

**THE ENDURANCE OF MEXICAN AMATE PAPER:
EXPLORING ADDITIONAL DIMENSIONS
TO THE SUSTAINABLE DEVELOPMENT CONCEPT**

DISSERTATION

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Preface

In 1992 I participated with a research team in a project on the potential management of trees for producing bark used in the manufacture of the hand-made bark paper called amate, one of the Mexican handicraft products in most demand. The manufacture of amate is carried out in the state of Puebla and we were based in the neighboring state of Veracruz. At that moment there was information among governmental institutions about the scarcity of trees for bark supply and the frequent intrusion of bark harvesters into Veracruz - it was said that most of them performed illegal bark extraction. The team was composed of biologists, artists and anthropologists. As an anthropologist, I was in charge of the social and cultural aspects of amate. I started gathering historical information about it and later prepared the field program. The financial support for the project stopped quite suddenly, as sometimes occurs in countries such as Mexico, where uncertainty is always present. However, my personal curiosity about amate continued.

When a new opportunity turned up to continue working on amate, some of my past motives were reawakened. The apparent scarcity of trees and the risk of over-exploitation were pointed out in some literature sources; the situation was vaguely described but it was generally assumed that the source of raw material was insufficient. Besides this, the most recent efforts of some institutions for rural development (INI and DGCP) had been oriented towards the implementation and coordination of tree nurseries where bark paper was manufactured. These projects had all failed. Overall, there was no clear understanding or knowledge of what was occurring as regards the resources used for bark.

I picked up the topic again at this stage. This time the scope was enlarged by the idea of analyzing the whole situation of bark supply, considering such questions as: Who are the harvesters? where do they debark? which tree species are used? and how are extraction activities carried out? I also contemplated elaborating suggestions to improve the management of tree resources in order to guarantee their conservation and thus the conservation of amate production. Even without preliminary fieldwork, I assumed that intervention for sustainable tree management was needed. As in other research cases and projects for rural development, the goals were established without a preliminary and unbiased study of the ground conditions.

It was assumed that the large amount of amate manufactured implied large amounts of bark; without this raw material there would be no such handicraft. On the other hand, it was astonishing that, although the bark raw material itself constitutes the main attraction of the amate handicraft for the consumer, there was no information about the resources employed, even though the scarcity or total depletion of these resources would mean the end of this handicraft.

The fieldwork lasted one year. As with other studies based on field observations, the original research questions and preliminary assumptions changed during the stay in the field. The supply of bark is based on diverse harvesting strategies, which include the expansion of the harvest area, the integration of more bark harvesters, the adoption of more tree species, and especially the recent adoption of a tree species of fast growth and wide distribution, occurring as part of the shade trees on coffee plantations. It became apparent that the problem regarding the supply of bark, which constitutes the first and main phase of the whole amate commodity chain, had basically been solved.

In a practical short-term sense, the questions first raised were answered: the supply of bark to meet demand are up to now resourcefully achieved. However, during fieldwork, continuous observation of how amate production and bark supply are accomplished and of the many different factors conditioning the everyday work of harvesters and artisans raised other questions. In a wider context, the continuity of amate cannot be answered straightforwardly and exclusively on the basis of the existence of a secure stock of raw material. It is linked to the historical background of amate and the present cultural, economic, environmental and political factors occurring at local, regional, national and international levels, which are shaping the everyday production of amate and bark harvesting. The historical background and multi-scale factors of amate production emerged as central to this study. In this way the scope of the original idea that centered only on bark harvesting became definitely wider.

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List of Acronyms

DGCP:	Dirección General de Culturas Populares / General Direction of Popular Cultures
FONART:	Fondo Nacional para el Fomento de las Artesanías / National Handicraft Development Fund
IMSS:	Instituto Mexicano del Seguro Social / Mexican Institute of Social Security
INEA:	Instituto Nacional para la Educación de Adultos / National Institute for the Education of Adults
INEGI:	Instituto Nacional de Estadística, Geografía e Informática / National Institute for Statistics, Geography and Information Systems
INI:	Instituto Nacional Indigenista / National Indigenous Institute
INMECAFE:	Instituto Mexicano del Café / Mexican Institute for Coffee
SAGAR:	Secretaría de de Agricultura, Ganadería y Desarrollo Rural / Secretariat of Agriculture, Livestock and Rural Development
SEDESOL:	Secretaría de Desarrollo Social / Secretariat of Social Development
SEMARNAT:	Secretaría de Medio Ambiente y Recursos Naturales / Secretariat of the Environment and Natural Resources (before SEMARNAP)
PAN:	Partido Acción Nacional / National Action Party
PRD:	Partido de la Revolución Democrática / Party of the Democratic Revolution
PRI:	Partido Revolucionario Institucional / Institutional Revolutionary Party
PROFEPA:	Procuraduría Federal de Protección al Ambiente / Office of the Attorney General for Environmental Protection
UAM:	Universidad Autónoma Metropolitana / Metropolitan Autonomous University of Mexico
UNAM:	Universidad Nacional Autónoma de México / National Autonomous University of Mexico
OIC:	Organización Internacional de Café / International Coffee Organization
NAFTA:	North American Free Trade Agreement

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Amate paper case study

1.1. A local handicraft with a long history in the world market

The history of amate is long and intricate (see amate time-line, Fig. 1.1). Amate has been manufactured in Mexico since pre-Hispanic times (ca. 300 A.D.). In the 1960s its production as a commercial handicraft started through the merging of two indigenous traditions: that of the Otomi people, who manufacture the bark paper, and that of the Nahua people, who decorate it with colorful paintings (Plate 1.1).



Plate 1.1. Amate paper: Otomi paper manufacture and Nahua painting.

Geographical area		Mexican history	
1200 - 1000 B.C.	Olmec Period	1000 - 300 B.C.	Middle Pre-Classical Period
Stelas (stone carvings) with representations of garments made from bark paper	Olmec (Gulf of Mexico) La Venta in Tabasco State and Tres Zapotes in Veracruz State	Maya (extensive spread into highlands and lowlands) El Peten, Campeche, Tabasco, Veracruz, Chiapas, Tampico, Guatemala, Belize, Salvador, Honduras	Maya lowlands Flourish and decline of great cities such as Tikal, Uaxactun, Palenque
		300 - 600 A.D.	Early Classic Maya till 900 A.D. end of Maya Classic Period
		Maya lowlands Flourish and decline of great cities such as Tikal, Uaxactun, Palenque	Maya lowlands Flourish and decline of great cities such as Tikal, Uaxactun, Palenque
		600 - 1200 A.D.	Early Post-Classical Toltec till 1200 A.D. decline of Toltec Empire
		Toltec Empire (central highlands) Tula city in Hidalgo	Toltec Empire (central highlands) Tula city in Hidalgo
		1200 - 1521 A.D.	Late Post-Classical Aztec Empire till 1502 major Aztec expansion
		Aztec Empire (Mesoamerica expansion) Tenochtitlan city Extended domain from central highlands to northern Honduras	Aztec Empire (Mesoamerica expansion) Tenochtitlan city Extended domain from central highlands to northern Honduras
			Profuse use of bark paper: tribute products, offerings, attire, codices, etc. About 45 Mesoamerica villages: paid tributes of bark paper to Tenochtitlan Bark paper codices: Matrícula de Tributos, Codex Huamantla, Codex Tlatelolco
			Assimilation and improvement of Mayan knowledge and techniques Masters in art, architecture and writing techniques
			Itzamna (the greatest god) one of the protecting gods of painted bark books, the inventor of writing, the "first priest" and "first scribe". Mayan screenfold bark paper books: Codex Dresde, Codex Paris and Codex Madrid
			Bark as cloth tunic Writing system is developed Mayan solar calendar in carved stone Extensive spread of Mayan knowledge (probably also of bark paper manufacture)

Geographical area (in relation to amate)	Amate history	1521 - 1540	1540 -1821	1821-1940	1960 -1990	The 1990s
Mexico Most Mexican territory	Burnt historical Mayan books and the Real Library of Texcoco Inquisition process against idolatry practices (thus use of ritual amate) Restricted use of paper, most coming directly from Spain "official paper" Spanish chroniclers recorded from direct sources the uses of amate in Mesoamerica	Spanish colonial period 1810 -1821 Independence from Spain	Liberal Reform The Republic 1910 -1940 Mexican Revolution	1968 Tlatelolco 1981 - 1985 Oil crisis Peso devaluation	The 1990s 1994 NAFTA The Zapatista Movement	
Central-West Mexico Tepoztlán, State of Morelos	In 1570 Dr. Francisco Hernandez, Spanish proto-medic collected information about American native plants: first news about amate manufacture by Nahuas of Tepoztlán European explorers (Boturini and Humboldt) recorded the manufacture and use of amate	Central-East Mexico Veracruz, Puebla, Hidalgo (mostly Otomí villages)	Ethnologists and explorers such as Frederick Starr, Dr. Leon, B. Christensen and H. Lenz visited indigenous villages where amate was still manufactured, San Pablito recorded as one of the most important amate producers	Emergence of amate paper as handicraft product Nahuas adopted the bark paper as surface for their traditional paintings First exhibition of painted amate in Mexico City (1963) Other important exhibitions: Mexico City (1982) France (1988)	Mexico and other countries	
Expansion of amate market Nahua and Otomí new paper products Amate exhibitions in Mexico and United States (1995) National Popular Art Prize (1998) UNESCO Handicraft Prize (1999)						

Figure 1.1. Amate time-line.

During the pre-Hispanic period amate paper was profusely used for many different purposes, such as ritual offerings, priestly attire, payment of tribute and as a surface for the elaboration of codices¹. Although its production and distribution were banned during the Spanish colonization, clandestine manufacture and ritual use persisted among a few indigenous groups. During the 1960s amate emerged as a handicraft product and was in great demand right from the start. Today it is one of the most widely distributed Mexican handicraft products at national and international levels. The Otomi people of San Pablito, a village in the mountainous region of Sierra Norte de Puebla, are the only people who manufacture amate paper in all Mexico. For the supply of bark they are increasingly reliant on the growing number of harvesters living in the region, who are expanding their harvest strategies to cover an area of about 1 500 km² within Sierra Norte de Puebla region. About half the total Otomi amate production is sold to Nahua painters, artisans in the state of Guerrero who, since the emergence of amate as a handicraft product, have been printing their traditional designs on bark sheets (Fig. 1.2).



Figure 1.2. Otomi - Nahua handicraft processing villages and bark harvest area. Otomi artisans, producers of amate paper settled in San Pablito village in Sierra Norte de Puebla, state of Puebla. Nahua artisans, painters of amate paper settled in eight Nahua villages along the Rio Balsas in the state of Guerrero. Harvest area refers to the effective area within Sierra Norte de Puebla from where bark trees are being harvested.

1 Amate constituted the base of the pre-Hispanic pictorial manuscripts called Códice (Codex).

At present, amate is probably one of the most versatile handicraft products in Mexico as regards use and distribution. Plain, colored or painted, amate can be found in different sizes and as decorative parts of a variety of products such as lamps and notebooks. Many types of market channels provide an outlet for the wide range of amate products. Amate is sold by the Otomi and Nahua artisans in the streets and open markets or plazas of the most important tourist cities and villages of Mexico. Exclusive pieces are sold in art galleries or exhibited in museums. They can also be bought via internet and can be found in handicraft stores in many cities of the United States and Europe – including Enschede.

The amate handicraft we currently find in many places all over Mexico, and in other countries besides, has a long history. Its endurance is based not only on the supply of the essential bark raw material but also on constant adaptations in terms of manufacturing technology, the resources used and channels of distribution. It is clear that the production of amate has been *sustained* over a long period of time, and that this production has adapted in various ways to both changing circumstances and contexts. Does this mean that production is, in the long run, sustainable? Is the history of amate the history of ‘sustainable development’ of a particular non-timber forest product? This thesis explores the ecological, economic and social dimensions of these questions, combining an analysis of the natural base with a historical understanding of *how* and *why* it has been used. In doing this, it was found that an understanding of the cultural aspects of the questions was central to the explanation of *how* and *why*.

1.2 Narrations from fieldwork

Since the last 40 years of its long history of production and use, amate has been commoditized as a handicraft product. So what we observe in the field are basically the changes occurring since its commoditization. As mentioned in the Preface, the first fieldwork observations motivated the widening in the original orientation of this study. The reader may well ask what was observed during fieldwork that prompted the change in orientation. Three narrations or sketches drawn from the fieldwork may serve as an illustration. At first glance they show the everyday life of Otomi artisans, but they also encompass complex linkages of various related social, economic and political factors.

First Narration: It is two o’clock in the morning. Otomi artisans, mostly women, are aware of the arrival of buses, trucks, cars or horses, especially those transporting bark bundles. During the last days of each week the *jonoteros*, as bark harvesters are called, come to San Pablito. Today five harvesters arrived, but sometimes 20 may arrive or, when the gathering of coffee grains starts, none. Some of them may

bring a few kilos of bark, others hundreds of kilos. Bark harvesters unload their bark bundles along the main street of the village and the selling starts. Negotiations among bark harvesters and the Otomi people may be quick or they may take all day. Although the selling may last the whole day and the revenues obtained may be low, more peasants from Sierra Norte de Puebla are engaging in this activity. Harvesters say that, although this is a risky and uncertain activity, owing to changes in the price of bark and sometimes difficulty in finding potential trees for bark supply, it is still the way to carry on and can at times be very profitable. Some participate the whole year round but others only during certain periods. To find harvestable trees is becoming more difficult although different tree types are being exploited which occur in forests, homegardens, ravines and mainly on coffee plantations.

Second Narration: In San Pablito large quantities of bark paper are manufactured by women. Early every day, they start to prepare for the manufacture of paper. As in pre-Hispanic times, a polished volcanic stone is the main tool used. They arrange the bark fibers in grid formation over wooden boards and beat them till the fibers amalgamate. During the day, women or children may transport packages of amate sheets. These packages, which contain maybe a few, maybe hundreds of sheets tied tightly together, are delivered to Otomi wholesalers. Most artisans sell their paper to local wholesalers; only a few sell it outside San Pablito. Throughout the day a wide range of paper products are manufactured in San Pablito: there are papers of different sizes in natural and artificial colors, as well as cut-out paper figures such as those representing the gods of plant seeds. During the night some families, guided by traditional healers, may participate in healing rituals. Traditional Otomi healers use the amate paper cut-out figures for special curations. Once, so they say, these were utilized for agricultural rituals, but working the land is no longer an important activity. Less apparent than the use of ritual paper is the conception about particular trees. Certain large *Ficus* trees, species used for bark supply since pre-Hispanic times, are surrounded with candles and cut-out bark paper – these are sacred trees.

Third Narration: Sierra Norte de Puebla, where San Pablito is located, is a very rough mountainous region. Walking through San Pablito, you are surrounded by mountains. This landscape contrasts sharply with the general appearance of the village. No longer rock walls and tiled roofs, but an increasing number of new houses, some half-built but all in different styles copying the houses of Mexico City or the United States, where the Otomi go to work. An increasing number of Otomi, and migrate to the United States. They generally go to North Carolina, where relatives or friends are working. They stay for a few months or even a couple of years, but most of them return to San Pablito. When the Otomi return, they quickly become involved in the life of the community – in work, family and also politics. Through their political work and pressure, the village is the only one in the municipality, besides the head village, which can boast a high school with a number of computers

for the students, and a private telephone service. And recently, an outstanding regional event occurred: for the first time an indigenous leader, an artisan from San Pablito, was selected as head of the municipality. It is the everyday amate paper production, the historical mobilization of Otomi selling amate outside their village, and their economic strength in comparison with other regional villages which form the basis of the extensive Otomi labor network and their regional political-economic status.

Thus amate paper is more than a handicraft and the supply of bark. Amate paper is a very versatile product with a long history. Throughout, it has been used for a variety of purposes with different social and cultural meanings. During the pre-Hispanic period it was profusely used for religious, economic and political purposes and was manufactured in more than 40 tributary amate villages. At present it is made in only one indigenous village in Mexico, by the Otomi people living in the mountainous region of Sierra Norte de Puebla. They manufacture large amounts of paper, using a basically manual pre-Hispanic technology and diverse tree species as sources of raw material. The supply of bark increasingly relies on the harvest activities of more peasants from the Sierra Norte region who are gradually integrating into this activity. The timing and strategies of the harvesters are based on a variety of tree types and sites of extraction, and are very much linked to the land use systems and agricultural labor calendars of the region. On the other hand, the manufacture of various types of paper products by artisans is generally linked to the outside demand associated with the tourist season. The integration of more peasants into local and regional forest extraction activities and handicraft production, as well as their engagement in national and even international labor markets, is a response to the social, economic and political changes all over Mexico. Amate paper, in its many different forms, ends up in the hands of consumers of all types. It is mainly used for decoration purposes or as a basis for manufacturing or decorating other products. It is also exhibited in national and international museums and galleries. Moreover, hand-made paper in general is in fashion. Amate, along with other types of hand-made paper, is sold in handicraft stores, open bazaars and shops specializing in natural products or fancy stationery; it is also peddled by artisans in streets, plazas, markets and on internet sites.

Insights from fieldwork narrations

Right from the start the three narrations, like initial images captured in the fieldwork, reveal the interrelation of social, cultural, political and economic factors across different spatial scales – from local to global – and the ways in which nature-society relations are occurring. These narrations outline current regional strategies for bark harvesting and the local organization of paper production, as well as their

links with agricultural activities, agricultural calendars and tourist seasons. The narrations depict changes occurring at national level, especially changes in labor patterns, tending towards the abandonment of agriculture and increased migration. They also depict the local internal social stratification among artisans, with differing conditions of access to markets, while at regional level San Pablito is building new forms of political interaction, based largely on the economic and social strength acquired through amate production.

The nature-society relations are depicted in the first and second narrations. These describe the perception and knowledge regarding bark trees, which are awarded different commercial and non-commercial values. Bark supply is not only the way of providing the raw material, it also reflects the way in which amate artisans - and now regional harvesters - interact among themselves and with their environment, and especially their perception, knowledge and management of bark trees. The local-global relations - relations that have intensified through the continuous market demand for amate - are depicted in the second and third narrations. The links among different geographical areas concern not only the places where bark extraction and the production, distribution and commercialization of amate are taking place but also the forms in which cultural values, images and messages are flowing from the local outwards, and vice versa. In this sense migratory movements and present forms of communication are bridging as well as imprinting new forms of paper production, local consumerism, social organization and personal aspirations.

One of the above aspects could have been selected as a study topic to deepen into the historical, social, cultural, political, economic or ecological understanding of amate production and to delimit it spatially and temporally. However, to understand the how and why of the long continuity of this production, and the ways in which paper manufacture and bark harvesting have been carried out, a holistic perspective was preferred. This perspective has been maintained, insisting on the relevance of understanding the historical background and the complex way in which different factors have and are shaping amate paper production. Along the way, the study revealed the underlying nature-society relations and local-global relations.

1.3 The case of amate: its place and aims within ‘sustainable development’

This study is positioned first within the sustainable development debate, and second within the non-timber forest products (NTFP²) approach, which constitutes one of the forms of operationalizing sustainable development, and under which amate paper made from bark raw material can be categorized. As will be discussed in chapter 2, it is proposed that nature-society relations and local-global relations are at the core of these perspectives. Amate as a case study attempts to unpack or spotlight them.

Sustainable development has been a controversial concept and defined in many different forms. In general terms the goals tend towards balanced development that considers ecological conservation, economic growth and social equity. Sustainable development pursues long-term goals and in this respect certain cases with a long history, such as the production of amate paper, deserve attention. In trying to explain their endurance, attention to the cultural dimension is essential. The cultural and historical dimensions combine to construct the common (social, economic and ecological) pillars of interest of sustainable development.

The worldwide social, economic and ecological conditions contrast with the goals promoted by sustainable development. While the aims of sustainable development tend towards achieving equity, social justice, economic balance and the integration of environmental conservation, worldwide conditions show acute social and economic stratification and the rapid deterioration of the environment. The basic premise of sustainable development in even today’s debate is that poverty is largely responsible for environmental degradation and therefore economic growth is required (Barrow, 1995)³. At the same time, the work of leading worldwide institutions is founded on the assumption that economic growth and enhanced world trade would benefit everyone. Nevertheless, the present situation reveals more stratified conditions between individuals, largely dividing the more developed countries from the less developed.

2 NTFP is the initialism for non-timber forest products. The term was coined about 15 years ago and refers to a wide range of forest products, excluding timber, which are potentially or currently used for commercial purposes. The term includes not only NTFPs from forests but also those from various other land use systems (chapter 2).

3 This is highly questionable assumption: much environmental degradation is the result of over consumption rather than under consumption.

Underlying these world-wide environmental, economic and social conditions, two major processes are occurring. These relate to the way in which nature–society relations are tending towards the commoditization of natural resources and the forms in which local-global relations are developing within a framework of globalization. Both types of relations are largely occurring to the extent of major pressure on resources at every level, while the intensification of interrelations through new means of communication and trade networks implies not only the exchangeability of products but also the flow of ideas, information and knowledge. These world-wide trends form the new context of nature-society relations and local-global relations.

The above forms the underlying processes of the NTFP approach. Targeting the goals of sustainable development, the approach seeks and promotes improved social conditions, the economic welfare of rural populations and the conservation of the environment, especially of forests. As will be explained in chapter 2, NTFP term as well as the sustainable development concept have been defined in diverse forms and endowed with different meanings. In the case of NTFP, the extent of the resources that the term covers still remains quite vague; there is no general consensus about the range of natural resources and products included. Nevertheless, one aspect that should be highlighted is the fact that in general the development of NTFPs promotes the commoditization of natural resources. In many cases this encompasses new forms of interrelating with nature and new ways of connecting with other individuals or groups in other geographical areas, mainly through market networks. This aspect is even more explicit in the case of NTFPs, where the end products are handicrafts that imply ample commercial circulation. Through the findings in the analysis of the amate case and the revision of the concept and forms of evaluating NTFPs, it was possible to identify and indicate certain aspects not thoroughly considered in NTFP evaluations. These deserve attention, at least in similar handicraft cases.

The study attempts to contribute to the actual discussion about NTFPs and sustainable development. This amate case study investigates the historical background and seeks to explain how this production has lasted for so long. In exploring the ways in which this production has endured, the cultural dimension offered important insights. Thus the amate case study examines how different types of relations among social actors at distinct spatial levels have been linked not only historically and economically but also culturally. In addition, it looks at how relations have evolved with nature, specifically bark trees, which are not simply seen as sources of bark supply but also perceived as culturally significant.

Throughout the history of amate paper, the interlinkage of different spatial levels has been a constant at local, regional, national and international levels where bark extraction, paper production and distribution have been carried out. Particular

emphasis can be placed on the relation between Otomi artisans and harvesters (for the bark supply), i.e. the local-regional levels. On the other hand, the supply of bark raw material implies the use, management and knowledge of bark trees occurring within the forests and different land use systems in the regional landscape, and is therefore also subject to regional land use changes. By considering these aspects the study attempts to engage in the debate about the cultural dimension of sustainable development, with emphasis on the nature-society relations and local-global relations.

As part of the thesis output, one of the research questions triggers the exploration of alternative recommendations for the development and conservation of amate production. The answer is complemented by discussion of possible changes that would certainly have implications for development recommendations. These observations and recommendations draw together many strands of information from the case analysis.

The amate analysis first delves into the history of use and the cultural aspects of amate paper and bark trees, then examines paper production and bark extraction, and finally explores the social, political, economic and ecological conditions that at different levels are shaping the everyday development of artisans' paper production and harvesters' bark extraction. Study of the regional landscape embedding bark harvesting and paper production was incorporated, expanding into the history of land use and aspects of land tenure, and contrasting the socio-economic and cultural conditions among different regional populations, both indigenous and non-indigenous.

As will be explained in chapter 3, a multi-dimensional framework was adopted to analyze the amate case. This framework made it possible, first, to integrate time and space scales and multi-level factors for the identification of change processes and, second, to adopt different interdisciplinary theories and concepts to enable the analysis of the amate case. The main processes of change were identified along the time and spatial scales, ranging from the pre-Hispanic past of amate to the present handicraft production, and covering different geographical areas – San Pablito village, the Sierra Norte de Puebla region, Mexico and other countries where amate has been produced and commercialized and where factors, especially economic and political ones, have directly or indirectly conditioned the amate paper production. A broad integral type of framework with a long historical view offers more insights for understanding the amate case than would be possible through single thematic researches⁴.

4 In practice most policies and projects for sustainable development but also researches pay attention to one of the main dimensions of the concept - the ecological, social or economic dimension.

This study may demonstrate that in the amate case, as perhaps in similar resource extractions and handicraft productions, the real conditions are far more complex than first thought, and many interrelated aspects must be considered before projects and policies for development and conservation can be elaborated or implemented. This study also demonstrates that elaborating these interrelated aspects goes far beyond using the three (ecological, economic and social) pillars of sustainable development as a sort of checklist, and their integrated analysis is found throughout the book.

1.4 Research questions

In what ways can the production of amate paper be said to be ‘sustainable’? And what light can the history of this product shed on the meaning of ‘sustainable development’, in particular its historical and cultural dimensions. This is a meta-question, which has to be analyzed using sub-questions that unfold into two types. The first three questions examine the amate case from the historical, cultural, ecological, political and economic dimensions. The fourth question, based largely on the information and analysis of previous answers, seeks insights that could contribute to the development and conservation of amate paper.

1. How have bark paper and bark trees been culturally embedded, and what social-cultural roles have they played throughout the long history of amate production?
2. What have been the effects of the commoditization of amate and the increasing demand for this product with regard to both local paper manufacture and trees used for bark supply?
3. What recent economic, natural resource and social factors at local and regional levels have significantly shaped the way that bark extraction and paper production are carried out today?
4. What insights can be derived from the previous discussions and what are their implications for the development and conservation of amate production?

These four questions are placed in a broad historical sequence for the amate case. The first question focuses mainly on the past of amate paper and bark trees. The second question investigates the initial and current effects of commoditization. The third question relates mainly to the present conditions of the regional context, and the fourth question looks mainly into possible alternatives for conservation and development of amate production.

1.5 Notes on sources of information and fieldwork

The key information for this study was obtained from different bibliographical sources and during fieldwork. A great part of the historical information about amate paper and tree resources was derived from the interpretation of codices and historical studies of the pre-Hispanic period in Mexico. The colonial period during which amate production was forbidden is less documented.

Two main aspects should be noted. These relate to the fairly abundant publications on amate paper but, in contrast, the lack of information on the Otomi. Amate paper is a topic that has already been studied from different perspectives. Some studies have focused on the historical archaeological aspects (Lenz, 1973; Seeman, 1990), on the symbolical aspect of Otomi ritual paper (Christensen, 1963; Sandstrom, 1983; Galinier, 1987), on the aesthetics and image representation of Nahua paintings (Stromberg, 1982; Amith, 1995), and on the work and commercial strategies of Nahua artisans (Stromberg, 1976; Good Eshelman, 1988). Amate has been a rich and attractive topic approached via different fields of knowledge, including archaeology, history and anthropology⁵.

Compared with other indigenous groups in Mexico, the history of the Otomi (as Carrasco Pizana (1979) and Galinier (1987) point out) is largely unknown. Galinier (1987) stands out as one of the few who have studied this topic from an anthropological and ethnographical perspective. Galinier remarks on the lack of studies about the Otomi people and the lack of documents and evidence concerning their past.

⁵ However as Goloubinoff (1994) comments, this does not necessarily imply thorough in depth-studies. Several publications about manufacturing technology, social and aesthetic aspects are quite superficial.

The same can be said for the whole Sierra Norte de Puebla region. This is one of the less documented regions within Mexico. The reconstruction of the changes in land use and land tenure carried out in this study was derived mainly from García Martínez (1987), one of the few historians who studied the social-political geography of the region. This author also notes the lack of regional information.

The bibliographical information was obtained from many different university libraries and official institute archives. It has been collected over the years since my interest in amate paper began. Most of the bibliography, both books and grey literature, was obtained from the libraries of the University of Mexico, the library of the Museum of Archaeology in Mexico City and Dutch university libraries.

Fieldwork was executed during 1999 and was divided into two main stages. The first was carried out in San Pablito village and the second around Sierra Norte de Puebla, where bark is harvested. The second stage was combined with regular visits to San Pablito village. The methods for data collection were various: mainly open interviews and systematic records about paper production and bark supply, and at the end of the fieldwork a formal ethobotanical survey on Otomi tree knowledge. The main stages of fieldwork and the methods used were as follows.

- *San Pablito, paper production*

Open interviews were conducted with different types of artisans and regular visits were made to some of them to record the paper manufacture technology, the forms of organizing handicraft production and the amount of paper elaborated. Some classes at the local high school provided the opportunity to share more information and make contact with more artisan families. The work in San Pablito did not concentrate only on handicraft production, but extended to other aspects of the village: religion, social organization, infrastructure, etc. Life stories were gathered about the involvement of artisans in craftwork and other activities, and the role or relevance of amate paper production in the regional context was discussed with artisans and non-artisans (wholesalers, immigrants, nurses, local authorities and school teachers).

It may be important to explain here that, according to some anthropologists, the Otomi are among the more reticent indigenous people in Mexico (Carrasco Pizana, 1979). Others have depicted the particular case of Otomi artisans in San Pablito (Christensen, 1963; Sandstrom, 1983). Goloubinoff (1994) comments on the reluctant attitude of the Otomi towards outsiders and the Otomi protection of their cultural patrimony.

- *Supply of bark to San Pablito*

To come into contact with harvesters and monitor the supply of bark, I joined Otomi women who wait for bark harvesters in the plaza of San Pablito, especially at the end of the week and in the early hours of the day. I joined them in the last week of each month. This enabled me to monitor the supply of bark and the temporal fluctuations in bark amounts and prices, and also allowed me to come into contact with harvesters. Most of them deny their involvement in harvesting and jealously protect their knowledge and information, so this was a valuable chance to meet them in action.

- *Regional bark harvest areas*

After I got to know the harvesters in San Pablito, I visited them in their villages to accompany them to the sites where they debarked trees. Around 20 visits were made, trying to cover the most representative sites in terms of biophysical characteristics, land use and types of trees debarked. This task allowed me to become familiar with the way in which harvesters organize their work and to recognize factors influencing these activities.

- *Tree species for bark extraction*

From the start of fieldwork tree specimens were collected, first within the limits of San Pablito and later in the areas visited with harvesters. These specimens were deposited in the herbarium of the Institute of Xalapa and the herbarium of the University of Puebla, where they were taxonomically identified. While collecting the specimens, open interviews with artisans and harvesters were conducted in relation to their knowledge about the trees, fibers and forms of tree growth. A more systematic exercise was carried out at the end of the San Pablito fieldwork. Key informants were chosen and were asked to group corresponding tree specimens, types of bark and types of paper – material collected during fieldwork. The objective was to record present knowledge about the trees as raw material for amate paper.

The reconstruction of the historical adoption of new tree species used for paper manufacture was based on existing bibliographical sources and interviews with Otomi artisans, especially those involved in bark harvesting at the start of amate commercialization, and regional harvesters. It should be mentioned that much confusion with regard to the tree species used exists in terms of their taxonomical identification (Appendix E). On the other hand, the lack of knowledge about the species being used has led to misinterpretations about the reality of bark supply found in different information sources.

- *Other information*

Much information was acquired in an informal way while traveling on local buses, waiting for buses and in markets and plazas in different parts of Mexico. In Pahuatlán, San Pablito and other sites along Sierra Norte, open interviews were possible with people linked to the commercialization of paper, who were acting as permanent wholesalers or temporary purchasers. In the tourist areas of Mexico City, Puebla, Oaxaca and Cuernavaca, among others, Nahua and Otomi artisans selling their products were interviewed regarding their sales strategies. Also some open interviews were carried out with regional government representatives to ascertain their opinion and perception about Otomi artisans, amate paper, harvesters and bark harvesting.

It is important to mention that, in comparison with other handicraft products in Mexico, amate paper has merited great attention from different perspectives. However, information remains scattered and uneven and, furthermore, the institutions involved in rural development, promoting handicrafts or conserving economic natural resources do not compile data or information on the bark supply or paper production and commercialization (e.g. number of artisans and harvesters, and material produced). There is a general lack of information in terms of the amount of paper being produced and the amount of bark required. An approximate and general estimation based on the field survey was attempted in this study.

1.6 Structure of the book

In Figure 1.3 the main phases of the bark paper commodity chain are disaggregated. The analysis did not follow the sequence of the commodity chain, however. For the purpose of explaining the components of this study, it is convenient to distinguish the main phases. These phases correspond to bark extraction, paper production and paper distribution. The topics studied are shown in Figure 1.3 and are located in distinct places along time and spatial scales: horizontally the local, regional, national and international levels are indicated; vertically the time scale is indicated, identifying three main periods: the pre-Hispanic past, the intermediate period of Spanish colonization and the most recent present, when bark paper emerges as a handicraft. As will be explained in chapter 3, identifying the spatial and temporal levels forms part of the framework used for analysis. These are mere categories that function for the analysis by breaking up the long trajectory of bark paper production into identifiable periods and into circumscribed geographical areas where bark paper moves. Figure 1.3 shows how distinct time and space interactions converge in each of the aspects studied. The numbers in parenthesis indicate the chapters in which these aspects are discussed.

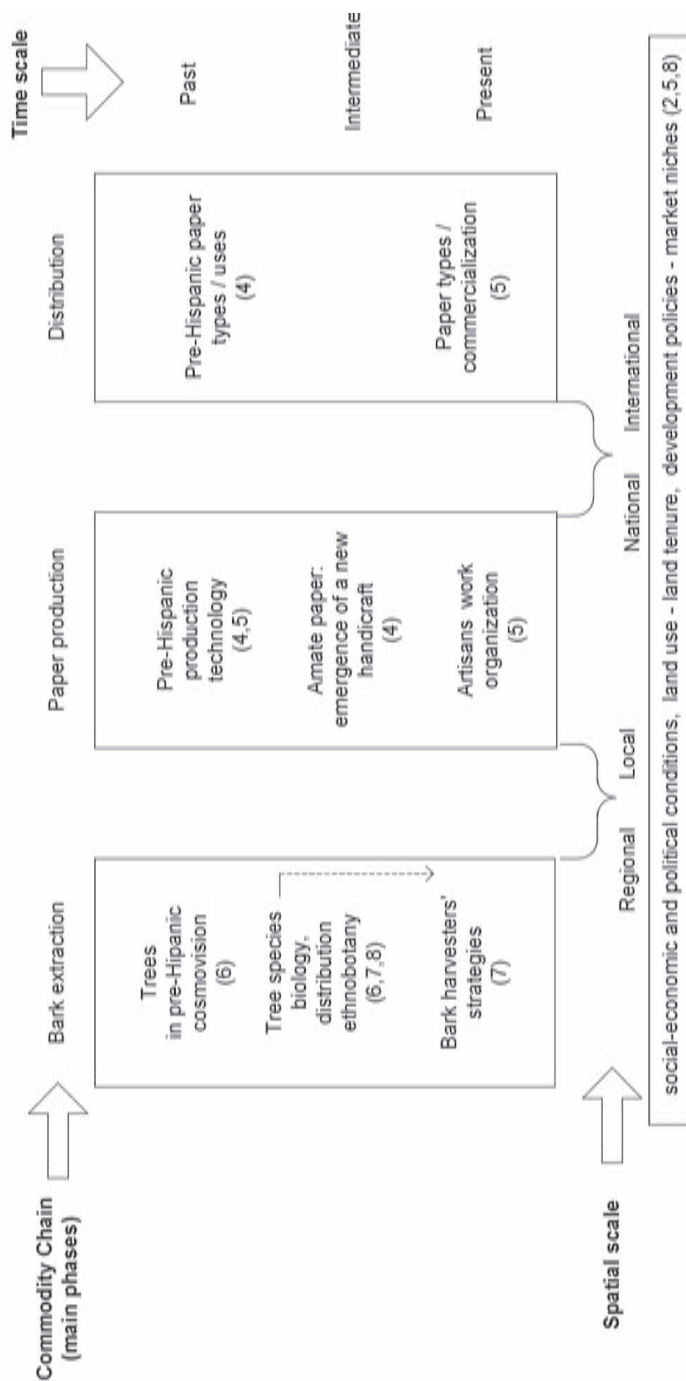


Figure 1.3. Structure of the book (chapters in parenthesis).

The material is divided into three parts. The first part of the study is dedicated to amate paper and its manufacture (chapters 4 and 5), the second part of the book focuses on the bark trees and the supply of bark raw material (chapters 6 and 7), and the third part covers the regional landscape (chapter 8).

Chapter 4 has bark paper itself as a line of discussion, charting its historical trajectory as a social production, from its origin to its present condition as a ritual and commercial object. The multiple uses of amate within XVI century life in Mexico are reconstructed and the impact of Spanish colonization on paper production is explored. The events that gave rise to the commoditization of bark paper and the present social-cultural role of amate paper production within local and regional contexts are also scrutinized. The role of paper within the Otomi political strategies in the most recent regional political movements receives particular attention. In chapter 5 different aspects of paper production are described. These cover the present and part of the past regarding the technology applied to paper manufacture, the actual organization of artisans for paper production and the forms of commercialization, as well as an overview of the whole amate commodity chain. The last part of this chapter describes the economic, political and social role of San Pablito and Otomi artisans within the regional context.

In chapter 6 the historical trajectory of trees used for bark raw material is described. The past and present symbolical values of the trees are analyzed, as well as historical use, the gradual adoption of new tree species since amate handicraft production started, and changes in the Otomi knowledge of bark trees. Chapter 7 focuses on bark harvesting strategies and the bark supply to the Otomi village. Within the whole bark paper commodity chain this activity stands as the first and prime commodity phase. It entails the harvesters' knowledge of trees for bark extraction and the display of different harvest strategies, as well as the different economic and natural conditions influencing temporal fluctuations of bark supply.

In chapter 8, the focus is on the regional context. Here the history of the land tenure and land use systems of Sierra Norte de Puebla are described and discussed in order to trace the context in which bark extraction and paper manufacture are carried out and to understand the present natural and managed distribution of the different bark tree species used for amate production. The contrasting socio-economic conditions of the two main population types of the Sierra, the mestizo and indigenous, are described. Within the land use systems where bark trees occur, coffee plantations deserve special attention, not only because they represent the main harvest sites but also because of their relevance at regional level, in ecological, social, cultural and economic terms. At the end of this chapter the national forest and law conservation regulations in relation to extractive activities and NTFPs are briefly discussed.

In the last chapter of the book (chapter 9) the research questions are addressed. However, a brief historical recapitulation of the case study is given first, to obtain a general overview of amate paper and compare the main characteristics within the three identified historical periods (pre-Hispanic, Spanish colonization and the present). Answers to each of the research questions are attempted, involving recommendations and suggestions for conservation and development and discussing possible future changes impacting on intervention for conservation and development of amate paper production. As part of the conclusions of this chapter, the amate case is discussed in relation to sustainable development concept with particular regard to the cultural and historical dimensions and the nature-society relations and local-global relations unpacked in the amate study case as an example of non-timber forest products. At the end some general reflections centered on the significance of the multi-dimensional framework are presented.

In the appendices, most sections concentrate on the biological aspects of bark trees. These include the description of the function of bark tissue (Appendix A), the characteristics of bark fibers in relation to amate manufacture (Appendix B), and the biological characteristics of bark tree species (Appendix C) and *Trema micrantha* (Appendix D). All this information is essential to understand the technology used for paper manufacture and bark harvesting, and also to understand the extraction bark calendar and the Otomi and harvesters' knowledge of bark trees. Appendix (E) offers an overview of the history and discrepancy regarding the identification of the tree species used for amate.

**Sustainable development and
non-timber forest products**

2.1 Introduction

This chapter focuses on the discussion surrounding sustainable development debate and the non-timber forest products NTFP approach – their definitions and implications, as well as the critiques reviewed. The first part centers on the sustainable development debate. First, the emergence of this concept and its various shifts are briefly reviewed. Second, the cultural dimension of sustainable development is discussed, followed by the nature-society and local-global relations involved in this concept.

Without trying to deepen the already rich discussion on sustainable development, this chapter is based on a literature review, with the aim of acquiring a comprehensive overview of the development of the concept itself and gathering significant opinions about the cultural dimension. The section on the cultural dimension of sustainable development is based largely on Milton's (1996) *Environmentalism and Cultural Theory: Exploring the Role of Anthropology in Environmental Discourse*.

The second part focuses on the NTFP approach. As mentioned in chapter 1, this approach stands out because the main raw material for amate paper is an NTFP. On the other hand, this approach illustrates one way in which sustainable development is put into practice. Among the various implementation strategies¹, an NTFP approach appears an appropriate way of analyzing and contrasting the reality of the amate case study with sustainable development goals. Although treatment of the case study does not follow any formal or established forms for studying or evaluating NTFPs, the amate case, particularly the bark extraction phase, does lie within the province of NTFP.

At the end of this chapter the conditions and status of NTFPs and handicraft production within the Mexican context are described.

1 Within the area of natural resources management, implementation strategies of sustainable development for agricultural purposes and forestry are important (Farshad and Zinck, 1993; Muul, 1993).

2.2 Sustainable development

2.2.1 Brief overview of the sustainable development concept

In the last 20 years ‘sustainable development’ has probably been one of the most quoted terms in development literature. It has been broadly adopted in different branches of social sciences oriented towards the analysis, design or implementation of development studies and programs, and has been copiously defined (Lélé, 1991; Farshad and Zinck, 1993; Barrow, 1995). Since its first application it has passed through various phases.

Within the environmental debate, sustainability was first used in the mid-1970s and widely promoted by *the World Conservation Strategy* (IUCN, 1980), demanding human welfare and support for conservation and the environment. During the 1980s and particularly the 1990s sustainable development became the developmental paradigm, adopted and promoted widely by international agencies as well as local ones. At the start it was dominated by an economic perspective, pointing towards a strong link or relationship between economic development, poverty and the environment. It was declared that poor economic performance increased poverty, which in turn aggravated environmental degradation. Reducing poverty was a crucial step according to the document that put sustainable development into the political and economic arena – the *Brundtland Report* (WCED, 1987).

While the economically oriented perspective of sustainable development continues to be the fundamental premise of the concept, there have been critiques and other views about its conceptualization and its forms of operationalization. In some of these more recent views the attention given to technical and managerial capabilities, pricing and subsidy policies has shifted towards other aspects of a more ecological and participatory nature. It has been recognized that there is a need to understand complex interactions between resources and activities and to consider the dynamic behavior of resources, as well as the need to go further into the causes of poverty and degradation. Blaikie (1994) combined the concerns of ecology with a broadly defined political economy, arguing that environmental problems in the Third World are less a problem of poor management, overpopulation or ignorance than one of social action and political-economic constraints. Blaikie coined the term ‘political ecology’, which appeals to the need to understand the relationships with nature while considering the historical, political and economic contexts. This analytical perspective has been partially or completely adopted in a number of natural resources management studies, such as studies of landscape change (Fairhead and Leach, 1996; Batterbury and Bebbington, 1999; Dahlberg, 2000).

Other new perspectives on sustainable development continue to arise in different fields of study, challenging the term and its implications. In geography, the understanding about the highly varied and changing conditions of biophysical environments and natural disturbances contrasted with past notions of inertia and equilibrium. Instability and even chaotic change in biophysical environments, as well as the capacity of systems to recover or restore themselves (resilience), have been considered, prompting the reformulation of some studies such as those concerned with landscape and landscape change (Zimmerer and Young, 1998). As regards the social aspects, Zimmerer (1994) stresses such concepts as adaptation, ethnicity and power. This author coined the term 'new ecology', stating that in a '... world where variation matters greatly, "new ecology" shares three environmental dimensions – the importance of time (history), spatial scale, and subjectivity' (ibid.:117) (subjectivity being understood as the capacity of humans to respond to environmental modification). Different capacities arise from unequal access to material resources and from divergent attitudes, values and beliefs. This view, according to Zimmerer (ibid.), calls for flexible and participatory approaches for the sustainable management and use of resources, noting that active local participation could fill the gap in environmental conservation and economic development.

Peet and Watts (1996) provide new ideas for the critical political assessment of environmentalism and sustainability. In their work, they open up a discursive arena that they call 'liberation ecology'. According to the authors, this enables the analysis of the relations between societies and natural environments, particularly the character of such relations, so often contradictory and conflictive. In their work various forms of socio-political actions, ranging from social movements to individual resistance, are seen as highly significant. These authors consider that Blaikie's 'political ecology' gives significant place to plurality but lacks analysis of social confrontation, struggle and conflict, and also misses the analysis of politics in various social arenas. Politics 'must be central to political ecology' (ibid.:8).

While new perspectives on development arise, sustainable development still remains a vague concept. There is a lack of consensus in defining it. Some authors such as Lélé (1991) feel that this allows the search for common ground, even from opposite positions within the environmental debate. It is interpreted differently and also manipulated by various interest groups (Eden, 1994, in Barrow, 1995). More recently the sustainable development concept has been criticized as being controversial and primarily a form of hegemonic discourse between developed countries (Escobar, 1995).

Despite the various shifts in its conceptualization and the lack of precise universally accepted definitions, sustainable development continues to be a useful multi-dimensional concept. The mainstream of sustainable thinking conforms to the basic idea of ecologically sound and socially equitable development. This idea, engendered by the Brundtland Report and reinforced in the most recent attempts to clarify and operationalize the concept at the 1992 UN Conference on Environment and Development (UNCED, 1992), involves diverse forms of participation and seeks to articulate local and global needs and agendas.

2.2.2 Nature-society relations and local-global relations

Two aspects within the sustainable development concept (chapter 1) need to be considered here. Sustainable development comprises the relations between the systems of society and nature, and those between different spatial levels, ranging from local to global. In fact, the emergence of the sustainable development concept has its origins in global awareness of environmental conditions and the identification of direct linkages between local environmental degradation and global consequences, and vice versa. The concept encompasses new forms of relations between nature and society across local and global geographical scales.

Nature-society relations

The way in which nature-society relations are considered within sustainable development has its roots in the way in which ‘nature’ has been conceived. In this sense the Brundtland Report has had severe implications. It marked the start of international concern about the need to confront increasing deterioration of the global environment, and recognition of the link between environment and development. Before publication of this report, ‘nature’ had been largely ignored in the economic development discourse. But this link between environment and development also implied a shift in the conceptualization of nature (which became ‘environment’) and in nature-society relations (Sachs, 1992; Escobar, 1995).

This aspect has been viewed from two perspectives. Prior to the Brundtland Report, development generally ignored the impact on nature; thus despite its implications, the shift to ‘environment’ can already be seen as a step forward in the new conception of sustainable development. But environment, according to Sachs (1992) and Escobar (1995), has largely meant the disregard of nature. According to Escobar (1995), when nature and everything relevant to natural functioning is called

‘environment’, it reflects a new view of nature defined according to the urban-industrial system. It implies the possibilities to plan, manage and organize nature. It also implies that nature is ‘natural capital’, comparable to economic capital and assessed according to costs and benefits (Sachs, 1992; Hajer and Fischer, 1999).

This last aspect has become an important element in sustainable development thinking. It implies that all aspects of nature have monetary value. The implications of valuing flora and fauna in this way are numerous. If nature can be priced, then knowledge of nature can be priced, including the historical forms of knowledge, such as knowledge of natural resources within local community processes (Ellen, n/d; Ellen and Harris, 2000). This is especially relevant in the case of NTFPs, as will be further explained.

The main idea behind sustainable development is based largely on the premise that economic growth would alleviate poverty. This implies, according to Escobar (1995), a new capitalization of nature. This capitalization extends to the appropriation of territories and communities and also to local knowledge, which is seen as a useful complement and as something that exists in the minds of individuals about external objects (*ibid.*).

In the conceptualization of nature-society relations it has been argued that the main difference between Western and non-Western societies lies in the way they perceive nature. Western perception is centered on opposition between or separation of nature and society, where non-formal oral indigenous knowledge has been largely displaced by science and technology (Ellen and Harris, 2000). In fact, as Milton (1996) states, the idea of nature and society as two separate systems is a product of the Western ‘scientific’ Cartesian forms of reasoning and categorizing.

The borders and separations between nature and society have long been a rich topic of discussion in the field of anthropology and in social science in general. It has been said that the nature-society dichotomy hinders true ecological understanding (Descola and Pálsson, 1996). According to Milton (1996), the continuous reproduction of this dichotomy between society and nature in scientific literature is the reason why the conceptualization of nature-society relations has failed. Among people in traditional societies the nature-society dichotomy seems meaningless (Descola and Pálsson, 1996). Milton (*ibid.*) states that, while some societies may draw predominantly social metaphors to describe nature, others may not recognize distinctions and have other ways of classifying the environment. Such variations will be found not only between cultures, but also between groups and individuals within a community and among different social contexts, e.g. domestic, public, religious and secular. These variations, however, appear to be vanishing in the face of global sustainable solutions.

Although, as explained in the overview of sustainable development, local forms of natural resources management and participation strategies have received attention, it appears, as Milton (ibid.) suggests, that the scientific basis of environmental knowledge at large is seen as more reliable than the knowledge derived from local experience. The main idea of sustainable development is based on the premise that economic growth will alleviate poverty) and that this can be solved through environmentally sound technologies and the equitable distribution of the international economy. Throughout, a parallel process occurs, tending towards the centralized control of local resources and the imposition of Western views regarding the environment, based on scientific premises.

Local-global relations

The sustainable development concept evolved from the recognition of the deterioration of ecosystems. Deterioration at local level affects the global environment and concurrently global environmental changes have impact at local levels. As Dryzek (1997:129) points out, ‘... the basic entities stressed in sustainable development are nested systems, ranging from the global to the local. The systems in question are both social and biological’.

The construction of sustainable development is in itself global. Sustainability must be managed at global level. The entire planet has become the object of environmental concern (Sachs, 1992) and the same technology has generated a global view that is held to be qualitatively different from local perspectives (Ingold, 1993, cited in Milton, 1996). But the implications have been various. The understanding of a single ecosystem has set new forms of international cooperation, observed in the way institutions, governments and organizations are dealing with the premises of this concept. In such a way a number of regulations and limits are settled and circulated among different spatial scales.

Apparently linkages among some aspects of the nature-society relations and certain levels in the local-global relations are occurring in governmental policy-making, planning and numerous actions in the political-social spheres. The local-global aspect has received most attention in the multi-level governance debate (and in the production-consumption cycle). Although already mentioned in the first Dutch NEPP² (1989), the interlinkage between the multi-scale aspect of environment and

2 NEPP: National Environmental Policy Plan, the Netherlands. First plan to develop at national level a strategy to move towards sustainable development through a set of goals that can be revised in response to evaluation or new circumstances.

the multi-level aspect of governance has only recently received more attention (Bressers and Rosenbaum, forthcoming). The nature-society relationship received attention in the discussion on 'ecological rationality' (Dryzek, 1997; Lafferty, 2000).

Sustainable development is a global argument that, as pointed out by Hajer and Fischer (1999), is far from being appreciated in a unified way, with a shared understanding. Rather than setting a pre-determined direction and a set of precise goals, sustainable development both as a concept and in practice offers paths for varying approaches to pursuing sustainability. But to reach long-term sustainable development stable institutions are needed. In this sense Dryzek (1997) mentions that, in order to achieve sustainable development, shifts in power are required between the different levels, the objective being to meet the challenge of sustainability more effectively. This applies particularly to the Southern nations, which are generally less industrialized than the Northern ones (Barrow, 1995), and where a shortage of institutions to promote long-term sustainable development is a common situation.

This aspect supports the experimental search for new forms of organization at local level (Dryzek, 1997). 'The frequent appeals to coordinated international action and grassroots participation suggest that these shifts would be away from the nation-state as presently constituted, to both higher (transnational) and lower (local) levels of political organization' (ibid.: 130). The need for political organization and local empowerment is also marked by Toledo (2001). The author explains the need to reorientate sustainable development into an integrative approach focusing on sustainable community development, where local self'-reliance is the primary goal, particularly of communities still largely exploited. It is basically the development of mechanisms that enable communities to take or retake control of the processes that affect it. Control needs to be re-established at different levels: control over territory, natural resources and cultural values, as well as social and political control. All this implies the capacity for a community to organize itself socially, politically and productively.

2.2.3 The cultural dimension of sustainable development

The cultural dimension has relevance within the sustainable development discourse and within its forms of operationalisation. Culture enables the way in which sustainable development is conceived and socio-cultural relations with the environment are carried out to be understood, as well as the diversity of meanings involved (Milton, 1996; Hajer and Fischer, 1999). Within the operationalisation of sustainable development the cultural dimension ‘... constitutes the way to move beyond the dominant global techno-managerial discourse and its recommendations and to uncover more socially and culturally appealing alternatives’ (Hajer and Fischer, 1999).

Hajer and Fischer (1999) note that, although within sustainable development the concept ‘culture’ has a number of interpretations, it has been largely relegated to the ‘diversity of folklore’, and in this sense the authors point out that ‘... Interpreting culture, in other words, is not limited to the understanding of “other” culture as is the case with indigenous culture, but rather is a reflexive exercise relating to the project of sustainable development as well: culture is also brought to bear in its very own conceptualizations and policy technologies’ (ibid.:8).

In the face of the various interpretations of culture, the concept needs to be defined. An extensive number of definitions have been coined. The one adopted in this study is proposed by Milton (1996) in his anthropological study about the cultural analysis of environmental discourse. According to Milton, anthropologists cannot separate politics, economics and culture into distinct spheres. All must be seen, at least in part, as cultural phenomena. In anthropology, the central analytical distinctions have not been between the different components of culture but within culture itself, as something that exists in people’s minds, and cultural phenomena are assumed to interact in active forms of social organization and processes. By defining culture, in general terms, as the totality of what people know, think and feel about the world, anthropologists are able to treat all differences in human action, whether they are observed within or between communities, as expressions of cultural diversity (ibid.).

The sustainable development discourse requires a particular kind of understanding. As Hajer and Fischer (ibid.) have noted, over the past decade the need to return to an analysis of the broader cultural implications of environmental discourses has become increasingly clear. It helps to answer questions about identity, about how social relationships become redefined, about how particular ways of doing things are either reproduced or changed.

Culture is adopted to delve further into the appreciation of the particularity of the way societies relate to the natural environment. The argument that the cultural dimension can contribute to an understanding depends on the idea that culture plays a role in nature-society relations. Culture, as Milton (ibid.) suggests, is basic to the way people interact with the environment, through which people understand the world and their place in it. Culture is in minds of people and consists of perceptions and interpretations. ‘... By analysing the relationship between people’s cultures and the ecological impacts of their activities, we might be able to understand which cultures, and which cultural features, are ecologically sustainable, and which are not’ (ibid.: 66). Milton goes on to suggest that more culture-sensitive observations should be made, not only to explore the different ways in which the social order is implicated in environmental politics, but also to observe it in the practice of sustainable development.

In the face of an increasingly globalized world and its commoditization, two last comments are important. Cultural relations have to be understood in relation to the local and the external, particularly within the sustainable development discourse that arose from a global standpoint. To study culture in the global arena requires new analytical concepts to be adopted. Traditionally, anthropologists have tended to select specific fieldwork locations, but in the global arena many cultural phenomena have no location and the products of contemporary discourse can be made available to anyone with access to the appropriate technology.

On the other hand, the privatization and pricing of nature have accelerated within globalization. Nature, according to Descola and Pálsson (1996), is no longer a local affair but has become a marketplace. A fundamental transformation is taking place in many societies as a result of the rapid extension of the market to include natural resources. The understanding of how this is occurring requires, according to the authors, anthropological studies of the concepts and practices of ‘environmental economics’ and the commoditization of the natural environment. At present commoditization is an important field of research within which anthropological knowledge could help in interpreting or ‘spelling out’ some key concepts frequently applied to the economy, such as *market*, *efficiency* and *production*.

2.3 Non-timber forest products

2.3.1 Brief overview of the development of NTFP approach

Although the term ‘non-timber forest products’ is new, these types of products are not new. In fact what are now called non-timber forest products (NTFPs) are in many cases products obtained from natural resources traditionally used and managed by rural populations, particularly indigenous people living in tropical forests. Furthermore, some are products that have been on the market circuits for a long time. Centuries ago, through the contact of cultures and inter-oceanic expeditions, natural products started to be interchanged. Many were highly valued and under intense extraction pressure, such as quinine, rubber, pepper, etc.

However, the NTFP approach emerged less than 20 years ago within the framework of sustainable development (in accordance with the goals and premises of sustainable development explained in section 2.2.1). NTFP approach begin with the overall goal of alleviating poverty, identified as one of the basic causes of environmental degradation, and economic growth should be promoted in ways both environmentally benign and socially just.

NTFP approach is are based on the assumption that the forest will remain standing and more or less biologically intact under sustained harvesting whenever local populations receive socio-economic benefits from the use and distribution of some forest resources. They generally imply environmental management and economic development while giving attention to rural populations living in or close to forest lands (Neumann and Hirsch, 2000).

Since the onset of NTFP awareness, three main periods can be identified:

1. At the end of the 1980s and the start of the 1990s, when study results showed the economic potential of NTFP in relation to other land uses. These studies aroused interest in NTFP (based on extractivism), which in turn generated new interest in specific forest resources with commercial potential.
2. During the first half of the 1990s, diverse studies and reports recorded, described or analyzed the current or potential importance of specific or diverse NTFPs centered in specific areas or regions. During this period frameworks or guidelines for assessing potential NTFPs and for planning commercial management were published by national and international agencies for rural development and forestry conservation.

3. From the mid-1990s onwards, frameworks and guidelines have continued to be published, as well as more in-depth NTFP studies . However, a change of view about NTFPs has taken place. There is generally a tone of reservation and doubt, which contrasts with the positive expectations raised a decade ago when NTFP awareness was new.

The enthusiasm for NTFPs was derived to a great extent from studies that acclaimed their economic value. Ecological and economic studies carried out in Amazonia to compare the production of fruits and rubber (Peters et al., 1989), in Belize on examples of medicinal plants (Balick and Mendelsohn, 1992), and in Sumatra on rattan (Siebert and Belsky, 1985) were among the first studies to demonstrate the economic importance of NTFPs. Compared with such land uses as agriculture and cattle ranching, the idea of NTFPs was widely promoted in the 1980s as an alternative use of forests. Other key factors behind this initial interest were: ‘The discovery of tropical rainforest as an endangered biome rich in biological and genetic diversity ... [and] the recognition of the limitations of traditional forest and protected area management’ (Neumann and Hirsch, 2000:4).

During the 1990s encouraging statements about the prospects of NTFPs were extensively circulated. Many governmental development, research and environmental organizations and NGOs followed this direction. In the UN Conference on Environment and Development (UNCED, 1992), NTFPs were included in the sustainable forest management agendas. FAO (1991) stated that:

‘In fragile ecosystems, NWFP [non-wood forest products] activities hold prospects for integrated forms of development that yield higher rural incomes and conserve biodiversity while not competing with agriculture.’

The initial paradigm, however, has been questioned. The parallel goals of sustainable conservation of natural resources and socio-economic development have demonstrated that in many cases these goals have not succeeded and are rather difficult to achieve. International agencies have recognized the limitations of NTFPs. Within Tropenbos International, the Dutch NGO supporting policy-makers and forest users, it has been stated that: ‘... It has become clear in the past few years that the conservation potential of commercial NTFP extraction is limited’ (Ros-Tonen, 1999:26).

NTFP development encounters difficulties. Among those mentioned are the contrasting perceptions of the social actors involved in the extraction-production-distribution of NTFPs. Stakeholders with evidently different interests are unlikely to share the same development or conservation objectives. Economic goals of local

users may not coincide with the conservation goals of those concerned with preserving biodiversity. In fact NTFPs encompass antagonistic views, since ecological sustainability is usually expressed in terms of maintaining biodiversity whereas NTFPs focus on selected resources. Various difficulties have arisen in NTFP development and, as more is done, it is being clearly revealed that sustainability has a number of dimensions.

There are also many aspects not previously foreseen that are difficult to assess. Among those mentioned are the changing social and political frameworks, the flexible and weak market networks, the emergence of complex commodity chains leading to socio-economic stratification and knowledge gaps, and the vulnerability of natural resources exposed to over-exploitation when market pressure exceeds their regeneration. In general it has become apparent that fulfilling the NTFP goals – sustainable forest conservation and socio-economic development for local populations – is subject to many conditions.

2.3.2 Evaluation and assessment of NTFPs

Although several evaluations or guidelines have been elaborated for identifying potential NTFPs and their commercial development, the main criteria for evaluation are still lacking. This is due to various reasons. First, the term ‘NTFP’ is vague. At least 11 different terms used for NTFP have been identified (Wong, 2000), which in turn and more importantly may assume distinct implications for development and conservation. These resources have been called ‘minor forest resources’, ‘non-wood forest resources’ and ‘non-wood forest products’, among other things. The definition of what these terms imply also remains vague. Two examples may serve as an illustration:

1. NTFPs are all products derived from biological resources found on forest land but not including timber, fuelwood, lac or medicinal plants harvested as whole plants (Wong, 2000).
2. The term ‘non-wood forest products’ used by FAO (1995) refers to goods of biological origin other than wood, as well as services derived from forests and allied land uses.

Second, and highly important, is the variety of situations under which NTFPs develop. They cover a wide variety of resources, extracted and processed within distinct ecological, economic, social and cultural contexts. The distinctiveness of such conditions has been identified as a current problem in the evaluation and support of NTFPs. The following problems are frequently mentioned.

- *Between plantation and forest management*

Non-timber forest resources occur within a wide range of land use types. A general tendency to sharply distinguish ‘natural forest management’ from ‘plantation forestry’ prevails, whereas in reality forest management and forest production are highly varied. A wide range of systems or a ‘continuum of production systems’ (Wiersum, 1996) exists, from basic resource collection in natural ecosystems up to the intensive management of trees. Often local resources management, such as agroforestry systems³, which range from forest to agricultural land uses and where NTFPs are common, is neglected or overlooked by governments. This has hampered the possibility to define commercial NTFPs as separate land use types.

- *Between agriculture and extraction activities*

Similarly to the land uses where these resources occur, the place of these activities within the living strategies of rural households is difficult to delimit. Since forest extraction is an activity originally carried out by rural peasants as part of other income or survival strategies according to temporal or random calendars, the limits between daily activities and income-generating activities are often not clear-cut. This contributes to raising possible conflicts between commercial and subsistence use of NTFPs and to the problem of considering NTFPs as a separate and unique economic activity within household livelihood strategies.

- *Flexible and fluctuating markets*

NTFP markets have been characterized as extremely dynamic in social, temporal and spatial terms. These markets are very flexible according to accessibility, seasonality and demand. NTFPs are characterized by long and complex commodity chains. A wide range of social actors operate between the harvesters and the final consumers, and the structure of relationships between collectors, middlemen, traders and wholesalers can be highly complex. These conditions complicate the planning and commercialization of NTFPs.

³ Agroforestry has been a collective term for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit, in either a spatial mixture or a temporal sequence. The trees in agroforestry practices generally fulfill multiple purposes, involving the protection of the soil or improvement of its fertility, as well as the production of one or more products (Cooper et al., 1996).

The lack of definition regarding NTFPs has hampered their recognition within governments, which for administration purposes are generally divided into forestry, agriculture and horticulture. Therefore, NTFPs often go unrecorded in official statistics and are usually not incorporated in national regulations about land, natural resources management and development programs. On the other hand, it has been observed that, owing to the great variability and flexibility of NTFPs, economic valuations can be misleading as far as real conditions are concerned. This is caused by ignoring the costs of transport, materials and marketing, and by taking for granted stable market and social conditions, which in most cases have proved to be highly changeable and flexible.

As more information is being gleaned from specific case studies, a more complex picture of all the aspects involved in NTFPs is being built up. First the difficulties inherent in NTFPs and in coining a general definition for NTFP have become apparent, as well as the problems in elaborating evaluations for their commercial development. Second the difficulties in arriving at generalizations or patterns of change have been demonstrated. Nevertheless, some studies based on numerous NTFP cases around the world attempt to arrive at general changing patterns and to generate hypotheses regarding NTFP dynamics. From a quantitative perspective, Byron and Ruiz Pérez (1999) are carrying out a worldwide comparison of NTFPs, and Wollenberg (1998) generates qualitative hypotheses about patterns of change in NTFP cases.

The need for more holistic NTFP methodology

There are some important aspects to depict: first, the types of studies that have prevailed within the NTFP approach and the aspects that have been given more attention; second, the need for integral studies covering the social, cultural and biological dimensions of NTFPs.

In NTFP evaluations, it generally appears that assessment of the ecological and biological aspects has been more systematized than that of the social and cultural aspects. The same can be said for the assessment or establishment of forest-based enterprises that involve conventional financial economic methods. The reason for this is probably the heavy reliance on formal quantitative methodologies in the ecological and economic spheres, but it could also reflect the general lack of understanding about social and cultural factors and their importance. However, in the practical sense, ecological and economic estimations have helped to attract the attention of policy-makers at national and international level, as well as, independent groups and people involved in private companies.

Since the rise of NTFPs is closely linked to objectives for forest conservation, and consequently the harvest phase and extraction limits have been treated in greater depth (Neumann and Hirsh, 2000), much attention has generally been given to extraction limits, stressing the importance of estimating and ensuring ecologically sustainable rates of extraction. But as more knowledge about NTFP cases have been acquired, it has become apparent that, even if sustainable extraction is achieved from an ecological standpoint, there are diverse conditions that could lead to or induce unsustainable harvesting levels, such as poverty, lack of alternative income-generating options and unfavorable policy and land regulations. Moreover, harvesting activities are closely related to external market conditions, which have showed to change fast and many times in an unpredictable way. In NTFP studies the attention in all these multi-level factors and a view of the whole extraction-production-distribution system is still lacking. This aspect is especially relevant for processed non-timber forest resources used as raw materials for the manufacture of other final products such as handicrafts.

Due to the diversity of aspects converging in NTFPs, their evaluation clearly requires the integration of many different fields of study, including economics, ecology, anthropology and geography. Still, evaluations focus on specific aspects, for example the ecology of NTFPs and management recommendations for sustainable harvest (Peters, 1996), following methods currently used in ethnobotany (Martin, 1995; Cunningham, 2001). Other evaluations concentrate on the economic aspects (Godoy and Lubowski, 1992). The challenge, as explained by Neumann and Hirsch (2000), consists of understanding the ‘areas of interaction’ between the different fields of study covering aspects of NTFPs. Falconer (1997) stresses the importance of a holistic multi-disciplinary approach to NTFP studies and establishes that:

‘Many models and research efforts attempt to simplify NTFP use/conditions/values in order to better understand the dynamic dimensions of NTFP exploitation or value. While such models may provide some insight into a particular aspect of NTFP use, they fail to assist the policy makers, foresters or local resource users with what is most critical when developing and managing NTFP. What is needed is a framework(s) which helps understanding of the linkages between various aspects of NTFP use, functions and values and the broader contexts which shape these uses, functions and values’ (ibid.: 155).

There are other aspects to depict in relation to NTFP evaluation, but particularly in relation to the whole idea or motivation behind valuing and commercializing specific forest resources. These refer to the non-commercial values and the effects of commoditization. NTFPs cover a wide variety of resources products, ranging from daily subsistence products to purely commercial ones, while some NTFPs have

been used only for ritual purposes. Since the commercial potential constitutes the main focus of NTFPs, local non-commercial values have been rather marginalized and the historical use of these resources is therefore not normally traced. It can generally be said that NTFPs are usually resources in commoditization processes. In NTFP evaluations there is an apparent lack of detailed study or monitoring of (1) changes and adaptations occurring within the commoditization processes; (2) the different adaptations this production implies in the cultural and social life of localities; (3) the cultural and symbolical aspects of the products themselves; and (4) changes in the knowledge of technology and forms of production. Furthermore, the wider context should be taken into account. This includes the economic, political, social and ecological conditions prevailing at the different levels where the various stages of the commodity chains take place, and where struggles and conflicts within and between groups of social actors occur.

2.3.3 The role of non-timber forest products and handicraft production in Mexico

The importance of handicraft production and NTFPs is increasing in Mexico and in many other countries. At present agriculture for subsistence or income has drastically decreased in several Latin American countries. It represents less than 50% of the total income of rural households. Non-farm wages constitute the most important source of income, and handicrafts and trade make significant contributions (de Janvry and Helfand, 1990).

According to a report by the International Fund of Agricultural Development (IFAD, 1993), rural poverty is concentrated among indigenous people in Mexico, around 65% living in conditions of extreme poverty on small land holdings of low productivity. According to the same report, a remarkable feature of the Mexican Indian communities is the diversification of their economic bases, in which micro-scale enterprises such as handicraft production, mostly organized at household level, supplement income from agriculture.

Handicrafts for rural development

In Mexico commercialization of handicrafts started in the 1920s. The main reasons prompting the circulation of these new commercial products were the growth of tourism related to the end of World War II, the opening of main communication roads, and the recognition of indigenous and popular art by Mexican artists and intellectuals (Nash, 1993). Another important reason, as will be explained in chapter

8, was a major national economic shift from 1940 to 1960 towards increasing the capitalist sector. This led to poverty in other sectors and created an urgent need for sources of income. At present there are about 50 institutions and official agencies promoting and supporting handicraft and popular art in Mexico (Kaplan, 1993). The number alone, as Kaplan (*ibid.*) states, attests to the important role of handicrafts as an economic alternative and source of employment for various sectors of society.

The rationale behind the promotion of handicrafts is the role that the non-commercial production of tools and objects has played in rural households. Before becoming commodities, most handicrafts have been utensils and tools for domestic and agricultural uses or objects used for ritual purposes. Most of the time, these objects have been produced at household level by household members for their direct use; only certain objects have been created by local specialists. This manufacturing formed part of the multiple survival strategies that included fishery, agriculture, extraction and domestic work – all oriented towards self-sufficiency and the continuity of household life (Toledo, 1990). These activities are highly flexible and dynamic, in constant adjustment according to the seasonal demand for labor and income, and directly linked to the agricultural activities. These activities, as in other cases around the world, generate income and employment, especially during periods of emergency (Fisseha, 1987; Falconer and Arnold, 1991; Arnold, 1994; Townson, 1995).

It is important to recognize the economic importance of handicraft production. At the same time, however, within development policy these income alternatives have become a recurrent discourse rather than a real solution to poverty. If livelihood flexibility is seen as an advantage and a positive aspect to be taken into account in rural development programs (IFAD, 1993), it is also true that some possible consequences of implementing local enterprises are not always foreseen. It should be mentioned that actual cases of local industries or enterprises have not always led to a better quality of life. Indeed sometimes they have led to greater internal stratification, with unfavorable results for the poor and particularly women, who mainly receive the lowest earnings⁴. On the other hand, possible constraints or problems that arise in handicraft production are also rarely foreseen. In Mexico and around the world the most common include limited access to markets,

4 As has been demonstrated in cases worldwide, women are in the sector that receives lower profits. For example, referring to Bengali women artisans Mayoux (1991) finds that, besides the resources required, a new perception of women's work is needed in order to achieve fairer work and trade conditions.

competition, inappropriate technology, and lack of finance and transport (Fisseha, 1987; Falconer and Arnold, 1991; Arnold, 1994; Townson, 1995). In the case of handicrafts produced from forest resources, the shortage of raw materials is becoming a major concern and bottleneck, particularly where artisans both gather the raw materials and elaborate the final craft product. Generally, the production depends on resources occurring within the community boundaries, but when demand for the product increases, the local resource stock becomes insufficient. This has also been identified as major constraint in similar handicraft cases around the world⁵.

Non-timber forest products

NTFPs have played an important economic role in Mexico. In the 1970s the growth value of non-timber products was lower than that of timber resources. However, records do confirm their growth. In 1970 the value of NTFPs was 245 million pesos, increasing to 895 million pesos in 1979 (de la Vega, 1992).

In general, census data and systematic NTFP records are lacking in Mexico. This is particularly relevant for the national tropical forests, where the multiple use of natural resources is very important for subsistence and income activities. At national level and from the economic standpoint, most attention has been given to NTFPs of arid areas, where agriculture and livestock activities face severe limiting conditions and where entire populations live from the extraction of certain NTFPs. In these areas extraction of plants such as maguey, lechugilla (*Agave lecheguilla*) and candelilla (*Euphorbia cerifera*) constitutes the most important economic activity and in fact these are a few of the resources (NTFPs) for which specific extractive regulations have been implemented.

NTFPs are closely related with forest conditions and people living in forests. Approximately one quarter (11 to 15 million) of Mexico's population lives in forest areas, often subsisting in extreme poverty (Adger et al., 1995). For people living in these ecosystems, natural resources represent key sources of a great variety of products to use directly for subsistence or commercial purposes. Toledo *et al.* (1992)

5 In several countries, such as South Africa and Botswana, the practice of harmful harvesting techniques and permanent exploitation have caused the depletion of palms and trees used for local mat and basketry manufacturing (Cunningham, 1987; Cunningham and Milton, 1987). The same was observed in India, among basket-weavers using bamboo resources (Joshi, 1987), and in Indonesia among the manufacturers of rattan furniture (Hadi, 1991).

carried out an ethnobotanical study on the various uses of different plant species within the humid tropical forests areas of Mexico. The study covered eight states in the south and southeast of Mexico and a total of 23 indigenous groups. The results show that indigenous people obtain from 125 to 170 products from one hectare of undisturbed forest. This confirms, according to the authors, that the forest constitutes a rich reservoir of resources used and managed by indigenous people, ensuring both their own maintenance and the existence of forests.

In Mexico the revenue from non-timber forest has been calculated. Alcorn (1984) calculated that the net return from one hectare for one year under traditional Huastec shade coffee management (called *te'lom*) reached the value of USD 1 540 including revenue from coffee, and USD 330 excluding coffee. In an even greater effort, Bye *et al.* (1993) tried to calculate the total revenue for three NTFPs for the state of Morelos. Their result reached a total of USD 616 872. By comparing their result with the official figures they found that the latter represented only 0.0008 of the NTFP for that state. Most estimates gave high revenues and, although figures are not easily comparable and are subject to site conditions, the general conclusion was positive, demonstrating the high potential of NTFPs, which according to Adger *et al.* (1995) may even exceed the value of commercial timber if the additive value of the various NTFPs extracted from certain forests is calculated.

The national context: conditions in rural areas

In the national context handicraft production and NTFPs have been increasingly important activities for rural populations in the last few years and have also received major attention from the government within new market and production economies. Their development is closely related to three main processes occurring at national level: the decline in agricultural activities and the increase in non-agricultural activities, the changes in land tenure regimes, and the impact on forests.

Decline in agricultural activities and increase in non-agricultural activities

The present scenario in rural Mexico shows the increment in food imports, demographic changes and a notable reduction in self-sufficiency. A major implication could be the risk to national food security. It is estimated that at least 15 million peasants have abandoned their traditional subsistence strategies in search of new activities that allow them to survive (Public Citizen, 2001). Earnings for peasants have dropped 70%, the national budget for the rural area fell almost 60%, while food dependency growth was almost 35% (ANEC, 2000). Consequently non-agricultural activities have acquired a major role.

Non-agricultural activities include forest extraction, mining, construction work, handicraft and wage labor in cities in Mexico or the United States. Even in the 1970s it had already been observed that income derived from farm activities represented only about 32%, while wages represented about 59%, the rest coming from other activities (IFAD, 1993). Over the last few years migration to the United States has become the most important income activity. According to the Mexican National Migration Institute, around two million Mexican people are living in the United States. The income obtained forms the basis of the subsistence of more than half the rural people in Mexico (La Jornada, 24 October 2001).

The reasons for migration are several and closely linked with the latest changes in the land tenure regime and modifications in the agricultural support sector. Among the most significant has been the withdrawal of government support policies for agriculture. This has occurred gradually since the 1980s, and has included a reduction in subsidies for electricity, water, fertilizers and credits used by farmers. And more recently the NAFTA agreement was signed, which establishes a schedule for the gradual removal of all tariff and non-tariff barriers for the sensitive crops of corn and beans. On the other hand, importing cheaper food stuffs has had a negative impact on small producers, who have continued to face higher production costs and lower subsidies than U.S. and Canadian producers (Public Citizen, 2001). This has resulted in the decapitalization of agriculture and the deteriorating conditions of agricultural workers.

The aim of SAGAR, the national body for agriculture development policy that works within the NAFTA framework, is to meet the needs of the rural population through programs supporting the commercialization and financing of rural agribusiness. These programs cover the planning of all phases involved in production and commercialization, from planting crops to reaching the end-consumer, attempting to increase employment in services, tourism, handicraft and processing. These strategies, according to SAGAR, would reduce poverty and stimulate competitiveness while raising the prices of rural products (Ramírez, 2001). One specific program seeks to support the production of small higher-value agricultural products, such as native fruits, tubers, spices and medicinal herbs, and to identify market niches where consumers in search of 'biodiverse' or 'organic' products are willing to pay more. Ramírez (2001) points out that the SAGAR program draws on the commercial potential of the country's biodiversity, which is scarcely exploited at present (only 500 out of more than 12 000 species with commercial potential are now being exploited). As such, the program implies the exploitation of resources on a completely new scale for commercial purposes. But infrastructure and other aspects, especially regulations on extracting resources (e.g. for bark paper), are still absent. This would require attention and regulation before such strategies could actually be carried out.

Land tenure changes and deforestation

Roughly half of Mexico's rural land is compressed in *ejidos*, on which three million *ejidatarios* (mostly indigenous) work. As will be noted in chapter 3 (section 3.3.3), in this respect Sierra Norte de Puebla constitutes a special case where, although an important part of its population is indigenous, most land is privately owned.

Ejidos were lands distributed by the post-revolutionary state to groups of 20 or more land claimants or *ejidatarios*, and could not be legally sold or rented. In 1992 the Mexican government introduced a set of reforms concerning land tenure and ejido lands can now be privatized. The debate surrounding the ejido reform raised several concerns. It was feared that the sale of ejidos could lead to reconcentration of the land and an end to land distribution. However, there has been no evidence of the rapid reconcentration of land or a massive rush to sell it. Throughout almost the entire country the reform has advanced slowly and in very different ways, according to geographical particularities (Harvey, 1996).

