Xate

An Educational Package

DARWIN INITIATIVE

Introduction

What follows is a mixture of information on a group of palms, known locally as xate, and scientifically as the genus *Chamaedorea*. This information has been made available to you by a Darwin Initiative project which, amongst other things, has funded a series of research activities focusing on xate relating to its biology, its ecology, and the social and economic issues that surround its extraction from Belize.

Format

We will talk first about palms in general and consider the following questions: 1) Why are they important? 2) What is their role in forest ecology and, 3) What is their social and economic value?

Then we will discuss xate and consider its biology and ecology.

Finally, we will take a look at the economic and social issues that surround xate. Xate has long been used by people as a source of food, basket weaving material, and as an ornamental pot plant. Recently however, the economic value of xate in the international flower trade has been a factor fuelling border tensions between Belize and Guatemala. It is in part due to this conflict, that funding has been made available for research and education on this controversial group of plants.

PART ONE: Palms - an introduction

A few palm facts to impress!

The world's longest woody vines are palms (*Calamus* spp., *Demoncus* spp.*)*

The world's longest leaf belongs to a palm (*Raphia* – 65ft!)

The world's largest seed comes from a palm (*Lodoicea maldivica*)

The world's hardest seed comes from the ivory nut palm (*Pytelephas*)

The world's single best starch source is the sago palm (*Metroxylon*)

You even get narcotic palms e.g. betel nut (*Areca catechu*) which is chewed for a stimulant effect staining the teeth dark (see below!)

Palm Ecology

Palms like heat and are mainly tropical. In general they cannot survive in cold climates as they have a sensitive growing shoot which is killed by frost. You won't find them in countries like Scotland or Russia. South America has by far the most species of palm (ca. 64 genera and 857 species) when compared to Africa (16 genera and 116 species). It is thought that the low numbers of palm species in Africa are due to a drying out of the African environment during the last glaciation (ice age).

Bayleaf palm with giant leaves

Palms play a great role in the ecology of the tropical forest. They range in size from small and seemingly insignificant understory plants, to large and dominating giants. They form a high proportion of the undergrowth and give shelter for numerous birds and small animals. In a study looking at all plants with a stem diameter between 2.5 and 10 cm near Las Cuevas (in Cayo), palms (in this instance represented by give-and-take) had by far the most individuals of any plant family i.e. palms are the most abundant small tree in the Chiquibul! In another study conducted in Costa Rica, palms formed just over a quarter of all live stems!

In the axils of the old leaves other plants such as ferns, orchids, and bromeliads grow. They shade the ground and help maintain high moisture levels. Palms are a principal source of food for many birds and mammals (e.g. xate seed is eaten by motmot, tinamou, guans and curasows).

Palms only having a single growing point. If this is cut it dies. It cannot resprout like other species. It is this growing point that many people like to eat. Although delicious this is very destructive activity as to get one meal you have to kill one palm!

Some palms flower once and then die e.g. *Metroxylon* (sago palm found in SE Asia).

Palms in general are an ancient group of plants with fossil evidence dating from the Cretaceous (145 – 66 million years ago) at the time of the dinosaurs, so they have done better than many groups (dinosaurs included) at surviving through history. Palms are so successful that they are commonly found to be among the most speciose families (most different kinds of species) in the neotropics and Africa, and also the most dominant in terms of numbers (population). Within Belize, there are ca. 46 species in 25 genera exhibiting a broad variety of forms, including the vine-like spiny *Desmoncus* (basket tie tie), and the canopy tree *Sabal mauritiiformis* (bayleaf) and the dioecious (i.e. separate male and female plants) understory genus of *Chamaedorea* (xate).

