In Search of a Sustainable Palm Market in North America

The Commission for Environmental Cooperation of North America

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The Commission for Environmental Cooperation (CEC) was established under the North American Agreement on Environmental Cooperation (NAAEC) to address environmental issues in North America from a continental perspective, with a particular focus on those arising in the context of liberalized trade.

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Table of Contents

Preface

This paper was prepared by the Secretariat of the Commission for Environmental Cooperation of North America (CEC) and combines the work of two research papers on the *Chamaedorea* palm, one by Dean Current and David Wilsey, and another (mainly incorporated here as Annex A) by Fulvio Eccardi, César Carrillo Trueba, Nasim Musalem and Clara Ramos in collaboration with Esteban Martínez and Luis Aznar.

The CEC's work on the project itself has been undertaken to identify opportunities for developing sustainable practices and criteria for trade in wildlife by ensuring that those practices: are legal and biologically sustainable, encourage *in situ* conservation, create economic opportunities (when applicable), and benefit local communities.

Executive Summary

The goal of the CEC's work on the *Chamaedorea* palm, a wild species endemic to Mexico and selected by the CEC's Governing Council as a pilot species, is to study the possibility of using the market to protect the species. The basic question is, under what conditions, if any, would trading of a wild species be sustainable? This report, the first for this project, documents palm collection and cultivation in Mexico, and its market structure within and outside Mexico. This information is used to assess whether eco-labeling palm would provide sufficient incentive for sustainable trade in the species.

Chamaedorea is a large family of palms that grow in the understory of tropical forests throughout Latin America. They are shade-tolerant and reproduce easily. They are valued by the floral and horticultural industries for their size and shade tolerance. These attributes have earned them a steady market as potted plants for interior decorating. *Chamaedorea* fronds are also used in floral displays, with peak demand during the Easter and Palm Sunday holiday seasons.

There is a large variety of palm species endemic to Mexico, one of the most biologically diverse countries in the world. The country is home to 95 species of palm grouped in 22 genera, which represent 18 percent of the palm species found worldwide. There are more than 130 species of palm that grow only in the Americas, and the majority—50 species—are *Chamaedorea* palms. Of these, 14 species are native to Mexico, making Mexico the leader in number and endemism of *Chamaedorea* varieties.

Trade in the 21 commercial species began long ago, but massive exportation—mainly to the United States with some re-exported to other countries—started just 50 years ago. The *Chamaedorea* palm family has a well-established international market. The existence of this market, which can be expected to remain fairly constant into the future, appears to be contributing to the maintenance of the forest areas where the palm products are gathered. At the same time, the availability of the palm for harvesting from the wild and its market price have maintained production primarily in natural forest areas, with some recent movement towards cultivation in tree or forest shade. There have also been reports of reductions in wild populations due to overharvesting and, primarily, habitat destruction.

Seed and leaf gathering are carried out by farmers, most of them indigenous, who grow corn and sometimes earn a large share of their income from palm. They live in towns located in the mountains of Tamaulipas, San Luis Potosí, Hidalgo, Veracruz, Oaxaca, Tabasco, Campeche and

Chiapas. Some of these states have important remaining forest areas and the most marginalized populations. This creates an interesting combination of biological and cultural diversity, although it carries with it the common problems found in rural areas. In some areas, income from palm has encouraged local residents to maintain the forests that shade the palms, but it also has led to overharvesting.

Marketing channels in Mexico, from regional buyer to exporter, are concentrated, there being only one or two of each (see Annex B for fuller treatment of this). This makes it hard for individual farmers to negotiate prices. They generally receive only US$1 to US$1.20 for 144 leaves (a gross). In the United States, the same price purchases just a dozen. These low prices, the time palms take to regenerate, the difficulty involved in leaf cutting, and the availability of other sources of income make harvesting of the *Chamaedorea* palm a sporadic activity. Yet, at times, such as this period of coffee-price crisis, farmers must cut a larger number of leaves to survive, irrespective of the regeneration process of wild populations. Overexploitation of commercial species and a dramatic reduction in rain forest areas over the last decades has affected many of the *Chamaedorea* species, especially those with restricted distributions or sold as seeds. Thirty-eight of the species of this genus are currently under official Mexican protection (NOM-059-ECOL-94).

In response, producers have begun to cultivate some of the most popular species, such as *C. elegans*, both in the primary and secondary rain forests, as well as in coffee plantations and in other shade systems. The initiatives are many and diversified, but have been impeded by low palm prices. Some of these projects have emphasized diversification of sources of income, but too many could lead to market saturation and additional downward pressure on prices.

To maintain and enhance the role of the palm as an important income-generating crop, and to maintain its function in protecting natural forest areas, certification may be an option. By tying certification to production in natural forest areas, as well as offering market premiums for forest-gathered sustainable production, both environmental and economic conditions may improve in the natural areas and communities where the palm grows and is harvested by local residents.

The *Chamaedorea* palm could be a candidate for certification efforts if the cost of certification is reasonable or can be covered by a premium paid for certified products. To do that requires identifying potential markets for the certified product or, perhaps more importantly, focusing attention on its quality. More information is needed on the specific market sectors that might demand certified production, and the costs and potential premiums available through certification. Attention must be paid to certification costs, since these have often been borne by producers, with no premiums paid in the marketplace.

There may be opportunities for marketing certified palm products in the United States and Europe. In the United States, the principal markets may be niche markets, since the floral industry has not pursued certified production. In Europe, there appears to be a growing market for certified products in the floral industry. Certification could be channeled through the existing certification efforts in Europe, while specific niche markets are approached and explored in North America.

To succeed in using the market to protect this wild species, further exploration of specific markets for certified palm is needed, as well as identification of palm-producing areas/communities that meet the basic tenure and production/distribution requirements for certification. More information is also needed on the sustainable management of *Chamaedorea* species, and on how it relates to conservation of the forests that provide the palms with shade.

Introduction

Chamaedorea: Greek word for "dwarf/near the ground" and "a gift"[1]

The Greek meaning of *Chamaedorea* points to characteristics that have made palms of the genus popular in both floriculture and horticulture. Highly ornamental and with an array of species, their small size, relative to other palms, makes *Chamaedorea* a desirable potted plant for interior applications. In the floral industry, the palm's fronds provide a good background for larger floral displays, as well as being the popular choice for Palm Sunday and Easter. The fact that the palms grow "near the ground" makes them especially useful for interior low-light applications. Their requirement of shaded environments has contributed and may continue to contribute to the maintenance of the forested areas from which seed and palm fronds are harvested.

Nonetheless, the palms' popularity has, according to some sources, led to their overharvesting and a decline in populations. This, combined with habitat destruction, has raised concerns about the long-term sustainability of the wild populations of *Chamaedorea* spp. The decline and loss of those populations carries with it an environmental and ecological cost, as well as the loss of an important source of income for the farm families and communities that use palm gathering to complement their income from other productive activities.

This study begins with an introduction to the *Chamaedorea* palm in Mexico. Later sections will give a history of its use, its main commercial applications, and its current status in Mexico, as well as laws and regulations governing its harvesting in Mexico and its trade internationally. The paper continues with a description of the supply side of the market in Mexico, followed by the main markets for palm in the United States, Canada and Europe. The paper then focuses on prices and margins along the supply chain, opportunities for green marketing, and market and policy tools to reduce environmental effects and enhance socioeconomic benefits at the local/producer level. The study then looks at Mexico, one of the major *Chamaedorea*-producing countries, to address the contribution of the palm-products market to local environments and livelihoods. Finally, the report suggests ways for the palm market to make a greater contribution to local livelihoods and environments, and the work needed to achieve this.

The principal sources of data for the North American and European study were: 1) a review of published government documents and databases on trade statistics; 2) personal and telephone interviews with wholesalers and retailers; 3) a mail survey of retailers and wholesalers to explore their use of the palms and knowledge of green marketing; 4) a review of relevant cases of certification and green marketing of nontimber forest products, and information gathered from groups directly involved in efforts to certify nontimber forest products. A trip to Texas and Florida was made to meet with major importers/wholesalers of seed and palm fronds, and to visit nurseries producing seed and potted palms for the nursery/interior landscape industry.

[1] Robert Lee Riffle. (1999) What's in a (Botanical) Name? <http://www.iconx.com/html/riffle_botanical_glossary.html>.

Palm Species in Mexico

Mexico holds a privileged position in worldwide biological diversity. Its is home to nearly 10 percent of all identified plants and land animals, and most of the Earth's ecosystems can be found there. In addition to this great biological wealth, making it one of the so-called "megadiversity" countries, Mexico has an equal wealth of human history, great cultural diversity—past and present—and the creation of cultivated plants (Ramamoorthy et al. 1993). It remains to be seen whether the genus *Chamaedorea* originated in Mexican territory and migrated south, or whether it comes from other regions of the world where, to some extent, it has disappeared only to be found today in the neotropical zone (Rzedowski 1992).

About 18 percent of all palm species worldwide are found in Mexico—95 species in 22 genera (Quero 1994). According to a review of the National Herbary, the genus *Chamaedorea*—whose more than 130 species exist only in the Americas—is the largest of the palm genera found in Mexico, with 50 species. Of these, 14 are endemic**.** This makes Mexico the country with the greatest number of endemic *Chamaedorea* species, and most probably one of two centers for the diversification of the genus (Hodel 1992).

In Mexican territory, *Chamaedorea* is found principally in the high- and mid-range perennial, sub-perennial and sub-hardwood forests, as well as in so-called cloud forests, at altitudes ranging from sea level to more than 2,000 meters above sea level. Some species live in oak and pine-oak forests, and several may be found in hardwood forests near rivers and streams, or in ravines where leaf loss is less. Only a few species grow in low hardwood forests, such as those of the central and northern Yucatán Peninsula, including *C. seifrizii,* whose thick fronds allow it to resist drying and live in direct sunlight.

Chamaedorea species are understory palms, mostly in the herbaceous stratum, and require shade. They generally grow in rocky areas with well-drained soil and abundant organic matter. One exception is *C. cataractarum*, which lives on the course of mountain streams. The light, humidity and temperature conditions are those prevailing where each type of vegetation grows (Rzedowski 1978).

The height and size of *Chamaedorea* leaves varies between species, from the small *C. tuerkheimii* to the majestic *C. woodsoniana,* which measures more than 10 meters, or *C. elatior*, which, as a climbing plant, easily surpasses them. Their morphology—leaf size, shape and pinnae (when they have them), as well as flowers and seeds—is likewise varied. Variations of the leaves' shades of green are also notable, and some have a more or less intense sheen. Their phenology is equally diverse, with individuals of a single species showing strong variations.

These palms have an enormous capacity to adapt to disturbances and transformations in habitat, which has allowed them to overcome major climate changes, and to live in diverse types of vegetation and disparate environmental conditions. Their shade requirements are highly flexible, as are their temperature and humidity requirements. They are resistant to predators since, as seen in the case of *C. tepejilote,* the defoliation of adult plants increases leaf production and does not affect fruit production (Oyama and Mendoza 1999).

Little is actually known about the biology of *Chamaedorea* species. It is known that they are dioecious, having male and female plants, although there may be hermaphrodite plants bearing flowers of both sexes. Based on what is known of *C. tepejilote* (Oyama 1984), the percentage of female and male plants seems to be equal (50 percent of each). It is not known precisely how

pollination occurs. It is believed that, by producing a dry pollen, some species must be pollinated by wind. Others, with sticky pollen, are probably pollinated by insects, which are also attracted by the scent of the flowers (Hodel 1992). Bees, flies, beetles and other insects have been seen visiting *Chamaedorea* inflorescences.

The plants flower once a year, but with various inflorescences, which makes fructification extend over several months. Individual variation in flowering, number of fruits, seed germination and growth rate, and mortality rates is large, in addition to the variation among individuals of different sexes, ages, and species. For example, a study of *C. tepejilote* has shown that the male plants produce more flowers than the females and, in each sex, the same percentage of individuals always contributes more of them (Oyama 1990). There are also few fruits in *C. ernesti-augusti*, maybe 40 or 50, while in *C. elegans* there may be more than 500, and up to 400 in *C. tepejilote* (Oyama 1991). In the Huasteca, a bird called *palsuquet* in Nahuatl does eat and disperse the seeds. However, most of the fruits stay close to where they fall, near the mother plant, which explains the spotty distribution characteristic of *Chamaedorea* species.

It is known that *C. elegans* can take up to nine months to germinate, while *C. tepejilote* requires about six. The growth characteristics of both sexes appear to be about the same. In *C. elegans*, growth is estimated at five centimeters per year, while in *C. tepejilote*, which can be more than five meters high, an average growth of six to 12 centimeters per year has been reported. Leaf production seems to vary from one sex to another, since, based on knowledge of *C. tepejilote*, the male plants produce an average of three leaves per year, while the female plants produce only two (Oyama 1990).

Mortality is higher in younger plants, cause more from falling trees and branches, and less from water erosion. The lifespan of each wild *Chamaedorea* species is not known with certainty. According to producers, the lifespan of *C. elegans* is estimated at 15 to 20 years, while it can be almost 60 years for *C. tepejilote* (Oyama, personal communication).

All these characteristics allow for an understanding of the environmental heterogeneity of these palms, as well as of the lack of homogeneity in individual physiology, i.e., the absence of synchrony in the different stages of the individuals' life cycles due to different growth conditions. This heterogeneity explains the broad altitudinal distribution found in some species, such as *C. elegans*. Furthermore, these factors allow distinct species to coexist at a single site, each occupying a specific niche and often being distributed on a slope, as was found in measurements taken in the Chinantla forest. There, seven *Chamaedorea* species were found in different locations on a mountainside, with densities that varied with altitude. *C. elatior* was found in greatest density between 300 and 400 meters above sea level (masl), *C. ernesti-augusti* showed a small increase around 420 masl, *C. metallica* between 400 and 450 masl, *C. concolor* between 480 and 520 masl, *C. tepejilote* around 550 masl, *C. oblongata* between 550 and 600 masl, and *C. elegans* between 600 and 650 masl. The topographical changes and soil abundance might slightly alter this distribution, as was the case with *C. tepejilote*, which had a higher density in places with abundant soil or with flat surfaces, although this was well below its highest density on the slope.

The result is a wide variation in the density of these palms, both from one region to another and within a single region, even at the same altitude and at neighboring sites. This makes an estimate difficult, especially an extrapolation of the number of plants per hectare to a larger area. However, in order to have an idea as to the density of *Chamaedorea* in conserved places, the

data obtained by Vovides and García (1994) in Veracruz can be taken, calculating an average of 680 *C. tenella* plants, 2,400 *C. metallica* plants and 9,000 *C. monostachys* plants per hectare. In addition, Hodel (1992) cites Olmsted's work (1988), reporting an average of 195 *C. seifrizii* plants per hectare in Quintana Roo, and the work done in Guatemala by Heinzman and Reining (1998), showing an average of 5,933 *C. elegans* plants per hectare.

History of Use

At the end of the 19th century, leading horticulturists in Belgium, England and France sold *Chamaedorea* plants. The United States had also adopted the fashion and, in the early 20th century, it was possible to obtain samples of *C. ernesti-augustii, C. oblongata, C sartorii* and *C. elatior*, cultivated from Mexican and Guatemalan seeds. However, trade in *Chamaedorea* species in Mexico began en masse several decades later. There are different versions of the history, but all set the beginning around the 1940s. It is said in the Huasteca, for example, that in 1945 or 1946 an American named Wilson—perhaps the palm collector Robert Wilson—began to buy *C. elegans* seeds to take back to his country, to be planted and sold in small pots as ornamental plants. However, Mr. Luciano Guerra, who currently owns the country's largest seed business, soon took an interest in the matter and replaced Wilson.

As for the fronds, Mr. Everett is said to have begun importing the *C. elegans* leaf in the second half of the same decade, and later to have founded the Continental Floral Greens company, which today sells nearly all the palm cultivated in and extracted from the country. There is, however, an anecdote relating to the rival Jewel Foliage Company. In mid-1949, the story goes, the company Flores de México S.A. ran out of the wax paper used to wrap flowers and, for some reason, could not obtain more. The warehouse foreman went to the Merced market in search of a replacement and found the so-called "palmilla" or "*tepejilote*," which was economical and served as packing material. In the United States, gladiola buyer W. F. Roger found this foliage among his flower bouquets and became interested. He later founded the first *Chamaedorea* palm importer, the Jewel Foliage Company, and patented the regulation sizes for sale (premium emerald, bunches of 25 sticks; regular emerald, bunches of 30 sticks; and econo emerald, bunches of 50 sticks). Its first suppliers were in the states of Veracruz and Puebla, and little by little, the extraction extended to the states of San Luis Potosí, Oaxaca, Veracruz, Hidalgo, Tamaulipas, Campeche, Tabasco and Chiapas.

Some *Chamaedorea* species have certainly been used for a long time in Mexico. Floral arrangements were made in churches for some festivals, and in cemeteries during the Day of the Dead. In addition, *C. tepejilote* leaves were traditionally used in some regions to cure insect stings, while the stem of *C. elatior* was (and is) used in basketmaking in various regions. The stem of *C. woodsoniana* has been eaten as heart of palm for some time. Consumption of the male flowers of *C. tepejilote*—considered a delicacy when tender—is so old that Hernández X. (1993) includes the palm among the domesticated plants of Mexico and Guatemala, where they are eaten most. There seem to be morphological and flavor differences in the plants preferred for eating (Hodel 1992). Mass extraction of *Chamaedorea* species dates from the mid-20th century, when the direct effect on their population begins by reason of both seed and leaf extraction, and the sale of the whole plant for ornamental purposes.

Over time, horticulturists and florists have selected the species with the broadest market, or those most easily found or harvested—a total of 21 species having different attributes.

The populations of these species have been affected in various ways during this time, through the pressures of fashion and the requirements of traders (principally abroad, in the United States), as well as through the technical changes developed to establish plantations to cover market demands. Intensive harvesting seasons took place with no regulation whatsoever—concern for the conservation of biodiversity is relatively recent—and almost parallel to the destruction of the populations' habitat. As is well known, the deforestation of most of the country occurred during the last 50 years (See Maps 1 and 2 in Annex C).

The result of all this was a major decrease in the populations of many useful *Chamaedorea* species. Those of commercial value and restricted distribution were placed at risk as their populations where reduced through the harvest of all their seeds (e.g., *C. tenella*), or through plant death in those species whose stem is harvested (e.g., *C. elatior*). Species whose foliage was used seemed to have fewer problems because of their broader distribution (e.g., *C. oblongata*) or higher density (e.g., *C. elegans* and *C. tepejilote*), the apparent regeneration capacity of the entire genus, and the rhythm and handling undertaken during cutting.

Major Uses of *Chamaedorea* Palms

Floriculture

Chamaedorea palms have specific uses in the floral industry based on their particular physical properties and, in some cases, very traditional uses. Although they are small compared to other palms they are generally used in large showy displays as a backdrop to flowers and other greens, and to provide support. Events calling for such displays include weddings and funerals. Funerals were most often mentioned as an event where the palms are used. In some cases, they were the only events the palms were used for. In all cases, the palms were used as part of a floral display or arrangement, so are not priced separately.

The other major occasion that represents a spike in demand for palm fronds is during the Easter season and, particularly, on Palm Sunday. These are the only times at which the palms are sold as fronds or bunches of fronds, and not as part of a floral arrangement. A flower-and-cut-greens supplier in Great Britain that carries the *Chamaedorea* palms (*C. elegans* and *C. erumpens*) included on its web site a special section of Easter palms, which did not, however, include *Chamaedorea* species. Thus, there may be some geographical variation in the use of palms at Easter, with the North American market using them more.

There are several characteristics of the palms that make them attractive to florists. Some have already been mentioned—stiffness in backdrops and filler for large displays. Another important characteristic of the palms is their relatively long shelf life of two to three weeks. This was discussed with a floral designer in Minnesota who had worked in several small communities before transferring to one of the major retailers in the Minneapolis-St. Paul metropolitan area. She mentioned that florists in the smaller communities tend to prefer cut greens to flowers because of their longer shelf life. Another comment from florists was the versatility of the palms, and that it is possible to trim the fronds and remove poor tips without hurting their appearance.

Two or three retailers (one was a specific designer), representing less than 10 percent of those interviewed, said they were not using *Chamaedorea* palms because they are old-fashioned. They

would now choose other greens. Other florists said palms are used in tropical displays for parties for upscale clients.

Horticulture

The use of *Chamaedorea* palms in the horticultural industry includes: i) seed for production of potted plants and nursery stock, ii) potted palms for interior decorating; iii) nursery stock for exterior landscaping; and iv) palms produced in limited quantities for collectors.

- By far the greatest quantity of palms are produced for interior decorating and are sold through nurseries, garden centers, department stores and other retail outlets.
- The seed for that production comes from Mexico and Guatemala, as well as from palm plantations in Florida, Texas, and probably Hawaii and California.
- Palms for landscaping purposes are limited to those areas where the climate permits their growth—e.g., Florida, Texas, California, other southern states, and tropical and sub-tropical regions of the world.
- The palms sold to collectors are often provided through specialized channels. This is frequently the most destructive type of collection because rare palms in limited populations may be greatly diminished by such specialized collectors. To quote Don Hodel (1988), an expert on *Chamaedorea* palms:

Perhaps of greater concern is the quasi-commercial collection of mature plants, seedlings, and seeds of several highly ornamental and often very localized and rare species by plant hobbyists and enthusiasts. This type of wholesale collecting has wiped out entire local populations of some of these species. Coupled with habitat destruction, the future for these species is not a bright one.