The issue of land reform becomes sensitive in relation to the state of forests in Mexico. The most distinguishing fact is that up to 80% of Mexican forest lands are held by ejidos. In Sierra Norte de Puebla (see chapter 8, section 8.2.1), forests have been severely cut down and now forest patches remain only in the most inaccessible places, regulated as communal lands by indigenous inhabitants. At country level, forests have been a source of conflict. Many opinions have been voiced but there are two main contrasting views in relation to forests.

As pointed out by several authors, Mexico is probably the only developing country where most of the forests are controlled by communities (Merino, 1999). According to some authors, communal forms of land organization have been crucial in the conservation of national forests (Alcorn and Toledo, 1998; Merino, 1999). Although the revolutionary legislation granting ejidos did not have sustainable resource management as its objective, the recognition of community-based tenure enabled locally adapted agro-ecosystems. While entrepreneurial farms lead in cattle ranching, irrigated areas and some profitable branches of rainfed agriculture, peasant units are the main economic agents of forested regions and most rainfed agricultural lands (Alcorn and Toledo, 1998).

However, as Merino (1999) indicates, the fact that most of the forested land is under a communal tenure regime has been seen by others (mostly the promoters of recent changes in land regulations) as the direct cause of the destruction of forests. In particular, protected areas established mostly on communal lands or ejidos are, according to FAO (2000), facing management problems arising from irregularities in land tenure and pressure from settlements in and around the protected areas. In the end this leads to conflicts between nature conservation and local utilization.

Part of the results of the World Bank analysis of the social and environmental consequences of growth-oriented policies indicate that forms of communal land tenure such as the ejido are not associated with higher levels of deforestation. Rather, higher levels of poverty have significantly contributed to increased deforestation (Deininger and Minten, 1999). According to neo-liberal policies, the transfer of appropriate technology and the generation of off-farm employment opportunities are two possible ways of alleviating pressure on the natural resource base. In this way, the Mexican government sees the modifications in the land tenure regime as necessary steps to attract private investment in agriculture. This would increase productivity, welfare and trade liberalization and eliminate government subsidies for agricultural products (as agreed under NAFTA), which would be expected to yield not only economic but also environmental benefits in the form of reduced pressure on existing forests (ibid.).

It is too early to evaluate the impact of the 1992 land tenure changes on forests but negative ecological and social impacts have been predicted (Alcorn and Toledo, 1998). The changes could potentially undermine the community-based sector and expand the rights of private property over resources in ecologically fragile areas (ibid.). Migration and the abandonment of rural areas demonstrate that prospects in relation to forest conservation, and to the new land tenure regulations and NAFTA in general, have not been fulfilled. Already negative effects are occurring in Mexico, particularly in rural areas where the socio-economic crisis has deepened and alternative economic activities that pressurize forest resources are increasing.

Recent changes around the world have affected socio-economic conditions in Mexico. The Mexican National Migration Institute stated that after the September attacks in the United States migration to that country fell by more than 50%, and in one month 10% of migrants returned to Mexico (La Jornada, 24 October 2001). If this trend continues, it could possibly bring about new changes in the rural environment, involving major pressure on forest resources, which have been the saving grace, especially during the scarcity of other income activities.

2.4 Summary

Sustainable development remains a controversial concept, vulnerable to different and contrasting definitions. The forms of operationalization have been wide-ranging, and within these NTFP development constitutes a means of seeking the welfare of rural populations and the conservation of ecosystems, mainly forests.

Some critics have suggested that sustainable development has implied a change in the view of ‘nature’ – now called ‘environment’ – with possibilities to be managed, planned and priced. Nature as a whole has acquired monetary value. This involves substituting local understanding of the environment and cultural variations for Western models. Two situations should be noted in this respect. On one hand, the pursuit of sustainable development destroys cultural diversity by causing local cultures to be absorbed in the expanding global economy; on the other, it is claimed that the quest for sustainable development should include the cultures of local people – potentially important sources of knowledge.

Within sustainable development, the cultural dimension is apparently one of the less explored dimensions. However, cultural interpretations may reveal important insights into the development and implications of the sustainable development concept itself and its forms of operationalization. The concept of sustainable development embraces distinct forms of the nature-society relation and local-global scales. Cultural interpretations enable us to understand how nature-society relations are being built and how they have changed. Such interpretations would promote understanding of the changes involved in the commoditization of nature, which is occurring throughout the world, cross-cutting different societies, with implications for new forms of relating to nature. On the other hand, the increasing globalization process, which implies new local-global relations, involves not only new market relations but also new social, political and cultural relations. Cultural interpretations are required to understand how these relations are occurring, and to analyze the new forms in which local activities are expanding and circulating on different geographical scales, no longer constrained to one delimited physical space.

The rise of the NTFP approach emerges within the sustainable development concept in the quest to alleviate poverty through economic growth. In general the literature on NTFP has increased tremendously over the last two decades. But several aspects relating to inherent difficulties and the implications for NTFP evaluation are indicated in this chapter. First, the term ‘NTFP’ comprises a wide diversity of products with varying characteristics and prospects for sustainable harvesting. As an analytical category it is too broad, since harvesting conditions vary greatly. Consequently generalizations and the elaboration of possible future scenarios for NTFPs are difficult to generate. Second, since NTFPs are embedded in very complex contexts, these require interdisciplinary studies in order to understand how the social, political, ecological and cultural dimensions are shaping NTFP development. Throughout, the great variability of NTFPs has complicated the tasks of assessing, promoting, regulating and indeed evaluating these activities.

Within sustainable development goals, NTFPs have been evaluated in a monetary way, with the intention of seeking economic alternatives to agriculture in rural areas. It has been indicated that, although realistic calculations regarding NTFPs embrace several shortages and difficulties, especially when extended into the future, the estimations of potential values have helped to attract policy-makers in the direction of NTFP commercialization.

Among other types of gap identified from the reviewed NTFP evaluations, it was observed that, although much attention is usually given to conditions prior to commercialization, little is given to the changes occurring after commercialization. The implications of commoditization for the use of resources and the production of objects at local level do not receive adequate attention – nor do the historical use and management of resources and products, or the changing perception of the resources. All these changes directly relate to the way people organize and it is essential to consider them within development programs.

The last part of this chapter explains the main socio-economic conditions of Mexico in relation to rural areas. Inspired by neo-liberal economic theory, significant changes took place during the last decade. The most recent changes in the Mexican national policy and economy, especially the NAFTA agreement with the United States and Canada, the parallel modifications of the agrarian policy and the 1992 reform of land tenure, are having an important impact on handicraft production and NTFPs. The present scenario in rural Mexico shows an increase in food imports, demographic changes and a notable reduction in self-sufficiency. This is resulting in major pressure on forest resources and the spread of non-agricultural activities.

A framework for the amate case study

3.1 Introduction

Chapter 2 discussed the definitions and implications of sustainable development and the NTFP approach that form the theoretical background of the study. In this chapter the framework adopted for analysis purposes is explained. This framework consists of two main parts. The first explains the multi-dimensional framework used; the second centers attention on the theories and concepts that enable the case of amate to be analyzed.

These two parts correspond to two steps on which the whole analytical framework was built. In the first step, an analytical framework was elaborated by integrating and interrelating social, economic and ecological factors at different time and spatial scales. The inclusion of different factors and scales enabled the processes of change to be identified and, thus, in a second step appropriate theories and concepts could be adopted to expand on certain aspects of these processes.

As part of the first step and as the point of departure for the whole framework, the relevance of sustainable development is explained. Next follows a brief review of studies pursuing the analysis of social and environmental changes within complex social, economic and ecological contexts. Such studies were considered for the framework adopted in this study.

The second step involved the theories and concepts used for analyzing the case of amate, and will be explained in the second part of this chapter.

3.2 Multi-dimensional framework

3.2.1 Sustainable development as point of departure

Although, as shown in chapter 2, the sustainable development concept has led to a wide array of different and sometimes conflicting perspectives, the concept is still very vivid, both as a flag for scientific approaches and as a basic criterion for governmental policies. The relevance of the sustainable development concept for developing a research framework is basically this: it implies that combined attention is necessary for the economic, ecological and social dimensions of the topic under study. While this study complies with that basic idea, two other aspects are significant for the framework.

First, as has been explained here and in chapter 1, the study builds on the three main pillars of interest of sustainable development, enabling to some extent the integral understanding of amate paper. In doing so, different theories were selected

for analyzing the amate case. The three main pillars of sustainable development (economic, ecological and social pillars) are basically supplemented (or enlarged if one wishes) by a variety of other important aspects, whose interaction must be taken into account. Presenting this as an enlargement of the three main pillars gives the following picture. In this study the economic pillar includes not only livelihood conditions but also the innovation of production methods, the development of infrastructure, the diversification of means of subsistence, and ownership. The social pillar relates not only to equity, but also to political power, social stratification in communities and social empowerment. The ecological pillar includes the identification of species used for bark paper, their biological characteristics, their distribution within the regional landscape and changes in land use systems.

Second, in addition to these three pillars of interest, the historical and cultural dimensions have been incorporated. While scientists working with the sustainable development concept and ways of putting it into practice often pay a certain amount of attention to the cultural and historical time dimensions, in this study these are placed at the core of the research. For instance, the historical and cultural dimensions are both expanded far beyond the norm. Culture includes knowledge for practical purposes, i.e. the uses and management of natural resources – in this case centred mainly on paper production and bark extraction. However, the concept is also extended to other aspects not regularly considered within the practice of sustainable development, such as the cultural perception and social values conferred on natural resources and products varying across time and spatial scales, and the social-cultural relations comprised in these productions. According to the discussion presented in chapter 2, cultural interpretations facilitate understanding of the nature-society and local-global relations enclosed in the sustainable development concept, as well as its forms of practice, such as the NTFP approach.

Finally, and as explained in chapter 1 (section 1.6), in this book the three pillars of sustainable development are not dealt with in separate chapters or even separate sections. Thus they are not easily recognizable from the table of contents. In this study another approach has been followed.

Imagine the three pillars could be visualized as three rolls of colored clay for modeling the research framework. Sometimes a sort of pyramid is constructed, with three standing sides. At the top the three sides join and sustainability is reached. Intermediate developments can be positioned somewhere on these sides. The model seems attractive, and it does recognize the dependence of each pillar on the other

two, but the crucial aspect of the interrelations between the three is kept hidden. Another model would be to stretch the three rolls into thinner ropes and twist them to construct a triple helix. The links or ‘bridges’ between the three pillars can in principle be shown that way. Yet although this is a much more realistic model, the reality of the amate case is even more complex. To tell parts of the economic or social stories, one needs to take bits and pieces of the ecological story and insert them, and vice versa. To present the case correctly, the clay ropes cannot neatly retain their own color. Ultimately they will all show spots of different colors and even become mixed into different sub-colors. This is exactly what happened as this research developed. Correctly visualized, it is a sort of kaleidoscopic image, with many colors involved in different patterns. The image changes with each twist, with each chapter, even with each section.

In such a way, the sustainable development concept constitutes the point of departure of this study. As schematically shown in Figure 3.1, the three main pillars of sustainable development are integrated to gain an understanding of the amate case. The historical and cultural dimensions are not parallel to these pillars but cut across all three of them, and the analysis follows the local-global and nature-society relations particularly enclosed (as explained in chapter 2) within NTFPs and handicraft products.

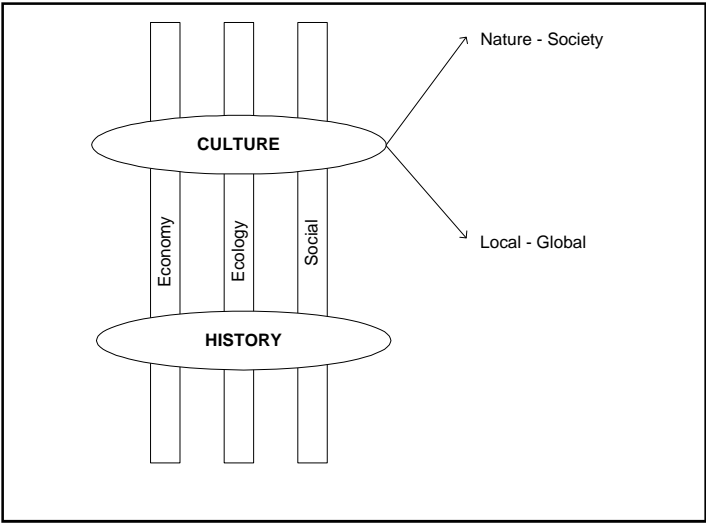


Figure 3.1. Sustainable development as point of departure.

To integrate holistic explanations a multi-dimensional framework is essential. The problem of dealing with multiple factors at different time and spatial scales has been faced in other studies treating nature-society and local-global relations, with emphasis on environmental issues and landscape changes. Different forms of analysis have been pursued, but in general similar constraints have emerged. In the next section a brief review is presented of some of these studies that form the background of the framework constructed for the amate case.

3.2.2 Linking social and environmental changes at different scales

In studies where nature and culture converge, it is necessary to consider the embeddedness of natural-social relations in social, political and economic processes operating at different scales. In the studies reviewed, it is claimed that local-regional changes involving social and natural linkages cannot be understood in isolation from larger processes occurring at national and global scales (Blaikie, 1994). Indeed, as discussed in chapter 2, the division between natural and social systems that originated from Western scientific philosophies is increasingly questioned. As Pritchard *et al.* (1998;18) point out: 'The separation of humans and nature has alienated society from its dependence on functional ecosystems and the support that they provide for social and economic development.' Furthermore, the separation appears quite artificial and inappropriate when applied to or confronted with local or indigenous views (Fairhead and Leach, 1996).

According to the above, the analysis of environmental change needs studies at different scales. It also needs procedures for understanding the relations between social and natural processes – from one side, related to different spatial scales; from the other, related to particular forms of perceiving and managing natural resources. Some studies have adopted a holistic approach, integrating information from different sources and detailed field surveys within interdisciplinary frameworks.

Blaikie (1994) proposes 'political ecology' as a research approach where a number of established disciplines and approaches are combined. Political ecology focuses on how regional, national or international processes articulate with local ones over time. Fairhead and Leach (1996) take into account locals' perception and narratives and note the importance of diachronic approaches. They affirm that: 'The effects of environmental policies must be contextualized in relation to the many other processes involved in shaping the environment, but also to the ways that villagers have dealt with, resisted and lived with them' (ibid:12). Berkes and Folke (1998)

have also adopted an interdisciplinary framework for understanding social and ecological linkages. They relate management practices based on ecological understanding to the social mechanisms underlying these practices and, afterwards, to seeking principles that may assist in successful resource management.

Although these types of approaches have enabled the understanding of complex interactions between nature and society, they face several difficulties and limits. Political ecology (Blaikie, 1994) may well allow changes and impacts on the proximate causes of social and environmental change to be identified, linking local/household level to regional and international levels, but this view leads to a mechanistic type of reasoning (Fairhead and Leach, 1996) and is still apolitical, failing to include the interactions of local social relations with regional political economy issues (Peet and Watts, 1996). Other authors point out that, in the case of multi-level frameworks based on hierarchy systems theory, simple causation might lead the analysis (Ahn et al., 1998). Other problems detected include the difficulties of discrimination; furthermore, as the number of levels involved increases, the difficulty in explanation would also increase (Ahn et al., 1998). Nevertheless, as stated by Pritchard *et al.* (1998), multi-level frameworks are the most appropriate for understanding processes that are nested between distinct levels.

Berkes and Folke (1998) propose a systematic approach for understanding the mechanisms behind social and ecological linkages. The authors state that the systems approach refers to a holistic view of the system components and the interrelationships among them. Accordingly '... this approach is replacing the view that resources can be treated as discrete entities in separation from the rest of the environment and the social system' (ibid:2). The authors demand that attention be given to the search for the causes of environmental and social change. Pritchard *et al.* (1998) state that there are proximate causes of change but that, behind these, indirect or underlying socio-economic driving forces may be occurring. Among these driving forces, the authors mention tenure regimes, technological change, international financial assistance, pressure for structural adjustment, government socio-economic policy, demographic change, international environmental institutions and world commodity markets. Nor do they forget the more distant determinants of environmental change, such as power relations in society, world view, lifestyle, religion, ethics and values.

Although none of the above-mentioned analytical approaches was systematically followed, the methodology of Berkes and Folke (1998) was to some extent adopted in this study. A multi-level framework and a hierarchical approach were constructed that helped to order and identify the processes that needed to be explored in order to answer the research questions.

3.2.3 Components of the multi-dimensional framework

In the first place the multi-dimensional framework adopted in this study allowed the possibility of dealing with time and spatial scales and also with multi-level factors. In the second place, this framework enabled the consideration and identification of diverse processes of change and the levels at which they operate, and the examination of not only the processes but also their links to each other.

Figure 3.2 illustrates the relations among the time-spatial scales, the main changing processes, the types of interlinkages, and the theoretical perspectives used to understand them. With the exception of the three main time periods (Fig. 3.2, first column), clear boundaries between all the other components of the framework are rather difficult to mark. Changing processes (Fig. 3.2, third column) overlap in time, and especially along spatial levels. The straight and dotted lines broadly illustrate how processes are linked or nested at the same level or across levels; two-directional arrows signify how processes interact through different types of linkages (Fig. 3.2, fourth column), cross-cutting time-spatial scales. Theoretical perspectives (Fig. 3.2, fifth column) extend beyond fixed or single units of study or topics; these will be discussed in the next section of this chapter.

- *Time and spatial scales*

Time and spatial scales cross-cut the topic of this study. Three main periods are identified (see Figure 3.2, first column); these are the end of the XVI century, the intermediate period between the Spanish colonial period and the start of amate as a handicraft, and the more recent years since amate emerged as a handicraft product. The spatial scale refers to settling in the local, regional, national and international levels where bark extraction and bark paper production/distribution are taking place and where political and socio-economic factors are directly or indirectly shaping the conditions in which handicraft and non-agricultural activities in general are developing.

The time scale covers some 600 years, from the pre-Hispanic past to the present day, enabling the historical trajectory of amate paper to be traced. Amate production is observed as a continuous history of adaptations taking place in bark extraction (tree species, extraction strategies), paper production (technology, places of production, production organization), types of paper produced (pre-Hispanic paper, Otomi-Nahua products) and final distribution (Mesoamerica, nowadays a wide range of market channels). The regional context of bark extraction and amate production was also explored through time, specifically in the history of land use and land tenure systems.

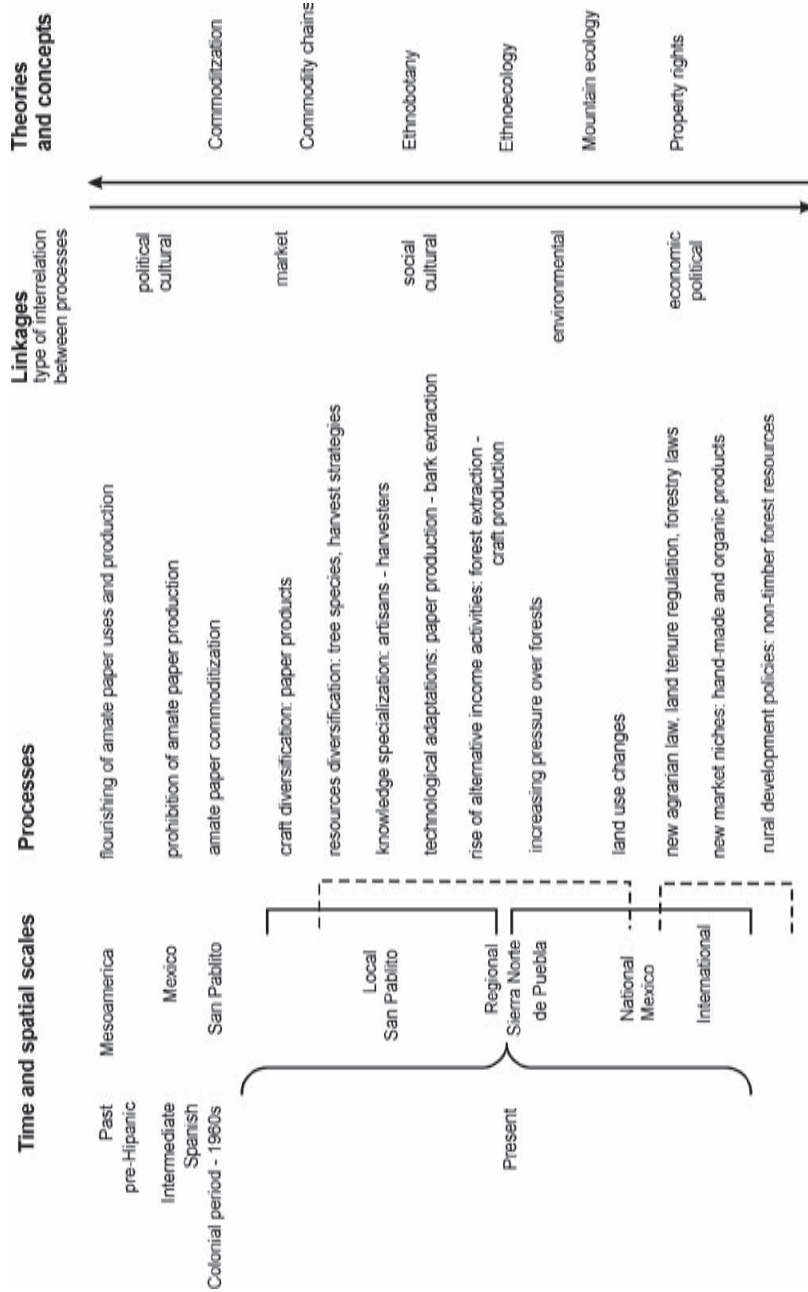


Figure 3.2. Multi-dimensional framework.

The spatial scale covers different geographical areas (see Figure 3.2, second column). During pre-Hispanic times it refers to Mesoamerican territory; during the Spanish colonial period and before amate paper emerged as a handicraft it refers to the Otomi and other indigenous villages in Sierra Norte de Puebla; coming up to the present time it includes places at local, regional, national and international levels. As occurs with other handicraft products, the phases of the amate commodity chain take place in various settings. Bark is extracted from trees growing within some land use systems of Sierra Norte de Puebla and is harvested by regional peasants. The manufacture of paper is carried out in San Pablito village by Otomi artisans, mainly women. Lastly the paper is distributed outside San Pablito directly by artisans and by many other social actors in local markets, tourist cities, museums and galleries around the world.

- *Processes*

Certain processes occurring at different levels and within socio-economic, political and environmental contexts constitute direct or underlying causes of change in amate production. As explained in chapter 2, among the most important in terms of impact in the Mexican rural context are the recent changes in land tenure regimes and the depletion of resources, including forests. Both are inducing the abandonment of agricultural activities and promoting migration and the intensification of alternative rural activities. At international level, processes influencing amate production include new styles in consumption – mainly the recent interest in alternative products such as handicrafts and organic products – and the implementation of development strategies such as support for NTFPs.

Other processes refer to changes occurring in the amate production itself. It is possible to identify three as the most relevant (see Figure 3.2, third column). In historical sequence, these are the change in status of paper during the pre-Hispanic period and the Spanish colonial era, paper commoditization, and most recently all the adaptations that have followed since amate emerged as a handicraft. The main changes that have followed since commoditization are: specialization of knowledge among and within Otomi artisans and regional harvesters; changes in the cultural perception of paper and bark trees; diversification in terms of paper products and uses, and raw materials and tree resources utilized; and technological adaptations in amate manufacture and bark harvesting activities.

- *Level linkages*

This refers to the types of links through which relations between the different spatial levels are built, such as socio-economic, cultural and political links (see Figure 3.2, fourth column). At international and national levels, these are very much related to world market conditions. New worldwide markets for natural and hand-made productions are currently influencing the global-local market for NTFPs and handicrafts. Concurrently national and international agencies for the economic development of rural areas are including support for rural non-agricultural activities, such as handicraft production and forest extraction.

Through the paper itself, other types of linkages can be identified. These are the cultural and social links built at the different levels where bark paper circulates. Throughout the amate commodity chain, the flow of influences and ideas from consumers to artisans, and vice versa, is constant, shaping tastes and preferences and assembling identities. Bark paper contains different meanings at local, regional, national and international levels. The production and use of amate constitute part of the Otomi identity and at regional level represent an Otomi form of political resistance. At national and international levels, although most consumers know little or nothing about the handicraft producers, amate paper is acknowledged as an indigenous hand-made handicraft, and forms part of the national identity.

The relations between local and regional levels are explored in more detail in this study. These include economic, social, cultural and political links. The socio-economic relations are built first through the regional supply and local demand for bark. This comprises the interface between Otomi artisans and regional harvesters, their knowledge specialization, forms of work organization and growing interdependence. Thus the socio-economic conditions of San Pablito have greatly changed its role within the regional context as well. The economic expansion of San Pablito has extended to many areas. As subsistence activities have been replaced by handicraft and wage labor outside the village boundaries, San Pablito has become a supply-dependent village – dependent not only on bark but also on many other products, including basic food stuffs. On the other hand, political relations between San Pablito and the regional authorities are tense and conflictive, with amate production playing an important role. The commercial success of amate confers on the Otomi a certain degree of socio-economic independence, which within the regional context gives them more possibilities for negotiating and demanding benefits.

3.3 Theories and concepts

In this section the second step of the framework is covered. This consists of the theories and concepts adopted for the analysis. A number of different theories were borrowed. Figure 3.3 schematically shows the theories and concepts used for the analysis (central column) in relation to the case study topics (left column) and the nature-society and local-global relations enclosed within the sustainable development concept (right column). As already mentioned, throughout the analysis a diachronic approach was sustained. It is important to clarify that in Figure 3.3 the boundaries between the areas of interest of the theories and concepts as well as the topics of study overlap (as is the case also in Fig. 3.2). The theories and concepts applied include: commoditization, commodity chains, land property rights, mountain ecology, ethnobotany and ethnoecology.

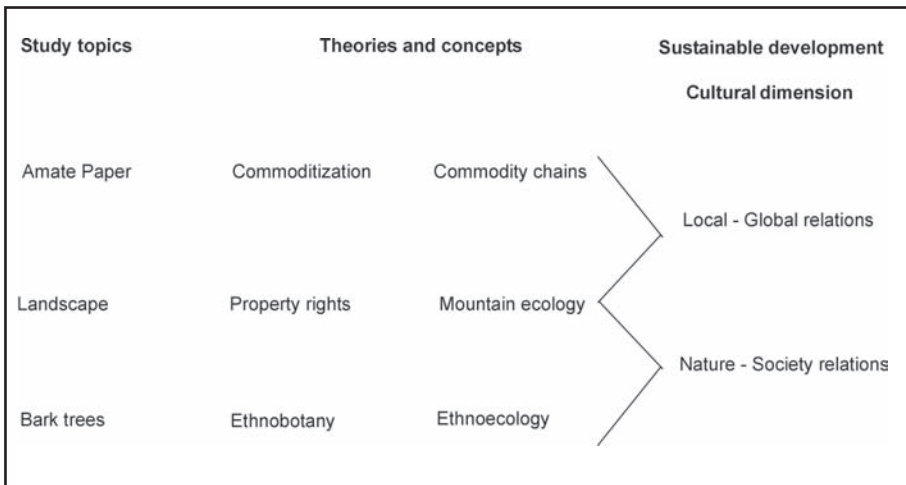


Figure 3.3. Theories and concepts used for the analysis of the amate case.

If we disaggregate the contents of this study, it first focuses on bark trees and amate paper; second on paper production and bark extraction; and third on the social, political, economic and environmental factors shaping the everyday development of artisans' amate production and harvesters' bark extraction, right from local to global level, but with emphasis on regional level.

This is also the sequence in which the theories applied unfold:

1. commoditization and the commodity chain (to understand the trajectory of amate paper and forms of paper production/distribution)
2. ethnoecology and ethnobotany (to understand the management of bark trees, comprising the knowledge involved in such activities)
3. mountain ecology (to understand the context, such as the regional political conditions, livelihood strategies and land use changes).

Each perspective impelled the examination of interaction among diverse disciplines. In the case of commoditization and commodity chains, cultural anthropology, sociology and ethnography combined, including concepts about identity and globalization. In the case of ethnobotany and ethnoecology, elements of biology, ecology and local knowledge are combined. In the case of land property rights, elements of governance, policy and resource management are combined. Mountain ecology stands as the center axis to which other theories are connected. As will be explained in this section, mountain ecology delves into the interaction between nature and social systems, where the emphasis is on understanding how mountainous areas, once perceived as relatively isolated and static, are increasingly connected or linked at regional, national and international levels in various complex ways.

3.3.1 Amate paper: commoditization and handicraft commodity chains

Commoditization

Appadurai (1997) and Kopytoff (1997) observe commoditization of things as a stage in the long life trajectory of these things, objects or articles. According to these authors, things may display diverse and also contrasting roles and values in their life, passing through different stages as decorative objects/resources, ritual implements or working tools, sometimes gifts or sacred objects. By tracing the life history of things and their meanings as inscribed in their forms and uses, the interpretation of human actions and transactions may be uncovered (Kopytoff, 1997).

Things may become commodities. How this occurs and what the particular characteristics of commodities are constitute the topic of Appadurai's essay *Commodities and the Politics of Value* (1997). The author explains that at certain stages in their lives things may pass through commoditization. The distinctive

characteristic of commodities is their potential to be exchanged. Exchange is identified as the source of value, and the link between value and exchange can be found in politics, the area where relations and contests pertaining to power take place. 'The creation of value is thus a politically mediated process and the commodity situation of any "thing" can be defined as the situation in which its exchangeability (past, present or future) for some other thing is its socially relevant feature' (ibid.:13).

The commodity situation entails three main characteristics. The first is that things can move in and out of the commodity state; the second refers to the cultural framework, the criteria that define the exchangeability in any particular social and historical context; and the third refers to the commodity context, the variety of social arenas within or between cultural units, which help link the commodity candidacy of a thing to the commodity stage of its career.

Within the commoditization process Appadurai recognizes two extreme conditions that apply to the way in which things become or stop being commodities. The author uses the terms 'enclaved' and 'diversion'. Enclaving seeks to protect certain things from commoditization, while diversion frequently brings protected things into the zone of commoditization. Things can also be removed from one zone to another, for example from an enclaved zone to one where exchange is less restricted and more profitable, or from an exposed zone to a protected one. Thus decomoditization takes place.

Appadurai (1997) explains that the challenge of anthropological research focusing on a given society or period lies in defining the customary paths '... diversions are meaningful only in relation to the paths from which they stray' (ibid.:28). The shifting of paths presupposes a change in the cultural construction and the cultural role of commodities cannot be separated from production, which in turn means new forms of political control.

The emergence of handicrafts also has a place in the work of Appadurai (1997). The author states that handicrafts are '... subtler examples of diversion of commodities from their predestined paths' (ibid.:26). Tourist arts are objects originally produced for aesthetic, ceremonial or sumptuary use within specific groups. These objects are transformed culturally, economically and socially by the tastes, markets and ideologies of larger economies (Graburn, 1976). The value of such an object lies in the fashion market, driven by novelty and the placing of things in unlikely contexts. This is a process of decontextualization and the direct exposure and display of tools and artifacts of the 'other'. In this way, Appadurai notes that things that become handicrafts obtain a new value, and this value is a combination of authenticity, novelty and aesthetics.

The history of the paper was analyzed tracing its symbolical and exchange values up to the present situation (chapter 4). In this study, it is presumed that, as objects can pass through commoditization, so certain natural resources, such as the bark trees used for amate paper, have also passed through this process during their long history of use and management. Amate paper and bark trees, as viewed in this study, receive different cultural values along the time line and also at specific time periods – and even among different social actors, who may have perceived them differently. In the last chapter, in partial answer to the first research question about the cultural value of amate paper and bark trees, an attempt is made to apply the views of Appadurai to bark trees and amate paper separately and in combination, identifying the facets in which their uses and values have met or diverged.

Handicraft commodity chains

As briefly suggested at the end of the previous section, objects may entail different social and cultural values for different actors. Across commodity chains the value and perception of products varies, and as discussed in several works, this is especially relevant to the case of handicraft production. According to Nash (1993), the value of handicrafts to consumers lies precisely in the human labor embodied in the product and what it tells of a whole way of life. According to Graburn (1976), commercial arts must symbolize to outsiders a few characteristics or beliefs central to their makers. He also states that for handicraft producers the value of their work varies greatly through time and from site to site. In general, craft production is a symbol of the producers' culture, still forming an integral part of their ritual or domestic life or already detached from their local life. In any case, handicrafts that cross the local boundaries enclose messages and symbols of presence.

In handicraft commodity chains the consumers are not the only receivers of messages. The flow of products and messages takes place in both directions. While handicraft products are reaching faraway places, technological artifacts from industrialized areas are fast entering remote rural areas – and the flow of products brings with it the flow of ideas. Furthermore, the interchange of ideas about handicraft objects is continuous; ideas that originate from handicraft producers are reshaped by consumers and later returned to producers. In this sense, Graburn (ibid.) debates the term 'arts of acculturation'. A more recent reading of these social and cultural itineraries is the process of globalization, which encloses the producer-consumer relation. Although the discussion about globalization is complex and some lines of thinking are quite radical, it is pertinent to explore certain basic ideas relevant to the commoditization and meaning of craftwork.

While globalization is largely seen as the trend towards the homogenization of all types of production and types of perception, there are also arguments that, on the one hand, question the assumption of dominant ways of thinking and economic expansion and, on the other, reveal new and enclosed aspects of identity and local responses. Long (1996:42) reflects on the terms 'localization' and 're-localization', arguing that these are contending and parallel processes to globalization. 'Changing global conditions –whether economic, political, cultural or environmental – are, as it were, "relocalized" within national, regional or local frameworks of knowledge and organization, which in turn are constantly being reworked in interaction with the wider context.' Castells (1999) argues that while dominant economies and forms of communication expand, the resurgence and construction of identities are distinctly occurring in many places around the world.

It is necessary to go more deeply into the term 'identity'. Graburn (1976) establishes that social identity such as ethnicity needs to be conveyed for two different purposes: for the members of the in-group (i.e. for the other people of the same group), and for members of the out-group (i.e. for people whose relationships depend upon their being different). In this way ethnicity is an increasingly important form of identity in a pluralistic world where communication, education and travel offer knowledge about many groups and access to almost everywhere. For Castells (1999), the term 'identity' refers to social actors in the process of constructing meaning on the basis of a cultural attribute or a related set of cultural attributes. This author proposes a distinction between three forms and origins of identity. The first, called 'legitimizing identity', corresponds to the identity introduced by the dominant institutions of society for the purpose of extending their domination. The second, 'resistance identity', is generated by those actors in positions devaluated and stigmatized by the logic of domination. The third, 'project identity', is generated by social actors redefining their position in society.

Castell's approach could be applied within the sphere of handicraft products and handicraft production. It is possible to distinguish the three types of identity proposed currently occurring within the context of amate paper and many other Mexican handicrafts. In Mexico the government has absorbed indigenous expressions in order to integrate them into the national image, and in so doing it has legitimized its power. In certain cases, handicraft products and the production process have enabled redefinition of the group identity by strengthening local institutions and/or traditional forms of self-organization and by presenting an image of this identity outside the localities. Besides amate, an example would be Zapotec pottery.

Furthermore, handicraft products (e.g. Nahua paintings, Chiapas textiles, as well as amate) have also been used as means of protest, of presenting demands, and in some cases of purposeful resistance oriented towards specific objectives.

In the Latin American context, some studies about handicrafts have gone deeply into aspects of ethnic identity and the space gained by artisans through their handicraft production and commercialization. Stephen (1991) explores cases where the stronger economic position acquired by artisans has reinforced local social organizations and local institutions. Stephen describes four Latin American cases of handicraft production, including Nahua bark paper painting, which according to her findings (shared by Eschelmann Good (1988) have successfully controlled economic endeavors while supporting communal and traditional non-monetary forms of cooperation and organization. Other studies explore the way in which artisans purposefully enclose messages of protest and resistance in their works. Again Nahua painters represent an example of this type of identity building. In 1986 Amith (1995) recorded the way in which the Nahua protested against an engineering project that proposed to build a dam within their territory. Their paintings on bark paper depicted scenes of what they imagined the ecological, social and cultural consequences of the dam construction would be. These works were successfully exhibited and published inside and outside Mexico, and led to the cancellation of the dam project.

The distinct value of handicraft products along commodity chains and the social, cultural and political implications that some handicraft products and their production embrace are explored in respect to amate paper (chapters 4 and 5). The Otomi too are directly and indirectly using amate production as an image of their identity and as a means of protesting and claiming rights. In more recent years their economic and social strength, gained largely via amate production and commercialization, has had remarkable implications for their role within the regional political context. Amate paper expresses distinct meanings at local, regional and national levels and, within these levels, among different social actors and social groups. While contrasting economic conditions among artisans are taking place at local level, San Pablito, as an indigenous artisan village, has turned amate into a form of expression and resistance in the regional political arena. At national level, together with other handicrafts and ethnic products, it is deliberately utilized as part of the national image presented to the rest of the world, and as part of the socio-economic strategies for integrating rural, particularly indigenous, inhabitants.

3.3.2 Bark trees: ethnobotany and ethnoecology

Ethnobotany

Ethnobotany encompasses all studies that describe local people's interaction with plants. Ethnobotany entails interdisciplinary studies that, depending on the study focus, give more emphasis to certain disciplines such as botany, linguistics, anthropology, ecology or economics (Martin, 1995). In the beginning, most ethnobotanical work concentrated on constructing folk taxonomies, but recently concepts about traditional ecological knowledge have been receiving more attention.

In ethnobotany special attention is given to indigenous or local knowledge. Before the 1980s indigenous knowledge, particularly what has been called 'indigenous technological knowledge' (ITK), was largely ignored. It was even excluded as being backward and inadequate when opposed to the prevailing ideas of the Green Revolution. This trend has now been reversed for a number of reasons. First, certain modern technologies have failed. Second, in the 1960s the notion that 'traditional' represented harmony and that traditional people lived in harmony with nature underwent a renaissance. And third, anthropologists and development professionals have tried to make indigenous knowledge acceptable to politicians and consumers (Ellen and Harris, 2000).

The result has been that indigenous knowledge has been integrated into almost all development strategies. It arose as a new challenge to find ways of building communicating bridges between indigenous and scientific knowledge. These efforts are widely reflected by the numerous booklets and checklists for collecting data, as well as in design format projects integrating indigenous knowledge, enhancing the virtues of 'participation', 'empowerment', 'bottom-up' and 'farmer-first' and, in some cases, incorporating decision support systems and geographical information systems.

Despite the enormous contribution of these approaches to the implementation of development policies in rural settings, some comments do have to be made. Ellen and Harris (1999) highlight two main points. The first is that most of these approaches decontextualize local knowledge from its past trajectory and the parallel processes surrounding the management of resources, and thus generally misrepresent or fail to consider the context in which knowledge occurs. The second point is that these approaches tend to limit the analysis of indigenous systems, narrowing the required parameters by using Western categories and selecting parts of knowledge for specific development strategies. As Ellen and Harris (2000) note,

traditional ecological knowledge is not only knowledge about entities *per se* (such as natural kinds of knowledge); it involves knowledge about natural processes and relations among entities – in this case relations between plants and humans.

Ethnobotanical knowledge is of relevance for the amate case and for handicraft in general. Handicraft production usually involves precise specialized knowledge about natural resources used as raw materials and detailed experimental knowledge about their management and the necessary technological steps. In the case of amate this type of knowledge is under continuous transformation and in this sense the remarks of Ellen and Harris (2000) are highly pertinent. The historical context of bark trees is fundamental to understanding current knowledge about bark trees and the forms of bark extraction. The history of using different tree species for bark supply and the specialist knowledge about bark trees and their management found among Otomi artisans and harvesters should be understood in relation to the natural and social context. This would include the driving forces behind market demand, regional land use changes, and shifts in regional labor and economic patterns (chapters 6, 7 and 8).

In the area of ethnobotanical knowledge it is important to note the role that some species play not only for subsistence or commercial but also for symbolical purposes. According to Ramakrishnan (1998), the concept of sacred species is well recognized by many traditional societies all over the world, based on the identification of values, especially their ecological importance¹. As the author states: ‘... Ecologically valuable keystone species performing key functions in the ecosystem and thereby contributing to support/enhance biodiversity, generally are also species that are socially selected and valued by the local communities, for cultural or religious reasons’ (ibid.: xviii). *Ficus* trees, for example, are culturally valued by many societies, especially in Asia and Africa (ibid.). In this specific case, as will be explained, these trees are sources of raw material and some are endowed with sacred values by the Otomi (chapter 6) in Mexico. Some *Ficus* species also have medicinal attributes.

1 It is interesting to note that fig trees, which perform key functions in ecosystems (see Appendix C, biological characteristics of *Ficus* species) are worshiped in several cultures, e.g. *Ficus religiosa* ‘the Peepal tree’ in Hindu society, *Ficus bengalensis* ‘Ala maram’ and *Ficus racemosa* ‘Athi’.

Ethnoecology

This section is based on the work of Toledo (1992, 2002), who proposes ethnoecology as a new interdisciplinary field of knowledge covering the three inseparable dominions of landscape: nature, production and culture. Ethnoecology explores ‘... how nature is seen by human groups through a screen of beliefs, knowledge and purposes, and how in terms of their images humans use, manage and appropriate natural resources’ (1992: 6). It largely emerged from the need to expand understanding of interactions between human beings and the environment, which has been based mainly on the exploration of knowledge about management and practical purposes. In this sense ethnoecology attempts to integrate intellectual and practical knowledge, thereby surpassing ethnobiology and other disciplines that aim to understand the interaction between nature and society.

Toledo (1992, 2002) proposes ethnoecology as a hybrid and holistic approach, integrating three main components (Fig. 3.4): the Kosmos, the Corpus and the Praxis. All are put into practice during the appropriation of natural resources. The Kosmos, the belief system, shows its most systematized form in the myth, and uncovers the role of myths in the management of natural resources. Since for most rural and traditional groups myths are mechanisms to regulate the management of nature, their study revealed a conception of nature as a sacred space in some sort of equilibrium, which must be maintained during the production process. The Corpus, the cognitive system, has been examined particularly by ethnobiologists and refers to the repertory of knowledge of individual and collective experience. This includes experience of natural cycles, variations and the unpredictable conditions associated with them. Praxis comprises the set of practices for the appropriation of natural resources.

Finally ethnoecology assumes a practical result, consisting of the validation of rural productive systems. ‘... ethnoecological research should be the evaluation of all those productive models that are useful for the implementation of sustainable (rural) development’ (Toledo, 1992:17). Thereafter ecologically appropriate models for the use and management of natural resources are generated from close interaction and dialogue between researchers and the human groups being studied (Fig. 3.4).

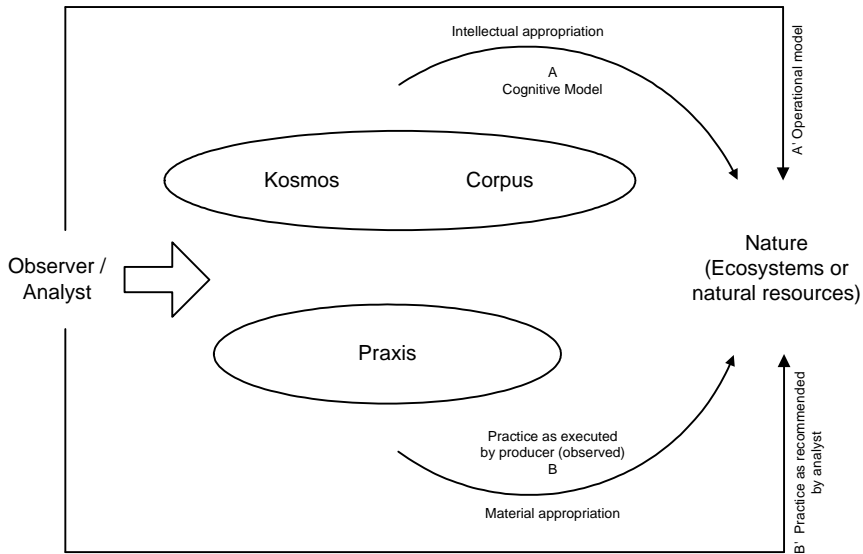


Figure 3.4. By dissecting and understanding the Corpus-Kosmos-Praxis complex, the ethnoecologist contrasts two different cognitive models of the same reality (intellectual appropriation), and two modes of management of natural resources (material appropriation). These explorations integrate the methodological procedures of any ethnoecological research (from Toledo, 2002).

3.3.3 Regional landscape: land property rights and mountain ecology

Land property rights

Berkes and Folke (1998) stress that there is no one method or universally accepted way of understanding the linkage between social systems and natural systems. Among the different concepts (e.g. systems approach, ecological resilience, traditional resource management systems) property rights deserve major attention. They suggest that institutions regulating the property of resources and acting as mediating factors between social groups and the life-support systems on which they depend enable understanding about the social and ecological linkages. In addition, they propose that property rights represent possible means for improving the performance of natural resource systems.

Some particularities about these institutions should be pointed out. Property rights arrangements are frequently complex; they mostly involve ‘bundles of rights’, including the right of use, right to exclude others, right to manage and right to sell. Alongside the common legal regulations, others may vary from village to village, and different resources in the same area might also be regulated by different property regimes. Similarly, local social systems might be developed for specific resources considered important for a particular community (Berkes and Folke, 1998; Pritchard et al., 1998).

To integrate property rights systems in rural development strategies, the analysis needs to include questions about the respective roles of local groups and government agencies. As Berkes and Folke (1998) establish, many systems of property rights show a mix of local and government jurisdiction and the sharing of resource management responsibility and authority between users and government agencies. In general, communal resource systems have received major attention in rural indigenous areas, where traditional ways of owning property and managing resources coexist in parallel with modern institutional regulations. A version of this is the Mexican ejido system. However, less has been written about private resource use.

As explained in chapter 2, up to 1991 collective land tenure under ejido regulations predominated in rural Mexico. Although ejido systems in general were qualified as a socially and ecologically successful form of land production and land tenure (Alcorn and Toledo, 1998), the Mexican government, within a worldwide context of privatization tendencies, declared an end to land redistribution and stimulated the privatization of ejido land. The future of land has already raised intense debates and concerns among academics and politicians, especially since the indigenous armed uprising in Chiapas². This movement has decided that within a wide range of social, economic and political claims land tenure reforms are the core of its platform.

Underlying the land tenure issue and the end of the ejido system in Mexico, the status, conservation and management of natural resources, particularly forest resources, emerge. As explained in chapter 2, about 80% of forest lands in Mexico have been held by ejidos or indigenous communities. Mexico, as already pointed out, is perhaps the largest community forestry sector anywhere in the developing

2 The most recent changes in the land tenure regime and its impact on rural Mexico have been thoroughly discussed from different perspectives (see, for example, articles included in Randall, L. (ed.) 1996. *Changing Structure of Mexico. Political, Social and Economic Prospects*. Columbia University.

world and represents the single greatest opportunity for many rural communities to participate in regional development³. At the moment the future of forests, together with the impact of land tenure changes, is on the table for discussion.

While the above scenario relates to most of rural Mexico, the regions where private forms of land tenure dominate have been less investigated, especially in regard to indigenous populations and traditional land uses. This is the case of Sierra Norte de Puebla, where most of the land is privately owned. Compared with other economic, political or cultural areas within Mexico, Sierra Norte de Puebla constitutes a special region owing to its pluri-cultural population and the permanence of private lands (chapter 8). Although these aspects could prompt questions about the degradation or conservation of natural resources (e.g. forests in relation to land tenure regime) and offer insights into the situation of particular sites within the general situation of Mexico, these could not be covered in the study.

The focus of this study shifted to reconstructing the history of regional land tenure and land use systems and the apparently acute historical difference between various types of populations (i.e. between mestizo and indigenous populations with different forms of access to land and resources). Thus the social, economic and political context of the region is generally linked to the historical division in the types of population. These developments explain to some extent the state of natural resources, especially regional forests, and the introduction and history of coffee plantations in Sierra Norte de Puebla, which are closely related to the actual access, distribution and management of bark trees (chapters 7 and 8).

Mountain ecology

Different approaches originating from physical and human geography disciplines have been developed to analyze human and ecological processes specifically in mountainous areas. According to some authors (Zimmerer, 1999; Sarmiento, 2000), mountainous areas all over the world have similarities in their main environmental characteristics and types of populations – mostly rural inhabitants practicing diverse agricultural activities in the face of similar biophysical limiting factors. In Latin America most mountainous areas have been populated since pre-Columbian times. The past conception of mountains as pristine isolated places no longer holds, since

³ This aspect has been highlighted at national and international forums, emphasizing the links between indigenous populations, ejido lands and the conservation of forest lands (e.g. by the World Bank, FAO and the Mexican government).

many of these areas were populated long ago and connected to the exterior through market and interchange linkages (Zimmerer, 1999). This is the case with Sierra Norte de Puebla, generally characterized as a secluded isolated area but, as more recently verified (García Martínez, 1987), constituting an important settlement and interchange area significantly populated since pre-Hispanic times (chapters 4 and 8).

The human geographical studies of mountain landscapes were largely influenced by or based on Murra's perspective (1975). Murra proposed the 'verticality aspect' and the 'vertical control' approach. In general this approach explains management practices and biological and physical processes according to altitudinal belts, which are viewed as ecological floors. More recently this approach has been challenged by Sarmiento (2000), who in an innovative way amplifies the concept of human presence and activities impacting on mountain landscapes within current relations at local, regional, national and international levels, and by Zimmerer (1999), who within the scope of political ecology focuses on the formation of farm landscapes at regional level. These two perspectives take as center of attention the Andean mountains.

Zimmerer (1999) proposes that Andean landscapes in Peru and Bolivia vary in degrees of patchiness or cohesion depending on farm spaces that differ according to farmers' responses to economic, social and political conditions. Farm landscapes are overlapping patchworks of multifaceted cropping systems, shaped by local knowledge and linked to extra-regional processes such as sectoral and macroeconomic policies, product and input markets, land tenure reforms, farm technologies and extension, NGOs and agribusiness at national and international scales.

Zimmerer's perspective on mountains as irregular or patchy landscapes closely related to the inhabitants' economic and social adaptations provides a view applicable to the case of Sierra Norte de Puebla. It is especially appropriate for observing the internal differences of the Sierra, which is divided into two main areas, the low and the high sierra, on the basis of physiographical and socio-economic characteristics. These characteristics are fundamental to the present supply of bark raw material, which lies on the scattered and mostly smaller coffee plantations of the high sierra, though also at times on the larger coffee plantations of the low sierra (chapters 7 and 8).

In mountainous environments, a prime characteristic according to Zimmerer and Sarmiento is that agriculture forms part of integral subsistence and that practices are usually adapted to micro-biophysical characteristics, taking advantage of the different altitudinal and site conditions. In Sierra Norte de Puebla successful adaptations occur, illustrated by adequate technology and the management of local

resources. Outstanding examples are the shade coffee plantations from which subsistence resources are gathered as well as cash income received for coffee grains. Shade coffee plantations are among the most adaptive land use systems in relation to the ecological, social and economic conditions of Sierra Norte de Puebla (chapter 8).

Sarmiento (2000) suggests that tropical ecology in mountainous areas should be revised to give a holistic view of what he calls the Tropandean landscape. Sarmiento establishes that the past idealized representation of mountain environments, consisting of layered floors associated with changes in elevation, temperature, atmospheric pressure and precipitation, is in fact more complex. Although, as the author points out, the management of different ecological floors is a response to elevation, these practices cannot be analyzed in a static way as independent horizontal ecological management layers. The seasonal use of the different belts, with an up-and-down flow of goods and services, is part of the complex processes of managing the mountainous environment. Beside the ‘verticality’ effect there are a number of landscape ecological effects expanding beyond vertical relations and describing what the author calls the ‘mountainous lifescapes’ (Fig. 3.5).

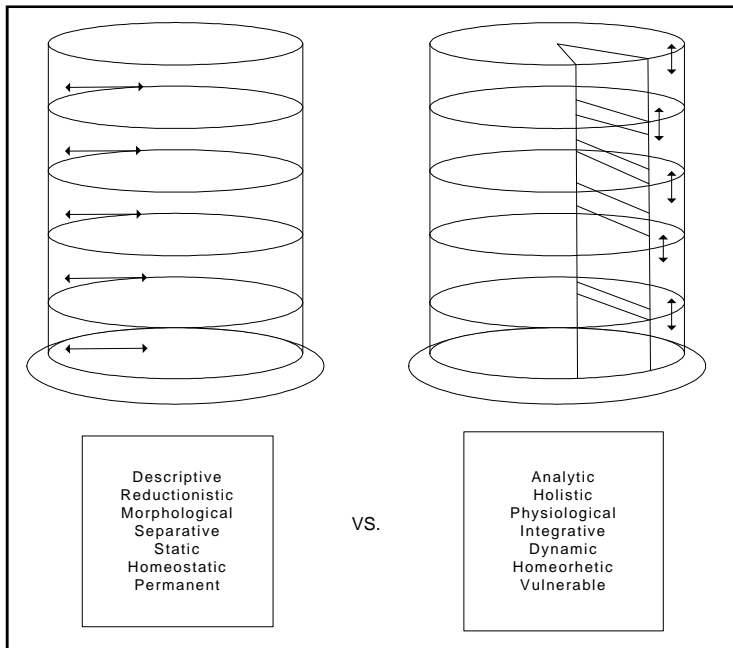


Figure 3.5. Schematic representation of the conceptual interpretation of verticality in mountain ecology systems, with horizontal descriptive (left) and vertical analytic (right) approaches to the location of altitudinal belts and functional processes (from Sarmiento, 2000).

Within the effects or dynamics of these mountainous lifescapes Sarmiento describes *marginality*, *centrality*, *power*, *violence* and *expansion*. *Marginality* refers to the seclusion of mountain inhabitants through urban-oriented policies. The author points out that mountainous populations still remain marginalized on the periphery of cities, the centers of economy and power. In contrast, *centrality* conceives of mountainous spaces as the axis of cosmological vision and the pivotal reference for the existence of mountain cultures. *Expansion* presupposes that mountains are no longer biogeographical barriers. New disregarding country borders. *Peripheral* and *ethnic pride* are other important dynamics. *Peripheral* refers to the influence of the outside globalized economy, considering originality, isolation and seclusion valued virtues rather than constraints. In this sense the author cites as an example the commercial success of the textile artisans and merchants of Otavalo, Ecuador, whose products are on sale all over the world. *Ethnic pride* is a notion illustrated in the increasing exposure due to migration and intergenerational choice of cultural identity.

Some of the dynamics that Sarmiento describes can be identified in Sierra Norte de Puebla. In the first place *marginality* and *centrality* occur as two contrasting dynamics in the region. Since pre-Hispanic times this isolated region has been marginal and, as will be explained, it even qualified as a 'refugee area' because of colonization difficulties and harsh relief characteristics. However, these conditions did not imply total separation because historically Sierra Norte de Puebla has constituted an important geographical cultural economic and ecological corridor between the central lands of Mexico and the eastern coastal lands (chapters 4 and 8). On the other hand for the Otomi people the mountains, caves and ravines where they have settled hold an essential place within their cosmology and ritual practices (chapter 4). In respect to the *peripheral* type of relation, amate paper constitutes an example comparable to the textiles of Otavalo.

The model of Sarmiento (2000), although still lacking a deep conceptual background, helps us to understand the actual processes of mountainous areas, which, as in Sierra Norte de Puebla, extend beyond local and regional boundaries. The model, like others that cover a wide range of factors and try to explain complex interrelations, still lacks a visual representation. Changes in land use systems and land use regimes have been represented in maps; however, more complex processes, such as land use conflict changes, are still difficult to represent⁴. On one hand visual representation of the findings of this study is lacking; on the other hand these would be difficult to represent and would likely simplify the reality of the case.

4 An exception is some studies conducted at ITC, attempting to visualize conflicts over land and water resources (e.g. Boix, F.C. 2002. Competition over water resources: analysis and mapping of water-related conflicts in the catchment of Lake Naivasha, Kenya. ITC MSc Thesis).

3.4 Summary

The amate case required a holistic perspective. This type of perspective is increasingly being adopted as more studies attempt to explore the complex way in which relations between societies and nature are developing, especially in light of rapid land degradation in many areas of the world and the increasing connectedness between different geographical areas. It is recognized now that strict or formal frameworks do not offer sufficiently ample scope for exploring the nature-culture and local-global relations. The possibilities to build or tailor frames suited to the case study are not free of inadequacies and limitations. Moreover, both lack of systematization and difficulties in replication or adoption for other studies are also possible criticisms. However, these are frameworks that do enable comprehensive answers.

The multi-dimensional framework elaborated is divided into two steps. In the first step, the objective was to understand the development of amate within spatial and time scales and to identify the main processes of change. In the second step, the objective was to select and combine theories and concepts to carry out the analysis. While the first part helped to draw the historical trajectory of the amate case and identify the main processes of change throughout, the second part centered on selecting different theories and concepts that could help to probe certain aspects of the amate case.

Amate paper: development throughout history

4.1 Introduction

In this chapter the long history of amate is reviewed with the main idea of understanding the economic, social, political, cultural and religious roles that amate paper has played throughout history. Rather than a thorough reconstruction of amate history, the focus is on the values it has been granted. As explained in chapter 3 (Fig. 3.3), this chapter returns in greater depth to the concepts proposed by Appadurai (1997) regarding the life biographies of things, together with the cultural interpretation of handicrafts by Graburn (1976). The concepts proposed by both authors helped in understanding the historical trajectory of amate and its recent commoditization.

The discussion centers on the uses and values of the paper. The chapter covers the three main time periods in which the history of amate can be subdivided: the pre-Hispanic period, the Spanish colonial period and finally the period since amate emerged as a handicraft product. There is no certainty about the time or place of origin of the paper, but its use greatly intensified during the period of Aztec domination. The different uses and values of bark paper during that period are described. After the Spanish conquest the use and manufacture of amate was forbidden. Consequently one of the main questions raised is how did this production continue and what conditions enable its continuity.

The Otomi, among other indigenous groups of Sierra Norte de Puebla, maintained the tradition of manufacturing and using bark paper. Its historical roots are explored and its particular use as ritual paper. A clear break in the history of amate paper was its commoditization as a handicraft product. The way in which this commoditization took place, exposing a product previously reserved for ritual purposes, raises questions about the national context that prompted this commercial production. There is a question mark especially over the conditions that at local level enabled the emergence of bark paper as a handicraft. In the last historical period an increasing diversity of paper products of different designs and for different uses has been actively produced by Otomi artisans to satisfy the tastes of the growing number of handicraft consumers. The grounds for such amate innovations are explored.

The past of the paper is documented in primary information sources, such as codices and early Spanish historical documents, which are difficult to access and could not be directly reviewed. Most of the information in this chapter comes from secondary bibliographical sources. Fieldwork interviews and observations were very important for the last part of this chapter, dedicated to the present uses and diversification of amate production.

4.2 Pre-Hispanic period and Spanish colonization

4.2.1 Origin of bark paper and its prosperity during the XVI century

The origin of amate paper is largely merged with the human need to express and communicate. All the civilizations that occupied present Mexican territory used different surfaces, such as stone, clay or leather, to transmit their knowledge and establish their cultural roots. The Olmecs and Maya were the first to give permanent content to their culture and their lives through their hieroglyphic writing. The Olmecs carved huge stones known as *Stelas*, containing representations of garments made from bark paper. The Maya owe much to the Olmec civilization, which flourished ca. 1200 B.C. on the coast of the Mexican Gulf (Fig. 4.1).

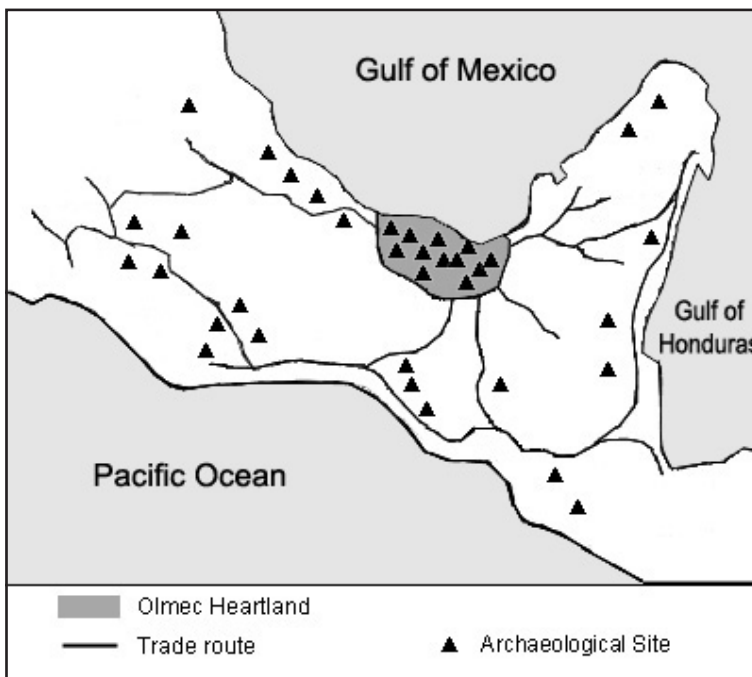


Figure 4.1. Olmeca culture: Pre-Classic Period 2500 B.C. – 250 A. D.

Although there is no certainty about the time or place of origin of bark paper, Lenz (1973) and Von Hagen (1945) argue that evidence of the manufacture of bark paper dates from as early as 300 A.D. and this indicates the manufacture and use of bark clothing by Mayan people. Ethnolinguistic studies have revealed that the names of two villages in the Mayan Peninsula depict the use of bark paper:

Excachaché ‘donde se alisan los bragueros blancos de corteza’ (place where white bark trusses are smoothed) and *Yokzachuín* ‘sobre el papel blanco’ (over the white paper) (Lenz, 1973). Moving to more recent times, the anthropologist Marion (1991) mentioned that Lacandonese, belonging to the Mayan cultural area in the state of Chiapas, was still manufacturing and using bark clothes in the 1980s.

Based on this evidence, it has been argued that the Maya were probably the first to propagate the knowledge about bark paper manufacture (Von Hagen, 1945; Lenz, 1973). By the time the Mayan civilization was flourishing (200-900 A.D.), it spanned an almost continuous territory of five countries, covering south Mexico, Guatemala, Belize, Honduras and El Salvador (Fig. 4.2). The Maya developed a sophisticated scientific and artistic knowledge, which included a system of hieroglyphic writing used to record political and dynastic history¹ and a highly acute knowledge of astronomy and mathematics. They were masters in art, sculpture, architecture and decoration techniques. Since the III century B.C. the Maya had carved their hieroglyphic inscriptions in stone and wood on Mayan monuments and architecture or painted them on plaster walls, pottery or bark paper (Von Hagen, 1945; Florescano, 2000).

Most Spanish chronicles about New Spain mention the use of books by indigenous people. These books, called codices, attracted the attention of Spanish missionaries such as Bernal Díaz del Castillo and Fra. Bernardino de Sahagún and Spanish chroniclers such as Pedro Mártir de Anglería, who recorded the indigenous paper-making knowledge². The codices were made from a great variety of materials, including animal skins and plants, such as maguey (*Agave Americana*), bark from the rubber tree (*Castilloa Elastica*), palm fibers from a palm called *izótl* (*Yucca* sp.) and bark from the *Ficus* sp. Spanish chroniclers identified three main types of paper:

1 The Mayan writing system is considered by archaeologists to be the most sophisticated system ever developed in Mesoamerica. The Maya wrote using 800 individual signs or glyphs, paired in columns that were read together from left to right and top to bottom. Mayan glyphs represented words or syllables that could be combined to form any word or concept in the Mayan language, including numbers, time, periods, royal names, names of gods, objects, buildings, places and titles.

2 The use of bark paper is recorded in various documents elaborated during the Spanish conquest and the colonial period. Some of these documents are: Pedro Mártir de Anglería. 1944. *Décadas del Nuevo Mundo*. Buenos Aires, Argentina: Editorial Bajel; Bernal Díaz del Castillo. 1968. *Historia Verdadera de la Conquista de la Nueva España*. Colección Austral 1274. Madrid: Editorial Espasa Calpe; Fra. Bernardino de Sahagún. 1969. *Historia General de las cosas de Nueva España*, México: Editorial Porrúa.

- bark paper (from *Ficus* sp.) - soft and light, thin and smooth
- maguëy paper - strong, thick, slightly rough and similar to tanned leather
- izótl or palm paper - similar to bark paper but finishing could be coarse or finer according to the manufacturing process.

In comparison with other materials bark paper from *Ficus* sp. offered various important advantages. In the first place the bark was easier to obtain than animal skins and was easier for manufacturing purposes compared with other raw materials. It could be bent, shirred, glued and melded for specific finishing touches and for decoration. Two more advantages stimulated the extensive use of bark paper: its light weight and ease of transport, which translated into great savings in time, space and labor when compared with other raw materials.

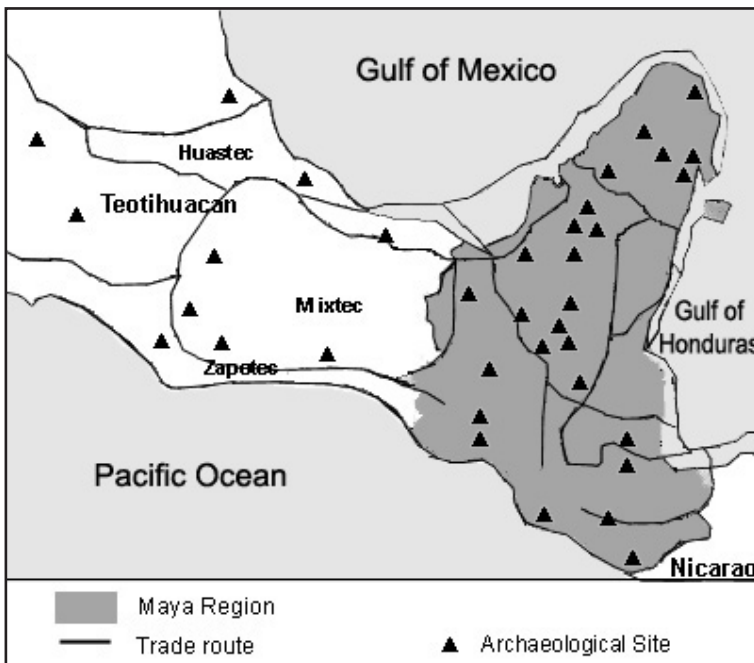


Figure 4.2. Mayan culture: Classic Period 200 A.D.- 900 A.D.

The period in which bark paper was most intensively used corresponds to the beginning of the XVI century, when the Aztecs dominated most of Mesoamerican territory. Mesoamerica stretched from central Mexico up to northern Honduras (Fig. 4.3), and was populated by related language groups that achieved a high level

of social, political and economic life³. Their ideas, beliefs and precepts were largely shaped in bark paper. Bark paper was bestowed with sacred and commercial values and was used profusely. Some of these uses were as follows:

- Writing surface: it was commonly used as a writing surface; some of the remaining codices demonstrate this important bark paper use.
- Ritual implements: it was extensively used in daily or occasional rituals, together with incense, copal, maguey thorns, rubber, etc.
- Tribute articles: it was used for lucrative purposes as a tribute or kind of tax paid by subjugated villages
- Transaction inventories: it was used for registering goods to the governing body and priests and for recording commercial transactions and tribute counts.

Bark paper was converted into books in the form of large paper rolls, similar to folding screens. These books recorded the names of heroes and gods, maps, historic and religious events, genealogies and calendars. Of approximately 500 conserved codices, around 16 are pre-Hispanic and are made of bark paper (INAH, 1979). Some of the most important are dealt with below.

- Dresden Codex: comes from the central or eastern part of the Yucatán Peninsula. It was made during the Mayan apogee and contains ritual scenes and mythological and astronomical information.
- Fejérváry-Mayer Codex: comes from Mixteca. It is a religious codex in which the world is ordered in time and space. Mesoamerica was represented in five directions: the four cardinal points and the center or up-down dimension. Every page of this codex is written on both sides, except the first and last pages, which are glued to the covers.
- Borgia Codex: comes from the region between Tehuacan, Puebla and Teotitlán del Camino, Oaxaca. It is a calendar containing the ritual cycle with representations of the monthly gods and daily signs.

³ Mesoamerica is defined as a cultural area geographically ranging from central Mexico to north Honduras. Related language groups with a common ritual calendar system and similar archaeological remains are some of the features that characterize this region. Many cultigens, such as maize, were first domesticated in this cultural area.

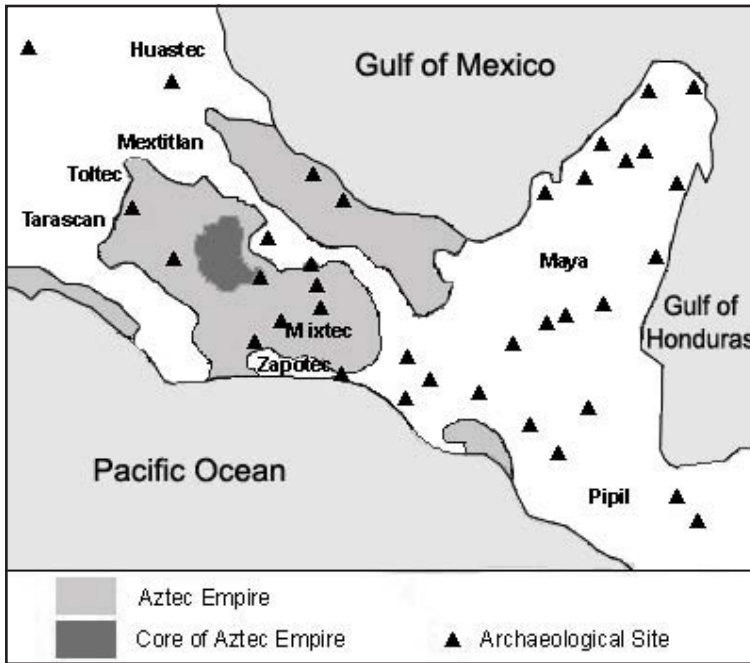


Figure 4.3. Aztec culture: Post-Classic Period 900 A.D. – 1521 A.D.

Ritual and political use of amate paper

Among the Aztecs and also earlier among the Maya, the use of books as well as the ability to read and write were exclusive activities. Similarly access to books was restricted to priests and governors. This exclusive use assured the conservation and control of knowledge, and contributed to strengthening the dominant regime. Reading and writing were special tasks that the Aztecs reserved for the *Tlacuiloque* (scribe). The *Tlacuiloque* used brushes made from rabbit and deer hair to first draw the main lines and then paint them in plain colors. Learning to read and write was part of the formal education in the *Calmécac* (schools); however, the possibility to apply this knowledge was reserved for the *Tlacuiloque*. To become a *Tlacuiloque* required great ability. This profession passed from parents to children and its execution represented the possession of important social status (Lenz, 1973).

Besides the exclusivity of writing, bark paper was closely related to the imposition of a common calendrical system for all Mesoamerica. As Marcus (1979) says, the emergence of writing during the Middle Formative Period took the form of political information presented in a calendrical structure. The equal importance of the Mesoamerican calendar depicted in bark paper codices and the ability and privilege

of writing is mentioned by Beyer (1979, cited in López-Austin, 1993), who indicates that: ‘... The calendar was one of the most solid and elaborate creations of Mesoamerica, but it was rooted in politics. In fact its history was tied to those of writing and of power.’

The Aztec religion and ritual calendar constituted a complex belief system that included the knowledge and expression of an extensive and diverse area. The Aztec religion imposed a common vision of the world and arranged the life of every individual through rituals and ceremonies. However, the priests, whose intention was a unique integrated explanation of the world, adopted the myths and practices of other villages. It functioned as an open religion, continuously annexing in its calendar the gods and rites of subjugated villages. The calendar has been a principal element of religion and power and has permeated all aspects of human existence (Beyer, 1979 cited in López-Austin, 1993).

Natural events were explained via the functioning of a hyper-human world, which became practical and rational through a vast number of religious practices and conceptions. These precepts enabled the world to be perceived in an ordered way, and offered the possibility of avoiding unexpected or threatening events. The Aztec calendar, divided into 18 months, indicates the respective monthly gods and festivities⁴. For each festivity an extensive celebration was organized, as well as sacrifices that linked individuals and deities in traditional unity. During the celebrations bark paper was extensively used in different ways (Lenz, 1973; Seeman, 1990):

As adornment:

- *Amapatlachtli*: garnish in the form of a pennant
- *Tetéuitl*: paper decorations placed in cane lances that were carried by young women during fertility rituals
- *Yiatatzli*: ceremonial paper bags
- *Amatetéuitl*: sacred badges made from bark paper to symbolize the prisoner soul after the ritual sacrifice.

4 The time-gods unity is indicated by López-Austin (1993:117) ‘... Time was gods in succession and the power of the gods over the earth was influenced by time... The concept of time-gods and their alternating influence in the modification of the world is one of the fundamental characteristics of Mesoamerican thought.’

As attire for gods, priests and human sacrifice:

- *Amacalli*: paper crown
- *Amacapanalli*: paper stoles worn by priests
- *Amacopilli*: conic plume made from paper
- *Amacuexpalli*: like hair made from paper
- *Amamaxtli*: paper truss used by the devout
- *Amaqueme* and *Amaquemiltl*: costumes made from paper
- *Cotceuatl*: paper bracelets
- *Tlaquechpaniotl*: winch-like garment placed at the nape.

As ceremonial offering:

- *Amapantli*: flags manufactured from paper
- *Amatétuitl*: skeleton decorated with papers which represented the prisoner soul after the ritual sacrifice
- Long papers, approximately the height of a man, width 20 cm. The ends of these huge papers were spread with rubber and at the end of sacrifices these papers were burned as offerings.

During the celebrations bark paper occupied a sacred place. Seemann (1990), in her study *Usos del Papel en el Calendario Ritual Mexica* (Uses of Paper in the Ritual Mexican Calendar), analyzes the various uses of bark paper. Through the interpretation of the Codex Florentino, Codex Borbónico and *Los Primeros Memoriales* by Fra. Bernardino de Sahagún, the author observes the constant use of bark paper in pre-Hispanic celebrations.

In every celebration amatetéuitl were used. These were trimmed paper in the form of long flags or trapezoids, and painted with black spots of rubber depicting the characteristic symbols of each god. The amatetéuitl served as offerings and ornaments. In the first month of the year during the celebration called *Cuahuitleua* ‘el árbol o los árboles se levantan’ (the tree or trees awaken) or ‘cuando empiezan a retoñar las plantas’ (when the plants start to sprout), these were carried out to ask for rain. According to *Los Primeros Memoriales*, the whole population participated, carrying amatetéuitl offerings. They were trimmed as standards and were richly decorated in blue and with rubber, with plumage at the spearhead.

The tetéuitl canes, decorated with paper at the end of the spearhead, were also intensively used. During the celebration for the god Tezcatlipoca, the governor's daughters carried tetéuitl in the procession (fifth month, called *Toxcatl*). In this same celebration a great paper ornament about 33 m x 1.54 m and one finger thick was used. The feats of each year were painted on it. Because of its great size several youngsters transported it and placed it beside the image of Tezcatlipoca.

The gods' attires were complicated and exuberant; they frequently consisted of paper, plumage, metals and precious stones. In Codex Borbónico, Tlaloc, god of the rain, who was celebrated in the third month, appears seated inside his temple located over a mountain. In his right hand Tlaloc is holding a staff molded in the form of a thunderbolt. He is fully dressed and decorated with paper painted with black rubber spots. His body and face are painted black; the upper part of his head is decorated with heron feathers, and a winch folded paper, characteristic of the water, mountain and vegetation deities, is placed at the nape of his neck (Plate 4.1).



Plate 4.1. Tlaloc, god of rain (Codex Borbónico).

The priests dressed and decorated themselves with trusses, head garments, flowers, and bands across the chest, all made from bark paper. They also used to carry staffs covered with decorated black rubber paper and bags made of animal skin or

paper for carrying incense. Those to be sacrificed were dressed in valuable materials such as tiger skins, small golden bells, thin fabrics and various paper adornments. To celebrate Xiuhtecutli, the god of fire, the priests painted the bodies of those to be sacrificed in white and dressed them in trusses, with bands across their chests and thin paper strips on their heads. They also carried small paper flags, which the priests took out of their hands to burn, indicating their sentence. The offering to Xiuhtecutli consisted of a tree trunk, the upper part decorated with a statue made of amaranth seeds, with long paper flags and white paper strips hanging down to the middle of the trunk. This statue represented the God of Fire. The tree, which was called Xócotl, was placed in the plaza and men and children danced around the trunk hand in hand. At the end, when the sacrifice was over, they all lifted the statue down and it was crumbled up into small pieces, which were distributed among the participants.

Use of amate paper as tribute

Bark paper was extensively used as a tribute. After 1325 A.D. the Aztecs maintained a type of commercial interchange that helped them to extend their dominion and control a vast part of Mesoamerica. The city of Tenochtitlan, center of the Aztec Empire, had around 300 000 inhabitants, maintaining a complex social structure. Governors and priests occupied the summit and wielded their superiority over neighboring villages and in the interior over merchants, artisans, agriculturalists, servants and slaves – all dominated by the political-religious system of the powerful sectors. As an urban city, Tenochtitlan had a high concentration of non-agriculturalist inhabitants. Its survival depended entirely on the supply of goods via the market and via the tributes that came from subjugated rural villages. As far as the Aztecs were concerned, the villages under their control could keep their land, resources and local organization provided the assigned tributes were promptly delivered.