Palm uses

Palms rank with grasses and legumes as one of the most useful plant groups worldwide. What can you think of? For starters there is the sago palm, the date palm, coconuts (the husk is now used in agriculture as well as the fruit being eaten), oil palm (massive areas of SE Asia are now plantations of this)……..what else?. In Central America different species of palms have traditionally been used since the Mayans, for a huge variety of purposes e.g. building walls with stems and thatching roofs. As with so many other natural resources, large scale exploitation of neotropical palms is now occurring, ranging from shampoos made from *Attalea babaru*, to the leaves, seeds and entire plants of *Chamaedorea* spp. which are used in the ornamental plant and floral industry.

Almost all parts of the palm can be used as food. The three most common food uses are of the sap, the accumulated starch in the stem, or the growing tip. The tapping of the inflorescence or the top of the palm yields sap, which can be made into a fresh drink, or fermented into an alcoholic toddy. The sap can also be boiled to yield palm sugar. The accumulated starch is harvested from the trunk of mature palms, and becomes not only a staple food but an industrial product as well. The third common use is of the growing tip hidden among the bases of the leaves. The tender tip, eaten raw or cooked, is frequently

called millionaire's salad. Harvesting the tip destroys the trunk, and thus the best species for this purpose are those with multiple trunks. The above general uses are shared by many, many species of palms.

PART TWO: Xate

Introduction

Chamaedorea is the largest genus of understory palms in the Americas with ca. 70-100 species (it is still not known exactly how many there are!). Belize has 10 or 11 of them. Some like the wetter south of the country (e.g. *C. arenbergiana*) whilst others like the drier north (e.g. *C. seifrezii*). Some like hill tops (e.g. *C. schippii*) whilst others like damp lowland areas (e.g. *C. tepejilote*, pacaya, chib).

Little is known about the ecology of xate species which makes it hard to manage this resource. It is thought that species such as fishtail may live for many decades in the wild, although in plantation environments where their leaves are harvested frequently they live shorter lives. Little is also known about how they germinate, although we do know that the seeds lie dormant in the ground for considerable times before sprouting. Horticulturalists who are keen to grow these plants in artificial conditions can break this dormancy by rubbing the hard seed coat with sandpaper and soaking the seeds for a short period of time in dilute peroxide. In natural conditions, dispersal of the seed is most likely done by birds such as motmots who are attracted to the black fleshy berries. The action of the seeds passing through their stomachs may well be important for natural germination.

Xate appears to grow slowly and studies show that in the wild they only produce on average two new leaves per year. It is important to know this kind of information if xate plants are to be managed sustainably.

The pollination biology of *Chamaedorea* is not well known. A current study in Belize has shown the palms being pollinated by thrips (small beetles). Other species have been shown to be wind pollinated. There may also be cases of insect-induced wind pollination in some species. This is an area that still requires research. There is still also much to be learnt about when and how xate evolved.

Uses of Chamaedorea

There are a number of traditional uses for *Chamaedorea* spp. in Central America. *C.elatior* is used in basket making for example, whilst the palm heart of *C.woodsoniana* is eaten, as are the immature male flowers of *C.tepejilote,* which are called pacaya, or chib, (you can find these in markets in Belize). However, it is above all the looks of *Chamaedorea* species that attract the global market. Their ornamental value is highly prized by the floriculture industry and the palms are primarily traded as pot plants, seed and foliage for flower arrangements. The variety of leaf form, rigidity and resistance to wilting make xate attractive greenery for florists. The leaf is called xate.

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Economic Importance Worldwide

As house plants the two most important commercial species are *C.seifrizii* (bamboo palm) and *C.elegans* (parlour palm), the latter being the most widely grown indoor palm in the world. Both of these species occur naturally in Belize! In terms of xate leaf, around twenty species are used by the floral industry and of these the most popular species are *C.elegans*, *C.ernesti-augustii* and *C.oblongata*. Xate is most often used in large and elaborate flower arrangements, such as those for funerals and weddings. Palm Sunday celebrations in the US also create a significant demand for *Chamaedorea* leaves. The harvesting of xate leaf is nothing new as it has been done in Central America for generations. For the last fifty years it has been exported to the USA and Europe for use in flower arrangements. The leaves can (theoretically) be cut without killing the palm and *Chamaedorea* require the shade of the forest canopy to survive. Therefore xate has been seen as a sustainable way to gain income from the forest, while providing an incentive to conserve the habitat. However, the sustainability of xate harvest has been questioned in recent years as high international demand for the leaf has led to the over-exploitation of commercial *Chamaedorea* species.

