

**TROPICAL FRUIT MARKETING IN YUCATÁN, MÉXICO:
PARTIAL REPORT ON SALE PRICES AND CITY MARKETS.**

Report by Sergio Magaña

A preliminary report about sale price analyses of tropical fruits in Yucatán is presented as part of a major report that will thoroughly describe how markets operate and the potential for farmers' involvement in fruit trading. The main contribution of this partial report is a detailed analysis of fruit prices obtained from surveys carried out for a year in three important city markets: Mérida, Valladolid and Oxkutzkab. An introduction to the links between the market analyses and the general project aims is provided, including a brief review on the importance of selvas and fruit tree species within the region, the different historical and present aspects to be considered to understand city markets, and different ways in which farmers participate for marketing fruits within them. Leading questions for sale price analyses are defined as well as the research methods employed to gather information. The results of price analyses include tables and graphs that show seasonal price variations of the fruits of interest: anonas, nances and zapotes. The report is organized within the following sections: (a) an introduction to the links between the general project and the study of markets and fruit sale prices; (b) a general background on fruit production and marketing in Yucatán; (c) a brief description of tropical forests and agriculture in the Peninsula of Yucatán; (d) the methodological approaches used to gather information; (e) the present organization of the three selected markets; (f) a working definition of the kinds of fruits traders found within the markets; (g) general design of surveys and research questions for price analyses; and (h) preliminary results on tropical fruit prices. Subsequent reports (January 2002) will include the connections between Mahas, Poop and surrounding rural communities and the market of Valladolid in order to identify opportunities to improve marketing practices; the opportunities prepared by the recently appointed ministries of environment and agriculture (federal and state); and the results of a quick survey on consumers' preference for tropical fruits in the market of Valladolid.

Introduction

This project was developed to enhance the role of forest fruits as a component of the capital assets in the livelihoods of poor farmers, landless families and rural artisans. Its particular expected outputs include the identification of technical ways to reduce labour demands of fruit production, improving information about economic flows (supply/demand, prices) and promotion of the integrity of the forest fruit resource base. These purposes would be achieved through the study of different people/forest fruit links:

- (a) humans: dissemination of knowledge and skills about enhanced fruit harvesting options;
- (b) society: improvement of marketing networks and information systems, and eliminate constraints imposed by land tenure issues;
- (c) economy and financing: increasing prices and profits through higher quality standards and the productivity of family labour;
- (d) physical: appropriate technological processing of forest fruits;
- (e) natural: fruit production monitoring and increased productivity through better harvesting techniques.

The outputs would be reflected as interdisciplinary project workshops, appropriate research methodology reports, identification of improved fruit processing/marketing options, and the production of manuals about research findings.

In Yucatan, the local research team managed the project as a way to assess the production and marketing of native tropical fruit trees in the eastern region of the state, so that Mayan campesinos¹ were presented with optional uses of their secondary vegetation (selvas). For practical purposes, the team divided the project in three study areas: (a) monitoring the productivity of a selected group of native fruit tree species, (b) surveys of rural family livelihoods from two small Mayan traditional communities, and (c) price monitoring of native fruits within the public markets of three regionally important cities. The latter also implied learning how market operations are regulated by vendors and local authorities, as well as surveying consumer's preferences of fruits.

This report presents the contribution of the Mexican researcher Sergio Magaña to the study of sale prices, marketing and market organization of tropical forest fruits. It includes: (a) a general description of fruit trees knowledge and uses; (b) the analyses of one-year monitored fruit price data; (c) a characterization of markets' internal organization; (d) a rapid survey on consumer's preference for fruits; and (e) a review of

¹ Small farmers in Yucatán, and in México in general, are often referred as campesinos, but their economic and social status (land ownership, capital availability, political stance, empowerment, etc.) are quite variable within and between communities.

official forest-related programmes that could impact on marketing of native fruits. Important methodological questions are discussed while these sections are presented because the development of appropriate research methods were also part of the aims of the general project.

General background on fruit production and marketing in Yucatán

Yucatan is one of the south–eastern sovereign states of the Peninsula of Yucatan in Mexico. Maya culture (particularly language) prevails among its rural people. In general, management of natural resources (water, soils, wildlife, forests) and, in particular, farming methods of staple crops like maize, beans and squash, are widespread and relatively well adapted to the regional ecological conditions. Farmer's natural resource management evolved for centuries under traditional farming methods such as slash and burn of primary and secondary (fallowed) vegetation, raised vegetable fields, manual and organic pest control, etc. During the last half-century, however, many farmers have tried and adopted mechanised practices, chemical external inputs and biologically engineered crop varieties into their production strategies. Others have found better opportunities on animal production (pigs and cattle) than on traditional staple crops, fruits and vegetables.

Extensive areas have been deforested since, with the consequent risks of wild species extinction. Worse still, many rural families never actually improved their livelihood conditions after implementing technological changes. Many rural people in Yucatan still live below economically desired standards. In particular, rural food intake is often below acceptable qualitative and quantitative national averages. Yet, tropical fruits still play a partial role in the nutritional status of numerous families and thus, they are an integral element of their economic and social life. Many native fruit species are grown as perennial trees, bushes or annual herbs at their backyards; some of them are replaced from wild trees still growing in or escaped to the remaining surrounding forests. The abundance, reproductive rates, growth patterns and effective yields are all often unknown. Yet, rural people often assign considerable value to those productive trees growing in the wild as much as to the ones planted on their backyards. Farmers certainly give them more value when they get cash from the sale of their diverse products.