It was through tributes that Tenochtitlan received a great quantity and variety of goods, including manufactured articles, food from different ecological areas, domestic objects used in daily life and luxury items for special occasions – costumes, blankets, weapons, fuelwood, incense, copper articles, precious stones and bark paper, to mention a few. Among the manufactured and luxury tributes, bark paper was allocated to the royal sector, to be used as gifts for special occasions or as rewards for warriors. It was also sent to maintain the priestly cults, the temple garments, the robes of idols, and ceremonies. Other portions of paper were assigned for manufacturing codices and writing records.

The tributes were received by principal majordomos, who were in charge of recording on bark sheets the amount, type and place of origin of the tribute. The *Matrícula de Tributos* (Tribute Register) is one of the books in which the tributes received by Moctezuma II, the last emperor of Tenochtitlan, were recorded. About

In this sense, Florescano (2000:2) points out: ‘... The denaturalization of Mesoamerican towns and history started with the negation [by the Spanish] of the artefacts that these towns invented to register their own history.’ After military victory the conquest focused largely on constructing a new history and this, as Florescano (*ibid.*) says, meant the suppression of historical memory. The old memory that narrated the origin and history of the indigenous civilization was destroyed. A new language and a new historical interpretation were imposed, and in these the indigenous people appeared only with reference to the actions of the Spanish conquerors.

In this whole ideological metamorphosis, one of the most significant changes was the suppression of the past calendrical system and its replacement by the Christian calendar and Christian festivities, promoted intensively by the missionaries. By suppressing dates of ritual significance, the Spaniards broke the continuity of the memory that celebrated the founding events of indigenous life. By overlaying new dates on the old – the imposition of Spanish-Christian ceremonies and festivities – the events important only to the conquerors were remembered (Florescano, *ibid.*).

At the start of the Spanish colonial period, the Bishop of Yucatán, Fra. Diego de Landa, ordered 27 historical Mayan books to be burned. Fra. Juan de Zumárraga did the same with the Real Library of Texcoco, at that time the great ancient depository of Aztec manuscripts (Lenz, 1973; Florescano, 2000). Fra. Juan de Torquemada (1976), a Franciscan missionary who arrived in New Spain towards 1560, wrote an extended work about the pre-Hispanic culture and the new colonial changes, recording the magnitude of the codices destruction: ‘... aunque por haberse quemado estos libros al principio de la conversion no han quedado para ahora, todo lo que ellos hicieron, y tiempo que poseyeron estas tierras’ (II-544) (as these books were burned at the start of the conversion, no record remains of all that they made and the time when they possessed these lands). As the religious and mystic books were also destroyed, the use of ritual paper diminished till it finally disappeared, an extension of the prohibition of traditional celebrations.

As mentioned before, about 500 codices have been conserved and of these just 16 belong to the pre-Hispanic period. The manufacture of post-Hispanic codices, mostly written on bark paper but a small number on European paper or cotton and skin canvas, is due to the work of missionaries such as Fra. Bernardino de Sahagún and Fra. Bartolomé de Las Casas, who were interested in describing in detail and from direct sources the traditions and knowledge of indigenous people. In this way some post-Hispanic codices were compiled, such as Codex Sierra, Codex La Cruz Badiano and Codex Florentino, containing information about daily life, rituals, myths, and Aztec medicine and knowledge of flora (INAH, 1979).

The manufacture of other codices, such as Codex Mendocino, was commissioned by Virrey Antonio de Mendoza around the year 1525 for the purpose of learning the geographical tribute system and the indigenous traditions. This codex is made from European paper and consists of three parts: the history of the Aztec conquests, a pictorial record of the tribute paid by the different provinces of the Aztec Empire (with a Spanish interpretation) and a report about the life of Aztecs. In this codex the tributary villages, collector routes and type of tribute were represented (Plate 4.2). Below each hieroglyphic Spanish glosses were written for the benefit of the Spanish conquerors who, from the very beginning, were interested in the villages paying tributes of gold, cacao and cotton blankets (INAH, 1979).

Prohibition of bark paper was absolute from the start of Spanish colonization. The codices and bark paper, which embodied a unity during pre-Hispanic times, became separated. While the manufacture of codices and register books continued, although only on a small scale for a few years and for special purposes, the traditional manufacture and uses of bark paper, especially the sacred ones, were completely forbidden.

European paper and bark paper

The Spaniards brought to New Spain a provision of European paper. However, during the following years of colonization this paper became scarce and after 1538 several requests to grant the opening of a paper factory were sent to the Spanish Crown. The bark paper, or as Spaniards called it *papel de la tierra* (paper from the soil), substituted for the European paper on several occasions. Bark paper was used mainly by the missionaries and their pupils, who required great amounts of paper for writing and teaching. Until 1580, when the first paper factory was opened, old clothes were used as raw material and also on some occasions maguey leaves and bark material boiled down to a pulp (Lenz, 1990). Although more paper factories were set up later, production did not satisfy demand and for many years paper consignments were brought from Spain. The German explorer Alexander von Humboldt (1984), one of the first geographers to travel extensively in Mexico, mentioned that even at the start of 1800 there was still a scarcity of paper factories in Mexico.

During the new colonial period, the use and control over the manufacture, use and distribution of paper, as well as the information on it, ensured the maintenance of power. European paper, particularly 'official paper', was kept out of the hands of the indigenous population. This official paper, was used to send important information to the Spanish Crown, and as such was reserved for governors and *encomenderos* in charge of the *encomienda* tribute system (Lenz, 1990). The

encomienda system, as will be explained in chapter 8 (section 8.2.1), aimed to supply cheap and adequate labor from among indigenous people, who were required to pay tribute in return for Spanish protection.

Although bark paper was strongly rejected and almost disappeared, some travelers and early explorers that arrived after the Spanish conquest observed that bark paper continued to be manufactured. Dr. Francisco Hernández (1942) was the first to record the use and manufacture of bark paper. He was the first naturalist that on direct request of the Crown visited Mexico to carry out an expedition as proto-medic. For around five years he traveled throughout Mexico, collecting information about native plants. In 1570 he visited Tepoztlán village in the state of Morelos and confirmed the use of bark for the manufacture of what was called ‘American paper’. Two decades later Boturini (1986) and Von Humboldt (1984) traveled along Mexico. They record in their publications the use of *metl* maguey leaves for the manufacture of paper by some indigenous people. Both authors describe the manufacturing process, although according to Lenz (1973) they probably did not witness it.

After Boturini and Von Humboldt, many years passed without a mention of native paper manufacture. At the start of the XIX century some travelers and ethnographers recorded the clandestine manufacture of bark paper in a marginal way in some isolated villages located far from the earlier settlements of Spanish domination. In 1898, the ethnologist Frederick Starr (1901, cited in Lenz, 1973) visited some Otomi villages in the Huasteca region⁵. There he saw the manufacture of bark paper. Years later, Dr. León (1924) records the manufacture of bark paper in Ixhuatlán, and Bodil Christensen (1942) in Chicontepec, both villages in the north of the state of Veracruz. Lenz (1973) followed the route of Starr and recorded that only a very few villages continued producing bark paper, Jalapa and Naranjo Dulce in the state of Hidalgo and San Pablito in the state of Puebla.

5 The Huasteca region extends into the mountainous areas of Veracruz, Puebla and Hidalgo just above the Sierra Norte de Puebla region. As explained by Fuentes (1972) in some geographical descriptions, the northern mountainous borders of Sierra Norte de Puebla are considered to lie within the Huasteca region.

6 The villages reported in the bibliographical sources as the places where bark paper manufacture survived were inhabited by Nahua, Otomi, Totonac and Tepehua people. Therefore paper manufacture was not only an Otomi tradition. The cultural interchange among ethnic groups in pre-Hispanic Mesoamerica is remarked on in bibliographical sources. In the Huasteca and Sierra Norte de Puebla regions, where historically different ethnic groups settled, knowledge and beliefs have been interchanged, as Sandstrom and Sandstrom (1986), Galinier (1987) and Dow (1990) point out.

After several decades of Spanish colonization the manufacture of bark paper continued only in scattered villages along the Huasteca and the Sierra Norte de Puebla regions⁶. According to Lenz (1973), the inaccessibility of this region and the distance from centers of dominion contributed to the survival of this pre-Hispanic tradition⁷. Among the paper-making villages, San Pablito inhabited by Otomi people was, at the time of Lenz's visit in 1942, the village where paper manufacturing knowledge was vigorously kept alive and the village supplying bark paper to other villages located in Sierra Norte de Puebla. According to Lenz (*ibid.*) and Galinier (1987), their paper was endowed with special power.

4.3 Otomi bark paper production

4.3.1 Antecedents of Otomi from 1100 A.D. till Spanish colonization

At present the Otomi are settled in two main geographical areas: in the semi-arid region called Valle del Mezquital in the west of the state of Hidalgo and on the eastern slopes of Sierra Madre Oriental in between the states of Veracruz, Hidalgo and Puebla (Fig. 4.5). Along these two Otomi areas runs a broad band occupied by other indigenous groups, mainly the Nahuatl. The separation of the Otomi in these two geographical areas started around 1100 A.D. and over time it has broadened in cultural and linguistic terms. The distinct environments, the semi-arid conditions in Valle del Mezquital and the steepness and humidity in the Sierra, have marked differences and have shaped different Otomi survival strategies (Manrique, 1969; Dow, 1990). Their distance to the main economic centers has also been crucial in their historical development. According to some researchers, until the 1980s the Otomi of Valle del Mezquital were generally more integrated into the national economy than those living on the Sierra (Galinier, 1987; Dow, 1990).

⁷ Indeed distance from the main Spanish colonial settlements and the roughness of Sierra Norte de Puebla are noted as important reasons for the survival of bark paper manufacture in this region by most authors studying the traditional use of bark paper figures (Lenz, 1973; Christensen, 1979; Sandstrom and Sandstrom, 1986; Galinier, 1987).



Figure 4.5. Distribution of Otomi groups in Valley of Mezquital, state of Hidalgo and Sierra Norte de Puebla, state of Puebla.

Knowledge about the Otomi past is still vague. The Otomi are one of the less studied ethnic groups in Mexico; their history remains unclear and the origin of their settlements is a matter of some controversy (Manrique, 1969; Carrasco Pizana, 1979; Galinier, 1987). A constant has been their subsequent displacement from their territories. The Otomi were displaced from the central lands of Toluca by the Nahuatl around 800 A.D., later by the Toltecs, who built the city of Tollan. The Otomi moved to the northern semi-arid lands in Valle del Mezquital. Here they constituted the frontier between the Toltec Empire and the Chichimeca nomads. This frontier represented a transitory terrain marked by the start and end of two geographical areas with two distinct subsistence life modes: the semi-desertic lands settled by agriculturalists, and the desertic lands inhabited by nomadic hunter-gatherers. The Otomi maintained close contacts with the Toltecs and also with the

nomadic Chichimec tribes, with whom they exchanged products. But Otomi also defended against frequent attacks of Chichimec tribes preventing in this way their pass to Valle del Mezquital, and to Tollan city (Galinier, 1987; Dow, 1990).

The second Otomi movement occurred when Tollan collapsed. Throughout the XII and XIII centuries the Otomi had been displaced and shifted towards the most arid regions within Valle del Mezquital and some groups started to migrate towards the Sierra. However, the great movement towards the Sierra seems to have occurred after the collapse of Xaltocan, the central city of the Otomi Empire, found in the Central Valley of Mexico. Although Xaltocan was not as grand as the capital of the Toltec Empire, its power lasted from 1220 till 1398 (Carrasco Pizana, 1979). The collapse of Tollan and then of Xaltocan led to an extensive diaspora. The Otomi withdrew to the west, north and east, and some towards the northeast into the Sierra (Manrique, 1969).

At around 1500, when the Aztecs started to overwhelm various oriental areas of Mesoamerica, the Otomi were already established in the Sierra, integrating into a wide region inhabited by other ethnic groups, such as the Tepehuas, Huastecos, Totonacos and Nahua. During the expansion of the Aztec Empire, the Tutotepec dominion in the Sierra, which was inhabited by Otomi and other ethnic groups, together with the neighboring Meztitlán dominion, were among the few territories that could conserve their independence. Towards the middle of the XV century, all Otomi in the valley were living under Aztec supremacy – except the Otomi of Tlaxcala and the Sierras, who were exempt from the tribute in exchange for military services in defense of the confederation, which was constantly being attacked by Chichimeca tribes. When the Spaniards arrived, the Otomi were living in an autonomous and independent settlement with almost absolute freedom. The Spaniards had to contend with their resistance and opposition as well as the vast geographical obstacles of the Sierra (Galinier, 1987; Dow, 1990).

The Spanish incursion into Sierra Norte de Puebla

At the start of the Spanish conquest, Tutotepec entered into an alliance with the Spaniards against the central power of the Aztecs. This agreement soon ended and the population of Tutotepec rebelled and was converted into the Republic of Indians. In exchange for some services the Spanish Crown granted the new colonists a land concession to pursue expansion of the Crown domination. The land concession occupied a substantial area that to a certain extent escaped central control because of the long distances and characteristically serrated terrain of the Sierra. Missionaries bent on indoctrination tried to assemble the Indians in settlements called estancias and barrios. However, they met strong resistance and many Indians conserved their dispersed settlement pattern (Carrasco Pizana, 1979) (see chapter 8, section 8.2.1).

From the beginning, the Sierra did not offer as many resources as other areas and the Spaniards quickly lost interest, mainly due to the absence of minerals. On the other hand the rapid decline in the Indian population, largely caused by epidemic diseases, prevented the development of large-scale farming on the Spanish *encomiendas*, which required a considerable number of Indian laborers. From the end of the XVI century till the XVII century *encomiendas* were transformed into privately owned ranches called *haciendas*, which relied on hired labor and were organized around cattle ranching (García Martínez, 1987). In comparison with other areas, *haciendas* in the Sierra remained few and mainly located in the warm lowlands where most Spaniards settled, whereas the mountains were left to indigenous peoples (Sandstrom and Sandstrom, 1986).

Before and after the Spanish conquest the Sierra constituted a complex area, receiving constant migrations of different ethnic groups, and migratory movements continued throughout the XVI century and the first years of Spanish colonization. During Spanish colonization the region was a refuge for indigenous people who had lived in independent villages, claiming rights to their own lands. A long period of time elapsed before the Spaniards could control the region and establish the first parochial churches.

While indoctrination of the Otomi in the valley was pursued in quite a pacific way, in the Sierra this was a slow and difficult task. Franciscan and Augustinian missionaries met strong resistance and a very rooted and complex belief system. In the XVII century missionaries wrote about the rites and beliefs of the population of Tutotepec, describing them as complete pagans (Lenz, 1973). Despite that, the same missionaries tried to protect the Indians from strong repressive measures by the authorities. They issued *anuencias* (permits) to let the indigenous people continue their celebrations, asking only that animal sacrifices be substituted for human sacrifices (Galinier, 1987). The Otomi showed a tenacious resistance towards indoctrination, conserving the gods, festivities, and beliefs strongly rooted in their religion. Within their religious system, the role of paper figures for ceremonies, some of them used in sorcery, was of prime importance (Sandstrom and Sandstrom, 1986).

It appears that the Spanish interdict on the use of paper did not interrupt the work of the shamans or their use of paper and, despite the tenacious indoctrination efforts of the missionaries, the use of paper as well as other indigenous religious aspects survived. In this respect López-Austin (1993:105) says that ‘... Indigenous societies began to be evangelized more than four and a half centuries ago in accidental and widely differing ways. Obviously the degree and form of Christianization differed

widely among the various groups, but even where conversion seemed to be more nominal than real, there were profound changes in religious concepts. On the other hand, even groups that were more completely Christianized still retain beliefs that can in no way be attributed to the sermons of the missionaries or to the dominion of the Christian church. Fields, springs, mountains, and homes are still inhabited by invisible beings similar to ancient ones; the etiology of diseases, the cyclic recurrence of cosmic forces, and the hierarchy of supernatural beings have Mesoamerican origins.’

On the other hand, as explained at the start of this chapter (section 4.2.2), although the most perceptible Mesoamerican traditions such as the calendar were the first cultural elements to be prohibited by the Spanish conquerors, there were other elements not so evident that persisted. It appears that the religious traditions that remained under domestic protection and did not require outward forms that might betray the faithful to the colonial authorities could persist. It is then within households, within family relationships, that Beyer (1979, cited in López-Austin, 1993) claims to find information about past Mesoamerican concepts, about the organization of the world and about the way of understanding it.

4.3.2 Otomi ritual bark paper

Before describing the role of bark paper within Otomi rituals, it is important to remark that the Otomi religion, as well as the religion of other Mexican indigenous groups, is constantly changing to adapt to new contexts, and has a strong syncretic character, involving Catholic and pre-Hispanic elements. In this sense, López-Austin (1993) mentions that current native religions differ from Mesoamerican ones. The present religions are ‘invaded religions’, as the author calls them, facing since the Spanish conquest external dogmas, principles and customs. Day by day indigenous people are reinterpreting, adopting and assigning new functions to Catholic and increasingly also to Protestant elements, giving rise to what López-Austin (*ibid.*) calls ‘colonial religions’.

The Otomi have a religious system composed of their ancient magic/religious conceptions and Catholic beliefs. This syncretic condition was already a notorious aspect of pre-Hispanic religions. The Aztecs, for example, often placed their own deities alongside those of the people they conquered, without attempting to destroy the local religion (see section 4.2.1). Thus the peoples of the Sierra, like those all over Middle America, were able to accept aspects of the new religion and at the same time practice their traditional rituals (Sandstrom and Sandstrom, 1986).

At present the Otomi religion is composed of Catholic saints, gods or deities and also, as Dow (1990) calls them, super-human beings. The Otomi venerate the God of Earth and the Goddess of Water, the God of the Sun, Earth and Wind, Our Sacred Mother, Our Sacred Father, the Divine Couple, and other minor gods such as the God of Fire, the God of Vegetation and the Deity of Death – all of pre-Hispanic origin (Dow, 1990; Galinier, 1990). The Otomi currently venerate Catholic saints and deities, but this practice is carried out in different social spaces.

Dow (1990), in his study of the Otomi religion in Sierra Norte de Puebla, proposes a distinction between two religious systems, the public and the private. The private is constrained to the household space and is related to the super-human deities. The shamans tried to arrange the disrupted relations between super-human and human beings. In the public system officiants try to harmonize the relations of the group with the Catholic saints. It is centered on the communal religious ceremonies. The officiants can be the *mayordomos* (godparents) sponsoring the party devoted to Catholic saints or the leaders of worship.

Sandstrom and Sandstrom (1986) observed other key differences between Catholic and non-Catholic practices: the participation of shamans and the use of paper figures. The reciprocity between super-humans and humans is pursued through the offerings and ceremonies held by the shamans, such as cleaning ceremonies and rituals to ask for good crops, for cures and for protection. In these ceremonies cut-out paper figures have a predominant place and represent various super-human beings, for example seeds of fruits and grains, the God of the Mountain or the God of the Earth, mythological animals or special characters such as the sentinel and the vigilant, and may also represent men, women and children (Fig. 4.6). These authors also observed that shamans never cut out images of Catholic saints and that most non-Catholic rituals do not have a specific celebration day, whereas calendrical ceremonies or festivities refer to the catholic ones⁸. This observation partly relates to the destruction of the Mesoamerican calendrical system, one of the first actions undertaken by the Spaniards, which implied the direct destruction of pre-Hispanic social, political and religious organization (section 4.2.2).

8 In this sense López-Austin makes an interesting observation and explains that, although the calendrical framework for the gods no longer exists, gods are constantly being recreated and reinterpreted. In the present indigenous conception '... gods favor or do damage to humans with the power of regularity and with the surprising appearance of the unexpected. Gods cannot be absolutely good or absolutely bad. They have free will, and today, when the calendar has lost its preeminence, their capricious nature stands out' (1993:110).

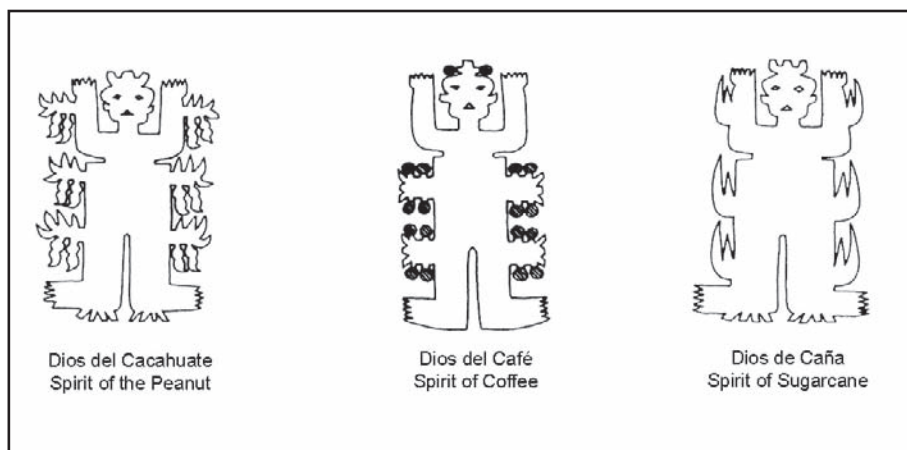


Figure 4.6. Cut-out paper figures (from Sandstrom and Sandstrom, 1986).

Principles behind the use of ritual bark paper

The principle behind the use of paper figures is animistic. The Otomi believe that all beings, human and super-human, have a living animating force, which they call *nzahki*. It is the Otomi version of a basic Mesoamerican Indian soul concept. People, plants and animals have reciprocal relations and the shamans can influence them. To perform cures, the shaman returns the *nzahki* using magic, but he can also produce sickness using sorcery (Dow, 1984; Galinier, 1987). When a shaman cuts out a figure, he gains power over the motivations of the being represented by the figure. Its function is to attract and influence the *nzahki*. Paper figures are always cut out and used in groups symbolizing social restructuring. The shaman is a mediator between deities, the sick person and his or her family. Cures are the process of restoring equilibrium to household groups; they guarantee the return of the cured person to the communitarian order and allow the reconciliation of the healing body with ancestors and divinities (Galinier, 1987).

Nowadays the role of shamans in San Pablito continues to be strong. According to local people rituals conducted by shamans decreased around 20 years ago when Protestant churches entered the community. However, through time their adepts have declined in number and many have returned to the Catholic religion, which in practice is carried out in close relation with the traditional rituals. Healing ceremonies are common in San Pablito. Their organization and execution can last from one day up to a week and may represent a high monetary investment for the preparation of offerings, which include candles, food, incense, cigarettes, flowers, in return for the help being received.

Since in San Pablito agricultural activities have been mostly abandoned, rituals related to cultivation and harvesting are no longer carried out. Nowadays cleaning ceremonies to recover from scares or the evil eye are especially common among young Otomi men and women returning from the United States. As will be explained in chapter 5 (section 5.5.2), temporary labor outside San Pablito is one of the main economic activities, especially among the younger generations. Some alarming events experienced abroad, such as illegally crossing the border or sudden expatriation, have traumatic repercussions that are solved through rituals conducted by shamans. Migrants, including young people, are helped to re-adapt to their life in the village through healing ceremonies.

In all the current rituals the use of paper figures is common. The paper in itself is neutral and has no symbolical value. It only acquires value when the shaman, through the cutting-out technique and his word, confers strength capable of making the symbolized divinity emerge (Galinier, 1987). There are two types of bark paper, dark and bright. The color is very important in identifying the deities or spirits represented by the figures. The sheets of dark paper have a threatening connotation whereas white paper is beneficial. Dow (1986) also explains that color is an important symbolical characteristic of the figure. White is reserved for the *nzahki* of humans or gods. Black is a significant color for indicating evil characters or for sorcery. In traditional thought the native bark paper is connected with bad things (Dow, 1986; Sandstrom and Sandstrom, 1986).

Besides bark paper, industrial paper has also been adopted. The utilization of industrial paper was already recorded in the 1940s (Christensen, 1942 and 1952). Tissue paper is used to represent the spirits of seeds of various crops; paper color corresponded to the plant represented, for example green paper for the banana plant and sugar cane and purple paper for beans. During the 1980s Dow (1986) also noticed the use of newsprint and banana leaves. The shaman he interviewed also utilized white writing paper, tissue paper, tiseled paper, metallic foil and, if bark paper could not be obtained, then newsprint, which according to the shaman was ‘... the companion of bark paper. The ancient ones don’t value bark paper highly, it’s used for sorcery’ (ibid.:36).

Researchers that have studied the use of bark paper among the Otomi do not discuss how the adaptation to industrial paper took place but suggest that its ready availability, diversity of colors and low price represented qualities that facilitated its adoption (Galinier, 1987; Dow, 1990). The use of industrial paper allowed an ample combination of colors with different properties known to the shaman, who according to Galinier (1987) always associates the color of bark paper with the different types of industrial paper. The same author continues by explaining that, in the case of newsprint, its adoption responded to a number of questions that the Otomi have about the world. For example, illiterate persons view the capacity of

urban people to read and write with a sense of distrust and manipulation. Industrial paper and bark paper are distinctly used to represent persons according to the purpose of the ceremony and the rank of those persons and the affection in which they are held. The spirit of an important person is represented with whiter and best quality paper (Lenz, 1969). Harmful or negative spirits are cut-out from dark bark paper and wear shoes to connect them symbolically to non-Indian persons (Christensen, 1979; Sandstrom, 1983).

The origin of bark paper figures

The roots of the use of bark paper figures are not known⁹. Sandstrom and Sandstrom (1986) suggest that paper images may have been cut out since pre-Hispanic times, although no chronicler of the XVI century specifically records this practice. Probably the manufacture and use of paper figures did not start until the conquest, and was possibly due to the lack of all other pre-Hispanic representations, as these were destroyed or forbidden by the Spaniards (Dow, 1990; Goloubinoff, 1994). Again, as in pre-Hispanic times, it is possible that the qualities of bark paper played an important role. Paper was easy to transport, to mold, to manufacture, to store and, in this case, also to hide.

Many religious concepts that at present Otomi shamans express through their paper cuttings have been in existence since the pre-Hispanic period (Sandstrom, 1983). Once the Otomi started to move and settle in the Sierra around the XII and XIII centuries (section 4.3.1), they brought with them their costumes, language and festive calendars. Seeman (1990) finds certain similarities between the rituals presently celebrated by the Otomi of the Sierra and the pre-Hispanic ones celebrated earlier in the semi-arid habitat of Valle del Mezquital. Fitl (1975, cited in Dow, 1984) suggests that the present paper figures have their origin in pre-Hispanic pictographs and that similarities can be observed between the Otomi paper figures and drawings of maguey and corn gods in the Codex Borbónico, Codex Fejérváry-Mayer and Codex Laud.

The use of cut-out bark paper figures for ceremonies is mentioned until the 1600s, when Otomi were discovered conducting pagan rituals for which they used paper cut into strips (Lenz, 1973; Carrasco Pizana, 1979). During the Spanish colonialism, accusations against the Otomi of San Pablito were common, citing their ritual practices and the use of bark paper figures to cause harm. Accusations were made

⁹ As explained in section 4.2.1 bark paper was extensively used in the pre-Hispanic period. The different uses are described in several pre-Hispanic and post-Hispanic sources of information but the specific use of bark paper figures is only recorded until the Spanish colonial period,

before the Tribunal of Pahuatlán, the closest important settlement to San Pablito and present-day head village (Lenz, 1973). These accusations reproach them for material and physical losses and criminal activities. As proof, victims showed bark paper cut-out figures that represented them, some with thorns and pins in them (Carrasco Pizana, 1979). The use of bark paper for harmful purposes is a very old practice, as noted by Carrasco Pizana (*ibid.*) and Galinier (1987). Even before the Spanish conquest the reputation of the Otomi as fortune-tellers and witchcraft practitioners using bark paper made them feared by their neighbors.

Although bark paper was produced in several villages of Sierra Norte de Puebla, the role of the Otomi in the continuity of bark paper manufacture has been essential. The first explorers and researchers that registered the manufacture of bark paper in the Sierra agree that the manufacture and use of bark paper strongly persisted among the Otomi (Christensen, 1952; Manrique, 1969). As said before, their paper was endowed with special power by other neighboring indigenous people, who used to request bark paper from the Otomi. In that way, even under Spanish colonialism, the use of bark paper and in particular of paper figures enabled the continuation of bark paper manufacture, and the shamans were the depositories of this specialized knowledge (Dow, 1986).

4.3.3 Concurrent manufacture: commercial and ritual bark paper

Although the important ritual role of bark paper among Otomi of San Pablito, its use was declining. At the time when commercialization of bark paper began, its manufacture had been diminishing in San Pablito as well as in other villages of Sierra Norte de Puebla where bark paper was manufactured. Various sources of information mention the displacement of bark paper by industrial paper. Christensen (1952) reports that indigenous paper manufacture was almost disappearing; Dow (1982) states that towards the 1930s the technique was disappearing, while Galinier (1987) alludes to the extinction of this traditional manufacture due to the introduction of industrial paper. Galinier (*ibid.*) observed that bark paper manufacture survived in only seven villages of Sierra Norte de Puebla, and in these villages traditions preserved three main characteristics: small production for rituals, technological specialization (only the shamans could manufacture paper) and abiding secrecy (its role in witchcraft obliged the shamans to keep its use hidden).

The trend towards the likely disappearance of paper manufacture changed at the onset of bark paper commercialization. Since the opening up of markets outside the village, external demand has constituted a key factor in the future of bark paper manufacture. In the first place the technology for paper production was revived as public knowledge and, as some authors observed, the Otomi religion was also revitalized due to the ritual values closely associated with bark paper (Sandstrom, 1983; Galinier, 1987). Among the few other villages that continued manufacturing

bark paper, only the Otomi of San Pablito currently maintain the technological knowledge of bark paper manufacture and continue to cut-out figures from bark paper. In other indigenous villages the manufacture of bark paper has disappeared and has been replaced by industrial tissue paper, from which ritual figures are cut-out (Sandstrom, 1983; Dow, 1986)¹⁰.

There are different versions of how commercialization of bark paper started. According to some authors, it appears that the whole paper marketing system began with the intermittent sale of bark paper figures on a small scale, even before the Nahua adopted the plain bark paper sheets as a surface for their paintings. Paper figures were sold in tourist markets in Mexico City, together with other Otomi handicrafts (Stromberg, 1982; Amith, 1995). Other sources state that after the Nahua adopted the paper some Otomi shamans realized the commercial success of painted Nahua paper and started to sell their bark paper figures (Galinier, 1987).

It appears that the first bark paper products to be sold were the cut-out paper figures. In fact Otomi shamans were the first to realize their attraction for foreigners. Since the 1940s Otomi shamans have had contact with several researchers, for example Frederick Starr, who was one of the first researchers of the XX century to witness the manufacture of bark paper, and Bodil Christensen, one of the first researchers to study the manufacture of amate paper and the trees used in the process. On the other hand, due to their professional specialization, only the shamans knew about paper cutting techniques and designs. In this respect there are two significant aspects: first the role played by shamans in introducing the paper figures into commercial networks, and second the transformation of bark paper ritual value into market value.

From the above, new questions emerge, in particular: How could shamans combine the ritual and commercial production of paper figures and how were the two paper values adjusted or reinterpreted to enable parallel manufacture and use within San Pablito? According to Galinier (1987), the aesthetic search led to the separation of the ritual and marketing values contained in bark paper. The author observed that shamans started to glue each figure onto dark bark paper to make the contours stand out; other Otomi artisans too started to explore new decorative techniques by crushing white pieces of paper onto black paper to fill in the contours of figures, mostly mythological animal figures. The new aesthetic version prompted the differentiation between the artistic and symbolical character of the paper. It is, as Galinier (1987) mentions, a new creation with a new content that respects the traditional values and mythological topics.

10 These observations were made in the 1980s. More recent field research to discover whether paper figures are actually being cut out and used in rituals in other villages is lacking.

At present paper manufacture and the cutting-out activities are not restricted to shamans; these activities are of a public nature among the Otomi of San Pablito village. But as will be explained in chapter 5, only shamans cut out ritual paper and the paper manufacturing knowledge is kept among the San Pablito inhabitants, who carefully protect it from other inhabitants of Sierra Norte de Puebla and from foreigners. Some shamans continue selling paper figures but mainly sell small books that are handwritten on bark paper, with cut-out figures glued in. Certain rituals and associated cut-out figures are described in these books. Otomi artisans have explored different designs, including paper figures glued on small cards with envelopes, and long rectangular strips combining bark paper figures of mythological animals or gods with other distinctly colored bark papers as background. Although these bark paper figures have apparently been circulating in the market for some years, the bark paper handicraft spread and acquired considerable commercial acceptance when the Nahua paintings and Otomi bark paper were merged.

4.4. Emergence and characteristics of a new handicraft

4.4.1 Amate, the fusion of two indigenous traditions

The boom in the amate paper handicraft is based on the cultural interchange between the Nahua, located in the state of Guerrero, who used to manufacture painted ceramics, and the Otomi who, as explained in previous sections, traditionally manufacture bark paper for ritual purposes. The Nahua adopted the bark paper as a surface on which to execute their traditional paintings. In the early years the Nahua hoarded the total Otomi production but lately the Otomi have started to produce and sell different types of bark papers. This handicraft is popularly known as amate. Although many other bark paper products besides the Nahua painted paper form part of this handicraft production, the name amate, which is a Nahua word meaning both paper and fig tree, has been conserved throughout (see also section 6.3.1).

Similar to the Otomi bark paper, the Nahua painted ceramics also have a long historical past. The Nahua people of the villages Ameyaltepec and Oapan, where the painting of bark paper started, belong to the Mezcala region, where ceramics have been produced since pre-Hispanic times (Good Eshelman, 1988; Amith, 1995). The ceramics were manufactured for domestic use (e.g. pots, filters and plates) and were exchanged for articles or goods from other villages in the region. The ceramics were decorated with paintings and each village developed its own painting style – this enables the place of origin of the pieces to be identified. In the 1940s and 1950s, with the rise of tourism in Guerrero, especially in the cities of Acapulco and Taxco, the Nahua started to sell their ceramic production to the increasing

number of tourist consumers. At the beginning of the 1960s they adopted bark paper for their painting. This new activity rapidly spread to other villages, in such a way that after some five years painted bark paper became the most important economic activity of eight Nahua villages: Ameyaltepec and Oapan in first place, and later Ahuehuepan, Ahuelican, Analco, San Juan Tetelcingo, Xalitla and Maxela (Amith, 1995).

There are different stories about how the Nahua began to paint on bark paper. It is documented that this craft production started as an artistic and expressive experiment among the Nahua and externals, especially artists who were trying to use surfaces such as cloth, wood, Bristol board and leather for the Nahua paintings (Stromberg, 1982; Amith, 1995). Some Otomi claim that they proposed to Nahua that they should take bark as a surface for their paper production (Otomi artisans, personal communication), others explain that the Nahua were looking to paint on materials of a lighter and more durable nature than the delicate ceramic work (Amith, *ibid.*). Nevertheless, as Stromberg (1976) notes, the fact is that the Otomi and Nahua used to sell their craft products in the same streets, markets and public places, and particularly in Bazar del Sábado, one of the most important tourist markets in Mexico City. Originally the Nahua brought their ceramic pieces while the Otomi offered their decorated blouses with beadwork and cut-out bark paper figures. In the Mexican context markets, as open public places, are common spaces of interaction where materials and knowledge are exchanged and where hybrid handicrafts such as amate paper have their origins.

Within the national political context the rise of amate handicraft relates to the renewal of policies oriented towards inhabitants of rural areas, particularly indigenous groups. The commercialization of Nahua ceramics occurred during the 1940-1950 period, when the Mexican government strongly supported the tourist sector, and the production and commercialization of handicrafts increased (Kaplan, 1993). Ten years later, at the start of the 1960s, when amate emerged as a handicraft, national policies oriented towards indigenous populations reinforced efforts for their integration into the economic and social life of the country. Behind these policies, the claim of a nationalist consciousness linked with the recognition of local ethnic identity was encouraged – on many occasions managed as a marketing strategy for tourism. Events such as the Olympics, celebrated in Mexico in 1968, promoted the spread of handicrafts, especially of painted bark paper. According to Stromberg (1976), its spread during this event responded to the purposeful elaboration of a Mexican cultural image in front of other countries and, in aesthetic terms, to the design characteristics of amate paper, which together with the handicrafts of the Huichol indigenous group, were in harmony with the artistic theme of the Olympics.

The intervention of FONART, the Mexican agency to support handicrafts, was crucial for consolidating the distribution and marketing of amate paper. Although amate was already being produced by the start of the 1960s, the intervention of FONART at the end of that same decade was crucial. Its support consisted in buying up the total Otomi paper production to ensure a constant supply to Nahua artisans. Although this intervention lasted for less than two years, it marked the consolidation of the commercialization of amate paper at national and also international levels (Amith, 1995).

Nahua and Otomi commercial strategies

Throughout, the Nahua and Otomi engaged in the handicraft market networks in rather different ways. The Nahua counted on a greater experience in production and commercial strategies. Before the bark paper craft production started, the Nahua used to produce ceramic work for their own use and regional interchange, and later for the tourist market (Good Eshelman, 1988). In general the Nahua had had longer and more intensive exposure to the handicrafts market through their entrepreneurial endeavors in different cities within Mexico, while the Otomi began to bring their handicrafts to the open markets and streets in Mexico City only a few years before the start of the 1960s. Two more important conditions have marked the different ways in which amate paper has been sold by the Nahua and Otomi. Most Nahua spoke Spanish whereas the Otomi did not. This implied a great advantage for the Nahua in commercializing painted bark paper outside their villages. Also during the first years of amate's appearance as a handicraft, all the Otomi bark paper was bought by FONART (as stated above) with the intention of ensuring a constant supply of bark paper to the Nahua painters. This, as will be further explained (chapter 5, section 5.4.1), had great implications for the ways in which local market conditions developed in San Pablito.

Historically the Nahua had developed a long and intense commercial tradition. Since pre-Hispanic times and during the colonial periods, Nahua of different villages, including Ameyaltepec, where the production of painted bark paper started, used to commercialize salt. The Nahua organized caravans to buy salt on the Pacific coast and transport it to villages along the Balsas River, where in turn they sold or exchanged it, together with their ceramics, for other articles or products (Good Eshelman, 1988). In this way, according to Good Eshelman (*ibid.*), the Nahua were able to maintain a prosperous economy based on salt commercialization and their own agricultural production, and in this past commercial experience the author finds the roots of the successful Nahua commercial strategies for painted bark paper.

At present most Nahua artisans have direct access to market. Their commercial success has implied adaptations in their household organization for the production and commercialization of amate (Good Eshelman, 1988; Goloubinoff, 1994). Originally women painted amate and manufactured ceramic while men were in charge of marketing; now women and men, as well as their children, are actively involved in both activities. It is notorious that for marketing youngsters 13 to 15 years old actively and responsibly commercialize the painted bark paper by traveling alone to different places (Good Eshelman, *ibid.*).

In the case of the Otomi, some used to sell the traditional clothes decorated with elaborate beadwork but in general commercialization was not a prime activity. As briefly explained in the previous section (4.2.2), San Pablito is located in the mountainous region of Sierra Norte de Puebla. This area, until some years ago rather inaccessible, constitutes a multi-cultural region inhabited by several indigenous groups who since pre-Hispanic times have migrated from different areas of Mexico, as well as latterly by mestizos. The survival strategies of most of the indigenous people were based on a combination of agricultural activities and resources gathering. Although the Otomi, as well as other inhabitants of Sierra Norte de Puebla, have long been engaged in external commercial circuits, mainly via the commercialization of coffee beans (see chapter 8, section 8.3.1), the difference in comparison with the Nahua appears to reside in the establishment of external direct marketing contacts. In the Sierra most commercialization of local food products, as well as handicrafts, is done through intermediaries.

In relation to the handicraft commercialization, the main difference between Nahua and Otomi artisans was that from the beginning the Nahua controlled the commercialization of their production, without the intervention of internal or external wholesalers. Nahua could also buy directly their painting material, since these were cheap and available in local stores. The main unit of organization was the household, where craftwork as a flexible activity was combined with maize cultivation for subsistence. In the case of the Otomi only a few knew Spanish, had past experience of commercialization, or could mobilize inside and outside their locality and the region.

The development of these two different commercial strategies between Nahua and Otomi have had consequences. Since most of the painted amate was sold by Nahua artisans, consumers in general assume they are the painters as well as the producers of amate paper. At local level, within San Pablito, paper commercialization stayed in the hands of the few Otomi that through time had become competent local wholesalers. Most Otomi artisans manufacture paper for these wholesalers, receiving low payment for their work. This situation has greatly stratified the population.

The national context

Besides the local conditions among the Otomi and Nahua, the emergence of amate as a handicraft is embedded in the national economic and social context. The impulse to produce and commercialize handicrafts started in the 1920s. Among some of the main reasons that prompted the circulation of these new commercial products were the increase in tourism related to the end of World War II, the opening and completion of main communication roads, and the recognition of indigenous and popular art by Mexican artists and intellectuals. There was also a major internal economic reason: the growth of the capitalist sector had led to poverty in other sectors of the economy and created the urgent need for new sources of income. Since then crafts have become a major source of employment in many rural areas (Kaplan, 1993; Nash, 1993). Today there are over 50 institutions and official agencies that promote popular art in Mexico. The number alone, according to Kaplan (*ibid.*), attests to the important role of handicrafts as an economic option and source of employment in some sectors of society.

In the particular case of amate, something that has been a constant is, on one hand, the lack of direct support at local level for Otomi paper production but, on the other hand, the continuous external spread of this handicraft. Amate pieces are constantly being exhibited in official and non-official folklore and art exhibitions. In this respect the bark paper constitutes a clear example of the government integration of indigenous expressions into the notion of nation. Among the different values of the paper, one major aspect recognized by all social actors involved – producers, intermediaries as well as consumers – is its historical past. Bark paper in general evokes the revivals of pre-Hispanic times. This becomes more obvious in the Nahua paintings depicting scenes of a glorious Aztec past but is also contained in the Otomi paper since the production technology is based on the pre-Hispanic past (as will be explained in the next chapter).

The commoditization of handicrafts within the Mexican context obeys the processes described by Appadurai and the convergence of different interests acting on specific social, political and economic factors. In Mexico the commoditization of crafts is largely, as Stephen (1991) says, the commoditization of indigenous culture. Throughout, the Mexican government has tried to validate its preeminence by building what Castells (1999) calls ‘legitimized identity’. The recreation of the past is in response to government institutions calling for the recreation of glorious past identities, and in this sense Graburn (1976:28) applies the term ‘borrowed identity’, saying that among ‘modern nations’ it has become usual ‘... to collect and display the arts of their present and past minority peoples as symbols of their national identity.’

4.4.2 New amate products, innovations and reinterpretations

Since the beginning amate has been successfully received by a wide public, and its commercialization is constantly expanding in national and international markets¹¹. This commercial success lies largely in the Otomi and Nahua ability and capacity to innovate and adapt to new public tastes permanently in search of new handicraft styles and uses. During the first years of amate commercialization, Nahua painters tried to adapt some of the traditional ceramic paintings to the new paper surface. These were scenes with birds and flowers (Plate 4.2). Through time they started to experiment with planes and to paint frames. Some years later a new style, called *paisaje* (landscape) appeared. These colorful paintings depict events in rural life, such as agricultural and fishing activities, weddings, funerals and religious festivities (Plate 4.3).

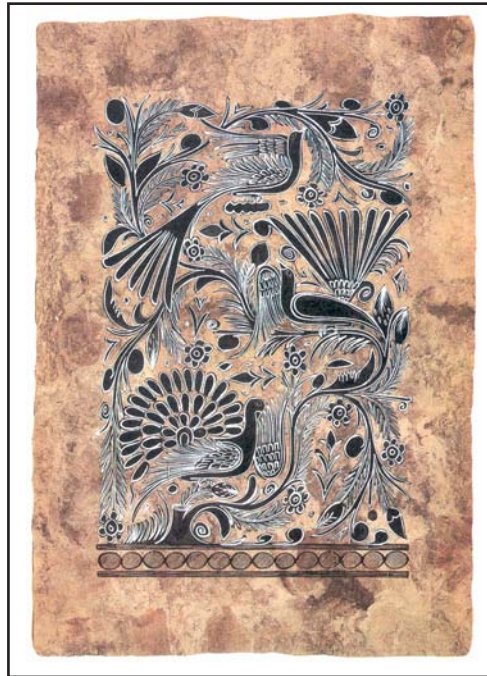


Plate 4.2. Nahua painting with traditional scenes of birds and flowers (40 cm x 60 cm).

¹¹ Although there are no official records about the amount of paper produced, it is presumed to be increasing since more Otomi are becoming involved in this handicraft production and more bark harvesters are also entering into bark extraction.



Plate 4.3. Nahua painting with scene depicting rural life (40 cm x 60 cm).

On the other hand, for the Otomi the first years of paper production were exclusively devoted to the Nahua market and consisted of producing standard 40 cm x 60 cm size paper. Although the Otomi continue to produce standard size for Nahua artisans, production is increasingly being diversified. Now the Otomi produce envelopes, book separators, cut-out paper figures, invitation cards, amate handwritten booklets and plain or colored papers of different sizes (1.20 m x 2.40 m, 20 cm x 70 cm or 60 cm x 80 cm). Some papers are decorated with artificial colors, dried flowers, leaves or combinations of different bark types. Since the start of the 1990s part of the Otomi paper has been sold to industries where the paper is semi-processed for different end-products, such as lampshades, furniture covers, wallpaper and parquet flooring.

Nowadays it is possible to recognize two main types of Nahua and Otomi handicraft work, standard products and the highly valued handicraft pieces manufactured by recognized artisans. The Nahua have longer experience with the second type. As explained in the previous section (4.1.1), people interested in folk art directly encouraged individual Nahua painters to use other materials besides ceramic for painting. In this way they identified styles of painting. The work of certain artisans of original and high quality stand out from the mass production; these are signed pieces that have been exhibited inside and outside Mexico. While from the aesthetic perspective Nahua paintings have been appreciated from the start, the Otomi bark paper represented only the supply of the base materials required by the Nahua, essential but lacking aesthetic value¹². Slowly this situation is changing. The work of more Otomi artisans is being recognized at national and international levels.



Plate 4.4. New Otomi design based on traditional cut-out bark paper technique. Brown cut-out bark paper over white bark paper (30 cm x 50 cm).

Two Otomi bark paper pieces have been awarded prizes in important handicraft competitions, the National Popular Art Prize (1998) and the UNESCO Handicraft Prize (1999). Increasingly more Otomi artisans are innovating their paper production. One of the Otomi artisans whose amate production is recognized inside and outside Mexico started to experiment and search for new designs around 10 years ago. First he experimented with different paper sizes, later mixing the original cut-out figures with new stylized forms on a larger scale. These he glues onto bark paper previously soaked in ashes or *soils* used as dyes that he gathers from the San Pablito and neighbouring areas. His work is highly elaborate and is becoming well known inside and outside Mexico. He has already exhibited in the Smithsonian Museum in the United States and the London Museum of Archaeology, among others (Plate 4.4).

12 In fact many consumers do not know that the bark paper is made by Otomi artisans (section 4.4.1). Among all the different types of amate products the ones enjoying major market circulation are the Nahua amate paintings. These are mostly sold by Nahua artisans directly to the consumers; thus most consumers assume the bark paper is also manufactured by Nahua.

Diversity of Otomi bark paper products

The Otomi paper manufacture ranges from mass paper production for the Nahua painters to individual pieces of bark paper made by recognized artisans, and in between trials of an increasing variety of new designs and paper types by some Otomi artisans. The most important production in terms of volume is plain standard size paper (40 cm x 60 cm). At present among the paper products most sold are small cut-out figures representing different gods, especially of seeds such as beans, coffee beans, maize, pineapples and tomatoes, and others representing the rain god. Very small figures are made and glued on small cards to be used as invitation cards. There are also big cut-out figures in richly decorative settings, such as suns, flowers and birds framed by friezes. In some, different types of barks are combined, in others the figure is outlined with dark paper while the background paper is white. The paper figures, as explained in sections 4.3.2 and 4.3.3, are also used in rituals, but these figures are only cut out by shamans, and as one artisan explains: ‘... we make the commercial ones while the others “representing the real gods” are kept for ceremonies.’

Other bark paper innovations include the handwritten books (briefly explained in section 4.3.3). These are made from a piece of paper of more than one meter and then bent into a small booklet. Inside, small cut-out god figures are glued on each page, with a description of their names and attributes and brief information about Otomi ritual practices. These booklets tend to imitate pre-Hispanic codices. One of the shamans that started their manufacture explains that the idea to elaborate these booklets started when researchers, especially anthropologists, came to ask him about the use and manufacture of bark paper cut-out figures. He thought this was an easier way to explain things and compile all the important information, and later realized these books could be sold. He explains that he got this idea from the photos and drawings he saw in books brought by researchers, and he started to imitate the codices with the intention of making his work more [historical] attractive.

Some Otomi artisans that have direct contact with the external market are very much aware of consumer tastes and new fashions. In this way amate paper made in the form of hearts and decorated with painted flowers has been elaborated for the 14 of February. Other artisans with painting skills are painting the bark paper with traditional Otomi designs, figures normally represented in the traditional clothes decorated with beadwork. These have turned out to be very successful paper products. In fact during fieldwork, some Nahua painters intended to copy these designs in order to reproduce them. On some occasions, Nahua and Otomi have experimented together with different paper sizes and combinations of different types of barks and painting styles.

The innovation of paper products has also been undertaken by external wholesalers. Stationary firms and other concerns specializing in paper products have taken bark paper as the main component of their paper production in booklets, envelopes, boxes, etc. Other medium-scale industries have used bark paper to decorate candles, by wrapping the candles in amate paper of different colors. Some medium external wholesalers use the bark as the base for other products – this can be illustrated by the story of a certain regional bark paper wholesaler.

Ramón Pérez is one of the regional paper dealers who has been trading in bark paper since around 20 years ago. He explains that through selling paper he obtains a stable enough income to maintain his family. He also explains the importance of maintaining cordial relations with the Otomi and especially with other members of San Pablito village who also trade in paper. Outside San Pablito, part of the struggle consists in the continuous search for new products, new uses for paper and new consumers. He explains that there is a kind of agreement among traders to keep the sale of certain types of paper products to certain areas. He sells paper basically in the south of Mexico, in the Yucatán Peninsula. He brings many types of paper, but since a few years ago a particular type of paper product has been especially successful. This consists of bark paper (40 cm x 60 cm) over which, using silk-screen techniques, he impresses some pre-Hispanic pictographical representations, particularly the Mayan God of the Maize, found originally on the Mayan archaeological site called Chichen Itza, in Yucatán. He brings a considerable amount of this paper to Yucatán, where he says he easily sells it in craft and souvenir stores, as well as in more selective art boutiques. He says he has been able to mix two cultural traditions, the attractive bark paper and the classical Mayan pictography, which certainly has attracted more attention and consumers.

4.4.3 Amate paper in San Pablito: social claims along with handicraft production

Through amate production the Otomi have developed new relations in the regional and national contexts. Besides the clear economic ones, these also refer to political, cultural and social relations. In the next chapter (5) this aspect will be explored, but here it is relevant to highlight the value and use of paper in contexts other than merely the commercial one.

Over time, the San Pablito authorities and villagers have found a more direct strategy to solve village problems and carry out projects, plans or requests that ordinarily should be done through the municipal authorities in Pahuatlán. The San Pablito authorities and villagers organize their committees to find alternative ways – or

increase pressure – to receive support directly from regional or state authorities in the capital of Puebla. In this way they have handled the legal registration of their high school, the paving of the main road in the village, and latterly they have acquired part of the budget required to build a larger local clinic with hospital facilities. The Otomi comment that since San Pablito is well known because of its handicraft production and maintains an important cultural and economic place within the region and the state, the authorities cannot overlook them and strongly express their willingness to help.

An episode that clearly demonstrates the above occurred two years ago. During the last days of October 1999 strong winds and rains hit part of Sierra Norte de Puebla. The results were severe, including the flooding of the main rivers, the flooding of temporary streams and drainageways, and landslides. San Pablito was cut off from the outside world – water and big boulders had closed the only dirt road communicating with Pahuatlán. The Otomi, as well as most of the affected people in other villages, waited for help. The Pahuatlán authorities promised San Pablito a number of goods that were going to be delivered by helicopter. When the goods arrived at Pahuatlán, the authorities decided to send on only about half the delivery. The San Pablito inhabitants, through their local authorities, refused the help and agreed among themselves to look for their own help. Paper traders and artisans with contacts outside the village started on a trip to ask for help. After one week several trucks arrived at Pahuatlán containing goods for San Pablito, all collected through the work of non-governmental organizations, Puebla university teachers and students, the state TV channel, Puebla artists, handicraft traders and owners of handicraft stores. The local authorities, as well as all the inhabitants of San Pablito, have claimed that they can survive and organize themselves without municipal authorities.

4.5 Summary

During the pre-Hispanic period bark paper, among other types of papers, were lavishly used for multiple purposes, such as offerings, priestly attire, surfaces for codices, etc. Pre-Hispanic bark paper was related to power and religion, a way through which the Aztecs imposed and justified their dominance in Mesoamerica. It was produced as tribute in villages dominated by the Aztecs and later used in many ways, such as ceremonial offerings, priestly attire, decorations, etc. In the first phase as tribute, the paper was in fact being exchanged; it represented a transaction between the dominant groups and the dominated villages. In the second phase, the paper used by the royal authorities and priests for sacred and political purposes was a way to empower and frequently register all the other sumptuary exclusive things.

In the second historical period, a combination of reasons (isolation, resistance, distance from new Spanish power and ruling centers) made it possible for the Otomi and other indigenous groups in Sierra Norte de Puebla to continue the manufacture of bark paper. However, it was the clandestine nature of its production that enabled the continuity of the paper's use and production. The clandestine use of bark paper for rituals and as a symbolical way to harm Spaniards was the route to reaffirming identity boundaries.

Nowadays, when bark paper has emerged as a handicraft, it appears that its commoditization changed the course of bark paper production, which in fact was en route to extinction. The Otomi and other indigenous groups of Sierra Norte de Puebla were replacing bark paper with tissue paper for the elaboration of amate cut-out figures used for rituals. It is precisely through the commoditization of amate paper that this product and, therefore the manufacturing technology, has survived. This has enabled the revival of an old paper manufacturing tradition and also the ritual life of the Otomi people.

In looking for explanations, about the continuity of bark paper embracing different meanings and values, and most recently its commoditization as a handicraft, the concepts proposed by Appadurai (1997) for tracing the cultural life of things are relevant. The author proposes the terms 'enclaved', when objects have been protected by concealing sacred values and 'diverse', when these have been exposed to the process of interchange and become exchangeable values.

During pre-Hispanic times the bark paper simultaneously attained two distinct and contrasting values: first, one of exchange as tribute; second, one of sacredness as paper used for rituals. The paper passed from a commodity phase into one of decommo-ditization, as Kopytoff (1997) and Appadurai (1997) call it. The situation for bark paper changed abruptly as soon as the Spanish conquest started. Since bark paper was intrinsically related to the religious system, it was banned and destroyed – as indeed were all other aspects that directly or indirectly referred to Mesoamerican religious and political systems. The paper became a threat, and was perceived by the Spaniards as a subversive object. The Spanish conquest meant the destruction of old traditions. Many survived and were integrated and reinterpreted in complex ways, but others were completely destroyed. As Appadurai (1997) notes with reference to traditional local arts, the reason for 'functional arts' to be produced is found in the traditional religions, and mostly the end of the local religion coincides with the demise of these local arts.

The emergence of amate as a handicraft responds to the larger national and international context, economic policies that support the movement of tourists, the introduction of infrastructure in the rural areas of Mexico, and support for

handicrafts as important for rural development. Within the local context the role of the shamans, who previously were the only ones using bark paper, appears relevant at the start of the paper commercialization. The local shamans, because of their knowledge about the use and manufacture of paper cut-out figures, were the first ones to have contact with outsiders, and apparently cut-out figures were already circulating in the market before the merging of the Nahua and Otomi traditions gave rise to the actual amate handicraft. In this sense Appadurai (1997) states that while enclaving is usually the interest of groups, diversion is frequently the recourse of individuals with entrepreneurial aspirations, who have control or have maintained the knowledge of these productions.

The present use of bark paper for ritual and commercial purposes illustrates the flexibility of the Otomi, maintaining two divergent values in one and the same product while also incorporating new forms of reinterpreting and expressing their culture within the local context and towards the outside. Ritual paper acquires a sacred value only when shamans confer strength through the cut-out technique and their word. But some cut-out figures are also being reinterpreted and sold as handicraft products, while the adoption of industrial types of paper for ritual paper is common. During fieldwork it was possible to observe that the Otomi cut-out paper figures most commonly manufactured for market represent the seeds of cultivated plants and gods related to agricultural practices.

During fieldwork it was observed that the most common Otomi cut-out paper figures manufactured for market were those representing seeds of cultivated plants and gods related to agricultural practices. Probably the abandonment of agricultural activities has contributed to the detachment of value. As in other cases observed by Appadurai (1997), specific uses of bark paper continue while the practices surrounding it both persist and adapt in a practical and meaningful way. Whereas in the past most rituals were related to agricultural activities, now they are executed for healing purposes, especially when Otomi return to San Pablito after working abroad as migrant laborers.

Throughout the time of bark paper as a handicraft product, a constant has been the diversification of market channels. Market diversification is based on artisans' continuous search for new paper uses, styles and decorations. The Nahua as well as the Otomi are continuously searching for new paper products, and more recently middlemen and businesses related to use of paper have also been using amate as a basis for many different uses.

**Amate paper production: context and
conditions of present amate production**

5.1 Introduction

This chapter describes the present Otomi paper production, the main characteristics of the whole bark paper commodity chain and the economic and social role of San Pablito within the municipal and regional contexts. As can be observed in Figure 3.3 in chapter 3, the commodity chain concept was adopted to understand the present production and distribution of amate paper. Commodity chains involve numerous social actors and phases through which products circulate, involving not just profits but also cultural values (Appadurai, 1997) and aspects of identity (Long, 1996; Castells, 1999) and knowledge. On the other hand the dynamics of mountainous environments described by Sarmiento (2000) are appropriate for understanding the way in which San Pablito is positioned in the regional context and the multiple types of relations built up externally.

In order to understand the way in which paper production is carried out at present, some antecedents about the manufacturing procedure are first explained. Recent technological modifications and the adaptations in handicraft work are then explained. Basically amate is manufactured at household level, but gradually this is changing and new units of paper production are emerging. The two most important types of paper production units, the household and workshop, are described. Throughout the year their paper production fluctuates according to tourist seasons, weather conditions and regional festivities. The overall paper production calendar is explained.

The end paper products are distributed and commercialized in different forms. These are explained by emphasizing the strategies that the Otomi follow at present. A brief overview is given of the whole amate commodity chain, comprising all the previous explanations about the paper manufacture, distribution and commercialization. This includes descriptions of the main phases of the commodity chain and the social actors involved in each of these phases.

The last section of this chapter explores the present social, cultural and economic interactions between San Pablito and other villages in Sierra Norte de Puebla, especially with Pahuatlán, the municipal head village to which San Pablito belongs. San Pablito being the only producer of amate handicraft, questions were raised about the uniqueness of this village and the impact of their livelihood strategies outside the village. Field narrations illustrate both commercial and political paper uses beyond the limits of San Pablito.

Most of the information in this chapter was gathered during fieldwork, from formal and informal interviews in San Pablito, in Pahuatlán, some other villages in Sierra Norte de Puebla and in handicraft markets in different cities of Mexico. Identification of the production units is based on field observations and regular field records about types and volumes of paper production. Bibliographical sources were mainly used for the first sections, in order to trace changes in the technological aspects of the paper manufacture and changes in the work division for paper production.

5.2 Amate paper manufacture

5.2.1 Antecedents of manufacturing technology and work division

The technology applied to bark paper production has changed throughout history. The adoption of new tools and the disappearance and emergence of new manufacturing stages have taken place. In general, the whole productive process has turned into quick manufacture. The tendency is towards major specialization, in terms of division of labor and the use of new materials and tools for increasing diversification.

There are no direct pre-Hispanic sources recording how bark paper was manufactured and who were involved in these activities. As mentioned in chapter 4 (section 4.2.1), writing was a prominent activity carried out by specially trained scribes, whose skills were believed to be sacred. However, no source mentions the people in charge of paper manufacture and, although about 40 amate paper tributary villages are recorded for the time of the Aztec Empire, whether men as well as women were involved in paper production remains unknown.

In respect to paper manufacture, the discovery of certain archaeological evidence has played a fundamental role. Stone beaters used to pound bark fibers have been found dating back to the VI century A.D. (Von Hagen, 1945). Most of these pieces have been found where trees used for bark paper occur¹. Stone beaters were mostly made from volcanic rocks, but also from granite and serpentine marbles; they have a horizontal or circular form, with longitudinal grooves on one or both surfaces to macerate the fibers. At present Otomi artisans still use these tools for bark paper

¹ In fact the discovery of these tools and linguistic studies of the names of pre-Hispanic villages enabled the identification and location of past bark paper tributary villages (Von Hagen, 1945; Lenz, 1973) (see Figure. 4.4, map showing pre-Hispanic amate tributary villages).

manufacture. The ones actually used are made from lava stone, rectangular with carved grooves at the sides to facilitate holding the stone.

Dr. Hernández was the first Spaniard to observe the production of paper in the state of Morelos² (see chapter 4, section 4.2.2). In his chronicles Dr. Hernández (1942) recorded how the locals of Tepoztlán in Morelos used to soften the bark by leaving it to soak in rivers over night. The next day the softer inner bark was separated from the external coarser one and the fibers were extended by pounding them with a grooved stone holed by a bent branch used as a handle. There is no further information about who was in charge of the paper manufacturing or whether labor was divided according to the different stages of the process.

It was not until some decades ago that certain authors identified labor specialization in paper manufacture. In the Otomi village it appears that paper manufacture was an activity carried out only by women. During their field explorations in the 1940s Starr (1901, cited in Lenz 1973) and Christensen (1942 and 1952) witnessed women manufacturing paper. Today the Otomi of San Pablito confirm that women were the ones in charge of paper manufacture. However, from ethnographical observations made in the Otomi villages in Sierra Norte de Puebla, Galinier (1987) explains that only shamans could manufacture paper because the secret had to be kept. The author implies a relation between knowledge of paper manufacturing and the use of paper for witchcraft purposes, which obliged the shamans to keep both use and manufacturing knowledge hidden.

During fieldwork it was recorded that, before the commercialization of bark paper started, the three main activities involved in bark paper production (bark extraction, paper manufacture and cut-out activities) were tasks specialized in terms of gender and were not always carried out by members of the same household. Men were in charge of extracting bark, women of manufacturing paper and shamans of cutting out ritual paper figures (activity restricted to shamans, as explained in section 4.3.2). Furthermore, it appears that, even before commercialization of the amate handicraft started, bark extraction and paper manufacture represented profitable activities (Christensen, 1963; Lenz, 1973). Each phase in production generated income. Men collected the bark and separated the inner bark to sell it to women; women manufactured the paper and later tied the paper together in bundles of 48

² Before Dr. Hernández, Spanish chroniclers only gave scarce and incomplete information about the technology used for paper manufacture (Lenz, 1973). Their descriptions were vague and raised more doubts about the manufacturing process and the types of fibers and natural resources used for pre-Hispanic amate paper (chapter 6, section 6.3.1).

sheets to sell at the local market or Pahuatlán market. In fact, as explained in chapter 4 (section 4.2.2), people from other villages manufacturing and using ritual bark paper preferred the paper made by the Otomi shamans of San Pablito; they believed this contained more power (Galinier, 1987). Consequently Otomi ritual paper was requested and purchased.

When bark paper was introduced into the market as a handicraft product, the traditional division of labor in paper production changed. Gradually, increasing pressure to satisfy the market implied major specialization, work intensification at household level and the integration of new social actors³. Harvesting became a specialized task, the main income activity for some Otomi working individually or in groups that organized fleets to extract bark from trees occurring in neighboring villages. These activities were accomplished on request or as entrepreneurial activities. Later on harvesters from villages along Sierra Norte de Puebla were integrated into these activities (chapter 7). Only a few Otomi artisans continue to gather their own bark raw material; in general it is supplied by regional harvesters. As will be explained in chapters 6 (section 6.4.2) and 7 (section 7.3.2), this has implied changes in the knowledge about the management and extraction of tree species used for raw material.

As regards paper manufacture, it is possible to identify two main periods in relation to the changes in economic activities in San Pablito. Although there are no formal records or census data about the number of Otomi involved in amate production, various bibliographical sources indicate that during the first years of this handicraft commercialization, the impact was great, promoting the integration of most Otomi into the different activities that this production involves (Stromberg, 1982; Galinier, 1987; Amith, 1995). Years later (1980s), temporary migration, especially by men to cities in Mexico and the United States, has gradually become the main income activity of San Pablito. Therefore amate production is now an alternative income activity remaining largely in the hands of Otomi women.

3 In the case of Nahua artisans, work specialization has also been reported. Men, those with greater painting ability, mostly paint the main lines, whereas women and children fill in the colors (Good Eshelman, 1988).

5.2.2 Paper manufacturing process and recent technological changes

Christensen (1952) described the paper manufacturing during the first years of the 1940s in two main steps.

1. Softening of bark fibers: Bark fibers are dried and stored away for later use. Before being used, they are boiled in ash-water or in limewater taken from maize that has been prepared for *tortillas*. Bark fibers must boil for three to six hours; then they are rinsed in clean water. While making the paper, the women keep the fibers in a wooden bowl filled with water to keep them soft.
2. Fiber maceration: The paper is made on a wooden board; the size depends on the dimension of the paper. The Otomi spread a layer of fibers on the board and beat them out with a stone until they are blended together. The stones are either grooved or smooth on the pounding surface, with fluted sides. The boards with the moist bark sheets are placed outside in the sun and left to dry; after some time the paper can be lifted off the board.

The above corresponds to the first written detailed descriptions about paper manufacture in San Pablito⁴. It is not known when the Otomi started to boil the bark fibers; previous descriptions regarding amate do not record this manufacturing stage. It might have been expected that the boiling of bark fibers started when demand for amate handicraft increased, in order to speed up the manufacturing process or, as will be explained in chapter 6 (section 6.3.3), to enable new tree species to be used as sources of bark raw material. However, boiling has apparently been carried out since the 1940s, years before the production of amate as a handicraft began.

Although some changes in the manufacturing process have now taken place, the main stages described by Christensen are still being followed. The most important recent changes are the adoption of new chemical products, especially caustic soda, to speed up the boiling of barks and the occasional use of chlorine to bleach the

⁴ These are also the main manufacturing stages for preparing bark cloth and paper produced in other parts of the world, such as Tahiti and Polynesia. Some groups beat freshly stripped bark, others soak it in fresh- or salt-water before beating. When soaked for a prolonged period, small pieces can be beaten together, thus forming larger sheets without any sewing. Beating the natural bark fibers in a sodden state not only blends them together but the thickness of the cloth can be controlled by the amount of beating given (Prance and Prance, 1993).

bark fibers⁵. Although, as Goloubinoff (1994) observes, in San Pablito the manufacturing process differs from artisan to artisan, the actual main stages of paper manufacture are as follows:

- *Drying the fibers*

After bark has been purchased from regional harvesters in a fresh state, artisans leave the fibers to dry in the open air; bark strands are extended and laid on the floor or over rocks. The tough fiber strands are then stored in dry places, preferably in high and airy places. When the fibers are properly dried and stored, they can be kept up to one year.

- *Boiling*

Before boiling bark some artisans soak the fibers to soften them and then spend less time on the boiling stage. The bark is soaked in water inside big boiling pans with a capacity of 50 to 80 liters. The use of ashes or lime was replaced around three to five years ago by the use of caustic soda. This product greatly accelerates the boiling process and, according to artisans, cooking time is reduced by two to three hours, implying an important saving in time and money. But still the whole bark boiling stage may take from half to a full day. It requires continuous attention, and the preparation of the materials also takes time. Once the material required has been obtained (mainly bark, fuelwood and caustic soda), the process is planned in advance, according to the workforce available and weather conditions. Dry days are preferred. In the morning the bark strands are arranged; some artisans fasten them with a cord as this facilitates the task of taking them out after boiling is finished. The quantity of bark normally boiled ranges from 60 to 90 kg, an amount that requires of about 3½ kg of caustic soda. Water is transported by bucket from the closest water pipe or spring; caustic soda is poured in and mixed; the bark strands are soaked and the fire ignited. To avoid wasting fire energy and to save fuelwood, some artisans cover the fire area with rocks, *laminas* or bricks, and pans are covered with large thick plastic sheets. The boiling process can take from three to six hours, depending on the amount and type of bark (see Appendix B). Bark has to be stirred constantly and artisans have to control the fire by adding more

5 The Nahua have also undertaken changes to reduce expenses and accelerate the painting of amate; some have adopted silk-screen techniques and the use of cheaper brands of paint (Amith, 1995).

wood when necessary. In more recent years, with the introduction of soda beverages in plastic bottles, some artisans have adopted these bottles as alternative materials to use for fire. The plastic bottles are combined with fuelwood to save on the purchase of fuelwood. Some Otomi children collect the bottles in big bags and sell them to artisans. Some implements once used for agricultural activities (such as the *coa*, a stick previously used to make holes in the soil and to fill them in again after sowing the seeds) are now used to stir bark fibers during the boiling stage (Plate 5.1).



Plate 5.1. Boiling bark, soaking bark fibers in the boiling pan.

After boiling, the bark strands are taken out and some artisans use the same water for boiling more bark. The boiled strands are then rinsed in running water. Bark can be directly used for paper manufacture but sometimes it is again soaked in water with chlorine (sodium hypochlorite) to bleach it. Chlorine is used to lighten brown fibers unevenly so that the finished product has a stronger marbled look. As will be further explained in chapter 6, this is related to the shortage of natural white fibers. On some occasions, after the fibers have been bleached they are

colored with industrial dyes in such strong colors as purple, pink and green, which have recently been in high demand. Other artisans leave the bark in water until it starts to rot, in order to obtain new natural bark colors. In any case, boiled bark cannot be kept for too long and should be used as soon as possible.

Boiling bark is one of the most time- and money-consuming manufacturing stages. Consequently the use of caustic soda, covering pans during boiling, the use of plastic bottles, and in some cases covering the fireplaces with bricks, stones or laminas are measures intended to save money and time. Up to now the consequences of using these materials have not been assessed. The use of plastic bottles is recent and apparently is quickly extending among artisans; in the long term, however, such use may well represent a threat to the environment and to the health of the artisans. The use of caustic soda has already produced some cases of intoxication due to inappropriate handling (doctor in San Pablito, personal communication). Furthermore, according to the municipal authorities based in Pahuatlán, contamination of the San Marcos River, lying in between San Pablito and Pahuatlán, has increased since the use of caustic soda. Used water from the Otomi village directly drains into the river owing to the lack of a proper drainage system. The utilization of new chemical products also has a negative effect on the end paper products. It has been observed that fibers treated with chlorine and caustic soda deteriorate and weaken faster⁶ (Bell, 1985; artisan's personal communication).

- *Maceration of fibers*

The dimensions of the wooden boards vary according to the size of the paper to be manufactured. First the boards are smoothly polished with soap to prevent the fibers sticking and then the bark strands are separated into thin long fibers, which are extended on the board in grid formation. The weight and amount of fibers will determine the end quality of the paper. Some artisans who have to fulfill numerous requests do not spend time on separating the bark strands into regular long fibers; rather they separate small irregular pieces, which are randomly and quickly thrown over the wooden board. In contrast, other artisans who maintain a high-quality production separate long thin fibers, which are closely distributed in a grid formation.

6 This is a relevant aspect, especially when considering that some pre-Hispanic codices have lasted for more than 500 years. Studies to analyze the effects of caustic soda and chlorine in the structure of bark fibers and the perishability of paper products are lacking.

The fibers are next pounded gently with the stone beater until the fibers spread and fill in all the gaps⁷ (Plate 5.2). To prevent the fibers sticking, they are occasionally moistened with drops of water and the porous volcanic stone beaters are kept damp during the beating process. Paper sheets are gently polished with the rounded peel of oranges in order to obtain a smooth uniform surface.



Plate 5.2. Otomi artisan beating bark fibers with volcanic stone.

- *Drying the paper sheets*

The wooden boards are next placed in an open area where they are left until the paper sheets are completely dry. On sunny days bark sheets can dry in one or two hours; if the weather is cold and humid, however, drying may take several days. Drying time also has implications for the end-product since the natural color may vary and occasionally the paper may decay due to humidity (Plate 5.3).

⁷ As observed by Prance and Prance (1993) in Polynesia, where bark fibers are also beaten to prepare the bark cloth called *tapa*, this task is a laborious activity; it takes a great amount of skill to beat the bark evenly to the correct thickness, as beating it a little too hard in one place will make a hole in the delicate fibre.



Plate 5.3. Dry bark paper on wooden boards exposed to sun.

- *Final touches and decoration*

These last steps depend on the type of market where the bark paper is to be sold. When the paper is sold in large amounts, the sheets are mostly left without any final touches. If the paper is to be sold in retail outlets, the sheets are carefully arranged with the use of a blade to take away residual fibers. Glass bottles and vegetable glue extracted from the root of an orchid (*Epidendrum pastoris*) are used to fill small gaps in the sheets with pieces of bark paper, which are glued and pressed with the bottle. Most of the production consists of plain sheets of standard size (40 cm x 60 cm) of natural bark colors. Some are made from two or more different bark types to enhance the color and texture variations, others are artificially colored with industrial dyes, and still others are decorated with dry flowers and leaves that are pressed when the sheets are still moist.

The supply of materials and resources required for paper manufacture

The whole manufacturing process requires numerous resources, tools and materials. Some have been used since the pre-Hispanic period, others have been adopted during the last decades; most are obtained from places outside San Pablito village. At present the Otomi paper production depends largely on external or local suppliers for materials coming from different places (see Figure 5.1). Some artisans do buy these products directly in the nearest cities; however, in general these are supplied

by local and external intermediaries. Bark is supplied by regional harvesters. Fuelwood is brought by regional suppliers, who since the 1980s have collected and transported thin wood branches, preferably from oak trees (*Quercus* sp.), which are the artisans' favorite because of their lasting properties. Fuelwood is gathered from neighboring pine forests that have partial legal status for commercial exploitation (see chapter 7, section 7.4.3). Chlorine is also sold by external intermediaries, most coming from the nearest cities such as Tulancingo. These intermediaries buy chlorine in large amounts and transport it in tanks. They drive around San Pablito selling this product, normally in plastic 1-liter bottles. Caustic soda is mostly obtained from small stores in San Pablito. The owners buy soda and other products in nearer cities and resell them in San Pablito. Other local intermediaries buy products such as dyes, paint and brushes required for paper decoration.

The basic tools required for paper manufacture are the stone beaters, wooden boards and boiling pans. These tools are long-lasting but their acquisition represents high investment. In fact this first investment constitutes one of the main obstacles for new Otomi entering into this handicraft production and for others wishing to start their own independent production. These tools are also acquired from outside. The stone beater is especially requested from stone-carving artisans in the state of Tlaxcala. Peasants from two other nearby villages (Zoyotla and Honey) supply wooden boards on request and two local Otomi carpenters give the final polishing touches. Boiling pans are also obtained on request from the owners of two local hardware stores, who in turn buy them in Tulancingo city.

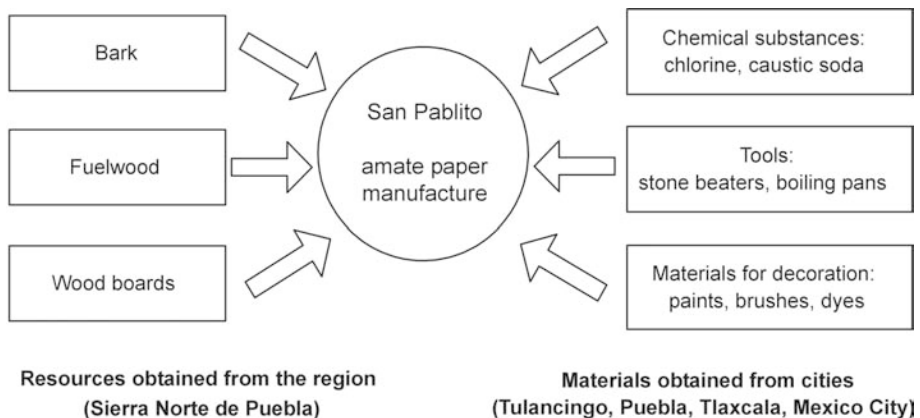


Figure 5.1. Industrial materials and resources used for bark paper manufacture.

As can be observed, most materials and tools required for paper manufacture come from places outside San Pablito village. These are obtained from local and external intermediaries. Over time this has meant the extension of economic relations outside San Pablito. At regional level this village is a prime consumer of materials and goods from neighboring villages and cities, as well as those farther away. This has not only implied the spread of economic links but also a greater dependency on external materials used for paper manufacture, and on many goods of primary importance.

5.3 Otomi artisans

5.3.1 Typology of Otomi artisans

As the specialization of paper production has been changing, so the organization for paper production has similarly been changing in close relation to market pressure. In general two main forms of paper production were identified in the fieldwork. These, however, are not static situations and they may change. The production organization can change through the year and in the long term the household composition also changes. The typology presented here describes the main production strategies. Identification was based on two main characteristics of the production units: the time allocated to paper manufacturing and the amount of paper produced. Both conditions are closely linked with the forms in which paper is being sold – the market options. The two main paper production units are as follows:

- *Amate production at household level*

Within household production units there are two main types. The first consists of households where a maximum of five members engage in amate manufacture. Production varies greatly through the year, according to the household's economic requirements, and on many occasions they do not have the means to produce paper. Some are hired as temporary artisans in other paper production units, particularly workshops. On other occasions they receive the material and tools (bark, stone beater and wooden board) from local wholesalers for producing paper according to specific requests.

