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# ATAULFO MANGO IN CHIAPAS

A VALUE CHAIN ANALYSIS

microREPORT #109



**JULY 2008**

This publication was produced for review by the United States Agency for International Development. It was prepared by DAI.

# ATAULFO MANAGO IN CHIAPAS

## A VALUE CHAIN ANALYSIS

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# EXECUTIVE SUMMARY

This report examines the Ataulfo mango value chain in Chiapas, scanning across the chain and its various actors and market linkages to put observed dynamics in context and identify opportunities. The report pays particular attention to financial flows through the chain which inform other non-financial dynamics and highlight conditions and opportunities where financial services might help address challenges or allow for upgrading. The authors address financial issues within the broader analysis, rather than as a separate issue, or as an input at one level of the chain.

Global mango consumption has grown steadily in recent years, both in producing and importing countries. Mexico has been one of the main producers and consumers of mango, and a leading exporter worldwide. Within an increasingly commoditized environment, the gold-colored Ataulfo mango from Chiapas (unlike the more common red or Florida varieties) has sustained a differentiated identity and a price premium in both domestic and export markets. Although Chiapas occupies a relatively minor place in overall Mexican mango production and exports, it leads both in production and exports of the Ataulfo variety and, as a whole, is well positioned to take advantage of changing market dynamics, such as the growth of supermarket chains in Mexico, as well as a growing market for Ataulfo mangoes abroad. The largest integrated grower/packers are clearly best positioned for these trends.

The Chiapas Ataulfo chain has important strengths upon which to build. The variety enjoys a high degree of market demand accompanied by higher prices, especially in the organic niche which enjoys a 30% premium above conventional Ataulfos. The Ataulfo was first discovered in and is most identified with the Soconusco region in Chiapas, around Tapachula and the Guatemalan border. The region is among the first areas to begin production each cycle precisely when the southern hemisphere competitors are winding down but before other regions in Mexico begin to harvest, permitting fruit to enter the market while stocks are low. The Soconusco also meets phytosanitary requirements for accessing US markets (the world's largest mango importer), although this requires constant effort and coordination across the sector and cannot be taken for granted. Other strengths include public sector support in the form of programs for supporting credit, irrigation, and organic conversion, among others.

Despite this privileged position, the chain faces a series of challenges. First and foremost is declining productivity, for which basic scientific research is necessary. While any of a range of factors may cause productivity declines under a given set of circumstances, the necessary scientific studies have not yet been conducted and disseminated to improve yields. One result of this uncertainty is a reduced propensity among chain actors, especially producers, to invest in upgrading.

Other challenges also revolve around the need for easy access to better, more timely information. The chain would benefit from improved market information, including regular pre- and post-harvest production estimates and data, regular tracking of flows of fruit from orchards to packing plants to markets, and regular tracking of prices in the main domestic and international markets. Such information would support decision-making based on factual market appraisals, rather than hearsay. The chain also needs an updated set of agricultural practices for the Ataulfo variety in the Soconusco and, in light of growing demand, a new set of agricultural practices for organic Ataulfo.

Once some of these basic needs are met, appetite for investment is likely to increase and the current lack of formal financial services may amount to a major constraint. Conventional credit relationships with private commercial banks are no more common for Soconusco Aaulfo growers or packers than for other agricultural activities in Mexico. The most common variation of formal financial services observed involved government-backed and subsidized (FIRA) lending from commercial banks that tend to concentrate on the largest companies, particularly packing houses which may in some cases on-lend to certain producers. In such cases, financial institutions take very little risk, use none of their own capital, and obtain operational subsidies. A bank's ability to measure and manage agricultural and business risks and costs is therefore considerably less relevant than its ability to understand and manage the subsidy scheme.