Tropical forests and agriculture in the Peninsula of Yucatán

The tropical forests in the Peninsula of Yucatán², known as selvas or montes, contain numerous tree species whose abundance, age and productivity can be as variable as their uses. Table 1 shows common

² The Peninsula of Yucatan in Mexico is politically constituted by the states of Campeche, Yucatan and Quintana Roo, but naturally and geologically speaking it also includes Chiapas, parts of Belize and Guatemala.

native tree species found in the Peninsula of Yucatán that are consumed as food – flowers, leaves, seeds, barks, fruits and roots –, building materials, wood fuel or ornaments. Their distribution depends on both physical and anthropogenic factors (climate, soils, solar radiation, pollination, slash and burn, fallow periods, traditional and commercial uses, etc.). The local scattering of tree species is a result of both their adaptation to natural conditions and people's past and present selection. Tree species resistant to seasonal dryness and high temperatures are better represented at the northern-central part of the peninsula (where this study took place), while wet tolerant species are usually found towards the southeast.

Agricultural production of local fruits in the state of Yucatán includes annual crops of herbaceous species such as melon, watermelon, squash and cucumber. Fruits harvested from perennial trees include exotic mangoes, papayas and citrus products (lemon, lime, orange, grapefruit), along with native zapotes, anonas, cocoyoles, ciricotes and nances (see Table 2 for species identification). Both native and exotic tree species can be found within households and around the traditional agricultural plots of maize known as milpas (usually < 1 ha per farmer). A few appreciated native fruit trees like zapotes are left growing sparsely within the social forest reserves of the communities and their propagation is mostly natural.

Table 1. Common native trees with varying uses (fruit and non-fruit) in the selvas of the Maya region.

	Scientific name	Common names		Scientific name	Common names
1	<i>Acacia dolichostachya</i>	Subín	19	<i>Guatteria anomala</i>	Corcho negro
2	<i>Acacia farnesiana</i>	Huizache (subinché)	20	<i>Manilkara zapota</i>	Zapote
3	<i>Acacia unijuga</i>	Gavia	21	<i>Metopium brownei</i>	Chechem negro
4	<i>Acrocomia mexicana</i>	Coyol o palma redonda	22	<i>Pimienta dioica</i>	Pimienta gorda
5	<i>Brosimum alicastrum</i>	Ramón	23	<i>Piscidia piscipula</i>	Jabín
6	<i>Bursera simaruba</i>	Chacá	24	<i>Pithecellobium dulce</i>	Guamúchil
7	<i>Castilla elastica</i>	Árbol del hule	25	<i>Pithecellobium flexicaule</i>	Ébano
8	<i>Cecropia peltata</i>	Guarumbo	26	<i>Platymiscium yucatanum</i>	Granadillo
9	<i>Cedrela odorata</i>	Cedro (kuiché)	27	<i>Pouteria mammosa</i>	Mamey
10	<i>Ceiba pentandra</i>	Ceiba	28	<i>Pouteria unilocularis</i>	Zapotillo
11	<i>Cordia dodecandra</i>	Siricote	29	<i>Protium copal</i>	Copal
12	<i>Cordia gerascanthus</i>	Bojón	30	<i>Sabal yapa</i>	Guano
13	<i>Cordia sebestena</i>	Anacahuite	31	<i>Sapindus saponaria</i>	Jaboncillo
14	<i>Dialium guianense</i>	Palo de lacandón	32	<i>Swietenia macrophylla</i>	Caoba
15	<i>Diospyros digyna</i>	Zapote negro	33	<i>Talisia olivaeformis</i>	Guaya
16	<i>Diospyros kaki</i>	Caquis	34	<i>Terminalia amazonia</i>	Canshán o sombrerete
17	<i>Enterolobium cyclocarpum</i>	Guanacastle	35	<i>Vochysia hondurensis</i>	Maca blanca
18	<i>Guaiacum sanctum</i>	Guayacán			

From: http://www.ine.gob.mx/dgvs/noticias_maya.htm

In general, most native fruit tree species are only seasonally harvested for self-consumption. Small produce fractions are exchanged within small towns (mostly as gifts or barter) and relatively minor amounts are taken to the regional markets. Exotic crops are more frequently grown for commercial purposes, but only a few campesinos make significant investments for their propagation, harvesting or marketing.

There is only one area in the state of Yucatan that, in terms of land surface, plant density and productivity, that has specialised on the production of fruits, mainly citrus products. This area is located at the south-central portion of the state where soils are relatively deeper and includes the municipalities of Akil, Muna and Oxkutzkab. Other native fruit species like zapote and nance are also commercially grown in this area, but their economic contribution is still minor in comparison to the exotic ones. Moreover, the relatively nearby states of Campeche, Quintana Roo, Tabasco, Veracruz and Chiapas, very often produce larger amounts and better qualities of both exotic and native fruits. Both fruits are nowadays wholesale-traded at the markets of major Yucatan's towns like Merida, Uman or Valladolid, and even at the specialised fruit market of Oxkutzkab.