The second type consists of households producing paper on a permanent basis. In these cases up to 10 adult members of the household are permanently involved in amate manufacture. Women and men jointly carry out every production stage, from the preparation of the bark fibers to the commercialization of end-products.

Children participate during their school holidays. For most of them, craft production represents the main economic activity and most of them have their own market contacts.

- *Amate production at workshop level*

The basis of these production units is also the household but the paper production relies largely on the work of hired artisans. The members of the household organize the daily paper manufacture and control the acquisition of the tools and raw materials required. They carry out the boiling of bark and occasionally participate in the beating stage, especially women. Hired artisans are only dedicated employed to beat bark fibers. Workshops are still few; they only started by the middle of the 1990s⁸.

The organization of paper manufacture and the type of paper produced are closely related to the commercial strategies (Table 5.1). Around 30% of the Otomi handicraft production units, basically those engaged in permanent production, maintain partial or complete access to market options outside the village. Workshops control their own external market channels. The majority (around 70%) manufacture paper for local and regional wholesalers. Among all artisans, the ones working as hired artisans belong to the most deprived group, lacking both external market channels and the means to invest in materials and tools required for amate production.

With respect to the type of production, the households producing paper on a more permanent basis and having their own market channels are the most active. They produce a great variety of paper products, frequently innovating in terms of design and technique. They enhance their designs by combining bark types, by combining cut-out figures and colored paper, and by the incrustation of dried flowers and leaves, among other things. The workshops are also characterized by a huge variety of paper products, but they conserve a more standard type of production, enhancing sizes instead of paper designs. They produce papers of 1.20 m x 2.40 m and the

⁸ The establishment of workshops is closely related to the history of migration of each household. As Conway and Cohen (1998) found out in villages of the state of Oaxaca, remittances are often spent immediately to meet the basic needs of families, but long-term investments are also carried out. In this sense, it is important to recognize that returnees are not only endowed with new technical proficiencies, but they still possess considerable local knowledge, education and expertise many times invested in opening local business such as family-based craft production.

typical paper size of 40 cm x 60 cm. Households producing solely for wholesalers center their production on standard bark paper of 40 cm x 60 cm. Mostly of very low quality, this paper – sheets are too thin and lack final touches – is sold to local wholesalers, who request large paper quantities for very low prices (see Table 5.1).

Table 5.1. Bark paper production units in San Pablito.

	Production unit / frequency production		
	Workshop Permanent	Household Permanent	Household Temporary
People involved	4-20 (family members and hired artisans)	Varies 2-10 (mainly family members)	Varies 1-5 (family members)
Estimation production (standard size paper*)	1000 paper sheets in one week and a half	20-26 paper sheets per day	5-20 paper sheets per day
Type of products	Diversified but tends to be specialized according to type of client: paper in different colors and sizes	Great diversification of production, including painted paper, different sizes, decorated paper, envelopes, etc.	Only standard size paper in natural colors
Quality	Good to high quality	High quality	Bad quality
Market channels	Stationery firms, art schools, printers	Mainly orders from handicraft stores, international clients, artists, universities, design firms, art companies Handicraft markets, festivity markets, tourist cities	Local wholesalers

* Standard size paper: 40 cm x 60 cm, the most common bark paper product.

Diversity within the identified paper production units

Although the above description of the identified types of paper production units enables the characterization of the main forms of paper production in San Pablito, these units are far from being static and homogenous. Their long-term production organization changes according to the household life cycle and daily production varies greatly according to the tourist seasons, the weather and the household members' activities. The next three cases may illustrate how bark paper production is carried out and adapted daily to internal household conditions and external factors such as market options, supply of raw materials, feast days and weather conditions.

Maria has four small children and one youngster in the last year of high school. Her husband is in the United States. He has been there for one year, working in a garage as a car mechanic, and he plans to stay one year more before returning to San Pablito. The money Maria earns through paper production is used for daily expenses, particularly for buying food. She does not work fulltime in paper manufacture; her involvement in the work varies greatly from day to day. Paper production becomes more intense when she requires extra money or when there is a special request, normally from local wholesalers. It is safer for her to elaborate paper on request because she knows how much she will earn and, even if she cannot produce all the paper, she hires her nephew for some days or hours to help her. Some weeks she can produce paper every day but there are also long periods during which the production comes to a stop. She buys the bark and other materials and boils the bark strands. She does this in between many other activities, especially cooking, washing clothes and other duties within the community, such as attending meetings or volunteer work at the clinic. Like many women whose husbands are abroad, she has to attend meetings, participate, vote and decide on behalf of her husband. Her paper production is very limited. At most she can elaborate 20 paper sheets on one day. Normally she just makes between five and 10, interrupting her work several times, and also changing from paper manufacture to beadwork. Her young daughter does not get involved in handicraft activities; she is mostly at school. She is also an intermediary in many activities outside the village as she knows Spanish and her mother does not. The next daughter is the one who frequently helps in the handicraft work. After school she normally engages in paper production while helping her mother in other activities and taking care of her smaller brother and sisters.

The Hernandez family maintains one of the largest amate production workshops. The number of hired artisans varies greatly, depending on weather conditions, community activities and other factors, but there are days in which around 30 people come to work. All the hired artisans receive daily or weekly payment but

the amount varies according to the number of paper sheets produced. Payment also varies according to the artisans' experience; the new ones receive lower payment per paper, and they are mostly involved in the manufacture of large paper (1.20 m x 2.40 m), which requires less attention and fewer skills. Hired artisans are mostly women; some bring their small children, who rest in small hammocks beside them while they work. Within the workshop, tasks are divided: some hired artisans separate the bark strands, others place them on the wooden boards and beat them, while the owners of the workshop, the head of the family and his sons, acquire the materials required and prepare the bark bundles for boiling. An ordinary working day, under sunny conditions, may consist of coordinating hired artisans while boiling bark, sometimes five to 10 pans at the time, and monitoring the drying process of the fresh sheets exposed to the sun. On occasions up to 30 wooden boards are laid on the patio for drying the bark sheets. Most of the work is done on request. A most frequent request is for large paper of about 1.20 m x 2.40 m. This comes from a furniture factory in the state of Monterrey, which in turn re-processes the bark with a special coating, finally to be used as furniture tapestry. Paper production in this workshop never stops. It only decreases on cold and rainy days, and also drops when few hired workers assist in the work.

One more example illustrates the very active paper production strategies. Rogelio and his family belong to the few household production units that maintain their own market channels. Only rarely do they sell their production to local wholesalers. Neither Rogelio nor his eldest son have ever been to the United States. His eldest son failed in his attempts to cross the border, but Rogelio himself does not want to take the risk and he foresees that if he goes he will lose all his clients. His production and commercial strategies are based on a very intense and active interaction with clients and a constant search for new ones. He continually travels, carrying out paper requests and reaching agreement on new requests. Each weekend his eldest daughter goes to special regional handicraft markets and, whenever possible, she also goes to special *plazas*, big markets organized in conjunction with religious ceremonies. Although all the family are engaged in the production of bark paper and beadwork, daily work may vary. As an example, one day Rogelio would go to extract bark from some trees in the neighboring village; earlier in the morning he started, with the help of his wife, to boil some bark. His three daughters and son carried water to fill the big bark pan; the preparation of the pan and the fire took around two hours. While he is extracting bark, his wife is taking care of the boiling process, constantly stirring the bark and checking the fire, and his daughters are processing bark paper and also engaged in beadwork. Although they can shift from one type of craft manufacture to another activity, depending on daily domestic work, they mostly do one type of job and this depends on their personal preferences

and abilities. That same day, during the evening, Rogelio will select and separate the barks he extracted in the morning. These barks, gathered from different tree species, will be used for a particular request made by art teachers from the Faculty of Art at the University of Puebla who are interested in the different bark paper qualities and textures. In the evening, before sunset, Rogelio will start painting a long paper, 1 m x 2 m, requested especially by the owner of a handicraft store in the city of Puebla. He will first draw the main lines and later on his daughters will start coloring the figures with thin pencils. His wife will wash the bark paper boiled that morning so they will have it ready for the next day, which will be a day devoted to beating paper sheets.

5.3.2 Paper production calendar

When traveling from Pahuatlán to San Pablito, even kilometers before reaching San Pablito village the echo of the bark beating can be heard. It is a deep sound produced by the beating of stones on wooden boards, where bark fibers are macerated. Every visitor notices it and almost all authors working on amate paper have described this in their studies and publications. Although this attracts the attention of everyone, it does not occur every day or with the same intensity during each day. Paper manufacture is greatly determined by weather conditions. This is one of the main limiting factors. The other two factors determining peaks and adjournments in paper production are tourist seasons and regional festivities.

In general production reaches its maximum during May, June and July. This is the period leading up to the top summer tourist season and are the warmest and sunnier months when more paper can be manufactured because paper sheets in wooden boards dry fast. During December, January and February, production falls because of adverse weather conditions. Two short high-production peaks occur at the start of March and in the middle of October, before two important religious festivities are celebrated: Holy Week in April and All Saints commemorated throughout Mexico at the beginning of November. To prepare for these celebrations, which require a large investment in food and decorative articles, the Otomi artisans try to maximize their income by intensifying amate manufacture. Daily production depends on weather conditions; during rainy, cold and foggy days production diminishes since all wood boards are in use with sheets waiting to dry, or may even stop in extreme rainy and cold conditions, when the paper can spoil with fungus due to high humidity. This is very important during August and September, months when the climate is subject to winds and cyclones from the Gulf of Mexico and daily weather variations are frequent.

5.4 Paper distribution and commercialization

5.4.1 The roles of artisans, traders and wholesalers

As explained in chapter 4 (section 4.4.1), artisans, particularly the Nahua, have actively taken part in the commercialization of amate paper. In comparison with the Otomi, they have considerable marketing experience and are increasingly reaching more market niches. As regards the Otomi, the presence of a few local wholesalers has been decisive. At present there are about 10 local wholesalers who control almost 50% of the total paper commercialization. Most of this paper is oriented towards Nahua artisans. Their appearance is considerably related to the way in which the commercialization of the amate handicraft started. At the start of amate commercialization, the entire Otomi paper production was bought for almost two years by FONART, the Mexican government agency for promoting handicrafts. Its aim was to support the distribution and commercialization of painted bark paper and to ensure a constant supply of bark paper to Nahua artisans. Some Otomi who worked as intermediaries between FONART and the artisans, coordinating the local production of amate, are the ones that currently sell bark paper on a wholesale basis. Others were dealers, owners of local stores or coffee intermediaries. Their common characteristics, besides knowing the Spanish language, are their experience in contacting people outside San Pablito and in maintaining a reasonably constant and dynamic relation with all their clients, new and old.

The way in which Otomi intermediaries have maintained the main market channels, especially the Nahua paper market, has been by displaying many driving strategies, which range from setting prices to intimidating local or external people who try to increase the internal wholesale prices. In fact among all the Otomi involved that have their own market contacts, control over these or potential contacts is a primary factor. Competition and long-rooted disputes about paper prices and market contacts are common. There is continuous suspicion of outsiders and also among artisans, and just as knowledge of paper manufacture has been guarded against outsiders, a ban on market contacts is in force.

Another aspect related to local paper market conditions is the control over the local means of communication, particularly telephone lines. Until 1999 there was only one telephone line service under the supervision and control of the owner of one of the oldest stores supplying food products. Last year the telephone service was introduced for the whole village. Many Otomi, particularly artisans, have bought their own line extension. Although it is still early days, some changes have already occurred – primarily direct contact with clients and the increase in petitions. It is notable that this is the only village, outside of Pahuatlán, the municipal head village, that has this service.

The most important purchasers of Otomi bark paper are the Nahua painters. At the start of paper commercialization, transactions were made in markets and streets where they met while selling their own handicraft products. Later FONART controlled the commercialization of the whole output of Otomi paper. They used to buy the paper from Otomi artisans and transport it to Nahua villages. FONART's intervention did not last for long, and when they stopped buying Otomi paper, local Otomi wholesalers were commissioned with the task of buying and transporting the paper to Nahua villages.

In the village it is common to observe the arrival of paper purchasers, besides tourists. There are a great number of different consumers, who come from the nearest cities in the states of Hidalgo and Puebla or from Mexico City, from farther states such as Chihuahua, Chiapas and Yucatán, or even from other countries. From interviews conducted in San Pablito and some handicraft stores in Mexico City, it appears that the Nahua and Otomi paper production that reaches the international market is traded by national and international handicraft exporters. Some of them buy paper on a regular basis, others come on only one occasion. They buy bark paper and also often beadwork handicrafts. Regional purchasers buy paper in a more regular way. Some of the regional wholesalers are established in Pahuatlán, the head village. Because of their closeness to San Pablito and the constant internal struggles about handicraft commercialization, they prefer to establish long-lasting relations with a few Otomi household production units, from whom they buy their products.

Among the Otomi production units, the ones manufacturing paper at household level and maintaining a constant production and their own market contacts are the ones displaying a greater diversification in market strategies. They reach all types of markets, from local to international, and they sell the paper directly to end-consumers, mainly tourists that come to San Pablito, or in streets, markets, plazas and open craft markets in cities and villages in Puebla and in other states of Mexico. They also sell their output to wholesalers in Mexico City and in other states and countries – to museums, galleries, and universities. The next two cases illustrate the diversity of the commercial strategies of two different handicraft production units.

Two cases of Otomi bark paper commercialization

Martin and Elena have five children for four to eight years old. They produce bark paper all the year round; this is their main income activity. They manufacture their paper but on some occasions they contract artisans to help them with the work. They only produce standard-size bark paper of natural colors and artificial colors,

and larger paper sheets of 1.20 m x 2.40 m. Besides maintaining relations with regional and occasional consumers, every weekend they go to Mexico City to sell their products. Martin goes to El Zocalo, the main central plaza, and Elena to La Merced, a popular and busy market. Both places are frequently visited by tourists, to whom they sell most of their output. In both places they rent a small site for selling, and they also rent a small warehouse located in the center of Mexico City, where they keep their products and where they sleep during their stay in the city. They sell most of the paper they bring each weekend, and they would like to increase their output as more clients are placing larger orders. However, up to now they have been maintaining their production at the same level until conditions are such that they can hire more artisans.

For almost 20 years the Domínguez couple have sold their paper and beadwork products in the open markets of Sierra Norte de Puebla or in markets held during religious festivities. As children they used to accompany their parents to the regional markets, where they used to sell their agricultural products and occasionally beadwork handicraft work. Now they continue to do this, and in this way they contribute to the household economy that they share with their sons. They comment that, although they can no longer maintain themselves through the profits from these sales, at least they can make a contribution. They say they will not stop selling their products since, besides making profits, this is also a way of visiting more places and getting to know more people. Every weekend they trade in standard-size (40 cm x 60 cm) bark paper, fossils collected within San Pablito territory, bead collars and, whenever possible, also fruit from their homegardens. They explain that this is the way they have always lived, by selling many different things at the same time.

5.4.2 Overview of the present bark paper commodity chain

In this chapter and in chapter 4 some of the phases of the actual bark paper commodity chain have been explained. In this section the intention is to give a general overview of the whole bark paper commodity chain.

Figure 5.2 seeks to represent the whole bark paper commodity chain. It is a simplification and does not contain all the components of this chain, especially where the very wide array of strategies now integrated within commercialization is concerned. However, it gives an idea of its dimension, in terms of number of phases, spatial locations and the complexity of relations among the different phases.

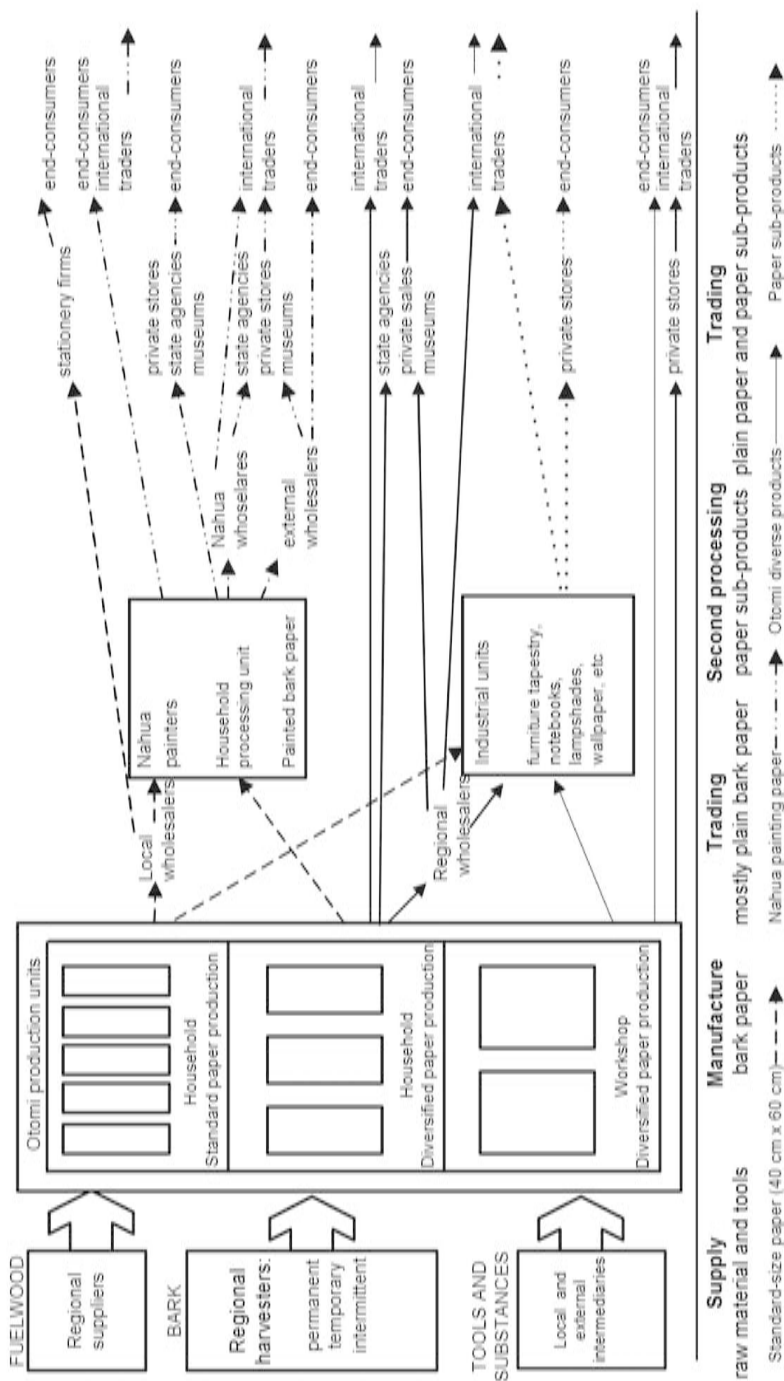


Figure 5.2. Bark paper commodity chain.

The bark paper commodity chain consists of three to more than six phases. The main phases are: (a) supply of raw materials, tools and substances; (b) paper manufacture; (c) paper commercialization, subdivided into direct sale to end-consumers, to Nahua painters, or to industries for the processing of bark paper products.

The first phases of the commodity chain relate to the supply of raw materials and tools required for paper manufacture. Bark raw material is supplied by the regional harvesters of Sierra Norte de Puebla. When amate first became a handicraft product the Otomi harvested trees within their own territory, but now they rely on the supply of regional harvesters. According to their yearly involvement in this activity, they have been categorized as permanent, temporary and intermittent harvesters (chapter 7, section 7.3.1).

Fuelwood is obtained from regional suppliers coming to San Pablito from neighboring villages. The tools required for paper manufacture, especially wooden boards, stone beaters and boiling pans, as well as other materials such as dyes, chemical substances and paints, are obtained directly by the artisans. They buy them in the nearest cities and other places. Most of the time, however, these are supplied by local and external intermediaries (section 5.2.2).

Within San Pablito three main paper production units were identified. The first type consists of workshops that maintain their own market contacts and a constant production based mostly on hired artisans. The second type of paper production unit consists of households with constant and very diversified production, which rely largely on household members and maintain their own market contacts. The third type of paper production unit refers to households producing only standard-size paper (40 cm x 60 cm), which is bought mostly by local wholesalers. Some of them that do not have their own materials and tools work as hired artisans in other households (section 5.3.1).

Part of the Otomi production passes through a second processing phase for the production of lampshades, furniture covers, wallpaper and parquet flooring. Since hand-made papers are in fashion, stationery stores in different cities throughout Mexico are selling bark paper or are using it as the basis for manufacturing small booklets, letter paper and envelopes.

The last phases of the commodity chain consists of the distribution and marketing of paper products, which is carried out in a great many ways at local, regional, national and international levels. Amate is sold to end-consumers directly by the Otomi and Nahua artisans or through local and regional wholesalers (chapter 4,

section 4.4.2). It is being distributed and commercialized through museums, art galleries and handicraft shops. Artists and people interested in the aesthetic qualities of this handicraft have also played an important role in the distribution of amate paper. Their attention centered first on Nahua paintings but Otomi bark paper has also attracted their attention. Some national and international sculptors and painters are using bark paper as a base material for their artwork. More recently, via internet services, artisans and private firms, particularly handicraft stores, have been offering plain and painted bark paper as well as other paper sub-products.

There are no registers or financial accounts concerning amate production and commercialization and within the commodity chain, as was observed on fieldwork, paper products might be sold directly to final consumers or they might pass through five or more intermediate phases before the final sale. Some rough field estimations indicate that about 50% of the Otomi production is sold to Nahua painters and around 70% of the total Nahua and Otomi production is sold on the national market, while the other 30% may reach the international market.

Paper prices vary greatly, whilst tending to increase throughout the commodity chain. Within the Otomi internal market, one plain paper sheet (40 cm x 60 cm), produced by hired artisans is priced at 21 cents⁹, but at 40 cents when made by the artisans belonging to regular paper processing households. Subsequently local wholesalers sell this paper to Nahua painters at about 57 cents per piece. After painting, the paper costs around \$3.60 when sold directly by artisans in streets or markets and \$15.00 in tourist cities. A third grade of traders, such as museums or handicraft shops, may sell it at \$30.00. When Otomi artisans sell their handicraft directly, the price of standard-size plain paper is \$0.60 and of standard-size colored paper \$1.30. The prices of products being sold in tourist cities fluctuate through the year, doubling during the tourist high season. Semi-processed products such as bark paper booklets that are sold in stationery stores of Mexico City might cost around \$25.00. High-quality paper of Nahua and Otomi artisans who have obtained national and international recognition might cost about \$500.00.

An important aspect is the attention given by governmental agencies and private organizations to the different phases of the amate paper commodity chain. There have been governmental and private initiatives for the support or improvement of amate paper production. Some initiatives have focused on commercial diffusion, others on incentives for paper designs for Nahua and Otomi artisans and on the paper manufacture, organizing local cooperatives to grant credits and standardize

⁹ Prices in USA dollar. Exchange rate in 1999: 9.5 pesos = 1 dollar.

prices. Yet other initiatives have focused on the installation of tree nurseries in San Pablito (chapter 7, section 7.2.2). Throughout it appears that the support has been fragmented. What has been a constant, however, is the lack of continuous support at local level for Otomi paper production and the continuous external spread of this handicraft. Amate pieces, particularly pieces of painted Nahua amate, are constantly being exhibited in official and non-official folklore and art exhibitions.

5.5 Beyond the locality: San Pablito in the municipal and regional context

5.5.1 Pahuatlán, the municipal head village

The Sierra Norte de Puebla region has 19 municipalities. San Pablito belongs to the Pahuatlán municipality, and the *cabecera municipal*, the head village, where the main municipal authority, the *presidente municipal* (mayor), resides, is also called Pahuatlán.

The municipality of Pahuatlán has 20 villages, nine of which are indigenous villages and 11 are mestizo¹⁰. The mestizo represent 51% of the total population, the indigenous account for a total of 49% – around 60% are Nahua and around 40% are Otomi (INEGI, 1990). Like other municipalities of Sierra Norte de Puebla, local power is in the hands of a few mestizo families, who control the political life of the municipality and who also own large stretches of land. This aspect has been stressed in studies of Sierra Norte de Puebla, where the differentiation among socio-economic groups but mainly among indigenous and non-indigenous populations has largely shaped the socio-economic relations, management and access to natural resources and regional land uses (chapter 8, section 8.2.3).

In general, municipal head villages in Mexico have more and better services than the rest of the villages. They mostly have light, and telephone and telegraph services. In Pahuatlán there are two primary and secondary schools and one high school. There is also an IMSS medical centre, and a new rural hospital, not yet open, is intended to have specialist doctors, with analysis laboratories and a proper system of routine surgeries. The differences between municipal head villages and the rest are quite visible. Moreover, most mestizo people reside in head villages, whereas indigenous populations are concentrated in smaller scattered villages.

10 Mestizo is a word used through all Central and South America. In Mexico it has several meanings but in general it refers to a person of mixed blood, of combined Indian and European extraction.

Pahuatlán as a tourist village

One of the main characteristics that has marked the social and economic development of the whole Sierra Norte de Puebla, including all villages, is the difficulty of access and the roughness of the terrain. In previous chapters the long-lasting isolation of the Otomi village was remarked on, especially in relation to the survival of amate manufacture (see section 4.2.2). During the Spanish colonial period, this village was isolated from larger towns and for some 10 years it remained quite cut off. In 1978 a road for cars was opened, connecting Pahuatlán and San Pablito (around 7 km.).

Pahuatlán also remained cut off. Up to the 1970s it could only be reached by a steep path used by people and their horses and donkeys¹¹. By the end of the 1980s a dirt road for cars was opened and in the middle of the 1990s a narrow paved road (still used) was built. This road connects Pahuatlán to San Pedro Tlachichilco village and Tulancingo city, the closest urban center to Pahuatlán, and from there to Mexico City via the national Mexico-Tuxpan highway (in total aprox. 150 km). So in fact transportation from Mexico City to Pahuatlán may take from three to four hours, but more to the rest of the villages of Sierra Norte de Puebla. Tulancingo is the closest urban center of great economic importance for the whole Sierra Norte de Puebla.

Pahuatlán is one of the villages most visited by tourists in Sierra Norte de Puebla. It is one of the easiest to reach and, although the village has grown in population and size, it retains much of the appeal of Sierra towns. Similarly to other head towns and villages in the region, Pahuatlán has a Spanish-type urban plan that was the model reproduced by the Spaniards when they settled in the old indigenous villages (Galnier, 1987). During holidays, December and Holy Week, regional and national tourists arrive to enjoy sightseeing, to hike and to practice hanggliding, sports that take advantage of the high mountain peaks. One of the main attractions has been San Pablito, and in fact the main destination of most visitors, particularly those from Mexico, is this village.

11 This communication system, known as *arriería*, was very important throughout Mexico and a whole tradition in cultural and economic terms developed along the arriería system. Several books have been written on this topic (e.g. Suarez, C. A. 1997. *La arriería en la Nueva España durante el S. XVIII*. México: Casa de Investigaciones, Tlalpan).

For those arriving from Mexico City and the central regions of Mexico, Pahuatlán constitutes one of the main entrances to Sierra Norte de Puebla. This strategic location has conferred some control over the resources and products transported into the Sierra. The weekly market held each Sunday, where people from Pahuatlán and neighboring municipalities come to buy and sell, demonstrates this.

This can also be observed each Saturday when a weekend market is held, and can even be detected from the appearance of the town. It has one of the largest plazas, one of the largest churches and one of the largest Saturday markets in the Sierra. It is during the Sunday open markets that the mix of people from different ethnic roots and mestizos becomes more apparent. The nature of the goods brought also show the great ecological diversity of Sierra Norte de Puebla. People from higher and colder regions, as well as from tropical ones, interact using Spanish or a few words of their own languages already shared by all for commercial purposes. The Sunday market is a vestige of the indigenous markets before the Spanish arrived. At the beginning of the colonial period they maintained the pre-Hispanic routes and customs that were organized on a 20-day cycle, but these were gradually adjusted in line with the Christian calendar and organized each Sunday when the main weekly mass is celebrated (García Martínez, 1987).

Every Saturday the main weekly market is organized in the plaza, the central square of Pahuatlán. All types of goods, food, materials and tools are sold. Women from villages travel to sell herbs, flowers and vegetables from their homegardens and fields, small farmers to sell costales, sacks of maize, beans, tomatoes and fruits, others to sell semi-processed products such as milled coffee and brown sugarcane, products grown on their crop lands and processed at household level. Weekly sellers from the cities come with large amounts of food products, while others bring clothes, kitchen utensils and field tools.

5.5.2 The expansion of Otomi livelihood strategies

In San Pablito an almost complete turnaround of activities took place in a very short time. This process was characterized by the fast expansion of craft production activities, particularly bark paper. In this process the intervention of governmental institutions played an important role. Their direct support, as explained in chapter 4 (section 4.4.1), gave the required security and supported the sudden success of the amate as a new handicraft.

Within the regional context San Pablito outstands due to the ways in which handicraft production and migration have started and developed. For San Pablito handicraft and beadwork are important income activities, in past years handicraft production constitute the main income activity, however at present migration is very important. Although there are no statistics, it can be observed that only a few villages have such a long migration history and one involving such numbers (such as San Nicolás village).

At present most Otomi households combine craft production and temporary labor outside San Pablito. The men are the ones who temporarily leave the village to go to other regions, mainly the United States. The women remain in the village, working in craft manufacture. They carry out every phase of the manufacturing process, occasionally helped by their children with specific tasks such as transporting water, rinsing the bark, carrying fuelwood. The children play a full part in the paper preparation during the summer holidays. Paper production is carried out among many other domestic activities, so the time devoted daily to this activity is constantly adapted in a very flexible way.

Expansion of economic strategies

In the last few years production strategies have greatly diversified and have been extended beyond the Otomi village. San Pablito has figured as a promoter of change within the region, introducing new income activities, new opportunities and driving relations inside and outside the region. This aggregates into the complex regional dynamics in which different groups, even those of different ethnic backgrounds and including mestizos, share this region under similar socio-economic conditions.

The way in which Otomi have introduced the beadwork activities in other villages and the form in which this activity is carried out currently constitute one of the best examples of the expansion of Otomi activities. As part of the traditional Otomi costumes, women used to decorate their blouses in a rich and colorful way, applying beadwork techniques. Such techniques have been adapted for the elaboration of necklaces, bracelets and purses – hand-made products commonly known as *chaquira*. At the start only San Pablito produced beadwork as a handicraft, but now many villages in Sierra Norte de Puebla are working in this craft production. Some are completely dependent on the Otomi people, others have sought their own markets.

As observed in fieldwork several Otomi households combine handicraft, agriculture and labor outside San Pablito. A representative case, observed during fieldwork, is next explained. Interviews revealed that some Otomi have purchased a car with money obtained in the United States. After working abroad they return to San Pablito and devote part of their time to the cultivation of peanuts and to the direct sale of crafts whenever possible. Occasionally they organize work efforts in certain villages throughout Sierra Norte de Puebla, for instance Tanchitla, a small village around 80 km from San Pablito. It is a village difficult to reach. There is a broad dirt road for 60 km to Tlacuilotepec but the last 20 km are quite difficult, via a recently opened dirt road that is frequently flooded or closed by small landslides. This short but difficult road might mean up to four hours of traveling. They arrive with the car loaded with sacks filled with peanuts collected from their own harvest. They also sell on behalf of their neighbors in exchange for payment. They usually stay in Tanchitla for about two weeks. First they sell the peanuts, then they extract bark from trees growing on coffee plantations. The women distribute raw material for the manufacture of beadwork and also teach women who have not done such work before. At the end they pay according to the number of bead-craft pieces produced. Before the journey, the Otomi make arrangements with coffee plantation owners, through contacts and personal communications. In Tanchitla, as well as other villages difficult to reach and far from San Pablito, no one is interested in harvesting bark, not even the coffee plantation owners themselves. Although they know that it is in demand in San Pablito, the distance and difficulties of transportation exceed the attainable income. When the Otomi return to San Pablito they bring bark for the production of amate paper and a considerable quantity of bead collars and bracelets, handicrafts that later on will be sold in local and national markets.

San Pablito as the only paper-producing village in the regional and national context

San Pablito is the only paper producer in all Mexico. Possible explanations for the Otomi exclusiveness include the protection of the manufacturing process knowledge and control of commercial channels. Some reasons can also be found in the perceptions that the inhabitants of neighboring villages have about the bark paper craftwork.

If these people are asked about bark paper manufacture, they immediately say it is hard work. They comment that making bark paper is not just mashing the bark strands with a stone, which is what most outsiders believe, but it requires a lot of previous work that takes a lot of time and effort. Furthermore, the commercial

activities outside San Pablito are special activities that cannot be carried out without previous experience. Looking for clients is seen as a very complicated task, especially in view of the competence of the Otomi. The manufacture also requires of a lot of work and skills; the knowledge is passed down from the oldest generations, and is carefully concealed among the Otomi.

The impression that neighbors have about San Pablito is based on their observations. This is how Victor from the neighboring village of Xolotla thinks and comments while traveling by bus on the daily morning route from Pahuatlán to San Pablito, where he takes avocados to sell. Victor says that from early in the morning Otomi people are working hard; it is possible to hear the noise of the stones being beaten on the wooden boards, even kilometers away from San Pablito. In the morning, around four or five vans are filled with bark paper, thousands of amate sheets; the Otomi traders are preparing to take them to Nahua painters in the state of Guerrero. Meanwhile, also early in the morning, Otomi women are waiting to discuss, or are already discussing, prices with bark extractors. During the day youngsters go from one side of the village to the other, carrying packages of 100 sheets to the houses of local wholesalers. In the buses, as Victor also comments, you can always find someone going to sell or returning from selling their amate handicrafts.

As mentioned above, other possible explanations for the Otomi exclusiveness include the protection of the manufacturing process knowledge. During fieldwork it was observed how Otomi enforced control over the knowledge about paper manufacture. Some bark harvesters stayed in San Pablito for quite some time to learn how to elaborate amate paper. When several Otomi artisans got to hear about this, they kicked the harvesters out of San Pablito and restrained them from making paper or teaching anyone else about this. Furthermore they asked them not to come back to San Pablito. People from the outside, especially people interested in the paper technology, such as Japanese people recording traditional forms of paper manufacture and others that come to the village only once, wishing to record the manufacturing process in a detailed way, have also been rejected.

5.5.3 The expansion of Otomi political actions

Political context in Puebla and Pahuatlán

The Organic Law that regulates the state of Puebla states that the municipalities must be considered as independent political units, and ruled by local authorities democratically elected every three years. The most important positions are the presidente municipal followed by the *regidores*, the aldermen.

Until some time ago political power in the Puebla was dominated by the Partido Acción Nacional PAN party but in the last 40 years the party's power has changed in line with the national and local power scenarios. At state level, the PAN has been the most powerful party and consequently its dominance has reached municipalities and villages; however, internally, at municipal level, divisions among mestizo families have filtered through the affiliation to different political parties. Meanwhile the marginal population, especially indigenous people, joins the party that currently represents an option to those dominating (PAN and PRI) – but without too much political conviction.

The center-right party PRI along with the PAN party of the right represent the two main political forces in Pahuatlán. Although during some periods the predominance of one or the other has changed, the power has remained in the hands of a few elite families. Predominance and the control of power are ensured by the way of pre-selecting the next political authorities to guarantee the political control and the economic power of the authorities.

The latest Otomi political actions

In the last municipal election, November 1998, the leftist party Partido Revolucionario Democrático PRD gained an important place among the indigenous population. Political force resided in the figure of an indigenous leader from the Otomi village who became a candidate for municipal authority. In Pahuatlán this was the first occasion on which a person from an indigenous village had become a candidate at municipal level. The indigenous population of the municipality, independent of their ethnic background, supported the Otomi leader. In the head town non-indigenous people who differed with the local powerful mestizo families also joined the campaign of the Otomi candidate. This event demonstrates that far from the dispute of political parties the historical conflict of this area is deeply rooted in the confrontation between the richest non-indigenous population and the poorest, mostly indigenous, population.

The Otomi leader lost in the 1998 municipal elections. The mestizos of Pahuatlán carried out an exceptionally forceful and menacing campaign, taking advantage of different strategies to convince or frighten opponents. They finally won the political post, beating the PRD candidate by a majority of only 20 votes (Personal communication, Comisión de Elecciones, Pahuatlán). In the following elections in April 1999 to assign local authorities at village level, the strategy of the indigenous population was to support internal candidates belonging to the PRD. During the period 1999-2002, local authorities belonging to the PRD party rule most indigenous

villages of the Pahuatlán municipality. They have formed a political group that regularly opposes policies and decisions of the municipal authority. They attend meetings and exert pressure to take part in decision-making and, whenever it is required, they carry their requests directly to state level, skipping the municipal authority. Through these actions the past ruling impositions are being partially eradicated.

The political scenario at municipal level and internally in the head town and villages is conflictive and dynamic. State and national political events, as well as the local differing interests of social groups, divide the issues. The results of the last national presidential elections in July 2000 brought a new political scenario. The PRI party that had retained the power for more than 70 years was defeated by the PAN, the most important party at state level in Puebla. At local level across Mexico this event led to the political rearrangement and several local political coalitions emerged. In the case of San Pablito these recent conditions together with the social and economic strength that the village has acquired through the marketing of their handicrafts has been especially relevant. Since 2001 an Otomi leader of San Pablito won the elections at municipal level. This is a unique event in Sierra Norte de Puebla where relations among indigenous and non-indigenous villages are historically tight and contentious.

5.6 Summary

One of the main aspects of the present production of amate as a handicraft has been the integration of a long and complex commodity chain. This has meant the building of links between distinct social actors acting at different spatial levels, such as artisans and wholesalers, and new ones such as regional harvesters, external suppliers of tools, transporters and owners of bark trees. The distance between each of the social actors implies differences in terms of the profits, knowledge and values granted to amate paper.

Along the entire commodity chain, wholesalers and middlemen have been the ones obtaining major profits. Unequal economic conditions are, as Graburn (1976) points out, a constant in most handicraft commodity chains where market relations are built under informal and very flexible conditions. Their formalization or institutionalization is thought to be the means of overcoming the distance between 'separated societies' and of establishing equal economy flows. The amate paper commodity chain also stands as a clear example of what Appadurai (1997) calls 'knowledge distance' across all the phases involved in the production and

consumption of this handicraft. These are large gaps of knowledge between producers and end-consumers, among consumers and even among the same producers. The distance is not just physical but also incorporates differences in the perception about bark paper. Throughout this chapter it can be observed how paper is valued in different contexts. It has acquired different values for producers in the local setting, for neighboring villages at regional level and for consumers and politicians at national and international levels. While amate is being used as part of the national image by building (as discussed in chapter 4) a legitimized (Castells, 1999) or a borrowed identity (Graburn, 1976), a lack of knowledge prevails about who are the producers and about their conditions. Since most of the amate paper was for long time sold mainly only by Nahua artisans most consumers assume they are the manufacturers of the amate paper. As explained in chapter 4 (section 4.4.1), Otomi are not recognized as the paper manufacturers among most end-consumers. Appadurai (ibid.) explains that handicraft productions as collective notions about fashion, consumption and authenticity are generally accompanied by ignorance about the production process and the craft producers. The lack of knowledge is also apparent at the other end of the chain, among artisans who lack direct access to handicraft market channels and do not know about the end-consumers.

One of the constant characteristics of this handicraft is the continuous innovation of the paper products. As expressed by Graburn (1976) and Stromberg (1976), flourishing commercial handicrafts are also characterized by the continuous innovation of the production. Within Mexico amate paper is probably one of the most versatile handicraft productions. The paper can be used in many ways and can be applied for many purposes, from standard uses to new forms. But the paper also ranges in terms of quality, from plain simple products to very sophisticated new products made by recognized artisans. The trend, however, as in other handicraft cases, is marked by the standardization of production, tending towards a major simplification of end-products and the manufacturing process. This runs parallel to the division of work into more specialized tasks among the Otomi and Nahua and throughout the amate commodity chain.

Another important aspect treated in this chapter refers to the notion of 'local production' and 'local conditions' within San Pablito and towards the outside. Throughout the chapter different ways in which paper production has transformed the relations the Otomi have built outside their village are mentioned. These are similar to the processes that Sarmiento (2000) identifies in mountainous regions and in certain Andean mountains, (discussed in chapter 3), where *ethnicity* as well as what he calls the effects of *centrality* and *expansion* are extending and linking villages to regions within the national context.

One of the first effects of craft commercialization at local level relates to economic activities. With the increasing commercial pressure the traditional division of labor changed and adapted to new conditions. Paper production demanded more time at household and individual levels and became the most important economic activity, alternating at first with agriculture and other craft production activities. Latterly agriculture has been almost abandoned and has been largely replaced by handicraft production and work outside the village, mainly in the United States.

In relation to the local conditions and their links with the outside, especially in the regional context, the role of San Pablito as a dynamic center of production and commercialization has had an important impact on Sierra Norte de Puebla. The political role of San Pablito is outstanding, especially when compared with that of other indigenous villages of the Sierra and also considering, as will be explained in chapter 8 (section 8.2.3), the differences in the population of Sierra Norte de Puebla, which is very much divided into indigenous and non-indigenous people.

In economic terms, the uniqueness of the Otomi village is outstanding in comparison with other regional villages. On one hand the Otomi have generated considerable political presence and independence from the regional and state authorities by using their economic strength to obtain certain services like the introduction of telephone explained in this chapter and the opening of the local high school (chapter 4, section 4.4.3). On the other hand they have increased their economic links with other villages in the Sierra for the supply of raw materials and tools for amate production and for the supply of beadwork now manufactured in many villages neighbouring San Pablito.

In cultural terms, this is one of the few villages within Sierra Norte de Puebla that has strongly maintained several of their ethnic expressions, especially language, traditional local organization, festivities, women's costumes and traditional healing. It appears that, as in other handicraft cases studied by Stephen (1991), when identity is placed in relation to society at large and outside government and business, community identity is the base. Otomi identity adapts to new conditions, including commercial ones, and continues to assign significance to old and new cultural elements that have a present use.

The Otomi identity is incorporated in the present paper production and has different forms of expression and interrelation with the outside. In this sense the few Otomi artisans who stand out through external recognition of their work (qualified as artistic) become important social actors within the village and outside. As Graburn (1976) explains, handicraft artists are designated by the dominant society and

become leaders by being at the forefront of contact in the movement of assimilation or resistance. They constitute an important interface between the producers of crafts and the rest of the world, because members of the dominant society inherently respect artists, even while often despising other members of an ethnic group. However, as already pointed out, the course of accommodation between the demands and traditional expressions of the culture often produces a narrow or stereotyped notion of what constitutes the important parts of their ethnicity (Graburn, 1976). In the case of amate most end-consumers do not know the background of the artisans. However, without knowing the ethnic background of the Otomi people in particular, they value the paper because it speaks of the national past.

**Bark trees: history and knowledge about
trees used for amate paper**

6.1 Introduction

This chapter focuses on the tree resources used for amate paper production. Taking a long perspective, it is possible to trace the types of resources used for paper manufacture since pre-Hispanic times. Besides bark trees, many other resources were used for paper production in the past. The richness in paper products and the use of different resources stopped after Spanish colonization, when amate paper was forbidden. The clandestine production of amate paper was based mainly on the *Ficus* species. Since the amate handicraft began to be commercialized, new tree species have been adopted for this production.

Some of the main questions raised regarding the long use of certain species for paper production concentrate mainly on the period when amate commercialization took off. How did the adoption of new tree species start? How did it evolve? In what context? How is knowledge about bark trees changing, especially since the impact of market forces? In the last 30 years the gradual process of adopting more tree species for paper manufacture has taken place. Past Otomi forms of management and traditional knowledge about the trees have changed; these aspects are explored. Each tree species attains different biological characteristics that have also implied distinctions between bark fibers and between paper types. Each species is distinctly recognized by the Otomi.

Furthermore, underlying the history of the use of resources for bark paper and of practical knowledge about the species, trees have been granted distinct cultural values. Trees in general occupy an important place within Mesoamerican cosmovision. Although there is no actual information about the symbolical place of trees – specifically bark trees – in Otomi culture, and the data gathered on fieldwork is scant and cannot be cross-checked, it was observed that some *Ficus* trees are currently bestowed with sacred values within San Pablito.

The principles of ethnoecology were adopted in this chapter. As explained in chapter 3 (Figure 3.3), this theory enables the understanding of nature-society relations, in this case for exploring the historical use of resources for amate production. This theory enables the three main components involved in the appropriation of natural resources to be identified: perception (Kosmos), knowledge (Corpus) and practices and use (Praxis) (chapter 3, section 3.3.2). These three components have been historically explored in regard to the resources used for amate production. However, the cultural perception of bark trees and trees in general is rooted mainly in pre-Hispanic times. The knowledge about bark trees, involving their identification, designation and classification, is explored to observe the changes since the impact of market forces, and finally the use and management centered in past and present forms of bark harvesting.

The information used in this chapter was found in bibliographical sources, and to some extent (whenever possible) was cross-checked in the field through interviews with Otomi people and regional harvesters, especially with respect to events occurring over the last 50 years. Several ethnobotanical exercises were applied in order to understand the current Otomi knowledge about tree resources.

6.2 The cultural value of trees through history

6.2.1 Trees in Mesoamerican cosmivision

Trees have occupied a prominent place within indigenous cosmivision, particularly during the pre-Hispanic period. This section intends to explore this topic. It is mostly based on *Tamoanchan y Tlalocan*, the study by López-Austin (1994), an anthropologist dedicated to interpreting and understanding Mesoamerican cosmivision, mainly through the study of pre- and post-colonial documents and the interpretation of present indigenous myths.

During the pre-Hispanic period myths were the main form of communication within and among the different indigenous groups that were integrated into Mesoamerica. As briefly explained in chapter 4 (section 4.2.1), the actual Mexican territory was occupied by several indigenous groups; the dominant group was the Aztecs but the diversity of cultures persisted. Myths, as López-Austin claims, were one of the main factors in Mesoamerican unity. In this way the fundamental concepts of Mesoamerican beliefs were held in common, although the details varied among the villages of the different indigenous groups.

Time and power were closely related and were a constant concern in Mesoamerica. The ruling class controlled the knowledge about time and propitiating the gods. Consequently the destruction of the calendrical system was fundamental for the Spaniards. The conquest started by destroying Mesoamerican power and the conception of time (chapter 4, section 4.2.1). As López-Austin (1993:50) points out, time was a main preoccupation. ‘... It was the origin of complex calendric systems that permitted the flow of destinies and the institution of rituals to be calculated, and which gave life to a powerful and costly religious hierarchy. The preoccupation has lasted, but to a much smaller degree. The religious and divinatory institutions were supported by and were part of the ideological base for the governmental apparatus.’

Trees appear right from the start, at the origin of the world. The myths tell that once the world was created from the body of the goddess Cipactli and a great division was made between the feminine and masculine parts of the cosmos. Four trees/posts/men/gods were raised as columns to prevent the reunion of the two parts of the goddess and to maintain the separation of the two halves. One main

tree was raised in the center of the cosmos and another four raised at the extreme corners of the earth to function as posts and separate the sky from the underworld¹. In this arrangement the three cosmic levels are integrated: nine heavens, nine levels of the underworld where gods reside, and the central section formed by the empty space where humans live (Figure 6.1). Time did not elapse. There was a constant present in the celestial levels and in the deepness of the earth.

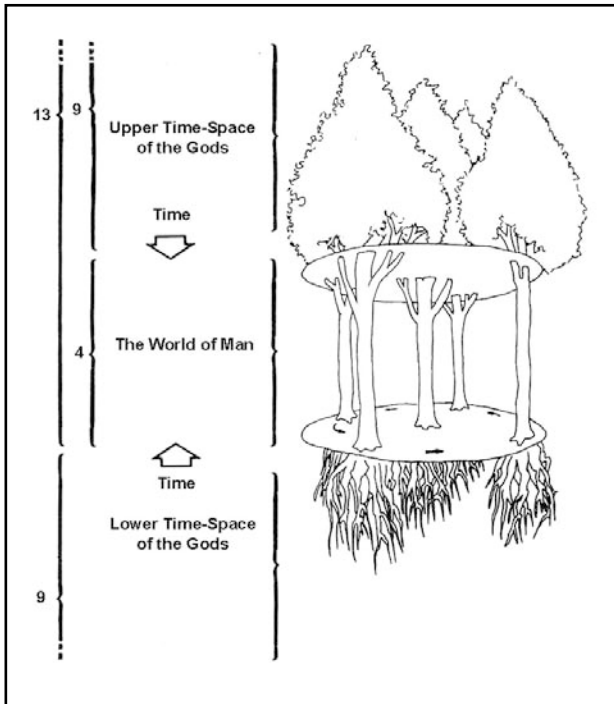


Figure 6.1. The world in the Mesoamerican cosmivision (from López-Austin, 1993).

Time emerged from the union of the gods of the sky and the gods of the underworld. The myths tell that the gods committed a serious transgression, so the two creators decided to disperse them throughout the space where humans lived. There they became subject to time, and thus subject to death, but in exchange they gained the possibility to reproduce. Time came through the four trees/posts and extended across the space separating the sky from the underworld. The rupture of the tree represents the passage of the gods to earth and the birth of time.

¹ These trees are only identified in Codex Tudela: in the East the mesquite, in the North the ceiba, in the West the cypress and in the South the willow (López-Austin, 1993 and 1994).

The roots of the knowledge and conception about time are found in the observation of natural cycles, in the timing of agricultural activities and in the beliefs about the reproduction and growth of vegetation. Trees occupied an important place within Mesoamerican cosmivision and the great cosmic tree was Tamoanchan. This tree ‘... plunge[s] its roots into the Underworld and extends its foliage in the Sky. In the Nahua conception the mist covers the base of Tamoanchan and the flowers crowns [sic] its branches. Its two twisted trunks in helicoidal form are the two currents of opposed forces that in the fight produce the time’ (López-Austin, 1993:225). One half of the cosmic tree was called *Tlalocan*, its plunging root formed the world of death from which the regeneration force emerged. It was the dark, cold and humid trunk. The other half of the tree was Tonátiuh Ichan, forming the branches of light and fire where birds perched. These were the souls distinguished by the celestial gods. In between the foliage the flowers of different destinies were born (Figure 6.2). All these places where divine forces circulated were needed to give movement and continuity to the beings in the world of humans. The alternation of two groups of opposing forces, and the idea of vegetal regeneration and the return of the rains, portrayed the great cycle of death and life. In the codices, as shown in Figure 6.3, the cosmic tree was represented as a divided tree with twisted trunks, symbolizing the two opposing forces.

Trees occupied an important place in some pre-Hispanic rituals. According to Fra. Diego Durán (1995), a forest was reproduced in the patio of the temples to honor Tlaloc, the god of rain, forests, mountains and water. For the ritual, the Nahua placed in the center of the patio a very tall tree surrounded by four smaller ones joined with big ropes. López-Austin (1994) interprets this ritual as representing Tlaloc, god of water, and Tlalocan, the forest – the vast space of exuberant vegetation that extended below the earth (Figure 6.4).

Tlaloc was the god of rain and from the Tlalocan he sent all that was needed to live. Tlalocan was the center of the earth, also seen as a great depository of water from which rain and terrestrial currents emerged. The world replicated Tlalocan in the mountains and temples. López-Austin (1994) mentions that this conception is similar to that of these days Nahua of Sierra Norte de Puebla. For them Tlalocan is under the earth; it is the center of the world, where the tree that gives flowers of different colors is growing. As will be observed in the next section, this is of special importance for the Otomi.

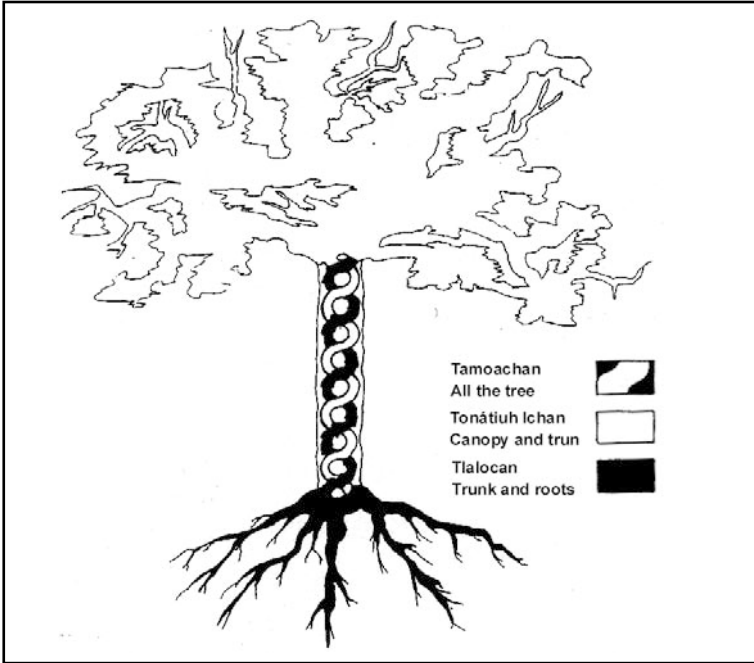


Figure 6.2. Tamoachan formed by Tlalocan and Tonátiuh Ichan (from López-Austin, A. 1994).

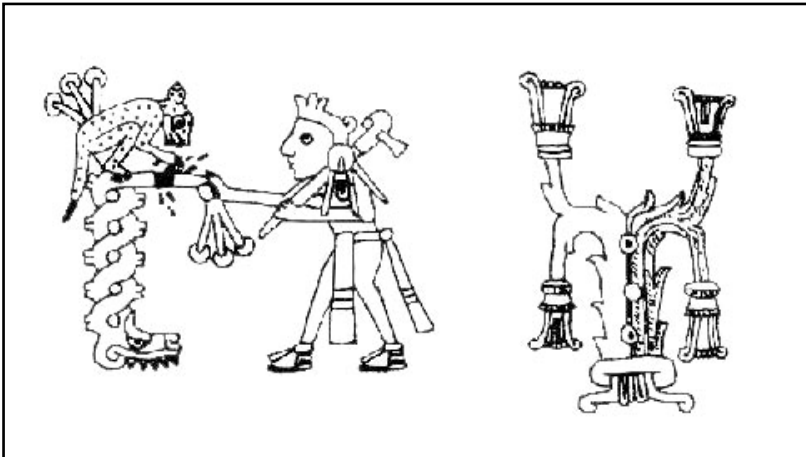


Figure 6.3. Pre-Hispanic representations of the Great Tree (Codex Fejérváry-Mayer and Codex Borgia).



Figure 6.4. Ritual in honor of Tlaloc (from Fra. Diego Dúran, 1995).

6.2.2 Mountains within the cosmovision of indigenous groups of Sierra Norte de Puebla

For indigenous people living in Sierra Norte de Puebla the mountains are the central part of life. Their thinking and practices are shaped by the mountainous landscape. For the Otomi each spatial site – a hill, a cave, a cliff – has a meaning and is associated with the places where the ancestors reside. These places are the receptacles of all the consecrated energies given by the community to guarantee their perpetuation (Galinier, 1990).

According to the myths of the indigenous people of Sierra Norte de Puebla, the essence of all world beings derives from a divine substance that created all at the beginning of the world. The gods of the primeval time gave origin to all that existed on earth. First came a dark time of breeding, and later came a second time of light, dominated by the sun and identified as the time of humans. With the light the mountains emerged and the moon and sun started on their course (López-Austin, 1994). The hills, pyramids and sanctuaries remained unfinished; they were being built during the time of obscurity but due to the sudden light the ancestors were surprised by the sun and died. The ancestors were transformed into rocks. For Otomi all types of rocks, stones and fossils are vestiges of the dark period (Galinier, 1990).

As explained in the previous section, the heart of the earth was Tlalocan. The Nahua of Sierra Norte de Puebla believed that Tlalocan supported the earth, lying

parallel to the land with trees, rivers, lakes and waterfalls. For others Tlalocan as an enormous cave, is the depository of all richness, the fount of all types of water sources. Tlalocan is the heart of the earth and the place where the tree *Xochinkuáuit* (flowered tree) rises. Shamans in the Sierra mention that there are four trees at the sides of the world over which the terrestrial land is supported (López-Austin, 1994).

According to actual myths collected in Sierra Norte de Puebla, mainly among the Nahua, Tlalocan, as the mythic mountain, was the depository and main source of the ‘seeds’ or ‘hearts’. The seeds are the divine life-giving entities that conferred nature to all world things; they are identified as the ancestors who at the moment of creation received the commands to give life and to protect humans. After the mythic mountain, the hills and natural water deposits are the second mythical sites. From these sites it is possible to obtain the seeds that are placed and kept in the form of cut-out paper figures (Galinier, 1987; López-Austin, 1994). The paper images are worshiped; if this is not done, they may become offended and leave. This is very dangerous because, if the ‘seeds’ leave, all the beings from which their soul is made will disappear. People in the Sierra tell that this was the reason why the seeds of tropical plants left this area, escaping towards the east to settle in warm lands (López-Austin, 1994). The cut-out figures do not represent gods and are not symbols of gods, they are receptacles of divine essence. The shaman confers them with soul and energy, and this soul corresponds exactly to the form of the figure. The images must be kept safe, since an injury to the image may signify a diminishing of the reproductive power of that species (ibid.).

The mountains and hills are the keepers of the ‘seeds’ and the places of worship. As Galinier (1990) points out, for Otomi that have lived in a very rough region, mountains and hills are their most important ceremonial sites. Each Otomi village of the Sierra Norte identifies with its own mountain. Numerous ravines, hillocks, cliffs, caves and even simple elevations covered by vegetation are conferred with symbolism and are worshiped. All the influence and power of past generations lie in these elevations, which ensures the historical continuity of the villages (ibid.).

Sacred mountains for the Otomi of San Pablito

In San Pablito the two most important elevations are *Tamhe Oni* (Hill of Turkey) and *Ndexoni* (Hill of the Eagle with Two Heads). The former corresponds to the summit of the mountain where San Pablito is located. The peak reaches almost 1 800 masl, the San Pablito urban settlement is at around 1 200 masl, and the lower part of this whole steep slope lies at about 7 000 masl. The highest part of the mountain corresponds to the place of origin of San Pablito. According to the Otomi, the ancestors used to live there but they moved to the lower part where San

Pablito is now located. The story says that before they moved they threw a turkey from the top of the mountain and the place where it fell indicated the place of the new settlement.

The conception of Tamhe Oni, the most important elevation, relates to the explanations given by García Martínez (1987) about the pre-Hispanic origin of indigenous settlements in Sierra Norte de Puebla (see chapter 8, section 8.2.1). According to this author, the first peoples occupying the Sierra started to settle (ca. 1100 A.D.) mainly at the top of mountains and along high steep slopes and ravines in rather rough terrain in order to protect themselves from the attacks of other groups, which at that moment were constant. In San Pablito, the highest part of the mountain, considered as the place of origin, corresponds to the actual communal lands where forest still remains and where the Otomi go at times to carry out rituals. As García Martínez points out (1987), the formation of the Altepeeme, which was the fundamental pre-Hispanic element of political-territorial integration in Sierra Norte de Puebla as part of Mesoamerica, also incorporates the symbolical reference to mountains as the place of origin.

The second important elevation in San Pablito is called Ndexoni. Since the urban area has grown very quickly, this elevation is already the San Pablito urban area. It consists of a huge outcrop divided into two halves by a deep fissure. According to the Otomi a fork of lightning divided the rock. At the top a *Ficus* tree is growing; its roots fasten strongly to the rock and down into the fissure. This place is called the Eagle with Two Heads, and constitutes the symbol of the Otomi village.

Considered as the prolongation of the great mountain, there are also sacred sites that the Otomi visit during pilgrimages. López-Austin (1994) indicates that *Mayonika* 'Iglesia Vieja' (Old Church) is considered the navel of the world, from which all the rain that fertilizes the earth emerges. All the openings, caverns and pits are replicas of the Iglesia Vieja, generators of clouds and rain where the gods of wind and rain reside. These divinities help in the growing of vegetation but at the same time can be destructive (Galinier, 1990).

All rituals that are carried out in mountains make allusion in one or another way to the water element. It is said that in the heart of the mountains ponds/reservoirs and rivers exist (Galinier, 1990) and that the mountains are filled with water (López-Austin, 1994). The elderly of San Pablito conserve in their memory the laborious process of one of their most important rituals for rain petition. This ritual has not been celebrated since around 40 years ago; however, even the young know about it and objects required for it are carefully stored in a special small house called the 'house of god' on the primary school property. This celebration could last up to eight days and required a high investment to buy flowers, palm decorations, incense, copal and candles, besides many other products. The ritual started by visiting a

sacred mountain in the neighboring state of Hidalgo. There they prayed to the mountain and the ‘seeds’ and they left rich offerings and paper figures representing the seeds. After two days they returned to San Pablito, where they rested for one day, continuing the next day to a lagoon called San Francisco, in the state of Hidalgo. At this site the Otomi offered the cut-out figures, besides many other offerings made, to the Goddess of the Lagoon. On the way back to San Pablito they visited the main brooks and mountains and in the village held one last smaller ceremony to store again all the sacred objects in the house of god, the small storage house²:

6.2.3 Trees in Otomi cosmivision

The conception of hierarchy applied to mountains, hills and other relief elevations extended to the vegetative world. As distinct sacred mountains were allocated a higher symbolical position (Galinier, 1990), so too were trees thought to have more soul than the rest of plants (Carrasco Pizana, 1979). To discriminate among plants, the Otomi recognized two types of elements, ‘strong’ and ‘weak’, which contained the viability of the energetic grade of the species recognized in their plant taxonomy (Galinier, 1990).

Plants for medicinal use were endowed with a strong force. In the case of some trees, the force called *nzahki*³ is directly proportional to their dimensions (height, trunk diameter, buttress width) (Galinier, 1990). In San Pablito it was observed that the actual venerated trees are the most solid and corpulent ones, with extended crowns and strong roots, in many cases growing over rocks (see Appendix C). In other areas of Mexico, such as the state of Guerrero, trees with impressive roots firmly seal the rocks. Other trees resemble the pre-Hispanic perception of the nature of snakes being closely linked to the Goddess of the Earth, which forms the basis of the actual rites around some *Ficus* trees (Anthropologist Lilian González-Chávez, personal communication).

For the Otomi trees are a symbol of potency, from its name *za* the term *nzahki* is derived, which refers to the vital energy situated in the stomach, the center of the body. Souls come to trees in search of nourishment and through their trunks divinities move. The Wind and the Whirlwind come to look for ‘water foam’ to create the

² Full descriptions of Otomi rituals and their interpretation are given by Galinier (1990). As mentioned in chapter 4, rituals for agricultural purposes are no longer celebrated; agriculture has been largely abandoned in San Pablito.

³ *Nzahki*: inner force, all living beings have *nzahki*. Otomi-Mesoamerican interpretation about the soul (see chapter 4, section 4.3.2).

clouds (López-Austin, 1994). The sap of trees contains the vital force; its name *khi* is the same word used for blood, and the *liber* carries the energy transmitted by the earth element. Thus according to Galinier (1990) the bark paper becomes the upholder of this force; it represents the symbol of richness. López-Austin (1988) reveals that the Nahua also metaphorically compared the life of humans with vegetal life. The Nahua word *Cuauhtlactli* (tree trunk) contains the particle *tlac*, which refers to the upper part of the body. According to this the branches are hands, the top is hair, the bark is skin and the wood is flesh.

Trees have played an important symbolical role in Otomi rituals. During the 1970s Galinier (1990) recorded Otomi rituals that involved the direct action of the shaman with regard to tree symbols. One of these rituals consists of curing children of whooping cough. For the preparation of the ritual, the shaman cut tissue paper of different colors, yellow, white, violet and black, representing different divinities. These figures were placed on a palm mat. One of the particularities of this ceremony was the placing of a small tree in the corner of a house, which allowed the ascension of the soul of the sick child. To assist in this process the shaman cut out a paper ladder, which he raised at the end of the ceremony. He prayed in front of the tree and later in front of the domestic altar. At the end the paper figures were placed close to the tree.

Ficus trees in San Pablito

The place of trees in present Otomi cosmovision has not been explored. During fieldwork in San Pablito it was only possible to observe some general aspects about the perception of *Ficus* trees, some of them considered sacred trees. In general it is possible to identify two main patterns in the use of trees, one related to specific *Ficus* trees conferred with sacred values and one related to non-sacred *Ficus* trees and all the other tree species used for bark supply.

One of the first effects of amate commercialization was the need for bark raw material, initially only obtained from trees occurring within San Pablito territory. Most researchers that visited San Pablito during the first years of amate commercialization have mentioned the high pressure on trees. According to some of them, this even led to their depletion in San Pablito (Torres, 1982; Galinier, 1987; Urbina, 1990). But some trees, especially *Ficus* – those conferred with sacred values – have never been extracted.

Most sacred *Ficus* trees, the majority growing on coffee plantations, are very old trees with very strong thick superficial roots adhering to rocks. Extinguished or burning candle trees are noticeable in between the rocks and roots. The link between the site where trees are growing and sacred *Ficus* trees is very important. From

pre-Hispanic information sources, Carrasco Pizana (1979) discovered the prominent place of a venerated tree growing on the summit of a hill in Otomi territory. Apparently till now the sacred values conferred on some *Ficus* trees have been associated with the places where they are growing, as is the case of Ndexoni, a huge outcrop where at the top a *Ficus* tree is growing – actually one of the most important elevations and sacred sites within San Pablito territory.

The rapid expansion of the San Pablito urban settlement is causing problems in relation to the access to some of the sacred trees. Since the urban area has expanded access is limited to some *Ficus* growing on coffee plantations that have now become the homegardens of new houses. Most properties are clearly delimited with barbed wire; this represents disagreement between owners and Otomi who want to visit the sacred trees. This situation is currently sensitive in relation to one sacred *Ficus* growing on a coffee plantation where shamans used to come with people to be healed and leave some offerings such as candles, bottles of alcohol, palm decorations and cut-out figures (Plate 6.1). The owners of the coffee plantation do not allow people to enter due to property land limits and in this case also due to their religious beliefs. They practice the Protestant religion. Although this *Ficus* tree is not visited as much as in the past, Otomi continue to come, often secretly, to carry out their rituals.

Besides the sacred trees, there are some non-sacred *Ficus* trees growing in between the limits of different land properties, in between two or even three properties. This mostly occurs on coffee plantations. In these cases the tree is subdivided according to the property limits division. Each owner can decide on his or her part of the tree but any of them can damage the parts not belonging to him or her. Only owners of the trees have the right to use and exploit the trees on their property. Extracting bark without asking permission is severely criticized. Stealing bark from *Ficus* trees growing close to the urban settlement and close to the houses of their owners is rare but, on the contrary, stealing bark from other bark trees, especially *T. micrantha*, is quite common, even from trees growing close to the urban settlement.

Some non-sacred *Ficus* are purposefully conserved and protected within homegardens and coffee plantations. Some Otomi artisans, mainly those living along the main village street and thus more visited by tourists and paper purchasers, maintain their *Ficus* trees as well as at least one *T. micrantha* in order to show the consumers the types of trees used as a source of raw material. Another Otomi mentioned that he keeps one of the *Ficus* that started to grow in his homegarden in order to conserve it as a memento of the trees that once occurred in the forests of San Pablito. However, most of the remaining non-sacred *Ficus* trees have been severely exploited. The branches of these trees are regularly debarked. Some of these trees have a huge but rather short trunk, with many thin and short branches.

Besides these *Ficus* trees, probably more than 100 years old, it is also possible to observe a number of new ones that have been planted from stalks to form part of live fences within coffee plantations.



Plate 6.1. Sacred *Ficus* tree in San Pablito, with candles and cut-out paper as offerings.

As explained later in this chapter (section 6.4.3), most *Ficus* species can be extracted at the start of spring, the period when the leaves are renewed. This time also corresponds to the days of Holy Week, devotedly celebrated in San Pablito. For this special occasion the church of San Pablito is decorated with fresh green leaves of *Ficus*. The branches are arranged in each of the corners of the church, imitating small huts⁴. According to the elderly, years ago the complete church was decorated,

⁴ The practice of decorating the churches with plants has its origin in the first years of colonialization. As part of their indoctrination strategies missionaries looked for ways to attract the Indians to the churches and reduce their fear in front of impressive church buildings. The construction of atriums between the external parts of the church, as well as the introduction of plants to decorate the church, aimed at attracting more faithful Indians.

with the branches being arranged as an improvised and sort of natural roof covering. The collection of the tree branches, as well as all the preparations for the celebration, is carried out by groups of volunteers called *cuadrillas*. Each *cuadrilla* carries out specific tasks, such as decorating the church, organizing and cooking the food, contracting a music group. Artisans commented that this was the only day in which anyone could cut branches from any *Ficus*, and many took advantage to extract the bark before carrying the branches to the church.

Using *Ficus* branches to decorate the church is no longer done. At first the scarcity of trees obliged the diminishing of decoration, reducing it to the corners of the church instead of the whole building. Later, due to the pronounced scarcity of raw material in 1998, the priest cancelled this custom. Today the mass of Holy Week takes place outside the church, in the front patio, where small huts built from light plastic sheets represent the corners of the church.

6.3 Tree resources for bark paper through history

6.3.1 Trees used for paper manufacture during pre-Hispanic times

In exploring the past of the resources used for paper manufacture, the etymology of the word *amatl* becomes relevant. Amate, the word used today for the bark paper handicraft, is derived from the Nahuatl word *amatl*, which means both paper and fig trees. In this way the pre-Hispanic past of trees is revealed in this word. As Lenz (1973) explains, *amatl* constitutes one of the strongest pieces of evidence about the type of resources used for bark paper during pre-Hispanic times.

The Nahuatl names of pre-Hispanic tributary villages contain the word *amatl*, for example *Amapala* (site of abundant paper manufacture), *Amazonco* (place of bark fibers) and *Amayuca* (place where paper is elaborated). In this way it was possible to reconstruct the tributary pre-Hispanic map (chapter 4, Figure 4.4). *Amatl* is also contained in the names that were used for each of the trees exploited as sources of raw material, for example *Texcalamatl* (tree of the rocks) and *Texcalamacoztli* (yellow amate of the rocks) (Urbina, 1903). Up to now the word ‘amate’ has been a generic word that implies the different *Ficus* species used for bark paper.

During pre-Hispanic times, other types of plants besides amate plants were also used for the production of paper. As briefly described in chapter 4 (section 4.2.1), the use of different raw materials for paper manufacture was common within Mesoamerica. Francisco López de Gómara (1979), chaplain of Hernán Cortés

mentions in his work *Historia de la Conquista de México* the use of maguey leaves for paper manufacture. Spanish missionary Motolinía (1997), who arrived in New Spain in 1524, made clear the difference in the use of resources according to the areas where these resources occur. Maguey leaves (metl) were used in the semi-arid central region, while in the more humid tropical areas fig trees were used.

The great amounts that were being used in Mesoamerica by the start of the 1500s would certainly have implied the intensive manufacture of paper and the use of different resources for its production (Seeman, 1990). This is corroborated by the finding of stone beaters in places where *Ficus* trees do not occur. The stone beaters are important archaeological evidence of the manufacture of paper. Most were found in warm temperate regions, below 1 500 masl (Lenz, 1973), areas of natural distribution of *Ficus* trees. Others, however, have been found in semi-arid regions, where only fibers from maguey leaves or other resources from these regions could be used. Otherwise, as Seeman (1990) and Lenz (1973) suggest, it is probable that *Ficus* fibers were transported to tributary villages where these trees did not occur. Besides *Ficus*, the authors name other trees and genera occurring in temperate regions that could have been used for paper manufacture, trees of the *Cordia* and *Garrya* genus (Seeman, 1990) and the trees such as the majahua and olquahuitl (Lenz, 1973). Whatever the type of tree used, the qualities of the bark fibers, their weightlessness, transportability and malleability, in comparison with other resources such as maguey leaves and animal skins used as surfaces for the specific elaboration of codices, made them the most intensively used for paper (chapter 4, section 4.2.1).

Post-Hispanic identification of resources used for bark paper

Information about the use of *Ficus* trees during the first years of the Spanish colonial period is vague. Lenz (1973) reveals that Pedro Mártir de Anglería was the first Spanish chronicler who, as part of his descriptions of bark paper, records the use of the inner soft bark of some trees for its preparation. Later the missionary Bernal Díaz del Castillo who, as Lenz (1973) reports, might have seen the manufacture of this paper or at least knew about it from direct sources, recorded the production of *librillos de un papel de corteza de arbol, que llaman amatl* (small books made from a bark paper that they call amatl)⁵.

5 Pedro Mártir de Anglería. 1944. *Décadas del Nuevo Mundo*. Buenos Aires, Argentina: Editorial Bajel; Bernal Díaz del Castillo. 1968. *Historia Verdadera de la Conquista de la Nueva España*. Colección Austral 1274. Madrid: Editorial Espasa Calpe.

The first detailed description of plants for paper manufacture was given by Dr. Francisco Hernández who, as explained in chapter 4 (section 4.2.2), was the first Spaniard sent by the Crown to carry out an expedition as a proto-medic. He was the first to systematize the knowledge and classification of plants in New Spain and was the first to describe the use and manufacturing process of the so-called ‘American paper’. Dr. Hernández grouped all species used for bark paper under the Amate family, later identified as *los amates de Hernández* by Urbina (1903). In Hernández’ work (1942) the Amate family was subdivided according to the distinctive use of each plant and their morphology. The generic name of Amate implies in the first place their use (especially of trees) as sources of bark material for paper production and on a second level other uses, especially for medicinal purposes. The dense whitish sap of some Amates were used to ameliorate skin infections and bursts, others were used to cure fractures and hernias⁶.

Urbina (1903), who studied the classification of trees belonging to the Amate family made by Hernández, mentions that at the start of the 1900s Biología Central Americana identified 26 species belonging to the Amate family. This family contained trees and other plants, such as herbs belonging to the Leguminosae family, which were also used for medicinal purposes. Moreover, as Urbina (1903) indicates, these plants were generally growing in the shade or along the exposed roots of amate trees.

The medicinal properties of the Amates are also mentioned in Codex Cruz Badiano. This codex was made by Martín de la Cruz, an Indian, under the direction of the missionary Sahagún, who organized and wrote it in Latin to demonstrate that Indians had also developed a complex medical knowledge but conceived it in a more religious way rather than the practical or laical one of the Spaniards (INAH, 1979). This codex contained the first pictographical representation of an amate plant, giving information about its medical qualities (the root of the tlamatl plant was prescribed for skin burns) (Plate 6.2). Consequently it appears that, although the

6 Medicinal properties of amate trees are still recognized among some indigenous groups in Mexico. In the state of Guerrero Nahua make fine incisions in the trunks of some fig trees to collect the fresh sap that is used for skin infections (Anthrop. Lilian González-Chávez, personal communication). Among the Otomi of San Pablito the medical properties of amate trees are not recognized. Probably this knowledge and use of amate trees has vanished, or maybe it never existed. It was not recorded in the field nor is it mentioned in any bibliographical source. The presence of certain substances such as balsams, gums, oils and resins that protect the tree from fungal and insect diseases are the sources of medicinal compounds (Prance and Prance, 1993).

Indian classification of plants (such as that for Amate, comprising all plants used for bark paper) was useful in understanding Indian plant knowledge, the initial Spanish attraction to medicinal properties rather than the use for bark paper also related to the prevailing ban on bark paper.



Plate 6.2. Post-Colonial Codex Cruz Badiano. Indigenous knowledge about medicine and flora. Description of medical properties of one variety of *Ficus*.

The interest in knowing and identifying the plants used for pre-Hispanic paper, especially for the remaining codices, started in the 1900s. Although it was known and accepted that *Ficus* trees were the main sources of bark paper in Mesoamerica, determination of the types of resources used specifically for the elaboration of codices roused discussions among botanists. Boturini (1947) and Von Humboldt (1984) described the manufacture of indigenous paper in Mexico and mentioned that this was made from maguey leaves (chapter 4, section 4.2.2). This led to the assumption that all the codices were made from maguey leaves. Uncertainty

remained for several years until in-depth analysis of the fibers of codices was carried out in laboratories, mainly by Schwede (1916, cited in Lenz 1949) and Lenz (1973). Schwede examined 21 manuscripts and Lenz examined 44 codices kept in the National Archeological Museum in Mexico City. Both confirmed that most of the codices were made from bark fibers.

More recently the different taxonomical determinations that have been made for bark trees have led to some incongruities. The actual problem resides in incompatibilities among the species mentioned in different literature sources and difficulties in obtaining an accurate taxonomical identification. This task is complex and has to cope with continuous adjustments and changes in taxonomical classifications, an aspect especially relevant to the *Ficus* genus. On the other hand incongruence is found among previous attempts to identify the species for bark paper. This sometimes relates to the use of common tree names and replicated inaccuracies (see Appendix E).

6.3.2 Implications of a larger bark paper demand: trees and related aspects

In general it has been mentioned throughout this book that the increasing demand for amate handicraft has implied the supply of more bark raw material. In particular the initial effects of a larger demand and the responses and strategies carried out to satisfy this demand are documented in some bibliographical sources and were a matter of comment in fieldwork interviews. Some studies mention the relation between the scarcity of bark material and the impact on the economic, social and aesthetic aspects of this handicraft production.

Amith (1995) studied the aesthetic history of Nahua paintings. According to this study, mostly based on interviews with painters, Nahua artisans did their paintings on Bristol board before the amate paper was introduced and, although amate paper was already being used, Nahua painters continued to use Bristol board for several years. ‘... Part of the reason was a shortage of amate: Pahuatlán was unable to increase production fast enough to keep up with the new demand, and a direct distribution network was not yet set up’ (ibid.:70). For that reason, although not so successful, Nahua paintings on Bristol board continued to circulate in the markets; though by the late 1960s ‘... the allure of amate, in contrast to industrial paper, was overwhelming and once the supply problem was resolved the distribution of painted amates expanded dramatically....’ (ibid.:70).