Species Used

In the Cut-greens Trade

There is a great deal of variation in the trade names used for the *Chamaedorea* palms in the cut-greens trade. Commodore is the generic trade name used to describe all Latin greens, possibly derived from the Mexican word *"camedor."* Latin greens should be distinguished from greens of other origins (e.g., Florida, Western). Trade names have become commonplace based on the various physical features of different species. Jade, Emerald, and Teepee describe wide-, medium- and narrow-leaf species. It is likely that the wide-leaved greens are *C. oblongata,* while the medium-leaved greens are probably *C. elegans*. The narrow-leaved greens or *"tepe"* are most likely *C. tepejilote.* Although other species are likely involved in the trade, *C. elegans* and *C. oblongata* appear to be the most common. Table 1 provides a list of some of the common and scientific names used for different species.

Continental Greens, one of the largest importers of cut greens, has three varieties with wider and shorter leaves which go by the designations Medium (narrow), Wide (long) and Wide (regular). The term "wide" refers to the width of the face of the leaf. They also carry a Jumbo (Chiapas), Jumbo (Regular), Giant (Narrow), Mayan and Tepe, all with narrower longer leaves. Moore Greens has a different set of names (see Box 1).

Box 1. Use of *Chamaedorea* in the floral industry

Jade: wide shiny light-green leaf of about 6" to 10" in length. It is 1½" to 2¼" wide at about two-thirds of the distance from the stem, after which it tapers abruptly at the tip. Stems have alternating leaf patterns (left, right, left), with the top two merging as a single co-joined leaf. Overall height is about 18" to 24". Cut and banded in bunches of 25 stems. Delivery and post-harvest handling may cause some stems to be removed from the bunch. Pricing is based on a 20-stem bunch allowing for some dumpage. The Detroit market for this product is **very poor**. Attempts at commercialization over the years have not worked out well, as this product has the **shortest shelf life of the three**. We have no historical data in our files at this time. It is no longer on our price list, however it is listed on the web site, as we do have a source for this item. It has probably been more than 10 years since the last sale from our shop.

Tepee is a narrow-sized dull dark-green leaf of about 8" to 12" long. It is 3/8" to 3/4" wide at about one-fourth the distance from the stem, then a gradually tapers to the tip. Stems have alternating leaf patterns, as above, with a similar co-joined leaf top. Overall height is about 22" to 34". Cut, banded and priced as above. There is **modest demand** for this product, as it gives strength or stiffness in floral arrangements. The slim leaves prohibit high demand.

Emerald is a medium-sized medium-green leaf of about 8" to 12" long. It is 1" to 2" wide at about one-fourth the distance from the stem, then tapers gradually to the tip. Stems have alternating leaf patterns, as above, with a similar co-joined leaf top. Overall height is about 22" to 32". Cut, banded and priced as above. There is **high demand** for this product, as it gives fast cover economically in floral arrangements, and is more lacy and flexible than the stiff Tepee. Some customers of larger orders occasionally purchase case quantities. But with Michigan retailers receiving wholesale deliveries on a daily basis, why stock up? Dun & Bradstreet show us at 54 turns per year on inventory. We handle fresh flowers, foliages, supplies and, for Christmas, wreaths and garlands.

All three of the abovementioned products come primarily from Mexico. They are also available from Guatemala and other Central American countries. In Mexico, they are predominantly from the Chiapas area.

Source: Steven Moore, Moore Greens, personal communication.

Simpson's Greens of Florida, which imports greens exclusively from Guatemala, sells Jade and Emerald, Jade being the shorter wider leaf, and Emerald being narrower and wider.

Table 1. Common and scientific names of *Chamaedorea* species used in foliage

Common Name	Species	Country	*Source*
Xate	*C. oblongata* *C. elegans*	GT	Morell 1990
Palma xiat (Hoja ancha) Palma xiat (Hoja angosta)	*C. oblongata* *C. seifrizii*	MX	Unknown
Camedor	*C. spp., C. elegans has greatest demand*	MX	Sanchez-Marcelino
Palma camedor	*C. elegans*	MEX	INIFAP, Manual para la produccion de P. Camedor 2000
Xate hembra Xate macho Cambray	*C. elegans* *C. oblongata* *C. erumpens*	GT	Robles-Valle 1999
Xate Jade	*C. elegans* *C. oblongata*	GT	Marmillod 1997
Camedor, Palma camedor, Cambray negrita, Palmilla de hojas angostas, Palma fina, Tepejilote, Xiat (Chiapas, GT)	*C. elegans*	MX	Red Mexicana de Germoplasmo Forestal IV, Ficha tecnica #10
Palmilla	*C. radicalis*	MX	Olivo et al. 1996

Source: prepared by Dean Current.

In the Nursery Industry

Although potted plants often have common names, the industry buys and trades seed and vegetative material by species. According to a report by Hodel (1988) on the California market, 99 percent of the total number and 85 percent of the total value of *Chamaedorea* in horticulture resides in two species, *C. elegans* and the *C. seifrizii* complex[2]. *C. costaricana* is the third palm listed by Hodel in his study, but at much lower volumes than the other two.

Although in smaller quantities, a number of other palms are produced for the nursery industry. The Florida Nurserymen and Growers Association (2001) lists most of the major producers in the state and lists nine species of *Chamaedorea* offered at the wholesale level. Hodel (1988) gives 15 species in his report on *Chamaedorea* production in California. Edmondson's (1989) study of the Florida Nursery Industry lists 15 species. Table 2 gives the species mentioned in those sources. Although there is some variation, the principal species remain the same.

Physical/Biological Characteristics Influencing Trade

The palms of the *Chamaedorea* genus used in the floriculture and horticulture industries have characteristics which make them popular and which, in the context of these markets, may help

[2] The *C. seifrizii* complex is *C. seifrizii*, the Florida Hybrid (*C.sefrizii* x *C. erumpens*) and *C. erumpens.*

contribute to more sustainable use. In addition, these characteristics and market forces appear to have led to the preservation of the palms' natural habitat in some areas, and have guaranteed the continued production of palm products where they grow naturally. This, in turn, has created opportunities for income-generating activities in the local communities.

Table 2. *Chamaedorea* palm grown in nurseries in California and Florida

Edmondson 1989 (Florida)	Florida Nurserymen and Growers Association 2001	Hodel 1988 (California)
C. elegans	*C. elegans*	*C. elegans*
C. seifrizii	*C. seifrizii*	*C. seifrizii*
C. seifrizii – Florida hybrid	*C. seifrizii – Florida hybrid*	*C. seifrizii – Florida hybrid*
C. amabilis	*C. cataractarum*	*C. cataractarum*
C. cataractarum	*C. erumpens*	*C. costaricana*
C. costaricana	*C. hooperiana*	*C. elatior*
C. ernesti-augusti	*C. microspadix*	*C. ernesti-augusti*
C. erumpens	*C. radicalis*	*C. erumpens*
C. glaucifolia	*C. humilis*	*C. metalica*
C. metalica		*C. microspadix*
C. microspadix		*C. neurochlamys*
C. radicalis		*C. oblongata*
C. stolonifera		*C. potchutlensis*
C. tenella		*C. satorii*
C. tepejilote		*C. tepejilote*

Uniform Growth Characteristics from Seed Gathered in the Wild

As one nursery owner noted, *C. elegans*, the palm most widely cultivated for the nursery industry, is fairly simple to produce. Seed gathered from wild populations, as long as it is cleaned and has any poor seed removed, will produce plants with uniform growth, shape and form. With that kind of performance from wild seed, there is little incentive to do any selection of seed or development of seed orchards to produce the uniform product the market requires. Although this increases the pressure on wild populations, it also discourages moving seed production into artificial shade in seed production farms, as has been the fate of many nontimber forest products. Because the seed is harvested from natural forests, it provides local communities with a motivation to maintain the forest as a source of income.

Seed Production Dynamics

As was previously mentioned, the most popular species of *Chamaedorea* in the nursery industry is *C. elegans*, accounting for approximately 97 percent of *Chamaedorea* production in California (Hodel 1988). *C. elegans* is insect-pollinated (Marshall 1989; Guerra 2001). It cannot, therefore, be produced outside of its natural ecological zones unless it is hand-pollinated—an expensive process. This makes gathering seed from wild populations in their natural habitat, or at least their areas of natural distribution, the most economical way to supply seed to the nursery industry. This, again, puts pressure on natural populations, but provides further incentive to preserve the natural forest habitat of the species.

Edmondson (1989) mentions that, in 1988, there were already efforts to cultivate the species in Mexico. A personal conversation with the Guerra family, who are one of the original and largest importers of seed, confirmed that both farmers and larger-scale producers are establishing *Chamaedorea* plantings for seed and foliage production under forest or tree cover. This is supported by numerous accounts of projects in Mexico promoting the cultivation of *Chamaedorea* as an income-generating option for rural communities, primarily for foliage production.

In contrast to the case of *C. elegans*, *C. seifrizii* is wind-pollinated. Much of the seed used for the nursery industry now comes from plantings growing in nurseries. Very little comes from Mexico or Guatemala. Bernecker's nursery in Homestead, Florida, has a seed orchard from which they produce all the seed they require. *C. seifrizii* is their specialty.

Complementary Seed and Foliage Production

Producers working for the Guerra family supply foliage for the floral industry and harvest seed for the nursery industry, thus having two sources of income from their plots. The Guerras had little information on the foliage harvest, since they deal only with seed. They did say they had had problems in the past because, when producers harvested the palm fronds, they often cut the stem carrying the seed. To remedy this, they gave producers "twist-ties" to tie the seed stem to the main stem of the palm and keep it out of reach during foliage cutting.

Production Costs for Seed and Foliage

The combination of low costs for seed and foliage production, and a relatively low market price for *Chamaedorea* palm products has tended to maintain the production of the palm products under natural forest conditions. For other floral crops, much of the production that might once have been carried out in natural shade conditions has been moved into artificial shade. In the case of *Chamaedorea*, this has not happened and is unlikely to happen in the near future because of production costs. Continental Greens does maintain production farms in Mexico where the palms are produced in tree shade (Continental Greens, personal communication).

Low Light Requirement

The low light requirements for *Chamaedorea* palms have made them attractive for interior decorating businesses, and means they must be produced in a shaded/forest environment. In guides for plants for interior decorating, the *Chamaedorea* species are recommended for interiors with low light conditions and are used extensively for that purpose. Their natural occurrence in low light conditions in forested areas contributes to the permanence of forest cover where the foliage and seeds are harvested. Seed and foliage production provide an incentive to local communities to maintain the forest. This could be increased through certification, provide there was an increase in benefits to the local communities doing the harvesting. If the cost of certification was reflected in lower costs paid to the individuals and groups doing the harvesting, they would be less likely to maintain the forest.

Current Population Status

Throughout Mexico's history, the rainforests have been most affected by environmental destruction, primarily due to extensive stockbreeding. Only about 10 percent of the original area occupied by rain forest now remains. The hardwood forests have fared better, although the pressure of farming on them has increased, rapidly decreasing the 40 or 45 percent of their original area that remains. Cloud forests, sparsely distributed in Mexico but of great biological value, have had little more than half their area preserved. This destruction has resulted in habitat reduction for thousands of species, not just plants, putting some on the verge of extinction and constituting a serious threat to hundreds of others. *Chamaedorea* populations are no exception (see Maps 1 and 2 in Annex C). Of 47 species, NOM 059 ECOL 94 regards 33 as threatened, four as endangered and one as rare (Semarnap 1997). *Chamaedorea* shares this fate will the other palm species. Of the 95 found in Mexico, 64 fall below standard—*Chamaedorea* species included. Despite the alarming fact that more than one-third of the species in this genus fall below the official standard, there are those who think these figures are not high enough (Vovides, personal communication), and the country's protected nature areas do not include the genus wealth (see Map 3).

Ironically, of these species, only 14 have any use and the most commercial species—those sold in large quantities as foliage—are not included.

Table 3. Marketable *Chamaedorea* species, and parts of the plant traded (distribution and status according to NOM 059)

D*	S*	Species	Parts Used				
			leaves	seed	plant	flowers	stems
E	T	*C. cataractarum*		X			
		C. concolor *	X				
	T	*C. elatior*		X			X
		C. elegans *	X	X	X		
	T	*C. ernesti-augusti*	X	X			
E	ES	*C. glaucifolia*			X		
	T	*C. graminifolia*	X				
E	T	*C. hooperiana*	X	X			
		C. liebmannii	X				
E	T	*C. metallica*		X	X		
		C. neurochlamys	X				
		C. oblongata *	X				
E	T	*C. pochutlensis*	X		X		
	T	*C. quezalteca* *	X				
		C. radicalis		X	X		
		C. seifrizii	X	X			
E	T	*C. stolonifera*			X		
	ES	*C. tenella*		X	X		

		C. tepejilote *	X	X		X	X
	ES	*C. tuerckheimii*			X		
	T	*C. woodsoniana*					X

***Notes.** D=distribution, S=status, E=endemic, T=threatened, ES=endangered species, *=most commercial species

Regulation

Domestic Regulation and Use

The market and use of palm in Mexico is regulated by NOM-006-RECNAT-1997. This Mexican Official Standard establishes the procedures, criteria and specifications for the use, transportation and storage of palm leaves.

As specifically mentioned in this standard, its purpose and scope "is of general observance throughout national territory and is intended to establish the procedures, criteria and technical and administrative specifications for the sustainable use, transportation and storage of palm leaves in natural populations."

On this basis, notice must be given of the use to be undertaken and of the measures for recovering the exploited area, in order to have a sustainable use.

The standard describes the procedures, criteria and specifications for using palm leaves from forest vegetation, as well as for registering the collection centers in the National Forestry Registry and their obligations. It also includes legal requirements for transporting palm leaves, and the origin, destination and volume transported.

In addition, NOM-059-ECOL-1994 details the endangered, threatened and rare species and subspecies of wild land and aquatic flora and fauna, and those subject to special protection, in addition to establishing the specifications for their protection.

International Regulation

The international trade of the *Chamaedorea* palm involves its green foliage and seeds. Based on the nomenclature of the Harmonized Commodity Description and Coding System in Mexico, the fresh foliage of *Chamaedorea* palms (*Chamaedorea* spp.) is not classified under a specific tariff section and thus falls under section 0604.91.01, described as follows:

Chapter 06	Live plants and floriculture products
Heading 04	Foliage, leaves, branches, and other parts of plants, without flowers or flower buds, and grasses, mosses and lichens, for bouquets or for ornamental purposes, fresh, dried, bleached, dyed, impregnated, or otherwise prepared
Subheading 91	Fresh
Section 01	Fresh

This section is part of the necessary and fundamental information to be included in export documents and data reviewed by customs.

With the entry into force of the North American Free Trade Agreement in 1994, all importations of flowers and plants made by the United States and Canada from Mexico are immediately exempt from the payment of import duties.

Given that there is no specific tariff section, data on the worldwide *Chamaedorea* palm trade cannot be precisely determined, as such data are included within statistics on fresh foliage generally.

The World Floriculture and Environmental Horticulture Trade

The trade in *Chamaedorea* seed, foliage and potted plants forms part of what is called, in the United States, the floriculture and environmental horticulture trade. Floriculture includes cut flowers, cut cultivated greens, potted flowering plants, and potted foliage, bedding and garden plants. Environmental horticulture includes nursery plants such as trees, shrubs, ground covers, vines, and fruit and nut plants; bulbs, turf grass, and unfinished plants and propagation materials such as cuttings, plugs, seedlings, and "lining out" stock used by other growers for growing on. *Chamaedorea* is primarily used in the floriculture trade as seed, foliage or potted plants (in different presentations and sizes). The extent to which *Chamaedorea* enters into that trade is hard to determine because it is often combined with other cut cultivated greens for reporting purposes. Nevertheless, the growth in cut greens is generally proportional to the increase in the demand for floral products since cut greens are often used in floral arrangements.

Because it forms part of that trade, setting aside differences in consumer preferences, the demand for *Chamaedorea* products will probably follow general trends in the industry. The floriculture and nursery industries have been growing in recent years, and demand has been growing both for flowers and foliage in the cut flower and greens sector, as well as for potted plants for interior decoration.

Below, an overview of the world market is presented, followed by a section looking at the supply side of the market Mexican market, and a description of the demand side in the United States,

Canada and Europe. (In 1, market overviews are presented which were extracted from recent studies of the industry in the United States and Canada, and present good summaries of trends in the industry in those countries.)

Overall, world markets for floriculture and environmental horticultural products have been increasing in North America and Europe, with South American cut flowers taking a greater share of the market. In Europe, there have been efforts to certify environmentally and socially "friendly" production (more on this in the section on opportunities for certification and green marketing). In North America, there has been little or no movement towards guaranteeing ecologically and socially sustainable production. Retailers surveyed were not aware of any efforts to certify flower and cut greens production, and very few were even aware of what it means to certify production.

Market Overview

The World Market

World markets for cut flowers are organized primarily along regional lines, with Asia-Pacific countries supplying cut flowers to Hong Kong and Japan. African and European countries are the main suppliers to Europe's markets. The African nations of Kenya, Zimbabwe and Zambia are producers, and the majority of their production is sent to Europe. In the Americas, the major market is the United States. Colombia and Ecuador send 70 percent of their production to the United States, although they are also producing for the European market.

Germany is the largest importer of cut flowers, followed by the United States. Nonetheless, the growth in German imports leveled off in the early 1990s, while the Netherlands, the United States and Japan have shown rapid growth. The Netherlands re-exports 70 percent of the flowers it imports through its auctions. Developing countries have rapidly increased their share of the market over the last decade. More favorable growing conditions, low production prices, foreign investment and rising fuel prices—which have a greater impact in developed countries—have helped make developing countries more competitive.

World demand for cut flowers has been increasing by about six percent to nine percent per year. The value of trade in potted plants in 1990 was US$14.2 billion, 21 percent higher than in 1985 and was expected to increase to $20–$23 billion in 2000 (de Groot, 1998). Production to meet this demand has been gradually shifting to developing countries, often with investment by foreign investors, banks and wealthy individuals. According to de Groot, the managers of these farms are frequently hired from the major producing countries in Europe.

Trends in the Floriculture and Environmental Horticulture Trade

Van Liemt (1998) identified several trends in the world cut flower industry that represent changes which may have important consequences in the trade of *Chamaedorea* palm products. Those trends are:

- Increasing importance of quality products and the need to invest more capital to achieve that quality. When discussing the purchase of palm fronds with retailers, particularly wholesalers, the quality issue was brought up as an important consideration and may be key to any potential increase in the prices that might be paid for those products.
- The emergence of new growing and exporting countries. This probably would have little impact on the *Chamaedorea* trade unless emerging Latin American producers were to become interested in palm production, and competed with producers in Mexico and Guatemala.
- Enhanced demand for mixed bouquets. This would have limited impact on the palm trade since palms are generally used in larger flower arrangements.
- The attention being given to higher ecological and labor standards. This refers to a growing concern about pesticide and herbicide use in production, and about the treatment of workers by the companies producing for the trade. This has become an issue in Europe with flower-labeling programs and could provide the potential for certification of palm products. This same concern has not yet become important in the North American market.
- The increased influence of supermarkets. Supermarkets and retail chains are increasingly involved in the sale of cut flowers and potted plants (K-mart, Home Depot, etc.). This trend could provide opportunities for marketing of palms, as well as an outlet for certified palm production. For example, Home Depot has decided to only sell certified wood. If supermarkets or large retail chains were to promote sustainable production, this could provide further impetus for certification.
- Another trend mentioned in several reports on world markets, and the US and European markets specifically, was an increasing use of the Internet to sell products, eliminating the middleman in some cases. Most researchers expect this trend to continue in the future.

The Palm Market in Mexico

It is difficult to establish general trends in the production and pricing of *Chamaedorea* palm, due to the lack of records on palm-use permits granted in Mexico. Furthermore, part of such use occurs outside the legal framework, making it difficult to draw a true estimate of production and trade volumes.

As noted above, *Chamaedorea* is principally used in two forms—leaves and seeds. The analysis of each of these products will be discussed separately.

Chamaedorea *palm fronds*

As described at the beginning of this chapter, the commercial process for *Chamaedorea* palm fronds may be summarized as follows: the producer or gatherer supplies the palm leaf to a local buyer or collector, who forwards it to a regional buyer, who transports the product to a regional collection center (Flor de Catemaco and Continental Greens). This center or collector channels the product to the wholesale markets in Mexico and abroad.

Based on use permits issued by the Semarnat Department of Non-Timber Usage, production varies widely by state, with greater volumes (exceeding 500 tons in recent years) in Veracruz, Chiapas and Tamaulipas. In addition, some states have not obtained use permits for several years, such as Campeche in 1994 and 1995, Hidalgo in 1997 and 1998, and Tabasco in 1994. Permits for lower palm–leaf-use volumes have also been granted in Tabasco.

Production volumes authorized by Semarnat for the eight states increased from approximately 1,500 tons in 1994 to nearly 2,000 tons in 1999 (see Table 4). Reported prices per ton for each producing state have been variable, rising from an average of P$2,574 per ton in 1994 to P$7,360 per ton in 1999. This represents accumulated revenues of around $20 million in 1999 (see Table 4).