The state of Yucatán has not received any major governmental programmes for fruit propagation and/or production, except for citrus fruit initiatives at the above-mentioned area during the early 1960s. At the time, agriculture was extensively dominated by sisal (henequen) crop fields. The sisal crop was heavily and permanently subsidized, both as agricultural activity and as textile industry, by federal and state governments until the late 1970s. Government support to the sisal agro-industry, however, was withdrawn since the early 1980s. Governmental withdrawal left farmers with few rural development options. Some "rescue" programmes were implemented to alleviate the resulting unemployment, low family income, the lack of previous social benefits (e.g. health insurance) and the consequent immigration to the cities. Art crafts, weaving, horticulture and animal backyard breeding programmes were usually promoted. Yet, tree fruit-related initiatives were never carefully planned neither intensively applied, as if the regional natural, economic and social conditions showed no potential for this kind of agriculture. The limited investment in significant agriculture initiatives was directed towards a few irrigation technologies, one unsuccessful citrus fruit-processing unit and access roads.

Farmers continued to grow traditional staple crops for self-subsistence. Exotic fruit trees, mostly as individual trees, were already planted in their backyards and land-holdings as part of their campesinos livelihoods. Many native fruit trees within forest reserves were abandoned but a considerable number remained as family fruit trees within backyards; no extensive plantations were developed. Fruits of native trees seldom turned out to represent significant crops because of their low productivity, infrequent generation of income and limited demand. Fruit quality also stayed behind the products from other states. Technological innovations and marketing incentives have been neglected or minimally supported by subsequent governments all this time.

Increasing the role of fruit trees for farmers' livelihood largely depends on the availability of financial incentives to the already weak campesino economy. Technological changes are nowadays very much constrained by their limited availability of capital. Pruning, fertilization, pest control, irrigation, fruit harvesting tools and packaging are all inputs that often represent high expenses and labour to poor farmers; they apply them only when sales are 'guaranteed at acceptable prices', usually with respect to a few cash crops like citrus fruits or papaya. Farmers' profits and their corresponding attention to fruit production are also negatively influenced by factors which are beyond supply and demand forces (as expressed on prices) or by profit-and-loss experience and forecast.

Methodological approaches to study fruit marketing in Yucatán

Several methods were followed in order to gather information about native fruit marketing and sale prices:

- (1) Monthly price monitoring for a year of selected fruit tree species within the local markets of the three above-mentioned cities.
- (2) A description of the internal organization (distribution, permits, fees, administration, etc.) of retailers and wholesalers in these markets.
- (3) A rapid appraisal of consumer's preference for fruits from a survey carried out at Valladolid's market.
- (4) The identification of links between livelihoods of a selected group of families from two small communities – Mahas and Poop with < 1000 inhabitants each – and their participation in Valladolid's markets.
- (5) Contrasting the social conditions of these two communities with other nearby and apparently similar communities.
- (6) Review of current forestry or forest-related programmes promoted or supported by national and state governmental agencies for rural farmers in the region.

Surveys, questionnaires, field visits and participatory research in general were used to identify opportunities and constraints for fruit production and marketing, but they were carefully applied to avoid raising false expectations that later on hampered public confidence.

Markets' organization

The way markets are technically and socially organized within their community and in the whole region influence farmers willingness to get involved in fruit production and trade. Influential that limit marketing

include their limited access to storage and transport facilities, sanitary restrictions at point stands, almost inexistent information about other producers and similar products, low competitive abilities, a relatively decreasing consumer preference for short-lived native fruits, and so on. The adoption of technological alternatives for fruit production, along with better marketing strategies, may eventually increase farmer's economic benefits, but current market structure (number and hierarchy of participants, physical access, storage facilities, etc.) and dynamics (transportation, changing regulations, credits, emerging official support programmes, etc.) may need concurrent changes.

This report concentrates on the description of prices and other marketing processes of native tropical fruits around the area of Valladolid (southeast) and the markets at Oxkutzkab (south) and Merida (north-central) (see maps). Valladolid and the nearby municipalities and towns is an economically and socially well-preserved Mayan area where maize production is still central to farmers' livelihoods, although they are increasingly influenced by economic and social external factors (labour markets, educational opportunities, health services, etc.). Oxkutzkab emerged economically in the 1970s because of the large volumes of fruit production and marketing, and federal and state governments still often focus their support to agricultural programmes based on this criteria. Mérida's historical background, political significance and economic importance suggested its inclusion in the project.

The markets in these cities can be briefly be characterized as follows:

- a. Mérida. The capital of the state ($\approx 650,000$ inh) has a central market with relatively well delimited zones for specialised food retail and wholesale including vegetables and fruits, meat, fish, processed items, and restaurants. Mobile fresh food stands are often found interspersed among the fixed stands. Most fruits come from local producers, brokers (intermediaries) and Oxkutzkab Large warehouses for many different food items are rented within or close to this market. Actually, some fresh food wholesale trading is carried out a few blocks away³.
- b. Valladolid. A demographically and culturally important city ($\approx 100,000$ inh) surrounded by numerous traditional small Mayan communities (< 2000 inh). Campesino family members often arrive to the central city market with the purpose of selling small amounts of fresh agricultural products to fixed retailers. They may also stand up for a

³ Fifteen years ago, a major supply storage and trading centre (Central de Abastos) was built at a distant place from Merida's old area with several purposes: concentrating most food-related wholesale trade from and to the city, freeing downtown from crowds, provide improved

few hours offering their items (usually at the bordering roads), or move around the market walkways to find customers. They leave the market as soon as products are sold or after several hours of bargaining without sales. No areas for wholesale are clearly delimited within it, and rather, trucks with fresh foods (vegetable, fruits, meats, etc.) arrive independently, allocate their products according to prearranged contracts, and/or look for interested retailers or costumers during the day. Fruits from Oxkutzkab and Mérida markets are regularly brought in, but their impact on local retailers and market organization is unclear.