Shortage of raw material is mentioned by Stromberg (1976:156) ‘... In 1966, the rapid destruction and threatened extermination of the amate trees in the region from which the bark was obtained prompted the government to prohibit the further use of bark paper.’ The effect of this measure, according to Stromberg (ibid.),

could be observed in two distinct forms. On one hand the Nahua went back to ceramic as the surface for their paintings; this was accompanied by an increasingly innovative phase of ceramic and painting styles. On the other hand Nahua painters took Bristol board to paint, a medium that did not succeed in the market. As mentioned in chapter 4 (section 4.4.1), events such as the Olympic Games organized in Mexico in 1968 prompted support for national indigenous arts and crafts and some action regarding amate paper was taken. ‘... The government also permitted the reinstatement of the manufacture of bark paper, provided that 10 trees would be planted for each one chopped down’ (ibid.:156).

Although it is not possible to confirm whether the government measures described by Stromberg (ibid.) were carried out – and among Otomi artisans no one could remember this intervention – it was mentioned that for some years permission had to be requested for bark extraction. FONART, the Mexican government agency for promoting handicrafts, issued these permits, but only a few Otomi could obtain them and the procedures were not regularized. Permits were issued on a personal basis; apparently there were no standard request forms.

By the 1980s Torres (1982) writes that the greater competence of Otomi artisans in producing and selling paper had translated into major pressure on trees within San Pablito territory. In first place this led to bark harvest intensification in the communal forests of San Pablito, to which all Otomi inhabitants have right of access (see chapter 8, section 8.2.1) and latterly to the search for bark in areas farther away. Forests came under great pressure. Young *Ficus* trees diminished in number and extraction was intensified without reference to the suitable natural periods of the species. The author remarks that, although the manufacturing technique followed till now is principally based on the one used during the pre-Hispanic period, the strategies for bark collection have considerably changed.

In other studies of the 1980s the potential risk of the over-exploitation of the trees used for bark supply and, as a direct consequence, the probable collapse of the Otomi paper-making industry were indicated. Peters *et al.* (1987:431) write that ‘... The depletion of local sources of bark as a result of commercialization and poor forest management would seem to limit the continued evolution of this cultural tradition.’ Goloubinoff (1994) establishes that the same success of amate commercialization could provoke the decline of the paper industry. She foresees that, without a proper ecological project based on understanding the present characteristics of the Otomi village, an ancient technique could vanish due to the exploitation of bark trees.

6.3.3 The adoption of new tree species

In the previous section the first and most direct effects of craft demand in relation to the need for more bark raw material were explained. In this section the response to ensure bark supply by adopting more species for bark extraction at local level – later extending towards the outside of San Pablito – is explained. At present this supply depends on three parallel strategies: the adoption of new tree species as sources of bark raw material, the expansion of the harvest area and the involvement of regional harvesters. Originally, Otomi artisans harvested trees within their own territory. Later the Otomi and a few regional harvesters supplied the raw material and now most of the bark supply comes from regional harvesters. The involvement of the regional harvesters will be explained in the next chapter (7).

The adoption of new tree species has been crucial. Thirteen species are actually used for bark paper production. The traditional species correspond mainly to *Ficus* sp., while the species adopted over the last 30 years belong to various families (Table 6.1). According to their life-forms attributes, these species can be divided into two main groups⁷:

- *Long-living species*

The first group comprises the original trees used since the pre-Hispanic period, *Ficus* sp. and *Morus celtidifolia*, and three of the most recently adopted tree species, *Ulmus mexicana*, *Brosimum alicastrum* and *Sapium*. All are typically tropical trees, slow-growing and found only as scattered individuals in the forest.

- *Pioneer species*

This group comprises *T. micrantha*, *Myriocarpa cordifolia* and *Urera caracasana*. These species were adopted after paper commercialization started⁸. All belong to the secondary type of vegetation, showing high growing rates and abundance in areas where the original vegetation has been removed. They naturally occur in dense aggregations, they grow extremely fast, and in the case of *T. micrantha* they can be debarked throughout the year.

7 Ecologists typically divide species into two types, r-strategists and K-strategists, based on their reproductive strategies. K-strategists are long lived, slow growing and slow reproducing whereas the r-strategists are short lived, fast growing and fast reproducing. This classification enable plants to be sorted into functional ecological groups and give better insight into plant population dynamics and improve ability to predict the impact of harvesting (Cunningham, 2001).

8 Although apparently *Urera caracasana* (teochichicastle or chichicastle) was used before, probably since the pre-Hispanic period, as Lenz (1973) notes from the study of Hernández (1942). Discrepancies in the taxonomical classification of this plant make it difficult to trace its historical use (see Appendix E).

Table 6.1. Species used for bark paper production.

Traditional species	New adopted species
<i>Ficus pertusa</i> L. f. Moraceae	<i>Trema micrantha</i> (L.) Blume Ulmaceae
<i>Ficus padifolia</i> H.B.K. Moraceae	<i>Ulmus mexicana</i> (Liebm.) Planch. Ulmaceae
<i>Ficus cotinifolia</i> H.B.K. Moraceae	<i>Brosimum alicastrum</i> Swartz. Moraceae
<i>Ficus calyculata</i> Miller Moraceae	<i>Sapium oligoneuron</i> K. Schum Euphorbiaceae
<i>Ficus goldmanii</i> Standl. Moraceae	<i>Sapium aucuparium</i> Jacq. Euphorbiaceae
<i>Morus celtidifolia</i> H.B.K. Moraceae	<i>Urera caracasana</i> (Jacq.) Griseb. Urticaceae
<i>Myriocarpa cordifolia</i> Liebm. Urticaceae	

Among all the species adopted, *T. micrantha*, known as *jonote* in San Pablito, is a key resource for present amate production. At present about 90% of the raw material used for amate production is extracted from *T. micrantha*, the majority occurring as shade trees on coffee plantations in the entire Sierra Norte de Puebla. Although in terms of bark volume, *T. micrantha* comes first, the other species are also important especially at certain periods of the year when *T. micrantha* trees are scarce or when certain practices for managing the coffee plantations are being carried out (see chapter 7 for further explanation). It is also important to mention that due to the ecological distribution of these species, three of the new species do not grow at the altitudes where San Pablito is located (around 1 200 masl). These are *Brosimum alicastrum*, *Sapium oligoneuron* and *Sapium aucuparium*. On the other hand *Ulmus mexicana* shows a limited ecological distribution. It appears to occur only at scattered locations along Sierra Norte de Puebla. Some individuals of this species are growing within San Pablito territory.

The gradual adoption of new tree species

The history of the adoption of new species has not been thoroughly recorded. In San Pablito this history vanishes and few literature resources refer to it. However, as explained in the previous section (6.3.2), the depletion of trees for bark supply, specifically *Ficus* trees, is mentioned in various sources. Amith (1995) mentions

that, at the very start of amate commercialization and before the intervention of FONART (see chapter 4, section 4.4.1), there was a shortage of amate production because a direct network supplying paper to the Nahua was lacking. As commented during the interviews, the lack of a direct and regular supply of Otomi bark paper to the Nahua painters is related among other reasons to the fact that the Otomi only had a small amount of raw material, and for this they relied on the *Ficus* and *M. celtidifolia* trees growing within San Pablito territory.

During the 1970s Galinier (1987) observed ‘massive exploitation’ of all trees used for bark paper. The author points out that *Ficus* as well as some of the newly adopted species (at that moment jonote still identified as *Heliocarpus* sp.) disappeared from San Pablito and neighboring forests. A decade later, according to Urbina (1990), the trees belonging to the *Ficus* genus vanished from San Pablito. The author notes that artisans did not respect the regeneration cycle of these trees and the Otomi people had no interest in reforestation and conserving them as a source of raw material. Prance and Prance (1993) indicate the depletion of *Ficus* through their overuse and the shift to pioneer species for bark paper manufacture.

Peters *et al.* (1987) established that adoption of the pioneer species that they identified occurred in the early 1980s. Their adoption, according to these authors, coincided with the increasing demand for paper and the decline in *Ficus* sp. and *Morus celtidifolia* due to frequent harvesting and changes in regional land use. In the early 1970s the road connecting San Pablito to Pahuatlán was constructed, prompting the expansion of agricultural activities. Much of the forest was cut and a variety of crops and pastures were introduced. The expansion of agriculture virtually eliminated the use of *Ficus* and *M. celtidifolia* trees for bark paper, and areas formerly covered by forest were soon dominated by communities of woody pioneer species (see Appendices C and D).

The *Sapium* sp. and *Brosimum alicastrum* are among the last tree species adopted. Since these trees do not occur in San Pablito, their adoption is closely related with the integration of regional harvesters. From interviews with regional harvesters it appears that these species have been adopted during the last 15 years. One more tree species also recently adopted is *Ulmus mexicana*. This species is known only by some Otomi artisans but not by regional harvesters, since these trees show restricted ecological distribution.

With respect to *Urera caracasana* and *Myriocarpa cordifolia*, according to the Otomi people these plants have long been used for paper production but are only used when other resources are scarce, since their debarking is a very laborious and time-consuming activity. Due to the apparent divergences in their taxonomical classification their historical use cannot be traced. These plants grow abundantly in San Pablito and are mostly used for medicinal purposes.

Among the pioneer species, *T. micrantha* has become a key tree resource for paper manufacture. According to Otomi artisans, this species was adopted about 10 years after bark paper commercialization started. In the bibliographical sources its adoption appears up to the 1980s; however, as explained in Appendix E this species was incorrectly classified before as *Heliocarpus* sp. Lenz (1973) explains about some plants that the Otomi unsuccessfully tested for amate manufacture in the 1940s. Among them he observed the use of jonote (*Heliocarpus* sp.), which was the least preferred because its bark is too slippery and difficult to manipulate for paper manufacture⁹. The author mentions that other species were also tested but were not adopted, probably due to restricted biological characteristics or difficulties for paper manufacture. Nevertheless, it appears that the testing of other trees was carried out even before the commercialization of amate as a handicraft started. If the testing of alternative species started before commercialization, then some of the technological changes that apparently also took place in the 1940s, specifically the boiling of bark fibers reported up to that decade by Christensen (1952), happened simultaneously (see chapter 5, section 5.2.2). Parallel changes in manufacturing technology and the adoption of tree species would be expected but there is no certainty about this.

Throughout, it seems that the adoption of new tree resources must have occurred in a gradual way. In the last few years, the participation of regional harvesters in the extraction of bark has developed parallel to the search for potential tree resources for bark supply. The trend shows intensifying adoption of pioneer tree species, linked in the first place with the search for continuously available species for bark supply, and second with the land use changes that have occurred in San Pablito (also occurring within the whole bark harvesting area, as will be explained in chapter 7). Lastly trees have been adopted because of their major distribution in comparison with traditional tree species, particularly *Ficus* sp.

This search implies communication between harvesters and artisans. Both regional harvesters and Otomi artisans, especially those with considerable experience in harvesting and considerable knowledge about trees, are continuously looking for new potential resources for bark paper manufacture. Although, as will be explained in the next chapter (section 7.4.3), relations between the Otomi and regional harvesters are tense and based on the supply irregularities in terms of volume and

⁹At present this is still one of the arguments used among Otomi artisans with respect to *Heliocarpus* sp. and also other species that have been tested for paper manufacture but do not meet the requirements for this use (see Appendices B and E).

price, some of them maintain close contact in the search for new species. The search entails constant testing from both sides: harvesters test detaching bark from the trees, while recognizing suitable harvest periods; the Otomi artisans test the bark properties for the manufacturing process.

6.4 Otomi knowledge about bark trees

6.4.1 Otomi identification and classification of bark trees

In the pre-Hispanic period *Ficus* sp. and other resources used for amate manufacture were identified in first place according to the color of bark fibers and in the second according to characteristics such as tree size, physiognomy, latex, leaf form and location. Urbina (1903) recorded that the trees, shrubs and all plants used for paper which were previously identified by Dr. Hernández under the Amate family (section 6.3.1) received the name *amaquahuítl*. The differences among them were established according to their uses and other characteristics, like color of bark: *tlilamatl* (black amate), *ixtacamatl* (white amate) and *amacoztic* (yellow amate).

By the time Lenz (1973) carried out his research in the 1940s, he found that indigenous people in Mexico recognized three types of amate trees, based on the color of the bark: *amate blanco* (white amate), *amate amarillo* (yellow amate) and *amate prieto* (black amate). In San Pablito Lenz identified the use of five trees for bark paper; each entailed a different paper color. The color, as Lenz records, was closely related to the purpose of the rituals for which the papers were used, basically white for good purposes and black for malicious ones (chapter 4, section 4.3.2). The classification of paper by color is confirmed by Christensen (1979), who also explain that the color of the paper depends on tree species and age but according to these authors there are two main color groups: white paper made from *M. celtidifolia* and from *Ficus tecolutensis*, and darker type of papers made from the rest of the species (see Table 2 in Appendix E).

Identification of bark trees in Otomi

In San Pablito the trees used for bark paper have an Otomi name as well as a Nahuatl one (see tables in Appendices B and E). The first one is used among the Otomi when using their own language and the Nahuatl names are used when communicating with outsiders. It is not possible to trace back to the time when the Otomi adopted Nahuatl words for amate tree designation. It appears that the Nahuatl language was used to communicate with people from the outside, who were and are more familiar with the Nahuatl language than the Otomi. In Mesoamerica the villages dominated by the Aztecs maintained their own language, but the Aztecs

imposed a Nahuatl name on each village, mostly translating the original name or making reference to some prominent characteristic, such as the type of tribute in which they specialized. The Otomi in Sierra Norte de Puebla, as explained in chapter 4 (section 4.3.1), were one of the few indigenous groups to keep their autonomy in the face of the Aztecs, and Otomi words to designate their villages. In contrast to other indigenous villages of Sierra Norte de Puebla that acquired Nahuatl names, Otomi villages conserved their names until the Spanish conquest, when new names were imposed, usually the names of saints. However, as observed in the field, the Otomi use their language among themselves, including the Otomi names of their villages and of the bark trees.

Otomi identify bark trees by the color of the fiber but also by characteristics such as amount of latex, shape of leaves and type of bark. *T. micrantha* trees are called *coni*. In Otomi the outer hard bark is called *hü-xi*, the trunk *ntzá* and the soft bark *coni*. Therefore *T. micrantha*, which are actually the main sources of bark raw material, are known as ‘bark’. The Otomi name for *Morus celtidifolia* is *tzhazúcuá*; from this word *zú* means document paper. Some Otomi explain that these trees are the original paper trees, the first before all the other trees started to be used. From these trees the smoothest and whiter type of paper is obtained. According to the quality criteria among the Otomi, these trees and therefore the paper manufactured from them are highly valued.

Ficus cotinifolia is called *tshax popotzha* and *Ficus calyculata* is called *buo popotzha*. Buo refers to black and tshax to white; popotzha means tree with a great amount of stickiness. These two species contain abundant latex, in the case of *Ficus cotinifolia* as pointed out by Pennington and Sarukhán (1998) abundant creamy latex. In the case of *Ficus pertusa* and *Ficus padifolia* their generic name *moushi* means lemon tree. Their leaves look like the leaves of lemon trees; they are differentiated in terms of color, the first one buo (black) and the second tshax (white). *Ficus goldmanii* is called *popotzha xibahua*; these trees look like avocado trees and xibahua refers specifically to the leaves and bark of avocado trees.

In the case of *Brosimum alicastrum*, a tree species that in fact the Otomi do not know because it does not occur within San Pablito or neighboring areas, it is identified by its characteristic bark, which in contrast to others once extracted it is not flat and extended but twisted and curved. So it is called *payu coni* (ring bark). Both *Sapium* species, which also do not occur in San Pablito, are called *coni pathi* (witch bark; bark from witch tree) and some artisans differentiate between them according to the slight difference in the fiber color: *palo brujo amarillo* (yellow one), *S. oligoneuron*, and *palo brujo blanco* (white one), *S. aucuparium*. Their bark is called *uini coni*, which means thorn bark, being the most difficult tree species to debark since its latex causes great irritation and also requires a long time for boiling. Part of the Otomi artisans’ knowledge about these last species, such as

the physical appearance of the trees and the characteristics of the fresh bark, is obtained from regional harvesters, who are the ones extracting bark from these tree species.

Urera caracasana and *Myriocarpa cordifolia*, which belong to the Urticaceae family, present minute thorns in their leaves. Accordingly they are called *tzhanná* and *husna*, words that refer to the strong itchiness that these plants cause, the first one more so than the second. These plants are very difficult to debark and are only used in periods when other barks cannot be acquired.

6.4.2 Changes in Otomi knowledge about bark trees

In order to analyze the knowledge about trees, fibers and papers in more detail, a short survey was carried out involving 20 Otomi people from San Pablito: six artisan women, three young Otomi involved in paper commercialization and 14 men (five were or still are bark harvesters and the others are artisans). The material used in the survey consisted of tree specimens (leaves and fruits together with photos of the trees), bark fibers and paper samples of the 13 tree species being used as sources of raw material. Each person was asked to sort or pile the samples in matching groups, so at the end bark specimens, bark fibers and paper samples were clustered into 13 groups.

The exercise implied the identification of each tree specimen, bark fiber and paper sample. Among the tree specimens, the one that was identified by all interviewees was *T. micrantha*. Few could recognize the different *Ficus* species, while *B. alicastrum* and *Sapium* sp. were not identified by any interviewee and *U. mexicana* by just two. A remarkable situation related to *U. caracasana* and *M. cordifolia*, which were identified very easily by the women, while the other interviewees could not differentiate between these two samples. These species are used for medicinal purposes and are growing all over the village, especially as live fences for homegardens, houses and coffee plantations.

In relation to the bark fiber samples, a relevant finding was that, although *B. alicastrum* and *Sapium* sp. do not occur in San Pablito, their bark was identified by 12 of the interviewees. Among the traditional tree species the bark from *M. celtidifolia* was identified by all interviewees; however, the barks from the different *Ficus* sp. were constantly confused. The bark more easily identified by all interviewees corresponded to *T. micrantha*. Besides identifying the barks, some Otomi also estimated the age of the trees through the texture, color and flexibility of the bark. At the end very few groups of tree specimens, bark samples and paper samples were correctly completed. Samples of *T. micrantha* were the ones grouped correctly by all interviewees, followed by those of *M. celtidifolia*.

The paper samples were the most easily identifiable by most interviewees but still there were some inconsistencies. As occurred with bark types, paper from *M. celtidifolia* was easily identified while papers made from the different *Ficus* sp. were confused. It was possible to observe that, of the interviewees, Otomi women who mostly manufacture standard-size paper made from *T. micrantha* could not recognize any other type of paper besides the one manufactured from this species. The paper samples that were more difficult to identify and in most cases erroneously identified were the ones made from *U. caracasana*, *U. mexicana* and *B. alicastrum*. On the other hand men and women belonging to paper production units where amate manufacture is constant and diversified could recognize most of the paper types (see chapter 5, section 5.3.1).

Another aspect that stands out is that in general the Otomi knowledge is based on the bark and paper but no longer on the trees. On some occasions women appear to be the holders of knowledge regarding some species, especially those related to the domestic and health domains (*U. caracasana* and *M. cordifolia*). Young Otomi who have access to publications about the bark paper industry with information about the trees and who know about these trees through these sources cannot recognize them in the field or from the samples.

The clear finding was that in general the Otomi can identify the bark fibers and papers but no longer the tree. Among all the samples, trees, barks and papers, the paper samples were the ones that most interviewees could identify, while the samples of trees were the less known, even among Otomi who used to debark trees. It is also clear that the knowledge about trees is no longer in the hands of Otomi; it is now common to both regional harvesters and Otomi (see chapter 7, section 7.3.2).

Unlike in the past, it is possible to observe that the identification of bark fibers and papers is not exclusive; nor is it reserved purely for ritual purposes. This knowledge is now part of the public domain among Otomi; however, it does vary. At present the knowledge tends towards greater division and specialization according to generation, genre and the paper production unit to which artisans belong. Knowledge specialization is also occurring between Otomi and regional harvesters, the latter being the ones who actually extract the bark and who know about tree species that the Otomi have never seen and know little about.

The fact that most of the bark is being extracted by regional harvesters marks a tendency towards the specialization of tasks, and thus of knowledge between artisans and harvesters. This knowledge, which for a long time was in hands of Otomi harvesters, specifically men – who as explained in chapter 5 were in charge of the supply of bark while Otomi women were specialized in the elaboration of the paper – is now vanishing.

6.4.3 New and traditional forms of bark extraction

One of the most important characteristics of present bark trees is their limited periodicity for bark extraction. The majority of the species, except *T. micrantha*, can only be debarked at specific periods of the year (see Table 6.2). This is related to the phenological stages of the species (see Appendix A). This has determined in the past, and still does so now, when and how bark trees can be harvested.

Table 6.2 Harvest period for each species used for amate.

Trees species	Harvest period
<i>Ficus pertusa</i> L. f.	April - July
<i>Ficus padifolia</i> H.B.K.	March - June
<i>Ficus cotinifolia</i> H.B.K.	June - December
<i>Ficus calyculata</i> Miller	March - June
<i>Ficus goldmanii</i> Standl.	July - August
<i>Morus celtidifolia</i> H.B.K.	April - May
<i>Trema micrantha</i> (L.) Blume	All the year round
<i>Ulmus mexicana</i> (Liebm.)	February - May
<i>Brosimum alicastrum</i> Swartz.	August - October
<i>Sapium oligoneuron</i> K. Schum	August - October
<i>Sapium aucuparium</i> Jacq.	August - October
<i>Urera caracasana</i> (Jacq.) Griseb.	July - November
<i>Myriocarpa cordifolia</i> Liebm.	April - May

Past debarking practices are rooted in the traditional knowledge of Otomi about their environment and natural resources. Bibliographical sources and interviews in the field reveal that in the past bark extraction followed several procedures. Besides debarking only during the plants' natural harvesting periods, other practices were also carried out. Christensen (1979) and Lenz (1973) observed that the extraction of bark took place during the months of April, May and June, and preferably when the moon was new, as this facilitates the work and does less harm to the trees. Lenz adds that during this period called *tierna la luna* (tender moon), before full moon but after the conjunction, the inner bark can be detached more easily from the outer bark¹⁰. In addition, on some occasions the Otomi wait for the first rains so that the water will soften the bark, facilitating the extraction of the bark

¹⁰ This is related to the variability of sap during the tree life cycles (Prance and Prance, 1993) (see Appendix A).

In Mesoamerican cosmovision the lunar phases were very important for ruling human, animal and vegetative cycles. As Petrich (1985:220, cited in López-Austin, 1993) points out: ‘... Regularities extend to every area. The world is completely bathed by the same ebbs and flows. The wet and dry period attributed to lunar phases are also seen in the child lodged in its mother’s womb, in the harvests, in grain, in the trees marked for cutting or the domestic animals to be castrated or sacrificed. If the moon is humid as it grows and declines, dry when its is full, and tender when its is new, then it is best for children to be born in the growing or declining period, because they will be softer. Sowing should be done when the moon is humid or tender; corn and trees should be cut by the dry (solid) moon, so they will not rot, because otherwise they would be full of water; hogs are slaughtered when there is a full moon and castrated when it is tender.’

Otomi observations about the relation between the phases of the moon and vegetation growth have largely determined the management of natural resources. Galinier (1990) points out that Otomi never fell trees when the moon is tender (*kinkiyas’I*) since it will rot and cannot be used. The most appropriate time is during full moon, when it is hard (*sunyas’I*), the time when the tree reaches its maximum vigor¹¹. Still, some artisans and harvesters mention that within the bark extraction period of each tree species the bark can be more easily detached when the moon is tender, but that in the case of wood that will be used as construction material such as thick planks, a full moon is better.

Outside the specific period for harvesting, the Otomi only extracted bark from branches to prevent damage to the tree. Old trees in particular were selected, and bark was extracted from the branches because the bark of the trunks was too thick and too difficult to extract (Torres, 1982). As mentioned in section 6.2.3, bark continues to be extracted from the branches of the remaining *Ficus* trees in San Pablito. But in general, as Goloubinoff (1994) indicates, since the first years of amate as a handicraft, and with the increased commercial pressure, extraction has intensified in different ways: moon phases are no longer taken into account, younger trees are extracted and, as could be observed in San Pablito and will be explained in chapter 7, all trees except *Ficus* sp. are completely debarked.

11 When the moon is full, a larger quantity of sap is found in the tree’s organism, improving its quality and moisture levels, which are better than those of trees felled during the other phases of the moon, when there is less sap. The process reflects the physical influence of the moon on liquids.

6.5 Summary

In this chapter the historical use of resources for traditional paper in Mexico was treated. First the history of different resources that have been used for paper was reconstructed, and in doing so different aspects relating to perception, knowledge and management were explored.

From the history of the use of resources for paper manufacture, it appears that during the pre-Hispanic period, as well as today, various strategies for the exploitation of different species have been followed. Furthermore, there has been a continuous search for different resources for the production of paper. If in the past these strategies extended along the Mexican territory and different resources were used, today they are concentrated within the Sierra Norte de Puebla region and merely on resources for bark yield. The commercialization of amate handicraft and the increasing demand have detonated the display of multiple strategies for the supply of raw material for paper (chapter 7), based as explained in this chapter, on diverse resources, including both new and traditional tree species.

This chapter covers the three components involved in the appropriation of natural resources, specifically resources for bark extraction. In first place lies the perception about trees, second comes Otomi knowledge about identifying bark trees and third their management, especially the forms of extraction – all components of ethnoecology, which involves the Kosmos (the belief system), the Corpus (the cognitive system) and the Praxis (the set of practices used for the appropriation of natural resources) (Toledo, 1992 and 2001) (chapter 3, section 3.3.2).

With respect to the Komos (the belief system), in Mesoamerican cosmovision five main trees represented the distribution of the world and of life. At present within the Otomi context, selected *Ficus* trees have a sacred value. Apparently a close link exists between these trees and the sites where they are growing, especially at the top of mountains and on rocks also venerated according to Otomi beliefs. This is a topic that has not been studied and, in the specific case of trees, it is not currently known what aspects of Mesoamerican cosmovision remain and represent the role of sacred trees in San Pablito. However, a worldwide constant emerges in relation to *Ficus* trees, also venerated among other social groups. Ramakrishnan (1998) explains that the ecological attributes of *Ficus* and its importance as a key resource for the maintenance of biodiversity (Appendix C) have been recognized through years of managing and using these trees, and are symbolically valued by different indigenous groups in the world.

The part of the cognitive component of ethnoecology (Korpus) that consists in knowing and identifying the bark trees varies among Otomi people but in general Otomi traditional knowledge about bark trees is diminishing. Through fieldwork and ethnobotanical survey it was observed that not all the new species are known by the Otomi, and even less so by young Otomi and artisans focusing on standard paper production made from *T. micrantha*. On the other hand the practical knowledge (Praxis), which relates to the management of bark trees and forms of extraction, has largely vanished, since most artisans obtain the bark from harvesters and consequently the direct contact with trees is no longer required. The traditional forms of bark harvesting have lessened but are to some extent still applied to the remaining *Ficus* trees. Within the Otomi people, the knowledge about bark fibers is more widespread. Since pre-Hispanic times the color of bark fibers has been the main criterion for recognizing and classifying bark trees, but other characteristics related to the malleability of fibers for paper manufacture and features of the end-product are also important criteria.

In the face of increasing demand for bark paper, one of the main processes has been the continuous search for new tree species for bark paper manufacture. The way in which the adoption has been taking place is gradual and linked with different aspects, such as artisans' creativity, aesthetic aspects (Stromberg, 1982; Amith, 1995), institutional and legal aspects (Stromberg, 1982), and land use changes (Peters et al., 1987). But up to now what has not occurred but was previously predicted (Peters et al., 1987; Goloubinoff, 1994) was the collapse of the paper manufacture owing to lack or scarcity of raw material, that is of trees to harvest.

Another aspect to highlight here in relation to the integration of the present amate commodity chain discussed in the previous chapter (5) is the knowledge about bark trees outside the local and regional context. As Appadurai (1997) says, the knowledge gaps along commodity chains are one of the main characteristics of large and complex chains. This is clear in the amate case. Information and knowledge about the tree resources being used, among consumers but also even in government agencies related to natural resources management and handicraft support, is minimal or nil. Just as the work participation of the Otomi is unknown to many consumers (chapter 5), so too are the resources, the places from where the bark is being obtained, and who are involved in this activity. Local knowledge about bark trees outside San Pablito is ignored. This situation persists although the commercial value of bark paper largely resides in the use of bark natural fibers obtained from trees. As Ellen and Harris (1999) point out, local knowledge, especially about natural resources with commercial value, is seen from outside as static, without recognizing its constant changes and technological adaptations.

**Bark harvesting: present harvest strategies in
Sierra Norte de Puebla**

7.1 Introduction

This chapter centers on the extraction of bark used in amate manufacture, and tries to answer the questions: From where is the bark being extracted? Who are the actual harvesters? And how do they carry out bark extraction? Peasants living in different villages within Sierra Norte de Puebla are the new extractors and suppliers of bark to the Otomi village; they are called jonoteros from jonote, the common name used for *Trema micrantha* trees. Their participation started no more than 30 years ago. They have become the most important bark suppliers, in such a way that now paper production and further phases of the bark paper commodity chain depend on them.

In the face of increasing demand, new strategies for bark harvesting have developed, and more harvesters are participating. Their strategies complement and develop based on the natural conditions of Sierra Norte de Puebla and land use systems. Within the latter, coffee plantations occupy a prominent place, as well as *T. micrantha* trees occurring as shade trees on most of the regional shaded coffee plantations. The supply of bark through the year, in terms of number of harvesters and the amount of bark delivered to San Pablito, largely depends on the management practices carried out on the coffee plantations.

Similar to chapter 5 (section 5.3.1) where the main types of artisans' organization for paper production were identified, in this chapter the main types of harvesters are described. Three main types of harvesters are identified. They display various bark harvesting strategies, differentiated in terms of their labor organization, bark volumes and harvest sites, as well as the tree species that they debark. The fluctuations in the supply of bark throughout the year are explained. The bark harvest calendar varies in terms of weather conditions, religious festivities and regional agricultural labor calendars, particularly the one related to shaded coffee plantations.

All the information discussed in this chapter was gathered during fieldwork, from open interviews with bark harvesters, observations on harvest sites and the systematic recording of bark supply in San Pablito.

7.2 Spatial and temporal complementarity in harvest strategies

Bark extraction is embedded in the present socio-economic and natural conditions of Sierra Norte de Puebla. The participation of peasants in bark harvesting, among other alternative economic activities, has been gaining importance in the last years. On the other hand harvesting activities are closely related to the present situation

regarding land use systems and the state of forests and other resources in Sierra Norte de Puebla. Therefore in the first section of this chapter a condensed overview of the socio-economic and natural characteristics of the Sierra is given.

7.2.1 Overview of the regional natural and socio-economic characteristics

As mentioned in the previous chapters, the bark harvest area and San Pablito village are located in the Sierra Norte de Puebla region. This region lies along the eastern slopes of Sierra Madre Oriental Province. Physiographically this province consists of folded ridges, elongated intermontane valleys and plateaus of sedimentary origin. Sierra Norte de Puebla is a transitional region between the high central plateau of Mexico and the low-lying lands towards the coast of the Gulf of Mexico, presenting great variations in elevation, relief, temperature and vegetation. It is subdivided into three sub-regions (Fuentes, 1972) but the actual bark harvest area lies in between two of them: the high sierra consisting of rugged mountains and the low sierra consisting of hills and dissected plateaus, low-lying towards the coastal plains (see Figure 7.1).

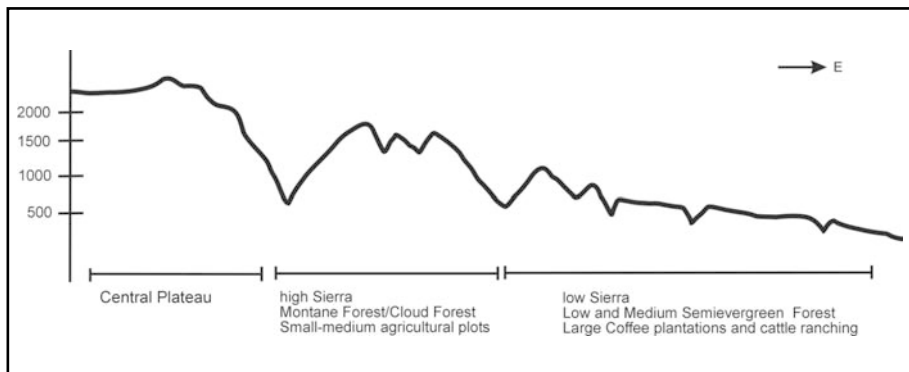


Figure 7.1. Schematic cross-section of Sierra Norte de Puebla

The high sierra is characterized by rough terrain and deep narrow valley depressions, with elevations varying from 500 to 2 500 masl. The climate is temperate humid and sub-humid, showing high annual precipitation values (2 000 mm to 3 500 mm). Above 1 200 masl, montane pine forests dominate; at lower altitudes, around 1 000 masl with 2 000 mm annual rainfall and humid and sub-humid climate, both cloud forest and semi-evergreen forest dominate. The original forest cover has been very much disturbed and forest patches remain only at the highest positions, in ravines

and on rocky slopes. San Pablito is located in this type of landscape, at 1 200 masl. In the mountains small land plots belonging mainly to indigenous people are used for subsistence agriculture and shaded coffee plantations (Guerrero, 1984). This landscape appears to have characteristics similar to those described by Zimmerer (1999) for mountains in Latin America – what the author calls ‘patchy landscape’ formed by overlapping land uses and multifaceted cropping systems. In Plate 7.1 the remnants of forest at the peak of the mountain can be observed, and on the very steep slopes shifting cultivation plots combined with plots for cattle; on the lower and gentler slopes plots for raising cattle prevail. As can be observed in this plate this is a landscape very much subject to landslides.



Plate 7.1. Landscape of the high sierra.

In the low sierra, the relief consists of low mesas, with elevations below 1 000 masl and decreasing towards the coastal plains. The climate varies between warm sub-humid and warm humid and annual precipitation varies from 1 500 mm to 2 500 mm. The characteristic forest cover is a low and medium semi-evergreen forest, of which about 25% is deciduous species (Rzedowski, 1978). The forest cover has been largely removed. Within the region the largest land holdings are located in the lowlands, where coffee plantations occupy the tops of mesas and grassland holdings for cattle extend along river valleys. On the steep mesa slopes indigenous people carry out shifting cultivation (Plate 7.2). Coffee plantations, predominantly of Arabica variety, are managed through hired labor. Within the whole Sierra Norte owners of these plantations control most of the market access at national and international levels (Guerrero, 1984; PDSNP, 1992).

Within the whole Sierra Norte de Puebla region, coffee plantations constitute the third most important land use system (INEGI, 1994). As will be explained in chapter 8 (section 8.3.2), coffee plantation systems vary according to tree density and tree species used for shade. In the high sierra mixed coffee plantations, with a high to moderate density of native and introduced tree species, are common. In the low sierra plantations with a lower density of one or only a few tree species prevail.



Plate 7.2. Landscape of the low sierra.

Along Sierra Norte de Puebla the bark trees are growing as part of different types of vegetation, in secondary forests, riparian vegetation and in different land uses: fallow lands, coffee plantations and homegardens (see Appendix C). The most common species is *T. micrantha*, as well as *U. caracasana* and *M. cordifolia*, which are typical species of secondary vegetation, quickly invading after other plants and trees have been removed. The *Ficus* species occur in evergreen and semi-evergreen forests. Most *Ficus* cannot grow above 1 200 masl. San Pablito is in fact located at the limit of the natural distribution of these trees. The species of most restricted distribution are *M. celtidifolia* and *U. mexicana*, both growing at between 500 and 900 masl, which are characteristic species of cloud forests. *B. alicastrum* trees are growing at 0 to 600 masl, being especially abundant in rocky soils and on slopes (Pennington and Sarukhán, 1998). In the field these were seen growing in ravines very difficult to access. There is no information about *Sapium* trees, but they also have a more restricted distribution. In the field they were seen growing at only altitudes between 400 and 800 masl, as part of semi-evergreen forest patches and fallow lands where vegetation has been left to grow for more than 10 years.

Main socio-economic conditions

As will be explained in chapter 8 (section 8.2.3), the difference between the two main sub-regions, the high sierra and the low sierra, not only resides in physiographical characteristics but also in contrasting social and economic conditions in terms of population density, type of population, land size holdings and land use systems. Most of the indigenous population is concentrated in small dispersed villages along the mountains, while the lowlands are less populated, concentrating most of the non-indigenous population in a few cities (Guerrero, 1984; INEGI, 1994).

With respect to land tenure, more than 90% of the land is privately owned, the remainder being defined as communal lands. Most of the remaining mature forest patches occur within the communal lands. Over 80% of private holdings average one hectare, but account for only 14% of all privately owned land. Holdings larger than five hectares, on the other hand, represent 17% of the total number but occupy 86% of the total area. The majority of larger holdings are located in the low sierra, where large coffee plantations and cattle ranches are the most important land uses. The smaller land holdings are mostly in the high sierra, belonging to the rural and indigenous population and used for subsistence agriculture and shaded coffee plantations (Masferrer Kan and Báez, 1995).

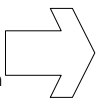
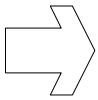
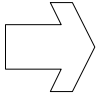
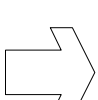
The socio-economic situation of the Sierra is subjected to national policies, especially those oriented towards the agricultural sector. Today two main social and economic changes occur along Sierra Norte de Puebla: the abandonment of agricultural lands owned by peasants with fewer resources, mainly indigenous people, and land monopolization for intensive and large-scale productions. In face of these, other activities are acquiring importance, such as temporary hired labor in large-scale agriculture and cattle ranching, the extraction of medicinal and decorative plants, craft production and migrant labor outside the region and the country. Most regional harvesters have integrated into bark extraction under these social and economic regional conditions.

7.2.2 Spatial expansion of harvest strategies

The greater demand for amate paper implies the increasing supply of bark raw material. At present this supply depends on three parallel strategies: the adoption of new tree species, the expansion of the harvest area and the involvement of regional harvesters. Table 7.1 shows how these strategies have developed over time. Four main periods of local and regional responses in respect to bark supply were identified. Originally, the Otomi of San Pablito harvested trees within their

own territory; in the next period, both Otomi and a few regional harvesters supplied the raw material. The expansion of the harvest area and involvement of a larger number of regional harvesters characterize the two more recent periods.

Table 7.1. Local and regional responses for bark supply

Time periods	Bark suppliers	Harvest area	Bark trees
Before and start of craft commercialization end of 1960s	 Otomi artisans	Otomi territory and surroundings	Traditional tree species (<i>Ficus</i> sp.)
1970s	 Otomi artisans Regional harvesters (around 8)	Otomi surroundings and high Sierra (around 10 km ²)	Adoption of secondary species (<i>T. micrantha</i> , <i>U. baccifera</i> , <i>M. cordifolia</i>)
1980s	 Regional harvesters (around 100)	high and low Sierra (around 250 km ²)	Adoption of long-living tree species (<i>U. mexicana</i> , <i>B. alicastrum</i> , <i>S. oligoneuron</i> , <i>S. aucuparium</i>)
1990s	 Regional harvesters (around 200)	high and low Sierra Extended harvest area (around 1500 km ²)	Search of new species Initial harvesters' tree management practices (<i>T. micrantha</i> cultivation)

In terms of spatial area, since regional harvesters have integrated into this activity, the harvest area has been increasingly extended. Figure 7.2 shows the expansion in three main time periods. During the first period harvesting was carried out in relatively closer areas to the Otomi village within the high sierra. Since then, the harvesters of these areas have integrated into this activity on a semi-permanent basis; in this study they are called ‘permanent harvesters’¹. For them the bark harvest represents an important source of income for most of the year. The second expansion period shows an extension towards the low sierra. Harvesters of this area – in this study called ‘temporary harvesters’ – integrate during specific periods of the year. The third and more recent period shows an extension towards the northern mountainous area, involving harvesters who occasionally integrate in bark harvesting, and harvesters from all over the harvest area who attempt this activity only once. They are called ‘intermittent harvesters’.

¹ The term ‘permanent’ was used in this study to differentiate the harvesters that devote more time to harvesting, although none of the harvesters relies solely on debarking for income or is fully dedicated to bark harvesting.

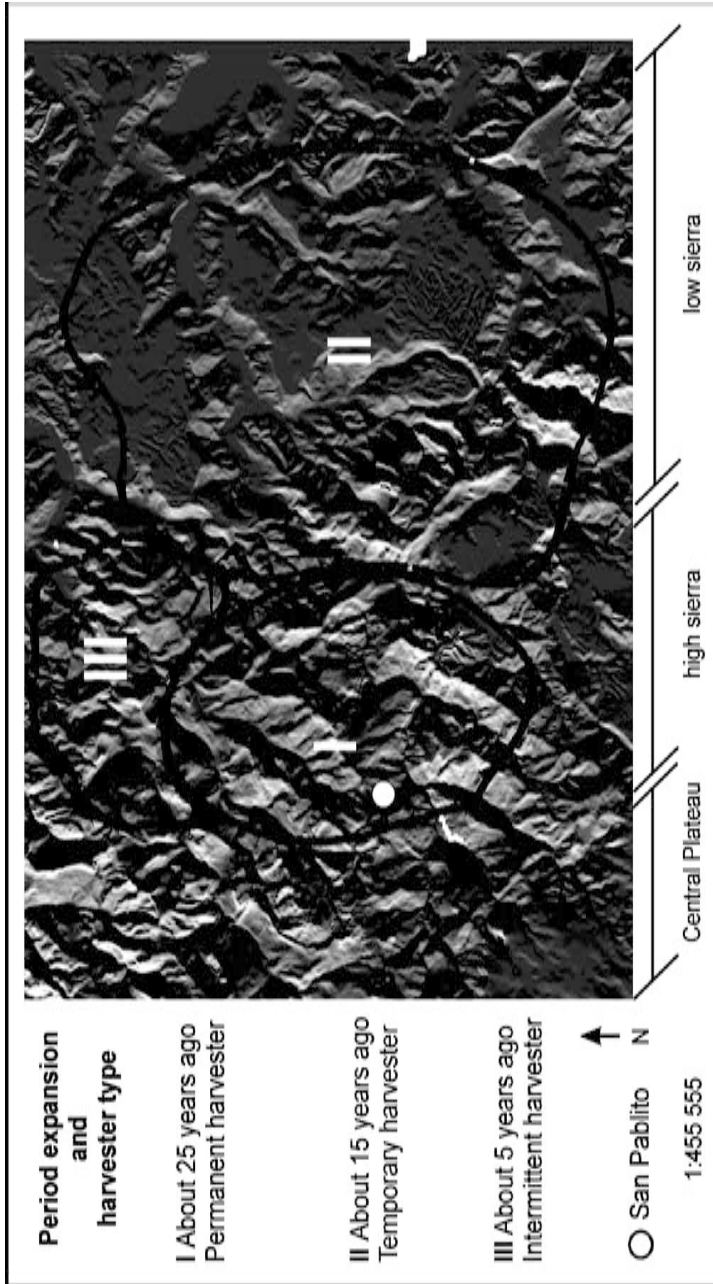


Figure 7.2. Harvest area and type of harvesters.

Pre-eminence of Trema micrantha

For the further sections about harvest strategies it is important to point out here some of the characteristics of *T. micrantha* trees. In fact the expansion of the harvest area has largely relied on the presence and wide distribution of *T. micrantha* trees. The common names of *T. micrantha* are jonote in the high sierra and *chaca* in the low sierra but all regional harvesters are known as jonoters.

This species is of very wide ecological distribution. It is a typical pioneer species, showing fast rates of growth, flowering after nine months, and reaching adult size after seven years (see Appendix D). Within the harvest area, *T. micrantha* trees occur in all vegetation types and within fallow lands, coffee plantations and homegardens.

Bark harvesters and Otomi artisans find *T. micrantha* has several advantages over other species. First, the trees can be harvested throughout the year (see chapter 6, section 6.4.3). Second, *T. micrantha*, along with the *Ficus* species and *Morus celtidifolia*, constitutes the easiest tree species to debark and to manage for paper production (Appendix B). Third, the harvest sites of *T. micrantha* are accessible, in contrast to such species as *Brosimum alicastrum*, *Ulmus mexicana*, *Sapium oligoneuron* and *Sapium aucuparium*, whose distribution in forest patches on mountain tops and in ravines represents a limiting factor. Still, all the other species are very important, basically during times when it is not possible to access coffee plantations, especially during the gathering of coffee grains when any damage to coffee plants must be controlled and avoided.

On coffee plantations *T. micrantha* trees are tolerated and managed along with other shade tree species. Along the entire Sierra Norte de Puebla this tree species is commonly used as shade for coffee plants. Coffee plantations require specific cultural practices such as clearing, thinning, pruning and tree shade management during the year. As part of shade management, some trees, such as *T. micrantha*, are removed when they are six to eight years old in order to eliminate excessive shadow and to control plant competitiveness. According to coffee plantation owners, coffee plants growing next to *T. micrantha* trees show low productivity over the long term. The allelopathic effects of this species have not been studied; however, it has been observed that *Trema* sp. harbor insect pests that cause defoliation and can spread to other plants (NAS, 1980). In the harvest area, before *T. micrantha* trees were used as a source of bark, they were girdled in order to avoid possible damage to coffee plants from felling. At present many are entirely debarked and left to rot on site; occasionally straight trunks are used as construction poles and dried wood is used as fuelwood.

According to the types of coffee plantations identified in Sierra Norte de Puebla, (see chapter 8, section 8.3.2), the average density of *T. micrantha* in mixed shaded coffee plantations is 12 mature trees per hectare, mostly in the high sierra, whereas in plantations where these are the only shade trees, the density can be 20 to 30 mature individuals, especially in the low sierra. Bark of *T. micrantha* is harvested from trees between three and eight years old, when the bark is thick enough to be used. Bark becomes difficult to remove from trees over 15 years old. Trees three to five years old yield an average of 5 kg of bark. Individuals on coffee plantations yield more bark, especially where fertilizers are applied.

Another important aspect to point out about the extraction of bark from *T. micrantha* trees in coffee plantations relates to the official regulations for harvesting. According to SEMARNAT, the official institute that sets policy norms that regulate the extraction and management of non-timber forest resources, the extraction, transportation and storage of NTFPs require official permission². Regulations regarding bark, stems and complete plants state that the owners of resources should submit a notification to the State Offices of SEMARNAT, which in turn grant the legal authorization to harvest, if the notification meets the regulations. In the case of bark, the regulations indicate that whenever extraction causes the death of trees, a forestry management plan should be formulated. Regulations also indicate that for transportation of bark, a commercial invoice given by the owner of the resources to harvesters and containing the identification of the legal authorization is required (NOM-005RECNAT-1997).

Since the extraction or removal of *T. micrantha* trees is part of the plantation cultural practices, a serious gap exists between national norms and the actual way in which bark harvesting for amate is carried out. This, as will be explained in this chapter, has contributed to the emergence of conflicts between different social actors.

Intervention strategies for the supply of bark have focused on the potential management of *T. micrantha* but have largely failed. Two of the most important government actions took place in the 1980s and early 1990s, when the official agencies INEA and Culturas Populares - Unidad Regional Puebla supported the implementation of *T. micrantha* nurseries in San Pablito, with the objective that over time Otomi artisans would become self-sufficient in bark supply. These projects failed due to the lack of sufficient technical advice and support, the serious threat of bark robbery and the lack of labor. An important aspect that the official agencies

² In Mexico regulations are generally set for all types of non-timber forest resources, according to the part of the plant exploited. As mentioned in chapter 2 (section 2.4.3), only a few species of high economic importance at national level are governed by detailed regulations, such as lechugilla (*Agave lecheguilla*) and candelilla (*Euphorbia cerifera*).

did not foresee is that a large proportion of Otomi men work outside the village, and handicraft manufacture, as well as many domestic and communal activities, is in the hands of Otomi women, who find it difficult to get involved in tree nursery activities. Moreover, within Otomi traditions the participation of women in field activities is limited.

7.2.3 Bark supply along the year

Bark supply to the Otomi village has larger fluctuations during the year. These fluctuations reveal a clear four-period distribution pattern in accordance with regional agricultural activities, weather conditions and regional festivities. Figure 7.3 shows these fluctuations. The quantity of bark indicated in the graph was calculated on the basis of an annual inventory carried out during fieldwork, which was based on observations made on the last Friday, Saturday and Sunday of each month in 1999. On these days the arrival of harvesters in San Pablito and their bark loads were recorded (fieldwork data collection explained in chapter 1, section 1.5).

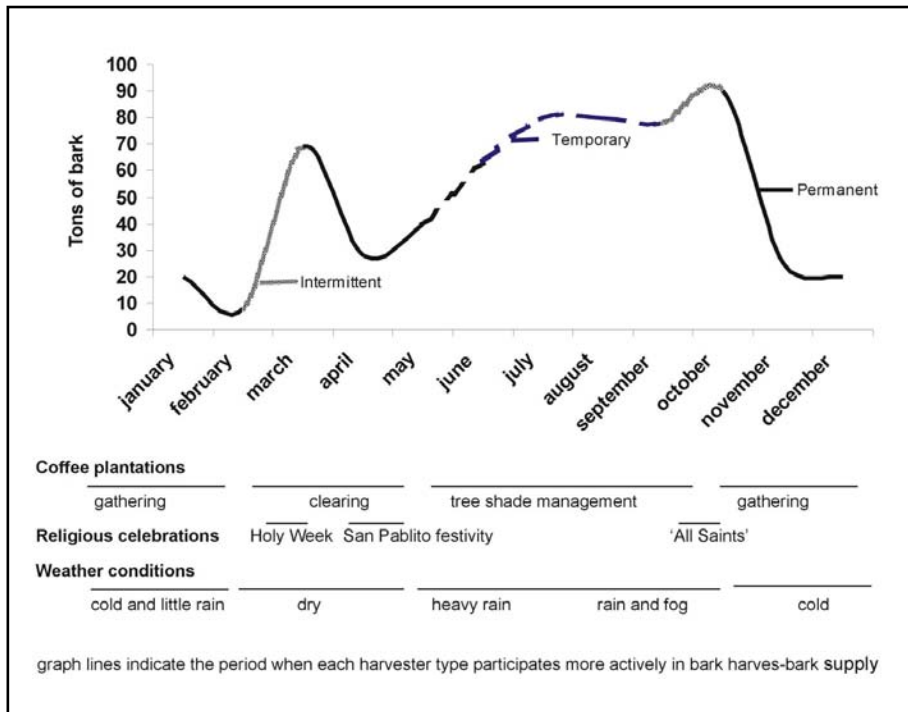


Figure 7.3. Bark supply to San Pablito.

1. The low bark supply period (end of November, December, January and February) occurs during the gathering of coffee grains. This is the most important temporary labor activity in the whole Sierra Norte de Puebla so most peasants of the region, including those involved in bark harvesting, participate in this activity. Bark cannot be extracted during these months because debarking may damage the coffee plants (pulling the bark off and its falling may lead to coffee grains falling from the plants). These months are also the coldest of the year. In the higher areas of the Sierra (approx. 1 000 masl) fog is thick and rain is frequent. Although bark can be detached from the trunk more easily than in other months it is also very slippery to manipulate when separating the outer bark from the inner one. Furthermore, access to some harvest sites becomes very complicated owing to rain, cold and fog. Another very short but also low period of supply, when comparing the amount of bark previously supplied, corresponds to April. During the first weeks of April San Pablito celebrates Holy Week and one week later the main local religious festivity, so all activities stop. Most harvesters avoid coming on these days. On the other hand, April and May are the warmest and drier months of the year, and detaching the bark from the trunks becomes a very difficult task. However for Otomi artisans April and May are the most suitable months for paper manufacture because of constant sun and dry conditions (chapter 5, section 5.2.2 and 5.3.2).
2. The high bark supply period covers June, July, August and September. These are the months that correspond to the periods of high and constant supply of bark. During these months several coffee plantation practices are carried out. The most important in relation to bark harvesting is the management of tree shade. As explained in a previous section, *T. micrantha*, among other trees, are selectively suppressed to avoid an excess of shade. In general, weather conditions are favorable for extraction and bark is easily detached from the tree trunk, but unfavorable conditions also occur especially during August and September, months when the climate is subject to winds and cyclones from the Gulf of Mexico. Then accessibility to harvest sites and bark transportation can be difficult. Since the high and low sierra present great variations in elevation, relief and rainfall, the cycle of coffee plantation practices varies. All practices involved in coffee plantations start earlier in the low sierra (500 masl), where coffee grains mature sooner than in the high sierra (1 200 masl, where coffee still grows). Consequently the integration of the type of bark harvesters linked with coffee plantations is timed gradually from the lowest to the highest parts of the harvest area. During these months, the demand for bark in San Pablito changes day by day - although it is especially high at the beginning of summer, which coincides with peak national and international tourism. Bark paper manufacture is very much subject to weather conditions. During August and September, when frequent rains hamper paper manufacture,

especially the drying of the amate sheets (see chapter 5, sections 5.2.2. and 5.3.2), bark demand changes daily. If the rains persist continuously for more than two days, Otomi harvesters stop buying bark raw material for some weeks.

3. Two of the highest bark supply periods (March, October) coincide with weeks prior to the most important regional and local festivities: Holy Week, All Saints and, one week after Holy Week, the celebration in honor of San Pablito's patron saints, San Pedro and San Pablo. The beginning of March is a very critical period due to the fact that most of the regional labor activities decline. Gathering coffee as well as planting maize have finished by the end of February. Alternative activities such as bark extraction and medicinal plant extraction, as well as construction work and other activities, become the only income source. This situation, along with the need to generate money for expenses to be incurred over Holy Week in April, stimulates various peasants to extract bark. It is the period during which many new peasants try bark harvesting as a new alternative activity. The same occurs at the end of October, when the inhabitants of Sierra Norte de Puebla prepare to celebrate All Saints on the first days of November - one of the most important festivities at national level. Similarly, as harvesters try to increase their income through different economic activities in order to celebrate the main local and regional festivities, Otomi artisans attempt to do the same through selling bark paper (chapter 5, section 5.3.2). This implies a major demand for bark fiber just before the festivities, followed by an abrupt change when bark paper manufacture stops completely during the festivities. Before the festivities paper production increases because national and regional tourists visiting San Pablito and other touristic sites during festivities bring significant affluence to the villages.

The present bark supply implies different harvesting strategies carried out by a growing number of peasants, complemented by taking advantage of the natural heterogeneity and land use systems of Sierra Norte de Puebla. Bark harvest strategies are becoming increasingly complex as the harvest area expands and as a growing number of harvesters are integrated. The three main types of harvesters and harvesting strategies will be explained next.

7.3 Bark harvesters

Bark harvesters are peasants from different villages, indigenous and non-indigenous, who have diversified their income activities in recent years. During interviews with some of them, they mentioned the increasing difficulties of living in Sierra Norte de Puebla. On one hand, wages are low and, on the other, traditional agricultural activities on their own lands – for those that possess them – are no longer profitable. Progressively they become involved in different activities, which

range from coffee plantations to relatively new activities such as construction work, bark harvesting, the extraction of other resources like decorative and medicinal plants, and also working out of Sierra Norte de Puebla. Migration to the nearest cities, Mexico City and the United States is becoming common, especially among young people, who engage in a new variety of jobs.

In general, involvement in bark harvesting responds to the present socio-economic conditions of Sierra Norte de Puebla and, on an individual scale, to particular conditions related to the specific case of harvesters. During interviews, some harvesters that have been involved in harvesting for quite a long time commented that they were used to moving along the Sierra because of their parents' earlier activities. Some harvesters used to accompany their parents on some of their travels, working for the mail service or transporting goods by horse for several days from the nearest cities to villages, before roads were introduced in the Sierra as part of the *arriería* system³. Some harvesters commented that before bark some used to bring to San Pablito part of the materials required for bark paper manufacture. As explained in chapter 5 (section 5.2.2), one of the paper manufacturing stages consists of boiling the bark; years ago the fibers were boiled in ash-water or limewater taken from maize to prepare tortillas. When the demand for bark craft paper started to increase and prior to the use of caustic soda, peasants living in villages neighboring San Pablito brought sacks of ashes. Several harvesters commented that in the past their parents too used to bring ashes to Otomi artisans,

Two conditions are important for bark harvesting. The first is the significance of an ample social network around the harvest area. Families, friends or neighbors advise harvesters of potential extraction sites, which may or may not be their own coffee lands and fallow plots. Consequently harvesters who used to travel around large areas of Sierra Norte de Puebla engaged in their own or, in the past, their parents' itinerant income activities, have more success in searching for extraction sites. Harvesters engaged in bark extraction for quite a long time have also made their own social contacts, while some cease harvesting owing to a lack of acquaintances. The second condition relates to the facility for transporting bark. Possession of the required means to transport the bark or previous investment in carriage services – which in turn implies knowing people who own a feasible means of transport – is a very important condition. This, as will be described in the following sections, largely determines the integration into bark harvesting.

3 This communication system, known as *arriería*, was very important throughout Mexico and a whole tradition in cultural and economic terms developed along the *arriería* system. Several books have been written on this topic (e.g. Suarez, C. A. 1997. *La arriería en la Nueva España durante el S. XVIII*. México: Casa de Investigaciones, Tlalpan).

Other common characteristics among most of the present bark harvesters are related to the possession of land and their household composition. Although it was not possible to obtain systematic information about the socio-economic situation of harvesters, it was observed that this varies greatly. Only a limited number of them, and few temporary harvesters in particular, have their own means of transportation or agricultural lands. In general most harvesters lack land of their own for agricultural production; others possess only small plots, mostly coffee plantations (average one hectare). In respect to the household composition, most of the harvesters are members of the extended type of household, composed of parents and children who on occasion join their parents to help them in harvest activities.

Another aspect of debarking shared by some harvesters, particularly the old ones, is the opportunity to go out. Some commented that they enjoyed the trip to San Pablito and the price negotiation. Even if harsh, they liked the opportunity to go out and meet the people of Sierra Norte de Puebla. Others also found the trip to San Pablito useful and, as will be seen, some take advantage of the day that they carry the bark to San Pablito to go to the regional markets or nearest cities, notably Tulancingo.

Social perception about bark harvesters in the regional context

Within the harvest area, bark harvesting is regarded as a low status activity, highly risky and hazardous. The opinion of other social actors, peasants of the Sierra Norte, government representatives, artisans, and owners of large coffee plantations and cattle ranches, about the bark harvesters and their work is cautious. The pressure on trees has led to cases of bark robbery all along the harvest area. This has been a matter of conflict among different social actors in the harvest area.

The extraction of trees without permission or payment is common. In the case of forested areas, and according to the harvesters, ownership is not always clearly defined, nor are the owners always known. In the case of forests under communal status, such as the case of San Pablito, explained in chapters 6 (section 6.2.2.) and 8 (section 8.2.1), access to them is allowed and bark is not paid for. Since the demand for amate has increased, the theft of bark from trees on coffee plantations has occasionally occurred. As a result, conflicts have emerged among the different social actors, and a generally hostile attitude towards harvesters has appeared in the harvest area.

On the other hand, as revealed in section 7.2.2, there are no specific rules for bark trees. However, according to SEMARNAT the extraction of bark from any tree

species should only be carried out with an official permit. In the case of bark extracted from shaded coffee plantations, the removal of *T. micrantha* trees is part of the plantation cultural practices. Due to misinformation harvesters consider bark extraction an illegal activity and recognize the need for special permission to safely carry out their work; meanwhile forestry guards take advantage of the situation and frequently detain them to confiscate their bark loads and fine them or encourage bribing.

Bark harvesting is highly risky and might not always be profitable. The search for potential harvest sites takes time and effort and might sometimes be unsuccessful. Weeks may pass without finding a harvest site and, on the other hand, the total bark harvested cannot be known until the trees have been debarked. Transportation itself requires previous investment. During bark transportation to San Pablito bark harvesters might be detained by forestry guards and, as will be explained next, the prices of bark in San Pablito vary greatly, changing from day to day. Profits may exceed the investment in debarking and transporting by up to four times, but the contrary may also be the case.

Despite all these limitations, harvesters, especially those extracting on a more permanent basis, prefer harvesting to regional daily wage labor that offers less income. None of the interviewed harvesters, even those involved more regularly in this activity, based their total income on bark harvesting. This is combined with many other activities. For permanent harvesters it represents their main income activity, for temporary harvesters the only source of income for three months of the year, and for intermittent harvesters the occasional extra profit. It is a significant economic entrance in specific situations. Some harvesters pointed out that at times the income obtained through bark harvesting has meant the possibility to go to a private doctor or to buy luxury objects for a marriage, baptism, etc.

7.3.1 Typology of bark harvesters

Bark harvesting includes the search for potential harvest sites, the extraction of bark, as well as transporting and trading the raw material. All these different activities are called harvest strategies. In general each harvester (permanent, temporary or intermittent) displays distinct strategies in bark harvesting (see Table 7.2). Each strategy is different in terms of labor organization, harvested bark volume, selected harvest sites and tree species and, as can be observed in Figure 7.3, in terms of participation during the year.

Table 7.2 Type of harvesters-bark harvest strategies.

Harvesters	Kilos per harvest endeavour	Main harvest period	Harvest site	Species
Permanent (individual work)	50 kg min.	rainy and cold season (December, January, February)	Coffee plantations fallow lands gallery and secondary forests	<i>Trema micrantha</i> <i>Ficus</i> sp. <i>Ulmus mexicana</i> <i>Sapium oligoneuron</i>
	150 kg max.	dry season (April, May, June)		<i>Sapium aucuparium</i> <i>Brosimum alicastrum</i>
Temporary (team or individual work)	500 kg min. 3 tons max.	rainy season (August, September)	Coffee plantations	<i>Trema micrantha</i>
Intermittent (individual work)	50 kg min. 200 kg max.	mainly before religious festivities (March, October)	Coffee plantations fallow lands	<i>Trema micrantha</i> (Occasionally other tree species)

1. Permanent harvesters: As can be observed in Table 7.2, permanent harvesters display a multiple strategy by exploiting various bark trees occurring in different vegetation types and land use systems. They mostly work individually, with the occasional participation of their household members, and sometimes they organize labor alliances with one or two harvesters on an equal basis of work and earnings. The amount of bark extracted each time varies throughout the year but shows two clear extremes. Minimum loads (around 50 kg) coincide with the time period when larger bark volumes are supplied by temporary harvesters and when bark prices drop substantially. In fact, during these months (June, July and August) the participation of permanent harvesters is very low. Maximum loads (average 150 kg but can be up to 300 kg) are brought to the San Pablito when they are the only suppliers of raw material and when bark prices increase (November, December, January and March). These harvesters bring their bark by bus, donkey or trolley. Some of them have settled very close to San Pablito.

2. Temporary harvesters: Temporary harvesters display a largely commercial and monospecific strategy. They harvest bulky amounts only from *T. micrantha* trees growing on extended shaded coffee plantations in the low sierra. Within the social and economic context of the low sierra, these harvesters, mostly landless laborers, depend largely on temporary activities on cattle ranches and coffee plantations, which are the main land uses in the low sierra (see chapter 8, section 8.2.3). Their involvement in bark harvesting is strongly determined by the cultural practices of coffee plantation (Figure 7.3). During removal of shade trees they integrate into bark harvesting. Some of them work on an individual basis, others through organized working groups. Within the small villages in the low sierra, some local actors have emerged as labor squad leaders, recruiting temporary laborers. Although the salary paid changes according to the price for which the bark is sold in San Pablito, the salary received is always higher than the regular regional salary, up to five times more. Squad leaders organize teams of 10 to 30 laborers, who stay for eight to 15 days in temporary accommodation, normally used for storing coffee grains and located on the coffee plantations. Each week they may harvest up to three tons of bark. They remain there for several weeks, depending on the available trees. While laborers extract, squad leaders deal with transporters, carry the bark to San Pablito to sell it, and search for new potential extraction sites. It was observed in the field that this type of strategy is expanding more and more in the low sierra, where large coffee plantations are found.
3. Intermittent harvesters: Intermittent harvesters live in the farther mountainous areas. They integrate in bark harvesting activities throughout the year but on a part-time or intermittent basis. Most are owners of small coffee plantations (average one hectare). Some of them debark their own trees and only come to San Pablito every five to eight years, others come to San Pablito only once. Their participation in the bark harvest is clear and, as shown in Figure 7.3, linked with two main harvest periods. The first coincides with short critical lapses when agricultural activities decrease, between the end of maize cultivation and coffee-grain gathering and the beginning of coffee plantation clearing activities. It occurs at the end of March and in the first weeks of April. Their participation also coincides with the celebration of important religious festivities that require high investment. These are Holy Week in April and All Saints during the first days of November. The days before these celebrations take place, many harvesters bring bark raw material to San Pablito. Although the prices are very low, some consider this to be an important profit, enough to buy some or all of the goods and objects needed for the celebrations. They do the work by themselves, saving the payment for shade removal while taking advantage of the transport to Pahuatlán or Tulancingo to buy the material

required for the celebrations. Although these harvesters work individually, some organize themselves into small groups to reduce the financial costs for bark transport, which are high because of the long distance in relation to the Otomi village. Their bark load varies from 50 to 200 kg, mostly harvested from *T. micrantha* grown on coffee plantations and in the second term from fallow plots and forests.

Diversity of bark harvesters

As for the Otomi artisans, where the main units of production were identified based on their work organization and type of production (see chapter 5, section 5.3.1), in the case of harvesters it was also possible to identify the main patterns described above. But in both cases, paper production and bark extraction do vary greatly and are more complex. Some examples from field observation may illustrate this.

Miguel Alvarez has been collecting bark since eight years ago. He has five children between 12 and 20 years of age, and at the back of their house compound a coffee plantation of one hectare. He comments that, since the coffee price dropped and due to the yearly price changes, at present he cannot rely on coffee as a main economic activity. He says that it was not difficult for him to engage in bark harvesting, since both he and his father were well known in various villages. Until six years ago his father used to transport foodstuffs by horse and donkey from Tulancingo city to remote villages in the Sierra Norte. According to Miguel, this is a great advantage because he, like many other harvesters, recognizes the possibility of knowing people that own or know other people that own potential trees for debarking. After he identifies a potential harvest site, he organizes his workday, leaving early by bus if it is far (as far as 60 km from his village) or walking anything from a few minutes to three hours, depending on the location of the harvest site. Normally he harvests by himself but at times one of his older sons comes with him. He never joins a group with other harvesters. Debarking may take several days. Each day he travels to the harvest site and brings back the raw material. During August he only collects about 50 kg per day, no more because even if he brings more to San Pablito the price of bark at that moment is low.

Maximino Gonzalez lives in the northern mountainous area. He has been engaged in bark harvesting since two years ago. He knew about this from a relative living in the low sierra who also harvests bark. Maximino explains he is the only harvester in his village. He participates in this activity for some months, especially during the summer when the removal of excess shade is carried out on coffee plantations. He does not find it as difficult or as time-consuming as other harvesters to find

potential harvest since most coffee plantation owners, as well as all the population in his area, do not know about the need for bark in San Pablito. So he does not meet competition in the search for and selection of harvest sites. He always extracts from *T. micrantha* growing on coffee plantations close to where he lives. The problem he faces is bringing the raw material to San Pablito. Traveling by bus is too expensive and, with several bus changes, takes a complete day. So he prefers to bring the bark by horse to a village closer to Pahuatlán called Tlaxco. From here he then takes a bus to Pahuatlán and from there another one to San Pablito. To accomplish this he has to call on some relatives in a village on his way to Tlaxco. One of them arrives early and carries the raw material back to Tlaxco. This takes more than half the day, because they have to go down, cross a river and walk up the very steep slopes again to Tlaxco. The next day Maximino makes the same journey without the bark load, so he takes only a few hours. Then he collects the bark and brings it by horse to Tlaxco, where he takes the earlier bus at 6 o'clock in the morning, which is expected to arrive at San Pablito by midday. He has to pay one and a half times the normal salary to the person that helps him to carry the bark and also the hire charge for the horses. Even with these costs, it is less expensive and time-consuming than traveling by bus.

Baltazar Dominguez used to live close to San Pablito and he used to debark trees whenever possible. After he married he moved to a village in the low sierra where he is more actively involved in bark harvesting. He is one of the few in the low sierra working individually but he is also the only one debarking close to the place where he lives. Baltazar, in contrast to other harvesters, also knows the different tree species used for paper production. He learned this through his past contact with Otomi artisans. Actually he finds it easier to search for potential harvest sites in the low sierra than in the place where he used to live close to San Pablito. He finds different types of trees in different land use systems to exploit, and without competition from more harvesters. Over the last years, bark harvesting has been his most important income activity.

7.3.2 Harvesters' knowledge about bark trees

Harvesters have developed their own practices around each tree species used for bark supply. During fieldwork the harvest sites were visited and the characteristics of the trees were discussed with the harvesters. Their knowledge is basically focused on the extraction technique applied to each tree, the characteristics of potential extraction trees and the areas where they are growing. These aspects form part of their continuous trials and experiences with natural resources.

In general extractive activities have been pre-qualified as pure exploitation, without taking into account that these activities also require observation, experimentation and communication among the harvesters. This type of knowledge could form part of probable future management strategies regarding trees. Here only the main characteristics mentioned for each tree species by the harvesters are documented.

Knowledge about T. micrantha trees

Since *T. micrantha* is the tree species most intensively used, harvesters have accumulated more information about it. *T. micrantha* trees are mostly completely debarked. These trees are not cut down for debarking; it is easier to extract bark while they are standing. Moreover, on coffee plantations this is done to avoid damage to the coffee plants. Harvesters that fell the trees do it at the request of the owners, who on occasion need them as posts for simple building constructions. Most trees can sprout and be exploited once more after two or three years when bark has regenerated. According to some harvesters, some debarked *T. micrantha* trees can regenerate their bark under specific conditions, especially trees growing in the shade and under humid conditions. However, the regenerated bark is very difficult to detach because it is irregular and pithed. According to Otomi artisans, the regenerated bark is too thick and rough and cannot be processed for bark paper manufacture.

Within the harvest area, harvesters have identified areas where *T. micrantha* trees grow better. In the first place, they agree that in the lower parts of the Sierra towards warmer areas (approximately 800 masl) these trees grow more quickly and vigorously. Furthermore, these trees grow taller, straighter and faster in what they call *monte* (hills) and in places near to water, rivers, temporary drainageways and springs, but not in areas where the water is stagnant for prolonged periods. On steeper rocky slopes with shallow soils the trees show low rates of growth. On fallow plots, by competing with other plants for light, these trees normally grow very high, but also extremely thin, thus yielding reduced amounts of bark. These trees do not grow easily on pasture plots since the animals eat the small sprouts. These trees definitely grow fast and show optimal characteristics on coffee plantations where fertilizers are being used. They grow abundantly in areas where the soil has been removed. After the strong storms of October 1999 (chapter 4, section 4.4.3), it was possible to observe that in the areas where landslides had occurred these trees were starting to grow in dense clusters. According to harvesters and some Otomi, these trees do not grow well in San Pablito, in comparison with other areas in Sierra Norte de Puebla, because of the abundance of rocks and stones.

For some harvesters the site is more important than the age of the tree. *T. micrantha* are debarked between three and five years old – at most 15 years old – but it would not be possible to debark trees growing in drier conditions (exposed to sun and shallow soils). In dry areas the bark remains tightly bound to the trunk, and to detach the inner bark from the outer bark is quite laborious. Also the characteristics and color of the bark vary according to site specifics – apparently in drier areas the bark is rougher. The characteristics of the harvest sites not only determine the growth of the trees but also the type, amount and quality of the bark, as well as the degree of debarking difficulty. All these are involved in the harvesters' selection of harvest sites and trees, and form part of their knowledge and work strategies.

As part of the continuous observation of *T. micrantha* trees, some harvesters have started to experiment with new purposeful management practices. The seedlings of these trees are removed and selectively preserved on the same site. On other occasions saplings are transplanted after one year. Permanent harvesters, who are also owners of coffee plantations, are experimenting with new practices by collecting and cultivating *T. micrantha* seeds on sites where they have observed that trees grow faster, straighter and taller.

Knowledge about other tree species

Sapium trees are debarked when they are young, between five and six years old. Normally they are felled for debarking. If at least 30 cm of the base trunk is left intact, the tree can regrow or sprout. If this occurs, the growth into tall straight trees again is quite fast. Because these trees are normally high and the bark sticks to the trunk, these trees have to be felled and the bark stripped from the tree by using a machete. After this, detaching the inner bark from the outer bark is also laborious and sometimes also requires of the use of a machete. Sometimes it can take up to three days to debark one of these trees. The bark of these trees becomes spoiled by fungus very easily and the whitish natural color changes very quickly, especially where bark has bent. This bark cannot stand being stored for more than three days so when these trees are debarked the material is transported as soon as possible to the Otomi village.

It was observed that harvesters who know *Sapium* trees to be sources of bark material do not distinguish between the two different species. Both trees of the *Sapium* species are called palo brujo. According to the harvesters, the trees with smaller leaves (*S. aucuparium*) are younger than those with bigger leaves (*S. oligoneuron*). Harvesters also differentiate according to the type of bark, which has two distinct colors: the first whitish and the second yellowish. Otomi artisans also use color to differentiate between these barks (chapter 6, section 6.4.1).

According to harvesters, *B. alicastrum* are the most difficult trees to be debarked, the bark produces irritation and the thick outer bark can be easily hurt. Moreover, these trees normally occur in ravines, on very steep or rocky slopes or near brooks, which are very difficult to reach and also risky sites for carrying out the extraction. This tree, as well as the two *Sapium* trees, is difficult to debark during rainy periods since the bark becomes too slippery. But this tree can be debarked without felling. If it is felled, it does not sprout like the *Sapium* trees.

The other plants used as sources of bark, *M. cordifolia*, *U. caracasana* and the *Ficus* sp., are not known by all the harvesters, and are only debarked during strict harvest periods or when other potential trees are scarce. Most of the knowledge about these species is in the hands of the Otomi. However, a few of the harvesters who knew about the use of *M. cordifolia* and *U. caracasana* mentioned that the latter is debarked in circles as this is the only way in which the very fine cover can be debarked. It is grows on sites difficult to access; it is also difficult to find suitable thick trunks. This is one of the species less preferred by Otomi artisans.

As regards *Ficus* trees, only a few harvesters have extracted bark from these trees. Although they all know about their use through the Otomi, these trees are less exploited. In first place there are few *Ficus*, and those remaining form mostly part of the shade on coffee plantations or in homegardens. Second, these trees can only be debarked during specific months and are difficult to debark because of the abundant latex of most of these species. If debarked, branches of two to three years old are mostly selected, especially from straighter and central branches; those growing at the sides yield less bark. From field interviews it was recorded that most *Ficus* trees are called Amate or Higuera. Some harvesters differentiate them in the way Otomi do, by using the generic name Xalamatl followed by the qualities of the trees, in this case translated from Otomi to Spanish (see Table 2 in Appendix E). Nevertheless, according to the interviews with regional harvesters, neither could recognize all the different types of *Ficus* species. Within the harvesters' strategies these trees are debarked the least.

7.4 Carrying out bark harvesting

7.4.1 Bark extraction and price of bark on harvest sites

Only a machete is required for debarking. The machete is used to pull and separate long bark strips from the base trunk up to the branches. Most tree species, with the exception of *Ficus*, as already explained in chapter 6 (section 6.4.3), are completely debarked. At the base of the trunk a circular incision is made with the machete and two parallel lines 15 to 20 cm apart. These are lifted with the machete until harvesters can hold them with their hands and strongly pull the bark away from the trunk. They always intend to lift them as high as possible, up to the branches. Straight tall

trees with few branches are the preferred choice, since their bark can be detached in long strips using most of the tree bark. Some harvesters start to debark from the crown of the tree to the base of the tree (Plate 7.3). After the bark is extracted, the fibrous inner bark is separated from the outer bark (Plate 7.4). Generally this is done at the harvest site to avoid carrying heavier bark strands back to the harvesters' villages. The bark strips are bent into small packages (approximately 1 to 3 kg) and then bound together into tight bundles of three main different sizes and weights. All these bundles are called *tercio* or *rollo*, small ones of 20 to 25 kg, medium ones of 30 to 35 kg, and big ones of 40 to 50 kg called *doble tercio* (Plate 7.5). A larger bark strand is used to tie all the packages together. Some harvesters use sacks to carry the bark.



Plate 7.3. Bark extraction: temporary harvester debarking *Trema micrantha* from a shaded coffee plantation in the low sierra.

Between bark harvesting and bark delivery to San Pablito a maximum of eight days elapse, since bark quickly loses weight and can spoil owing to fungus, especially during cold and rainy periods. During fieldwork it was observed that one to three days after extraction, one kilo of fresh bark would weigh about 700 gm. This aspect is very important for selling in San Pablito. The Otomi lift the bark packages to estimate the weight; this is one of the Otomi selection criteria when it comes to buying bark. On the other hand, bark has a low rate of perishability. Bark from *T. micrantha* trees can be stored for up to one week, and even more if weather conditions are suitable – not too humid or cold. However, other tree species are more susceptible to fungus, especially *Sapium* and *Morus celtidifolia*. Although Otomi artisans regularly dry the bark to store it for up to one year (chapter 5, section 5.2.2), they demand it fresh from the harvesters. It is very important for the Otomi to estimate the bark quality before buying it and this can only be done when bark is fresh.



Plate 7.4. Harvester separating the inner soft bark from the outer hard bark.



Plate 7.5. Harvester transporting bark loads called 'tercios'.

The time required for extracting varies according to the quality and amount of bark collected from each tree. According to harvesters, the maximum that can be collected from an approximately eight-year-old *T. micranta* is up to 15 kg and the minimum 5 kg. Depending on the types of trees and the harvest site one harvester can debark two to nine trees in a day. The average one harvester can collect in a day is up to 50 kg of bark. On some harvest sites, such as coffee plantations, 50 kg might be extracted from about three trees or from more than 20 when trees are growing on fallow plots. The time taken also depends very much on access to the harvest site. Coffee plantations are normally easier to enter and to debark, whereas forests and fallow lands are more inaccessible and the vegetation hampers extraction activities.