Table 4. Evolution of production and price of *Chamaedorea* fronds in Mexico, 1994–1999

STATE	YEAR	PRODUCTION (tons)	PRICE (P$/ton)	REVENUE (P$)
CAMPECHE	1994	0	0	-
	1995	0	0	-
CHIAPAS	1994	407	1,405.78	572,152.46
	1995	68	522.00	35,496.00
	1996	435	1,088.00	473,280.00
	1997	1052	4,500.00	4,734,000.00
	1998	515	5,500.00	2,832,500.00
	1999	500	5,500.00	2,750,000.00
HIDALGO	1994	114.7	1,649.34	189,179.30
	1995	170	4,008.15	681,385.50
	1996	30	11,067.04	332,011.20
	1997	0	4,000.00	-
	1999	0	0	-
OAXACA	1994	90	2,927.62	263,485.80
	1995	148	4,030.78	596,555.44
	1996	42	6,907.89	290,131.38
	1997	146	3,250.00	474,500.00
	1998	182	4,000.00	728,000.00
	1999	108	6,310.00	681,480.00

SAN LUIS POTOSI	1994	437	1,148.46	501,877.02
	1995	254	4,480.56	1,138,062.24
	1996	150	50,301.91	7,545,286.50
	1997	478	10,500.00	5,019,000.00
	1998	150	8,000.00	1,200,000.00
	1999	359	8,250.00	2,961,750.00
TABASCO	1994	0	0	-
	1996	17	1,087.00	18,479.00
	1997	36	4,500.00	162,000.00
	1998	40	5,715.00	228,600.00
	1999	31	8,000.00	248,000.00
TAMAULIPAS	1994	432.5	969.36	419,248.20
	1995	807	4,182.31	3,375,124.17
	1996	633	9,005.44	5,700,443.52
	1997	574	4,300.00	2,468,200.00
	1998	578	4,300.00	2,485,400.00
	1999	596	5,000.00	2,980,000.00
VERACRUZ	1994	12.9	7,346.95	94,775.66
	1995	150	2,990.43	448,564.50
	1996	598	1,383.07	827,075.86
	1997	610	6,500.00	3,965,000.00
	1998	800	6,500.00	5,200,000.00
	1999	872	11,100.00	9,679,200.00

Source: Department of Non-Timber Forest Usage, Semarnat 2001.

Prices vary according to the species, region, and product demand of local and regional collectors. In general, producers receive between $12 and $15 per gross (144 fronds). The local or first-level intermediaries collect them at places where they are gathered or produced. The regional collection centers manage a similar price with a markup of two or three pesos. One advantage they offer is that, once the buyer's material pickup date is agreed upon, the centers assume all risks.

In the domestic market, wholesalers manage prices ranging from $30 to $35 per gross, while the price to the end consumer varies between $10 and $15 per dozen. The price on the international market is variable, ranging from US$3.00 to $3.50 per 25-stem bouquet in the US wholesale market.

Table 5. Average prices paid to commercial agents on the domestic market

Agent	Price* (P$/gross)
Producer / Gatherer	12.00
Local collector	14.00
Regional collector	16.00
Mexican wholesaler	30.00
Mexican retailer or US wholesaler	180.00

* Average price per gross in pesos. Source: Author's research, April 2001.

In analyzing the prices paid to the different agents participating in the commercial process, the trade margins increase for each successive agent in the chain of commerce. The share received by the producer/extractor is only seven percent of the final price.

Chamaedorea seed

The *Chamaedorea* seed shares the same trade route as the leaves, but it is used on a smaller scale because it is not common to all regions. In most cases, the seed is sent to the United States, although there are no detailed records on volumes exported. It is generally known that the seed comes from the Huasteca region, the main seed-producing area in Mexico. To a lesser extent, seed is used to establish vivariums and new plantations.

The seed trade is very similar to the leaf trade, and takes place among local and regional buyers and collectors. Seed does not require special handling for storage or transport, and follows the same pattern of seasonal prices—starting at about P$40–$50 per kilogram in September, and coming down in October, the main maturity season, to as low as $6 per kilogram in some areas.

The seed trade in recent years has realized about $13 million between 1995 and 1998 for the state of San Luis Potosí alone (see Table 6).

Table 6. Evolution of production and price of *Chamaedorea* seed in Mexico, 1994-1999

STATE	Year	Production (tons)	Price ($/ton)	Revenue
Hidalgo	1994	50	6,597.36	329,868.00
San Luis Potosí	1994	166	3,828.21	635,482.86
	1995	103	21,856.40	2,251,209.20
	1996	49	167,673.04	8,215,978.96
	1997	113	17,000.00	1,921,000.00
	1998	3	15,000.00	45,000.00
	1999	0	-	-

Source: Department of Non-Timber Usage, Semarnat 2001.

Extraction of palm seeds and fronds takes place in parts of the states outlined above that are generally quite marginalized and poor. The relatively high prices that can be obtained for palm, combined with this marginalization, puts pressure on, and in some cases leads to overexploitation of, natural populations of palm. One region in which overexploitation is of particular concern is Chiapas. It is reported that overexploitation has taken place for quite some time, in particular, in both northern and southern Chiapas and that in some cases it is being extracted illegally, either within nature reserves, or in *ejidos* by non-*ejido* residents. Various government programs have attempted to better inform on, and encourage residents to undertake, more sustainable practices of palm cultivation and extraction, such as Fonaes, the National Reforestation Program, and the shared risk trust (Firco). For more information on the particularities of palm producing regions, please see Annex C.

Current and Projected Market and Trade in *Chamaedorea* Palm Products

The Growing US Market

The value of floriculture and environmental horticulture crops reached US$12.1 billion in 1998, an increase of two percent over the previous year. This maintained a trend that had seen an average increase of $440 million per year since 1991. The United States is a net importer of green products. Domestic grower cash receipts for cut flowers and cut greens have shown a decline from $671 million in 1989 to $642 million in 1996. Cut-green receipts increased in 1996 by seven percent (Stevenson 2000). The decline in grower cash receipts is not a reflection of lower demand, but of increasing imports of cut flowers, primarily from Latin America.

Receipts for cut flowers increased three percent, receipts for cut greens jumped nine percent, and receipts for potted foliage plants increased by four percent. Also in 1998, retail expenditures reached US$203 per capita, which represents an increase of 37 percent since 1991. The floriculture and environmental industries are growing, which should provide a steady and

possibly increasing demand for *Chamaedorea* products, although it is likely that the recent downturn in the US economy will affect the growth of both markets.

Americans consumed nearly 2.2 billion stems of cut cultivated greens in 1998. Only 17 percent of these were imported. Leatherleaf, a cut green raised in the United States, represented nearly 62 percent of purchases and *Chamaedorea* nearly 14 percent. Greens from the Pacific Northwest are another important component of the cut-greens trade although not reaching the proportions of Leatherleaf and *Chamaedorea* greens. The USDA Economics Research Service records data on the amount and value of *Chamaedorea* palm imported into the United States, primarily for the cut-greens trade. Figure 1 below presents time-series data on the quantity of *Chamaedorea* palm fronds imported into the United States between 1971 and 1998, while Figure 2 presents the volume and value of the *Chamaedorea* palm fronds imported between 1985 and 1998, the dates for which that information was available.

Figure 1. Time-series amounts of *Chamaedorea* imported to the United States

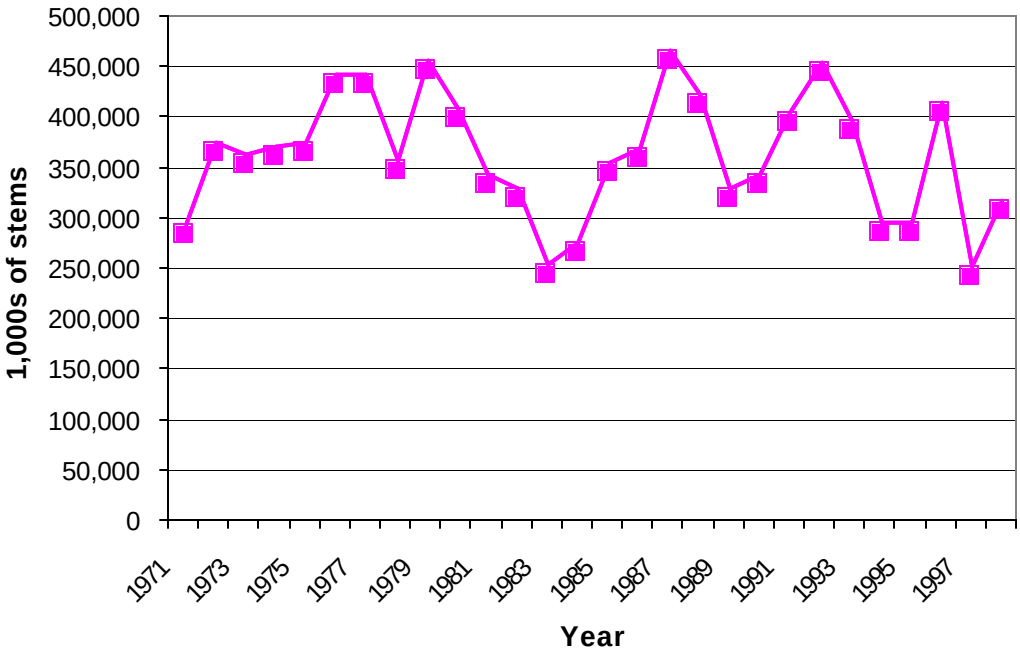
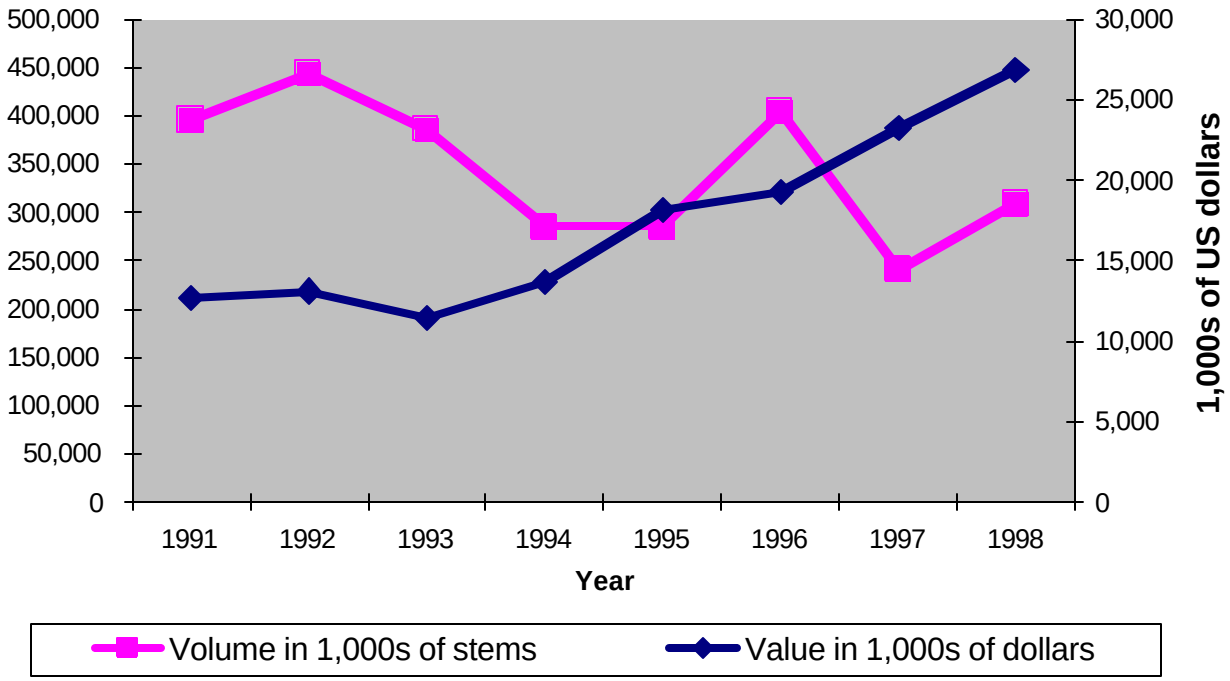
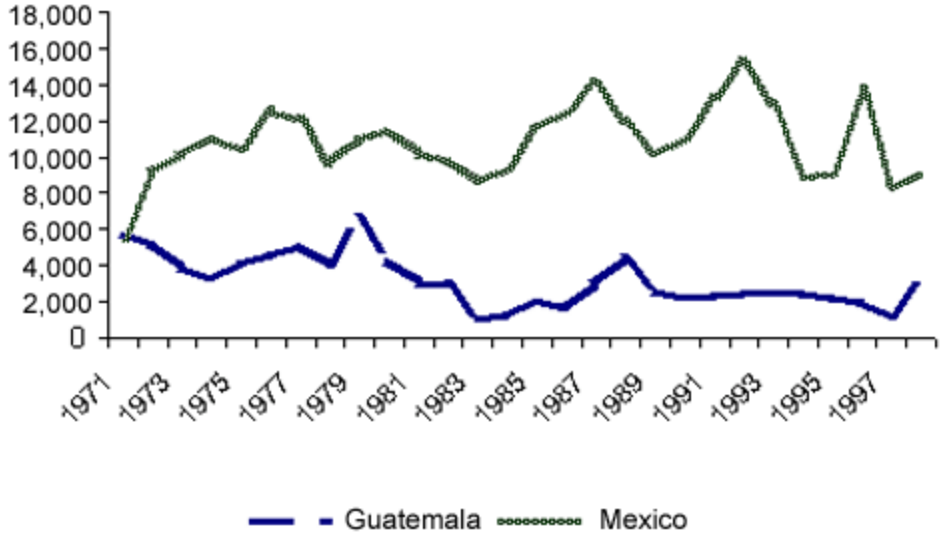


Figure 2. Volume and value of *Chamaedorea* imports



The import of *Chamaedorea* shows a somewhat erratic trend over the years. In recent years, there has been an average annual importation of about 350,000 stems, the majority coming from Mexico and the remainder from Guatemala. Figure 3 compares the percentage of total imports from Guatemala and Mexico When questioning retailers, wholesalers and importers, we were told there was no problem supplying the market with the amount of product required. The only exception was during holidays in Mexico and Guatemala, when frond gatherers were not working, but that was expected and suppliers planned accordingly, stockpiling for those occasions. Other disruptions in supply were related to weather conditions that made gathering fronds impossible. Again, retailers were still generally getting the palm fronds when they needed them.

Figure 3. Percent of foliage from Guatemala and Mexico



An analysis of the last 10–15 years shows a tendency for palm imports to decline. This is consistent with some of the comments from retailers, who mentioned they were using less of the palm, although those comments came from less than 10 percent of the retailers surveyed. The picture that emerges from the survey of retailers, wholesalers and importers is one of a fairly static market over the years, with few changes in supply and demand for a product that has a well-defined end use. The palm fronds are a relatively low-volume product for wholesalers, but one they carry because of the needs and demands of their customers. When asked if there were other greens that florists would use if the palms were not available, florists mentioned several of the northwestern greens although, for some uses, *Chamaedorea* is preferred.

Some of the retailers surveyed mentioned that they felt that the palms were "old fashioned" or "passé." These respondents represented less than 10 percent of those surveyed. This could, however, be a problem for the market in the future if consumer tastes in floral arrangements change, although there is no indication that such a change is imminent.

The time-series comparing volume and value covering a shorter period does show a decline in the imports of *Chamaedorea* and an increase in total value reported for the fronds. That would be consistent with a declining supply and subsequent increase in prices. Here again, the survey of retailers, wholesalers and importers provided no indication of such a relationship. When asked if there had been any changes in price or supply, most responded that both price and supply had remained constant. A few said the price had increased, but not more than would be expected over time.

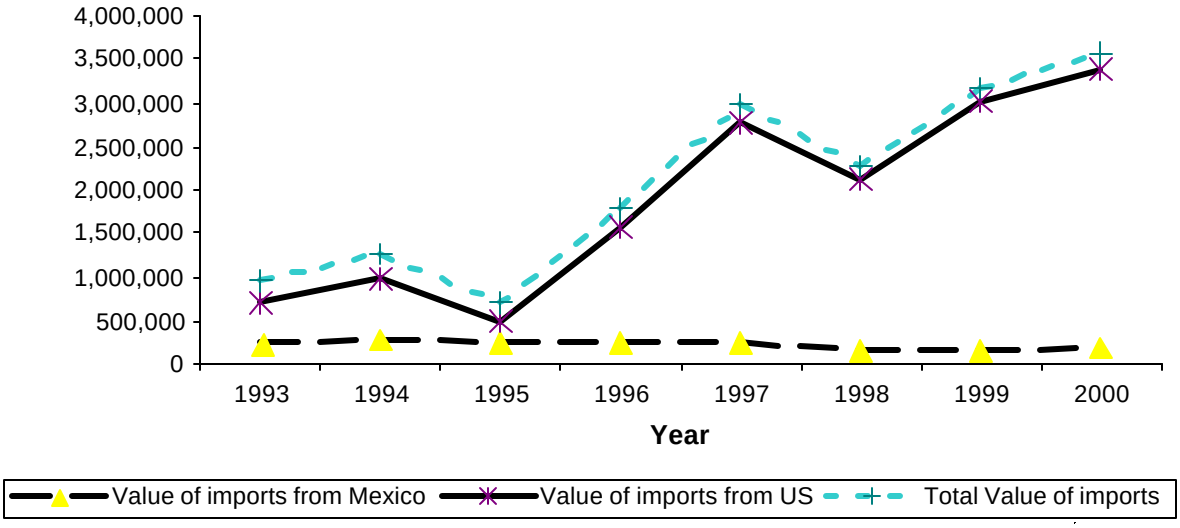
The Canadian and European markets

The Canadian and European markets are serviced by some of the same importers that import *Chamaedorea* into the United States, so some of the palms imported to the United States are re-exported to Canada or Europe. Others are exported directly from Guatemala and Mexico to other foreign destinations, primarily Germany and Holland.[3] It is hard to estimate the amount of *Chamaedorea* imported or exported to and from Canada and the European Community. Data are not readily available and, when they are, *Chamaedorea* is often lumped with other cut greens. Imports to Canada are probably channeled through the United States, because the United States has been the traditional importer of the palms and is in direct communication with gatherers in Mexico.

In Canada, imports of cut greens have been rising steadily since the early 1990s. Canadian import/trade statistics report *Chamaedorea* in a group labeled "Grasses and palm leaves, fresh, suitable for bouquets or for ornamental purposes." Statistics are available for imports of that category from both Mexico and the United States (see Figure 4). Because *Chamaedorea* cannot be separated out from the rest of the greens, it is not possible to determine the trends in the market for the palm, other than to assume they are most likely similar to those in the US market. According to Canadian government reports, the increase in imports is part of a general trend to the use of more cut greens in the floral industry.

[3] US importers interviewed said they also ship *Chamaedorea* to Europe and Canada.

Figure 4. Canadian imports of cut greens from Mexico and the United States



The same is true of published statistics on the European market, based upon the harmonized tariff schedules used to report trade activity. *Chamaedorea* is lumped with other similar products. The Dutch flower auctions do report individual products and demonstrate a relatively stable market for the palms. Several publications mentioned the export of *Chamaedorea* from Guatemala, but gave little detail on amounts and destinations (Nations 1992).

Markets for Seed and Potted Plants

Chamaedorea seed is used extensively throughout the world for the production of potted plants and outdoor landscape plants where the climate allows. By far the greatest volume of sales is of *C. elegans* (Neanthe Bella, Parlor Palm). This is reflected in the fact that this species' seed was always the least expensive in the commercial seed lists reviewed.

The market and supply of seed is hard to determine for a number of reasons. Imported seed is subject to some control at the USDA quarantine stations. Nonetheless, because of the large flow of goods through Miami, seed imports are not always registered or may be registered as "cut flowers and miscellaneous" rather than seed, making it impossible to get an accurate reading of the amount of *Chamaedorea* seed entering the United States (Ron Sponaugle, USDA Port Operations, personal communication). In Canada, the government does not keep records of seed imported for palms, although they do have records for flower-seed imports. Records were obtained from the USDA, but the information proved unreliable so it was not included in the report. To be able to get a good estimate of seed imported would probably require a survey of importers of seed and, as Edmondson found earlier, most importers are reluctant to provide information on their commercial activities.

Another phenomenon which has probably affected the amount of seed imported has been concern over the effect of unsustainable harvests of seed and fronds, and the loss of habitat for

Chamaedorea in Mexico and Guatemala. Some *Chamaedorea* species were proposed for inclusion in the CITES lists in the late 1980s and early 1990s, but eventually were not included because of industry objections and a lack of data on sustainable harvest levels (Endress 2001). Because of these concerns over unsustainable harvests and habitat loss, production has often shifted to cultivated seed orchards.

For those palms that produce seed when grown outside of their native habitat (e.g., *C. seifrizii),* the trend toward production from ornamental plantings and seed orchards will likely continue. For palms that do not produce seed outside of their native habitat (e.g., *C. elegans*), there will be a continuing demand for imported seed that may increase as new markets develop. An illustration of this is recent sales to the Chinese market.

Summary

- Time-series data suggest that the market for *Chamaedorea*, although showing considerable variability from year to year, has remained relatively stable.
- There has been a decrease in foliage sales in the last few years but, given the changeability of the market, this may not be a trend.
- It is difficult to find data on the palm market outside of the United States. There has been a continuous market in Europe for foliage supplied by direct and US importers.[4]

The *Chamaedorea* Supply Chain

The *Chamaedorea* supply chain is fairly simple, as little processing is required.[5] The leaves are harvested in Guatemala and Mexico, culled, packed and shipped by air or truck to the United States as primary destination. Other recipients are members of the European Union. In the destination country, the fronds are boxed in case lots and shipped, usually by truck, to wholesalers and retailers throughout the floral industry. Wholesalers, depending on their size, generally deal with cases of fronds which they ship to retailers. Sometimes cases are broken down into bunches, which are shipped to retailers. The bulk of the culling (removal of undersized or poor fronds) takes place in collection points in the country of origin, although importers do some culling.