The xate industry is worth an estimated US$140 million annually. Mexico has 70-80% of the world market. Guatemala is the second largest exporter, with an industry worth in the region of US$4-6 million. Belize does not export xate leaf.

The majority of Guatemala's exports are destined for the USA. From 1990 to 1998 exports from Guatemala more than doubled reaching US$5.6 million, but dropped again to US$4.2 million by 2001 due to a decline in the resource. Guatemala supplies 25% of the European market, with the rest coming from Mexico. Mexican xate has been reported as being better quality and is in highest demand (the Mexican form *C.elegans* for example, has broader leaflets, which are more popular in Europe).

The most comprehensive report available on the market for *Chamaedorea* was published in 2002 by the Commission for Environmental Cooperation (CEC), a Canadian NGO. This report focuses on the North American market for xate, which it describes as being erratic but generally "fairly static over the years with few changes in supply and demand". The European market was found less easy to judge as data is not readily available due to *Chamaedorea* leaf and seed being categorised with other similar floral products in trade statistics. However data from Dutch flower auctions indicated a relatively stable market for the palms.

The study reported that supply was consistently met for the US market and noted that if production increases, there is a danger that the market will be saturated and prices driven down. The global trend in demand for cut flowers in general however has been increasing by around 6-9 % per year, with developing countries rapidly increasing their share of the market over the last ten years.

Although the biggest markets for xate are primarily USA, Holland and Germany, there is also demand from Japan and Russia, with fresh markets emerging in the new EU countries, such as Poland. Different species of *Chamaedorea* are preferred by different markets, Europe favouring *C.elegans* and the USA *C.oblongata*. Although *C.ernesti-augustii* (fishtail palm) is the species being taken in quantity from Belize's forests today, it is not mentioned as being in high demand in the most recent study on the US market, which gives *C.elegans* and *C.oblongata* as the two main xate species. Fishtail is however the main species exported to Europe from Guatemala .

There is a definite seasonal variation in demand for xate. For the USA and Europe, March to June is the peak period. These months include traditional flower giving days such as Mother's day, the main wedding season and Palm Sunday which in the USA makes up nearly 10 per cent (US$ 4.5 million) of total US palm sales. There is another period of high demand, from December to February, which includes Valentine's day and Christmas. Sales to Japan peak from August to October, creating year round demand for the leaf.

Economic Importance to Guatemala

Xate harvest in Guatemala provides in the region of 6-10,000 jobs, benefiting around 4,000 families. Processing xate also provides employment outside of collection regions in national

processing centres. The sustainability of the xate collection is therefore essential in maintaining rural employment in key harvesting area such as the Petén. A decline in xate could lead not only to decreased rural incomes but also put increased pressure on tropical timber resources (logging) as communities seek alternative incomes.

From the literature it is clear that the price a harvester is paid for xate varies considerably. A number of factors affect the price of a leaf including the species, the size, the seasonal demand, the country of origin and the export destination. There is no evidence to show a consistent price difference between plantation and wild xate. One of the tables in the Appendix summarises prices paid to xate harvesters from three different sources. One report gives the average price for a hundred leaves at around US$0.49. However it ranges from twenty eight cents to just over a dollar. Some figures quote three times this value, but there is a tendency to exaggerate! The most recently published paper on xate, reported that Mexican harvesters received US$1.12 per 100 *C.radicalis* leaves.

Xate and the border dispute

The depletion of wild xate in Guatemala has led to unregulated palm harvest in neighbouring Belize by Guatemalan xateros (xate collectors), who have been crossing the border illegally. These incursions into Belizean territory have exacerbated the long-standing border tensions between the two nations and highlighted the value of the xate resource. The Belizean government is keen to stop the illegal harvest and for Belize to benefit from the resource through the development of a sustainable xate industry.