During the week harvesters tend to allocate their time to all the activities involved in harvesting. They estimate one or two days for searching for potential harvest sites, two or three days for harvesting and one day for selling the bark in San Pablito. The search for potential harvest sites is in fact carried out all the time. Wherever harvesters go they look around for possible trees to debark. They always attempt to find harvest areas in advance, and close to their villages of origin. Harvesters prefer to collect all the bark from the same harvest site, be it a coffee plantation, a forest or a fallow plot. This means less time taken in searching and in dealing with the owners of the harvest sites. Moreover, the bark loads (50 up to 300 kg, as explained before) show a homogeneity in quality and color that is very important for meeting the buying criteria of Otomi artisans. This also implies the possibility of selling the complete bark load, thus avoiding the necessity to sell the bark to different Otomi artisans.

Although in most cases one member of each household carries out these activities, a wide array of arrangements can exist at household level. On most occasions the work is done by one person, sometimes helped by the older children, especially during holidays, in arranging the bark packages and bending the bark strands. Although this is a male activity, women occasionally help on the harvest site by separating the inner bark from the outer bark, by joining their husbands in the collection of fuelwood or edible plants, or by bending the bark at home when harvesters bring it, thus avoiding possible bad weather at the harvest site.

Although most harvesters carry out the work at individual level, a wide array of arrangements exist among harvesters. As described above (section 7.3.1), temporary harvesters are sometimes organized in groups for extraction; others also join forces for transporting and selling bark. Sometimes harvesters may work in groups of two or three, especially when they find a harvest site with numerous trees. Also they may join forces to pay for transportation, or on some occasions ask another harvester to bring their raw material to San Pablito and sell it. This particularly

occurs when harvesters suddenly have to cope with other activities and cannot go to San Pablito or when harvesters come from the most isolated villages. These are usually indigenous villages, where the inhabitants are less used to leaving their villages and where agricultural activities still demand daily attention.

Price of bark raw material

Bark attains monetary value on some harvest sites and on others not. On coffee plantations and fallow plots the value of bark is recent. Since the removal of shade trees is part of normal coffee plantation management practices, bark from coffee plantations did not fetch a market price until around seven years ago. Coffee plantation owners used to allow harvesters to freely debark *T. micrantha* trees, which in fact meant saving laborers' salaries for shade management on the plantations. The situation is different in the case of bark extracted from forests, secondary forests or riparian vegetation. Bark from these sites is not paid for.

At present the price of bark on coffee plantations remains fairly constant throughout the year. It is controlled by coffee plantation owners and varies depending on a range of aspects, such as the accessibility and distance of the harvest site and on the personal link between harvesters and plantation owners. Price is higher in areas closer to San Pablito than in the northern mountainous area. Furthermore, price is higher on harvest sites located close to villages or roads. Price can be settled according to the number of trees within the harvest site, or based on the total number of harvested trees, bark kilos or the extension of fallow plot or coffee plantation.

Harvesters prefer to settle the price based on the standard bark load, *tanto* or *tercio*, which varies from 25 to 35 kg (small or medium bundles, described above). From their point of view, this is more effective than using the number of trees or extension of harvest sites. It is hazardous to estimate the total amount of bark before debarking. Even if trees show the best condition according to harvesters' criteria, the yield may still be very low. One of the main reasons is that the bark can be strongly attached to the trunk. Bark is weighed only on a few occasions. It is weighed particularly by coffee owners who are selling bark to harvesters for the first time.

Nevertheless, changes in bark prices at harvest sites are not so abrupt as changes in bark prices in San Pablito, as will be explained in the following sections. Changes range up to 10 cents⁴. Nor have the prices varied over time as much as the price of

4 Prices in USA dollars. Exchange rate in 1999: 9.5 pesos = 1 dollar.

bark in San Pablito. About five years ago one kilo of bark cost less than 1 cent; at present it is between 10 and 20 cents. Depending on the kind of agreement, the owners of harvest sites are paid before the bark is carried to San Pablito. However, on many occasions harvesters pay after they have sold the bark. This method is preferred by all of them, since debarking represents a previous investment.

7.4.2 Transportation and delivery of bark to San Pablito

One of the most important aspects in relation to the frequency of harvesting and the harvesters' decisions about the sites of extraction is the distance factor. This implies transportation, which subsequently implies monetary investment before bark selling. The investment for transportation is generally high. It might vary according to many factors, such as the time of the year, distance and means of transportation, but it normally represents one of the most important investments of harvesters. The cost might exceed the income gained from selling the bark in the Otomi village.

Due to the rugged relief conditions of the Sierra Norte, to reach a harvest site might imply crossing rivers and walking long distances. The use of donkeys or horses are then required for carrying the bark load on the return trip. Some harvesters own their animals but others do not. In the latter case harvesters rent the animals from other peasants. Depending on the time required for transportation and extraction, they bring the animals with them or pay another person to bring them once they have finished the bark extraction. If harvest sites are close, harvesters walk, carrying the bark load themselves or with the help of other harvesters. If the amount of harvested bark is high and the harvest site is located along a dirt road or highway, a truck or car is then rented.

Once harvesters bring the bark to the nearest road or to their villages, the next step one or two days later is to carry the bark to San Pablito. Different means of transportation are used to accomplish this. In the case of harvesters living long distances from San Pablito – mainly temporary harvesters who are generally involved in bark extraction during certain periods of the year and who bring larger amounts of bark (see Table 7.2) – they normally rent trucks to transport 1 to 3 tons of bark. Some of them have already established informal agreements with truck owners whose services are required each year. In these cases even the truck owners have gathered over the years information about potential extraction sites, owners of trees and coffee plantations, variations in the price of bark in San Pablito, and transportation routes. A kind of informal agreement is established between transporters who protect this information and harvesters who maintain relations with the same transporter.

Most permanent and intermittent harvesters use regular regional bus transportation and, depending on the distance from their place of origin, the trip to San Pablito can take from half an hour up to six hours, implying also the change of buses on the way. Since harvesters have to pay an extra quota for each bark bundle, they normally tie two bundles together, which may weigh up to 100 kg but are paid for as one bundle.

Peasants within the harvest region indicate transportation as one of the main limiting factors to getting involved in bark harvesting. For all types of harvesters, the transportation of raw material from harvest sites to the nearest road and then to San Pablito village constitutes a significant factor. In the case of harvesters (mainly intermittent) coming from the northern part of the harvest area, their involvement in bark harvesting started once the problem of transporting bark had been solved. In one of the villages in the north, a truck owner decided to start harvesting to fill his truck. He also transports the bark of other harvesters that have recently become involved in this activity.

Arriving at San Pablito

Harvesters prefer to arrive at San Pablito very early; this means from three to five o'clock in the morning. The earlier they arrive, the more they can obtain from selling the bark. On the other hand, it is the way to avoid being stopped by forestry guards on roads and highways because the guards are at their posts during the day but not at night. Temporary and intermittent harvesters that come from farther away are more likely to pass through temporary or permanent control points on the highways that link their villages with Pahuatlán. These harvesters start the trip to San Pablito very early and arrive when it is still dark.

The bark is brought towards the end of the week. Although harvesters bring the bark throughout the week, Thursday, Friday and Saturday are preferred. The reason is that most workers and peasants, including artisans, receive their wages – or paper payment if they sell directly to the consumers – on Friday or Saturday. Another reason is that the regional markets and the main market in Pahuatlán plaza (chapter 5, section 5.5.1) are held at the weekend. People from neighboring villages congregate and harvesters too come from far away especially for a specific product or for amusement. Some harvesters, living in the most remote areas, make use of these days to leave for cities such as Puebla or Tulancingo.

Bark is sold in packages or bark bundles called tercios (25 to 35 kg) and doble tercios (around 50 kg). Harvesters try to sell the whole bark load at once and preferably to one Otomi. Sometimes a group of two to four Otomi women agree to buy together, and as they buy they split the bundles and packages between them.

As soon as harvesters arrive at San Pablito they unload their bark from the trolleys, horses, cars, trucks or buses and they tie them up, placing the bundles one on top of the other and leaving them available for inspection by Otomi artisans. If the raw material is brought in sacks, the bark is taken out and carefully displayed. Most harvesters congregate in the main street of San Pablito, where the buses stop and where the main entrance to the church patio rises up. This in fact is the busiest place in all San Pablito, where people who want to sell something peddle their wares, where those who are waiting for a bus or car to go to Pahuatlán stand, and where people of all ages congregate to talk.

Harvesters stay close to their bark loads and, depending on the time of the year and the conditions of the day, they can sell the bark very quickly or take all day. They remain standing, watching other harvesters and the Otomi people. The attitude in general is suspicious. Talking is not very common, only among harvesters previously acquainted; but in fact communication is avoided even between harvesters from the same area. Information about harvest sites, routes, names of coffee plantation owners and so on is reserved and not shared. Among harvesters that come more regularly conversation is more frequent and whenever possible they try to settle a common price for the bark.

Otomi artisans, mostly women, are the ones who buy the bark. As explained in chapter 4, at present most Otomi artisans are women. This situation has been accentuated, with increasing numbers of men migrating to the United States. But in the field it was also observed that, even within artisans' households where the whole family is actually working, women are the ones in charge of buying the bark. The selling of bark is quite tough and arrangements about prices might take all day. Negotiations continually become prickly, not helped by the use of two distinct languages, Otomi and Spanish.

When negotiations become hard and there are numerous buyers, Otomi women sit on top of the bark bundles, making it difficult to sell the raw material to other people and pressing to obtain a lower price. The intentional use of the Otomi language by Otomi women, even those who know Spanish, and Spanish by the harvesters, even those who can speak Otomi, makes it very difficult to reach rapid and direct agreement. Harvesters who have long been involved in this activity foresee this situation and take into account that they might spend the whole day trying to sell – and that even at the end of the day the sale might be unsuccessful.

Before buying, Otomi women carefully check the raw material in terms of color, texture and thickness, and lift the packages to estimate the weight. Scales are never used. They do not unpack the bark bundles, but the bark is touched and even smelled, and the whole bark bundle is lifted to calculate the weight. The bark should be soft, should show no signs of being rotten, and should have a firm

consistency, not *bofa* or *espumosa* (frothy), without traces of *cascara* (inner hard bark). The complete and longer fiber strands are preferred, as well as the bundles containing bark of the same color. Any small defect in the bark is pointed out by the Otomi women, who then pressure the harvesters to reduce the price.

7.4.3 Bark trading strategies in San Pablito

The price of bark in San Pablito varies over the year and even during the day. The general pattern shows that, from June till September when shade management practices in coffee plantations are carried out and higher volumes of bark are supplied, the average price of one kilo of bark is 36 cents. From the end of November till February, the bark harvest declines due to the gathering of coffee beans and the cold and rainy conditions of these months, which hamper bark harvesting tasks and transportation. During these months the average price is 84 cents per kilo. There are two peaks, in the middle of October and March, which correspond to the celebration of two religious festivities as well as the decrease in agricultural activities, especially the end of coffee gathering and maize cultivation. The average price of bark during these two peak periods is about 31 cents per kilo.

The prices change throughout the year but noticeable changes also occur throughout the day. After long negotiations between Otomi artisans and harvesters the buying price of bark may reach half the original – or even less – proposed by harvesters. Time of arrival depends on the annual bark supply calendar. During those months when more bark is brought to San Pablito, harvesters, especially those who bring less bark, tend to arrive extremely early so that when other bark harvesters arrive, especially the temporary ones, they have already sold their bark without having to compete with the very low prices of other harvesters. Temporary harvesters bring tons of bark in trucks and stop close to the houses where they know large amounts of bark are required – mostly paper craft workshops and Otomi wholesalers who used to give the raw material to salaried artisans (see chapter 5, section 5.3.1). If the raw material is not sold within a few hours, the trucks with bark then start to go around San Pablito, making several stops to let the Otomi come and see the raw material. As for the harvesters with a smaller bark load, they leave their bark in the main street and start to go from house to house, looking for possible purchasers. At the end prices might not be profitable at all but, as harvesters comment, they do prefer to sell it at a very low price rather than throw it away, as has already happened to some of them. The opposite situation occurs during the period when bark supply shrinks. Then harvesters arrive later and Otomi artisans have difficulty in buying bark. The shortage of bark stimulates the Otomi to go to Pahuatlán, or along the road that connects Pahuatlán to San Pablito, to intercept the harvesters and buy their bark. These are the periods when bark is sold at higher prices throughout the day.

Changes in price throughout the day are also subject to weather conditions. As with paper production (chapter 5, section 5.3.2), which diminishes during cold and rainy months and during rainy days within warm periods, the arrival of harvesters and the price of bark also tend to diminish. Whenever rain starts, harvesters try to sell their bark sooner to avoid transport problems on the dirt roads leading to their villages and the prices of bark generally drop. Whenever harvesters foresee bad weather conditions, and depending on their daily activities, they prefer to remain in their villages and wait till the next day to go to San Pablito.

Sudden weather changes also have an impact on the bark supply calendar. While in the field, the floods of October 1999 (chapter 4, section 4.4.3) severely affected Sierra Norte de Puebla, leaving several villages stranded for several days. During the early days after being cut off, the prices of all types of goods and commercial objects, including bark, soared. Paper production as well as other activities stopped for almost a week. Only a few artisans could re-establish their craftwork quite quickly. But when activities re-started the demand for bark increased, and the price was high.

Otomi artisans are the ones who largely control the selling of bark in San Pablito. Similar to the way they protect knowledge about the manufacturing process (see chapter 5, section 5.5.2), if they do not agree with the harvesters on prices and quality of bark, artisans do not buy their bark and eventually these bark harvesters are thrown out of San Pablito. The quality of the bark is very important. For example, some years ago a harvester tried to sell bark and the artisans discovered that, although the bark looked similar to the bark they used, it was not suitable for paper and had probably been extracted from another type of tree. The Otomi threw away their bark and prohibited him from returning again to San Pablito. Whenever a harvester, mostly a new one, tries to sell bark at a higher price than other harvesters, Otomi artisans cease buying this bark until the harvester reduces the price or stops harvesting bark altogether.

In general there are no requests or previous arrangements made between harvesters and artisans. Only rarely do people, especially owners of bark paper workshops who require large amounts of bark for external orders, request a trusted harvester to bring raw material. In other cases some Otomi artisans who receive special requests for paper made from the bark of *Sapium* trees, *Ficus* or *Brosimum alicastrum* apply to known harvesters for these types of barks. In general, however, there are no previous arrangements between harvesters and Otomi artisans. The latter buy bark from different harvesters. Then bark is not paid for in advance, and at times harvesters accept payments in instalments. On other occasions the monetary payment is replaced by objects such as used radios, televisions, etc.

The lack of previous arrangements is apparently more convenient for the Otomi artisans than for the harvesters. This condition leaves the Otomi artisans with space for daily negotiations to obtain the lowest price. This is especially relevant considering that although, as was seen in chapter 5 (section 5.4.1), the majority of bark paper is sold through internal wholesalers, most artisans have their own means of production and decide on their own work. Therefore the selection of bark is part of this production strategy and is also reflected in the end-product. A good quality product made from good bark can be later negotiated with wholesalers, who check the paper quality. In the end, the final profit from bark paper depends on the amount of money invested in purchasing bark, among other materials required for paper production. The prospect of obtaining larger profits increases when the price of bark is low.

Resale of bark is not practiced in San Pablito. Urbina (1990) observed that internal resale of bark was a common practice around 10 years ago but at present most Otomi artisans purchase their own raw material. A few Otomi artisans, anticipating the months when bark supply diminishes, buy bark to store it for a long time. These artisans are mainly the owners of workshops or households of permanent paper production (see chapter 5, section 5.3.1).

The price has increased over the years since bark has been supplied to the Otomi village. Harvesters, especially those that have been involved in this activity for a longish time, comment that, although the price has increased in past years, they used to be able to earn more money from bark harvesting than now. According to them, the participation of more harvesters has opened up the market to more people and more competition in prices. On the other hand, the cost of transportation has increased, and the need to search for harvest sites farther away has increased too.

It is also pertinent to mention the position of fuelwood, which is utilized for boiling the bark strands (chapter 5, section 5.2.2). Similar to bark, bunches of thin wood and branches of wood of around 40 kg are supplied by regional peasants. Although no detailed information was collected in the field about the supply of this resource, it was observed that fuelwood too is subject to price changes throughout the year. The first period corresponds to the colder months, from September till February, when the fuelwood supply decreases and prices rise. The second period corresponds to the warmer months, from March till August, when the price decreases. Although no exact numbers were gathered, Otomi artisans comment that the price changes are moderate in relation to bark, increasing by half.

Throughout the year the supply of fuelwood appears to be more regular than that of bark. Probably this is related to access to the trees exploited, to peasants' activities and to distance to the Otomi village. All the villages from where fuelwood is

extracted are located about 15 km from Pahuatlán, at most an hour and a half by car from San Pablito, and in this case, most suppliers have their own transport and own the lands where trees are being exploited. Part of these lands are devoted to economic forestry activities and part are protected. However, illegal exploitation is also occurring and part of the fuelwood delivered to San Pablito comes from protected forests.

7.5 Summary

The multiple harvest strategies developed in the last few years have become very important and the main way in which amate paper production has survived. In general bark harvesting strategies show the form in which adaptations in relation to the environment and specific natural resources are being developed. During the last few years, bark harvesting has been carried out by taking advantage of the contrasting environmental conditions and land use systems of Sierra Norte de Puebla. One main aspect of the new harvesting strategies is the use of different bark trees growing in different land use systems. Although even now Otomi people debark and maintain bark trees within homegardens, coffee plantations, fallow lands and forest patches, the majority of bark is obtained from regional harvesters. Both Otomi artisans and regional harvesters are continuously experimenting with different tree species as potential sources of bark. This aspect is highly relevant for amate production.

There are important aspects to point out about the present bark harvesting activities. In the first place, although an increasingly important economic activity at regional level, bark harvesting continues to be a secondary activity for most regional harvesters. During fieldwork it was observed that the income received from bark harvesting plays a very important role during critical household events or periods, but does not constitute the main income activity of harvesters. This is an aspect to be considered in any intervention strategy since often the support centers on a single extractive activity without considering the whole economic and social situation of the peasants involved in these types of activities.

Other aspects to consider in intervention strategies are the highly informal and changing trading conditions in which this activity is carried out and the legal aspects involved – more broadly speaking, the access of harvesters to places where bark trees are growing. Harvest activities are characterized by being inserted into an informal market – always subject to changes in the demand for bark from Otomi artisans – in relation to other regional agricultural activities. The relations that these activities involve among coffee plantation owners, bark harvesters and Otomi artisans have developed.

The legal aspect and access to bark trees, as described in this chapter, has led to conflicts arising at different levels, not only among the social actors directly involved, such as forestry guards, owners of bark trees (particularly coffee plantation owners) and bark harvesters, but also with those at regional level, such as local authorities who accuse bark harvesters of contributing to deforestation. As observed during fieldwork, conflicts have emerged among the different social actors, and a general attitude of hostility towards harvesters has appeared in the harvest area.

On the other hand, some harvesters do say they need a permit for extraction. But as the rules are not clear to the harvesters, this is also used as an argument to debark without the permission of the owners. In this sense, uncertainty about the ownership of harvest sites appears to be rather an argument used by harvesters than a real situation. From the government side, there is a total lack of information about extraction regulations. Moreover, as explained in chapter 2 (section 2.3.3), specific rules for bark trees as well as for agroforestry systems in general are lacking – a serious gap when it comes to developing these kinds of activities (NTFPs) in Mexico and many other parts of the world.

Bark harvesters have developed their own knowledge about bark trees. The use of different bark trees by bark harvesters implies the perception and knowledge about natural resources – what Toledo (1992) calls cognitive and practical knowledge (Corpus and Praxis, see chapter 3). The practical knowledge involves knowing about extraction calendars for each tree species and applying specific harvesting techniques. The practical component of ethnoecology (Praxis) is subject to continuous examination through the search for new potential species for bark supply and more recently through the purposeful management practices for bark tree cultivation.

Finally, as mentioned in chapter 2 (section 2.4.3), the harvesting of bark and of various NTFPs in general is embedded in the national and regional economic and social contexts. The decline in agricultural activities has produced changes at local level and the pressure on forests is generally increasing. In the case of amate, the approximate total number of harvesters has rapidly increased over the last few years. Approximately seven years ago Urbina (1990) registered seven harvesters. During fieldwork more than 100 were recorded. As will be explained in the next chapter, decline in agricultural activities, especially coffee plantations, has largely prompted the search for new income activities inside and outside Sierra Norte de Puebla.

**Land tenure and land uses: access to
and distribution of natural resources
in the regional context**

8.1 Introduction

Sierra Norte de Puebla is basically a mountainous rugged region that constitutes a transitional area between the high central plateau of Mexico and the low-lying lands towards the coast of the Gulf of Mexico. Historically different indigenous groups have inhabited it; at present mestizo groups are dominant. The configuration of this region is based on a combination of different factors such as historical boundary territories, biophysical boundaries, cultural backgrounds and the development of different land use systems.

The first part of this chapter focuses on the land uses and land tenure systems of Sierra Norte de Puebla by giving a historical account of how these have developed. Both aspects are closely linked with the types of populations that through time have settled in the Sierra, mainly indigenous and mestizo peoples embracing contrasting socio-economic conditions. The second part focuses on the coffee plantations, their history in Sierra Norte de Puebla, and the present social, economic and ecological characteristics.

Several questions prompted the exploration of these topics. Some directly relate to the context within which bark harvesting and amate production are carried out, inquiring about the social and economic dynamics that have led to the emergence of these types of activities. In the case of coffee plantations – the land use from which most of the bark is being extracted – questions about how they developed and what are their characteristics are basic to understanding the forms in which bark is obtained and probable changes. It is likely that trends in coffee plantations would have a direct effect on the whole amate commodity chain.

Other aspects treated in this chapter relate to the pluri-ethnic composition of the Sierra, expressions of identity, the physical isolation of the Sierra from centers of domination, and the forms in which different populations have settled and established social, economic and political links. These aspects are related to the development of amate production, especially the way in which amate production has continued in the last 400 years, since the Spanish colonial period to the present day.

The information presented in this chapter derives from bibliographical sources. Most of these, particularly the one related to Sierra Norte de Puebla, were produced during the 1970s and 1980s; there are no more recent studies of this region. Consequently new changes that have had great impact in Mexico, such as changes in land tenure regulations and agricultural policies linked to NAFTA, have still to be explored for the specific setting of the Sierra.

Studying land property rights, as explained in chapter 3, enables the ways to be observed in which people are linked to the environment by forms of regulation, organization and access to land. The concept of land property rights and mountain ecology as shown in Figure 3.3 (chapter 3) was adopted for studying the regional context. By using mountain ecology, the dynamics occurring in mountain areas and the way in which these areas are economically, politically and culturally linked with the outside can be observed from a new perspective.

8.2 Land tenure and land use systems

As mentioned in the previous chapter (section 7.2.1), Sierra Norte de Puebla presents great variations in elevation, relief, temperature and vegetation. It is subdivided into three sub-regions but the harvest area lies in between two of them: the high sierra and the low sierra. The whole region is predominantly rural, however the sub-regions present contrasting social and economic conditions. Three main urban settlements are located in the low sierra, where most of the extended land holdings of the region are located. In the high sierra indigenous villages are common, with mainly small private land holdings. Land issues have shaped relations among the Sierra sub-regions and the different population groups living there.

Land possession and regulation in the Sierra has been crucial throughout the region's history. It is closely related to regional biophysical factors and the slow settlement process of the different population groups. According to García Martínez (1987), rather than a unified area it consists of internal sub-regions showing ethnic differentiation in parallel with a process of spatial integration into centralized areas concentrating ritual, administrative and economic activities. An overview of the historical changes in land tenure in parallel with the changes in land use systems is summarized in Table 8.1.

Table 8.1. Land organization-tenure systems and land use in Mexico.

Historical Period	Land organization and tenure systems	Land use systems
Pre-Hispanic	Altepeme	Subsistence crops (mainly maize)
Spanish colonization (first years)	<i>Encomienda</i> to Spanish soldiers	Introduction of cattle and new European crops
	<i>Pueblo de Indios</i> to indigenous territories	Tribute goods (crops, crafts, gold, silver, etc.) Subsistence crops
Spanish colonization	<i>Estancias</i> and <i>Haciendas</i> for Spanish farmers	Cattle, cotton, fruits, etc.
	<i>Congregaciones</i> concentration of indigenous people for religious purposes	
	<i>Tierras protegidas</i> for the exclusive use by indigenous population	Agriculture lands protected from cattle
Revolution (1910-1920)	Re-distribution of land	Mainly subsistence crops
Lázaro Cárdenas regime (1934-1940)	<i>Ejidos</i> Land distribution	Subsistence and commercial crops
	Private land Small property and large properties	Extensive cattle ranching and commercial crops
New land tenure law (1992)	Privatization of land	Support to export commercial crops

8.2.1 History of land tenure systems

Colonial land organization

At the start of Spanish colonization the Spanish demand for lands in the Sierra was much lower than for lands in the high Central Plateau, where lands were more available and where flourishing *encomiendas* linked to zones of colonial economic expansion attracted major attention (García Martínez, 1987). A combination of elements, according to Kelly and Palerm (1952), prevented the early Spanish settlers from developing large-scale farming in the mountainous part of the Sierra. Among the most commonly mentioned are terrain steepness, the difficulty in transporting products, reduced population, labor shortage and lack of mineral resources to be exploited. In the low sierra, Spaniards gained major benefit through *encomiendas*, a piece of land granted to the soldiers entrusted by the Spanish Crown with colonializing the Indian territories

The formation of *encomiendas* was based on the past pre-Hispanic configuration of what is called *Altepeme*, which constituted the fundamental element of political integration and organization in Mesoamerica. Their subsistence through the first years of Spanish colonialization was vital for the development of the conquerors' projects. The objectives of *encomiendas* were the military defense of the territory and promoting indoctrination while the indigenous population continued to pay tributes.

According to García Martínez (1987), 'Altepeme' is probably a word derived from the Nahuatl language, and refers to a genealogical tutelary god that resides in the mountains and gave origin to water. *Cerro* is the earth where water, which is life, was born. The mountains and water were collective patrimonial property. In this way the concept gives a symbolical reference that embraces earth and germinal forces, territory and resources, and the resulting political institutions. *Altepeme* were not ruled by a centralized structure, and the borders were not always clear, but diffuse and changing. They were units of organization but not all the groups were integrated into an *Altepeme*; some were dominated or annexed. Each *Altepeme* was linked to a person or a lineage called *Tlahtoque*, who was the head of the political organization of a collective, linked with the origin, experience and destiny of the group.

Through *encomiendas* Spaniards took advantage of the past indigenous organization to build political and economic systems for their own benefit. *Altepeme* were called *pueblo de indios* (village of Indians) and the *Tlahtoque* was replaced by the *cacique*, the new governance figure. The *encomienda* implied the almost absolute ownership of indigenous people and unlimited economic exploitation, but it did not imply the appropriation of lands. The communal indigenous tenure system was mostly

respected, especially during the first years of colonialization, since the Spanish population was still small and pressure on lands was not strong. Moreover, tribute was the main interest of the colonists.

At the beginning *encomiendas* were very profitable but by the middle of the XVI century the scenario had changed. Two events had a great impact: the epidemic diseases that hit the whole Mexican territory but mostly the low humid and warm areas, and the movement of the population towards fixed nuclear centers called congregations. Congregation entailed moving the dispersed indigenous population into concentrated villages in order to carry out indoctrination. Head towns were clearly designated as part of the process to introduce Spanish institutions and the Spanish way of life.

Depopulation led to new spatial arrangements, characterized by the drastic expansion of the conquerors into available lands. Possession of land increased by conquerors, while the limits of indigenous towns comprised. Between 1642 and 1645 a large number of properties were legalized throughout New Spain. The financial difficulties of the Spanish Crown around the 1590s favored land titling in exchange for money. In this way illegal operations in respect to land possession became frequent.

Land tenure after the XVI century

By the end of the XVI century the *encomiendas* were being transformed into haciendas, and this continued through the XVII century. The presence and characteristics of the *pueblos* gradually changed as private enterprises grew and demanded more services and time. Labor was freely contracted and relations of an individual type became more frequent between the Spanish and the Indians. These privately owned ranches relied on hired labor and were organized around cattle ranching, while indigenous populations were systematically dispossessed of their land holdings (Galiniér, 1987; García Martínez, 1987).

During the government of President Porfirio Díaz, whose dictatorship lasted for 12 years, the laws of colonialization called *desamortización* produced a drastic change in the social and economic organization of rural villages. These laws supported private property and private land ownership, and thereby many indigenous villages were deprived of their land (Kraemer and Solorzano, 1990). The problem of land tenure became a crucial issue in Sierra Norte. Instability in the region increased as the population increased and concessions granted during the colonial period to the Otomi disappeared in the face of confrontation with mestizos, whereas social stratification within the villages was reinforced (Galiniér, 1987).

The aims of the Mexican Revolution included an end to haciendas and the abolishment of dictatorships. In 1915, five years after the victory, dictatorship was abolished and laws were enacted to return land to the indigenous population. It was not legally possible to keep political posts for more than one electoral period but strategies were developed to conserve power. However, to ensure the continuity and participation of the political party PRI, which in fact maintained its power for more than 70 years, successors were previously chosen. At local level, in rural head towns, this situation enabled the conservation of political authority by powerful mestizos – or neo-caciques as they have been called by rural sociologists (Paré, 1976).

The figure of the cacique is identified with local authorities (municipal president), holding large stretches of land, in addition to the ownership and control of transport, communication and other types of properties. Paré (1976) explains that after the revolution and the destruction of most large haciendas, these new social actors in the Sierra and many other rural areas came into view. After defeating the landlords a power gap emerged. The gap was filled by the return of past landlords, who, whenever they could not recover their lands, started to control local commerce, and by the heroes of the revolution, who took possession of the political and economic power recently expropriated. The main processes at the end of this period were the concentration of land, the fragmentation of communal lands, demographic growth, and an increase in agricultural activities.

After the triumph of the revolution, land was redistributed to local inhabitants. Land reforms were implemented on a significant scale, mainly during the presidency of Lázaro Cárdenas (1934-1940). New laws provided for several forms of land redistribution: *dotación ejidal* (ejido endowment), *ampliación ejidal* (extension of existing ejidos), *nuevo centro de población ejidal* (resettlement of peasant groups on more distant land) and *bienes comunales* (the allocation of common or communal property).

From 1923 to 1940 the peasants of Sierra Norte continued fighting to reconquer their lands, but distribution was at individual level. This process was conditioned by the organization and pressure from farmers, and hacienda owners retained part of their properties whenever they could, selecting the most fertile and productive land for themselves and leaving the less desirable hilly tracts for the indigenous population (Kelly and Palerm 1952; Galinier, 1987). According to Masferrer and Báez (1995), in contrast to other rural areas, in the Sierra Norte the rugged terrain conditions hindered the formation of haciendas right from the start, and later the formation of ejidos since there were no haciendas to produce them after the revolution.

Since 1940, and especially during the 1950s, lands have continued to be illegally concentrated in the hands of caciques who deliberately took advantage of their political and economic power (Ramos and Magnon, 1979). Concentration of lands was also, as Navarro (1979) suggests, promoted by the application of the agrarian distribution policy. Unaffected lands of even 300 hectares were allowed for intensive use and the establishment of large agricultural enterprises devoted to commercial plantations such as banana, sugarcane, latex, coco, vanilla, quinine, cocoa, coffee and fruit production. The few rural communities that were not absorbed by large new haciendas remained linked to them in one way or another.

As a consequence of the social changes produced by the revolution, new people arrived during the last years of the XIX century and the first years of the XX century. The Sierra Norte, mainly in the lowlands, was the scenario of new migrations (Kraemer and Solorzano, 1990). Large communal lands were the origin of private property and sharpened the differences between two types of population groups: the natives and the immigrants (Navarro, 1979). Kraemer and Solorzano (1990) describe a case that occurred in the municipality of Zihuateutla, where in 1950 an immigrant from Veracruz took advantage of the laws of *deslindamiento* by buying a great stretch of land that later he sold to national and foreign coffee producers. In a few years, around 2 751 hectares out of a total of 6 000 hectares were converted into coffee plantations belonging to 27 owners. This occurred mainly in the low sierra, where new social actors took possession of communal and forest lands and converted them into large coffee plantations and cattle ranches (Kraemer and Solorzano, 1990).

In 1991 the agrarian legislation was reformed by making considerable changes to Article 27 of the Constitution and replacing the agrarian reform law, declaring the end of land redistribution and stimulating the privatization or individualization of ejido land. From then on, land regularization has been an ongoing issue throughout Mexico, causing different impacts at social and economic level in diverse rural and indigenous areas of the country. In some regions peasants have decided not to privatize their ejidos but to maintain them on a communal basis; in others privatization has taken place. The impacts of these changes in Sierra Norte de Puebla are minor compared with those in other rural regions in Mexico. However, the new changes in neighboring areas might have an effect on the Sierra in the long term, similar to events that occurred during the colonial period, when pressure by neighboring settlers on the depopulated or unused lands of the Sierra Norte increased.

Communal lands

In Sierra Norte de Puebla, the ejidos, communal lands and agrarian communities represent less than 1% of the total number of properties (Guerrero, 1984; INEGI, 1994). García Martínez (1987) gives a possible answer to the paucity of communal lands in the Sierra Norte. The designation of protection areas seems to have had little significance in most of the Sierra, as in other mountainous areas of Mexico, due to the rough terrain and the slow and subtle infiltration of Spaniards. Protected areas were delimited by taking a standard radial distance from the central point of the village to the surroundings. The main purpose was to avoid conflicts between indigenous people using agricultural lands and Spaniards introducing cattle. Over time there was a tendency to identify the concept of protection with property, making this equivalent to what were considered communal lands.

Protected lands were not confused with village limits. However, since the end of the XVIII century the situation in relation to the Spanish presence has changed. Various disputes demanding rights over these lands have arisen, not just between villages and Spanish properties but also among neighboring villages and even between members of the same village. The villages maintained part of their properties, but they lost their jurisdiction and progressively became threatened by fragmentation, reduction and impoverishment (García Martínez, 1987).

Galinier (1987) reports that communal property originates in a pre-Hispanic tradition that was forbidden by the Spaniards. By definition these lands are reserved for indigenous communities. The author also states that the places where these land property systems have survived are the most inaccessible areas, while in areas where potential commercial agriculture could be carried out, conflicts with the mestizo population arose.

Despite the limited extent and economic importance of communal lands, at local level they play a very important role by representing a few of the domains where communal work is still carried out and by significantly contributing to the subsistence of peasant families. These lands are mostly located in the most inaccessible areas, especially on mountain peaks, where agricultural or livestock use is limited. In every village these lands are ruled by different traditions. Communal legislation preserves the ancestral right of free access to municipal lands. They are rotated among the poorest or are used by peasants who have previously lost yields or obtained low ones. The yield is divided up as payment to the local authorities or as a contribution to the communal good, or is distributed among other peasants working on the same communal lands. Due to their location, these lands, and therefore crops, are at permanent risk, and subject to freezing and erosion.

Up to now most of the communal lands have been limited to forest areas. Within the communal system, forests have the same juridical status as the rest of the lands belonging to the village. Most of the time, forests are considered as a communal patrimony to which all inhabitants of the village have free access. They are mostly used for extracting fuelwood and other resources. They are always located on the rockiest terrain, where steepness impedes any form of cultivation (Galinier, 1987). At present most of the preserved forest occurs on such sites, which, as in the case of San Pablito and other indigenous settlements, are considered sacred (chapter 6, section 6.2.2).

The ejido lands in Sierra Norte de Puebla have been under pressure from non-indigenous populations and are now mainly under pressure from market forces. As explained in chapter 2 (section 2.3.3), at national level most ejido lands are in the hands of indigenous populations. Conflicts over ejidos between indigenous and non-indigenous people have been documented. Galinier (1987) observes that in Texcatepec and Zontecomatlan, indigenous villages where at least until the 1980s the communal system was dominant, there has been great pressure from mestizos or landowners aiming to invade, obtain or buy the potential lands for agricultural use. In other cases the uses and customs of solidarity in communal lands have not been carried out owing to discrepancies between local and regional laws for private land. The fiscal regime is a case in point. Beaucage (1974) reveals that, although communal lands exist and are ruled by similar local laws, in practice the issue varies a lot and becomes quite complex. He calculates that in the case of at least six indigenous villages in the municipality of Zacapoaxtla collective property has not functioned since the imposition of market conditions. According to Galinier (1987), these conflicts show the need for efficient legislation to protect land tenure and guarantee the means for a harmonic development of local resources.

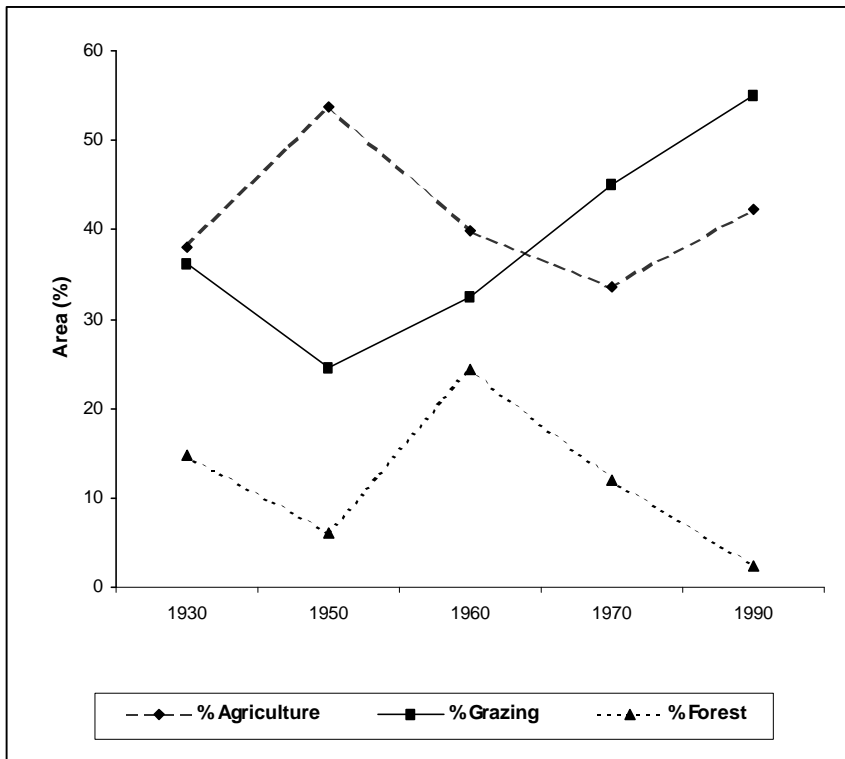
8.2.2 History of land use systems

Historically, starting with Spanish colonization, three main periods in relation to land uses can be identified:

1. the introduction of new crops and cattle ranching during the Spanish colonial period, mostly in conflict with indigenous agricultural subsistence practices; all these activities were still characterized by low technical input and a reduced labor force
2. expansion of commercial agricultural activities and decrease in agricultural subsistence practices, tending towards the use of more technological advances and intensive labor both for extensive lands and fragmented plots

- expansion of larger commercial activities and the shrinking of subsistence activities.

In recent decades, changes in regional land use systems have been closely linked with local processes, especially population growth, the fragmentation of small properties and land monopolization, and at national level with national policies, especially those oriented towards the agricultural sector. As can be observed in Figure 8.1, during the last 60 years two main changes have taken place. In the 1950s the first communication roads were opened and the introduction of commercial crops began. Traditional agricultural techniques were mostly abandoned and deforestation increased. In the 1970s many gravel roads were constructed; since then agricultural activity has expanded and much of the existing forest has been cut down and burned.



Sources: Censo Agrícola – Ganadero 1930, 1950, 1960, 1970, 1990.

Figure 8.1. Land use 1930-1990 for Sierra Norte de Puebla.

Introduction of European crops during the Spanish colonial period

Most of the Sierra Norte was unsuitable for many European crops. The techniques employed as well as the types of crops did not always suit the regional topography and climate. Nevertheless, some crops were slowly introduced by the Spanish farmers and by the end of the XVII century a great variety of European crops were growing in the Sierra, mainly fruit trees such as nut, apple, pear, peach and orange trees. The elaboration and commercialization of water extracted from orange flowers was an important activity in large areas of the Sierra (García Martínez, 1987). Throughout the region, common products included maize, cotton, honey and fruits; some areas specialized in extracting or manufacturing certain products, such as ceramic (agave) and wooden furniture. In the historical sources¹ that García Martínez (ibid.) examined, the municipality of Pahuatlán, where San Pablito is located, appears as a place devoted to the production of cotton, bananas, oranges, avocado, tobacco, orange flower water, *mecaxuchil* (cotton clothes) and cotton blankets.

The encomenderos were the first Spaniards to establish agricultural and cattle ranching enterprises. However, compared with other richer and more accessible areas, the Sierra lacked incentives for the colonists. The Spaniards did not enter the high sierra, much less the warm low sierra; they were mostly concentrated in the high lands close to the Central Plateau, where climate and less rugged terrain conditions favored European agriculture and cattle.

The few first Spanish settlers in the Sierra showed a clear preference for cattle ranching, especially for the extensive minor livestock raising that developed very well on the highest lands. Typical Spanish exploitation of the Sierra was livestock based on relatively simple organization and a small labor force. By the end of the XVII century the livestock had multiplied excessively, especially the goats and sheep. This activity did not have many of the spatial restrictions then becoming the source of many conflicts among agriculturists. These were mainly indigenous people who maintained agriculture as their main activity, based on subsistence crops such as maize and beans (García Martínez, 1987).

1 Suma de visitas de pueblos por orden alfabético (ca 1548). Papeles de Nueva España: 2a serie, geografía y estadística, Francisco del Paso y Troncoso, ed. Madrid, Sucesores de Rivadeneyra, 1905, 1906. 9 vols. 'Descripción del pueblo de Guauchinango y de otros pueblos de su jurisdicción' (1o mayo 1609). Colección de documentos inéditos relativos al descubrimiento, conquista y colonización de las posesiones españolas en América y Oceanía, sacadas en su mayor parte del Real Archivo de Indias [el título varía], Joaquín F. Pacheco, Francisco de Cárdenas y Luis Torres de Mendoza, eds. Madrid, 1864-1884, 42 vols. (Facsimil: Vaduz, Nendeln, 1964-1966.)

Over time the introduction of some commercial crops, mainly sugarcane in the low sierra, succeeded. The areas located at around 200 and 1 500 masl were devoted to cotton, later to sugarcane and now to coffee plantations. The colonial cotton plantations were replaced by sugarcane and by fruit plantations, which expanded during the 1940s when the first transport roads were opened (Beaucage, 1974). In general, as production diversified and became linked to national markets and communication roads were opened, the economic and social links of the Sierra Norte with national political and economic policies strengthened.

New land uses after land distribution 1930-1960

By the 1940s the Sierra Norte, as indeed all the country, was receiving support for the introduction and establishment of commercial crops for national and international markets, and cattle ranching was extended in large areas. But as the Sierra Norte became increasingly linked with the national economy, the contrast between the mestizo population and the poorest, mostly indigenous population increased, and conflicts arose. During that period there were social movements claiming labor rights and agricultural support, mainly in the low sierra.

The economic model implemented by President Cárdenas (1934-1940) consisted of obtaining economic growth through the development of the industrial sector, which was in turn based on agricultural production. During the three decades 1940-1950-1960 manufacturing constantly achieved annual growth. During the decade 1930-1940 the cattle ranching sector grew, mainly due to the agrarian distribution. Peasants who received their land during the Cárdenas period achieved this growth. This was partly possible because ejidos had more resources at that initial stage than in later decades. During the next decade, 1940-1950, growth continued due to extending the agricultural border, opening irrigation systems and introducing more equipment and technology, all based on international models of agricultural development. A small group of privileged agriculturists could benefit from technology, while the majority of small peasants prospered through the opening up of new lands for agricultural purposes (claimed as ejidos), as in the case of Zihuateutla municipality in Sierra Norte de Puebla. During the 1950s, economic growth started to slow down and by 1960 the agricultural model declined through inadequate land expansion for agriculture, stagnating irrigation programs and failure to balance yield.

During the decades of national economic growth, three main changes, all oriented towards the intensification of land uses occurred: the almost total disappearance of forest cover, the increase in lands devoted to agricultural activities, and the extreme expansion of grazing lands. In a few years some municipalities, such as Zihuateutla, which until the 1950s had maintained extensive natural vegetation,

were transformed into extended areas for grazing and coffee plantations, and other minor areas were turned over to commercial crops such as peanut, chili and ornamental plants. Some activities such as hunting, growing timber trees and gathering wild fruits almost disappeared, while new problems such as diverse plagues in maize, chili and grasses became common. Throughout the region, traditional agriculture carried out by indigenous people was intensified and diversified combining commercial crops, such as tobacco, oranges and pineapples in the low sierra and peanuts and avocados in the high sierra.

Decline of agriculture and social responses 1960-1980

A major national agricultural crisis occurred in 1965. Its origins are found in the permanent transfer of resources from the peasant sector to the industrial one. This led to the depletion of means of production, the abandonment of fields, migration to the cities and declining maize cultivation. Basic crops and maize were removed in favor of more profitable crops. The model of agricultural expansion based on the Green Revolution was only applicable in some areas of the country used for profitable crops such as sorghum and fodder. This substitution of commercial crops for basic crops generated the scarcity of basic grains at country level.

Not all the effects of the crisis in the Sierra Norte are recorded – this occurs with all the agricultural history of the Sierra. The national and international crisis led to a series of local peasant risings. Navarro (1979) records the effect of the sugarcane crisis in the Sierra Norte, which was produced by the decline in the prices of raw materials in the international markets. In New York, a major buyer, the price of sugar dropped from 2.34 pesos per kg in 1963 to 0.51 pesos per kg in 1966. During 1975 and 1977 in the municipalities of the southeastern portion of the Sierra, particularly Zacapoaxtla, a group called UCI initiated its fight against the state and the landlords, demanding a change in the economic system of the region.

At national level the government tried to stop peasant movements with a popular development policy channeled through a program called *Política Desarrollista Populista* (Political Popular Development). This considered isolation as the origin of marginality, especially for those ‘indigenous people largely confined to the low and backward ways of production’. The government started to open transport and dirt roads all over the Sierra Norte (1969). In the case of Zacapoaxtla, documented by Navarro (1979) and Paré (1976), the merchants of the municipality blocked and delayed the construction of roads into the Sierra in order to maintain the isolation of the indigenous villages and retain commercial control in the region. Dow (1973) mentions that the opening of roads also meant increased trade control by mestizos, dealing more with imported rather than exported products.

In face of the deep economic and social crisis of the last years of the 1960s and the first of the 1970s, the Mexican State was forced to design new economic strategies. At the start of the presidential term of Echeverría (1970-1976), several institutes were created and others were restructured for increasing certain agricultural products. This was done through the diffusion of modern crop techniques, the promotion of credit programs to stimulate peasants to adopt new techniques and the organization of peasants. The surplus produced was co-opted by the institutions. In this way the special commissions and institutes for sugar, tobacco and coffee were created (Comisión Nacional de la Industria Azucarera in 1970; Tabacos Mexicano S.A. de C.V., Comisión Nacional del Cacao and Instituto Mexicano del Café in 1972).

In this way the most visible effects of the crisis, such as food scarcity and peasant movements, were temporarily mitigated. However, there were some irreversible changes due to the major concentration and transnationalization of the agro-industrial sector. These were the expansion of cattle ranching, together with the development of grain cultivars, fodder and oil seed crops, and other products such as tobacco, sugar, coffee, fruits and vegetables gained importance at local scales. Most of the support for commercial crops was oriented towards coffee plantations, especially after the creation of the national coffee institution. As will be explained in the next section, the introduction of coffee implied a new regional economic and social context.

8.2.3 Contrasting conditions in land and population

One of the main characteristics of Sierra Norte de Puebla mentioned by different authors is the pluri-ethnic composition of the population (Aguirre Beltrán, 1963; García Martínez, 1987; Masferrer Kan and Báez, 1995). For centuries different indigenous groups have settled along the Sierra Norte. During pre-Hispanic times, indigenous people escaping from stronger and hegemonic groups, mainly the Totonaco and Aztec Empires, started to settle in the Sierra Norte. Later, during the Spanish conquest, population displacement from other areas and within the Sierra continued, while settlements started to link to the predominant hegemonic centers, configuring, as García Martínez (1987) calls them, pluri-ethnic and pluri-cultural 'regional spaces'.

The region is inhabited by Nahua, Totonacos, Otomi and Tepehuas. There is no sharp frontier between them and in most municipalities, such as the case of Pahuatlán (chapter 5, section 5.5.1), there are more than one indigenous group. Some anthropologists have called this area a 'refuge zone'. Aguirre Beltrán (1963) was

one of the first Mexican anthropologists to propose this term. According to this author, such regions share similar ecological, demographic, social and economic conditions in all Latin America. They are mostly located in isolated areas with extreme climatic and topographic characteristics, where intercultural relations have developed among people of different cultural backgrounds – the indigenous population living under marginal conditions and the non-indigenous population. Generally the non-indigenous population settles in the few centers or cities that become the regional ruling cores. These two types of populations are dependent on each other but each maintains a social organization, a technology for agricultural activities, an economic organization and an end orientation production distinctly its own.

The two main sub-regions of Sierra Norte de Puebla, the high sierra and the low sierra, show different conditions regarding population type and density, settlement patterns and the availability of services. Semi-dispersed villages are common in the low sierra, while grouped types of villages are most common on the mountains where more severe natural limitations occur. The total number of municipalities that compose the Sierra Norte is 19; from these only four are considered non-rural (Xicotepec de Juárez, Huauchinango, Oriental and Zaragoza). Of the total population 91% is rural and 8% is urban. The latter is composed basically of non-indigenous people concentrated in a few cities, mostly in ruling towns settled in the low sierra. The majority of the indigenous population live in small villages dispersed along the mountains. According to some authors and official development programs in Puebla, the high dispersion of the indigenous rural population in small inaccessible localities has restricted access to main public services, such as medical assistance, education, water and sanitary infrastructure (PDSNP, 1992; Masferrer Kan and Báez, 1995).

Several authors (Aguirre Beltrán, 1963; Beaucage, 1974; Galinier, 1987) report that until the end of the 1980s the presence of two different groups, the indigenous and the non-indigenous, was the cause of land conflicts. Most conflicts relate to the historical dominance of mestizos, pushing local indigenous populations into remote steep lands, especially after the agrarian reform when large landowners obtained subsidies for dairy and agricultural enterprises. More recently urban expansion has tended to marginalize poor landless peasants by forcing them onto less productive land. But this is not a situation unique to Sierra Norte de Puebla; it is a common characteristic of Latin America (Beaucage, 1974). Pluri-ethnic regions are areas of conflict, where different economies and types of organization share the same territory. Economic interests among the indigenous and mestizos conflict, owing to marketing dynamics. However, at present most indigenous and mestizo populations are already entwined in marketing nets. Indigenous perception towards marketing has changed as migration and communication increase.

Decline of traditional agricultural systems

The high sierra and low sierra comprise contrasting social and biophysical conditions, which become perceptible in the distinct land use systems and management of natural resources. As revealed above, the extensive cattle ranching and intensive agriculture are carried out mainly in the low sierra by mestizo owners of large tracts of land. In the high sierra, the indigenous populations base their economy on different non-agricultural activities and agriculture pursued on a small scale. Until some years ago, before work outside the region started to be a regional economic strategy, the traditional forms of agriculture were the main source of subsistence of the indigenous peoples.

Indigenous people in the Sierra Norte have developed a diversity of strategies for managing different ecosystems, and they have developed traditional forms of agriculture adapted to the rugged terrain. Among the various agricultural practices, cultivation of maize is the most important; it is the main crop for subsistence purposes. This practice has been found to be an efficient technological adaptation in the tropical agriculture of mountainous areas and until some years ago constituted the basic subsistence strategy (Beaucage, 1974).

In the high sierra the main crops are maize and beans, which produce one crop per year and the harvest is minimum. There are two agricultural systems. The first relies on the use of a small plow for the very steep slopes and, where possible, an animal-drawn-plow. The raising of animals is reduced owing to the characteristics of the land. The cultivation of maize and beans is most important. On some sites, where it is possible to take advantage of micro-climatic differences, the cultivation of potato, barley and fava bean is also carried out. In the flat ravine and valley bottoms, tropical fruit trees are planted.

Traditional agriculture, devoted particularly to maize, demonstrates fine adaptations to the Sierra climate and relief conditions. This slash-and-burn practice called *roza-tumba-quema* was adapted to different specific conditions but it was the most common agricultural practice among all peasants of the Sierra. Its roots are found in pre-Hispanic agriculture practices. Totonacos carried out this practice, and later Nahua arriving in the region would have practiced a similar cropping system (Kelly and Palerm, 1952). This system was based on certain practices that accelerate soil recovery. Once slash-and-burn had been carried out, crop plants grew among the weeds and some seeds of successional tree species started to germinate. After two or three more cropping cycles the land was abandoned for the regeneration of

vegetation. The time the land was left to rest, depended on the land characteristics, but it appears from some studies in the Sierra (Kraemer and Solorzano, 1990) that on average it was at least seven and a half to eight years after three crop cycles. In this way around nine to 10 hectares were required to maintain one hectare of maize per year.

In recent years slash-and-burn techniques, as well as other traditional agricultural practices, have almost disappeared. Although it is not possible to calculate the extent of land still devoted to these practices or the approximate number of peasants still practicing them, certain parallel processes confirm this tendency. Some processes that have contributed to the abandonment of traditional agricultural activities are the fragmentation of small agricultural lands, the expansion of cattle ranching and coffee plantations, and growing temporary migration beyond regional borders.

For Kraemer and Solorzano (1990) one of the main factors affecting the slash-and-burn system is the *parcelación* (land fragmentation). Navarro (1979) observes that most communities where traditional maize agriculture was carried out were in possession of communal lands. However, by the end of the 1960s landowners of large properties obliged them to gradually sell their properties off in very small plots². Besides land fragmentation, Masferrer Kan and Báez (1993) mention other processes that contributed to the decrease of slash-and-burn practices. By the end of the 1970s, when INMECAFE support was successful, the conversion of maize lands to coffee plantations increased. A hectare of coffee yielded more than one hectare of maize and beans, even when coffee prices were stagnant. The national policy of buying operations and granting credit gave security to many small peasants, who decided to convert their small agricultural plots to coffee plantations.

The abandonment of traditional agriculture has impacted on the social and natural environment of the Sierra. García Martínez (1987) points out that current intensive land use practices have negatively affected natural resources, but human activities of the past have already had an impact on soils and vegetation. García Martínez (ibid.) mentions that during the Spanish colonial period, minor livestock, such as sheep and particularly goats, provoked erosion. A high erosion rate has been reached in some parts of the Sierra and is the focus of increasing attention in regional development plans (PDSNP, 1992).

² Land fragmentation, and especially pressure on owners of small land plots, continues even on private properties. During fieldwork it was observed that small scattered properties dedicated to maize cultivation remained in the middle of large properties, particularly cattle ranches. Peasant owners of small land plots in Tlacuilotepec called to their properties 'islands of maize'.

Increase of non-agricultural activities

Most small peasants of the Sierra Norte have based their subsistence on a combination of different activities, involving diverse non-agricultural activities. From as early as the XIX century the population could not survive from agriculture alone and had to complement their daily subsistence by other activities (Beaucage, 1974). The most common were extraction and handicraft production. Lately temporary labor within and outside the region has become a significant economic activity.

Since the beginning of the XX century, the population of the low sierra has moved towards the state of Veracruz to work in sugarcane plantations and processing plants. From the late 1950s people from the high sierra started to migrate during coffee harvest periods to the extensive coffee plantations located in the low sierra. Later, alternative migratory currents started to move towards the state of Tlaxcala, to Tulancingo, Puebla and Mexico City, where workers engaged in construction activities or were employed in processing factories (Masferrer Kan and Martínez Alfaro, n/d). Around 20 years ago, a new period in labor migration began. Some indigenous villages, apparently mostly Otomi people living in the state of Hidalgo, began to migrate to the United States. Through their links and channels other inhabitants of the Sierra have taken this step (chapter 5, section 5.5.2).

Among alternative regional activities, extractive activities have greatly increased, especially the extraction of decorative and medicinal plants. In the last six years, three new processing plants for the elaboration of herbal medicine have been established in Pahuatlán, the head village to which San Pablito belongs. A greater number of peasants from the region are involved in extraction activities, including bark extraction for the manufacture of paper. These are very flexible yet low-paid activities, and are also carried out under illegal conditions.

The increase in non-agricultural activities has become an important source of income for many peasants, not only in Sierra Norte de Puebla but also in all Latin America. In a comparative analysis of the dynamics of different farmer groups in Latin America, de Janvry and Helfand (1990) observed a considerable degree of specialization in farming systems according to farm size. The large farms are substantially governed by market dynamics, with either industrial inputs or urban food and export crops. For owners of small farms, farm income constitutes considerably less than 50% of their total income. Among non-farm activities wages are by far the most important source of income as they account on average for some 43% of total household income. Among 11 regions analyzed, Puebla occupied the second place as regards income derived from non-agricultural activities.

Although there are similarities across some Latin America regions, particularities arise when considering the local driving forces. In the Sierra Norte, the coffee crisis that occurred at the end of the 1960s marked an important regional transformation with significant consequences. Since then, the agricultural sector has not recovered and has shown neither economic growth nor growth in production. The coffee crisis was part of a major national agricultural crisis that marked the end of nearly all state support for agriculture. After the coffee crisis, migratory movements at regional and international level intensified, especially to cities closer to the region, such as Pachuca and Tulancingo in the state of Hidalgo and Mexico City.

Even though the region has a long tradition of migration and, as Beaucage (1974) comments, it has been a constant condition throughout the Sierra, migration has increased in the last two decades. Today it is an option increasingly undertaken by indigenous people, small poor peasants, as well as mestizo people living in head towns and engaged in a variety of commercial and processing activities. The decline in rural subsistence practices and the present trend in land use changes have intensified migratory movements towards urban areas inside and outside Mexico (chapter 2, section 2.3.3).

In Mexico migration to the United States is now standard practice in rural areas and across the economic spectrum. Through migration indigenous peoples are establishing new social, economic and cultural relations inside and outside their village territories. Although increasingly more migrants do stay permanently in the United States, in general migration is still temporary, lasting no more than two years and limited geographically – that is, migrants belong to specific villages and arrive at specific cities and towns in the United States. The close links and communication with the place of origin remain strong, and new forms and types of relations start to build up between the migrant population and those staying behind in the village (Conway and Cohen, 1988).

The migratory movements of the Sierra Norte have not yet been studied or documented but will certainly require analysis. The effects on the environment will emerge in the coming years. Nonetheless, the first impact, which is accompanied by the effect of the last agricultural policies, is the gradual abandonment of subsistence agricultural activities and all types of agricultural lands.

8.3 Coffee plantations

The introduction and expansion of coffee plantations in the Sierra have been evaluated in different ways. For some social researchers, regional social and economic stratification among the different population groups has polarized in two main sectors: the owners of large coffee plantations retaining links to national and international markets, and the small and poorest coffee plantation owners dependent on local and regional wholesalers (Beaucage, 1974; Paré, 1976; Navarro, 1979). From another point of view (Beaucage, n/d; Kraemer and Solorzano, 1990), coffee plantations represent a successful land use system, particularly in temperate mountainous areas. Their adoption by indigenous people reflects their adaptability and constant innovation in resources management, based on the display of diversified strategies for different purposes, including cash income.

Both points of view correctly describe the reality of Sierra Norte de Puebla and are crucial in the building of economic relations among inhabitants of the region. Due to their importance, the way in which this land use system was introduced and has expanded explains to a great degree the interlinked social and economic conditions of the Sierra and the survival strategies of the people living in this region.

8.3.1 History of coffee plantations

Coffee was introduced to Mexico around 1700. It appears that the focus of dispersion was the plantations established in the municipality of Córdoba, the state of Veracruz, from where the crop advanced towards the north of Veracruz and the neighboring northern portions of Puebla and Oaxaca, and into the state of Hidalgo and San Luis Potosí. The ecological conditions in Sierra de Puebla were suitable for coffee plantation; introduction depended more on the existence of other conditions, especially transportation. The first areas in Puebla where commercial coffee was introduced were a few municipalities (Cuetazalan, Tlatlauqui, Heytamalco, Hueyapan and Zoquiapan in neighboring Veracruz State). A less important region producing coffee was reported in 1932, involving the municipalities of Pahuatlán, Tlacuilotepec and Huauchinango, where there were only dirt roads for animals, called *caminos de herradura* (dirt roads for horseshoe), to transport coffee from the processing unit in Pahuatlán to the nearest train station in the municipality of Honey (Navarro, 1979).

For some authors, such as Kraemer and Solorzano (1990), Navarro (1979) and Beaucage (1974), the introduction of coffee in some areas in the Sierra is closely linked with the appearance of caciques (1920-1930), the later agrarian distribution

under the Cardenas presidency (1935-1940) and the opening of new roads. Before the introduction of coffee, the situation saw the prevalence of indigenous people with communal and private lands used for subsistence agriculture, and private lands used for extensive cattle ranching. This is exemplified by Kraemer and Solorzano (1990) in the case of the municipality of Zihuateutla located in the low sierra. Indigenous people claimed their lands as ejidos but the local cacique, who at that moment was functioning as municipal president, hoarded the lands by illegal means. The authors identify that dispossession of communal land was consolidated by the irruption of agricultural enterprises in which the government institutions for coffee (first the Comisión Nacional de Café (National Coffee Commission and later INMECAFE) played an important role, supporting the establishment and development of coffee-producing enterprises.

The Comisión Nacional del Café was created in 1949. Its main objectives were to improve plantations by applying modern production systems, to organize services for laboratory research and for experimental field bases, and to handle the paperwork with bank institutions for granting credit to coffee plantation owners. In practice this commission supported mainly the large coffee producers. In 1950 and 1957 an increase in production of 63% was obtained, mainly due to the expansion of the area under coffee. In 1957 Mexico signed an international agreement with other coffee-producing countries to achieve the stabilization of grain prices in the international market. This agreement forced Mexico to control the coffee industry by promoting internal coffee consumption, and by reducing the amount of land for its production and the productivity increase. To reach these objectives, in 1957 the Mexican government created INMECAFE to be in charge of buying and selling operations and of regulating supply and demand. A guaranteed price was implemented but, due to the reduced number of INMECAFE public processing plants and buying centers, the price of coffee could not be effectively standardize in most parts of the country. In remoter areas marketing continued to be harnessed to the presence of wholesalers, who utilized credit systems and paid lower prices than those of the real market.

As part of the new agrarian policies in 1972, INMECAFE policies also changed. The programs implemented focused on organizing economic units for production and commercialization, with the intention of avoiding intermediaries, and on organizational support for crop technologization in order to obtain high yields. During those years the spread of a plague called *roya anaranjada*³ necessitated

3 A fungal disease of coffee known in Spanish as la roya and in English as coffee leaf rust (*Hemileia vastatrix*). In Mexico and Central America the outbreak of this plague occurred during the 1970s.

technological changes to keep the coffee plant vigorous and the application of fungicides. Programs were applied attending to these demands. Technical supervision and market operations were reorganized. From 1970 to 1980, INMECAFE exported around 40% of the total Mexican coffee. The international coffee roasters brought the product directly to exporters/coffee processors or but especially to INMECAFE, who were in control of the export market and who in turn were controlled by the International Coffee Organism (OIC) (Kraemer and Solorzano, 1990).

The next changes promoted by INMECAFE, expanding coffee on peasant lands and steering the crop system in a more technological direction, led to exhaustion of the system, which together with the spread of plagues, marked the decline of this land use system (Kraemer and Solorzano, 1990). In 1980 international coffee prices dropped drastically and INMECAFE introduced sun-grown coffee plantations, intending to modernize and increase production. At the beginning of the 1990s the closure of INMECAFE implied the end of financial support and controlled subsidized prices (Nestel, 1995).

At present coffee is in crisis as a result of the fall in international prices. Some peasants have abandoned their plantations in the high sierra, while in the low sierra producers with more means are actually buying more land and introducing extensive commercial crops or intensifying coffee plantations through open-sun plantations and the intensive use of agrochemicals. Other coffee producers of the low sierra started to compete by installing their own coffee processing installations and reaching markets to sell their own products directly.

8.3.2 Ecological, social and economic attributes of shaded coffee plantations

Coffee plantations are managed as agroforestry systems. These systems, which can range from little disturbance to natural forest to more intensive use of forests or forests species, have proved to be sustainable forms of land management. They combine economic benefits with seemingly diversified production and maintenance of the landscape equilibrium (Beaucage, n/d; Nestel, 1995; Moguel and Toledo, 1999).

In Mexico five main coffee production systems have been distinguished according to management level and vegetational and structural complexity. These range from plantations where multi-layered vegetation is maintained to agro-industrial open-sun plantations (see Figure 8.2).

1. **Unmanaged polyculture:** On this type of plantation, plants growing on the floor of temperate forests are replaced by coffee bushes and consequently the original tree cover is maintained. This system requires minimal management and no use of agrochemical products.
2. **Traditional polyculture:** This is considered the most advanced system in terms of manipulating not only native but also introduced plant species. As in the previous case the vegetation on the floor is removed and replaced by coffee plants, but alongside the coffee plants numerous other species are introduced for local subsistence and market, such as foodstuffs, medicines and raw materials.
3. **Commercial polyculture:** This system involves the complete removal of the original forest trees and the introduction of appropriate shade trees for coffee cultivation. The production is exclusively for market and the use of agrochemicals is frequent.
4. **Shade-grown monoculture:** This system was introduced by INMECAFE and consists of only one type of tree as shade, Leguminous trees. This is a market-oriented system, with the obligatory use of agrochemicals.
5. **Unshaded monoculture:** In this system there are no trees at all. It requires high inputs of chemical fertilizers and pesticides, the use of machinery and is labor-intensive throughout the year. The highest yields are obtained under this system.

These five systems represent a gradient from the most traditional low-input and vegetationally and structurally diverse systems to the least diverse and most intensive technologized modern systems. Traditional coffee plantations maintain multi-layered shaded coffee agroforests, which contrast sharply with the modern agro-industrial sun coffee plantations, with their chemical inputs and year-round labor.

Shaded coffee plantations in the mountainous areas of Mexico, as well as in other countries of Latin America, are qualified as the most suitable land uses for diverse (e.g. ecological, economic and cultural) reasons (Moguel and Toledo, 1999). From the ecological point of view, the role of shaded coffee plantations is essential, particularly in heavily deforested areas where they constitute important repositories of biological diversity because of their vegetation composition and their function as habitats for many mammals and birds (Moguel and Toledo, 1999). As some studies have pointed out, shaded coffee plantations are highly biodiverse natural reservoirs, representing in extensive areas at country level the only remaining forest patches (Gallina et al., 1996).

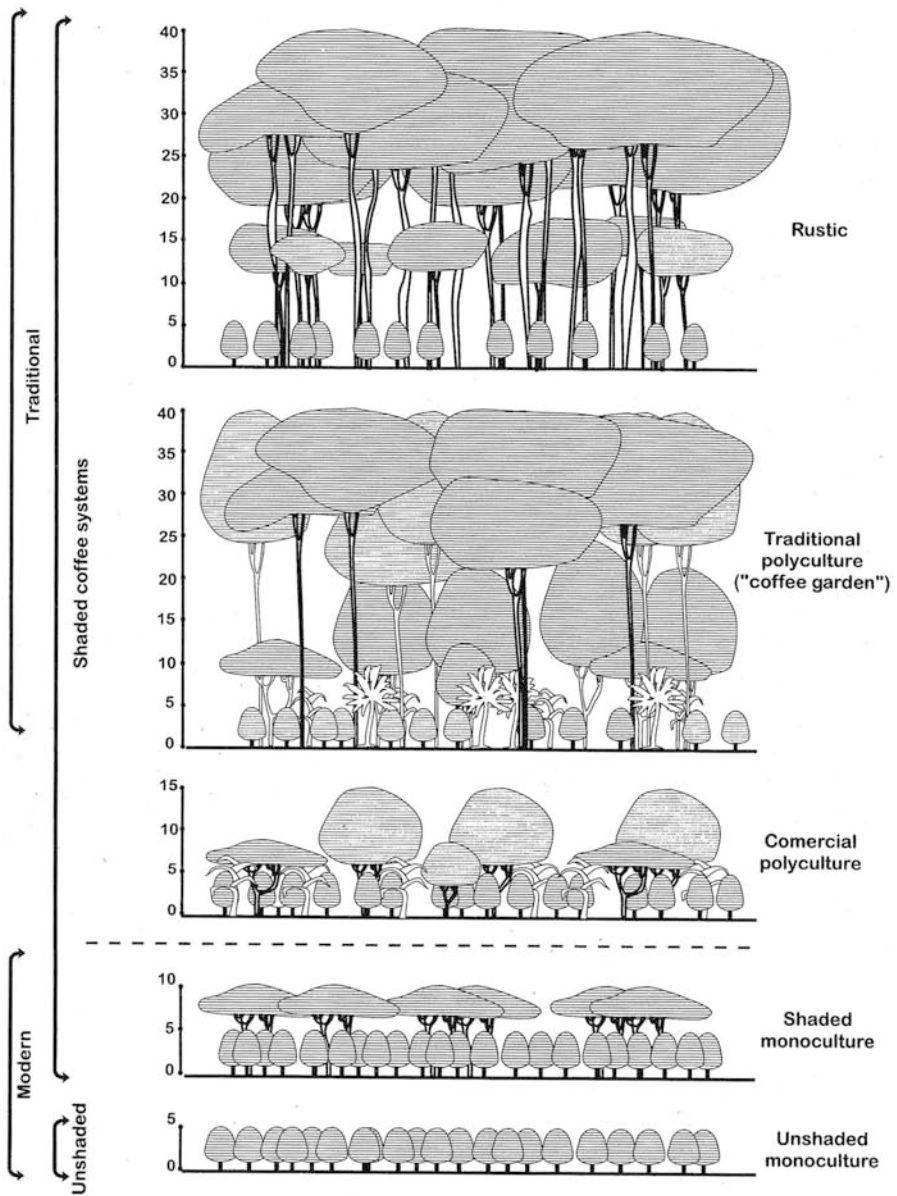


Figure 8.2. Coffee growing systems in Mexico (from Moguel and Toledo, 1999).

From the socio-economic point of view, within the Mexican context it has been calculated that around 90% of coffee growers work small holdings covering less than five hectares and a substantial amount of coffee is being produced in indigenous areas (Moguel and Toledo, 1999). Similarly, as occurs with the management of shifting agricultural systems (explained in section 8.2.2) with roots in pre-Hispanic natural resources management, coffee plantations illustrate, according to Beaucage (n/d), the form in which indigenous people resourcefully adapt new cultivars, such as coffee brought by the Spaniards, into previous multi-strategy land uses. At present traditional enhancement of natural conditions and ecological knowledge through coffee plantations constitute alternatives to overcome limits in land and production means, especially for indigenous people.

More recently traditional shaded coffee plantations have acquired greater importance at national and international levels, since organic coffee is being gathered from plantations of this type owned mainly by indigenous people. Through direct agreement with producers some international trading organizations are supporting the production and commercialization of organic coffee via international distribution of this product and the maintenance of fairer local market conditions for coffee producers.

8.3.3 Characteristics and present conditions of coffee plantations in Sierra Norte de Puebla

Coffee plantations constitute the third most important land use system in Sierra Norte de Puebla (INEGI, 1994)⁴, varying greatly between the mountain and lowland landscapes. Coffee production is carried out in numerous small and medium production units (less than 15 hectares), of which the indigenous population possesses and exploits the small ones (less than five hectares, average one hectare). In the low sierra extensive coffee plantations from 50 to 200 hectares are the most common. In the high sierra, as in most mountain areas in Mexico, shaded plantations

4 In fact Sierra Norte de Puebla attained the highest production rates in the country in 1975, with a harvest of 6445.83 kg of coffee (*cereza*) per hectare, while the mean national average per hectare was 3075 kg (Kraemer and Solorzano, 1990).

of on average one hectare are widespread and in the hands of small-scale peasants and indigenous peoples (INEGI, 1994).

According to the classification described in the previous section, in terms of vegetation composition and management intensity, four main types of coffee plantations can be recognized, at least within the actual harvest area. In the high sierra mixed coffee plantations (average one hectare) are common, which range from the traditional polyculture to commercial polyculture that requires low technological input with a high to moderate density of native and introduced tree species. In the low sierra extensive plantations with a low density of one or two tree species – the commercial polyculture type and shaded monoculture plantation requiring high technological levels – prevail. Finally open-sun plantations are found in the low sierra.

Trends of change

Within rural Mexico, the most recent changes are related to depressed national and regional socio-economic conditions, along with the signing of international commercial treaties, basically NAFTA. First, the cancellation of agricultural credits and the reduction of subsidized prices for staple goods and commercial crops such as coffee grains have had a great impact on small farmers, who are gradually abandoning agricultural activities (Harvey, 1996). Second, commercial crops, in this case coffee, are subject to international market regulations. This implies constant changes in price and market opportunities, widening contrasts among regional populations, mainly between owners of large intensive productive plantations and indigenous owners of most traditional shaded coffee plantations.

These national and international policy changes have impacted on the Sierra Norte. In the case of small landholders uncertainty has led them to lose interest or abandon their coffee plantations. In the case of large-scale owners, this has led to major competition and intensification of their production through open-sun plantations. These types of plantations are high yielding but require high inputs of chemical fertilizers and pesticides, the use of machinery and intensive labor throughout the year. Their introduction in the Sierra Norte is increasing (Plate 8.1). In one municipality in the Sierra Norte, this plantation type represents more than half of the total plantations, a case that also stands out at country level (Santoyo et al.,

1995) (see Table 8.2, where among different important coffee areas in Mexico, Xicotepec in Sierra Norte de Puebla and one of the main areas for bark harvesting ranks second, showing a high percentage in coffee plantation conversion). Open-sun plantations, if correctly managed, represent a high-yielding system. However, their introduction, as several authors point out, implies negative impacts for the environment and for local social and economic conditions (Pimentel, 1992; Moguel and Toledo, 1999).

It appears that, as mentioned at the start of this section and as already observed since the 1970s (Paré, 1976), social and economic relations in the Sierra Norte are very much shaped by the production of coffee in a hierarchical way. At the base are the great majority of small coffee plantation producers and at the top the owners of large plantations, who are the regional wholesalers and own processing installations concentrated in the regional cities or in the municipal head towns. Some wholesalers are not producers so they ensure a regular volume through extending credit and through a complex intermediary network (Beaucage, 1974).

The old market structure controlled by local and regional middlemen, owners of the larger coffee plantations, had become a major obstacle for more recent initiatives, such as the one attempted by small plantation owners willing to introduce their production into fair trading organizations. There was also the Max Havelaar project, which had supported coffee production in south Mexico, where indigenous people owned small shaded coffee plantations. For the Sierra Norte, the most recent situation continues to entail greater competition, leading to intensification of the system (from shaded-grown to open-sun plantations) and the organization of small enterprises for processing coffee from grain to end-product and intended to compete at national and international scales.

The implementation of an economic organization around coffee plantation is shaped by the ecological and historical conditions of Sierra Norte de Puebla. Coffee production is carried out in numerous small and medium production units (less than 15 hectares), of which indigenous peoples possess and exploit the small ones (less than five hectares, average one hectare). The internal situation reflects the increasing deterioration of market conditions for smaller producers and falling salaries, while external conditions are greatly determined by a competitive international market.

Table 8.2. Types of coffee growing systems in the main coffee producing regions in Mexico, 1994.

Regions	Type of coffee growing system (% area)				
	Unmanaged polyculture	Traditional polyculture	Commercial polyculture	Shade-grown monoculture	Open-sun monoculture
Atoya Guerrero State	70	30	--	--	--
Cuetzalan Puebla State	--	85	5	5	5
Xicotepec Puebla State	--	20	20	10	50
Central Veracruz	1	32	54	12	1
Pochutla Oaxaca State	65	5	25	5	--
Soconusco Chiapas State	--	15	50	5	30
Selva Lacandona, Chiapas State	3	28	60	8	1

Source: Santoyo et al., 1995



Plate 8.1. Conversion of shaded coffee plantation at the back to open-sun plantation at the front.

8.4 Summary

This chapter has focused on Sierra Norte de Puebla. The aim was to recognize the regional context in which paper production and bark harvesting are carried out, and identify the historical antecedents of the region, in terms of land tenure, land use systems and type of population. Three main characteristics of Sierra Norte de Puebla have been pointed out in literature sources and also repeatedly in this book: the isolation, the division of the population into two types, and the multicultural character of the region.

While these characteristics have shaped life in the Sierra (as discussed throughout in this chapter), it is also important to observe how the latest changes have taken place and how they could modify past views of the Sierra. In this sense, Sarmiento's theoretical model proposed for mountainous areas (chapter 3, section 3.3.3), in which the author explains that previous views (Murras' vertical view) of mountainous areas were quite static, is appropriate to use here. Sarmiento (2000) makes a claim for a new form of analysis within a framework of the new processes linking mountainous areas, once considered isolated, with the exterior through market, political and cultural ties.

One of the most marked features of the Sierra is its isolation. Historically the location of the Sierra settlements in relation to the most important colonial and current centers of development has been a factor that contributed to the slower settlement process and integration into dominant economies, especially when compared with other regions in Mexico. This factor that, as Sarmiento (2000) states, was thought to be the ruling factor for mountainous areas, needs to be

reoriented. As this study also reveals, the long-lasting isolation and tough terrain conditions of mountainous areas are no longer restrictions, especially at present, when goods are circulating, new markets are opening and migratory movements are increasing.