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[4] Pathfinder Publishing, <http://www.pathfastpublishing.com/>, which publishes statistics on the floral trade in Europe and worldwide, reports that the use of palms in Europe is generally limited to Palm Sunday, and is relatively minor compared to the use of other cut foliage, such as leather leaf, tree fern (various asparaguses), bear grass and western greens. They estimate that *Chamaedorea* accounted for less than five percent of the trade in that sector (personal communication). The Guatemalan Ag. Export agency reports leatherleaf as a major export crop, while "Xate" is mentioned as a traditional export but not a major export commodity.

[5] The information presented in this section is based on mail surveys and individual interviews with importers, wholesalers and retailers, including interviews conducted during visits to floral shops and wholesale operations.

The Supply Chain

In the country of origin[6]

Fronds are gathered from natural forest areas and, increasingly, from areas of cultivated palms under forest cover. Continental Floral Greens, one of the largest suppliers of "Latin greens", has production areas and processing plants in both Mexico and Guatemala, and received an award from the former President of Mexico for its service in providing job opportunities in Mexico. The Luciano Guerra family also has seed production. The same plantings are used for frond production.

Fronds are gathered by individuals and organized groups, and are sold to middlemen hired by the importers. The middlemen generally develop long-term relationships with the importing companies, and often will receive advances to cover emergencies and their expenses. The palm fronds are transported to centralized collection points, and thence to processing plants where they are prepared for shipment by truck or plane to the United States and other destinations.

There are about a half a dozen major importers of *Chamaedorea* palm fronds and about the same number of seed importers working out of Texas, Florida and California. Seed is collected in much the same way the palm fronds are collected, from a mixture of wild and cultivated palms. As was previously mentioned, there has been a predictable trend towards cultivation of the palms for both seed and foliage collection, and often the same palms are used for both.

The harvest and transport of palms in Mexico is subject to government permit and control. The Guerra family indicated that it is a system that they have learned to work with and that the government has exercised greater control over the years, primarily for purpose of tax collection. The government is now asking palm collectors to be registered by the Guerra family, so the income they receive from seed collection can be monitored. Another seed importer, who has not been in the business as long as the Guerras, commented that the government permit requirements were a serious constraint on his business.

After the palms are prepared for shipping, they are loaded into trucks and transported to Texas, or are sent by air to Miami. Continental Floral Greens said their costs have not improved following implementation of the NAFTA agreements because they have to change drivers at the border. According to the NAFTA agreements for free trade, trucks from Mexico are supposed to be able to travel freely in the United States, lowering transport costs. Recently, the US Congress enacted legislation to allow trucks from Mexico to enter and travel in the United States, but imposed strict safety standards. The palms are subject to an inspection at the USDA quarantine post at the border. If they have insect pests or other phytosanitary problems, the shipment may be delayed or refused. According to the importers interviewed, the preparation of the shipments is the responsibility of the middlemen and if there is any problem at the border, the middleman is responsible for any loss.

In discussing the study, Randy Natalino of Foremost Co, which imports plant material from Latin America, mentioned that problems at the border can be very expensive and, in countries

[6] The section on the country of origin is based upon published reports and discussions with importers, and is not meant to be a detailed discussion of harvesting. A parallel report is being prepared in Mexico on the harvesting and processing of palms and seeds.

like Israel, the USDA actually stations an inspector to ensure that shipments conform to US phytosanitary standards before they leave. This serves more than one purpose. It provides training to shippers in the exporting country to bring them up to international standards. It also eliminates problems and delays at the border which, in turn, lowers costs and helps ensure better phytosanitary control of imported materials.

Importers and Wholesalers

As already mentioned, importers of foliage and seed are located in Texas and Florida. Many have been in business since the 1940s and 1950s, when the trade began, and have well-organized collection and distribution systems in Mexico, Guatemala and the United States. Most of them have diversified into other floral products and cut foliage from other sources. Jim of Continental Floral Greens said he is still dealing with Latin greens primarily because that was how his father got started.

The importers compete against each other in the market for Latin greens, although there are some differences between Guatemalan and Mexican fronds. Wholesalers, as might be expected, base their purchases on quality and supply issues. They receive shipments on a weekly basis, and turn around and distribute to their client wholesalers and retailers. They make all deliveries within a day of receiving orders. Distribution is very efficient, with fast turnover of the product. Within the floral industry, such efficiency is essential. An advantage of the palms already mentioned is a relatively long shelf life—up to two weeks—although shelf life varies between species.

Florida importers concentrate more on the East Coast; Texas importers concentrate on the Midwest and Western states. The range of wholesalers varies depending on size of operation and location. Wholesalers working out of the Minneapolis-St. Paul Metro region distribute to an area within a day's travel of the city. They may supply palms to smaller metropolitan area distributors who service retailers.

Importers sell flowers by the case; wholesalers sell by the case or by the bunch, breaking the cases into bunches. Even wholesalers with annual sales volume of US$20 million distribute palm by the bunch. If wholesalers sell by the case, they basically act as a warehouse facility, receiving the cases and then dispatching them to their customers. Others break the case down and sell the product in bunches. Probably, most wholesalers do both, depending on their clients' demands. The importers generally use their own trucks and guarantee the product will arrive in good condition. If a refrigeration unit breaks down or something else happens during transport causing deterioration of the palms, the importer/wholesaler is responsible for any loss. Figure 5 illustrates the distribution of *Chamaedorea* in the United States, using Minneapolis, Minnesota, as an example. The pattern illustrated in Minnesota would be repeated in major cities throughout the country, generally with the palm originating from importers in Texas and Florida.

Wholesalers and retailers interviewed indicated that there is little or no need to cull or discard palm fronds as long as a minimum effort is made to provide the conditions necessary for maintaining the palms—low moisture and refrigeration. With excess moisture or exposure to heat or higher temperatures the leaves will often turn black.

Figure 5 - Illustrative example of the distribution of Chamaedorea Palm in the US; Minneapolis, Minnesota, wholesaler

Importers are located in Texas and Florida, and ship to wholesalers throughout the United States, Canada and Europe. Wholesalers are located in both large and small metropolitan centers. Wholesalers in larger metropolitan areas generally receive their palms directly from the importer. For example, the wholesalers interviewed in the Minneapolis-St. Paul Metro area received shipments from two different importers, one in Texas and the other in Florida. There were minor differences between the two importers but the wholesalers worked with both to guarantee a good supply.

Retailers

Retailers are generally the last link in the supply chain before the palms reach the consumer. They are served by wholesalers within a day's shipping distance. The majority of the retailers surveyed purchase the fronds by the bunch (63 percent), while many of the larger retailers also

purchase fronds by the case (43 percent). The fronds are incorporated into large, showy floral arrangements for weddings and funerals, and, to a lesser extent, for parties with a tropical theme. During the Easter season and especially for Palm Sunday, palms may be sold to churches by the frond or by the bunch.[7]

The demand for palms has been fairly constant over the years, according to the retailers and wholesalers interviewed. About 25 percent mentioned some decrease in sales while 20 percent mentioned increases. Some decreases were attributed to there being fewer funerals, which is where many palms are used[8]. Others were attributed to changing tastes and, in one case, the "Martha Stewart" effect[9] was mentioned. Frequently, where a decline in sales was noted, the decrease was small.

Prices

Retailers were asked to indicate the prices they pay for different varieties of the *Chamaedorea* palm fronds. As might be expected, the prices seemed to vary with the volume purchased and, to a certain extent,with the distance from the supplier. Prices for bunches (25 stems) ranged from US$1.45 per bunch to $4 or more. The most frequent price for a bunch ranged from $2 to $2.50. The lower prices were reported by those retailers who used a greater volume of palms and those who purchase by the case (see Table 3 for a summary of prices). According to the wholesalers interviewed, there is a difference in quality between the various palms available, and this too is reflected in the price.

Volumes play an important role in prices, but they are also indicative of the type of market in which *Chamaedorea* is sold. Retailers reported use of *Chamaedorea* ranging from one to two floral arrangements per year, up to four cases per week. The average use was 10–30 bunches per week, representing an expenditure of $20–$100 per week for an item that is included in floral arrangements. This is a relatively small-volume expenditure for most retail florists, but the palms are an essential component of certain flower arrangements.

For wholesalers, the price per bunch varied from $0.80 to $1.70, while case prices ran from $25.50 to $50. The lowest price was paid by a wholesaler in Louisiana, where transport costs are among the lowest. The wholesalers purchase by the case, and distribute by the case and bunch. The per-bunch cost provided is arrived at by dividing the case price by 25 or 30 bunches, depending on which is the number of bunches in a case.

Processing Along the Supply Chain

As was noted earlier, there is relatively little processing of *Chamaedorea* palm. This is also true for the seed. In both cases, the products are culled, graded and loaded into cases. The only major

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[7] In Europe, Pathfinder Publishing commented that this is largely restricted to the Catholic Church, while in the United States the use is more widespread and includes other Christian denominations.

[8] Some 98 percent of the retailers mentioned using *Chamaedorea* for funerals and several shops indicated that funerals were their only use for the palm.

[9] Martha Stewart publishes home decorating magazines and guides that are distributed throughout the United States. As a result, she has had a significant effect on how people use plants and flowers when decorating or preparing for social events.

handling and changes in the product take place in the retailers' shops, where the fronds are added to floral arrangements. This last phase is of interest because how much the palm gets used often depends upon individual floral designers' tastes; some prefer other species for their designs. Nonetheless, *Chamaedorea* palms fill an important niche in the floral designs due to their ability to function well as filler for large arrangements and to add stiffness to arrangements. Apart from that, their use for Palm Sunday and Easter is unique and leaves little room for substitutes.

The one area of processing where efficiency and income-generating potential could be improved is the process of gathering the palm fronds in forest areas. A number of publications have indicated that anywhere from 40 to 60 percent of the harvested leaves are culled out at collection points in Guatemala (Nations, 1995; Segura-Bonilla, 1999). Although some of these losses may be unavoidable, due to transport problems and local conditions, it is reasonable to expect that some could be avoided. Buyers would pay more for the fronds if they did not have to discard such a larger percentage of what they purchase from collectors.

Market Concentration

Market concentration does not seem to be a problem in the US market. Given the volume of *Chamaedorea* palm sold there, the current number of importers probably reflects an effective number of suppliers. It was evident from conversations with importers that there is competition in the market. This was also evident in discussions with wholesalers who will work with more than one supplier to guarantee their supply and who discriminate on the basis of product quality. The prices for the palms are low compared to those for other floral greens, so there is no evidence of monopolistic price setting. If there is a problem, it may be in Mexico and Guatemala, where the palms are gathered and where it is often a single buyer who sets the purchase price. Although there is not good data for analyzing the price at which other greens might be substituted for the palms. If collection costs were to increase, boosting the cost of the palm to wholesalers and retailers, substitution might be a problem.

Opportunities for Value-Added Processing and "Green" Marketing

Because of the limited amount of processing that is required for the production of fronds and seed from *Chamaedorea* palm, there is not much room for value-added processing. Nonetheless, there is some potential for eliminating inefficient gathering practices, improving quality, and shifting some stages of potted plant production from importing countries to the seed-producing countries (Mexico and Guatemala). Such opportunities will differ depending on the destination country, and its markets and regulatory requirements.

There are a number of different areas to consider for green marketing, depending upon the objectives, target audience, and potential for and interest in providing financing for activities which would promote green marketing. Green-marketing efforts in the floral industry have been limited to Europe. Surveys in the United States indicate that more than 90 percent of retailers are unaware of any such efforts in the US floral industry.

In a recent CEC (1999) study of the shade-grown coffee market, it was found that people were primarily interested in taste as a criterion for purchasing coffee. The fact that it was shade grown was a secondary consideration. In the floral industry, an equivalent primary criterion is product

quality. The demand for greater quality has increased in recent years and is primary consideration for florists. It should be a key element in any effort to certify or promote *Chamaedorea* as a green-market product.

Value-Added Processing

Palm fronds

Because of the limited amount of processing done to *Chamaedorea* palm, there may be little scope for value-added processing. Nonetheless, there may be some opportunities to improve prices paid at the producer/*campesino* level. Information from experience suggests that there may be opportunities to improve individual frond selection in the forest to increase value and prices. According to some sources, there is a high level of culling after the gatherer sells the fronds to buyers and before they are exported. If this is the case, and gatherers become more selective to minimize culling, they should be able to demand a better price for the fronds. Other options for value-added processing will be explored and presented.

Potted-plant production

The preparation of germinated seedlings (slips) and potted plants for the nursery and interior-decorating industry is mostly undertaken outside of Mexico and Guatemala. This is a type of value-added processing which could be done in the countries from which seeds and fronds originate. However, the production of slips and potted plants is subject to the phytosanitary regulations of the importing countries. The most significant restriction is that against the importation into the United States of plants with soil, that eliminates the possibility of exporting potted plants from other countries. The other limitation on potted-plant exports is the cost of transport that, in many cases, would make the product unprofitable.

For communities and companies to be able to compete in potted-plant production would require training, investment and an efficient exporting system. The benefits would be employment opportunities, and greater social and economic benefits than those earned for simply exporting seed. It would also require a careful analysis of the potential costs and benefits. Rising fuel prices would likely make Mexico and Guatemala more competitive compared to countries that must maintain plants in greenhouses during the cooler months. In Florida, plants can be maintained outside greenhouses year round, but this is not be possible in important production centers such as the Netherlands.

Green Marketing and Certification

The ultimate goal of certification should be to facilitate better management of nontimber forest products and reward exemplary producers with reputable marketing claims, not serve as an impediment to technical assistance and market access. (Pierce 1999 #5)

Certain characteristics of its current production practices and markets make *Chamaedorea* palm a promising target for green marketing and certification efforts. *Chamaedorea* are nontimber forest products (NTFP) with an established and stable position in international markets. At their present level of domestication and production, they promote the preservation of natural forest areas. Furthermore, they have well-established processing chains that already are subject to a

certain amount of control. In Guatemala, *Chamaedorea* are harvested from natural forest areas under management by community concessions, many of which are already certified for timber production. In Mexico, by contrast, harvesting is often from forest areas with little control, and gatherers move from one area to the next as palm populations dwindle or are harvested.

Caution should be exercised when considering options for certification. *Chamaedorea* are a low-volume, low-value item, and that is what gives them their competitive edge. The danger exists that the costs of certification could remove that competitive advantage. In addition, the market for palm fronds is limited. Recent efforts to promote palm planting often describe a market with an unsatisfied demand. If promotion programs succeed in getting large areas planted to *Chamaedorea*, there exists the real possibility of saturating the market and driving prices down to the point where production would become unprofitable. Ultimately, this would lead to the replacement of forests—now protected for palm production—by agricultural crops. These considerations need to be taken into account and dealt with.

The following section will examine the potential for the certification and green marketing of *Chamaedorea* palm products. This potential will be analyzed with reference to the objectives of certification, an evaluation of the current situation of the palm, the objectives that might be reached through different certification and green-marketing strategies, and the range of options that might be considered.

Factors influencing the potential for certification

In recent years, there have been several efforts to promote the certification of NTFPs. Those efforts, successful or not, have provided practical field experience with certification, and lessons have been learned about certifying these products. There has been a coordinated effort among different certifying groups and organizations involved in certification efforts to extract lessons from experience to help guide present and future certification work. (Shanley 2001 #4). In the Shanley, 2001 #4 manual, several factors are identified which influence the potential for certification and its possible effects, both positive and negative. In this section, several of those factors and considerations are presented and analyzed for the case of *Chamaedorea*.

The factors that have the greatest relevance for *Chamaedorea* include:

- **Market**: issues related to the existence of a market and the demand for certified products.
- **Tenure**: issues related to ownership of the forest areas from which *Chamaedorea* palms are harvested, and to the ability to control that harvest as part of a certification process.
- **Technical knowledge**: existence of good scientific and local empirical knowledge that would form the basis for sustainable management guidelines.
- **Coordination with timber certification**: opportunities to combine timber certification and palm management certification in order to lower costs and apply the effects of timber management on the palms.
- **Chain of custody**: issues related to the ability of certifiers to effectively monitor the chain of custody from forest to retailer.
- **Social factors**: issues related to wages earned by gatherers who are basically paid for the number or weight of fronds and seeds harvested by middlemen.

A preliminary assessment, based on secondary sources of information, indicates that there are significant differences between Mexico and Guatemala with regard to opportunities for certification and the above-mentioned factors. This assessment is only preliminary and should be interpreted as such. Further investigation will be needed to determine how well the conclusions reached here apply in the field.

Markets for Chamaedorea palm products

Initially, NTFP certification many be most useful for a limited number of products with international markets. Markets for environmental and fair trade certified products are primarily found in Europe and to a lesser extent in North America (Shanley 2001 #4).

This statement, from a forthcoming book on the certification of NTFPs, provides insight into the opportunities for the certification of *Chamaedorea* palm products. Their well-established international market makes them good candidates for certification. That market, however, is in a sector with existing certification activities in Europe, but with little or no history of certification in North America. This was evident in the survey of US retail florists and wholesale suppliers, and was reflected in the review of secondary information sources. It would, therefore, appear that the greatest opportunities for initial certification would exist in the European markets and, possibly, in some niche markets in North America that will be discussed later.

The other important factor in certification is the guaranteed quality of the product, as discussed earlier. Wholesalers and retailers mentioned this as an important factor for them in selecting their sources of palms. Any efforts to certify would have to guarantee that the quality of the certified product is at least equal to alternative noncertified sources and, if a premium is expected, efforts need to be made to improve quality to the point where certified products are of higher quality than noncertified products.

Tenure: ownership and control of palm-gathering areas

To be able to certify any product, it is necessary to control the areas in which it is produced so as to ensure a sustainable harvest. This implies both the ability to control the harvest by the certified group (community, cooperative, association, individual, company etc.), and to exclude other individuals and groups from the harvest areas who may be harvesting in a nonsustainable manner. This could create problems for the certification of *Chamaedorea* palm products in two ways. First, according to published accounts of palm frond gathering in Mexico, much of the palm is harvested opportunistically from natural forest areas—harvesters move in, gather what is available, then move on to a new area. There is not necessarily a continuous sustainable harvest from well-defined areas. Under those circumstances, it would probably be impossible to certify the production due to the uncertain tenure and lack of control of the resource.

The second problem is related to the potential effects of certification. If certification is implemented, and well-defined tenure and control are required, and if those criteria are not satisfied, gatherers may be driven from the natural forest to production in planted shade and a more domesticated production. If this were to happen, it would remove the incentive, provided by the current system, to maintain natural forest areas. Thus, an indirect effect of certification could conceivably be the movement of *Chamaedorea* production out of natural forest areas, leading to loss of the protection harvesting now provides for natural forests as sources of income from palm-frond gathering.

The tenure issue may provide opportunities for individual property owners and communities with *ejidal* lands in Mexico, and for community concessions in Guatemala already certified for forest management activities. If those communities can effectively control harvest from their forest areas, they would be good candidates for certification and could directly cater to niche markets for certified palm products. In some areas of Mexico, individual farmers are cultivating *Chamaedorea* palms for seed and fronds in natural shade. Here again, if they have the capacity to control harvesting and exclude opportunistic gatherers, they might also be good candidates for certification. In either case—community or individual production—tenure and control of harvesting will be important and limiting considerations.

Technical knowledge: sustainable harvest guidelines

In order to come up with guidelines for certifying sustainable harvest practices, we must understand the biology of the palm species in question. We must understand how many fronds per plant can be harvested at a given frequency of collection without degrading the resource. We must also understand how changes in the habitat in which the palms grow and reproduce might affect their long-term viability. In cases where other timber and NTFPs are harvested from the same area, we may need to understand how the interaction between the harvest of one or several species affects the viability of the others. For many NTFPs, this information is not available.

Because *Chamaedorea* has a relatively long history of exploitation for international markets, there have been efforts to research and define sustainable levels of harvest by researchers in Mexico, Guatemala, United States universities and international institutes such as CATIE in Costa Rica. In Mexico there have been efforts to promote the cultivation of *Chamaedorea* palms that include a published manual for their production. In addition, there is undoubtedly a significant amount of local knowledge that could provide guidance. The existing information could serve as the basis for the development of guidelines, but first would require a thorough review to see if it is sufficient and to identify additional information needs. Nonetheless, with the existing information it should be possible to develop preliminary guidelines that could be used while more complete information is developed.

Coordination with timber certification

In forest areas in which palm production is practiced and which are subject to certification for timber production, it may be possible to reduce costs by combining efforts and using single visits for both appraisal and monitoring. Obviously, this would not always be an option, but where it is, it could significantly lower the cost of certification. At present, several community concessions in Guatemala have received forest certification. They provide an opportunity to carry out trial certification of palm-frond harvesting in combination with forest certification, if the certifying organization is willing to consider that arrangement.

Chain of custody

One of the major difficulties with certification is in guaranteeing that a product certified in the field is the same one that arrives at the retail outlet, without having noncertified products included in the final sale. This is the chain-of-custody issue. With logs and lumber from certified forest management operations, this has been possible. With palm fronds and seeds, it may be more difficult, although probably not impossible.

At present, palm fronds and seed, gathered by individuals or groups at the request of a middleman, are sold to that middleman who then sells them to the companies that import them into North America and Europe. These companies then distribute the products to wholesalers and retailers. It is not a long chain of custody, but noncertified palms could enter at any time if adequate control were not provided. The importer/wholesalers generally control the product once they receive it from the middleman, through the warehousing and transport phases in Mexico and Guatemala, until it reaches their warehouses in the United States. They usually control the transport of the boxed fronds to wholesalers and some retailers throughout the United States. The palm is then bundled as cases or bunches in retail orders.