- c. Oxkutzkab. The market of this city mostly receives tropical fruits produced in the agriculturally-specialised southern area of Yucatan, but fruits and vegetables from other distant Yucatan municipalities or the adjacent states of Campeche and Quintana Roo are also brought and sold in this market. Tropical and temperate fruits from states as distant as Tabasco, Veracruz, Chiapas and Puebla are also distributed for resale in Oxkutzkab. Because of the continuous and large-scale merchandising of vegetables and fruits, Oxkutzkab's market is usually regarded as the wholesale trade centre for fruits in the state, although no objective comparisons with other markets are available. Fruits sold at Mérida and Valladolid get frequently concentrated (stored) for a few days or weeks at Oxkutzkab's market.

The operation of these public markets is the responsibility of the municipal authorities who are legally bound to enforce regulations that facilitate and improve trade services for citizens. The authorities organize markets through administrative staff, distribution of stands, public sanitary provisions, security, and so on. Authorities at each municipality will have different degrees of control and influence in its public market, which in turn is influenced by the volume of the traded goods and number of customers. Political affinities and support can also influence the access to merchants.

Imported fruits are seldom sold in any of these public markets. Conversely, private supermarkets nowadays usually sell imported fruit items from temperate-cold regions such as apples, kiwis, grapes, apricots, pears or plums; to a lesser extent, they also offer products from the arid and temperate regions of Mexico (e.g. cactus fruits known as tunas and apples from Chihuahua).

sanitary conditions, and so on. Yet, trader's preference effectively made this Central de Abastos useless, except for some storage purposes (e.g. non-perishable goods).

Surveyed merchandisers

In general, retailers and wholesalers participate in public marketing for short and mid-term periods depending on their financial performance, but also on their capacity to fulfil the complex obligatory regulations (not always) enforced by municipal authorities. Regulations include licensing, fees, restricted positions, and sanitary control. These basic conditions determine salespeople willingness and possibilities to act in any of the three following categories:

- (1) *Ambulantes*: mobile retailers selling on a non-permanent basis who very often only sell only one or two different products obtained in their home gardens, milpas or secondary selvas.
- (2) *Semifijos*: regular retailers who get 'partial rights' to occupy a preferred location within the market, but cannot legally build or possess a fixed stand. The fruit stand is made of wood boxes or even metallic bars and tables that are mounted very early in the morning and dismantled through mid-day-afternoon. They are used to selling more than 3-4 different products which are obtained at their home yards and milpas, but they also buy wholesaled small amounts (e.g. 3-5 fruit boxes) that retail on a daily basis.
- (3) *Fijos*: merchandisers who have formally legalised the property of a fixed stand through fees, certificates, etc. Fixed stand sizes vary from 1x2m to 3x4m; they are built as a regular pattern (parallel rows) with cement, metal and wood. Secured storing facilities within the small stand area are sometimes built and represent capital investment that give added value to the market location. Fixed stands may operate as retailers or wholesalers; they usually offer more than 4-5 different products (perishable or non perishable) on large amounts along with small amounts of fresh products as seasonal local fruits.

Price data collection

At the start of the research project, a preliminary questionnaire was designed to collect sale and purchase prices of a group of selected fresh fruits offered at the three city markets. The questionnaire would be applied during one or two consecutive days on a monthly basis. The initial set of selected fruits is shown in Table 2. Abundantly sold exotic fruits such as melon, watermelon, papaya, apples, grapes, etc. were not included in the monitoring.

Table 2. Fruit tree species surveyed for prices at the markets of Merida, Valladolid and Oxkutzkab.

Local common name, species (other non-local common names)	Family	Brief tree/product description
Anona colorada, <i>Annona reticulata</i> (Custard apple, Bullock's heart)	Annonaceae	A 25' low-branched deciduous tree, scraggly in appearance. The fruit is large, with yellow or brownish skin and a creamy pulp. Generally used as a rootstock for other anonas.
Poox, <i>Annona purpurea</i> (Soncoya)	Annonaceae	Tropical lowland, moisture-loving tree with a fruit up to 6" in diameter. It is brownish-gray and covered with protuberances ending in hooks curved toward the stem. The flesh is bright orange and soft.
Saramuyo, <i>Annona squamosa</i> (Sugar apple, sweetsop, anon)	Annonaceae	A deciduous tree, small and open. They are primarily seedling trees, though some are grafted. The fruit is green, heart-shaped, 3" long, with protuberances on the skin. The flesh is sweet and refreshing. The flavour is best when picked before maturity and ripened in a bag. Fruits are good sources of potassium and contain moderate levels of Vitamin C.
Sak paj, <i>Byrsonima bucidiaefolia</i> (Nance blanco)	Malpighiaceae	
Nance amarillo, <i>Byrsonima crassifolia</i> (Golden spoon).	Malpighiaceae	Small Central/South American tree that produces a spray of yellow flowers followed by yellow acid fruits, which are eaten fresh or used for jellies, wines, liquors. Sweetness is variable.
Cocoyol, <i>Acrocomia mexicana</i> (Coyol)	Palmae	This palm tree is widely distributed in Mexico and Central America. People make use of its sap, flowers, fruits, and bud or heart.
Ciricote, <i>Cordia dodecandra</i> (ziricote, copite, cupapé)	Boraginaceae	A lowland rainforest species. In Quintana Roo, the species occurs in forests on black soils and in secondary formations. Pulp eaten fresh. The wood is used for flooring and furniture.
Zapote, <i>Manilkara achras</i> (sapote)	Sapotaceae	

¹ <http://www.crfg.org/fg/xref/>

² http://www.unep-wcmc.org/species/tree_study/americas/

All these species produce fruits at different times of the year, but the sale of products at each regional market varies considerably. Some fruits might not be brought to markets at all, even when trees are most productive, because demand is too limited or prices too low.