Trade credit, which was found to flow both from suppliers to buyers and vice-versa at different points in the season, has important benefits, including the simple fact that it often exists as an option where services from financial institutions do not. But it also has drawbacks in terms of limiting choices, or sub-optimizing commercialization and other decisions throughout the chain. Liquidity, or lack thereof, often determines the channel into which Aaulfos from the Soconusco are sold. While this is common for capital-constrained producers who access the quick payment terms (but lower prices) of local intermediaries, it was also observed among packers that sometimes base channel strategies more on whether or not they require extending credit to their producers, than whether they are optimal channels, preferring to remain in channels where they don't need to use their scarce capital to finance the producers, regardless of the market opportunities in that channel. In this sense, understanding trade credit and the flow of information through the chain offered insights into the nature of commercial relationships through the chain, as well as the potential for mutually beneficial improvements.

Upgrading opportunities in the categories of production, commercialization, finance, and policy include:

#### **Production**

- Research root causes of productivity declines and mitigation approaches. Based on findings develop and disseminate a set of recommended Aaulfo agricultural practices.
- Develop organic-specific recommended agricultural practices for Aaulfo in Chiapas for producers interested in doing so to obtain benefits of excellent market opportunities for organics.
- Develop certification process for Aaulfo nurseries to mitigate a source of reduced productivity.
- Examine the potential for enhanced irrigation techniques, especially lower cost approaches, in terms of their contribution to productivity, quality, and returns to growers.
- Given the environmental importance of the Soconusco region, work with environmental specialists to evaluate production and identify strategies to address biodiversity threats.

#### **Commercialization**

- Given its attractive characteristics for juice and pulp and the lack of such channels in the Soconusco, support chain actors to examine business cases for different investment scenarios.
- Improve information and transparency along the chain, starting with the field-level data and following product flows to market, in terms of pricing, inventories, and competitive conditions.

### **Finance**

- Assist financial institutions to serve this potentially attractive niche, by helping them understand chain dynamics including costs, returns, and risk, in order to design appropriate financial services. Designs should build on lessons learned in value chain finance (e.g. structuring repayment schemes through buyers) and in microfinance (e.g. including household cash flows in credit analyses).
- Help research the feasibility of long-term finance for investment and upgrading for multiple actors in the chain, including growers, packing houses, cooperatives and growers' associations.
- Assist interested financial institutions to obtain and leverage rich *information* that packing plants and others have on producers that could support financial decisions.

### **Public Policy**

- Enhance collaboration across public and private sector actors to improve the design and implementation of public policies and programs, especially in the areas of agricultural extension, finance, irrigation, environmental standards, and phytosanitary compliance.
- Work with stakeholders including government, the phytosanitary board and the producers' association to ensure coordination across the chain on phytosanitary compliance continues to improve, ensuring continued access to US and other export markets.



# INTRODUCTION

## BACKGROUND

One goal of the USAID-funded AFIRMA Project is to support upgrading of agricultural value chains in Mexico through, among other means, improved financial services to value chain actors. As part of this goal AFIRMA analyzes potentially competitive agricultural value chains, including chain dynamics and access to financial and other services, and options for upgrading and enhancing competitiveness.

To select value chains to analyze, AFIRMA conducted a quick review of agricultural activities in Mexico and their potential competitiveness, using data bases from the Mexican Secretary of Agriculture (SAGARPA) and the Food and Agriculture Organization (FAO) as initial filters to obtain a shortlist of chains for further consideration. The team applied four main categories of criteria:

- **Current and potential competitiveness** of Mexican products in the activity/crop, analyzing global and national trends of supply and demand, and locating Mexico within this context.
- **Chain organization and leadership**, estimating whether the level of organization within might present opportunities to improve conditions among chain actors, especially producers.
- **Social relevance**, using secondary sources to estimate the number of participants, to focus analysis on chains with large numbers of small-scale producers (the assumption being that in Mexico size of holding correlates to wealth).
- **Relevance for Biodiversity** – as an additional cross-cutting theme, AFIRMA seeks to work in activities and areas that have potential to address specific threats to Mexico’s biodiversity.