Certification efforts would have to work at three levels: 1) at the forest level in areas with well defined tenure and control of harvesting; 2) with the middleman or directly with the importer, if that arrangement were made; and 3) at the wholesale distribution and retail level in the country of destination. If importers could buy directly from the certified community or organization, it would simplify the monitoring. Most importers of palm fronds have been in the business for at least 10 years, and some have been the pioneers in the market and have a very well-defined process for importing and distributing palm products. Working through those companies and their well-established networks in Mexico, Guatemala and North America would probably be the most efficient and cost-effective way to carry out certification.

Social factors

Since most of the transactions related to the trade in palm products occur between independent gatherers and middlemen or the companies that import the palms, the primary concern related to social issues is fair payment for the palm products. This report does not include an analysis of the prices paid for palm fronds and seeds, nor is that its aim, but there are some probably outdated publications that discuss the issue. One report from Guatemala indicated that frond gathering provided a daily wage three to four times the going rate for day laborers. If that continues to be the case, it would seem that prices are certainly sufficient and provide a good source of cash income for gatherers. There would need to be an analysis of present conditions, as far as prices are concerned, to determine if gatherers are being treated fairly—an issue that would have to be addressed for certification.

Options for green marketing and certification

If the ultimate objective is to promote and maintain sustainable production of the palm while improving the well-being of the communities harvesting the palm, there are three general approaches that could be taken toward certification or green marketing. The first option is principally a market mechanism that is not closely linked to sustainable management of the resource. The other two options are:

1. Working with market to increase demand would allow new areas to be included in production and, thus, protection.
2. Maintain forest protection and production through certification program that would require production under forest cover as a condition for certification. This would discourage intensification of production (moving production into artificial shade or planted forest). Certification at this level that might not necessarily include all the requirements of many certification programs.

3. Certify production as sustainable under criteria similar to that used to certify wood production.

When discussing certification and green marketing, it is important to understand the effect certification might have on the market and on the profitability of the activity being certified and, ultimately, the objective of the certification. The instrument or strategy chosen must be the most effective for reaching the objective.

In any certification or green-marketing strategy, it is essential to produce the same quality product now available. If such a program were seeking higher prices for the product, improving quality relative to the present supplies would be necessary. It is doubtful that consumers would be willing to accept a product of lower quality just because it is certified.

Working with the market to increase demand

The objective of this first option would be to increase market demand to accommodate greater production of *Chamaedorea*, assuming that increased demand could lead to expansion of the area under harvest. This would provide an incentive for local communities to preserve larger forest areas for palm production. This option assumes that an increased supply will come from new forest areas, but it may also come from a greater intensity of harvest from existing areas, or from cultivation of palms in planted shade. The present structure of the supply and demand for seed and fronds tends to encourage harvest from the wild, since the prices received do not justify more intensive production requiring investment in shade structures or plantation operations. Continental Floral Greens has started production from plantings established in natural tree shade, which could be a first step towards more intensive production.

Advantages:

- Would not require the infrastructure and costs involved in setting up certification of palm products.
- Market entry could be tied to sustainable production.
- Could have a significant effect on the areas protected by palm production if there is unsatisfied market demand.

Disadvantages:

- It is uncertain what the effect of increased market demand would be, and whether it would be beneficial or detrimental to the forest and wild populations of Chamaedorea.
- It is uncertain how much, the market for Chamaedorea products can increase, if at all. This study suggests the market is fairly static and there may not be opportunities for expansion.
- Could potentially lead to a degradation of the forest and/or Chamaedorea resource.

Certification of products as coming from forest shade under a sustainable-harvest regime

The objective of this option would be to provide a certification which would: encourage harvest from forest areas; discourage production in artificial shade; guarantee a sustainable harvest without the expense that full certification of sustainable production often requires. This would be

important if the costs of full certification were so high they discouraged or prohibited certification. Collection areas maintained with forest cover and under a schedule of harvesting intensity that sustained production without degrading the resource would receive certification that would provide them with access to markets for certified products. Obviously, identifying and developing those markets would have to be an important part of any certification program. At present those markets do not exist.

Advantages:

- Would promote the production of palm products in natural shade and discourage production in artificial shade.
- If a simpler scheme than full conventional certification could be worked out, it might be possible to avoid those costs that might make full certification economically unviable.
- A process of certification that is simpler and less costly would improve the chances of its being accepted by the current producers, importers and distributors. The importers and distributors interviewed are concerned about government intervention and controls on their businesses. Those businesses, because of their organization and control of the supply chain, would be the logical vehicles for any certification program.
- Starting with simplified certification might help initiate a market for certified products and give a competitive edge to those producers who are certified. If there were a positive market response, it might be possible to develop more stringent certification guidelines in the future based on consumer demand.

Disadvantages:

- This simplified certification process would not be as rigorous as other certification systems now in place; there could be objections to that.
- Any potential intervention in the trade is likely to be met with objections from those involved unless there is an associated benefit.

Certification of sustainable production under current guidelines for forest certification

This option would contemplate a certification process similar to that used for shaded coffee and timber production, with comprehensive guidelines covering social, economic, biophysical and ecologic issues. This type of certification would probably be too costly for *Chamaedorea* palms, given the relatively low volume and price the palm represents in the market.

Advantages:

- Provides a more comprehensive protection for the forest. Could also address social issues if there were problems with compensation for frond gatherers.

Disadvantages:

- The cost of certifying the palms under a format similar to that used now for forest certification could be prohibitive.

Potential Markets for Certified Products

North American markets

The surveys of retail florists, as well as personal interviews with importers and wholesalers in Florida and Texas, revealed an almost total lack of awareness of certification of products used in the floral trade. Approximately five percent of the persons and businesses participating knew of certification efforts. There is evidently no movement in this direction in the floral industry. Those that were aware of certification had read about it. Roughly five percent more expressed an interest in certification because of the allergic reaction of floral workers to some of the chemicals used either for the production of flowers or for post-harvest treatments.

One response to the question on certification indicated that the factor that had the greatest effect on sales was quality. This same point was mentioned in the literature as an important trend in the floral industry—the increasing market demand for higher quality. This was also mentioned by wholesalers as one of their principal criteria in choosing a supplier for *Chamaedorea* palm.

Based on the results of the surveys and interviews, and on the literature, it is likely that certification of *Chamaedorea* palm products will not be an option in the near future. If it were to become an option, certified products would have to be of equal, if not of better quality than the uncertified products with which they would be competing. Nonetheless, there may be opportunities to introduce certification in parts of the palm market. One potential area is religious organizations.

Palm fronds for funerals, weddings and the Easter season represents a major part of the market for *Chamaedorea* products in North America. These are all events closely associated with the Church. Increasingly, religious organizations are getting involved in environmental issues and social justice issues, both issues often linked to certification efforts in the floral industry in Europe. The Minnesota Council of Churches was contacted about their current efforts in encouraging action on the CO_2 issue. They suggested that, if they were aware of a certified source of palm products, they could use their newsletter to advise churches of the existence of an alternative source. The decision of whether or not to purchase certified palms would be left up to individual churches. There are several organizations representing different religions and religious denominations involved in environmental and social justice issues that could potentially support certification efforts.

European markets

Europe, and particularly Germany and Holland, are home to several efforts to provide certification of the floral industry. Two programs, the Milieu Project Seirteelt (MPS) (Floriculture Environmental Project) in Germany and the Flower Label Program (FLP) in the Netherlands, both started in the mid 1990s. They are certifying flowers grown in Africa, Latin America and Europe.

The MPS program has developed criteria for certification which include: crop protection agents, fertilizer use, energy use, waste and water use. They issue a label to growers meeting their

standards which is accepted in the market and for which there has been a growing demand. In 1999, there were 3,309 participants in the Netherlands and 326 international participants.[10]

The Flower Label Program, based in Germany, is working primarily in Africa and Latin America. Twenty-nine companies participating in Ecuador, and another 11 in Kenya and Zimbabwe. They have developed comprehensive criteria, grouped into a technical-environmental section, and a social and industry security section. A German company carries out the certification and the flower growers cover the cost. There has been some criticism from the international human rights organization Food International Action Programme (FIAN), which would prefer that the certification be awarded by an independent body, not a company. FLP is working with FIAN to improve certification.

The European market is opening up to certified flowers and contrasts sharply with the US market, where there is little awareness of certification and, apparently, little interest. This may mean that European markets for palm products should be targeted for certified production if the costs are reasonable.

Summary

The *Chamaedorea* palm family is well-established in international markets at present. That the existence of this market is expected to remain fairly constant into the future appears to be contributing to the maintenance of the forest areas where the palm products are gathered. At the same time, the availability of the palm for harvesting from the wild and its market price have maintained production primarily in natural forest areas, with some recent movement toward cultivation in tree or forest shade. There have also been reports of reductions in wild populations due to over harvesting and, primarily, habitat destruction.

The palm family could be a candidate for certification efforts if the cost of certification were reasonable or could be covered by a premium paid for certified products. To do this requires identifying potential markets for certified production or, perhaps more importantly, attending to the quality of the certified product. It is recommended that certification be linked to production in natural forest areas in order to maintain the protective function of the economic forest asset the palm represents to local communities.

There may be opportunities for marketing certified palm products in the United States and Europe. In the United States, the principal markets may be niche markets since the floral industry has not pursued certified production, while in Europe there appears to be a growing market for certified products in the floral industry.

To be able to promote a program of certified palm production would require further exploration of specific markets for certified production, and the identification of palm-producing areas/communities that meet the basic tenure and chain of custody requirements for certification. Furthermore, the information on sustainable management of *Chamaedorea* species needs to be synthesized and any information gaps addressed.

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[10] 1999 Annual Report of MPS—Dutch Floriculture Environmental Project. <http://www.st-mps.nl/jaarverslag991_uk.html>.

Appendixes

Appendix 1: Additional Information and Research Needs

In preparing this report, it has been possible to identify information needs that would help clarify issues related to the potential for certification of *Chamaedorea* products, as well as their role in promoting the preservation of natural forest areas. Some of those issues and areas for future research and information gathering are listed below.

1. Determination of the contribution of palm frond and seed collection to individual and family income.

Published reports differ on the degree to which the prices paid to harvesters can be considered adequate. In one study in Guatemala, the author found that palm gatherers were earning two to three times the going wage for agricultural labor. In other publications, the fairness of price paid to harvesters, as compared to prices paid once the palm products are exported, has been questioned. There is no doubt prices paid for the palm vary, although there are relatively few exporters and their prices in the US market do not vary greatly. The variation is, therefore, most likely related to the prices that local middlemen pay for the product, as well as other economic factors which determine price (transport, quality of fronds/seeds, amount of handling and processing required, opportunity costs for labor etc.). In addition, most of the claims of low prices reflect the disparity between those paid to the gatherer and those paid in export markets, but do not include an analysis of the costs of getting the products to market.

One consideration in certification is the income provided by the sale of certified products, and the contribution to the well-being of the individuals, families and communities involved in the activity. It would be helpful to have information available that would provide a gauge of the importance of the income from palm product gathering and cultivation, and its magnitude compared to that of income from other productive activities.

2. Identify communities/forest areas where forest certification could be combined with the certification of the sustainable harvest of palm products.

An important option, identified by the international community engaged in efforts to certify nontimber forest products, is the joint certification of timber and nontimber forest products. This has the potential to lower costs and improve efficiency of certification. If a pilot project were developed to promote certification of palm production, it would be advisable to identify cases where it could be combined with forest certification. This could be done with multiple objectives. One would be to lower costs and improve efficiency; another might be to provide a test case for the joint application of certification of timber and nontimber forest products.

3. Feasibility study for certification for provision of palm products to religious groups.

Initial discussions with religious groups involved in environmental issues, although only exploratory, suggest that there may be an opportunity to work with those groups on the certification of palm fronds, since churches and church-related activities are a principal market for palms in the floral industry. It may be possible to set up a pilot project to explore the certification of palms for this niche market. This would require identifying forest areas/communities where palm production could be controlled, coordinating with importers of

palm fronds, and distributing (chain of custody) in the North American and possibly European markets. A recommended first action would be a feasibility study of such a certification effort to determine if there might be a significant demand for certified palm fronds and, if so, if the certification would be logistically possible.

4. Preparation of manuals for sustainable harvest of palm products.

As has been mentioned, there exists some information and research on the sustainable harvest of *Chamaedorea* palm species, but it is often isolated and may benefit from a synthesis, to extract preliminary management guidelines for the sustainable harvest of palm fronds and seed. This would be needed if palm production were to be certified and would be a valuable resource for the sustainable management of the palm resource.

5. Determination of the extent to which palm harvesting has contributed to the preservation of forest areas.

Anecdotal information suggests that the income communities receive for the harvest of palm products may be an important factor in preserving some forest areas. This would obviously be an important reason to promote certification and support for the production of palm products from natural forest areas. However, the information encountered is primarily anecdotal. An objective study would be useful for determining the extent to which this is actually happening and would also provide valuable information that could be used in certification efforts.

6. Explore the potential for improving quality by training harvesters.

Because quality is such an important issue in the floral industry, improving quality could be a key factor in improving prices and market share for certified production. If quality becomes associated with certified products, there will likely be a greater demand and higher price for the products. To guarantee quality would require control, from harvest through the entire chain of custody. Improvements in quality could be achieved through education of harvesters, with the added benefit of improving efficiency by lowering the number of fronds culled out due to damage and size issues.

7.* Further research on the biology of the species of Palm *Chamaedorea

Little is actually known about the biology of *Chamaedorea* species. It is known that they are dioecious, having male and female plants, although there may be hermaphrodite plants bearing flowers of both sexes. Based on what is known of *C. tepejilote* (Oyama 1984), the percentage of female and male plants seems to be equal (50 percent of each). It is not known precisely how pollination occurs. It is believed that, by producing a dry pollen, some species must be pollinated by wind. Others, with sticky pollen, are probably pollinated by insects, which are also attracted by the scent of the flowers (Hodel 1992). Bees, flies, beetles and other insects have been seen visiting *Chamaedorea* inflorescences.

Appendix 2: Market Summaries for the United States and Canada

Canada (source: Agrifood 2000)

The floriculture, nursery and Christmas tree sectors recorded the highest production value in the Canadian horticultural industry in 1998, with receipts of nearly C$1.2 billion. This represented 35 percent of the receipts for the total horticultural sector and 4.2 percent of total agriculture farm cash receipts (FCR). In fact, this sector was the highest FCR crop, after wheat and canola. The sector's total FCR increased by one percent from 1997, and 44 percent over 1993, maintaining strong export sales. For the past 10 years, the sector has increased its production value by 8.7 percent a year.

According to the industry, the sector employs 150,000 people. Nursery farms increased by 26 percent from 1991 to 1996, while greenhouse flower farms decreased in number. The area of production increased by 52 percent from 1991 to 1996. For the floriculture and nursery sectors, Ontario and British Columbia are the largest production regions; for the Christmas tree sector, Quebec and Nova Scotia are largest. These three sectors have national associations and have developed web sites for contacts and information

Floriculture: In 1998, Ontario (52 percent), British Columbia (23 percent) and Quebec (12 percent) accounted for 87 percent of the Canadian floriculture production. Floriculture sales reached C$903 million in 1998, up eight percent from 1997 and 44 percent from 1993, mainly due to increased export sales. Sales to wholesalers and to the public continue to be the preferred channel for marketing flowers and plants, representing 25 and 21 percent respectively of total flower and plant sales. Through research, the sector continues to produce a wide variety of floral products for consumers. Through AAFC's Matching Investment Initiative (MII), new research helps to improve the quality and develop new varieties of floral products.

In 1998, the main varieties of cut flowers produced in Canada were roses, tulips and chrysanthemums. The main potted plants produced were geraniums, chrysanthemums, poinsettias and tropical plants (including foliage and green). The production of cuttings and other propagating material included chrysanthemums, with 12.7 million cuttings, and geraniums, with 18.4 million. Bedding plants for ornamentals totaled 584 million plants in 1998, down 1.6 percent from 1997, and 348 million vegetable plants, up 37 percent from 1997. The floriculture industry shares the same issues as those identified for the nursery industry. Canada has to compete with the world in this industry since 25 percent of the total supply comes from outside Canada, mostly the United States, Europe and South America.

The influx of cut flowers from South America is a concern for Canadian growers, who face higher wages, and higher heating and lighting expenses. This is resulting in a shift to different specialty crops, and research into ways of improving crop yields and quality in general. Canada lags behind other major flower producing countries in rapid access to newer, cheaper and more effective pest-control products.

In 1998, imports of floriculture and nursery products accounted for $289.8 million, up 16 percent from 1997, and 48 percent from 1993. The main products imported were cut flowers (32 percent)

and live plants, including cuttings (47 percent). Many imported nursery products go to nurseries that use cuttings and tissue culture to propagate saleable plants. The United States accounted for 54 percent of all imports, 20 percent from South America (cut flowers and flower buds) and 19 percent from Europe (bulbs). The competition is worldwide, as imports originate from more than 100 countries. The largest suppliers are the United States, the Netherlands, Columbia, Ecuador and Mexico.

The United States (source: Stevenson 2000)

The market for floriculture and environmental horticulture (greenhouse, turf grass, and nursery-related crops) represents the fastest growing segment of US agriculture, typically increasing grower cash receipts by US$500 million annually. In 1996, with $10.9 billion in grower receipts, floriculture and environmental horticulture crops ranked as the United States' seventh most-important commodity group, behind cattle and calves, dairy products, corn, hogs, and soybeans. By 1998, American grower receipts were valued at $12.1 billion. While these are impressive figures, it must be noted that they represent only a fraction of the overall American "green industry". In 1998, retail expenditures for all floriculture and environmental horticulture products, as estimated by the Economic Research Service (ERS), reached $54.8 billion or $203 per capita.

The $54.8 billion makes the United States the world's largest market for floriculture and environmental horticultural products. While there are still many nations—such as Japan and several in the European Union—that show a higher per capita expenditure on floral products, the United States spends the most in total dollars. The United States is an extremely competitive market. As of 1998, it housed 14,308 growers, an increase of 1,591 from the previous year. That said, a large percentage of the growers are small farmers with low gross sales. In fact, only 1,533 of the American growers report revenues in excess of $500,000. This figure is down from 1,829 in 1997, indicative of the mergers and amalgamations which have become commonplace within much of the business community. As already mentioned, the majority of grower businesses are smaller. Revenues of $10,000–$19,999 will be realized by just 2,459 growers, and 3,075 will earn $20,000–$39,999 in gross sales.

American floriculture and environmental horticulture producers tend to specialize. Bedding/garden plants are the dominant specialty, with 3,748 growers concentrating their efforts in that field. This is followed by potted flowering plants, produced by 2,543 growers, and by foliage, which has 1,510 growers. Cut flowers and cut cultivated greens receive the least attention by domestic producers, as this market is largely satisfied by foreign exporters.

The United States is both the largest market for and producer of floriculture and environmental horticultural products. Commercial growers can be found throughout the United States. However, production tends to be concentrated in the southern and western states, where the climate is more temperate. In fact, 10 states account for more than two-thirds of the total US output. They are California, producing 20 percent of US output; Florida, 11 percent; North Carolina and Texas, eight percent each; Ohio and Oregon, five percent each; and Michigan, Pennsylvania, Oklahoma, and New York each produce two to four percent of the total. Regardless of locale, net farm income for growers of "greenhouse and nursery crops" is among the highest of all production specialties. Furthermore, according to a University of Georgia

study, the floriculture and environmental horticulture sector ranks as the second most important segment of US agriculture, behind beef and beef products. This study takes into account the industry's total economic output, or the value of the industry and its closely associated business activities, such as product handling, marketing and distribution.

Much of the growth seen in this industry can be attributed to the market for outdoor flowers and plants. The United States produces and spends more on this category than any other country. Furthermore, the United States is the world's largest producer and consumer of nursery products, such as trees and shrubs, bedding plants, and turf-grass. When discussing the floriculture and environmental horticulture sector—commonly referred to as the "greenhouse and nursery" sector—it is important to distinguish between the two. Floriculture includes cut flowers, cut cultivated greens, potted flowering plants, potted foliage, and bedding and garden plants. Floriculture crops are predominantly grown under protective cover, such as in plastic or glass greenhouses. This category typically accounts for one-third of all grower cash receipts for floriculture and environmental horticulture crops. Environmental horticulture, accounting for two-thirds of all grower cash receipts for floriculture and environmental horticulture crops, includes nursery plants such as trees, shrubs, ground covers, vines, and fruit and nut plants; bulbs, sod (turf-grass), and unfinished plants and propagation materials such as cuttings, plugs, seedlings, and "lining-out" stock used by other growers for growing-on. Environmental horticulture crops are predominantly grown outdoors and used for landscaping purposes. That said, trees and plants used for conservation, reforestation, seedlings for Christmas tree plantations, and nursery stock grown for transplant sales to growers of fruits and vegetables are also included within this category. Excluded from this category are cut Christmas trees, seeds (flower, vegetable or others) and food crops grown in greenhouses.