The questionnaire included the amount sold as retail or wholesale, the frequency with which salespersons attended the market and current sale and purchase prices. These questionnaires were tested for a few weeks and then were adjusted and more precise questions included: fruit presentation (trays, individual fruits, fruit sizes, etc.), origin or source of the fruits and the location of the stand within the market. The survey continued weekly until completing a whole year.

Research questions

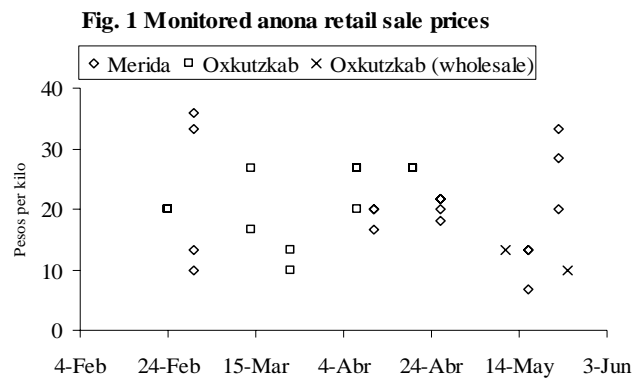
The leading questions asked on collected data were:

1. Are there important price differences between fruits?
2. Is seasonal availability of fruits too influential on prices?
3. Is it possible to estimate profits from sale and purchase data?
4. Can any marketing strategy be derived from price data?
5. How many people participate in fruit trading?
6. What are the major price-related constraints for marketing?
7. Are marketing regulations impinging on prices?

8. What is the influence of *intermediarios* on price fixing?
9. What are the social links that facilitate or impede marketing?

Preliminary results of fruit price analyses

Anona colorada (*A. reticulata*)



This fruit was recorded 35 times during 12 visits from early March until the end of May (3 months) in the markets of Mérida (6 stands) and Oxkutzkab (4 stands), but not in Valladolid. Figure 1 shows retail and wholesale sale price data of anona colorada at those markets. Retail prices varied considerably both within the same day and at different days (from 10 to 36 pesos). Only two records of wholesale prices were obtained at Oxkutzkab from the same retailer, María Yam. Overall, anona colorada retailing averaged $\$20.8 \pm 6.8$ per kilo; the difference between Oxkutzkab and Mérida was not significant ($\$20.3 \pm 8.3$ and $\$21.3 \pm 5.1$, respectively; $t=0.377$, $d.f.=31$, $p>0.05$).

Fruits were sold individually (large ones), as piles with 3-6 pieces (medium size), or as plates with numerous small pieces. Plates with 5-6 fruits were the most common presentation, without any wrapping materials, and interspersed with other more abundant fruits like bananas, papayas or mangoes. No fruit washing or packaging was observed, and neither descriptions of fruit quality standards were provided by salespersons. As other tropical fruits, anona's age determines fruit quality and acceptance (sweetness, taste, hardness, odour) which in turn influences sale price while put on the market (a few days or during the same day). So, according to retailers, too young or too ripen fruits are definitively less demanded, sold at very low prices or thrown away.

The amount sold was usually 10–12 individual fruits or 1–2 trays, but some retailers said anona's total sale was too small. Sold fruits at Mérida had been harvested on nearby properties (milpas or backyards), but they also had bought them as individual (selected) fruits or as complete boxes (19–20 kilos per box @\$80–\$120) from unspecified persons at Oxkutzkab's market. A few retailers informed that fruit producing trees could be found at Hunucmá. Retailer's were both ambulantes and semifijos, and a few refused to provide their names as if distrusting interviewer's relation with market authorities.

Retailed anonas sold at Oxkutzkab's market were either harvested in the surrounding area of this city or bought from wholesalers within the same market. At least 10 different persons, all women, were identified as anona retailers (6 in Oxkutzkab and 4 in Mérida).

Saramuyo (*Annona squamosa*)

A total of 88 retail records were gathered for saramuyo from late June until early September on different occasions: Mérida, 6 visits (June-August); Oxkutzkab, 4 visits (June-August); and Valladolid, 9 visits (July-September). Only 10 wholesale price data were obtained at Oxkutzkab's market on three different days from 10 different adults.

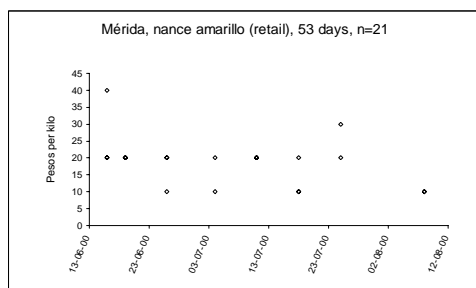
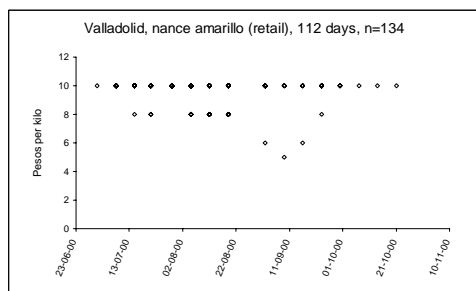
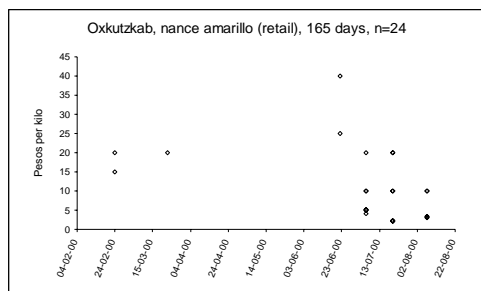