The future

Xate: A Non-timber Forest Product

For centuries, timber has been extracted from forests for economic gain. The extraction of timber, however, often destroys the entire forest. For this reason, many conservationists have searched for “non-timber” forest products that can be extracted from forests in such a way, that the forest can generate income for people, without the trees having to be chopped

down. The sustainable harvest of xate from Belizean forest reserves has this potential. Other non-timber forest products that have been harvested in the past are chicle, all-spice, orchids, and wildlife such as deer and gibnut for food. However, not all of these have been harvested sustainably. When forest products are not harvested sustainably, they become depleted (run out, finish), and when parts of the forest become depleted, or extinct, the whole forest suffers.

The question here, is whether or not xate can be harvested sustainably, and if so, what is its value for Belizeans. If xate cannot be harvested sustainably, perhaps the best route is the establishment of plantations which by and large, Mexico is increasingly favouring.

Sustainability

Based on the experience Belize has had with Guatemalan xateros, the collection or harvest of xate from wild forests is not currently environmentally friendly. The reason why xateros take the legal risk of collecting xate in Belizean forests is because xate has been depleted or virtually extinguished from all nearby Guatemalan forests. As Guatemalan xateros exhaust xate supplies nearest the border, they progressively have to move further and further into Belize in search of healthy plants with healthy leaves. They leave behind the forests that can no longer be harvested from as the xate plants left behind are either dead, too weak or don't have enough leaf to make it worth their while. It is not know how long it will take for these plants to recuperate.

The basic problem is that xate grows slowly and that people are greedy! Plants produce an average of two leaves per year, and the plant needs these leaves to collect solar energy and carbon dioxide, which is its food. When xateros remove the leaves of the plant, the plant can no longer photosythesize. Without photosynthesis the plant cannot produce flowers, seeds, or new leaves and eventually dies. Xateros should only take the most beautiful leaves that can be sold to the floral industry, leaving behind older, and torn leaves. Unfortunately they are often paid by quantity and not quality so they take more leaves than they need. Most are later discarded which is a waste as the plants would have found them useful even if a florists doesn't want them! The result is plants that are still alive, but very weak. They produce less flowers, less fruit and seeds, and their capacity to fight off disease is diminished leaving them vulnerable. Sometimes the plants manage to generate new leaves and recuperate fully, but other times they do not. It is not known how long it might be before the heavily harvested xate in the forests of the Chiquibul nearest the Guatemalan border will recover.

An obvious solution, is to harvest only some of the healthy leaves from each plant and to leave behind enough young leaves so that the plant can recuperate quickly. In a wilderness setting however, it is difficult to regulate how many leaves each xatero collects from each

plant. The xatero's reasoning seems to be that if he or she leaves behind healthy leaves on a plant, it would only benefit the xatero coming behind him who will likely remove any healthy leaves left, with the result to the plant being the same. Therefore, he or she might as well collect all the leaves he can from every healthy plant encountered.

There are secondary problems with the collection of xate from the wild that make this method even more unsustainable. For example, in the Chiquibul, fishtail xate plants grow scattered throughout the forest at a rate of approximately 200 individual plants per hectare (1 hectare = 2.5 acres). This means that in the Chiquibul, the xatero must be away in the forest collecting for as much 7 to 10 days at a time in order to collect a worthwhile amount of xate for sale. It is almost inevitable that during this time he will feed himself on game meat, and hunting exerts yet another pressure on the forest. Subjective data suggests that there has already been a drastic reduction of edible wildlife in the Chiquibul and surrounding forests. Some of the animals being hunted are deer, armadillo, gibnut, turkey, peccary, but also endangered species such as Belize's national animal, the Baird's tapir. In addition to illegal hunting, there is evidence that xateros are engaging in illegal logging. It is probable that since xateros are hunting they are also engaged in the capture and sale of animal infants (baby jaguars, monkeys, etc) for sale on the international black market. Other secondary problems taking place are the looting of undeveloped archaeological sites, and the trampling of seedlings in the forest.