Appendix 3: Internet Sites with Information on the **Chamaedorea** *Palm for the Floral or Horticultural Industries*

<http://www.ars-grin.gov/ars/Beltsville/na/research/index.htm>
<http://www.cec.org/home/index.cfm?varlan=english>
<http://www.fas.usda.gov/htp/circular/2000/00-12/toc.htm>
<http://www.marketag.com/links/>
<http://www.iied.org/smg/pubs_stsc.html>
<http://www.fao.org/docrep/X0451e/X0451e08.htm>
<http://www.undp.org/sgp/cty/LATIN_AMERICA_CARIBBEAN/GUATEMALA/pfs791.htm>
<http://www.mesoamerica.org.mx/Simposio/marmillod.htm>
<http://www.fao.org/forestry/FOP/FOPW/NWFP/nwfp-e.stm>
<http://www.flowerweb.com/>
<http://host8693.hostamerica.com/index.htm>
<http://www.rfaflorist.org/>
<http://www.ftdassociation.org/ftda/home.nsf/public/contact_FTDA.htm>
<http://www.safnow.org/>
<http://www.flowersource.net/>
<http://www.endowment.org/>
<http://www.tapin.co.uk/services.htm>
<http://www.ifas.ufl.edu/~apkweb/folnotes/chamaed.htm>
<http://mrec.ifas.ufl.edu/cutfol/cutinfo.htm>
<http://www.rainforestcollection.com/html/welcome.html>
<http://nav.webring.yahoo.com/hub?ring=palmring&list>
<http://mobot.mobot.org/cgi-bin/search_vast>
<http://www.lakesidenursery.com/info.html>
<http://www.usda.gov/nass/>
<http://www.forestdirectory.com/>
<http://sfcw.org/background_articles.htm>
<http://www.wfrinc.com/>
<http://www.nass.usda.gov/census/census97/horticulture/horticulture.htm>
<http://www.stern.nyu.edu/~akambil/teaching/cases/auction/flowers.html>
<http://www.gemi.org/>
<http://www.plant-care.com/PlantCareTips/082500.asp>
<http://www.attra.org/attra-pub/cutflower.html>
<http://www.fintrac.com/gain/>

<http://www.usnews.com/usnews/issue/980420/20fore.htm>
<http://www.select-seeds.com/Seeds.htm>
<http://www.hortworld.com/scripts/hortworld/plantsearch.asp>
<http://www.plantapalm.com/vpe/misc/vpe_commonnames.htm>
<http://www.palmcollector.com/palms/*Chamaedorea*_turkheimeii.htm>
<http://www.palmcollector.com/palms/*Chamaedorea*_hooperiana.htm>
<http://www.volcano.si.edu/botany/projects/centres/lacandon.htm>
<http://nmnhwww.si.edu/botany/projects/centres/gfar-elc.htm>
<http://www.marketsearch-dir.com/html/d8102.htm>
<http://www.pathfastpublishing.com/qr27/qreport.htm>
<http://dataweb.usitc.gov/scripts/user_set.asp>
<http://www.ita.doc.gov/td/industry/otea/ref-room.html>
<http://europa.eu.int/comm/eurostat/Public/datashop/print-catalogue/EN?catalogue=Eurostat>
<http://www.ita.doc.gov/td/industry/otea/>
<http://www.iconx.com/html/riffle_botanical_glossary.html>
<http://www.ilo.org/public/english/dialogue/sector/papers/ctflower/index.htm>
<http://tradeforum.pressflex.com/news/fullstory.php/aid/224>
<http://www.enterweb.org/market.htm>
<http://www.un.org.mx/cepal/link/enlaces.htm>
<http://www.agribiz.com/agInfo/usdalist.html>
<http://usda.mannlib.cornell.edu/reports/nassr/other/zfc-bb/>
<http://www.ams.usda.gov/fv/mncs/fvcomp.htm>
<http://www.cbi.nl/marketinfo.htm>
<http://www.oneworld.de/eco-label/umweltsiegel.htm>
<http://www.semarnap.gob.mx/proders/gestion/oax98.htm>
<http://mobot.mobot.org/cgi-bin/search_vast>
<http://www.voyager.net/mfa/cut.html>
<http://www.itto.or.jp/newsletter/v10n1/4.html>
<http://www.fao.org/docrep/t2354s/t2354s0f.htm>
<http://www.statcan.ca/trade/scripts/trade_search.cgi>
<http://www.fintrac.com/gain/traderegs/>

Annex A: Harvest and Cultivation of the *Chamaedorea* Palm

Introduction

Chamaedorea palm is the name given to the various species of *Chamaedorea* that are harvested. They constitute one of the 250 non-timber products extracted from Mexican forests. Along with plants such as the pepper, the palapa palm, the royal palm and the *cascalote*, *Chamaedorea* palm is regarded as having a "high development potential" in both perennial and hardwood forests (Semarnap 1997).

The map of current vegetation (see Map 2 in C) shows the distribution of forests where *Chamaedorea* palm is found. These areas coincide with the mountain zones where indigenous peoples and peasant farmers live. These zones have been called "refuge regions" because of the natural and cultural preservation maintained in them (Aguirre Beltrán 1967). *Chamaedorea* palm has been included in the multiple-use resource strategy practiced in these zones for centuries, as a product that the communities can use to supplement income.

In these subsistence zones, field corn rules productive and social life. The opportunity to cut several gross *Chamaedorea* palm fronds or to gather seed during the *apuración*—the season of reduced corn work—was welcomed. This rate of harvest was compatible with the time needed for the plants to regenerate and maintain the populations needed to sustain the resource. Inevitably, marketing of the palms became part of the dominant market in these regions. This market formed after the Mexican Revolution, when families whose lands had been expropriated and the new middle class formed a new class: intermediaries or *coyotes*. These coyotes paid low prices to peasants for their produce, resulting in an increased harvest that today threatens the conservation of the resource.

Harvest

Leaf production is variable in *Chamaedorea* palms, making it inadvisable to try to obtain a consistent yield. Excessive technification does not appear to improve cultivation. Fertilization does not significantly increase production and can be costly. However, leaf-cutting and seeding techniques are fundamental to keeping plants in good condition. As mentioned above, two leaves—three if there are seeds— and new shoots must always be left for proper maturation. The fronds must not be cut too close to the stem, because this leaves the growing inflorescence unsupported. The time for cutting new leaves also needs to be established; if cut at the wrong time, the frond thickens and is no longer useful.

This does not mean that yield is unimportant in the cultivation of *Chamaedorea* palm. There is a problem of waste due to deficient leaf quality from spotting, bites, thickening, etc. Also, about 10 percent is discarded when the leaves are wrapped in a parcel, another 10 percent by the producer when the leaves are tied, and another portion is lost at the different collection centers (10 percent regionally and another 10 percent when sent abroad). This problem must be addressed, not directly with additional material inputs, but perhaps by means of careful shipping and, on-site, by shade selection, soil drainage, and other factors known and regularly managed by the peasant farmers and indigenous people of Mexico.

Palm frond harvesting

Since the trade in *Chamaedorea* palm began, frond harvest has been sporadic. The decision to harvest depends on the season, the cutters' economic conditions and specific conditions of families, which means it impossible to make generalizations or reliable calculations. There are those who cut once a week, or every two weeks, or once a month. Many cut only during seasons when they do not have other work, such as clearing coffee fields or cornfields. Others never cut. For example, in the Chinantec community of Monte Tinta, one-third of the heads of households do not cut palm, whether because of age (younger men generally cut palm), gender (few women cut palm), or simply because they prefer not to go too far up in the mountains. Most people who cut do so primarily in the months of June, July and August. They cut to a lesser extent in April and September, which fall after planting and before the harvesting of corn, and do not overlap the coffee season. Those who cut regularly throughout the year tend to be young, as the rate of leaf production does not create an abundant harvest and, thus, considerable effort is required to walk through rough and dangerous terrain, often with meager results—only a few hundred fronds—and the threat of a major loss to the palm population if cutting is increased. Over the course of a year, this cutting pattern results in harvested volumes of a fairly fixed quantity, with notable increases during high-extraction seasons (Carrillo-Trueba 2001).

There are communal farms (*ejidos*) and communities where attempts have been made to regulate cutting, establishing periods and rules in assembly resolutions. For example, at the Martín Chino *ejido* in Chinantla, it was agreed that cutting would take place only during March and April. In Ozumasín, cutting is allowed only when a buyer agrees to a good deal.

This type of land generally has vegetation areas that are in common use by all members of the *ejido* or community. This is where the cutters go. As *Chamaedorea* tends to grow in particular spots, there are places where they are found or sought. The same places are visited by several people, who return from time to time. An interesting aspect of the cutting is that, at least for the more commercial species (*C. elegans*, *C. tepejilote*, *C. oblongata* and *C. quezalteca*), it leads to greater frond production. In the case of *C. elegans*, according to the producers, this allows for a harvest of a couple of leaves every four months instead of one every three months. The same amount can be harvested from *C. tepejilote*, instead of one frond every four or five months (Oyama and Mendoza 1999).

When cutters, alone or in a group, come to a spot where there are palms of appropriate size and density, they may cut up to 12 or 15 gross of fronds each. An average cut would be seven or eight gross, 10 at most. If the harvest is not so good, they might cut four gross each. Thus, when a cutter finds a place with several *C. elegans* spots—such as those counted in Chinantla for this study—after leaving the required two leaves on each palm, he might harvest ten gross of fronds in just a quarter hectare. Likewise, a cutter in the Los Tuxtlas region might visit one of the sites counted by Ken Oyama and his collaborators (1992), and gather about five gross in a quarter hectare. On such a site, in 1,800 square meters, there are 63 *C. tepejilote* plants taller than 1.5 meters, 34 *C. oblongata* plants, and an equal number of plants too small to be harvested. From this we can grasp the volume of palm leaves moved each day. It is otherwise inconceivable that a community where only 30 people cut leaves, such as the Miguel Hidalgo *ejido* in the Sierra de Santa Martha, can extract 500 gross per week, or 60,000 leaves (Velázquez and Ramírez 1995), or that communities like San Antonio de las Palmas, in Chinantla, can extract between 800 and 1,000 gross every week during non-corn seasons, as it has been doing for many years (Carrillo-Trueba 2001).

Most farmers know that they must not cut the leaves too close to the plant, because doing so takes the stem off the budding inflorescence. The leaf stem must also be cut to a size meeting the commercial standard, which varies for each species. At least two leaves should be left on each plant, along with any new shoots. A person who fails to observe this kind of recommendation generally does so in an "emergency," and will do anything to get the needed money. It is unusual for someone to do it unknowingly. Even those who know that a plant left leafless can bud, also know that it takes longer and that the plant will probably not flourish.

This awareness has contributed to some extent to the preservation of *Chamaedorea* populations. It should be noted that, in most regions where leaves are cut, the seed is not harvested for sale, so palm populations are able to regenerate. Furthermore, as seen in the case of *C. tepejilote*, leaf cutting has practically no effect on the plants' reproductive capacity nor on seed germination. In fact, plants pruned regularly tend to produce from two to three times more offspring, given the necessary reproductive interval.

Despite all these factors, the ever-present high demand for palm and the fall in prices for agricultural produce have led to increased pressure on this resource in many producing regions. Thus, "emergencies," and increased and more regular cutting, are pushing the palm use to its limit. There is a clear reduction in populations near human settlements, constituting a loss. At the same time, the distance to be traveled to harvest palm has become excessive and involves a series of hazards—snake bites, falls on the rough terrain, traveling alone to cut more than if accompanied, etc. This makes many people, especially older people, less interested in cutting, which affects their family incomes.

Thus in recent years *Chamaedorea* cultivation has become prevalent in almost all production regions, even though the possibility was first promoted nearly two decades ago (Saldivia and Cherbonnier 1982). The most marketable species for foliage are *C. elegans*, *C. tepejilote, C. quezalteca, C. oblongata* and *C. concolor*, which are the most attractive to producers, with some variation by region. Due to the high demand, *C. elegans* ranks first.

Seed

Until a few years ago, marketing seeds for various *Chamaedorea* species was common. In 1988, Mexico exported 100,000 kilograms of *C. elegans* seed, about 18,000 kilograms of *C. seifrizii*, more than 11,000 kilograms of *C. cataractarum* and a little more than 10,000 kilograms of other species (*C. elatior, C. ernesti-augustii, C. metallica, C. radicalis, C. tepejilote* and several others). At the same time, US horticulturists were planting to obtain seeds of the more commercial species, and the lower price for seed from Mexico gave them a good profit margin. They also financed research and equipment to enable them to stop buying seeds when pressure from conservationists, in response to the destruction of wild populations, compelled them to do so (Hodel 1992).

At present, environmental regulations do not allow this type of trade, principally because the majority of species are endangered to some extent and thus fall under NOM 059. Nonetheless, there appears to be enormous demand for *C. elegans* seeds, and all seeds sold in the United States seem still to come from Mexico. In contrast to other species—e.g., *C. seifrizii*—which are widely produced in Florida and Hawaii, *C. elegans* does not produce seeds in plantations there, and artificial pollination is difficult and costly (Hodel 1992). Almost all *C. elegans* seed is produced in Huasteca region. As mentioned earlier, the seed trade began in the Huasteca about

50 years ago. The forest loss was already dramatic in this region, and palm populations were not abundant. Cultivation of oranges and clearing for livestock delivered the final blow. Mr. Guerra began the cultivation of *C. elegans* in the 1960s to satisfy the seed demand of buyers in Florida, with no decrease in purchases from the communities. Some *ejidos* in the region soon followed modestly—a few producers in each, with no more than half a hectare. Today there are very few wild populations, as the forest has completely disappeared. Only a few peaks have secondary vegetation at a certain altitude, although some researchers say there is still mid-perennial forest in southern San Luis Potosí (Rivera and Domínguez 1994). There is no academic consensus on this assertion.

In Veracruz, a certain amount of seed seems to have been harvested from wild populations. For the same reasons as the destruction in the Huasteca region, this appears to be true in only a few places and in minimal quantities. There is no information from other zones where the seed is commercialized. In recent years, low-level trade circuits have been created in response to demand by those who acquire seed to establish plantations.

C. elegans seeds are gathered from September to December, during the season in which they mature, although there are regions, such as Lacandon, where this process appears to begin earlier (Saldivia and Cherbonnier 1982). In general, the plants begin to produce seeds at four years of age, but may have only one or two infructescences, perhaps without many fruits. Over time and given the necessary conditions, they produce more—up to six—all of which are full. At eight years, they seem to reach their peak. Harvesting a plant's seed is not done in one cutting, since the fruits mature slowly, so the same site must be visited several times. Each mature plant produces from 100 to 150 grams of seed. The collectors gather seed until they have several kilograms to sell. Each kilogram amounts to about 5,000 seeds.

Not much is known about other species. As mentioned above, there is currently no seed trade for them, except to a few local horticulturists. This is changing, through regulation of their use.

Cultivation

Although *Chamaedorea* cultivation in Mexico goes back 50 years, awareness and practice are fairly recent, going back no more than 10 years. There have been many initiatives but, because of lack of awareness, the same errors are often repeated. It is worth noting that producers, institutions, some nongovernmental organizations and research centers alike, have undertaken this task with similar results, using very diverse methods.

Cultivation should not be seen as simply technical. It has a social dimension, including the application of traditional knowledge, forms of organization, types of landholding, relationships with governmental institutions, and strong repercussions in the regional and community economies. There is extensive literature on the technical aspect of cultivating *C. elegans*, and it refers to a variety of situations and environmental conditions (see bibliography). There is still much to learn about the biology of the other species, which would be useful in the handling, preservation and possible search for new *Chamaedorea* species for ornamental purposes and for foliage. As our intent is not to create a manual or guide to cultivation, we will cover the most relevant aspects of the process that may provide elements for support and awareness in Mexico.

Raw Material

This is perhaps the most difficult and costly part of the entire process. It is easier in regions where *Chamaedorea* populations still abound, although the problem is that the grower must be willing to sacrifice practically an entire "generation." In general, growers prefer to transplant seedlings from the forest directly into the defined cultivation sites when seed is being gathered for vivariums, at the plot or where the seed will be sown. In places where neither seeds nor seedlings can be obtained, the cost of acquisition must be considered, implying a somewhat larger support for producers wishing to cultivate the palm.

In cases where seed is purchased, buyer pressure has led to the introduction of *C. elegans* seed from San Luis Potosí in various production regions throughout the country. This creates a problem since most of these areas have great biological diversity and some border on protected zones, as in the case of Montes Azules and El Triunfo. This may affect the native varieties of *C. elegans*. If plantings are extended to other *Chamaedorea* species, the preservation of this diversity should be a priority in the various production regions, since this represents potential wealth for them.

Germination

Germination is the aspect most studied by research institutions, educational institutions and producers. There are numerous methods, many of which reduce germination time. A chemical may be used, or the seeds may simply be washed and kept in a bag for a time. Many growers prefer to wait for the natural germination process to occur. Using germination beds or making small furrows in the forest plot where the seeds are planted give similar results. In fact, it depends more on the producers' organization.

Germination tends to be the key to cultivation. If producers are convinced it is possible, the rest comes easily and there are several ways to control germination (Velázquez and Ramírez 1995; Carrillo-Trueba 2001). The technical part is so easy and there is such a mass of documentation (see bibliography) that, at this stage of the process, a promoter or facilitator is needed more than a technician, to involve the entire community even if not everyone plants at first. If a given community is the first to plant in a region, it may have a major influence at the regional level.

Planting

The choice of planting sites is a decision made with the community's participation, allowing for the recovery of community-owned property on which there may still be primary vegetation because of the impossibility of planting corn—e.g., on hilltops and hillsides—and which may be allocated to a grower without troubling the rest of the ejido, or as little as possible. Because of light, temperature and substrate conditions, these are actually the most appropriate places for cultivating palm. This method of allocating land for palm cultivation is also an indirect way to conserve the forest areas that still stand in Mexico. It is preferable for small areas to be planted, separated by forest extensions rather than affecting the diversity of the understory. If an *ejido* is fully parceled, each person may decide what portion of their land to plant with palm.

If there is little or no primary vegetation, palm could be planted on land that has lain fallow for a certain time. With adequate land management planning, this can even allow the palm stands to grow to maturity. However, this measure should be accompanied by a program of intensifying

corn production elsewhere, since using fallow land for palm will take land away from corn. One of the advantages of using this kind of vegetation is the ability to manage shade by cutting some branches or trees to let in light and thus increasing leaf or seed production. The same result may be obtained by planting in shade coffee plantations, which will also conserve the coffee trees, even during low-price seasons when producers are tempted to cut them down.

Certain fruit trees, such as mango, and products like allspice may provide good shade for palm. Some may cause spotting and leaf loss, as happens with orange trees. Shade management is something that palm producers in various regions have experimented with in recent years, developing and fine-tuning techniques appropriate for the conditions prevailing in each region. These initiatives will bear fruit in the near future.

Care

As with other cultivation, workdays must be spent on the palm plantation every now and then to keep it in proper condition. Tasks include weeding, making sure that the shade is not spotting the leaves, pest control, and cutting diseased leaves to prevent problems from spreading.

Pests

This is a somewhat controversial issue, since pests are scarce where *Chamaedorea* is cultivated in its natural habitat. Most that are reported (Hodel 1992) appear to be in plantations in Florida and California. However, producers complain about lichens and fungi causing spots on leaves, earworms attacking leaves, crickets eating fruit pulps, rabbits eating seedlings, and red spiders and other herbivores harming the palm. These do not seem to be as extensive as the pests characteristic of monoculture, even in large plantations such as La Flor de Catemaco. In any case, it is an aspect that requires observation, since the temptation to use pesticides is present. Perhaps better handling will reduce these pests to acceptable levels, as has occurred with corn in some of these regions, where certain mountain pests cause light damage without being regarded as a major problem.

Renewal

It is not known precisely how long a cultivated plant lives. It is said that *C. elegans* begins to produce fewer leaves and seeds after 15 years and, if it has not died after 20 years, it must be replaced. Of course, as the cultivation of *Chamaedorea* species develops, this type of knowledge will increase. Meanwhile, the only assertion that can be made is that renewal must be accounted for, so seedlings within a parcel are planted at 10-year intervals to ensure enough plants to maintain production as established plants reach 15 years of age.

Commercialization

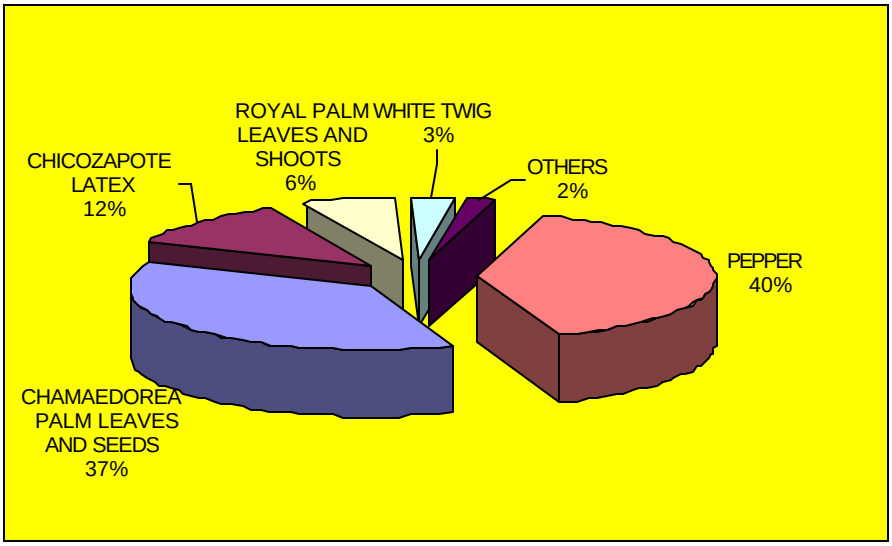
Mexico's rain forest zones are characterized by a broad environmental, biological, social and cultural diversity, enabling the use of a wide variety of natural resources. These zones are characterized by agricultural and forestry activities carried on at the peasant farmer level, making a diversified use of ecosystems. They organize their activities by combining farming with gathering. Part of the products obtained are allocated for their own consumption, while others are marketed.