Retailers got the saramuyos from varying sources including a nearby wholesale centre (e.g. Calle 54 in Mérida), the commercial fruit producing area of Oxkutzkab, or their own land/backyards at nearby small towns (e.g. Chichimilá, Tesoco, Popolá and Tikuch for Valladolid's market). Only one retailer at Valladolid responded that she repeatedly bought anonas at Mérida to be sold at Valladolid. Wholesaled fruits were mostly brought from commercial agricultural lands (very likely for citrus fruits) at Oxkutzkab, Tzucakab and Akil.

Many more salespersons participate as retailers of this fruit. At least 50 different interviewed persons – mostly women and a few children – were found scattered around and within the markets. They all offered the product as ambulantes and semifijos, while wholesalers were fijos.

The average retail price at Valladolid was higher (\$22.18±14.8) than at the other markets (Mérida, 15.2±8.1, Oxkutzkab, 14.4±11.1), but not significantly ($F=2.851$; $d.f.=87$; $p=0.06$). The retail highest price

(5/Aug) was almost ten times higher than the lowest wholesale price (6/Jul/00). Prices were often lower by the end of the sales day. Fruits were offered individually and/or as piles of 5-8 pieces without any special packaging, whereas wholesaled fruits were bought and sold within 18-20 k boxes or buckets.



Saramuyo sale price records			
Market		Retail	Wholesale
Mérida	Earliest	26-Jun	
	Latest	8-Aug	
	Records	18	
	Average price (\$/k)	15.2	
	Max	33.3	
	Min	7.7	
Oxtutzkab	Earliest	22-Jun	6-Jul
	Latest	7-Aug	7-Aug
	Records	10	10
	Average	14.4	2.5
	Max	33.3	4.0
	Min	3.3	0.6
Valladolid	Earliest	1-Jul	
	Latest	2-Sep	
	Records	60	
	Average	22.2	
	Max	53.3	
General	Earliest	22-Jun	6-Jul
	Latest	2-Sep	7-Aug
	Total records	88	10
	General average	19.9	2.5
	Max	53.3	4.0
	Min	3.3	0.6

Poox (*Annona purpurea*)

Poox was only found in very small amounts only a few times (6 records) at Valladolid’s market during October 2000. Price per kilo varied between \$20 and \$60 and fruits were brought from retailers’ land or backyards at Popolá, Tikuch, San Lorenzo Temozón, Espita and Tepich, Q. Roo. Despite the attractiveness for future marketing of this annona, it was always referred as a species with very low-yields during a very limited season.

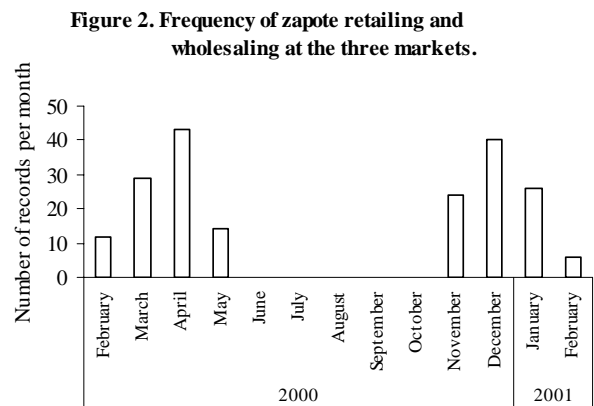
Price and marketing differences between the anona colorada, saramuyo and poox.

The seasonal availability of anona colorada (*A. reticulata*), saramuyo (*A. squamosa*) and poox (*A. purpurea*) differed substantially at the three markets. Anona colorada and saramuyo sales were clearly separated between the dry (January-April) and rainy (June-September) seasons, respectively, which in turn is determined by macro-regional climatic conditions. Poox availability was definitively limited to three weeks during October, although retailers indicated there could be a few fruits before and after this month.

No major technological constraints or local marketing barriers (e.g. transport prices, sanitary regulations, fees, permits, etc.) were identified in relation to these respective availabilities, although refrigeration could make fruit quality last longer. Therefore, anona trading seems to be more determined by fruiting patterns and yields rather than by marketing or technological constraints.

Saramuyo average retail price of (19.9 ± 13.6 ; $n=88$) was significantly higher than anona colorada ($\$14.8 \pm 8.8$; $n=109$) ($t=3.17$; $d.f.=195$; $p=0.001$). Poox prices were definitively a lot higher than the other anonas (average $\$37.6 /k$), but the small number of data ($n=6$) did not allow testing for significance.