All of these problems make the current method of xate collection from the wild unsustainable. Even if the xateros were Belizean, it is likely that these problems would persist unless a rigorous system for regulation were put in place and enforced. Regulation is possible, but very difficult to enforce when those being regulated are scattered throughout a forest the size of the Chiquibul.

Making the Xate Industry Sustainable

There has been interest in recent years in using market forces to promote the conservation of commercial non-timber forest products (NTFPs) such as xate. This can be done through certification and eco-labelling. Products that are certified to meet certain social and

environmental standards are given an ‘eco-label’. In the case of xate, current methods employed by xateros would not qualify for an eco-label, due to all the unsustainable practices described above. In theory consumers will be willing to pay more for a product that has been harvested sustainably, because it is in the consumer’s best interest that forests anywhere are not destroyed. In theory, if consumers pay more for xate that has been harvested sustainably, then xateros will have an economic incentive to cease unsustainable practices such as harvesting too many leaves, illegal hunting, illegal logging, etc. Also, the added income from the eco-label could theoretically generate sufficient income to finance the necessary regulation.

Another route would be to grant eco-labels only to xate that was grown in plantations, again providing economic incentives for xateros to abandon the collection of xate from the wild and to switch instead to the establishment of plantations. In addition to added sustainability, xate plantations are more profitable than wild collection for a variety of reasons (see tables 1 and 2). Plants are grown much closer together (as much as 89,000 plants/ha) so collection time is reduced. Plants are managed easier, so the quality of leaves is often superior which can lead to higher prices.

Conclusion

Xate is an interesting and important part of Belize’s ecology, culture, and natural resources. If managed properly, xate might also become part of Belize’s economy. It seems worth the effort to learn more about xate, and to protect this valuable piece of Belize’s natural heritage. For more information on xate, feel free to contact the authors and researchers that have made this educational package possible at:

Kimo Jolly,	Las Cuevas Research Station	kimojolly@yahoo.com
Sam Bridgewater	Darwin Initiative	lascuevas@btl.net

Appendix

The price of *Chamaedorea* leaf

	Price Paid to Harvesters/Producers (US$/100 leaves)			
Species / **Source**	*C.elegans*	*C.ernesti-augustii*	*C.oblongata*	**Average**
FIPA/AID (2002), Guatemala	0.28	0.41	0.28	**0.32**
CEC (2002), Mexico	1.02	0.60	0.69	**0.77**
Ramirez (2002), Mexico	0.35	0.44	0.38	**0.39**
Average	**0.55**	**0.48**	**0.45**	**0.49**

How much can a plantation make?

Species	**Plants per Ha**	**Leaves/Ha/yr (leaves/plant/yr)**	**US$/ 100 leaves**	**Gross Income (US$)***
C.elegans	89,000	320,000 (3.6)	0.75	2,400
	8,570	171,420 (6)	0.39	669
	16,890	202,680 (12)	0.91	1,836
C.ernesti-augustii	60,000	180,000 (3)	0.75	1,350
	20,000	60,000 (3)	0.49	294
C.oblongata	20,000	60,000 (3)	0.42	252

How much xate does Belize have?

We are still far from understanding the extent of the xate resource in Belize. From preliminary work in the Chiquibul it is known that much of the forest contains fishtail, but only in relatively small quantities. Out of 128 sample sites studied in one research project, for example, 31 (24%) contained no fishtail. The same study found that the average number of fishtail recorded per hectare was 200, although the average number of high quality 'unblemished' leaves (i.e. of commercial value) was found to be half this. Only 18 plots (18.5%) out of those which contained fishtail (97 out of a total of 128 plots) showed no signs of harvesting. In plots where no harvesting occurred, the average number of leaves per fishtail plant was 5.7. However, in plots where no harvesting occurred, the average number of leaves per fishtail plant was half this!