It should be understood that the harvest of non-timber products has traditionally complemented family subsistence farming in these regions. The principal farming activities include production of basic crops for consumption by the farmers and their families (corn and beans), and of some products for sale, such as coffee and citrus fruits (Paré 1997).

As stated above, these activities are complemented by the gathering of non-timber products such as allspice, *Chamaedorea* palm leaves and seeds, chicozapote latex, royal palm leaves and shoots, and white twig (see Figure A1).

Figure A1. Principal non-timber products in Mexico's tropical ecosystem

(Percent of economic share within the ecosystem)



Source: SEMARNAP Undersecretariat of Natural Resources, Semarnap, 1997.

The price drop suffered by agricultural products such as coffee, the dismantling of the regulatory structure, and the withdrawal of coffee promotion programs in Mexico, have resulted in an economic crisis in Mexico's coffee-producing regions. As a result, farmers need to find more profitable options by diversifying their products or increasing complementary activities (Anta 1992).

In recent years, the gathering and, to a lesser extent, production of *Chamaedorea* palm has been a major complementary option for coffee farmers. It has become part of existing farming systems. In some regions, it has led to a considerable increase in the gathering of this non-timber forestry resource, putting some species at risk of extinction, with no guarantees for their conservation or sustainable use. Some examples of this association with other plants or systems are brush/palm, coffee/palm, orange/palm and forest/palm.

For years there has been high demand for *Chamaedorea* palm— foliage, live plants and seeds— on the domestic and international markets. Green foliage provides the most revenue and a number of commercial agents participate in its marketing, from harvest and production to final delivery.

In Mexico, *Chamaedorea* palm gathering and production activities are principally carried on in 84 municipalities within the following eight states: Campeche, Chiapas, Hidalgo, Oaxaca, San Luis Potosí, Tabasco, Tamaulipas and Veracruz.

An analysis of the municipalities and of their economic and demographic indicators from census data reveal them to be similar in their high levels of marginalization, largely communal landholdings, high percentage of indigenous population, mostly rural settings, high percentage of population carrying on primary economic activities, and low compensation for agricultural activities (see Table A1).

Table A1. Summary of socioeconomic information from *Chamaedorea* palm producing/gathering municipalities in Mexico.

State	State population*	Population of palm-producing municipalities **	Leading degree of marginalization***	EAP* (economically active population)	EAP in primary sector *	Illiterate population*	Population speaking indigenous language *	No. of rural towns ****	No. of urban towns ****
Campeche	535,185	44,496	Medium	11,821	6,118	4,783	2,496	519	2
Chiapas	3,210,496	749,637	High	199,340	134,076	115,867	94,120	7769	37
Hidalgo	1,888,366	253,717	High	63,658	44,961	57,464	138,801	755	10
Oaxaca	3,019,560	239,467	High	65,627	35,533	31,851	86,853	629	11
SLP	2,003,187	180,848	High	47,756	32,346	28,743	86,808	737	5
Tabasco	1,501,744	152,705	Low	33,090	16,317	12,065	8,669	352	7
Tamaulipas	2,249,.581	419,825	Medium	126,507	32,000	21,195	580	1715	8
Veracruz	6,228,239	1,035,704	High	289,326	148,175	142,444	123,625	3642	48

* 11th General Population and Housing Census 1990, National Institute of Statistics, Geography and Information (*Instituto Nacional de Estadística, Geografía e Informática*—INEGI)

** 7th Agricultural and Stockbreeding Census 1991, INEGI

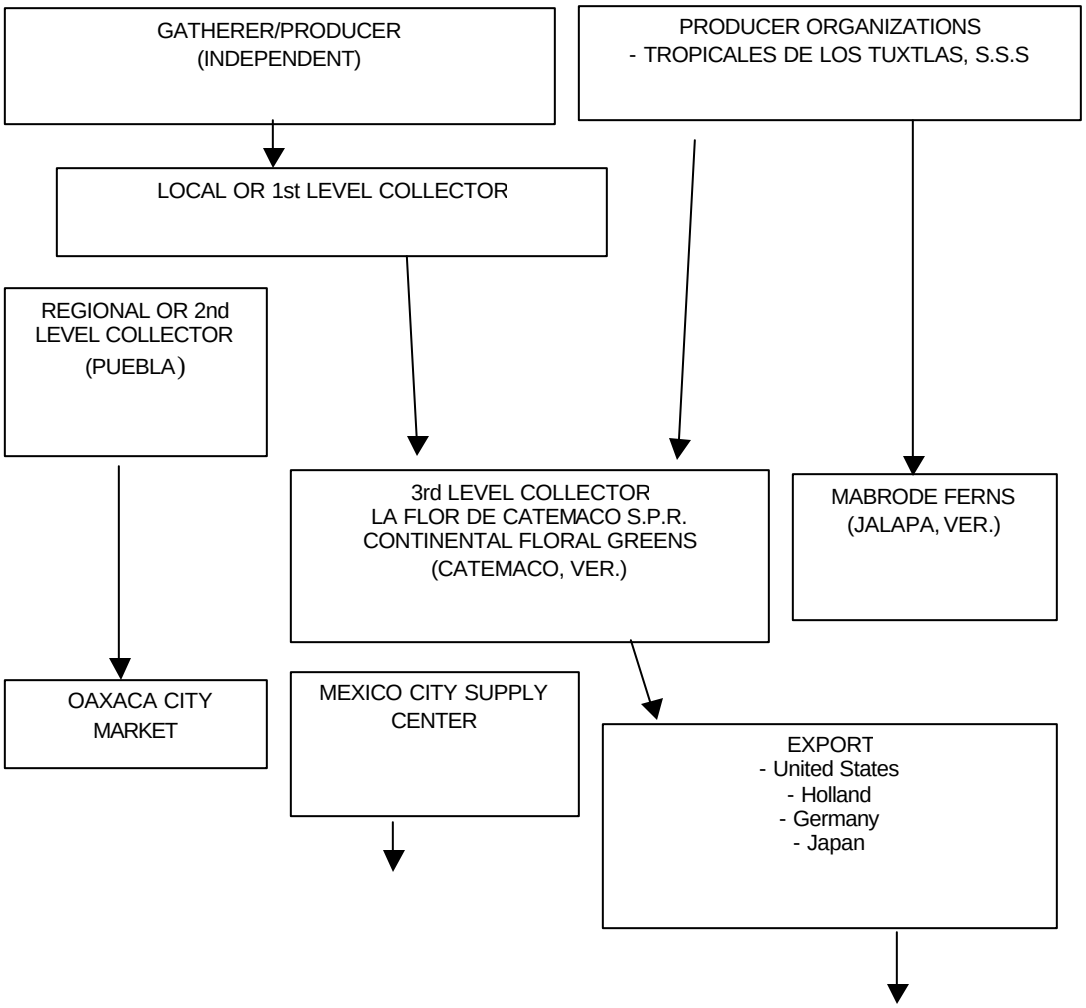
*** National Population Council (*Consejo Nacional de Población*), 1995

**** National Population and Housing Count 1995, INEGI

The marked poverty and, in some cases, malnutrition, health problems and limited access to education are characteristic of the studied regions. The low prices for agricultural produce or difficulties in marketing them are factors contributing to the production regions' socioeconomic situation.

In general, the commercial process for *Chamaedorea* palm fronds is as follows: the producer or gatherer delivers the palm leaf to a local buyer or collector, who may also be a producer. He gathers together the fronds from his community and from some surrounding communities, and delivers them to a regional buyer. The buyer transports the produce to a collection center, where leaves are selected, packed and distributed, according to quality. Lower-qualify foliage is allocated to the domestic market, while better quality fronds are exported. The same criteria are applied to the different species. For example, *C. oblongata* is allocated to the domestic market and *C. elegans* goes mostly to the export market, including its main destinations in the United States and Canada in North America, Germany and the Netherlands in Europe, and, more recently, to Japan (Figure A2).

Figure A2. Channel of distribution, Veracruz region



Annex B: Mexico's Regional Markets

Chiapas

In the state of Chiapas, palm is gathered and produced in the municipalities of Acacoyagua, Albino Corzo, Arriaga, Cacahoatán, Catazajá, Cintalapa, La Concordia, Huehuetan, Jiquipilas, Mapastepec, Ocosingo, Ocozocoautla de Espinosa, Pijijiapan, Tonalá, Tuxtla Chico, Villa Corzo and Villaflores. These municipalities, representing 39.6 percent of the state's area, have similar land characteristics: most is privately held, little is communal. According to the National Population Council (*Consejo Nacional de Población*—Conapo), the Lacandon, Chole and Tzetzal indigenous populations all share a high level of marginalization (Conapo 1985).

Southern Chiapas: The southern region of the state has important palm harvests within the El Ocote, La Sepultura and El Triunfo reserves, especially for *C. quetzalteca*. Some harvests are illegal. For example, in the San Gabriel community, on the Ocozocuautla *ejido* at the edge of the El Ocote reserve, the *C. elegans* has been illegally extracted for years. This stopped from 1992 to 1994 due to agrarian disputes over the allocation of communal lands. Today, the extraction of natural populations is done by residents and people outside the *ejido*.

Producer organizations: In 1994, *Chamaedorea* palm producers in the region established palm plantations on nine *ejidos* in the municipalities of Cintalapa, Villacorzo, Tonalá Jiquipilas, Pijijiapan and Acacoyagua, planting approximately 280 hectares of *C. quetzalteca*. These producers also formed Social Solidarity Companies (*Sociedades de Solidaridad Social*—S.S.S.) and commercial associations with the company Palmeiras S.P.R. de R.L., which for the past year have sponsored a pilot project for regenerating *Chamaedorea* palm with seed in the town of San Fernando, Chiapas. This project was carried out with the help of the company Continental Floral Greens, which provided technical advice in establishing vivariums and plantations.

Northern Chiapas: This region has recently established palm cultivation in the communities of Lacanjá, Palestina and Frontera Corozal, with two-year-old plantations and vivariums. The Chole producers in Frontera Corozal use wild seeds for their seed plots and vivariums, which each producer has on his plot.

Eighty percent of the communal and productive lands of the Lacanjá community are inside the Montes Azules Biosphere Reserve. There is no handling program or specific regulation for using the palm. However, the community has had unsuccessful plantation experiences, as it depended on outside financing and assistance with no commitment from the community. Only 35 persons have permission from the authorities to carry out palm production, although there is a greater number of cutters.

Producer organizations: There are major producer organizations in the region, including Follajes Lacandones. The organizational structure, objectives and background of this federation have allowed for the development of microenterprises as an interesting model for community organizations for the use and conservation of natural resources.

Follajes Lacandones is a young cooperative formed by *Chamaedorea* palm cutters who, for years, were exploited by collectors and officials. In 1995, after obtaining a permit from Semarnap to use and commercialize palm for a five-year period, they found that the cutting area had been reduced by overexploitation. Thus, in 1997, with the participation of 72 partners with their own seed plots and backyard vivariums, a commercial plantation program was begun with a

goal of establishing 800 hectares in 10 years. As a result of the consolidation of their organizational process, they managed to cultivate 125 hectares in 2000.

This federation has organizations for land transport, tourism, furniture making, stores, stockbreeding and foliage marketing. According to its bylaws, it works as follows: members participate with a half-hectare for planting palm on a designated parcel. Each month, the partners deliver palm leaves, paid one week after the leaves are cut and selected. The payment is made in cash, set according to the seasonal price. Follajes Lacandones commits to paying a royalty to the Assembly in order to ensure that there are no internal rivalries or conflicts regarding use of the land. Profits from the sale of palm are divided into equal portions, establishing two types of payments to members, one on sales and one paid into a social interest fund to support members' health services, education, food, infrastructure, property or loans. With the diversification of activities, a total of 604 beneficiaries derive production benefits from the organization.

Pricing

The price paid to cutters in the region is P$9.00 per gross. It is estimated that an average five-member family cuts around 60 gross per day. These families may cut between 300 and 400 gross per week, doing so all year long, principally after the rainy season and depending on the intensity of their other agricultural activities.

In the Nueva Palestina community, there is a roster of 115 cutters recognized by the Lacandon authorities, although there are more than 200 potential cutters belonging to the community who have not joined the roster for fear of being penalized or controlled by Semarnat.

Given that its communal and forest areas are extremely degraded, there is no potential for production or reforestation projects. This leads to the illegal sale and trade of palm to "*coyotes*" and other local collectors, resulting in cutting within the Montes Azules Biosphere Reserve and nearby forest areas.

Institutional Support

Follajes Lacandones obtained financing from the National Social Company Support Fund (*Fondo Nacional de Apoyo para las Empresas Sociales*—Fonaes) for 1998–2000, the National Reforestation Program (*Programa Nacional de Reforestación*—Pronare) for 1999–2000, and the Shared Risk Trust (*Fideicomiso de Riesgo Compartido*—Firco) in 2000, for a total of P$2,498,000 over three years for the establishment, planting and maketing of *Chamaedorea* palm.

With Fonaes' support, last May Follajes Lacandones called for a national meeting of owners, producers, and farm and business organizations to analyze and promote the creation of a national distributor for *Chamaedorea* palm. This proposal is being analyzed and discussed in each group's headquarters, in order to define guidelines and strategies for implementation.

The channel of distribution in the south of Chiapas is similar to channel for independent producers/collectors in Veracruz above, except that the local organization of producers are SOCAMA and PALMEIRAS, S.P.R.DE R.L, the second-level buyer is Sr. Araiza, and there is only one third-level buyer (CATEMACO, Ver). The channel of distribution in the north of Chiapas is similar to the one in the south, except that the local organization of producers are Follajes Lacandones (frontera Corozal, Chiapas) and the second-level buyer is Sr. Olvera. There is only one third-level buyer (CATEMACO, Ver).

The Huasteca Region (Hidalgo and San Luis Potosí)

C. elegans palm is gathered and produced in the municipalities of Aquismon, Tamazunchale, Xilitla and Matlapa in the state of San Luis Potosí, and in the municipalities of Atlapexco, Calnali, Huautla, Huazalingo, Huejutla de Reyes, Lolotla, Molango de Escamilla, Tianguistengo, Tlanchinol, Xochiatipan, Xochicoatlan and Yahualica in the state of Hidalgo. According to CONAPO data (1995), all of these municipalities are highly marginalized.

C. elegans is marketed in the Huasteca regions of both San Luis Potosí and Hidalgo. In San Luis Potosí, palm is cultivated; in Hidalgo, it is gathered. Most of the palm used is cultivated. It appears that only *C. elegans* is cultivated, under pressure from intermediaries who wish to satisfy the demand of US buyers, and because of the scarcity of palm growing in natural conditions in the region.

At present, the Huasteca region leads the nation in the production of seed from this species. According to decade-old data, the United States bought between 80 and 100 tons of *C. elegans* seed per year from this region. In 2000, according to Semarnat data, 284 tons of *C. elegans* seed were exported to Miami, Florida.

Palm cultivation in the region began more than 20 years ago. Members of virtually all palm-producing communities are indigenous Nahuas, some with broad experience and others just beginning to plant. In the mountain zones, palm is grown with coffee trees, and very little in the secondary forest. In the valleys, palm is grown with orange trees, to a lesser extent with coffee trees, and minimally in brush and forest remnants. There are towns where most inhabitants cultivate palm, as well as towns where few people do. They have relatively small holdings, with an average of a half-hectare each.

Producer organizations: The National Indigenous Institute (*Instituto Nacional Indigenista*—INI) has promoted the organization of palm producers to improve conditions for their market participation. The first step took place in the mountains around the Huasteca region of Hidalgo in 1997, when the INI promoted the formation of the Hidalgo Sierra Palm Producers' Company, composed of 13 communities from the municipalities of Tepehuacan, Tlanchinol and Molango. Although this group was not legally registered, it obtained INI funding and support to collect palm leaves and to look for an outside buyer. Through a Mexico City distributor, it was able to establish a purchase agreement with a Dutch buyer for 300 packages per week. The package price paid to the cooperative was P$10.50.

The organization opened a warehouse to receive palm fronds from the Tlanchinol community, and had two vehicles for picking up palm from the communities and bringing it to the warehouse. One vehicle was INI property, the other was privately owned. The cooperative also hired a technician to organize and support the collection and commercialization work.

When palm leaf collection began, the price was P$7 per gross, gradually increasing to P$12. The regional collector with a warehouse in Ixtlahuaco reacted by increasing his price over the price paid by the cooperative. With late payments from the buyer and pressure from the regional collector, the organization became undercapitalized and could support only four months of work.

With INI support, 21 communities in the Huejutla area are currently organizing to undertake projects involving coffee and *Chamaedorea* palm. The organization will encompass 900 small producers, with the aim of improving the members' economic situation by establishing better conditions for the production and sale of their produce.

Pricing: In this region, prices for palm leaf vary over the year. From March through May, prices reach their highest point. The lowest prices are in December. In the case of seed, the purchase

price from producers reaches its high in late September and early October, drops and then recovers at the end of the collection season. Currently, the average price for one kilogram of seed is around P$50.

The chain of commerce in this region is well defined. Generally, there is an intermediary, whose profit per unit is small, buying from producers directly in the communities. The intermediary takes the produce to another regional intermediary collector, who in turn takes the produce to the main collection centers in the region.

In the Huasteca region of Hidalgo, there are three major regional collection centers for palm fronds and seed. The biggest is located in the El Pintor community, outside the city of Huejutla. It has large refrigerated vaults, a leaf selection area and a seed disinfection area. Two more centers are located in Huejutla and Tehuetlán. There is a smaller center with less capacity in the Ixtlahuaco community in the municipality of Lolotla, where palm is gathered from the high range (Tepehuacán, Tlanchinol, Lolotla).

The larger collection centers have refrigeration chambers to keep palm in good conditions while the load is put together. These centers also have areas for disinfecting seeds.

Most palm producers in the Huasteca region are small producers with a few plants, or up to three or four hectares for growing. The producers with more growing time have better established and better tended plantations, while the producers with less experience usually have only small areas of their parcels planted with palm.

Institutional Support: The region has had institutional support to promote or improve *Chamaedorea* palm cultivation. In 2000, the Hidalgo Delegation of the Secretariat of Agriculture, Stockbreeding and Rural Development (*Secretaría de Agricultura Ganadería Desarrollo Rural*—Sagar) began a program providing seed to producers to increase the area cultivated with *Chamaedorea*. In the Tlamamala community in the municipality of Huazalingo, 40 producers joined the program along with the 10 established palm growers.

The INI has made important efforts to improve producers' trade conditions, using resources from the Regional Funds that are donated by the federal government but administered by producers, and also from the Productive Agroecology Fund.

In San Luis Potosí, the Xochiayo community in the municipality of Tamazunchale received a support of P$40,000 from the INI Productive Agroecology Program. It plans to use the funds to increase the planting density of its palmillo plantations under coffee trees. The INI is planning to develop a palm leaf marketing project in this community. Other communities in the states' Huasteca region have received funding for frond collection from the INI Regional Fund.

The channel of distribution in Hidalgo and San luis Potosí is segmented into what goes to the Molina family, which is exported directly to Germany, and the other segment that is similar to the independent channel in Veracruz above, except that there are five second-level buyers (Huejutla, Comunidad "El Pintor, Tehuetlan, and Lolotla in Hidalgo and Tamazunchales in San Luis Potosí), and only one third-level buyer (CATEMACO, Ver).

Oaxaca

In the state of Oaxaca, the gathering and production of palm is carried out in the municipalities of Ayotzintepec, Chahuites, San Felipe Usila, San José Chiltepec, San Juan Bautista Tuxtepec, San Juan Lalana, San Lucas Ojitlan, San Miguel Chimalapa, Santa Maria Chimalapa, Santa Maria Jacatepec, Santiago Choapam, Santiago Jocotepec, Santo Domingo Zanatepec and San Juan Bautista Valle Nacional.

These municipalities represent 11.33 percent of the state's area and share general *ejido* characteristics such as high and very high levels of marginalization (Conapo 1995). Identified populations are Chinantec, Mazatec, Zapotec and Mixes indigenous groups.

The principal regions using this resource are the Mazateca region and Chinantla. The species most commercialized are *C. elegans*, *C. tepejilote* and *C. oblongata.* In the Chinantla region, according to estimates, about 2,000 gross of *C. elegans*, 1,500 gross of ancha and 300 gross of chapana are sold each week. While there used to be three buyers, today there is only one. The Valle Nacional, Ayotzintepec, Río Mazo and Usila communities each harvest an average of 500 gross per week.

Producer organizations: Some producers in the region are trying to eliminate the use of local and regional intermediaries; one collects and sells to the public directly in the Oaxaca City market.

In this region, the communities negotiate the sale collectively and not individually. Likewise, *ejidos* establish cutting plans and negotiations for the sale of palm on the basis of communal assemblies.

Pricing: The average price per gross is P$12. Of this, 50 centavos are allocated to a common community fund for eventualities or accidents arising from palm collection.

Producers and collectors are organized in ejidos in Oaxaca. The channel of distribution in Oaxaca is segmented: some goes directly into the city of Oaxaca and the rest goes to second- and third-level buyers as in the independent channel in Veracruz above.

Tamaulipas

The production and gathering of *Chamaedorea* in the state of Tamaulipas is concentrated in eight municipalities: Gómez Farias, Güemez, Hidalgo, Jaumave, Llera, El Mante, Ocampo and Victoria, which occupy 13.6 percent of the state's total area. The land is mostly privately owned, and these municipalities are generally considered to have a medium degree of marginalization.