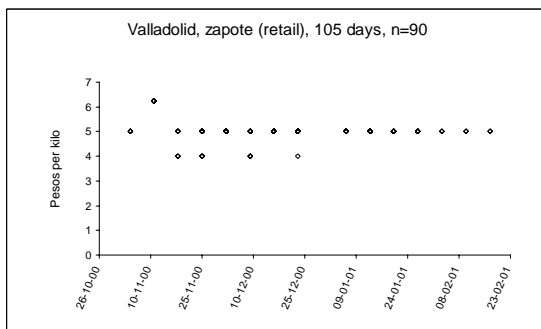
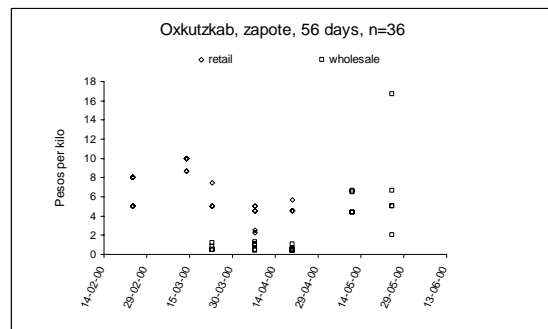
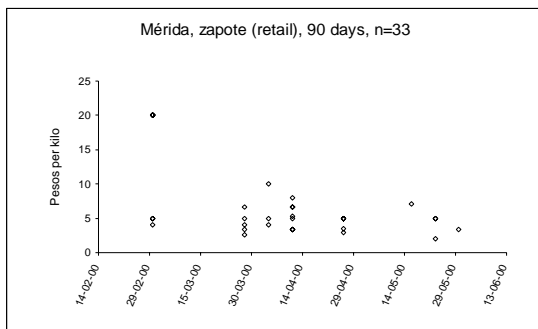
Zapote (*Manilkara achras*)



A total of 194 sale records from early March 2000 – mid February 2001 on 30 separate days were collected for zapote: Mérida 33 records, Valladolid 96, and Oxxutzkab 36. Frequency of zapote records at the three markets is shown on Fig. 2. Two frequency peaks were identified which suggests a bimodal availability of zapotes, i.e. two market seasons, one between November and January, and another one between March and May. The relative decrease of zapotes on sale around February was not explained by retailers as due

to production-related factors (flower blooming, fruit set or climate). No zapotes were found between June and October when drought and phenological conditions restrict any production.

At least 30 different salespersons (mostly women) were retailers and other 20 wholesalers (the latter only in Oxnkutzkab). Retailers were mobile, semifixed and fixed, and purchased zapotes in boxes of 10-15 kilos or 19-20 kilos each. Wholesalers were stationary at a different area, but no nearby large storage facilities for zapotes were identified (as compared to exotic fruits such as banana, watermelon, papaya, orange, etc).



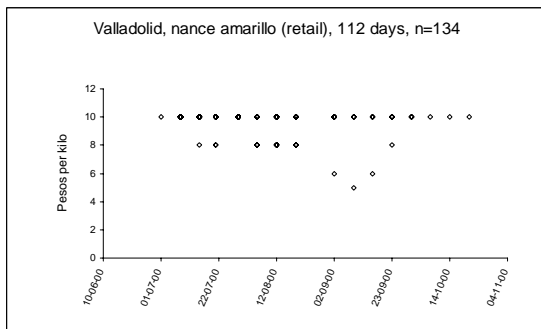
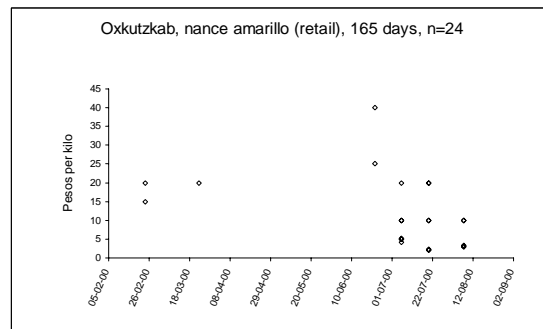
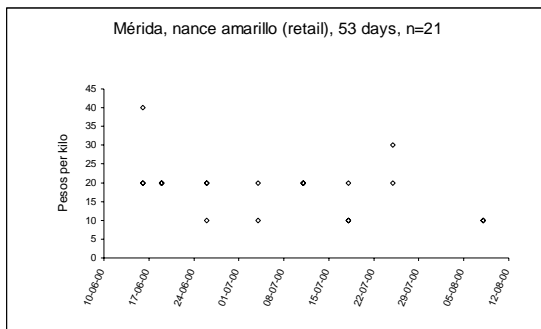
Zapote sold amount per vendor each day was usually lower than the purchased amount. Unsold fruit was often disposed as garbage by the end of the day, and only a few took it back or stored it. Fruits were mostly got at Oxnkutzkab's market itself (from wholesalers) and only a small amount was brought from relatively close small towns like Yotolín, Yaxón and Pustunich.

Retail prices ranged from 2 to 20 pesos per kilo, although the latter data (4 records) may actually be unreliable outliers. Overall, retailing averaged $\$5.6 \pm 2.7$ ($n=33$) per kilo. Figure IV shows that zapote retail prices at Valladolid varied very little between early November and mid January ($\$4$ - $\$6.3$), while wholesale prices changed considerably within a few weeks, e.g. $\$0.5$ (March 23), $\$6.7$ (May 11), $\$16.7$ (May 25). Interestingly, mean retail prices per kilo in Valladolid were significantly lower than in the other,

relatively larger, markets ($F=7.295$, 164 gl; $p<0.001$): Mérida $\$6.67\pm5.28$ ($n=33$), Oxkutzkab $\$6.39\pm2.29$ ($n=36$) and Valladolid $\$4.97\pm0.42$ ($n=96$).