But even before the Spanish conquest, in fact since the pre-Hispanic period, as García Martínez (1997) points out, the Sierra as a transitional physiographic area has been a place of communication between the coast of Veracruz and the Mexican central lands. Consequently, as García Martínez establishes, the settlement of the Sierra has to be seen as a conglomeration of populations, each connected to other places of temporary transit. This aspect is important in relation to the continuity of the amate paper manufacture, since several authors (Lenz, 1973; Dow, 1986; Sandstrom and Sandstrom, 1986) designate isolation as one of the conditions that enabled the survival of this technology during the Spanish colonial period. But besides the isolation – or even more important – it is the historical ethnic background of the Otomi people, as one of the indigenous groups in Mesoamerica that maintains their autonomy and continued to maintain it during Spanish domination (chapter 4, section 4.3.1). In this sense isolation since pre-Hispanic times can be relativized as a ruling factor in the Sierra mountainous region.

Within the Mexican context, another way in which Sierra Norte de Puebla has been observed is as a place of refuge. The concept ‘refuge zone’ coined by Aguirre Beltrán (1963) was extensively used among Mexican anthropologists to characterize indigenous villages in mountainous areas as populations escaping from centers of domination. But in the face of the present situation the term conjures up rather static bipolar conditions, whereas the historical development of the Sierra – as probably of other mountains – is more complex, involving the constant incursion of different groups, indigenous and non-indigenous, and the settlement of centers of power even within the same region.

In relation to the above, the composition of the Sierra, with the clear distinction between indigenous and non-indigenous, is also found in several bibliographical sources about Sierra Norte de Puebla (Aguirre Beltrán, 1963; Paré, 1976). Among several aspects that mark the difference between these two population groups, it was stated that a very important difference resides in their contrasting attitudes towards the market. At present most indigenous and mestizo populations are already integrated in marketing networks. As the amate case demonstrates, indigenous perception of marketing has changed as migration and communication increases.

Throughout, the very static and sharply stratified social situation of the region is given in most bibliographical sources. However, it is presumed that more recent changes – the national land tenure and agricultural policies with direct effect on rural areas, and local processes such as migration, non-agricultural activities,

political conflicts and new markets – mark new socio-economic conditions for the whole Sierra. Although economically and socially indigenous people lie within the population of the Sierra, they are the most marginalized. The difference still largely remains in the economic conditions and in general access to education, health, infrastructure and services. Within this social and economic context San Pablito stands out as one of the few indigenous villages that has acquired an important economic and political role in the Sierra, mostly through its handicraft production.

In general, however, Sierra Norte de Puebla continues to be a highly diverse and contrasting region in natural and social terms – historically populated by different indigenous and mestizo people, carrying out different economic activities. Indigenous people, as well as other inhabitants, had less access to land, resources and economic means than the mestizos, who had more economic and social power. Indigenous people were until some two decades ago immersed in agricultural activities, but at present economic activities outside their villages and the Sierra are most important. For owners of extensive properties the expansion in terms of land and economic means continues to be increasingly based in technologized or intensive land use systems. At regional level, one of the most drastic changes has been the abandonment of traditional agriculture, especially of maize cultivation, for what has been considered very fine adaptations to the Sierra climatic and relief conditions. This has meant the loss of self-sufficiency and, moreover, increasing deterioration of the environment.

Coffee plantations constitute the third most important land use system in the harvest area in ecological, economic and social terms. These, as explained in this chapter, vary greatly between the mountain and lowland landscapes. Small shaded plantations of on average one hectare are most common in the high sierra, while large plantations (up to 200 hectares) are found in the low sierra. This situation where a few wealthy people specialized in intensified agricultural or grazing production own the best and largest areas is, as pointed out by Zimmerer (1999), a frequent occurrence in many places in Latin America. But, also as Zimmerer points out, peasants coping with limited land availability and production factors maintain and even enhance intermediate systems such as shaded coffee plantations on small land plots.

Coffee plantations, as could be observed in chapter 7, are essential for the supply of bark extracted from *T. micrantha* trees. Through the new forms of bark supply a strong link emerges between shaded coffee plantations and amate production. Nowadays amate depends on these land use systems and its future also depends on the prospects for shaded coffee plantations. The existence of coffee plantations and their status as privately owned lands have enabled the continuity of this handicraft production.

Overview, answers and conclusions

9.1 Synoptic history of amate paper

In this section a historical overview of amate paper is presented. This preliminary section provides essential information and helps to recall the contents of this book before the answers to the questions are discussed. On the other hand, it is at this stage, after the history of paper and bark trees has been explored, that some main characteristics of amate production can be compared, contrasting the three main historical periods: the pre-Hispanic period, the Spanish colonial period and the last 40 years of amate as a handicraft product.

9.1.1 Summarizing amate history

Archaeological evidence of the manufacture and use of amate by Mayan people in the south of the Yucatán Peninsula in Mexico dates from about 300-500 A.D. From 1100 until the Spanish conquest, the Aztecs used it extensively in rituals, decorations, offerings, ceremonial costumes and as tribute. Amate constituted the base for the codices in which the history, religion and culture were recorded and described. Tenochtitlan, which was the center of the Aztec Empire, received amate paper from about 40 tributary villages.

When the conquest of Mesoamerica started, the Spaniards suppressed the historical records and ritual traditions of the Indians, thus the elaboration and use of amate was forbidden. Although the aim of the Spaniards was to achieve control over all Mesoamerican territory in order to homogeneously impose their laws, traditions and religion, some indigenous groups, such as the Otomi of Sierra Norte de Puebla, who were one of the few indigenous groups not dominated by Aztecs before the arrival of the Spaniards, displayed great resistance and covertly preserved their rituals. The Spaniards faced resistance and opposition, as well as the significant geographical obstacles of the rough mountainous region of the Sierra. A long period of time passed before the Spaniards could control the region and establish the first parochial churches. The Otomi of San Pablito were among the indigenous groups that during the Spanish colonial era continued to manufacture bark paper in Sierra Norte de Puebla. It is not known how or when the Otomi started to manufacture bark paper but according to some colonial documents and studies they have long used bark paper for rituals, by cutting out paper figures that represent their gods and deities. At present the Otomi of San Pablito are the only artisans at national level producing commercial bark paper, although other groups add value through decorating. Within San Pablito two types of bark paper are produced: for commercial and ritual purposes.

The launch of amate as a handicraft product dates from the 1960s. In the early stages of amate commercialization, the entire Otomi paper production was sold to Nahua artisans living in the state of Guerrero. Nahua artisans decorate the paper with colorful paintings. In the last few years, however, Otomi artisans have greatly diversified their production and market options. Nahua artisans still take about half of all Otomi bark paper but the other half is sold in different markets. Nowadays, Nahua and Otomi artisans are constantly innovating and introducing new paper products. Amate is sold directly to end-consumers by Otomi and Nahua artisans and indirectly through a great array of arrangements with wholesalers and intermediaries at local, regional, national and international levels. A complex and long commodity chain has been developed involving a large number of social actors, including bark harvesters, artisans, transporters, wholesalers, handicraft entrepreneurs and artists.

As market demand rises there are increasing pressures on tree resources to augment bark supply. Traditionally the Otomi debarked selected species of trees growing within their territory. Today, however, the supply depends on regional harvesters who gather the resource from an expanding harvest area of around 1 500 km² within the Sierra Norte de Puebla region. On the other hand, more tree species are being adopted for bark harvesting; at present 13 species occurring in different land use systems of the Sierra Norte are being used. Of these species, *Trema micrantha* is the most important; about 90% of the raw material at present used is extracted from this species. *T. micrantha* are managed as shade trees in coffee plantations, the third most important land use system of Sierra Norte de Puebla. The persistence of this handicraft production, previously expected to disappear because of the scarcity of bark raw material, is at present based on the exploitation of *T. micrantha*, the continuous adoption of suitable tree species for bark production and on the integration of more regional harvesters.

The knowledge, management and perception of trees used for bark paper also have, as the paper itself, a long history. Although, compared with the bark paper, there are fewer historical documents about bark trees, it is known through interpreting past and present myths that trees attained important symbolical value in Mesoamerica. At present in San Pablito some of the tree species traditionally used for paper manufacture, mainly *Ficus* trees, still maintain an important symbolical place. As Otomi artisans are increasingly relying on regional harvesters for bark supply, knowledge about managing bark trees and harvesting techniques leads to the consideration of paper manufacture and bark harvesting as separate activities.

9.1.2 Comparison of three identified historical periods

The history of bark harvest and amate paper is largely a history of adaptations. During the long historical trajectory of amate the key aspects of this production have changed: bark trees, production places, paper products and places of distribution. Throughout this book different aspects have been explored, specifically the cultural values granted to bark paper and bark trees (chapters 4 and 6) and the changes in paper production and bark extraction activities (chapters 5, 7 and 8). These adaptations have meant the expansion or reduction of options in terms of natural resources used, places of production, channels of distribution and uses of products. Figure 9.1 attempts to schematically represent the main changes during the three main historical periods of amate: the pre-Hispanic period, an intermediate period between the Spanish colonial era and before amate became a handicraft product, and the most recent period since amate has constituted a handicraft.

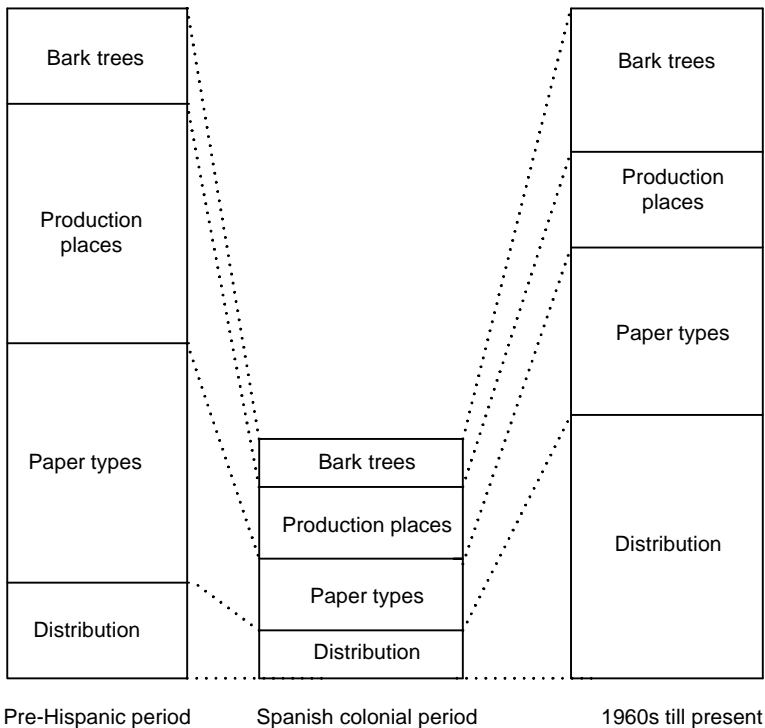


Figure 9.1. How the paper production has adapted. Comparison of options in terms of tree species used for bark supply, number of places from where bark is extracted, type of paper produced and end distribution channels, illustrates changes in the three identified historical periods. (Note that present paper production is not the same as that assumed for the pre-Hispanic period.)

Of the three periods, the pre-Hispanic and present can be compared against the intermediate. In general, during the past and present periods numerous options based on the diversification of resources, modes of production and types of products were and are available, whereas during the intermediate period, between the Spanish conquest and the start of amate as a handicraft, all options were minimized. During the intermediate period, the manufacture and use of amate was restricted to a few villages in Sierra Norte de Puebla, San Pablito being one of them, and the type of production was restricted to ritual paper. The pre-Hispanic past and present periods can be contrasted. In the past there were numerous villages producing bark paper; at present San Pablito is the only commercial paper-producing village in all Mexico. The opposite is the case with the paper distribution. Whereas in the past the paper produced in many villages was concentrated in Tenochtitlan, the paper today from San Pablito is distributed to different places inside and outside the country. In both periods, bark paper has attained distinct cultural values, such as sacred values and exchange values, but in the past a greater part of the paper was used for ritual purposes, whereas at present the majority is used for decorative purposes.

This compact and rather simplified historical overview and comparison of the main historical periods roughly illustrates the main changes in amate production. In reality, however, events and the sequence of adaptations overlap. Amate has persisted throughout a long period of time, expanding and contracting in terms of 'options', resources, people and places.

In making this comparison an aspect that attracts attention is the amount of bark paper produced today and in the past. There are no sources of information about this, and only rough estimations offer some figures. In Codex Mendocino made at the request of the Spanish Crown to ascertain the tribute system in Mesoamerica, an approximate 480 000 paper sheets produced in only two tributary villages are recorded (Lenz, 1973). It is also estimated that there were more than 40 amate tributary villages, so it can be assumed that much larger quantities of amate were delivered to Tenochtitlan (ca. 1100-1500 A.D.). At the start of the 1970s Gobi Stromberg (1982) studied the production of Nahua amate painters. From her monthly estimates she gives a figure of about one million paper sheets painted per year. For the present study, rough estimations were made based on monthly records of paper production and of bark volumes supplied to San Pablito (chapter 1, section 1.5). Both estimates were cross-checked and gave a figure of about two million paper sheets per year.

The amount of amate produced at present is not the same as the amount of paper produced during the pre-Hispanic period. The main difference is that now all the actual paper is produced in one village only, whereas in the past numerous

villages were involved in this activity. The implications of this situation are various and include the enormous pressure on bark trees growing close to the area of paper production and the concentration of specialist manufacturing technology maintained solely among Otomi artisans. The numerous implications of the growing commercial demand are discussed in the research questions.

9.2 Answers to the research questions

This section proposes responses to the four research questions posted in chapter 1. As mentioned in chapter 1 the order of the questions reflect the historical trajectory of amate paper.

9.2.1 Question 1. Cultural values through history

How have bark paper and bark trees been culturally embedded, and what social-cultural roles have they played throughout the long history of amate production?

Exploration of the cultural aspects of bark paper and bark trees reveals important aspects about how amate production has continued to present times. These cultural aspects refer to the values conferred by people, societies or individuals on the paper and the trees, and the way these have been perceived through history.

Amate paper and bark trees

Observing the whole historical trajectory of amate production, it is possible to generalize three main time periods: its past versatile condition during the pre-Hispanic period, the ban during Spanish colonial period, and profuse handicraft production during the last 40 years.

The history of bark paper is closely linked with the human need for communication and expression. The use of paper for writing and communication purposes was, and largely continues to be at present, the manifestation of the control of information, of power. The period before the Spanish conquest when bark paper was most widely used was during the period of Aztec ruling. Religion and politics joined forces in order to control and dominate and bark paper, among other objects played an important role within these arenas of power. Aztec ideas, beliefs and precepts were largely shaped in bark paper, which implied a great saving in time, space and labor in their expansion.

Throughout, amate has played important roles within power and resistance relations. During the pre-Hispanic past amate constituted a form of control used by Aztec authorities in extending their domain through all Mesoamerica. During the Spanish colonization its use represented a form of resistance by the few indigenous groups in the Huasteca and Sierra Norte de Puebla regions who continued elaborating paper as part of their ritual customs. Its use in forms of sorcery directed against the Spaniards also constituted a form of direct resistance. At present it is principally a handicraft product, but it has also been used as a direct form of protest. Chapter 3 (section 3.3.1) cites examples. The Nahuatl successfully used their amate paintings to protest against the construction of a dam in their territory, which was going to bring damaging social and environmental consequences. Or in more indirect way, like the Otomi due to their economic and political strength acquired through amate production, have found a way to advance their political objectives and social rights, including infrastructure (chapter 4, section 4.4.3 and chapter 5, section 5.5.3).

In relation to the cultural values of trees there are fewer sources of information than the amate paper. However, it is known that trees in general have retained an important symbolical role within past and present indigenous populations in Mexico. In pre-Hispanic times trees were key elements of the cosmovision of indigenous people in Mesoamerica, including the Otomi people. Trees, as described in chapter 6, represented the layers of the mythological universe, divided by the sky, earth and heaven and the start of time.

After Spanish colonization, the fundamentals of Mesoamerica cosmovision were disrupted, syncretic conceptions composed of pre-Hispanic origin and Catholic elements emerged (chapter 4, section 4.3.2). In relation to amate and bark trees, forbidding amate manufacture implied an end to the use of bark trees; moreover the whole imposition of the Catholic religion implied a change in the perception of nature¹. In the case of trees used for amate paper, it is known from different bibliographical sources that during pre-Hispanic times different types of *Ficus* trees (or *Higueras*, as they were called, the popular generic name grouping different *Ficus* species) were being used for amate production (chapter 6).

The commercialization of amate paper prompted several changes in the use of bark trees, in the first place the gradual adoption of new tree species. There are

¹ The perception of nature is largely rooted in the basis of beliefs and religions. The main difference is found between the Judeo-Christian beliefs (spread mainly throughout Western societies) with an anthropocentric basis separating humankind from nature, and those traditional religions (extending mainly throughout non-Western societies) where man forms part of the natural world and nature and its forces are personified as deities.

now 13 tree species used for amate, among them *Ficus* are the only ones that have an important sacred value for Otomi people. But of all *Ficus* growing in San Pablito only a few are endowed with sacred value. It appears that in contrast to paper, which has passed through different various value phases, the sacred *Ficus* have conserved their sacred value throughout.

Have the values of amate paper and bark trees converged?

If amate paper and bark trees are separately observed, it appears, as explained above, that amate paper has attained different values at the same time. As in the pre-Hispanic period amate is used today as ritual paper and an exchangeable product, formerly used as a tribute, now as a commercial handicraft. In contrast to the bark paper, *Ficus* trees in specific have been conferred with sacred value throughout, and the separation between sacred and non-sacred trees is quite clear. Only some *Ficus* are sacred according to Otomi cosmovision, other *Ficus* are exploited for bark paper.

A further step would be to explore if the values for bark trees and amate paper have converged. It is not known if in the past the bark of sacred *Ficus* was being used for ritual paper. However, something that can be pointed out is that in Mesoamerica amate paper and trees were deeply related to the mythical conception of the world. In this aspect their values converged by containing meaning about the conception of time. While trees themselves in Mesoamerican cosmovision signified or represented the start or birth of time (see chapter 6, section 6.2.1), bark paper was the surface on which this information was impressed. Bark paper was used as the surface for codices, some containing information about ritual calendrical systems, indicating and describing the cycles, motives and procedures of different ritual events.

Now, in the present, it appears that the sacred values of bark trees and amate paper are not linked. Although Galinier (1987) reports that bark paper becomes the upholder of the force that Otomi recognized in plants - which according to Otomi beliefs attain weak or powerful attributes according to their size and corpulence (see chapter 6, section 6.2.3) - it appears, as even Galinier and other authors (Dow, 1986; Sandstrom and Sandstrom, 1986) state, that bark paper used for ritual purposes only acquires power through the actions of the shaman (explained in chapter 4, section 4.3.2). It appears, then, that the sacred value of paper is separate from the sacred value of trees. It is not necessary to use sacred trees for paper used for ritual purposes, and not even *Ficus* species; furthermore commercial tissue paper can be used.

A relevant aspect in this sense is the variety of colors of bark fibers. Each tree species presents distinct fiber colors. The purpose and specific use of cut-out amate figures were closely linked to the color of the paper, therefore of the fibers. In general a light paper color is related to beneficial purposes, darker ones to harmful purposes. The traditional *Ficus* species and *Morus celtidifolia* offered an important variety of bark fibers, ranging from light to dark colors, industrial tissue paper offered even more colors and was quickly adopted by the Otomi and other indigenous groups of Sierra Norte de Puebla. The reason of the quick adoption of industrial paper probably resided in the availability of more colors (yellow, red, green, etc.). The adoption of tissue paper meant the near disappearance of the manufacture of bark paper. The tradition revived when the commercialization of amate began (chapter 4, section 4.3.3).

The above indicates that in general the permanence of bark paper production over a long historical period is linked to the social and cultural values granted to the different amate paper products. Besides the organizational and technological factors the continuity resides in the values conferred on amate paper and its uses for different purposes. Its continuity depends on the permanence of the social practices. If these social practices lose meaning, they could vanish together with all the implements used for their re-creation. What the history of amate demonstrates is that its continuity has not always resided exclusively in the ritual or the exchangeable values and uses. These have overlapped, or at some periods it has been either the ritual or the commercial that has enabled its continuity.

9.2.2 Question 2. The recent commoditization and effects

What have been the effects of the commoditization of amate and the increasing demand for this product with regard to both the local paper manufacture and the trees used for bark supply?

The recent commoditization of amate as a handicraft has had an impact in several ways. The cultural values of amate paper and the trees used for bark supply have been transformed, as already explained in the previous question. Most apparent have been the effects on the bark trees due to the high rates of harvesting, and the changes in the technology applied to the paper manufacturing. The tendency towards the specialization of activities between bark harvesting and paper manufacture has also been observed, which in turn implies the specialization of knowledge. Specialization also occurs among harvesters and artisans. In the case of the artisans, work specialization also conveys different options for paper trading, a condition that has contributed to a major social and economic stratification among artisans.

The answer to this question covers various aspects but here the most outstanding effects are discussed: first the effect on bark trees, second the increasing tendency towards the specialization of activities and therefore of knowledge, and last a discussion covering the effects on paper manufacturing technology and the quality of the end paper products.

Impact on bark tree species

The initial commoditization of amate and the continuously increasing demand have impelled in the first place the search for more tree species to use as sources of bark raw material. In addition to seven species traditionally used before paper commoditization, six more species have been adopted in the last 30 years (Table 6.1). While it is difficult to assess the ecological impact of bark harvesting without in-depth studies of the population dynamics of the species, a first distinction based on life-form attributes may be made between the different species, i.e. long-living species and pioneer species (chapter 6, section 6.3.3; Appendix C and D).

Long-living tropical tree species such as *Ficus* sp., *B. alicastrum*, *U. mexicana*, *S. oligoneuron* and *S. aucuparium* are those most endangered. Their distribution is limited to a few remaining scattered forest patches and their reproduction is threatened owing to their ecological characteristics. The lack of specific regulations for the extraction of these species and their unlimited extraction could cause over-exploitation. The decrease in *Ficus* trees, which have been used longer for amate production, is visible in areas close to San Pablito. Only mature non-harvestable *Ficus* are common in forest patches and in mixed shaded coffee plantations.

Among the pioneer species and the most recently adopted species, *T. micrantha* is a species of very wide distribution and fast growth. It grows wild and is tolerated on coffee plantations. Around 90% of the bark used for amate production is now extracted from these trees. One of the main advantages in the use of *T. micrantha* is that debarking activities can be integrated within the management calendar of coffee plantations. When excess shade trees are removed, *T. micrantha* are then debarked. After *T. micrantha* trees have been debarked, most harvesters return to the same coffee plantation when new trees have grown, around four to eight years later. Up to now a rather successful cyclical harvest pattern has been performed, integrating ecological characteristics and the management of shaded coffee plantations and *T. micrantha*. Nevertheless, the continuous expansion of the harvest area appears to indicate that the rate of bark demand is higher than the rate of tree growth, driving the expansion of the harvest frontier and the pressure on bark tree resources in the present harvest area. Further analysis is pending.

Peters *et al.* (1987) mention the depletion of bark trees, including pioneer species (*T. micrantha*), from areas near to San Pablito. Apparently this situation is far from arising in all the harvest area, but a decline in bark tree density, even of *T. micrantha*, is already occurring in some locations of the present harvest area, primarily those taken over during the first expansion period (see Figure 7.3, harvest area-periods of expansion, section 7.2.2). Permanent harvesters who have settled within this first area of expansion invest more time in finding harvest sites, and are increasingly harvesting less suitable trees. Most harvesters complain of increasing difficulties in finding harvest sites, and of their need to extend their search for harvest sites over greater distances. Apparently the negative effects of harvesting on tree populations gradually diminish with distance from San Pablito.

Towards specialization of activities

Since the commoditization of paper began, a division of activities has been taking place as more social actors integrate into the amate commodity chain. In the Otomi context the division of tasks is not new. As explained in chapter 5 (section 5.1.1) harvesting, manufacture and the preparation of ritual paper were separate activities. Before its commercialization paper production was in the hands of women while men were in charge of bark supply. However, both activities were displayed by Otomi people within their village territory, and were therefore under Otomi control and confined to a geographical area. The new condition since the commoditization of amate paper has been the integration of external social actors, such as transporters, wholesalers, intermediaries and harvesters. Bark harvesting has expanded into a larger area and a major number of harvesters are getting involved in this activity. The division among bark harvesting and paper manufacture, as will explained, has prompted the specialization of knowledge about the identification, use and management of bark trees.

Besides the main division between paper manufacture and bark harvesting, there are different forms of work specialization occurring among the different types of Otomi artisans and among bark harvesters. Three main units of paper production were identified at household level and workshop level (chapter 5, section 5.3.1), and three other forms of bark harvesting were identified: permanent, temporary and intermittent (chapter 7, section 7.3.1).

In the case of artisans the three units of paper manufacture relate to their socio-economic conditions and the types of end-products; this is not only the case of Otomi artisans but also of Nahua artisans. In both cases the traditional livelihood strategies have been largely replaced by new ones. Agricultural activities have been mostly replaced by handicraft work. Also as demand increases there has

been a major division of labor in artisan households. The ways in which the two indigenous groups have adjusted to these changes differ (chapter 4, section 4.4.1). In general Nahua artisans have generated more experience in the commercialization of their products than Otomi artisans have. For many years Nahua artisans controlled the whole external commercialization of amate, until the Otomi started to search for their own market contacts. Within the Otomi, one of the main differences among the identified units of paper production corresponds also to the options for amate commercialization. The majority of artisans belonging to paper production units organized at household level and manufacturing paper on a permanent to semi-permanent basis do not have access to commercial channels outside San Pablito. A few local wholesalers control most of the internal market paper.

The specialization of work among artisans is also observed in the types of handicraft products of Otomi and Nahua artisans. In this sense two processes are occurring, one leading to more creativity in the search for new paper types, and the other, more general, leading to the standardization of production. In this respect what Graburn (1976) has observed from different handicraft cases around the world applies also to amate handicraft. Innovation is a vital aspect of handicrafts; the impetus of innovation may come from inside or outside as a result of artistic excitement, ethnic revitalization or simply as an economic response to the perceived desires of the consumer. However, as the author also points out, economic forces do lead to changes in the product sizes, and in general towards a greater simplification of form and decoration.

The commoditization of amate and the increasing paper demand has impelled specialization along the amate commodity chain, and led to contrasting socio-economic effects among all social actors involved, markedly among Otomi artisans. Parallel to the search for great creativity and new paper products, social and economic stratification is taking place among artisans. While some artisans can maintain their own market channels with better profits, the majority of Otomi artisans, particularly women, obtain low revenue for their work and do not count in amate market channels outside San Pablito. Their production consists of standard and simplified types of paper of low quality.

Harvesters' and artisans' knowledge about bark trees

Dividing activities between bark harvesting and paper manufacture has led to the specialization of knowledge. In the case of the Otomi, this has tended towards the decrement of traditional knowledge about bark trees and, on the other hand, to the accretion of knowledge about bark trees by some of the regional harvesters.

For the Otomi this has meant the loss of knowledge about the richness of different species used before. This, as revealed in chapter 6 (section 6.4.2), was detected through an ethnobotanic survey carried out among Otomi artisans and non-artisans (20 in total), who from a set of bark fibers, tree specimens and paper samples of the 13 species being used as sources of bark were asked to identify the species and group the samples accordingly. None of them could identify all the tree samples, nor group all the samples. Knowledge is now oriented towards recognizing the different bark fibers, especially their characteristics for manufacturing purposes, such as malleability and the characteristics of the end-product. Today Otomi recognize the fibers and may know the name of the tree from which the bark is obtained but are unable to identify the tree (chapter 6, section 6.4.2).

For harvesters the use of bark trees as a quite recent activity has meant the accretion of knowledge about bark trees - knowledge that they did not have before. Harvesters' knowledge involves the identification and selection of bark trees according to their structure and potential for bark harvesting and their extraction periodicity (chapter 7, section 7.3.2). Among harvesters knowledge differs. Harvesters involved in this activity on a more permanent basis tend to know more bark tree species than the temporary and intermittent harvesters (see type of harvesters, section 7.3.1, chapter 7). The knowledge of most regional harvesters centers mainly on *T. micrantha*; most of them also know about other species.

What was generally observed in the field is that the knowledge of the Otomi and bark harvesters is increasingly focusing on *T. micrantha*, from which most of the bark is obtained. Consequently the richness of use and knowledge based on managing and extracting bark from different tree species is diminishing. Another aspect is that, due to the ecological distribution of *Sapium* trees and *B. alicastrum* (occurring below the altitudinal belt where San Pablito is located), these tree species are not known to the Otomi artisans. One last thing to mention is that within both types of social groups the knowledge, identification and management of bark trees differ greatly. They cannot be taken as homogenous groups for intervention strategies oriented towards the conservation and management of bark trees.

Paper manufacture technology

Another important aspect that has occurred since amate commercialization began covers the changes in the steps and tools used in paper manufacture. As explained in chapter 5, it appears that some changes took place even before paper commercialization started. In the first place boiling bark to soften it is not recorded

until the end of the 1940s (Christensen, 1952) (chapter 5, section 5.2.2). No earlier source of information registers this manufacturing phase. A few historical documents indicate that the main manufacturing steps consisted of softening the bark by soaking it in water or rivers and in beating the fibers to compose the paper. On the other hand, boiling bark is not a common practice in other parts of the world where hand-made paper is manufactured. Most probably the adoption of species such as *T. micrantha* for paper manufacture is closely related to adaptations in the manufacturing technology (chapter 6, section 6.3.3).

Since amate commoditization the Otomi have undertaken the continual search for technological changes or adaptations to speed up production and also save costs. Up to now the most important are the introduction of new chemical products to accelerate the preparation process of bark fibers and the visible lack of finishing touches on the end paper products. Simplification has also occurred on the Nahua side, mostly in regard to some technological steps, for example the use of silk-screen techniques by some artisans for painting large amounts of bark paper. In most handicraft cases this simplification, as Graburn (1976) explains, is the result of economic changes that lead to changes in size, form and decoration. The fewer steps involved, the more the artisans are able to produce.

The two chemical products that Otomi have adopted are caustic soda and chlorine. Caustic soda is being used to speed up the boiling of bark. This has several effects, first on the health of artisans, and second on the contamination of waters and lack of proper drainage systems (chapter 5, section 5.2.2). Neither effect has been studied, and assessment is required, as well as measures and studies to replace the use of caustic soda. Chlorine is occasionally used to bleach the bark fibers, which are then colored with dyes and artificial colors, affecting the quality of the bark paper. There are still studies to do in relation to the effects of the use of new chemicals on the quality and durability of the paper. More importantly the effects of the use of these chemical products on artisans' health have not been assessed and there has been no attempt from the village or from outside to look for substitutes.

The commoditization of amate, as can be observed in the answers to this question (9.2.2), has implied changes and adaptations in different aspects of the paper production. The most evident are the changes in the effects on bark trees, the technology applied for paper production and the consequences for the quality of the paper end-products. Other changes are more difficult to perceive and need deeper observation, such as the changes in knowledge about paper manufacture and bark trees which occur together with a major specialization of tasks along the amate production chain. Although the essential characteristics of this handicraft have been conserved, especially the use of bark as raw material and the paper manufacture grounded largely in pre-Hispanic tradition, many changes have taken

place. This case demonstrates that, probably as in other cases where local and traditional products become commercial products, the implications and changes are numerous and it must be assumed that the traditional forms of production will certainly be transformed.

9.2.3 Question 3. Changes within the regional context

What recent economic, natural resource and social factors at local and regional levels have significantly shaped the way that bark extraction and paper production are carried out today?

The impact of paper commercialization has meant pressure on tree resources, first at local level and now also at regional level. At present most bark is obtained through regional harvesters. Besides the connectedness through the supply of and demand for bark, the bridging between regional and local levels can be observed in the economic, social, ecological and political dimensions.

The different harvest strategies complement one another by taking advantage of the natural heterogeneity and land use systems of the Sierra Norte (chapters 7 and 8). Otomi and harvesters have displayed diverse strategies for bark supply, showing their adaptation to and practical knowledge of their environment. These strategies follow cycles according to the biological characteristics of the tree resources exploited and according to the regional yearly religious celebrations and agricultural calendars. Among all the different bark strategies, the extraction of bark from coffee plantations constitutes the most important one. It comprises complementarity between coffee plantation management and *T. micrantha* trees growing as part of tree shade for these plantations.

In the way bark harvesting is carried out today, the ecological and economic attributes of coffee plantations are very important. Within the Mexican context, coffee plantations are composed of a complex vegetational structure and are managed as agroforestry systems (chapter 8, section 8.3.3). Due to their ecological complexity and multi-purpose management (non-timber products, fuelwood, etc.), these plantations play a substantial role in people's subsistence strategy, especially that of people with limited land and production resources. As some studies have pointed out, these land uses are highly biodiverse natural reservoirs, representing the only remaining forest patches in extensive areas at country level (Gallina et al., 1996; Moguel and Toledo, 1999). Within Sierra Norte de Puebla, coffee plantations constitute the third most important land use system in the harvest area, which greatly varies, as explained in chapter 8, from mountain to lowland landscapes. Small shaded plantations of on average one hectare are the most common in the high sierra, while large plantations (up to 200 hectares) are found in the low sierra.

The landscape of the Sierra Norte de Puebla is integrated by small land holdings of coffee plantations, fallow lands, cornfields and cattle plots, with different tree species including those used for bark supply. These types of landscapes, according to Zimmerer (1999), are characteristic of mountainous landscapes in Latin America and are formed like 'overlapping patchworks' consisting of multifaceted cropping systems shaped by local knowledge and linked with external regional processes such as sectoral and macroeconomic policies. Frequently, according to Zimmerer (ibid.) a few wealthy owners specializing in intensified agricultural or grazing production own the best and largest areas, and peasants with limited availability to land and production factors, maintain and even enhance intermediate systems, such as shaded coffee plantations on small land plots. This implies acute socio-economic differences, very apparent in the Sierra Norte de Puebla region where indigenous and non-indigenous populations (mestizo) are settled. Historically, the indigenous people of the Sierra Norte de Puebla have had less access to land, resources and economic means than the mestizo, who have had more economic and social power. For owners of extensive land properties, expansion in terms of land and economic means continues to be increasingly based on technicized or intensive land use systems.

At regional level, one of the most drastic changes has been the abandonment of agricultural activities. Indigenous people who until some two decades ago were immersed into agricultural activities, now look for economic activities outside their villages. Abandonment of what have been called the very efficient micro-agroecosystems of the Sierra, especially for maize cultivation, has meant the loss of self-sufficiency at regional scale as well as increasing deterioration of the environment (chapter 8, section 8.2.3).

With respect to the social and political dimension, and compared with other villages of Sierra Norte de Puebla, particularly the indigenous ones, San Pablito is gradually playing an important dual role at regional level. It is increasingly dependent on outsiders, like for example bark harvesters and other handicraft raw material suppliers, as well as an increasing number of people involved in regional commercial activities for the supply of diverse products, including basic food products. Concurrently, San Pablito is expanding its economic activities towards neighboring areas, involving more people in handicraft manufacture but, as specified in chapter 5, solely beadwork for necklaces and bracelets, not amate. San Pablito has attained a special status by acquiring social, cultural and economic strength through handicraft production and commercialization. This has meant relative independence from tense regional power relations, enabling them to actively participate in the political life of the region. During the last electoral process at the end of 2001, an Otomi leader of San Pablito won the elections and became the legal authority at municipal level. This in fact was a unique event in Sierra Norte de Puebla, where relations between indigenous and non-indigenous

villages have historically been tense and contentious (chapter 5, section 5.5.3 and chapter 8, section 8.2.3).

It can be observed that the interaction between Otomi artisans and bark harvesters does not only refer to the supply of bark, but also involves the political conditions. The dynamics described by Sarmiento (2000) for the Andean landscape can also be identified in Sierra Norte de Puebla. As discussed in chapter 3 (section 3.3.3), Sarmiento proposes a new view for the analysis of processes in the mountainous areas of the Andes. According to Sarmiento, explanatory studies of mountainous areas are needed to link the ecology and social concerns of mountain communities and the ways in which they are linked with regional and national contexts. The past view of mountainous areas as isolated and static areas, and the view that altitudinal belts mark the limits of biological characteristics and types of human intervention are in fact more complex. They are also changing fast, crossing natural and socio-economic borders, both those within mountainous regions and with the outside.

In the amate case, paper manufacture and bark harvesting have implied growing links with external markets, for selling handicraft products and for buying tools and substances required for manufacture. Bark harvesting is also linked to the exterior through the international coffee market. This shows how the Sierra is linked to the national and international market economy and the way in which nowadays paper manufacture and bark harvesting depend on market conditions far from the context of the Sierra but directly affecting the production and livelihood of its inhabitants. This exemplifies the effect of *marginality*, which, according to Sarmiento's (2000) interpretative model of mountainous areas, occurs as mountainous regions become more involved and linked with external conditions, remaining, however, a marginal relation dependent on the changes occurring in other geographical areas. On the other hand, the opposite of the marginality effect is also occurring in the Sierra, what Sarmiento calls *centrality*, defined in terms of notions of periphery in relation to the outside globalized economy, where originality, isolation and seclusion emerge as valued virtues rather than constraints. The production of indigenous handicrafts on sale all over the world constitutes, according to this author, one of the best examples of this effect.

9.2.4 Question 4. Insights for development and conservation

What insights can be derived from the previous discussions and what are their implications for the development and conservation of amate production?

From previous questions it is possible to identify and outline alternatives for conserving and developing amate production. Two main alternatives for bark harvesting are explained, the first with respect to the managing of *T. micrantha* trees, and the second with respect to managing traditional bark tree species. The conservation and development of amate requires attending to and incorporating the aims and opinions of the Otomi artisans and harvesters. Some of their main opinions heard during fieldwork are explained here. On the other hand, two conflicting situations hampering alternatives for the sustainable development of amate are explained. The first relates to divergences between national forest extraction regulations and the current way in which bark is being harvested. The second refers to the local conditions of paper marketing in San Pablito.

Potential management of T. micrantha trees

The adoption of *T. micrantha* growing in coffee plantations has been crucial to the continuity of amate production. Harvesting from these trees is a strategy particularly adapted to the regional agricultural calendars and land use systems, and compatible with the social, economic and ecological characteristics of Sierra Norte de Puebla. Furthermore, *T. micrantha* trees and shaded coffee plantations play a beneficial ecological role. *T. micrantha* trees contribute to soil amelioration in disturbed lands (see Appendix D). Because the variety of shade tree species and ecological benefits, shaded coffee plantations constitute important repositories of biological diversity, particularly in deforested areas. Taking all this into account, the potential management of *T. micrantha* within shaded coffee plantations should be seriously considered for bark supply.

The integral management of *T. micrantha* and shaded coffee plantations should involve technical and economic support for improving these tree species in terms of growth, dimension and health, and must include the most recent practices among some harvesters who attain land and are collecting *T. micrantha* seeds for cultivation on coffee plantations and in homegardens, deforested areas and fallow plots (chapter 7, section 7.3.2). The intensification of *T. micrantha* has the potential to become a generalized and positive practice; however, two main situations hampering *T. micrantha* intensification must be considered.

The first one refers to the number of *T. micrantha* trees growing on coffee plantations. The average number of these trees on the most common type of

coffee plantations (mixed shaded) is about 12 trees per hectare. Apparently a larger number is detrimental to coffee plants, although studies of probable allelopathic effects among *T. micrantha* and coffee plants are still pending (see chapter 7, section 7.2.2). In this sense, it is important to bear in mind that within the Mexican context the economic and ecological importance of shaded coffee plantations relies on the variety and combination of native and introduced tree species for multi-purpose use. *T. micrantha* as the only shade tree will result in monospecific coffee plantations, thus threatening the combination of sustainable benefits and conservation attributes of traditional plantations. *T. micrantha* might be introduced in fallow lands, and deforested or open areas but cannot be introduced in greater numbers in coffee plantations.

The second situation to consider is that up to now tree planting for bark supply has not been economically attractive for harvesters or coffee plantation owners (chapter 7, section 7.4.1). Although intensification of bark tree management is becoming a local response, especially among permanent harvesters, it is unlikely to become a generalized practice, as bark harvesting does not constitute the only or even the most important income activity for most harvesters or coffee plantation owners. The price of bark is very low and does not represent important income. An additional very important factor is that the legal status of bark harvesting remains ambiguous. Considering all the above, both positive and constraining factors, it is strongly recommended that the ecological, economic and social links existing between coffee plantations and amate production should be explored and evaluated.

Potential management of traditional bark tree species

In the answer to the second research question, it was important to note that several facets of amate production have changed, such as the adoption of new substances, new tools and new technological steps, most intended to speed up the manufacturing process and produce more products. One component that has remained is the utilization of bark as the raw material. Even though new tree species have been adopted, there has been no substitution for the raw material itself. The bark constitutes the essential base component of this handicraft. The decrease in the number of consumers when the Nahua adopted board paper for their paintings when facing scarcity of bark paper from Otomi artisans demonstrates this (chapters 6, section 6.3.2).

Out of the total bark tree species, the traditional *Ficus* species are rarely used and actually most of amate is made from *T. micrantha* (chapters 6 and 7). As Peters *et al.* (1987:428) comment ‘...In essence, the modern-day Otomi have removed all traces of amate from papel amate’². The diversity of fibers and papers, as Goloubinoff (1994) mentions, has been reduced mainly to one type of paper, the one made from *T. micrantha* bark. The author distinguishes two types of paper, the ancient and the modern, the former made for consumers who appreciate fiber/paper diversity.

Although some consumers, like those Goloubinoff (1994) describes, appreciate fiber diversity and would pay higher prices for paper made from *Ficus* fibers, the information about types of trees and barks is not generally shared by paper consumers; consequently prices, independent of the types of bark fibers utilized, are the same for all papers. Differentiating in the market the types of papers produced from each tree species could be a way of improving the current economic situation of paper manufacturing and raw material supply conditions. This could be beneficial for the economic, ecological and social-cultural dimensions.

From the economic point of view, the management of traditional bark tree species could be a way for Otomi artisans to obtain more income from paper of higher quality and adjust prices more fairly according to paper quality and the ecological and biological importance of selected bark trees. From the ecological point of view, as explained in Annex C, *Ficus* sp. play an important role in nature biodiversity. These species as well as *B. alicastrum* and *U. Mexicana* take two to three times as long as *T. micrantha* and other secondary tree species to grow before they can be debarked. Also their fibers and the paper produced, at least in the case of *Ficus* sp., are of better quality than those from *T. micrantha* trees. From the social and cultural point of view, marketing differentiation of fibers and papers could lead to the possible integration of Otomi artisans (who showed little interest in earlier projects on *T. micrantha* plantation) into the whole process of tree management, extraction and paper production. In this case it is also important that *Ficus* sp. attain important cultural value among the Otomi of San Pablito (chapter 6, section 6.2.3). Strategies like this have proven successful in other cases. The linkage that exists between ecologically significant keystone species and socially selected ones has the potential to conserve ecosystems and ensure people’s participation in ecosystem management (Ramakrishnan, 1998).

2 As mentioned in chapter 6 (section 6.3.1) Amate is the Nahuatl word for fig trees and bark paper.

Another positive aspect to note regarding the intensive management of *Ficus* sp. is their capacity for bark regeneration. Although, as mentioned in chapter 6 (section 6.4.3), Otomi artisans do not find regenerated bark suitable for amate manufacture, the potential for regeneration could ensure the survival of these ecologically important trees. It has been observed that *Ficus* sp. can regenerate their bark (Peters et al., 1987) in no more than three years (Lenz, 1973). Moreover, if some traditional practices such as those practiced in Africa, e.g. wrapping the exposed trunk in natural materials (Kabuye, 1999), are adopted, this could improve the management of *Ficus* sp.

Aims of harvesters and Otomi artisans

The conservation and development of amate requires giving attention to the aims of harvesters and Otomi artisans. Some of their main opinions recorded during fieldwork are explained here. Regional harvesters are interested in becoming involved in the management of trees for bark supply, and are seeking support for bark transport from the harvest sites to San Pablito. They recognize that bark transport and the lack of legal harvest permits are limiting factors in ensuring a regular supply and higher, or at least steady, profits. Several harvesters consider that the establishment of bark storage houses located at strategic places within the harvest area would facilitate the regular and cheaper transport of bark to San Pablito. Harvesters do spend considerable money and time on transporting their bark loads to San Pablito. This has to be done quickly as bark can spoil and Otomi artisans require it fresh. In storage houses with ideal conditions, bark could be preserved longer and perhaps, as harvesters comment, groups of harvesters – and not each individually - could transport the bark to San Pablito.

As far as the Otomi artisans are concerned, bark supply irregularities and price changes have a great impact on profit margins for paper. These change not as a function of bark prices, but of prices in the external paper market. Otomi artisans have expressed their desire to legally certify bark paper manufacture as part of their cultural intellectual property. This could take place in combination with the production of a specific variety of papers highlighting the differences and qualities of each tree fiber used, and the search for market channels where these products could be fairly valued. Innovations in this sense would be more attractive to youngsters. Some of them with access to high school and willing to continue their education have shown interest in learning about design and computer skills in order to combine technology with the promotion and design of amate paper products.

Current conflict: legal constraints in relation to bark extraction

Legal ambiguity constitutes one of the constraints on managing bark trees, especially *T. micrantha* trees on coffee plantations. As explained in chapter 7 (section 7.2.2), there are no specific rules for bark trees but according to SEMARNAT, the official institute that sets policy norms regulating the extraction and management of non-timber forest resources, the extraction of bark from any tree species should be carried out with an official permit. These legal procedures are not currently followed for bark used in amate production. In the case of bark extracted from shaded coffee plantations, the removal of *T. micrantha* trees is part of the plantation management practices. There is thus a serious gap between national norms and the actual way in which bark harvesting for amate is carried out.

The lack of official recognition for bark trees has been detrimental, especially for long-living tree species such as *B. alicastrum* and *Sapium* sp., but in general the lack of regulation has not had any consequences for the permanence of this industry. Other cases in the world show that some extractive systems not officially recognized have remained strong for long periods. Moreover, even where systems of extracting forest products in high demand have not been legalized and are even banned, extraction continues and often intensifies³. The problem of regulation remains and, as pointed out in chapter 2 (section 2.3.3), resides in the legal aspect and in the difficulty to categorize or identify NTFPs as officially and legally recognized land use systems⁴.

In the case of bark harvesting for amate paper, one of the main consequences of insufficient information and understanding regarding the regulations is the everyday conflicts between different social actors (chapter 7, section 7.3). Due to misinformation, harvesters consider bark extraction as an illegal activity and recognize the need for special permission to carry out their work safely. For local authorities bark harvesting is another cause of deforestation. Occasionally forest guards stop harvesters on the road to confiscate their bark loads or exact bribes. On their way to San Pablito harvesters select the less observed routes and/or

3 The national ban declared in the Philippines (Siebert and Belsky, 1985) and in East Kalimantan (Peluso, 1992) to protect the rattan resources and, more recently in Cameroon for the conservation of the *Prunus africana* trees (Cunnigham and Mbenkum, 1993), have shown that restraining laws frequently produce contrary effects, as the scarcity of the resource might stimulate illegal gathering.

4 Legal recognition, including access rights, institutional control and land tenure, is essential for NTFP planning (FAO, 1991). As explained in chapter 2, confusion about the legal status of NTFPs resides in the fact that most extractive systems are highly dynamic and are very difficult to categorize, especially when compared with agricultural land uses.

start their trip late at night, thus avoiding forest guards and the highway police. Coffee plantation owners do not and will not carry out environmental impact assessments to remove *T. micrantha* trees, since this activity forms part of the coffee management practices. The ambivalent legal status of commercial bark harvesting constitutes one of the limiting factors for involving more regional peasants in bark harvest activities and establishing regular bark prices.

Current conflict: local control of market options

The second conflict limiting the options for sustainable development of amate production and more specifically for the improvement of working conditions for artisans relates to the internal market conditions. The tense market conditions for amate paper within San Pablito have had an impact on the actions of some institutions aiming to support the commercialization of paper. One of the most recent official actions, which ended in December 2000, was coordinated by INI and for six years supported a cooperative of almost 100 artisans, who benefited from credits. This program as well as earlier official support has searched for alternative forms of production/market organization. However fairer agreements about prices and market opportunities have been hampered by tight internal market conditions.

The prevalence of internal wholesalers has contributed to great economic stratification and unequal economic and productive capacity among artisans. However, as commented by Otomi artisans during fieldwork, this constitutes the only way through which most artisans, mainly women, can find a commercial channel for their paper products. Otomi artisans consider that, although there is a lot of complaint about internal low paper prices, this is a way by which paper production and commercialization may stay in hands of the Otomi people. In this sense institutional actions have to be cautious, since the impact of commercial development plans could lead to serious internal conflicts. In fact, as was explained in chapter 5 (section 5.4.1), the emergence of internal wholesalers in the Otomi village, since almost the start of amate as a handicraft product, is closely related to the support that some official organizations have given to Otomi artisans. At the start of amate commercialization, the whole Otomi paper production was bought by FONART to ensure a constant supply to Nahua painters. Paper prices were officially set and credits were granted to local cooperatives. This support lasted for a few years, after that the Nahua and Otomi began to trade in their handicrafts themselves. In the Otomi case, commercialization remained in the hands of the few artisans who gained experience in handicraft marketing during the FONART period.

9.2.5 Following up on Question 4. General considerations and changing trends

Considerations for conservation and development of amate production

In general, as mentioned in chapter 5, there is a lack of information about amate production; there are no records or census about production, artisans or market channels. The official local and national agencies normally dealing with forest regulations and plant extraction, and more generally all those agencies related to rural development, are totally unaware of the present forms in which bark supply for amate production is carried out.

Past intervention projects for the supply of bark raw materials (chapter 7, section 7.2.2) but also for amate manufacture and commercialization have largely failed (see chapter 5, section 5.4.2). The present conditions of bark supply and paper production have not been assessed and the voices of harvesters and paper producers have not been listened to. Furthermore, not only have the goals of sustainable bark harvesting and amate production not been reached but sometimes, intervention has produced drastic and to a certain extent negative effects, such as the emergence of wholesalers in San Pablito. To date around 10 wholesalers have controlled most of the commercialization of bark paper and maintained very low prices.

The sustainable development of amate production requires integral programs including natural resources management in order to secure the supply of raw material and programs to promote development for amate manufacture production and amate commercialization. Table 9.1 shows that every phase of the commodity chain should be considered (bark harvesting, paper manufacturing and commercialization) and includes some of the most essential studies required for specific intervention strategies. It is necessary to carry out studies on tree ecology, growth, distribution, density, bark production and harvesting capacity in relation to actual paper demand and the state of regional coffee plantations. An assessment of amate manufacturing technology needs to be done, together with the obligatory replacement of some chemical substances, especially caustic soda. Fuelwood is another resource used in large quantities. Any plan must also include the management of trees for fuelwood supply, considering alternatives such as fuel-efficient cooking stoves for bark boiling. Future studies should also include an economic market study, a social anthropological study of the interactions of different social actors, and the assessment of the institutional legal aspects.

Table 9.1. Possible intervention strategies for the development of bark supply, paper manufacture and paper commercialization

Main phases of commodity amate chain	Kind of interventions required	Studies required
Supply of bark	Management intensification of <i>T. micrantha</i> in coffee plantations	Ecology, growth and characteristics of <i>T. micrantha</i> in different coffee plantations types
	Integral management of traditional and new bark trees	Options for cultivation and harvesting techniques of all bark trees
	Improve fiber qualities	Studies about the fibers qualities in relation to paper qualities. Appropriate techniques for handling bark fibers
	Improve transport, storage options	Search of efficient forms of transportation of bark and appropriate storing conditions
	Legalization of bark extraction	Design of appropriate rules for extraction of the different bark trees in different land uses
Paper manufacture	Support of manufacture organization	Socio-economic studies, organization through cooperatives and enhancement of working conditions
	Supervision of paper quality	Laboratory studies about wood, property of fibers according to manufacture technology and end paper products
	Promotion of paper innovations	Identification of consumers preferences, and of different types of markets
	Monitoring of manufacture process	Study of the manufacture process, search for substitution of damaging chemicals, techniques for save energy (fuelwood)
Paper commercialization	Control of paper prices	Feasibility studies for internal and external control of paper prices
	Promotion of paper products	Design of diffusion activities
	Opening of new market channels	Identification of new markets, new consumers; potential for certification
	Promotion of fair trade conditions	Potential studies for certification

One possible way to work for the improvement of paper manufacture could be through the local schools in San Pablito. In general schools constitute rather impartial spaces, where many activities are incorporated as part of the learning process. Rural schools involve practical activities; mostly related to farming, such as experimental cultivation and raising of farm animals, in some cases these involve production of handicrafts. The integration of amate workshops, including paper manufacture and the management of bark trees, could become an alternative strategy for the development of amate production. These workshops could also work on searching for less harmful materials than those used now, on improving the quality of paper, and on searching for new market channels and better prices.

Nonetheless, all the types of programs and measures that can be implemented for the balanced extraction of bark and the production of amate paper should contain social significance for the people involved. It is clear that neither monetary values and revenues nor planting trees constitute the only key solutions. If sustainable forms of production are the aim, a complete package of measures and proposals for long-term policies is needed - which in principle requires the acceptance of the people involved. In this sense, understanding the local view of development is indispensable.

The goals of agencies in terms of social welfare and nature conservation might not coincide with the goals of local populations. The Otomi are living through fast-changing situations that tend towards increasing interchange and communication with the outside, mainly through handicraft marketing and wage labor in the United States. These new relations are not only shaping local economic conditions but also Otomi aspirations, goals and perception regarding development.

Possible changes with implications for intervention

Generally, a major concern in the planning of intervention strategies - but one more difficult to elaborate - relates to possible future changes that would transform the whole context and certainly the strategies planned. In the amate case some of the processes shaping current and future conditions of bark harvesting and paper manufacture relate to the international market for handicrafts and agricultural products such as coffee, to the regional land use changes, and to the local situation. One more aspect of great relevance for intervention is that the Otomi have remained the only paper producers in all Mexico. The possible future changes are discussed at four spatial levels: international, national, regional and local.

International and national levels: market and labor patterns

In general, at national and international levels, several factors point towards the permanence of amate production. At international level, the explosion of tourism since the 1970s, accompanied by a growing tourist sector that is the main consumer of amate paper, guarantees a constant demand for amate. Furthermore, the market for organic products and products hand-made from natural raw material is rapidly increasing within the more recent 'eco' market niches⁵. At national level, as explained in chapter 2, the decline in agricultural activities is contributing to massive out-migration and to the intensification of extractive activities and handicraft production.

In Mexico, amate paper has become one of the most widely known and commercialized folk products, very much admired for its manufacturing technique and designs. The Otomi and the Nahua painters are continually innovating and testing new techniques and decorations, and their work is constantly being exposed in national and international art galleries and museums. Recently the National Popular Art Prize (1998) and the UNESCO Handicraft Prize (1999) were won by an Otomi artisan. This means a major diffusion of amate and increasing demand.

The above conditions indicate at least a constant, and probably an increased, market for amate, ensuring to some extent the continuity of this handicraft production. However, other aspects might negatively affect the harvesting of bark, and therefore the whole paper commodity chain; these relate to the regional land use systems.

Regional level: Sierra Norte de Puebla land use changes

In Sierra Norte de Puebla, as in other Mexican tropical mountainous areas, regional land use patterns are rapidly changing. Over the last 50 years, land use change trends show an acute depletion of forest cover, the rapid expansion of rangeland, a substantial reduction in staple cropland, and the recent introduction of open-sun coffee plantations.

⁵ This is especially relevant for all types of hand-made paper. In recent years, a kind of fashion for traditional or natural paper has emerged. There is a greater market circulation of hand-made paper such as tapa paper from the Pacific region, papyrus from Egypt, rice paper from the Asian region, Daphne paper from Nepal and new varieties made from recycled materials.

In relation to bark harvesting and bark supply, the present land use changes in Sierra Norte de Puebla could lead to the following situations. The first situation refers to the reduction of bark trees, especially *T. micrantha*. As explained in chapter 8 (section 8.3.3), shaded coffee plantations could be replaced by open-sun plantations, mainly in the lowlands. This land use change, closely linked to the international market for coffee grains, might have a major impact on the paper manufacture since the largest bark volumes are obtained from shaded coffee plantations in the lowlands. Another impact of this land use change could be major pressure on other bark tree species growing in forests. The second major trend shows the introduction of cattle grazing, which in turn leads to the reduction of bark tree resources. Land use conversion occurs in a scattered pattern in the mountains, where less steep areas are used for cattle grazing while the steeper and most inaccessible sites continue under shifting cultivation and shaded coffee plantations. The third trend is linked to the disappearance of traditional agricultural activities, especially among peasants with small land plots who, in the face of great irregularities in coffee prices at international level, prefer to abandon this activity. For bark supply, the abandoning of agricultural lands under coffee plantation or shifting cultivation might imply an increase in bark tree species, especially those bark tree species growing at a fast rate as part of secondary types of vegetation.

It appears that the future of coffee in Sierra Norte de Puebla, and consequently that of amate production, is very much subject to changes in the national agricultural policies impacting on coffee plantations. The prices of coffee, determined at national and international levels, have drastically fallen. The second aspect to point out is that if major land use changes continue, especially the replacement of shaded coffee plantations, this would definitely lead to a reduction of potential harvest sites and bark trees. Critical to the above is maintaining the shaded coffee plantations and shifting cultivation as important subsistence strategies for the peasants of the Sierra Norte de Puebla region.

Local level: Will San Pablito remain the only village producing bark paper?

San Pablito is the only paper producer in all Mexico. Otomi people claim that the knowledge about paper-making is only passed on among the Otomi of San Pablito. This is also mentioned in different bibliographical sources and was heard during fieldwork. However, the amate manufacturing process is quite well known outside San Pablito. In fact, the manufacture of amate is not so laborious when compared with other Mexican handicrafts such as the laborious extraction of linaloe balsam. Moreover, the manufacturing process has been documented, published, and demonstrated in courses on paper design and paper recycling techniques inside

and outside Mexico. Apparently the kind of ban enforced by the Otomi is strong enough to prevent the reproduction of knowledge - more because of what this enforcement represents than because of any real possibilities of preventing the transmission of this knowledge outside San Pablito. The two passages about foreigners and regional harvesters attempting to learn the amate manufacturing process, described in chapter 5 (section 5.5.2), exemplify this.

Besides the protection of knowledge about paper-making, other explanations for Otomi exclusiveness include the control of commercial channels. About 50% of the total paper production is commercialized by Otomi wholesalers - no more than 10 wholesalers sell the paper at very low prices, particularly to Nahua painters (chapter 5, section 5.4.1). It is very difficult for outsiders to compete against the low paper prices of the Otomi, this would imply very low or zero revenues from the beginning. On the other hand, inhabitants of different Sierra villages who were interviewed to ascertain why they had not attempted to produce amate commented that, besides the difficulty in competing with the Otomi market and the need for an initial investment to buy basic tools and materials (including wooden boards, stone beaters, bark, fuelwood, chemicals), the manufacture of paper was a very laborious and time-consuming activity that required a lot of effort and dedication (chapter 5, section 5.5.2). Another aspect observed among all inhabitants of the Sierra Norte, but especially among other indigenous people of neighboring villages, is that the production of amate is very much linked with its uses as ritual paper, and as such greatly respected and even feared.

In comparison with other Mexican handicraft products, the production of amate is apparently one of the few handicraft manufacturing processes that has not spread beyond its immediate locality. Other cases, such as the wooden linaloe boxes in the state of Guerrero, black clay pottery in the state of Oaxaca, wool weaving in Chiapas, and even the painting of amate paper have extended to more villages. In the case of amate painting, this activity has already spread to eight Nahua villages settled along the Rio Balsas. Apparently the fact that Sierra Norte de Puebla constitutes a historically pluri-cultural region where Nahua, Otomi, Totonacos and also mestizo people have lived has contributed to the maintenance of the most rooted traditions that define the cultural borders of each ethnic group. Furthermore, the physical separation or isolation of even the same ethnic groups living in scattered villages along the Sierra has had an impact, hampering their relationship and communication. However, as also mentioned in chapters 5 and 8, the interchange of knowledge, techniques and products between different ethnic groups in the pre-Hispanic period and at present is an important aspect of the everyday life of indigenous people. Both situations take place in the Sierra Norte. This has definitely contributed to the social and cultural configuration of the Sierra Norte de Puebla region (chapter 8).

If amate paper starts to be produced outside San Pablito, Otomi artisans themselves could perhaps promote this. Possible changes in this direction, such as the introduction and improvement of communication services, appear to be linked with migration movements. From what was observed in fieldwork, migration is linked to some extent with the emergence of new forms of paper production and paper commercialization. In general Otomi people who have migrated to the United States (for two to six years), the majority men, intend to save money and on their return build a house, buy a car or open a local store (food, stationery, etc). Others have invested in tools and materials for setting up paper production workshops (see chapter 5, section 5.3.1, types of paper production units). The few workshops existing in San Pablito started in this way. Such a venture requires high investment but in the end guarantees major profits and market independence from internal wholesalers. One Otomi artisan, however, has already extended this practice beyond San Pablito, to another state in Mexico. He comments that in this way he attains more freedom in the type of production, design, markets and prices. This artisan, who also continues to keep his links with San Pablito, covertly maintains his handicraft activities outside the village. Disapproval of this initiative would be severe; internal coercion to keep the knowledge and production within Otomi hands is very strong.

If migration from San Pablito to cities within Mexico and especially to the United States should decrease, or if, as observed at national level, younger people should gradually become the new migrants, this would generate another scenario. This latter trend has been observed in San Pablito, where in 1999 for the first time youngsters of 13 to 16 years old migrated to the United States. As younger people move to the United States, greater detachment from their villages of origin is foreseen. This new generation owns no land in their places of origin and also lacks close or nuclear family links. Nonetheless, changes in migration flow are very much restricted by international regulations between the United States and Mexico. Already, as described in chapter 2, politicians saw a change in the migration flow shortly after the events of 11 September. Migration regulations tightened and the flow of migrants declined, especially during the first months (La Jornada, 24 October 2001). This event, but in general the tighter migration regulations, would probably have an impact on the number of people traveling to the United States for work.

Another condition that might contribute to the end of San Pablito as the only paper producer in Mexico is the introduction of more services in the village. This relates especially to the introduction of more communication services, such as roads and the telephone. One rural telephone line was established in the 1980s in San Pablito and, as explained in chapter 5 (5.4.1), was controlled by one person. However, two years ago domestic lines became available for those who could

pay the installation charge and the monthly fee. It should be noted that San Pablito is the only village in Sierra Norte de Puebla that has this service. The introduction of the telephone could possibly imply the disruption of the control of internal amate wholesalers, which could lead to greater marketing independence and possibly, in the case of direct contact with consumers, the start of paper production in other sites.

9.3 Conclusions

The conclusions further explore the lessons of the amate case in order to discuss the cultural dimension of sustainable development and NTFP approach. The discussion is divided into two main parts. The first part concentrates on what the insights gained from analyzing the amate case reveal for sustainable development. Discussion is based on the core meta-question of this study: Why has amate production continued over such a very long period of time, and how? In this respect some answers probe the cultural dimension of this production and the nature-society and local-global relations involved. The meta-question suggests that if amate production has been maintained over a long time period, this could probably be considered as an example of sustainable development, specifically NTFP sustainable development. Although the study does not aim to evaluate the sustainability of amate paper as a product, some implications are discussed by recalling the answers to previous research questions.

The second part centers on the amate case findings and the value of the multi-dimensional framework for the NTFP approach and for understanding handicraft production, within the wide range of non-timber forest products. NTFPs constitute appropriate examples of the way in which nature-society and local-global relations are taking place. Moreover, NTFPs provide an opportunity to observe a form of operationalization of sustainable development and, in this respect, some remarks derived from the amate case findings are pertinent to the ways in which NTFPs are being identified and evaluated. The intention is to contribute to the discussion on NTFPs, participating in the forms of evaluating and understanding them.

9.3.1 'Changing to remain constant'

The study has as point of departure one main or meta-question, which like an umbrella covers all the aspects discussed in this book and from which the more specific research questions emanate: How and why has this production survived?

The history of amate is mainly a history of adaptations. Constant changes in many aspects of the paper production have enabled the continuity of amate from pre-Hispanic times till today. Throughout, it could be observed that, as with other products with a long history, the adaptations have occurred in the economic, technological and organizational aspects. These constitute the most evident ones. However, the answer regarding the continuity of amate paper extends beyond the most direct reasons, and the reader can observe in some chapters, especially 4, 5 and 6, that the cultural aspects also play a crucial role.

The historical development of amate paper has implied subtle or more drastic changes in the values contained in the paper and the bark trees (discussed in question 1). Throughout, amate has conserved a ritual value, but at times its endurance has resided precisely in its condition as a commercial product. The decline in its manufacture - there was even danger of disappearance - was in progress just before its commercialization as a handicraft started (chapter 4, section 4.3.3). It was precisely the commoditization of amate that enabled the continuity of this manufacture and even enhanced its ritual uses. At present both values are found in San Pablito.

As discussed in question 1, another aspect that emerged is the ongoing role of amate in relation to spheres of power and control - as a form of domination or resistance. During pre-Hispanic times it was used as one of the means of domination. Codices made from bark paper contained crucial information about religion, lineages and politics, and its use as a tribute object represented a direct route through which power was maintained. When indigenous/locally-made paper was banned in the colonial period, amate paper became a form of resistance, being clandestinely used for traditional rituals and against the Spaniards. In more recent years it has constituted a form of direct protest for the Nahuatl and an indirect way of backing political and economic power for the Otomi (chapter 4, section 4.4.3 and chapter 5, section 5.5.3).

On the whole it can be observed that the cultural dimension of amate is relevant in the search for answers about the continuity of amate paper and in understanding its present conditions. In this sense the probable reason why the production of amate is concentrated and remains in the hands of the Otomi can be found to some extent in cultural explanations (discussed in question 4). Explanations about the way some forest patches remain under collective control in the face of the private property regime that dominates in Sierra Norte de Puebla embrace a cultural symbolic component. Mountain peaks where most of the forest cover remains constitute, together with caves, outcrops and ravines, places of origin within the Otomi cosmology, and although severe changes are occurring (deforestation, land use changes), the landscape continues to embrace meaning and significance (chapter 6, section 6.2.2). On the other hand, more

communication and interrelationships via mainly market channels has not meant the disappearance of the Otomi identity; on the contrary, it appears to reinforce it.

From all the observations explained above, it is apparent that the cultural dimension cross-cuts the three pillars (economic, social and ecological) of sustainable development. As stated in chapter 2, culture is broadly understood as the totality of what people know, think and feel about the world. Debates on sustainable development and the environment have indicated the need to adopt a broad analysis of culture and its implications (Milton, 1996). Culture has been rather relegated to understanding the ‘diversity of folklore’, with the failure to observe that the debate about sustainable development already contains strong cultural and political constituents (Hajer and Fischer, 1999). In the practice or operationalization of sustainable development, culture has also been largely consigned to the understanding of ‘others’. Here it has focused very much on traditional or indigenous cultures, spotlighting their historical forms of land use and natural resources management, which in many cases have proven to be sustainable forms of ecosystem conservation (Berkes and Folke, 1998). Even though this new cultural perspective has been brought into the debate on policies and projects for sustainable development. Culture is still narrowly focused on the knowledge and understanding of local practices. In the debate as well as the practice of sustainable development, culture should be understood and analyzed in a broad fashion. If not, development studies and plans suffer from inadequacies and limitations (Ellen and Harris, 1999) since selecting only certain pieces of information isolates not only the whole local environment but also the understanding of the context in which it takes place.

In summary, what the amate study demonstrates is that the endurance of amate production resides in the constant adaptations to new contexts and that the cultural dimension is crucial to understanding this long-standing production. In this sense, and as explained in the Preface, the original idea of the study, based on the first assumption that the supply of raw material was essential for ensuring the continuity of the paper manufacture, has been surpassed. Concurrently the historical and cultural dimension, like research filters or lenses, enables the field data and many literature sources to be interpreted and analyzed. As can be observed, part of the answers to the research questions rely upon the cultural aspects of the case.

9.3.2 Nature-society relations and local-global relations

The amate case demonstrates new forms in which nature-society and local-global relations are emerging. With the expansion of the market and the present forms of communication, former concepts about local identities and local

knowledge –also covering natural resources – have to be revised under new forms of interpretation and analysis.

The amate case shows the way in which different values (e.g. assigned to ritual and commercial paper) can operate at local level. New and past local traditions, such as the different uses of paper, remain whenever the practices that involve their use continue to have social and cultural meaning. They can even be strongly revitalized when granted commercial value. The same applies to natural resources, as observed with the sacred *Ficus* trees in San Pablito. In these cases, the amate paper and the *Ficus* trees are granted commercial and symbolic values by the Otomi.

As explained in chapter 2, nature-society relations are changing as new market forces are having a great impact on natural resources at local and global levels. With regard to amate and bark trees, new users with new knowledge are emerging and, although past knowledge and perception of trees remain, they are quickly changing or vanishing, as could be observed in the field and from the ethnobotanical survey (chapter 6, section 6.4.2). The general trend shows that bark trees have come under high pressure at local and regional levels, responding to national and international commercial demands.

Amate has had a long historical trajectory. As explained in chapter 4 the paper has been a commercial and exchangeable product since long ago, and during pre-Hispanic times it was extensively used as a tribute product. The difference today might be that commoditization as a handicraft means immediate and intense external links. Overall, commoditization has implied integration into a complex commodity chain, which is greatly expanding and diversifying in geographical and production terms, as well as in the types of social actors involved.

While it is true that, as argued in chapter 2, not only monetary exchange but also the interchange of ideas and knowledge takes place along the commodity chains, they do imply distance between all the social actors involved. The distance, more clearly in physical terms but also in terms of knowledge and information between the social actors involved, is considerable, especially between producers and consumers. This, in many cases, has contributed to the generation of high profits, especially by traders who gather most of the profits. In long commodity chains involving numerous social actors - and amate is an example - it is common that consumers know little or nothing about the artisans. They know not who they are nor their context (chapter 4, sections 4.4.1 and 4.4.2) and in the case of amate they know even less about bark harvesters. In general, knowledge about the natural base used for amate is absent. In the other direction, artisans appear

to acquire more information about end-consumers; they identify types of consumers, demands and tastes. However, other information such as the legal status of NTFPs and certification procedures does not reach harvesters and artisans.

The distance between consumers and artisans also implies differences in the cultural values granted to the paper. This is especially relevant in the case of handicrafts. As argued by Appadurai (1997) and Graburn (1976) (chapter 2), different social actors appreciate and value these types of products in very distinct ways. In this sense handicrafts might represent a pertinent example of products used as images by nationalist and populist politicians in their discourses and strategies for building national identities. But even if they play an active and important role in this construction of national identities, these products are largely conceived of as a remnant of the past in a quite romanticized way, especially by consumers, as in the case of amate. As Ellen and Harris (1999) point out, indigenous knowledge is both an 'economic commodity' and a 'political slogan' and local knowledge is often considered a static package of practices.

But on the other hand, the process of commoditization, when observed at local level, has enabled the continuity of amate production and has been a means of Otomi political resistance and expression of identity. The commoditization of amate paper, which was in course of being replaced by tissue paper, as discussed in question 1 (chapter 4), served to revitalize a pre-Hispanic technology en route to disappearance. In this sense the question that could be raised is: To what extent has the market value of local products meant the preservation of the Otomi identity and culture? Amate paper widely constitutes a means of resistance and this is a new way of linking up with the exterior. In this sense, although indigenous identity has been linked to specific territories, it can now be observed that identity and new expressions persist under new market and labor patterns in a very movable and dynamic way, crossing geographical borders. Identity, as mentioned before, is built in contrast to the exterior (Stephen, 1991), but not necessarily constrained to geographical limits.

Under the umbrella of sustainable development, cases such as that of amate illustrate the actual conditions under which nature-society and local-global relations are occurring. These involve changes in perception about nature, and changes in the way people in different geographical areas interact.

9.3.3 Amate paper, a case of sustainable development?

Another part of the meta-question raised at the start has yet to be answered. Is the history of amate the history of the sustainable development of a handicraft product or NTFP? This question is posed with modesty since the intention of this study was not to evaluate or assess the *sustainability* of amate production. However, thinking about this aspect leaves space for discussion, especially when sustainable development is confronted with long-lasting products and manufacturing processes.

The answer is not straightforward. The best way to answer the question is by visualizing, as in chapter 2, the three (economic, social and ecological) pillars of interest to sustainable development as three colored ropes. In chapter 2, the image was used to describe their interconnectedness. In this section the image is used again but in a different way. If sustainable development is achieved through the balance between the economic, social and ecological dimensions, ideally the colored ropes should be rolled together. When considering amate production within San Pablito, the economic and social ropes, including the cultural and political ones, would be rolled together but, since the Otomi people have in general terms lost control over the resources being used for bark supply, the ecological rope might be loosened. At regional scale, if one considers the integral use of *T. micrantha* and shaded coffee plantations fitting within the economic, social and ecological cultural context of the Sierra Norte, all the ropes would probably be rolled together – although the institutional dimension would be looser. If one considers all the phases of the amate commodity chain, the geographical areas to which it extends and the social actors involved, assessment would be extremely difficult and would most probably show that all the ropes are loose. The problems here relate to spatial scales and also to time scales. The question about amate as a case of sustainable development requires specifications of spatial and time variations. The inquiry is then confronted with numerous difficulties, also entailing the consideration of alternatives for sustainable development, as will be further explained.

The answer, as mentioned above, is not straightforward and the case cannot be positively or negatively qualified. Throughout the book, aspects such as social inequalities, loss of knowledge, market gaps and pressure on resources have emerged. Furthermore, it is possible to observe contrasting and concurrent processes. While the types of paper are being richly diversified, knowledge about the entire manufacture process is fragmenting. On the other hand, while new forms of paper production are leading to very creative paths of innovation, overall the actual paper production is of very low quality. Moreover, while amate

production has clearly led to Otomi self-reliance in regional political life, locally the paper production has led to an acute increase in socio-economic stratification. Finally, while economic profits via amate and migration are generally growing, the village as a whole is becoming increasingly dependent on the outside, not only for the supply of raw materials for handicrafts but also for daily subsistence, thereby losing self-sufficiency.

In summary, although the case cannot be uniquely qualified in positive or negative terms, in general the amate case does not satisfy the goals that have been proposed for sustainable development, and cannot be considered a case of sustainable development. At present, probably only one facet of the amate case satisfies the sustainable development goals. The integral use of *T. micrantha* and shaded coffee plantations was not deliberately planned but rather emerged as an alternative strategy in the face of bark demand. It was prompted by the initiatives of Otomi artisans and peasants in the Sierra Norte in search of new tree resources for bark extraction.

9.3.4 The amate case in relation to non-timber forest products (NTFPs) and handicrafts

As explained in chapter 2, NTFPs are not new; in fact some are resources and products that started to circulate on a worldwide scale during the XV and XVI centuries as colonies expanded. The new aspect is the link made between the valuation of certain natural resources and the alternatives for the conservation of ecosystems and the development of local populations. Even though the range of resources and products that this term covers has not been completely defined, it is assumed that their economic valuation would make them competitive with other land uses that could put certain ecosystems at risk.

Within sustainable development the NTFP approach aims to support the economic and social welfare of local populations and the conservation of ecosystems, mainly forests. But the current results, as explained in chapter 2, have shown that in reality this is still far from occurring. In practice it is unlikely that different social actors with an interest in a forest and a particular NTFP will share the same development or conservation goals. On the other hand, the conservation of ecosystems has usually been expressed in terms of maintaining biodiversity, while NTFPs essentially rely and focus on particular resources. The implications and ongoing results demand a deeper analysis. In this sense it would be right to study the underlying discourses on NTFPs and to deconstruct the term and its implications as a form of practicing sustainable development.

The commoditization of natural resources in general and specifically of non-timber forest resources, as argued in chapter 2 and as the amate case has demonstrated, implies on one hand the change in perception, use and management of natural resources used as raw materials and end-products, and on the other hand the start or intensification of interrelations through commercialization among local producers and social actors outside the localities. Nature-society and local-global relations are at the core of NTFPs and even more so of handicraft products.

Among the various NTFPs, handicrafts represent some of the most interesting cases for the study of nature-society and local-global relations and the ways in which these develop. Handicrafts involve a wide range of products, such as domestic articles, ritual objects and working tools. Their production implies in the first place the occurrence and use of certain natural resources, the processes of experimentation that have employed tools to transform raw materials, ways of production, organization and cooperation, and continuous innovation in production and marketing - all constantly adapting to social, economic, political and ecological changes. The fact that handicrafts are directed to outsiders (mainly tourists) already implies a wide commercial circulation, on many occasions across national borders and often entailing high pressure on the natural resources used as raw materials.

From the amate case and the way in which NTFP evaluations are carried out, there are three main aspects to highlight. Since the NTFP approach searches for potential commercial products, the non-commercial values of resources have not received thorough attention. The historical background of the knowledge and the management of plants are rarely explored. Furthermore, the effects of commoditization are rarely traced; commercialization is directly or indirectly inducing changes in the way resources and products are perceived, transformed and managed. These gaps in NTFP evaluations certainly have implications for the basis of intervention strategies. As the amate study demonstrates, the underlying cultural aspects are important for understanding the continuity of this production, the adaptations, and the way the current situation regarding handicraft and extraction is developing.

To evaluate and understand NTFPs has proven to be a rather difficult task. The need for interdisciplinary studies has been stressed (Neumann and Hirsch, 2000). It has been observed that NTFPs are quite dynamic and the social, cultural, ecological and economic factors affecting NTFPs are interrelated in very complex ways. Consequently their analysis requires a combination of disciplines from social and natural science fields of study. Economy, ecology, anthropology and geography, among others, have been suggested. In this sense broad analytical

frameworks, as adopted for the amate case prove to be useful. The multi-dimensional framework applied here enables a holistic perspective, deepening into the historical and cultural dimension of this production, and the integration of field observations leading to a more integrated understanding of the present reality.