Mostly *C. radicalis* is gathered in Tamaulipas. This activity has been carried out since the 1940s, especially in the El Cielo Biosphere Reserve. The gathering is a family activity and represents the main source of income for many homes in the region. Ten communities in the El Cielo Reserve sell their product to a single collector, and some negotiate the payment of a royalty.

The channel of distribution in Tamaulipas is similar to channel for independent producers/collectors in Veracruz above, except that the second-level buyer is La Huasteca in San Luis Potosí and El Hidalgo).

Veracruz

It is important to note that Veracruz is the state with the most municipalities involved in the gathering and/or production of *Chamaedorea* palm in Mexico, including the following 28: Alto Lucero, Amatlán de Los Reyes, Catemaco, Córdoba, Coyutla, Cuichapa, Las Choapas, Emiliano Zapata, Hueyapan de Ocampo, Juchique de Ferrer, Mecatlán, Mecayapan, Misantla, Omealca, Pajapan, San Andrés Tuxtla, Santiago Tuxtla, Soteapan, Teocelo, Tepatlaxco, Texcatepec, Tezonapa, Tlachichilco, Tlaltetela, Totutla, Tuxpan, Zongolica and Zontecomatlán.

More than half the land area of these municipalities is in *ejidos* and they have a high or very high level of marginalization. The mestizo population, and Nahua and Popoluca indigenous groups predominate.

Of approximately 15 species found in the state, nine are developed. Veracruz is the main frond-producing state. Most of the harvest is *C. elegans*, which is produced under natural canopy or coffee.

Producer organizations: Important regional initiatives in the use and cultivation of palm have be identified. In communities such as San Fernando Soteapan, vivariums have been established for palm reproduction. The palm seedlings are sold as an additional source of income.

In the production zones in the state of Veracruz, there have been several attempts to consolidate palm producer organizations such as Tropicales de los Tuxtlas S.S.S., Aguanacida S.S.S., San Fernando S.S.S., Grupo Nacional de Reforestación S.S.S. and Tatahuicapan de Juárez. Of these, the most successful has been Tropicales de los Tuxtlas, S.S.S with 150 affiliates, seven communities and two more becoming affiliates, as shown in Table B1.

Table B1. Municipalities under the influence of Tropicales de los Tuxtlas, S.S.S.

Community	Municipality
Miguel Hidalgo	Catemaco
Adolfo López Mateos	Catemaco
Perla San Martín	Catemaco
La Esperanza	Huayapan de Ocampo
Sta. Rosa Loma Larga	Huayapan de Ocampo
Cartagena	Catemaco
Amayada	Catemaco
Nvo. México	Mecayapan
San Fernando	Soteapan

Source: Félix Flores Zamora, president of Tropicales de los Tuxtlas, personal communication.

Of the foliage volume handled by the social solidarity company (from 75 to 150 gross per week), 90 percent is sold to Continental Floral Greens at P$14.50 per gross, while the remaining 10 percent is sold to Mabrode Ferns in Jalapa, Veracruz, atP$16.00 per gross.

Pricing: Table B2 provides a summary of prices paid per gross to the producer, according to the species in the main region of Chamaedorea palm use in the state of Veracruz.

Table B2. Summary of producer prices paid on three *ejidos* in the Los Tuxtlas, Veracruz region (P$/gross).

Species	San Fernando*	Santa Martha (collector)	Santa Martha (S.S.S.)	Adolfo López Mateos (collector)	Adolfo López Mateos (S.S.S.)	Adolfo López Mateos (Mabrode Ferns)
C. elegans	$12	$12	$14.50	$11	$16	$22
Negrita *C. liebmannii*	$12	$12	$14			
Mayan *C. hooperiana*	$14	$14	$16		$13	
Ancha *C. oblongata*	$11–12					
Atoyac *C.elegans*	$12–$14					
Bejuco *C. elatior*	Not commercialized					
Fishtail *C. ernesti-augustii*	Not commercialized	$8–$12				

*Personal communications, Esteban Cruz, Secretary of the San Fernando Soteapan Palm Committee, Regulo Chachas Rivas, Félix Flores Zamora.

Institutional Support: There are various agencies in the state of Veracruz that support the production and sustainable use of *Chamaedorea* palm.

The Secretariat of Agricultural and Fisheries Development (*Secretaría de Desarrollo Agropecuario y Pesquero*—Sedap) of the Veracruz state government has published manuals to promote and support palm cultivation, in addition to supporting plantation establishment projects and increasing awareness of the overexploitation of natural populations.

The Veracruz Institute for Rural Development (*Instituto Veracruzano de Desarrollo Rural*—Inveder) promotes the transition from traditional farming to modern agricultural and the market economy, as well as further increased productivity and quality of life for the traditional farm sector. For *Chamaedorea* palm, this is done in two ways: financing for the promotion of production projects, technology and materials for palm plantations; and advice on selling produce such as *Chamaedorea* palm.

With more than 10 years' experience in palm growing and community work, its members began to implement palm production and cultivation techniques. Test runs with treated seeds generated proposals for planting and experimenting with palm, relieving the pressure on wild populations.

Inveder's working area in the state includes 18 municipalities and about 70 communities. It covers more than 840 beneficiaries and an area of approximately 700 hectares for palm production (principally *C. elegans*), not including other producers who have yet to join the effort but who practice systematic palm cultivation independently.

The promotion, planting and cultivation began in 1995 with the Forestry Bureau, although the responsibility and follow-up was assigned to Inveder. Beginning in 1998, Inveder reactivated systematic palm-growing in communities where there was community work. State and federal resources were invested and cooperative business strategies were designed, although they remain in the proposal stage.

Cost Analysis

Table B3. Cost of establishing one hectare with 16,890 Chamaedorea palm plants

ACTIVITY (day-work)	COST ($)
4 kilograms of seed at P$50 ea.	200
Seed scarification	55
Bedding or seedling preparation and setting	140
Seed planting	105
Establishment of shade	250
Seed plot handling and maintenance; pest, disease and weed control	800
Preparation of ground for transplanting	315
Transfer of seedling from seedplot to planting ground	300
Holing and transplanting (14 days' work at $35.00/day)	490
TOTAL	**2,655**

Source: Author's research with field data from Veracruz, 2001.

Table B4. Harvest production and value per 16,890-plant hectare

Plants /Ha.	No. of leaves/cut per plant	No. of cuts per year	No. of gross per cut	Total gross per year	Value of gross (P$)	TOTAL VALUE harvest per year (P$)
16,890	3	4	351.9	1,407.5	15	21,112.5

Source: Author's research with field data from Veracruz, 2001.

The case of La Flor de Catemaco, S.P.R.

The company Continental Floral Greens, through its Mexican counterpart La Flor de Catemaco, S.P.R., is the main state and regional collector exporting to the United States and Europe. One-half of the palm traded by this company is grown on its plantations, while the other 50 percent is collected directly or through intermediaries (personal communication with plantation manager Leobardo Tollen).

In April 1989, La Flor de Catemaco was formed and the first *Chamaedorea* were planted. The company has 85 *Chamaedorea* palms planted on different lots spread across the property, with 20 on the largest plot. Five species, *C. ernesti-augusti*, *C. quezalteca*, *C. tepejilote*, *C. oblongata*, *C. hooperiana* and *C. elegans* are grown, comprising more than 90 percent of the total.

There are 200 people working at La Flor de Catemaco, 10 percent of whom work exclusively on intensive palm cultivation. The rest handle the planting of other foliage such as the leatherleaf

fern. In the cutting season, each worker cuts from 600 to 700 leaves per day. The weekly wage is P$315 (Monday through Saturday) with P$8.50 per hour of overtime.

Bedding is made for seed germination. *C. elegans* seed comes from San Luis Potosí and Huejutla, Hidalgo, while the *C. quezalteca* seeds are from Zanatepec, Oaxaca and Chiapas. When seedlings reach an appropriate size, they are transplanted to the lot, principally in the month of June or, ideally, during the period with the highest rainfall. Weeding, pest and disease control, and shade management are performed until the plants reach three years of age and leaf-cutting begins. According to the plantation managers, pests and diseases are minimal. Weeds and dry leaves are left on the ground to be reincorporated into the soil, acting as organic cover.

Of the palm traded by this company, 50 percent is collected by regional collectors in different Mexican states, while the rest is produced on company plantations. Between 20 and 22 percent of the palm collected does not meet the market's quality requirements in areas such as size, color, quality (extent of withering) and maturity.

According to plantation managers, selection is the most delicate stage of the whole process. Fronds are chosen for size, color, height, health and freshness. The company has a selection room where approximately 35 people select about 100 bunches (3,000 fronds) per day. From eight to 10 percent of the palm coming from company plantations is discarded. Once selected, the palm leaves are packed into cardboard boxes, containing from 25 to 30 bunches in commercial sizes. These boxes are put in a chamber refrigerated to 5ºC, where they remain until transport. They are shipped in 40-cubic-foot refrigerated trailers with room for about 1,000 packages. An average of two trailers a week are sent to the United States. Table B5 shows the three commercial sizes for *C. elegans*.

Table B5. Commercial sizes of *C. elegans* from La Flor de Catemaco, S.P.R.

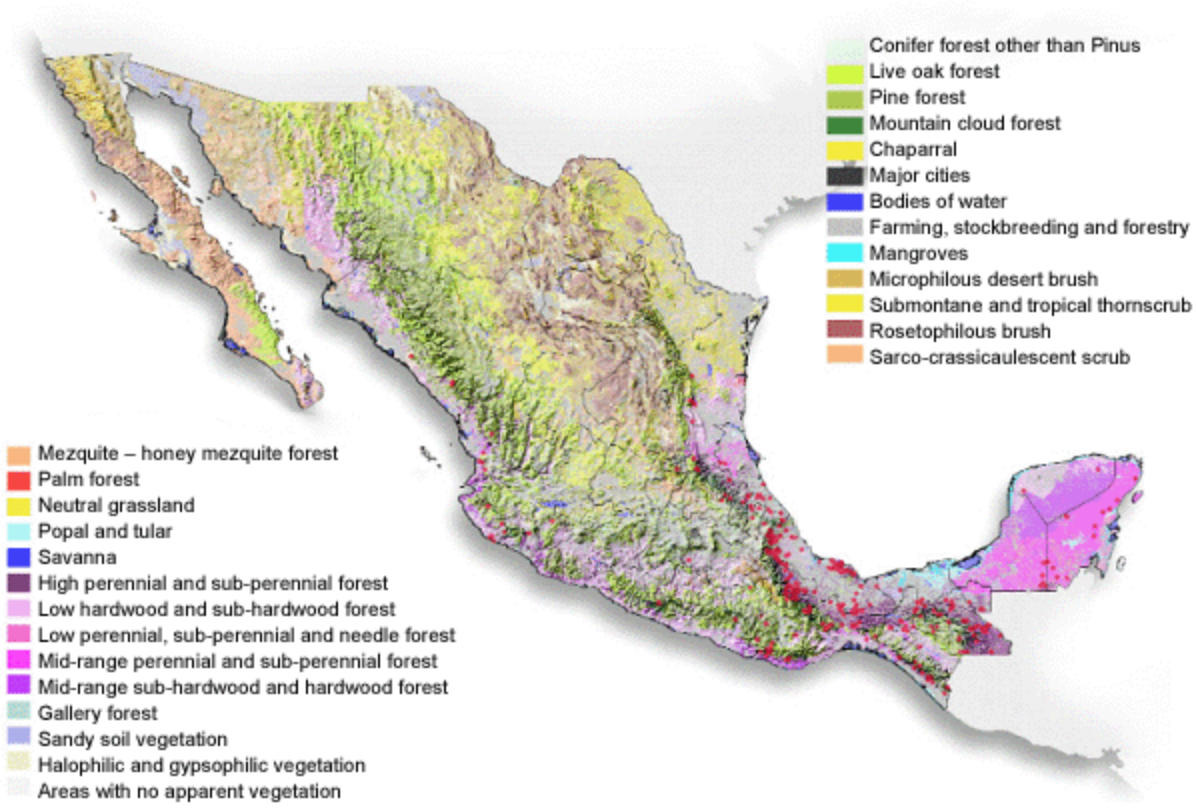
Leaf width (inches)	Brand name	Leaves per bunch	Bunches per case
14"	Chico Jumbo D´oro	20	30
15"	Mediano-Regular Jumbo	20	30
17"	Grande Jumbo Lutz	20	30

The Jade brand also is used for *C. oblongata,* and Teepee seems to be a variety of *C. elegans*.

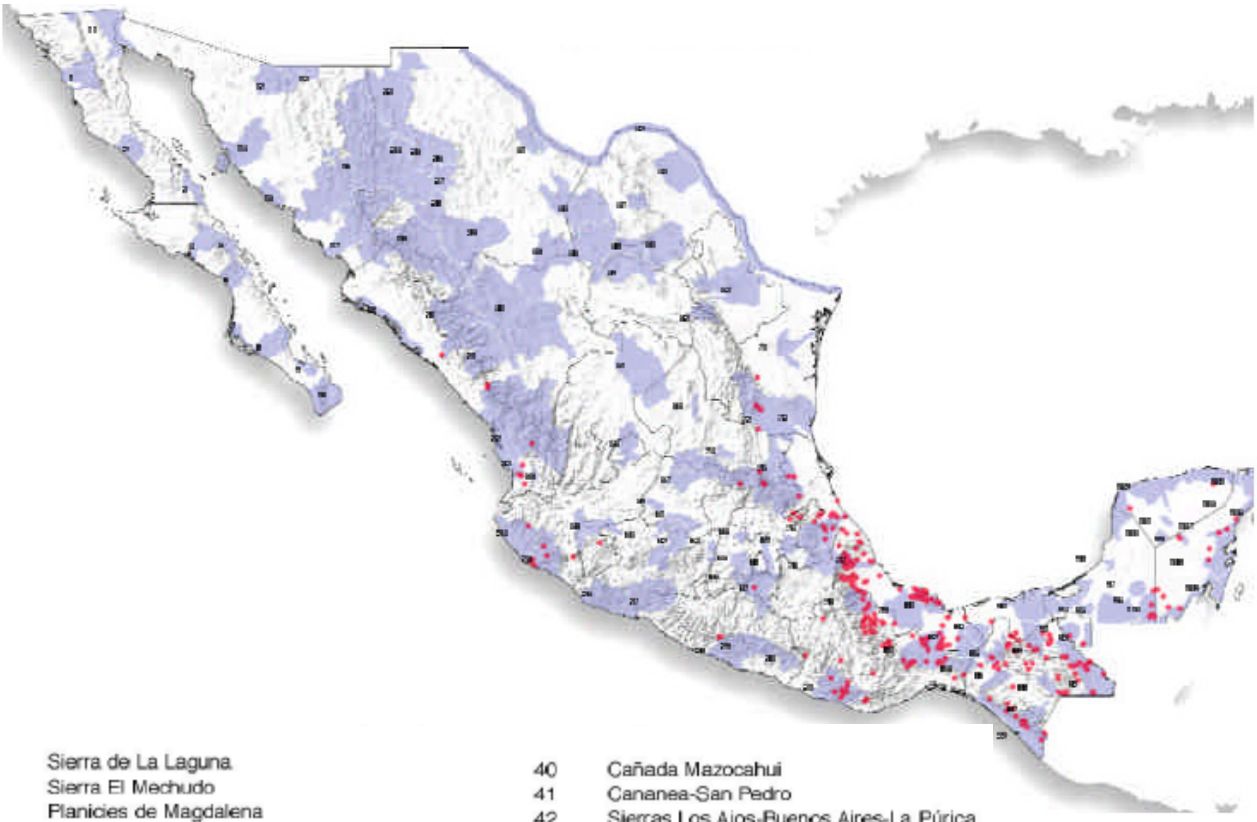
Annex C: Maps

***Map 1. Estimated historical vegetation and distribution of the genus* Chamaedorea**

Map 2. Estimated present vegetation and distribution of the genus Chamaedorea



Map 3. Regions considered as priorities for the conservation and distribution of the genus Chamaedorea



1 Sierra de La Laguna
2 Sierra El Mechudo
3 Planicies de Magdalena
4 Sierra La Giganta
5 El Vizcaíno-El Barril
6 Sierras La Libertad-La Asamblea
7 Valle de los Cirios
8 San Telmo-San Quintín
9 Punta Banda-Eréndira
10 Santa María-El Descanso
11 Sierra de San Pedro Mártir
12 Sierra de Juárez
13 Delta del río Colorado
14 Gran Desierto de Altar-El Pinacate
15 Bahía de San Jorge
16 Sierras El Álamo-El Viejo
17 Sierra Seri
18 Cajón del Diablo
19 Sierra Libre
20 Sierra El Bacatete
21 Las Bocas
22 Marismas Topolobampo-Caimanero
23 San Juan de Camarones
24 Río Humaya
25 San José
26 Guadalupe y Calvo-Mohinora
27 Barranca Sinforosa
28 Bocahuachi-Nanaruchi
29 Lago Los Mexicanos
30 Alta Tarahumara-Barrancas
31 Sierra Álamos-El Cuchujaqui
32 Cañón de Chínipas
33 Bassaseachic
34 Babícora
35 Cuenca del río Chico-Sirupa
36 Yécora-El Reparo
37 San Javier-Tepoca
38 Sierras El Maviro-Santo Niño
39 Sierra Mazatán
40 Cañada Mazocahui
41 Cananea-San Pedro
42 Sierras Los Ajos-Buenos Aires-La Púrica
43 Sahuaripa
44 Bavispe-El Tigre
45 Sierra de San Luis-Janos
46 Pastizales del norte del río Santa María
47 Sierra del Nido-Pastizal de Flores Magón
48 Médanos de Samalayuca
49 Cañón de Santa Elena
50 El Berrendo
51 Laguna Jaco
52 Mapimí
53 Cuchillas de la Zarca
54 Santiaguillo
55 Río Presidio
56 Pueblo Nuevo
57 Guacamayita
58 La Michilía
59 Cuenca del río Jesús María
60 Sierra Los Huicholes
61 Marismas Nacionales
62 Sierra Vallejo-río Ameca
63 Chamela-Cabo Corrientes
64 Manantlán-Volcán de Colima
65 Sierra de Morones
66 Sierra Fría
67 Sierra de Órganos
68 Sierra La Fragua
69 Cuatrociénegas
70 Sierra de La Madera
71 Sierras La Encantada-Santa Rosa
72 Sierra Maderas del Carmen
73 Sierra El Burro-río San Rodrigo
74 Cinco Manantiales
75 Matorral tamaulipeco del bajo río Bravo
76 Sierra Picachos
77 Sierra Bustamante
78 La Popa

(con't next page)

79 Sierra La Paila
80 Tokio
81 El Potosí-Cumbres de Monterrey
82 Cañón de Iturbide
83 Laguna Madre
84 Sierra de San Carlos
85 Puerto Purificación
86 San Antonio-Peña Nevada
87 El Huizache
88 Pastizales gipsófilos de Matehuala
89 Valle de Jaumave
90 El Cielo
91 Sierra de Tamaulipas
92 Encinares tropicales de Loma Las Pitas y Sierra Maratines
93 Rancho Nuevo
94 Cenotes de Aldama
95 Laguna de San Andrés
96 Sierra Abra-Tanchipa
97 Llanura del río Verde
98 Sierra de Álvarez
99 Sierras Santa Bárbara-Santa Rosa
100 Cerro Zamorano
101 Sierra Gorda-río Moctezuma
102 Bosques Mesófilos de la Sierra Madre Oriental
103 Laguna de Tamiahua
104 Encinares tropicales de la planicie costera Veracruzana
105 Cuetzalan
106 La Malinche
107 Sierra Nevada
108 Ajusco-Chichinautzin
109 Nevado de Toluca
110 Sierra de Chincua
111 Cerro Ancho-Lago de Cuitzeo
112 Hoya Rincón de Parangueo
113 Cerro Viejo-Sierras de Chapala
114 Tancítaro
115 Sierra de Coalcomán
116 Infiernillo
117 Sierra Madre del Sur de Guerrero
118 Cañón del Zopilote
119 Sierra Nanchititla
120 Sierras de Taxco-Huautla
121 Valle de Tehuacán-Cuicatlán
122 Pico de Orizaba-Cofre de Perote
123 Dunas costeras del centro de Veracruz
124 Humedales del Papaloapan
125 Cerros Negro-Yucaño
126 Sierras Triqui-Mixteca
127 El Tlacuache
128 Bajo río Verde-Chacahua
129 Sierra sur y costa de Oaxaca
130 Sierras del norte de Oaxaca-Mixe
131 Sierra de los Tuxtlas-Laguna del Ostión
132 Selva Zoque-La Sepultura
133 El Triunfo-La Encrucijada-Palo Blanco
134 El Mozotal
135 Tacaná-Boquerón
136 Selva espinosa Alto Grijalva-Motozintla
137 El Momón-Montebello
138 Lacandona
139 Bosques mesófilos de los Altos de Chiapas
140 Huitepec-Tzontehuitz
141 La Chacona-Cañón del Sumidero
142 El Manzanillal
143 Lagunas de Catazajá-Emiliano Zapata
144 Pantanos de Centla
145 Petenes-Ría Celestum
146 Dzilam-Ría Lagartos-Yum Balam
147 Sian Ka'an-Uaymil-Xcalak
148 Río Hondo
149 Zonas forestales de Quintana Roo
150 Sur del Punto Put
151 Silvituc-Calakmul