Nance amarillo (*Byrsonima crassifolia*)

A 179 total records of nance amarillo wholesale and retail sale prices (10 and 169, respectively) were obtained at the three markets. Data spread over 10 months (June-March), including the hot ($n=3$), wet ($n=173$) and cool ($n=3$) seasons, but not during the driest period (April–May).



All wholesaled fruits were harvested at the region of Oxkutzkab (including Akil and Yotholin). Fruits were packaged and sold as boxes of 18-20 kilos, and price varied between \$2.1 – \$5.3 per kilo. At least 8 different women and men (all adults) participated as wholesalers, and they usually sold 2-4 boxes per day; more than 5 boxes per day was infrequent event at the highest fruiting peak.

On the contrary, more than 50 different people, including children, carried out retail sales but the majority were women. Most retail prices were actually obtained from Valladolid's market ($n=134$) where they ranged from \$5 to \$10 per kilo, and averaged $\$9.6\pm0.91$. The latter price was significantly lower than at the other two surveyed markets (Mérida $\$18.6\pm7.27$, $n=21$; Oxkutzkab $\$17.1\pm8.5$) ($F=77.3$, d.f. 168,

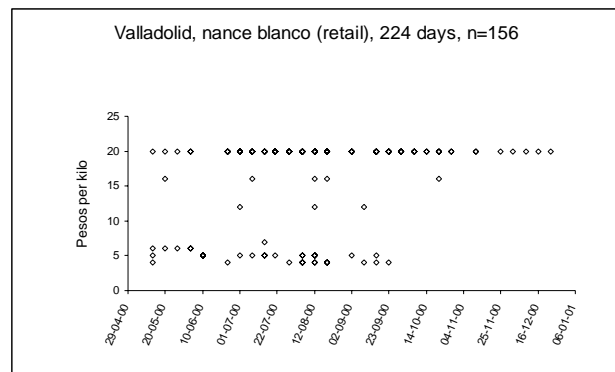
$p > 0.05$). Actually, nance amarillo in Mérida and Oxkutzkab was sold several times at \$20/k or more and not less than \$10/k. In general, a higher price variation was observed at the onset of the fruiting season (see figure). Retailed amounts per salesperson mostly ranged between half a box (around 10 kilos) and 2 boxes (up to 40 kilos).

Retailed fruits at Mérida were brought either from Campeche or Oxkutzkab (the latter acting as a wholesale point). Contrastingly, a larger number of towns were reported as sources of nance amarillo for Valladolid's market: Tesoco, Popolá, Chichimilá, Tikuch, Kanxuc, and Valladolid itself. A few saleswomen ($n=4$) at Mérida reported that family members provided the fruits to them directly in the market, but it was not clear if they were harvested from their landholdings or from the nearby wholesale supply centre.

Nance amarillo fruits were retailed on small plates of $\frac{1}{4}$ - $\frac{1}{2}$ kilos, without any special presentation and at different fruit maturity conditions. Too ripe fruits were mostly thrown to the garbage by the end of the day. Yet, as nance is also often sold as a liquid sugary preserve in small plastic bags or glass bottles (very much liked in the region by its slightly acidic/alcoholic condition), too ripe fruits might often be used or sold by retailers to prepare the preserves, even though this possibility was not confirmed through the survey.

Nance blanco (*Byrsonima bucidaefolia*)

A considerable number of records ($N=156$) were obtained for nance blanco, a traditional Mayan fruit only found at Valladolid's market. According to indirect reports, this poorly known fruit from eastern Yucatan (wetter climate) is also sold at the surrounding areas of Cancun, but it was definitively not found at the markets of Mérida or Oxkutzkab. This fruit is basically consumed as snack or pickle, i.e. small pieces mixed with spices and chilli soaked in salty water or vinegar for a few days/weeks. People are used to buying it fresh in the market and preparing it at home, but it is also very much consumed at regional restaurants and bars.



Nance blanco retail price was very often ($n=107$) set at \$5 per disposable plastic bag of $\frac{1}{4}$ k from mid-May until late December. This was equivalent to \$20/k. Actually, lower prices (\$4–\$16/k) were also recorded all that time but less frequently (see graph). Lower prices usually corresponded to fresh fruit, but

other reasons were also given (e.g. wholesaling, competitiveness and bargaining). Fresh fruit sales were basically limited to the summer rainy season (May-September); as a snack, it was sold until the end of the year.

Fruits were all got regionally from many different nearby small towns: Chauay, Chemax, Chichimilá, Hunukmá, Kanxic, Múcel, Popolá, Tepich, Tesoco, Tikuch, X-alam, Xkalakdzonot, X-lan, among others. Only one person said she wholesaled nance blanco from Tepich (Quintana Roo) @ \$6/k. Fruit was all brought from retailers' backyards or agricultural lands. More than 30 different young to middle aged women and men were seen as active ambulante and semifijo retailers at many different sales points within and around the market, and no fixed stands offered the fruit. Sold amounts ranged from a 1 to 50 kilos, but most responses (n=73) were between 2–5 kilos.

Tangible research from the study of markets and sale prices

Two manuals have been considered as the ultimate products for the market research aspects of the project. The first type will be a manual for future research on the subject, which helps other researchers design more effective field data collection and analyses. The second one will be an uncomplicated short manuscript about the options that farmers may find attractive for presently marketing their produce, mostly in terms of the financial assessments for potential profits.

Another already available product of this study is a database containing all the information records gathered at the markets for a year. This database was filled in an Excel 2000 spreadsheet to facilitate its compatibility with other numerical and statistical packages. The analyses of data have revealed important methodological problems that suggest future alternative surveying methods.