Integration of non-timber forest products and handicrafts

The amate case revealed the need to extend the scope of NTFPs and handicrafts which is of prime importance when alternatives for development and conservation are being considered. Since NTFPs approach largely emerged from awareness about deforestation and the need for conserving forests and other ecosystems, the focus of this approach has centered basically on the biological and ecological characteristics of plants and extraction conditions. In fact, as noted by Neumann and Hirsch (2000), the extractive phase and role of extractors is the primary area of interest of NTFPs approach. However, this hampers the understanding of whole extraction-production systems - more apparent in the case of handicrafts.

Within the wide range of activities and products involving NTFPs, handicrafts constitute a group of products and activities that can be delimited and differentiated from the rest. Three main conditions characterize them. First, handicrafts imply the processing steps and the transformation of raw materials into handicraft products. They involve knowledge about the natural resources used as raw materials as well as production knowledge - in most cases traditional forms of production that require laborious and detailed hand-made work. Second, as most handicrafts derive from local and traditional industries, handicrafts generally continue to embrace social and cultural meanings. This implies their possible different uses in distinct contexts. Third, handicraft commodity chains are usually highly complex, generally characterized by flexible and informal forms of trading and the involvement of multiple social actors.

As it is recommended here that NTFPs should embrace a general view of extraction, production and commercialization for handicrafts, so on the other hand handicraft production projects must acutely and systematically consider the biology, ecology and extraction of the natural resources used as raw materials. Past experiences show that when handicrafts are considered within development goals, the management and secure supply of raw materials are generally ignored. As commented in chapter 2, this has been detected as one of the reasons why handicraft projects are failing in Mexico and at worldwide level. Consequently the planning of handicrafts should involve concern for the conditions of production and commercialization, as well as the resources used as raw materials.

The failure of past interventions in the case of the amate paper shows the need to consider whole NTFP production-distribution systems. Since one important characteristic shared by handicraft and NTFPs is their circulation through very long complex commodity chains, it is necessary to consider the whole commodity chain in order to carefully generate strategies for each phase of the chain. It should be recognized that in practice this is rather difficult to achieve but this represents a way to overcome the shortcomings of most development programs focused on particular aspects of NTFPs or handicrafts.

9.4 Reflections on the multi-dimensional framework

The analytical framework used for the amate case consists of two parts. The first part focuses on elaborating a multi-dimensional framework to identify and understand the processes of change, partly based on the analytical framework grounded in systems theory proposed by Berkes and Folke (1998). The second part focuses on selecting theories and concepts adopted for the analysis of fieldwork and bibliographical information. Figure 3.1 in chapter 3 attempts to visualize this framework - a kind of mapping of the study, which allows connections between scales, key processes, links and theories to be viewed simultaneously.

The first part of the framework provides the possibility of sequentially ordering or ranking the changes, and in this way allowed the identification of key processes such as the later commoditization of amate and subsequent adaptations. The second part of the framework refers to the theories and concepts used for analysis. The combination of theories from various disciplines helped towards a broad understanding of the amate case.

The multi-dimensional framework enabled discussion of the cultural and historical dimension of sustainable development and the forms in which nature-society relations and local-global relations are developing. Two main aspects deserve attention: the holistic and interdisciplinary nature of the framework and the strong empirical character of the whole study.

A holistic type of framework enables the possibility of integrating ecological, social, political, cultural and economic factors that are operating at different time and spatial scales. The nature of the case, reflected in the narrations presented at the beginning of this book, demanded such a framework. These narrations from fieldwork embrace different aspects of amate production and interrelations, revealing the difficulty of disaggregating parts of reality into specific areas of study. By choosing a holistic or integral framework, the potential to go deeper into certain aspects is lost. However, only this kind of perspective enables a complete picture of the case study to be obtained, which appears especially relevant for policy-making and intervention.

The study is largely based on recent ethnographical information. The empirical character of the study enables actual ground information to be incorporated which perhaps would not be possible if following settled systematic methods or a unique analytical theory. The empirical character of the study enables questions about current situations to be answered considering actual ground information, especially when there is no other source of information. Throughout the study the presentation of life stories is expected to exemplify the real current diversity of situations. All the changes, after all, touch individual lives and greatly vary in terms of beliefs, work, tastes, health and aspirations, which cannot be grouped into fixed categories.

The holistic and empirical characteristics of the framework offer the possibility to explore the past and incorporate social and cultural values while yet considering changes which are difficult to embrace under a single theoretical perspective. This has an important impact on the potential for intervention. Any type of intervention strategy is embedded in a larger context where multiple factors may condition the course of these actions in direct or indirect ways. In this sense the study points out that for intervention a broad perspective is needed. When thinking about present options for sustainable development in amate production, a wide range of aspects must be considered, including new technologies, forms of communication, migration movements and conflicts in access to natural resources, bark trees and market channels.

The multi-dimensional framework enables cross-cuts along spatial and time scales. But along these scales detailed understanding of the processes occurring at local level is essential. Thorough comprehension of the local enables the connectedness with higher spatial scales; probably this could not be achieved the other way around, i.e. from global to local. In the face of current rapid changes in the rural context, local settings are the scenes of specific manifestations and where solutions articulating alternatives are undertaken. Local settings are unique; consequently generalizations or assumptions are particularly risky for the planning of intervention strategies.

Amate paper and other commercial handicrafts are good examples of how local productions and local economies are inserted in wider national and international contexts. When considering intervention strategies it is essential to understand how these linkages at different levels are built. The amate case also demonstrates the continuous adaptations in values, technologies, forms of production, organization and the ways in which different social actors interact. Holistic approaches make possible the understanding of how adaptations and multi-level interactions have taken place and which possible intervention strategies could be implemented.

References

- Ackerly, D. 1997. *Trema micrantha* (capulín). In González, S.E., Dirzo, R. and Vogt, C.R. (eds.) Historia Natural de Los Tuxtlas. México: Comisión Nacional para el Estudio y Uso de la Biodiversidad CONABIO / Universidad Nacional Autónoma de México UNAM. pp. 156-158.
- Adger, W.N.; Brown, K.; Cervigni, R. and Moran, D. 1995. Total economic value of forests in Mexico. *Ambio* 24(5): 286-295.
- Aguirre Beltrán, G. 1963. Regiones de Refugio. *Revista Mexicana de Estudios Antropológicos*. Sociedad Mexicana de Antropología. Tomo 19. pp. 81-92.
- Ahn, T.; Ostrom, E. and Gibson, C. 1998. Scaling issues in the social sciences. A Report for the International Human Dimensions Programme on Global Environmental Change. IHDP Working Paper 1.
- Alcorn, J.B. 1984. *Huastec Mayan Ethnobotany*. University of Texas Press.
- Alcorn, J.B. and Toledo, V.M. 1998. Resilient resource management in Mexico's forest ecosystems: the contribution of property rights. In Berkes, F. and Folke C. (eds.) *Linking social and ecological systems. Management practices and social mechanisms for building resilience*. Cambridge University Press. pp. 216-249.
- Amith, D.J. 1995. La creación de imágenes indígenas: de la pesadilla privada a la protesta pública. The creation of indigenous images: from private nightmares to public protest. In Amith, D.J. (ed.) *La tradición del amate. Innovación y protesta en el arte mexicano. The amate tradition. Innovation and Dissent in Mexican Art*. Chicago: Mexican Fine Arts Center Museum / México: La Casa de las Imágenes. pp. 41-100.
- ANEC (Asociación Nacional de Empresas Comercializadoras). 2000. *Nuevo pacto nacional para el cambio en el campo: soberanía alimentaria, revaloración de la agricultura campesina y mercado justo para un desarrollo incluyente, equitativo y sustentable (propuesta de política para el campo 2000-2006)*. México.
- Appadurai, A. 1997 [1986]. Introduction: commodities and the politics of value. In Appadurai, A. (ed.) *The social life of things. Commodities in cultural perspective*. Cambridge University Press. pp. 3-63.
- Arnold, J.E.M. 1994. Nonfarm employment in small-scale forest-based enterprises: policy and environmental issues. The Environmental and Natural Resources Policy and Training Project. EPAT / MUCIA Working Paper.
- Balick, M.J. and Mendelsohn, R. 1992. Assessing the economic value of traditional medicines from tropical rain forests. *Conservation Biology* 6: 128-130.
- Barrow, J. 1995. Sustainable development. Concept, value and practice. *Third World Planning Review* 17(4): 369-386.
- Batterbury, S.P.J. and Bebbington, A.J. 1999. Environmental histories, access to resources and landscape change: an introduction. *Land Degradation and Development* 10: 279-289.
- Beaucage, P. n/d. *The domestication of innovation: the traditional Indian coffee – orchard of Eastern Mexico*. (manuscript).
- Beaucage, P. 1974. Comunidades indígenas de la Sierra Norte de Puebla. *Revista Mexicana de Sociología*. Instituto de Investigaciones Sociales UNAM. Volumen XXXVI, Tomo 1, Enero-Marzo, Número 1. pp. 111-147.

- Bell, L.A. 1985 [1983]. *Papyrus, tapa, amate and rice papers: papermaking in Africa, the Pacific, Latin America and Southeast Asia*. Oregon: Liliaceae Press.
- Berkes, F. and Folke, C. 1998. Linking social and ecological systems for resilience and sustainability. In Berkes, F. and Folke C. (eds.) *Linking social and ecological systems. Management practices and social mechanisms for building resilience*. Cambridge University Press. pp. 1-25.
- Beyer, H. 1979. Relaciones entre la civilización teotihuacana y la azteca. In Gamio, M. (ed.) *La población del Valle de Teotihuacan*. Tomo II. México: Instituto Nacional Indigenista. pp. 273-293.
- Blaikie, P.M. 1994. *Political Ecology in the 1990s: An Evolving View of Nature and Society*. Center for Advanced Study of International Development. CASID Distinguished Speakers Series No. 13. Michigan State University.
- Boturini, L.B. 1986. *Idea de una nueva historia general de la América Septentrional*. Colección Sepan cuántos 278. México: Editorial Porrúa. (First published in Madrid, 1746).
- Bravo, C.M. 1997. Inventario especies usadas en San Pablito Pahuatlán, Puebla para hacer papel. Amate, artesanos, medio ambiente y teconología. *Boletín Bimestral de la Asociación Mexicana de Arte y Cultura Popular, A.C. AMACUP*. Año 1, Número 2, p. 12.
- Bressers, H.T.A. and Rosenbaum, W.A. (eds.). Forthcoming. *Governance for sustainable development across social scales*. Praeger.
- Bye, R.A.; Caballero, J.; Linares, E.; Mapes, C.; Martínez Alfaro, M.A. and Mendoza, C.M. 1993. Non-timber forest resources in Mexico. An overview. A consultation report in support of the Mexican Forest Sector Review under the direction of the World Bank. June 1993. (Unpublished report).
- Byron, N. and Ruiz Pérez, M. 1999. A Methodology to Analyze Divergent Case Studies of Non-Timber Forest Products and Their Development Potential. *Forest Science* 45 (1): 1-13.
- Carrasco Pizana, P. 1979 [1950]. *Los Otomíes*. Cultura e Historia Prehispánica de los Pueblos Mesoamericanos de Habla Otomiana. Biblioteca Enciclopédica del Estado de México. Toluca, Ed. de México.
- Castells, M. 1999 [1997]. *The Information Age. Economy, Society and Culture. The Power of Identity*. Volume II. Great Britain: International Ltd.
- Christensen, B. 1942. Notas sobre la fabricación del papel indígena y su empleo para 'brujerías' en la Sierra Norte de Puebla, México. *Revista Mexicana de Estudios Antropológicos*. Sociedad Mexicana de Antropología. Volumen VI, Enero-Agosto, Número 1-2. pp. 109-124.
- Christensen, B. 1952. Los Otomíes del Estado de Puebla. *Revista Mexicana de Estudios Antropológicos*. Sociedad Mexicana de Antropología. Volumen XIII. Número 2-3. pp. 259-268.
- Christensen, B. 1963. Bark paper and witchcraft in Indian Mexico. *Economic Botany* 17:360-367.
- Christensen, B. 1979. Brujería y papel indígena. In Christensen, B. and Martí, S. *Witchcraft and pre-columbian paper*. Biblioteca Internacional Bilingüe 1. México: Ediciones Euroamericanas. pp.1-44.
- Conway, D. and Cohen, J.H. 1988. Consequences of Migration and Remittances for Mexican Transnational Communities. *Economic Geography* 74(1): 26-43.
- Cooper, P.J.M.; Leaky, R.R.B.; Rao, M.R. and Reynolds, L. 1996. Agroforestry and the mitigation of land degradation in the humid and sub-humid tropics of Africa. *Experimental Agriculture* 32: 235-290.

- Cunningham, A.B. 1987. Commercial craftwork: balancing out human needs and resources. *South African Journal of Botany* 53(4): 259-266.
- Cunningham, A.B. 2001. Applied ethnobotany. People, wild plant use and conservation. People and Plants WWF / UNESCO / Royal Botanic Gardens, Kew. London and Sterling, VA: Earthscan Publications Ltd.
- Cunningham, A.B. and Mbenkum, F.T. 1993. Sustainability of harvesting *Prunus africana* bark in Cameroon. A medicinal plant in international trade. UNESCO People and Plants Working Paper 2.
- Cunningham, A.B. and Milton, S.J. 1987. Effects of basket-weaving industry on mokola palm and dye plants in Northwestern Botswana. *Economic Botany* 14(3): 386-402.
- Dahlberg, A.C. 2000. Interpretations of environmental change and diversity: a critical approach to indications of degradation – the case of Kalakame, Northeast Botswana. *Land Degradation and Development* 11: 549-562.
- Deininger, K. and Minten, B. 1999. Poverty, Policies, and Deforestation: The Case of Mexico. *Economic Development and Cultural Change*. 47(2): 313-344.
- de Janvry, A. and Helfand, S. 1990. The dynamics of peasant agriculture in Latin America: implications for rural development and agroecology. In Altieri, M.A. and Hecht, S.B. (eds.) *Agroecology and small farm development*. Florida, USA: CRC Press. pp. 61-69.
- de la Vega, C.F.R. 1992. Principales productos forestales no maderables de México. Universidad Autónoma de Chapingo.
- Descola, P. and Pálsson, G. 1996. Introduction. In Descola, P. and Pálsson, G. (eds.) *Nature and Society. Anthropological perspectives*. London and New York: Routledge. pp. 1-21.
- Dow, J. 1973. Models of Middlemen: Some Issues Concerning the Economic Exploitation of Modern Peasants. *Human Organization* 32(4): 387-406.
- Dow, J.W. 1982. Las figuras de papel y el concepto del alma entre los otomíes de la Sierra. *América Indígena*. Instituto Indigenista Interamericano. Volumen XLII, Octubre-Diciembre 9. pp. 629-650.
- Dow, J.W. 1984. Symbols, Soul and Magical Healing among the Otomí Indians. *Journal of Latin American Lore* 10(1): 3-21.
- Dow, J.W. 1986. *The Shaman's Touch. Otomi Indian Symbolic Healing*. University of Utah Press.
- Dow, J.W. 1990. Santos y Supervivencias. Colección Presencias 31. México: Consejo Nacional para la Cultura y las Artes / Instituto Nacional Indigenista.
- Durán, Fray Diego. 1995. Historia de las Indias de Nueva España e Islas de la Tierra Firme. México: Consejo Nacional para la Cultura y las Artes. (First published in 1867).
- Dryzek, J.S. 1997. *The Politics of the Earth. Environmental Discourses*. Oxford University Press.
- Eden, S.E. 1994. Using sustainable development: the business case. *Global Environmental Change* 4: 160-167.
- Ellen, R. n/d. Indigenous Knowledge of the Rainforest: Perception, Extraction and Conservation. University of Kent at Canterbury. (<http://lucy.ukc.ac.uk/Rainforest/malon.html>).
- Ellen, R. and Harris, H. 1999. Embeddedness of indigenous environmental knowledge. In Posey, D.A. (ed.) *Cultural and Spiritual Values of Biodiversity. A Complementary Contribution to the Global Biodiversity Assessment*. United Nations Environmental Program UNEP, Intermediate Technology Publications. pp. 180-184.

- Ellen, R. and Harris, H. 2000. Introduction. Ellen, R.; Parkes, P. and Bicker, A. (eds.) *Indigenous Environmental Knowledge and its Transformations. Critical Anthropological Perspectives*. Amsterdam: Harwood Academic Publishers. pp. 1-34.
- Escobar, A. 1995. *Encountering Development. The making and unmaking of the Third World*. Princeton, New Jersey: Princeton University Press.
- Fairhead, J. and Leach, M. 1996. *Misreading the African landscape. Society and ecology in a forest-savanna mosaic*. African Studies Series 90. Cambridge University Press.
- Falconer, J. and Arnold, J.E.M. 1991. Household security and forestry, an analysis of socio-economic issues. *FAO / SIDA Forests, Trees and People. Community Forestry Note 1*. 147 p.
- Falconer, J. 1997 [1996]. *Developing Research Frames for Non-Timber Forest Products. Experience from Ghana*. In Ruiz Pérez, M. and Arnold, J.E.M. *Current Issues in Non-Timber Forest Products Research*. Center for International Forestry Research CIFOR / ODA
- FAO. 1991. *Non-wood forest products: the way ahead*. FAO Forestry Paper 48. Rome, Italy.
- FAO. 1995. *Non-wood forest products for rural income and sustainable forestry*. FAO Non-wood forest products 7. Rome, Italy.
- FAO. 2000. *Global Forest Resources Assessments 2000. Main Report*. FAO Forestry Paper 140. Central America and Mexico. pp. 243-247.
- Farshad, A. and Zinck, A.J. 1993. Seeking agricultural sustainability. *Agriculture and Environment* 47: 1-12.
- Fisseha, J. 1987. Basic features of rural small-scale forest-based processing enterprises in developing countries. In *Small-scale forest based processing enterprises*. FAO Forestry Paper 79. pp. 31-60.
- Fitl, R. 1975. *Die 'Muñecos' von San Pablito: Ein Beitrag zur Kenntnis der 'Brujería' in der Sierra de Puebla, Mexiko*. PhD Dissertation, Austria, University of Vienna.
- Florescano, E. (ed.). 1983. *Atlas Histórico de México*. México: Secretaría de Educación Pública / Editorial Siglo XXI.
- Florescano, E. 2000. *El canon occidental versus el mesoamericano*. *Historia de las Historias de México*. La Jornada, 10 Noviembre.
- Fuentes, A. 1972. *Regiones naturales del Estado de Puebla*. México: Instituto de Geografía UNAM.
- Galinier, J. 1987. *Pueblos de la Sierra Madre. Etnografía de la comunidad Otomí*. Colección Clásicos de la Antropología 17. México: Instituto Nacional Indigenista INI / Centro Francés de Estudios Mexicanos y Centroamericanos CEMCA.
- Galinier, J. 1990. *La mitad del mundo. Cuerpo y Cosmos entre los Rituales Otomies*. México: Universidad Nacional Autónoma de México UNAM / Centro Francés de Estudios Mexicanos y Centroamericanos CEMCA / Instituto Nacional Indigenista INI.
- Gallina, S.; Mandujano, S. and Gonzalez-Romero, A. 1996. Conservation of mammalian biodiversity in coffee plantations of Central Veracruz Mexico. *Agroforestry Systems* 33:13-27.
- García Martínez, B. 1987. *Los Pueblos de la Sierra. El poder y el espacio entre los indios del norte de Puebla hasta 1700*. México: El Colegio de México.
- Godoy, R.A. and Lubowski, R. 1992. Guidelines for the Economic Valuation of Nontimber Tropical-Forest Products. *Current Anthropology* 33(4): 423-433.

- Goloubinoff, M. 1994. *Relations Sociales et Commerce chez les Indiens Nahuas du Balsas (Mexique)*. PhD Thesis. Laboratory of Ethnology and Comparative Sociology. University of Paris X.
- Good Eshelman, C. 1988. *Haciendo la lucha. Arte y comercio nahuas de Guerrero*. Sección Obras de Antropología. México: Fondo de Cultura Económica.
- Graburn, N.H.H. 1976. Introduction: Arts of the Fourth World. In Graburn, N.H.H. (ed.) *Ethnic and Tourist Arts. Cultural Expressions from the Fourth World*. Berkeley: University of California Press. pp. 1-32.
- Guerrero, C..S. 1984. *Población economicamente activa (PEA) indígena de la Sierra Norte de Puebla*. Tesis de Licenciatura. Colegio de Geografía UNAM.
- Hadi, S. 1991. Forest-based handicrafts in Indonesia. In *Case studies in forest-based small scale enterprises in Asia: rattan, matchmaking and handicrafts*. FAO / SIDA Forests, Trees and People. Community Forestry Case Study 4. pp. 51-86.
- Hajer, M. and Fischer, F. 1999. Editors' Introduction. Beyond Global Discourse: The Rediscovery of Culture in Environmental Politics. In Fischer, F. and Hajer, M. (eds.) *Living with Nature. Environmental Politics as Cultural Discourse*. Oxford University Press. pp. 1-20.
- Hartshorn, G.S. 1983. *Trema micrantha* (Jucó). In Janzen, H.D. (ed.) *Costa Rican Natural History*. Chicago and London: The University of Chicago Press. pp. 337-338.
- Harvey, N. 1996. The Reshaping of Agrarian Policy in Mexico. Randall, L. (ed.) *Changing Structure of Mexico. Political, Social and Economic Prospects*. Columbia University Seminar Series. Armonk, N.Y.: M.E. Sharpe. pp. 103-110.
- Hernández, F. 1942. *Historia de la Plantas de la Nueva España. III Volumen*. México: Instituto de Biología UNAM. (First published in Mexico, 1615).
- IFAD (International Fund of Agricultural Development). 1993. *The state of world rural poverty. A profile of Latin America and the Caribbean*.
- INAH (Instituto Nacional de Antropología e Historia). 1979. *Los códices de México*. Catálogo de la exposición temporal en el Museo Nacional de Antropología. México: Instituto Nacional de Antropología e Historia INAH / Secretaría de Educación Pública SEP.
- INEGI (Instituto Nacional de Estadística, Geografía e Informática). 1990. *XI Censo General de Población y Vivienda*. Puebla.
- INEGI (Instituto Nacional de Estadística, Geografía e Informática). 1994. *VII Censo Agrícola – Ganadero*. Tomo I. Puebla Resultados Definitivos.
- IUCN (International Union for Conservation of Nature and Natural Resources). 1980. *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. Gland, Switzerland: IUCN / United Nations Environment Program UNEP / World Wildlife Fund WWF.
- Ingold, T. 1993. *Globes and spheres: the topology of environmentalism*. In Milton, K. (ed.) *Environmentalism: The View from Anthropology*. London and New York: Routledge.
- Joshi, D. 1987. Shortages of forest raw materials and the development of small-scale enterprises in India. In *Small-scale forest based processing enterprises*. FAO Forestry Paper 79. pp. 99-116.
- Kabuye, C. 1999. *Bark cloth in Buganda*. In Posey, D.A. (ed.) *Cultural and Spiritual Values of Biodiversity. A Complementary Contribution to the Global Biodiversity Assessment*. United Nations Environmental Program UNEP, Intermediate Technology Publications. pp. 371-372.

- Kaplan, F.S. 1993. Mexican Museums in the Creation of a National Image in World Tourism. In Nash, J. (ed.) *Crafts in the World Market. The Impact of Global Exchange in Middle American Artisans*. SUNY Series in the Anthropology of Work. State University of New York Press. pp. 103-124.
- Kelly, I. and Palerm, A. 1952. *The Tajín Totonac*. Publication No. 13. Washington, D.C.: Institute for Social Anthropology, Smithsonian Institution.
- Kopytoff, I. 1997 [1986]. The cultural biography of things: commoditization as process. Appadurai, A. (ed.) *The social life of things. Commodities in cultural perspective*. Cambridge University Press. pp. 3-63.
- Kraemer, G.B. and Solorzano, L.A.T. 1990. Los productores de café en Zihuateutla, Puebla. Origen, entorno y perspectivas. Serie Ciencias Sociales 8. Departamento de Sociología Rural. Universidad Autónoma Chapingo.
- La Jornada. 24 October 2001. Desciende 50% la migración hacia Estados Unidos: Instituto Mexicano de Migración.
- Lafferty, W.M. 2000. Democratic Parameters for Regional Sustainable Development: the need for a new demos with a new rationality. Working Paper 1. University of Oslo.
- Lelé, S. 1991. Sustainable Development: A Critical Review. *World Development* 19(6): 607-621.
- Lenz, H. 1949. Las fibras y las plantas del papel indígena mexicano. *Cuadernos Americanos*. Volumen 8, Mayo-Junio, Número 3. pp. 157-169.
- Lenz, H. 1969. El papel y las supersticiones. *Artes de México. Mitos, Ritos y Hechicerías*. Año XVI, Número 124. pp. 84-92.
- Lenz, H. 1973 [1948]. El papel indígena mexicano. Serie Cultura Sep Setentas 65. México: Editorial Cultura Sep Setentas.
- Lenz, H. 1990. *Historia del papel en México y cosas relacionadas (1525-1950)*. México: Editorial Porrúa.
- León, N. 1924. La industria indígena del papel en México en los tiempos precolombinos y actuales. *Boletín del Museo Nacional de Arqueología, Historia y Etnografía*. 4a época. Enero – Marzo, Número 5. pp. 101-105.
- Long, N. 1996. Globalization and localization. New challenges to rural research. In Moore, L. Henrietta (ed.) *The Future of Anthropological Knowledge*. London and New York: Routledge. pp.35-59.
- López-Austin, A. 1988 (1980 Spanish). *The Human Body and Ideology. Concepts of the Ancient Nahuas Vol. I*. Salt Lake City: University of Utah Press.
- López-Austin, A. 1993 (1990 Spanish). *The Myths of the Opossum. Pathways of Mesoamerican Mythology*. Albuquerque: University of New Mexico Press.
- López-Austin, A. 1994. *Tamoanchan y Tlalocan*. Sección Obras de Antropología. México: Fondo de Cultura Económica.
- López de Gómara, F. 1979. *Historia de la conquista de México*. Biblioteca Ayacucho. Caracas, Venezuela. (First published in 1552).
- López, C. 1992. El papel amate. Sagrado, profanado y proscrito. *Ciencias. Revista de la Facultad de Ciencias UNAM* (28): 31-36.
- Macheca, E.V. and Echeverri, R.R. 1983. *Arboles del Valle del Cauco*. Bogotá, Colombia: Progreso Corporación Financiera S.A. / Litografía Arca.

- Manrique, C.L. 1969. The Otomi. In Vogt, E.Z. (ed.) Handbook of Middle American Indians 8. Austin: University of Texas Press. pp. 687-772.
- Marcus, J. 1979. Los orígenes de la escritura mesoamericana. *Ciencia y Desarrollo* 24: 35-52.
- Marion, M.O. 1991. Los hombres de la selva. Un estudio de tecnología cultural en el medio selvático. Colección Regiones de México. México: Instituto Nacional de Antropología e Historia.
- Martin, G. 1995. Ethnobotany: a methods manual. People and Plants' Conservation Manuals, WWF / UNESCO / Royal Botanic Gardens, Kew. London: Chapman and Hall.
- Martínez, M. 1987 [1979]. Catálogo de nombres vulgares y científicos de plantas mexicanas. México: Fondo de Cultura Económica.
- Martínez Alfaro, M.A; Evangelista, V; Mendoza, M.; Morales, G; Toledo-Cortina, G and Wong-León, A. 1995. Catálogo de plantas útiles de la Sierra Norte de Puebla. Cuadernos del Instituto de Biología 27. México: Jardín Botánico, Instituto de Biología UNAM.
- Masferrer Kan, E. and Martínez Alfaro M.A. n/d. La dinámica económica de los agroecosistemas de la Sierra Norte de Puebla. (manuscript)
- Masferrer Kan, E. and Báez L.C. 1993. Diagnóstico sobre la situación socio-económica de la población jornalera de la Sierra Norte de Puebla. Programa Nacional de Solidaridad con Jornaleros Agrícolas / Secretaría de Desarrollo Social SEDESOL. (Unpublished report)
- Masferrer Kan, E. and Báez, L.C. 1995. Los Nahuas de la Sierra Norte de Puebla. En Etnografía contemporánea de los Pueblos Indígenas de México. Región Oriental. México: Instituto Nacional Indigenista / Secretaría de Desarrollo Social SEDESOL. pp. 167-204.
- Mayoux, L.C. 1991. The poverty of income generation: a critique of women's handicraft schemes in India. Wallace, T. and March C. (eds.) Changing perceptions. Writings on Gender and Development. Oxford, U.K.: Oxfam.
- Merino, P.L. 1999. La gestión colectiva de los recursos forestales. *Revista de Comercio Exterior*. Diciembre 1999. (<http://www.mesoamerica.org.mx/manejocomunit/docdiscusion/Gestion.html>).
- Milton, K. 1996. Environmentalism and Cultural Theory. Exploring the role of anthropology in environmental discourse. London and New York: Routledge.
- Miranda, F. 1946. Algunos comentarios botánicos acerca de la fabricación del papel por los Aztecas. *Cuadernos Americanos* 5: 196-204.
- Moguel, P. and Toledo, V. M. 1999. Biodiversity conservation in traditional coffee systems of Mexico. *Conservation Biology* 13(1): 11-21.
- Motolinía, Fray Toribio de Benavente. 1997. Historia de los Indios de la Nueva España. México: Editorial Fondo de Cultura Económica.
- Murra, J. 1975. El Control Vertical de un Máximo de Pisos Ecológicos en la Economía de las Sociedades Andinas. In Formaciones y Políticas del Mundo Andino. Lima, Perú: Instituto de Estudios Peruanos.
- Muul, I. 1993. Tropical forests, integrated conservation and the concept of critical mass. Paris: MAB Digest, UNESCO.
- Nash, J. 1993. Introduction: Tradicional Arts and Changing Markets in Middle America. In Nash, J. (ed.) Crafts in the World Market. The Impact of Global Exchange in Middle American Artisans. SUNY Series in the Anthropology of Work. State University of New York Press. pp. 1-22.

- NAS (National Academy of Sciences). 1980. *Trema* species. In Firewood Crops. Shrub and Tree Species for Energy Production. Report of an Ad Hoc Panel of the Advisory Committee on Technology Innovation Board of Science and Technology for International Development Commission on International Relations. pp. 68-69.
- Navarro, G. 1979. Un desarrollo reciente: las empresas cafetaleras de Zihuateutla. En Sociología del Desarrollo Rural. Memoria del Primer Seminario Nacional de Sociología y Desarrollo Rural celebrado en la Universidad Autónoma de Chapingo. Tomo I. pp. 190-213.
- NEEP (National Environmental Policy Plan). 1989. Second Chamber of Parliament, Meeting year 1988-1989. No. 21137-2. 's-Gravenhage, the Netherlands: SDU Publishers.
- Nestel, D. 1995. Coffee in Mexico: international market, agricultural landscape and ecology. *Ecological Economics* 15:165-179.
- Neumann, R.P. and Hirsch, E. 2000. Commercialisation of Non-Timber Forest Products: Review and Analysis of Research. Bogor, Indonesia: Center for International Forestry Research CIFOR / FAO.
- Niembro, A.R. 1986. Árboles y arbustos útiles de México, naturales e introducidos. Departamento de Bosques. México: Universidad Autónoma de Chapingo / Editorial Limusa.
- Paré, L. 1976. Caciquismo y estructura de poder en la Sierra Norte de Puebla. En Bartra, R. (ed.) Caciquismo y poder político en el México rural. México: Instituto de Investigaciones Sociales UNAM / Editorial Siglo XXI.
- PDSPNP. Programa de Desarrollo de la Sierra Norte de Puebla, México. 1992-1994.
- Peet, R. and Watts, M. 1996. Liberation Ecology. Development, sustainability, and environment in an age of market triumphalism. In Peet, R. and Watts, M. (eds.) *Liberation Ecologies. Environment, development and social movements*. London and New York: Routledge. pp. 1-45.
- Peluso, N.L. 1992. The Rattan Trade in East Kalimantan, Indonesia. In Nepstad, D.C. and Schwartzman, S. (eds.) *Non-timber products from tropical forests: evaluation of a conservation and development strategy*. *Advances in Economic Botany* 9. pp. 115-127.
- Pennington, T.D. and Sarukhán J. 1998. Árboles Tropicales de México. Manual para la identificación de campo de las principales especies. México: Fondo de Cultura Económica / Instituto de Ecología UNAM.
- Peters, C.M.; Rosenthal, J. and Urbina, T. 1987. Otomi Bark Paper in Mexico: Commercialization of a Pre-Hispanic Technology. *Economic Botany* 41(3): 424-432.
- Peters, C.M.; Gentry, A.H. and Mendelsohn, R.O. 1989. Valuation of an Amazonian rainforest. *Nature* 339 (29): 655-656.
- Peters, C.M. 1996. The ecology and management of non-timber forest resources. World Bank Technical Paper 322. Washington, D.C.
- Petrich, P. 1985. La alimentación mochó: acto y palabra (Estudio etnolingüístico). San Cristobal de Las Casas, México: Centro de Estudios Indígenas, Universidad Autónoma de Chiapas UACH.
- Prance, G.T. and Prance, A.E. 1993. Bark. The formation, characteristics and uses of bark around the world. Kew, U.K.: Timber Press / The Royal Botanic Gardens.
- Pritchard, Jr. L.; Colding, J.; Berkes, F.; Svendin, U. and Folke, C. 1998. The Problem of Fit between Ecosystems and Institutions. A Report for the International Human Dimensions Programme on Global Environmental Change. IHDP Working Paper 2.

- Public Citizen. 2001. En el campo: el impacto del TLACN para campesinos y ganaderos en los E.U.U., Canada y México. Public Citizen Global Trade Watch. (http://www.citizen.org/trade/ftaa/ALCA_Espanol/articles.cfm?ID=7514).
- Quintanar, A. and López, C. Forthcoming. Un enfoque biológico y antropológico para el estudio del papel amate. In *Plantas, Cultura y Sociedad*. México: Universidad Autónoma Metropolitana UAM.
- Ramakrishnan, P.S. 1998. Conserving the Sacred for Biodiversity: The Conceptual Framework. In Ramakrishnan, P.S.; Saxena, K.G. and Chandrashekara, U.M. (eds.) *Conserving the Sacred for Biodiversity Management*. USA: Science Publishers, Inc. / UNESCO.
- Ramírez, L.F. 2001. Globalisation and livelihood diversification through non-traditional agricultural products: the Mexico case. *ODI Natural Resources Perspectives* 67.
- Ramos, H.M.G. and Magnon, C.B. 1979. La lucha de clases en la Sierra Norte de Puebla y en la Sierra Central de Veracruz: el caso de la Unión Campesina Independiente. En *Sociología del Desarrollo Rural. Memoria del Primer Seminario Nacional de Sociología y Desarrollo Rural* celebrado en la Universidad Autónoma de Chapingo, México. Tomo I. pp. 353-376.
- Ros-Tonen, M. 1999. Introduction: NTFP Research in the Tropenbos Program. In Ros-Tonen, M. (ed.) *NTFP Research in the Tropenbos Programme: results and perspectives*. Wageningen, the Netherlands: The Tropenbos Foundation.
- Rzedowski, J. 1978. *Vegetación de México*. México: Editorial Limusa.
- Sachs, W. 1992. Environment. In Sachs, W. (ed.) *The Development Dictionary: A Guide to Knowledge as Power*. London: Zed Books. pp. 26-37.
- Sandstrom, A.R. 1983. Paper Dolls and Symbolic Sequence: An Analysis of a Modern Aztec Curing Ritual. *Folklore Americano*. Instituto Panamericano de Geografía e Historia. Julio-Diciembre 36: 109-126.
- Sandstrom, A.R. and Sandstrom, P.E. 1986. *Traditional Papermaking and Paper Cult Figures of Mexico*. University of Oklahoma Press.
- Santoyo, C.V.; Díaz-Cárdenas, H.S. and Rodríguez-Padrón, B. 1995. *Sistema Agroindustrial Café en México: diagnóstico, problemática y perspectivas*. México: Universidad Autónoma de Chapingo.
- Sarmiento, F.O. 2000. Breaking Mountain Paradigms: Ecological Effects on Human Impacts in Managed Tropandean Landscapes. *Ambio* 29(7): 423-431.
- Schwede, R. 1916. *Ein weterer Beitrag zur Geschichte des altmexikanischen Papiers*. Berlin.
- Seeman, E.C. 1990. Usos del Papel en el Calendario Ritual Mexica. Serie Etnohistoria 207. México: Instituto Nacional de Antropología e Historia.
- Siebert, S.F. and Belsky, J.M. 1985. Forest-product trade in a lowland Filipino village. *Economic Botany* 39: 522-533.
- Starr, F. 1901. Notes upon ethnography of southern Mexico. *Proce. Davenport Acad. Sci.* 8: 102-188.
- Stephen, L. 1991. Culture as a Resource: Four Cases of Self-managed Indigenous Craft Production in Latin America. *Economic Development and Cultural Change* 40(1): 101-130.
- Stromberg, G. 1976. The Amate Bark-Paper Painting of Xalitla. In Graburn, N.H.H. (ed.) *Ethnic and Tourist Arts. Cultural Expressions from the Fourth World*. Berkeley: University of California Press. pp. 149-162.

- Stromberg, G. 1982. La pintura sobre amate. In *El Universo del Amate*. México: Museo Nacional de Culturas Populares / Cultura SEP. pp. 31-62.
- Terborgh, J. 1986. Keystone plant resources in the tropical forest. In Soulé, M.E. (ed.) *Conservation Biology. The Science of Scarcity and Diversity*. University of Michigan. Sunderland, Massachusetts: Sinauer Associates Inc. 330-344.
- Toledo, V. M. 1990. The ecological rationality of peasant production. In Altieri, M.A. and Hecht, S.B. (eds.) *Agroecology and small farm development*. Florida, USA: CRC Press. pp. 53-60.
- Toledo, V. M. 1992. What is ethnoecology? Origins, scope and implications of a rising discipline. *Etnoecológica* 1: 5-21.
- Toledo, V.M.; Batis, A.; Becerra, R.; Martínez, E. and Ramos, C. 1992. Products from the tropical rain forest of Mexico: an ethnoecological approach. In Plotkin, M. and Famolare, L. (eds.) *Non-Wood Products from Tropical Rainforests*. Washington, D.C.: Conservation International. pp. 99-109.
- Toledo, V.M. 2001. Biocultural Diversity and Local Power in Mexico. Challenging Globalization. In Maffi, L. (ed.) *On Biocultural Diversity. Linking Language, Knowledge and Environment*. Washington and London: Smithsonian Institution Press. pp. 472-488.
- Toledo, V. M. 2002. Ethnoecology: A conceptual framework for the study of indigenous knowledge on nature. In Stepp, J.R et al. (eds.) *Ethnobiology and Biocultural Diversity: Proceedings of the Seventh International Congress of Ethnobiology 2000 Athens, Georgia*. The University of Georgia Press.
- Torquemada, Fray Juan de. 1976. *Monarquía Indiana*. Tomo II. Instituto de Investigaciones Historicas UNAM. (First published in Sevilla, 1615).
- Torres, B. 1982. El papel del amate, historia y significado. In *El Universo del Amate*. México: Museo Nacional de Culturas Populares / Cultura SEP. pp. 13-29.
- Townson, I.M. 1995. Forest products and households incomes: a review and annotated bibliography. *Tropical Forestry Papers* 31. Oxford, U.K.: Oxford Forestry Institute / Center for International Forestry Research CIFOR.
- UNCED (UN Conference on Environment and Development) 1992. Agenda 21. United Nations General Assembly, New York.
- Urbina, T.G. 1990. Impacto socioeconómico de la producción de papel amate en la comunidad de San Pablito, Pahuatlán, Puebla. Tesis Ingeniera Agrícola. Facultad de Estudios Superiores FES-Cuautitlán UNAM.
- Urbina, M. 1903. Los amates de Hernández o Higueras Mexicanas. *Anales del Museo Nacional de México*. 1a época, Tomo VII. pp. 93-114.
- Vander Mareen, M. 1995. El Papel Amate: Tecnología, Composición y Alteraciones. *Imprentura, Revista de Restauración* 9. pp. 3-12.
- Vázquez-Yanes, C. 1998. *Trema micrantha* (L.) Blume (Ulmaceae): A promising neotropical tree for site amelioration of deforested land. *Agroforestry Systems* 40: 97-104.
- Von Hagen, V. 1943. Mexican Paper-Making Plants. *Journal of the New York Botanical Garden* 44: 1-10.
- Von Hagen, V. 1945. La fabricación del papel entre los aztecas y los mayas. México: Editorial Nuevo Mundo.

- Von Humboldt, A. 1984. *Ensayo político sobre el reino de la Nueva España*. México: Editorial Porrúa. (First published in 1811).
- Wiersum, K.F. 1996. Domestication of valuable tree species in agroforestry systems: evolutionary stages from gathering to breeding. In Leakey, R.R.B.; Temu, A.B.; Melnyk, M. and Vantomme, P. (eds.) *Domestication and commercialization of non-timber forest products in agroforestry systems*. Proceedings of an international conference, Kenya, February 1996. ICRAF, FAO, IUFRO. *Non-wood forest products*, 9. pp. 147-159.
- Wollenberger, 1998. A conceptual framework and typology for explaining the outcomes of local forest management. *Journal of World Forest Resource Management*. Vol.9 pp. 1-35.
- Wong, J.L.G. 2000. The biometrics of non-timber forest product resource assessment: a review of current methodology. European Tropical Forest Research Network ETFRN. (<http://www.etfrn.org/etfrn/workshop/ntfp>).
- WCED (World Commission on Environment and Development). 1987. *Our Common Future* (The Brundtland Report). Oxford: Oxford University Press.
- Zimmerer, K.S. 1994. Human Geography and the 'New Ecology': The Prospects and Promise of Integration. *Annals of the Association of American Geographers* 84(1): 108-125.
- Zimmerer, K.S. 1999. Overlapping Patchworks of Mountain Agriculture in Peru and Bolivia: Toward Regional-Global Landscape Model. *Human Ecology* 27(1): 135-165.
- Zimmerer, K.S. and Young, K.R. 1998. Introduction: The Geographical Nature of Landscape Change. In Zimmerer, K.S. and Young, K.R. *Nature's Geography. New Lessons for Conservation in Developing Countries*. The University of Wisconsin Press. pp. 3-34.

Bibliography

- Boix, F.C. 2002. Competition over water resources analysis and mapping of water-related conflicts in the catchment of Lake Naivasha, Kenya. MSc Thesis. International Institute for Aerospace Survey and Earth Science ITC. Netherlands.
- Código Borbónico. 1981. Descripción histórica y descripción por Francisco Del Paso y Troncoso con comentario explicativo por E.T. Hamy. México: Editorial Siglo XXI.
- Código Borgia. 1988. Comentarios al Código Borgia por Eduard Seler. México: Fondo de Cultura Económica.
- Código Dresde. 1988. Un Comentario al Código Dresde por Eric Thompson. México: Fondo de Cultura Económica.
- Código Fejérváry-Mayer. 1971. Edición Facsimilar. Austria: Editorial Graz 1971.
- Código Florentino. 1976. Colección Palatina de la Biblioteca Medicea Laurenziana Manuscrito 218-220. México: Edición facsimilar de la Secretaría de Gobernación.
- Código Matrícula de Tributos. 1968. México: Aportación de la Secretaría de Hacienda y Crédito Público a la XIX Olimpiada. 32 facs.
- Código Mendocino. 1943. México: Artes Gráficas Comerciales.
- Díaz del Castillo, Bernal. 1968. Historia verdadera de la Conquista de la Nueva España. Colección Austral no. 1274. Madrid: Edit.Espasa Calpe.
- Las Casas, Fray Bartolomé de. Historia de las Indias (First published in 1875)
- Pedro Mártir de Anglería. 1944. Décadas del Nuevo Mundo. Buenos Aires, Argentina: Editorial Bajel
- Randall, L. (ed.) 1996. Changing Structure of Mexico. Political, Social and Economic Prospects. Columbia University.
- Sahagún, Fray Bernardino de. 1969. Historia General de las cosas de Nueva España. México: Editorial Porrúa. (First published in 1825).
- Sahagún, Fray Bernardino de. 1974. Primeros Memoriales. Colección Científica Histórica 16. México: Secretaría de Educación Pública / Instituto Nacional de Antropología e Historia.
- Suarez, C. A. 1997. La arriería en la Nueva España durante el S. XVIII. México: Casa de Investigaciones, Tlalpan.

Appendix

Appendix A: Structure and function of bark

In this appendix the main components and functions of the bark are explained; the information is extracted from the work of Prance and Prance (1993). The part of the bark that is used for the production of Otomi bark paper corresponds to the phloem. This part is essential for the life of trees. The whole bark is composed of two principal zones, the inner bark and the outer bark (Figure 1). The outer bark consists of several layers: protective layers (periderm), old dead phloem from inner layers and a cork-producing layer. The inner bark consists of the phloem or conductive tissue by which sugars are transported from the leaves to the roots, and from storage tissues to other parts of the plant during spring. Subsequently a layer of cells called vascular cambium surround the wood. These cells divide and produce new cells which build up the wood on the inside of the cylinder and the phloem or inner bark on the outside of the cylinder. When trees are debarked, it is the vascular cambium that lies exposed.

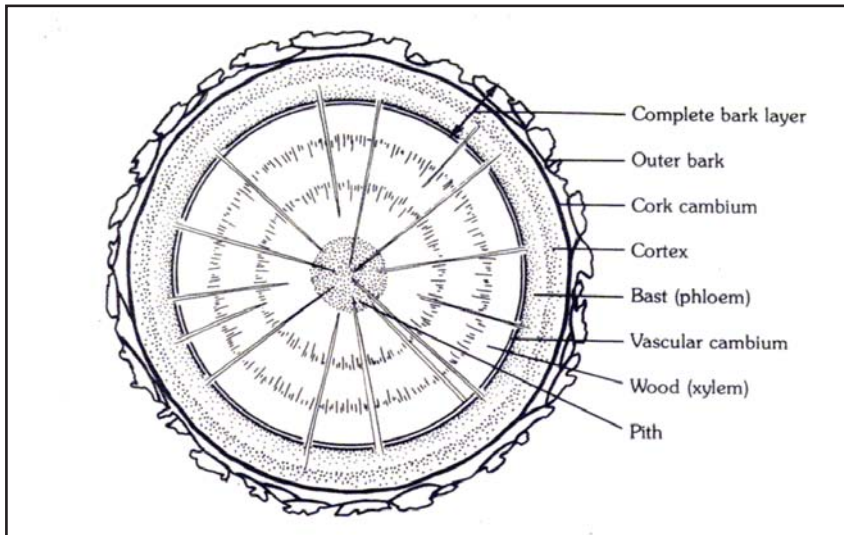


Figure 1. Cross-section through the trunk of a three-year old tree (from Prance and Prance, 1993).

The inner bark, as can be seen in Figure 1, lies between the vascular cambium and the outer cork cambium, the two layers where cell division and growth take place. The vascular cambium produces nutrient-transporting tissues that during spring, when the cells of the cambium are actively dividing, it is easier to remove the bark of most temperate-region trees. This condition related to the phenological stages of the trees is quite relevant for the bark supply for amate paper. It determines the calendar/timing for extracting bark from each of the tree species used in amate production.

The function of the cells of the inner bark is part of the trees' life-support system. Trees have two separate systems for moving liquids. The first one relates to moving liquids to the leaves. Roots absorb water, which is carried up to the leaves through conductive cells present in the wood. The second system relates to moving liquids from leaves. In this case the products obtained from photosynthesis in the leaves flow downwards through the conductive tubes of the inner bark (phloem). These conducting cells are elongated; their form, diameter and length have relevance for paper manufacture and for the final characteristics of the paper sheets. Besides the conductive cells, inner bark also contains fiber, parenchyma cells and ideoblasts. Parenchyma stores tannins and resins and food materials for the tree. Ideoblasts secrete a variety of substances such as balsams, gums, mucilages, oils, resins and tannins. These give color to the amate paper, while parenchyma enables different grades of stickiness among the fibers (Biol. Alejandra Quintanar, UAM wood laboratory, personal communication). Another type of cell common in the inner bark is the latex-containing cell, also important for the amate paper.

Appendix B: Characteristics of bark fibers in relation to bark paper

Among Otomi artisans the bark properties for paper manufacture are qualified by two main criteria: the malleability of the fibers for the boiling process so they can reach the softer state required; and pliability so they can be blended by being beaten with the volcanic stone. The purpose of boiling the bark is to remove the latex and soften the bark so it can be easily separated into long thin fiber strands (see Table 1).

For boiling *Ulmus mexicana* and *Sapium* trees take longer than the rest of the bark trees; these species have a higher content of latex. In fact the Euphorbiaceae family, to which the *Sapium* trees belong, comprises trees with very high contents of latex, such as *Hevea brasiliensis*, one of the most important sources of commercial rubber (Prance and Prance, 1993). Fibers of *Ulmus mexicana* take up to twice as long as other barks to be softened by boiling. In the case of the two *Sapium* trees, fibers are too sticky due to their abundant sap content. This cannot be completely removed through boiling so the beating phase becomes a harsh activity; the fibers persistently stick to the volcanic stone. Of all the resources used, the most suitable fibers for the boiling and beating processes come from first *Morus celtifidolia* and second *Trema micrantha*.

Table 1. Species used for amate and main characteristics of bark fibers and paper .

	Species	Otomi name*	Color of fiber and paper	General characteristics of bark-fiber	Paper characteristics
Traditional tree species	<i>Ficus pertusa</i>	Buo moushi Black + lemon tree	Dark brown	Sticky	Easy to bend
	<i>Ficus padifolia</i>	Tshax moushi White + lemon tree	Light brown creamy	Easy to boil	Easy to bend
	<i>Ficus cotinifolia</i>	Tshax popotzha White + abundant sticky juice	Light brown	Sticky	Easy to bend
	<i>Ficus calyculata</i>	Buo popotzha Black + abundant sticky juice	Brown	Sticky	
	<i>Ficus goldmanii</i>	Popotzha xibahua Abundant sticky juice + avocado tree	Brown	Easy to boil	Easy to bend
New adopted tree species	<i>Morus celtidifolia</i>	Tzhazúcuá Fiber + paper, documents	White	Softest fiber, boils very quickly	Easiest to bend but also resistant
	<i>Trema micrantha</i>	Coni Bark, inner soft bark	Brown – reddish	Easy to boil and beat	Moderately flexible
	<i>Ulmus mexicana</i>	Sxifi-tzha	Brown – orange	Fibers that take the longest time to boil	Breakable
	<i>Brosimum alicastrum</i>	Payu coni Ring + bark	Cream		Breakable
	<i>Sapium oligoneuron</i>	Coni pathi Bark + witch	White – yellowish	Very sticky difficult to beat, boils slowly	Breakable
	<i>Sapium aucuparium</i>	Coni pathi Bark + witch	White	Very sticky difficult to beat, boils slowly	Breakable
	<i>Urera caracasana</i> <i>Myriocarpa cordifolia</i>	Tzhanná Fiber + itching Husna	White cream White cream	Very difficult to extract Difficult to extract	Very resistant Resistant

* Otomi words. Phonetic transcription implies difficulties due to existing heterogeneous systems used by linguistics specialized in Otomi. This language varies from the Sierra and the Altiplano. In the last years some teachers of the bilingual school in San Pablito have tried to elaborate their own Otomi dictionary. The Otomi words contained in this table were corrected by them. Still a thorough revision from an ethno-linguist is required.

The characteristics of the end paper product, such as color, texture but also ease of bending - very important for the traditional cutting-out techniques and also for some new paper designs that require bending - varies from species to species (Table 1). The whitest paper is made from *Morus celtidifolia*, while the darkest is made from *Ficus pertusa*. The most resistant and at the same time most flexible paper (it can be bent without risk of breaking, and is therefore the most suitable for cutting) is made from *Morus celtidifolia*. The most breakable is paper made from the fibers of the *Ulmus mexicana* and *Sapium* trees, while paper made from any of the *Ficus* sp. is moderately flexible. Some of the names that bark trees are given in Otomi make reference to some of these characteristics, as can be seen in Table 1.

Ongoing studies are being carried in the Laboratory for Wood UAM out to find common characteristics among the distinct tree species belonging to different families and genera that are being used for bark paper production (Quintanar and López, forthcoming). Bark specimens were collected during fieldwork and are now being examined in the wood laboratory to evaluate the characteristics of the bark fibers (length and diameter of fiber, thickness of the cellular wall, extent of lumen). First results indicate that among the normal quality indicators used for paper made from wood, which especially include the cellular dimensions of fibers, there are other kinds of cells that appear relevant to bark paper. These are the parenchyma cells, which contain pectic compounds such as gums, which in the case of amate paper function as natural glues.

Results such as this one could yield important information for understanding fibers and paper qualities and thus the potential tree resources to select for management purposes. Laboratory analysis has already yielded useful information, Vander Meer (1995) compared 15 codices and the fibers of *Ficus* and *Morus* species collected in San Pablito. The objective was to understand certain phenomena in the behavior of the paper by analyzing its components. The results of Vander Meer show that the laboratory analysis of the fibers of codices clarified the relation between the tissue of the inner fibers and the characteristics of the paper, results especially relevant to methods for conserving codices.

Appendix C: Main biological characteristics of bark trees

The main biological characteristics of the resources used are next explained. *Ficus* and *Morus celtidifolia* trees belong to the Moraceae family. This family contains more than 1 000 species of shrubs, trees and some herbs and rattans distributed all around the world. In tropical America there are around 500 species of trees belonging to 27 genera. There is a lot of variability among the species but generally these trees or shrubs show bark with attractive lenticels, simple and alternate leaves, their edges, smooth, serrated or lobular (Macheca and Echeverri, 1983).

There are more than 20 *Ficus* species in Mexico. One of the main characteristics of some *Ficus* species is their type of growth. At one stage of their growth as epiphytes, they stand over another tree or rock until they develop roots that plunge into the soil and can also strangle their hosts. These trees are generally medium to high, reaching up to 30 m, generally with extended and leafy canopies. In the harvest area they occur within all the different vegetation types but their altitudinal limit is 1 200 masl, in fact San Pablito is located at that limiting altitudinal level. The most widely distributed are *F. cotinifolia* and *F. pertusa*, which can grow from 0 up to 1 500 masl (Pennington and Sarukhán, 1998).

Before systematic ecological studies were done, *Ficus* had not been fully valued. A common characteristic is that different *Ficus* species have been used around the world for bark paper and bark cloth manufacture. Von Hagen (1943:6) mentions that ‘... Although fig-trees often constitute a substantial percentage of tropical forests in any part of the world, and the trees attain great size, they are among the least useful of all the trees of the world – except for this [bark paper] one great exception which has affected the culture of the people in many regions.’

Their ecological importance has now been fully recognized. Among palms, nuts and nectar, figs have been identified as keystone plant resources. These are trees of great ecological significance because they appear to set the carrying capacity of the community by sustaining frugivores during times of general scarcity. These are crucial resources – a lean season food supply for birds and mammals throughout the Neotropics (Terborgh, 1986).

Brosimum alicastrum of the Moraceae family is one of the dominant species of tropical forests in Mexico, with the largest extension in the country, growing from sea level up to 800 masl (Pennington and Sarukhán, 1998). In Sierra Madre Oriental it is abundant on hills of karstic characteristics. These trees can reach a

height of 40 m. In Sierra Norte de Puebla *Brosimum alicastrum* grows mainly in ravines, on very steep and rocky slopes, and close to rivers. It shows a restricted distribution, occurring especially below 700 masl. Therefore these trees are not known by Otomi artisans.

Many different uses are reported for this species in both Mexico and other countries. In Jamaica *Brosimum alicastrum* is a prized fodder tree; the leaves are cut and fed to cattle as fodder. It is also highly valued for charcoal production. Many different products can be obtained from this tree. For example, the wood can be used for furniture, agricultural tools, parquet, boxes, as well as in house construction and decoration. The pulp can be used for paper. The leaves and fruit can be used as fodder for cattle during the dry season and the seeds can be used as a food complement (Niembro, 1986). The seeds are sometimes used as a substitute for coffee when this product is scarce, and are also combined with maize to prepare tortillas (Pennington and Sarukhán, 1998). In the Sierra Norte, besides being combined with maize, these seeds are mixed with other ingredients to prepare full meals (Martínez Alfaro et al., 1995).

Ulmus mexicana belongs to the Ulmaceae family, which is predominantly a temperate family of about 15 genera and 200 species (Hartshorn, 1983). It is of restricted distribution. In Mexico it only occurs along a narrow fringe facing the Gulf of Mexico and the Pacific coast, between 500 and 900 masl, in cloud forests. Apparently this is the highest woody-tree species of Mexico, reaching up to 90 m in height. Its strong wood is used to make planks for building houses and fences (Pennington and Sarukhán, 1998).

Sapium trees as well as *Brosimum alicastrum*, according to peasants in Sierra Norte de Puebla, can be used for fuelwood but not for construction - particularly *Sapium* whose wood is considered of very low quality. The same occurs with *U. caracasana* and *M. cordifolia*. In the case of the latter, medicinal attributes have been recognized; inhaling the smell of the stems is a cure for flu and it is also used in 'cleaning rituals' (Martínez Alfaro et al., 1995).

Appendix D: Main biological characteristics of *Trema micrantha*

The pantropical genus *Trema* contains between 14 and 55 species (Vázquez-Yanes, 1998) but *T. micrantha* is the sole species in Central America. *T. micrantha* has a very wide distribution, which ranges from Mexico and the West Indies to southern Brazil and northern Argentina.

T. micrantha are fast-growing heliophile trees, common in early successional fallows, in forest gaps and on disturbed sites (Ackerly, 1997; Vázquez-Yanes 1998). These short-lived small to medium-sized trees can be found in the moist tropical forests in southern Florida and from Mexico to northern Argentina. In Mexico, these trees can be found in several vegetation types, ranging from tropical lowland evergreen rainforest and moist semi-deciduous forest to mountainous mesophilous forest (Vázquez-Yanes, 1998). These trees are particularly abundant along the southeastern coastal plains of the Gulf of Mexico, with an altitudinal distribution from sea level up to 1 500 masl (Ackerly, 1997).

T. micrantha trees produce abundant inflorescence with small monoecious flowers once a year. The reproductive season starts in May and frequently lasts until December. In a nursery located in south Mexico, it was observed that these trees started to flower after nine months (Ackerly, 1997). Another study showed that, in humid tropical areas of Mexico, about 25 local and migrant birds carry *T. micrantha* seeds in their faeces and in most cases this type of seed dispersal is effective. *T. micrantha* are very fast-growing trees. In Costa Rica it was observed that these trees reached their adult size of 20 m after seven years. When growing in secondary forests, they are completely replaced by longer-living mature trees after about 30 years (Vázquez-Yanes, 1998).

T. micrantha plants hold an important place in relation to the ecosystem and dependent organisms. They are second only to *Ficus* sp. in the number of bird species that feed from their fruits (Ackerly, 1997). They have been recommended for the amelioration of degraded sites, and as suitable in the afforestation of denuded and disturbed areas (NAS, 1980; Vázquez-Yanes, 1998). In such conditions the abundant litter and fast-growing crown shape of these trees improve soil quality and change the ground microclimate to more stable and moist conditions (Vázquez-Yanes, 1998).

As to use of this species, regional harvesters commented that debarked or girdled *T. micrantha* trees are occasionally used. When their wood has dried completely - about six months after extraction - the branches are chopped into small pieces for fuelwood. For people in Sierra Norte de Puebla this is not the best type of fuelwood since it burns too quickly; still, it is particularly significant during scarcity of other fuelwood sources. The characteristic straight tall trunk also makes these trees highly suitable for building houses and huts, as well posts for barbed wire fences. Thick planks can be made from the trunk, especially if these are made from wood treated under a full moon, which, according to regional harvesters, avoids contamination by moths.

Appendix E: Taxonomic classification of species used for Otomi bark paper

Table 2 contains all the species that have been identified for bark paper manufacture. This is an update of the original table of Peters *et al.* (1987). Two observations are pertinent. The first is that earlier authors (Starr, 1901 cited in Peters *et al.*, 1987; León, 1924; Lenz, 1973; Christensen, 1963; Christensen and Martí, 1971) based their observations on San Pablito and also various locations in Sierra Norte de Puebla and Huasteca where bark paper was made in the past. More recent authors (Torres, 1982; Peters *et al.*, 1987; Bravo, 1997) based their findings on the species only occurring in San Pablito, while for this study tree specimens were collected in San Pablito and on actual harvest sites within Sierra Norte de Puebla. The second observation is that taxonomical classification has changed, becoming more precise and detailed as morphological aspects of plants become known. This is especially relevant to *Ficus* species. In general Table 2 gives a historical review of the different resources that have been used for paper manufacture. Up to the 1960s *Ficus* sp. and *Morus* sp. were the only sources of raw material; the integration of more species is clear from the work of Torres (1982).

The collection of specimens with flowers and seeds and also bark samples for this study was divided into two phases. The first phase was carried out with the help of Otomi from San Pablito who know more about the different bark trees, and the second along the harvest area with regional harvesters. Trees tested by Otomi artisans but not suitable for paper manufacture were also identified and their bark is being analyzed at the UAM wood laboratory. The botanical specimens were classified in the Herbarium of the of the Institute of Ecology, Veracruz (Taxónomo E. Duran). Some of these identifications have been corroborated at the Herbarium of the University of Puebla (Biol. José Luis Contreras).

Table 2 demonstrates discrepancies among the different species, especially *Ficus* sp., but the changes or errors in these particular species are difficult to trace due to the subsequent taxonomical changes of this genus. In addition to the change in taxonomical classification, *Ficus* species are among the most difficult species to identify (Herbarium of the Institute of Ecology, Veracruz).

Besides *Ficus* species, there are incongruities with respect to other species. The *Morus* described by Lenz (1973) as *Morus microphylla* and by Christensen (1963) as *Morus nigra* is *Morus celtidifolia*. A similar situation occurs with the plant called teochichicastle, reported first by Lenz (1948) and Christensen (1963) as *Morus celtidifolia*, later by Christensen and Martí (1971), Peters *et al.* (1987) and Bravo (1997) as *Urera baccifera*, and in this study as *Urera caracasana*. Other species previously identified by Peters *et al.*, (1987) as *Myriocarpa longipes* is now classified as *Myriocarpa cordifolia*.

Two species included in Bravo's study (*ibid.*), *Heliocarpus donell-smithii* and *Bursera simaruba*, are not extracted. Otomi artisans have tested them but they confirmed they do not use them because the first one is too thick and cannot be boiled, while the second is very difficult to detach from the tree and also too hard for paper manufacture. Besides these species there are others that have been tested for paper manufacture. During fieldwork it was possible to collect samples from some of them, these were identified as *Heliocarpus donnell-smithii*, *Trichospermum mexicanum*, *Triumfetta* sp. and *Heliocarpus appendiculatus*. There are still other trees that could not be identified due to lack of specimens, these were *pino*, *lima aguatole*, *mora silvestre* and the aquatic grass *tule*. A few Otomi mentioned these, especially those who till now used to gather their own bark and are continually looking for more potential trees but neither their use nor their taxonomical classification could be corroborated because of the lack of specimens.

T. micrantha was identified by Peters *et al.* (1987) as one of the most important species in terms of bark collected. In the harvest area these trees have different names: in the Otomi village and other villages located in the higher parts of the harvest area (between 1 000 to 1 500 masl) they are called jonote; moving towards the lower lands and the coast they are called chaca. In the work of Martínez (1987), one of the sources of information widely used in Mexico to identify plants according to their local name, jonote is identified as *Heliocarpus* sp., while *T. micrantha* has 13 different names, none of them jonote. In the same source there are seven Amate trees cited, each identified with a different taxonomical name. These cases clearly show divergences between the local and scientific use of names.

Table 2. Species used to make bark paper.

References	Species	Common names
Starr (1901)	-	Amate (S) xalama (N)
	-	Moral (N)
León (1924)	-	Amate (S), xalamatl (N)
	-	Moral (N)
Lenz (1973) [1948]	<i>Ficus</i> sp.	Xalamatl grande (N), ntá-po-potzá (O)
	<i>Ficus</i> sp.	Xalamatl bayo (N), popotzá (O)
	<i>Ficus tecolutensis</i> (Liebm.) Miq.	Xalamatl limon (N), muxi-coni (O)
	<i>Morus microphylla</i> Buckl.	Moral (N), tzá-secuá (O)
	<i>Morus celtidifolia</i> H.B.K.	Teochichicastle (N), ix-ná (O)
	<i>Ficus petiolaris</i> H.B.K.	Amate (S)
Christensen (1963)	<i>Ficus padifolia</i> H.B.K.	Amate (S)
	<i>Ficus tecolutensis</i> (Liebm.) Miq.	Amate (S)
	<i>Ficus cotinifolia</i> H.B.K.	Amate (S)
	<i>Ficus involuta</i> (Liebm.) Miq.	Amate (S)
	<i>Ficus elastica</i> Roxb.	Amate (S)
	<i>Morus nigra</i> L.	
	<i>Morus celtidifolia</i> H.B.K.	Teochichicastle (N)
	<i>Ficus goldmanii</i> Standl.	Xalamatl (N)
Christensen and Martí (1971)	<i>Ficus</i> sp.	Xalamatl grande (N)
	<i>Ficus</i> sp.	Xalamatl bayo (N)
	<i>Ficus tecolutensis</i> (Liebm.) Miq.	Xalamatl limon (N)
	<i>Morus celtidifolia</i> H.B.K.	Moral (S)
	<i>Urera baccifera</i> (L.) Gaud.	Teochichicastle (N)
	<i>Ficus tecolutensis</i> (Liebm.) Miq.	Xalama limon (N), mushi-coni (O)
Torres (1982)	<i>Ficus</i> sp.	Xalama grande (N), napopotzá (O)
	<i>Ficus</i> sp.	Xalama bayo (N)
	<i>Morus celtidifolia</i> H.B.K.	Moral (N), tsazecua (O)
	<i>Urera</i> sp.	Chichicastle (N), tzaná (O)
	<i>Heliocarpus</i> sp.	Jonote Colorado (S), xangaconi (O)
	<i>Bursera simaruba</i> (Sw.) Sarg.	Chacá (S)

Peters <i>et al.</i> (1987)	<i>Ficus padifolia</i> H.B.K.	Xalama limón (N)
	<i>Ficus cotinifolia</i> H.B.K.	Xalama con hojas redondas (S)
	<i>Ficus tecolutensis</i> H.B.K.	Xalama (N)
	<i>Morus celtidifolia</i> H.B.K.	Moral (N)
	<i>Urera baccifera</i> (L.) Gaud.	Chichicastle (N)
	<i>Trema micrantha</i> (L.) Blume	Jonote colorado (S)
	<i>Myriocarpa longipes</i> Liebm.	Chichicastle (N)
Bravo (1997)	<i>Ficus goldmanii</i> Standl.	Xalama (N), popotzha coní (O)
	<i>Ficus padifolia</i> Kunth	Xalama hoja limón blanco (N), tshax muoshi (O)
	-	Xalama hoja limón negro (N), buo moushi (O)
	<i>Ficus glaucenscens</i> (Liebm.) Miq.	Xalama hoja redonda (N), tshax popotzha (O)
	<i>Ficus involuta</i> (Liebm.) Miq.	Xalama hoja ancha, bayo (N), buo popotzha
	-	Xalama hoja de pahua (N), popotzha xibáhua (O)
	<i>Ficus petiolaris</i> Kunth	Texcalama (N)
	<i>Morus celtidifolia</i> Kunth	Mora, moral (S), tzhazucúa (O)
	<i>Trema micrantha</i> (L.) Blume	Jonote colorado (S)
	<i>Heliocarpus donell-smithii</i> Rose	Jonote (S)
	<i>Bursera simaruba</i> (L.)	Chaca cueruda (S)
	<i>Trophis racemosa</i> (L.) Urb.	Brujo, palo de leche (S), phathi coní (O)
	<i>Brosimum alicastrum</i> Swartz	Ojite (S)
	<i>Urera baccifera</i> (L.) Gaud.	Chichicaxtle (N), tzhanná (O)
	<i>Acacia cornigera</i> Willd.	Tortocal (S), sxifi-tzhá (O)
	-	Moral de espina
	-	Chiquiliche
	-	Listoncillo

This study	<i>Ficus pertusa</i> L.f.	Xalama limón negro, buo moushi (O)
	<i>Ficus padifolia</i> H.B.K.	Xalama limón blanco, tshax moushi (O)
	<i>Ficus cotinifolia</i> H.B.K.	Xalama hoja gruesa, tshax popotzha (O)
	<i>Ficus calyculata</i> Miller	Xalama hoja redonda, buo popotzha (O)
	<i>Ficus goldmanii</i> Standl.	Xalama hoja pahua, popotzha xibahua (O)
	<i>Morus celtidifolia</i> H.B.K.	Tzhazúcuá
	<i>Trema micrantha</i> (L.) Blume	Jonote, chaca (S), coní (O)
	<i>Ulmus mexicana</i> (Liebm.) Planch.	Tortocal, cueruda (S), sxifi-tzha (O)
	<i>Brosimum alicastrum</i> Swartz.	Ojite (S), payu coní (O)
	<i>Sapium oligoneuron</i> K. Schum	Palo brujo (S), coní pathi (O)
	<i>Sapium aucuparium</i> Jacq.	Palo brujo (S), coní pathi (O)
	<i>Urera caracasana</i> (Jacq.) Griseb.	Chichicastle (N), tzhanná (O)
	<i>Myriocarpa cordifolia</i> Liebm.	Hortiga (S), husna (O)
	-	Listoncillo
	-	Sabino
	-	Pino

* (S) Spanish, (N) Nahua, (O) Otomi

Samenvatting (Dutch summary)

Amate is een papiersoort die op een ambachtelijke manier wordt gemaakt van boomschors. Op dit moment is het een van het belangrijkste commerciële handwerk op nationaal en internationaal niveau in Mexico.

De productie van amate vond al plaats vóór de Spaanse tijd. De productieprocessen zijn nog steeds gebaseerd op processen uit die tijd. In de periode voor de Spaanse tijd werd het papier in veel dorpen in Meso-america gemaakt, later, onder de Spaanse overheersing, werd het gebruik en de productie van amate verboden. Dit heeft tot gevolg gehad dat de totale commerciële productie nu wordt verricht door één stam, de Otami stam.

Hoewel er geen officiële gegevens zijn over de amate papierproductie, is de vraag toegenomen. Het grotere aantal ambachtslieden en overige sociale actoren betrokken bij de hele productieketen van amate papier wijst op een groei van de productie.

De grondstof voor het ambachtelijke proces is ruwe boomschors. Voor de productie is een grote hoeveelheid boomschors nodig. In een eerste opzet was dit onderzoek gefocussed op de huidige aanvoercondities van de ruwe grondstof boomschors. Na analyse van het veldonderzoek bleek dat voor de aanvoer van dit materiaal verschillende strategieën worden gebruikt. Er worden verschillende boomsoorten gebruikt, het oogstgebied is uitgebreid en het aantal mensen werkzaam in de oogst is toegenomen. Een van de oogststrategieën, het oogsten van de schors van *T. micrantha* bomen die overvloedig voorkomen in de Sierra Norte de Puebla (voornamelijk als schaduwbomen in koffieplantages), laat de ontwikkeling zien van een vindingrijke strategie, aangepast aan de regionale sociale, economische en ecologische kenmerken.

Tijdens het veldonderzoek werd ook duidelijk dat de tegenwoordige continuïteit van de amate productie niet alleen afhankelijk is van de schorsoogst. Andere aspecten zoals de culturele waarde van amate en de daarvoor gebruikte bomen, zijn van belang om de huidige stand van zaken ten aanzien van dit ambacht en zijn lange historische aanwezigheid in Mexico te begrijpen.

De focus van de studie werd daarom verlegd van de in eerste instantie gestelde vragen ten aanzien van de aanvoer van boomschors, naar de veel bredere vraag naar de oorzaken van het gegeven dat dit oude ambacht door de jaren heen is kunnen blijven bestaan.

Dit nieuwe perspectief heeft tot een holistische benadering geleid die ook gebruikt is als basis voor de praktische toepassing van interventiestrategieën gericht op de ontwikkeling en de instandhouding van de amate papierproductie.

De studie gaat in op het duurzame ontwikkelingsconcept, met speciale aandacht voor de culturele en historische dimensies, die over het algemeen niet veel aandacht krijgen in het debat over duurzame ontwikkeling, en de vormen waarin duurzame ontwikkeling wordt doorgevoerd.

In veel omschrijvingen wordt de culturele dimensie van duurzame ontwikkeling gereduceerd tot de herkenning en beoordeling van praktische kennis over het managen van natuurlijke bronnen door lokale, inheemse mensen in verschillende delen van de wereld. Maar cultuur omvat ook andere aspecten zoals de manier waarop mensen hun omgeving ervaren en de manier waarop culturele waarden worden toegekend aan bronnen en productiewijzen. Bovendien, door toenemende interactie tussen lokale populaties en hun omgeving, voornamelijk door handelsnetwerken, ontstaat duidelijk druk op hulpbronnen als gevolg van lokale reacties om aan de vraag te voldoen. Maar het doet ook nieuwe concepten ontstaan ten aanzien van ontdekken en managen van bepaalde natuurlijke bronnen of hele ecosystemen. Lokale traditionele vormen van management van bepaalde natuurlijke hulpbronnen worden in belangrijke mate toegepast in een nieuwe context. In dit opzicht onderscheiden andere bosproducten dan kaphout (“non-timber forest products” ofwel NTFP’s, een operationalisatie van duurzame ontwikkeling) zich als producten en hulpbronnen die potentieel nieuwe en complexe lokale–internationale en natuur-samenleving relaties scheppen

Dit onderzoek heeft tot doel de lokale-internationale relaties en de natuur-samenleving relaties te ontdekken in de amate papier case, met de nadruk op culturele en historische dimensies. Het historische perspectief maakt het mogelijk de ontwikkelingen in de tijd goed te volgen. De huidige productiemethoden zijn ontstaan door voortdurende aanpassingen. Het is belangrijk deze aanpassingen te traceren om de huidige situatie te kunnen begrijpen. In de historische reconstructie van amate vallen vooral de doorlopende aanpassingen die leiden tot een nieuwe en veranderende context op. Door de jaren heen zijn papierfabricage en het oogsten van schors op technologische wijze aangepast. Maar veranderingen in productiewijze, organisatie en technologie vertegenwoordigen ook verschillende waarden, zoals een religieuze waarde of een ruilwaarde.

De recente ontwikkeling in de laatste 40 jaar van amate als commercieel handwerkproduct heeft grote veranderingen ingehouden in gebruik, in kennis over en teelt van schorsbomen en in de papierproductie en in de types papier die worden geproduceerd.

Het begrijpen van deze historische veranderingen in waarde, functie en gebruik is belangrijk voor NTFP’s en voor actuele benaderingen van duurzame ontwikkeling.

Om dit te kunnen bestuderen was een breed analytisch raamwerk nodig om tijd- en ruimteschalen en de verschillende sociale, economische, ecologische en politieke factoren, die belangrijk zijn voor de productie van amate en schorsoogst, te kunnen omvatten. Het multi-dimensionele raamwerk dat is opgezet voor het onderzoek van de amatecase, maakt het mogelijk om veranderingsprocessen te analyseren in tijd en plaats en hun verbindingen in kaart te brengen. Het bestuderen van de veranderingsprocessen en ze vergelijken met de opgestelde schalen, vroeg om verschillende concepten en theorieën. Sommige werden ontleend aan sociale studies, maar het overgrote deel komt van bestaande multi-disciplinaire benaderingen, analyses combinerend uit de antropologie, geografie, biologie, ecologie en geschiedenis.

Het onderzoek is gebaseerd op veldwerk en literatuuronderzoek. Veldwerk werd uitgevoerd in San Pablito, waar amate papier wordt geproduceerd en in de oogstgebieden langs de Sierra Norte de Puebla, gedurende 1999. Verschillende historische bronnen werden geconsulteerd om de geschiedenis van amate en schorsbomen te reconstrueren.

De resultaten van het onderzoek laten belangrijke aspecten zien van duurzame ontwikkeling en in het bijzonder betreffende de benadering van niet-kaphout bosbouwproducten (NTFP's). Amate wordt beschouwd als een NTFP en als een ambachtelijk product, als twee vormen van kijken naar één product. Het onderzoek laat de behoefte zien aan een bredere kijk op NTFP's, waarbij men zich gewoonlijk richt op de oogst en handwerkersprojecten gericht op het productieproces. Deze bredere kijk impliceert de roep om een brug te slaan tussen deze twee vormen van kijken naar één product en het zien van de gehele productieketen van amate bij het invoeren van bemiddelingsstrategieën. De culturele en historische dimensies van duurzame ontwikkeling zijn essentieel voor het begrijpen van de manier waarin amate, en waarschijnlijk ook andere al lang bestaande producten, heeft voortbestaan en zijn ook belangrijk bij overwegingen betreffende alternatieve benaderingen voor conservering en ontwikkeling. Deze studie benadrukt het belang van het identificeren van processen die belangrijke veranderingen teweegbrengen, van het feit dat door handel in natuurlijke hulpbronnen zich nieuwe lokale-internationale en natuurcultuur relaties vormen en van de behoefte tot het begrijpen van de geschiedenis van het management, de kennis en de culturele beeldvorming van de natuurlijke bronnen die gebruikt worden. Deze aspecten worden tot nu toe niet uitgebreid overwogen in duurzame ontwikkelingsstrategieën in het algemeen, noch in het bijzonder in het onderzoek naar NTFP's.

ITC dissertation list

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