By applying these categories of criteria, the team identified Ataulfo Mango along the coast of Chiapas in southeastern Mexico as a promising chain for analysis.

## APPROACH AND ORGANIZATION OF THE STUDY

This report analyzes the Ataulfo Mango value chain to identify chain upgrading opportunities that would improve livelihoods of chain participants. The study looks across the entire value chain to put dynamics in context and identify opportunities for improvement. In this sense it is similar to value chain studies in other areas. One emphasis of this study, however, is that it takes a holistic view of the current and potential role of finance, offering analysis of financial flows through chain—formal and informal, current and potential—to highlight conditions and opportunities where financial services might help address challenges or take advantage of opportunities.

In addition to a review of secondary sources, the report is based on interviews with a wide range of actors in the mango business in Chiapas, Nayarit, and Mexico City in spring 2008. The authors hope this report is useful to: stakeholders and decision-makers within the chain and in the public arena; researchers interested in the topic who wish to build on lessons learned or further analyze issues presented here; and financial institutions motivated to understand opportunities and risks in serving the Ataulfo mango chain.

Following the executive summary and this introduction, the report comprises four main sections. Below is an overview of the context and national and global trends related to mango production and consumption. The following section offers a basic mapping of the Ataulfo mango value chain including trends specific to the Mexican market and findings related to organic mango production and Ataulfo mango. The next section analyzes the chain's key strengths and weaknesses and the final section offers conclusions and recommendations on upgrading opportunities and actions to be taken.

# MANGO CONTEXT AND TRENDS

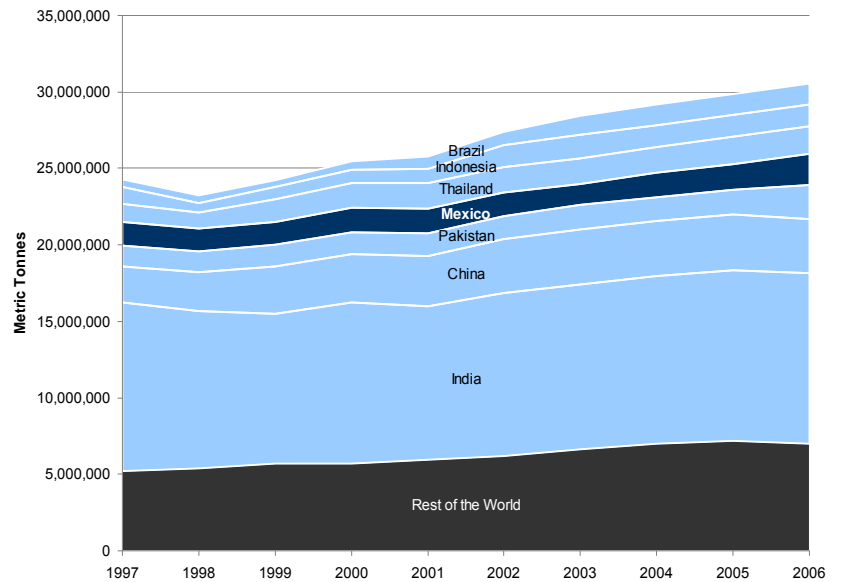
## WORLD OVERVIEW

World mango production<sup>1</sup> in 2006 stood at just over 30 million metric tons. Figure 1 shows Principal origins contributing to this production and the overall growth trend in mango production. India remains the dominant world producer, with 36% of global production, followed at a considerable distance by China, with only 12%. The next eight volume leaders combined amount to roughly India's annual production.

The vast majority of the world's mangoes are consumed in the country where they are grown. In 2005, only 912,000 metric tons entered global trade channels, representing just 3% of global mango production for that year. Of the 11.1 million metric tons grown in India, for example, 98% of the crop is consumed within its domestic market, although India has increased its participation in the world export market and in 2005 overtook Mexico as the world's largest mango exporter in terms of volume. Still, the ranking among world export leaders is distinct from that of production, with greater presence among western hemisphere exporters, as shown in Figure 2.

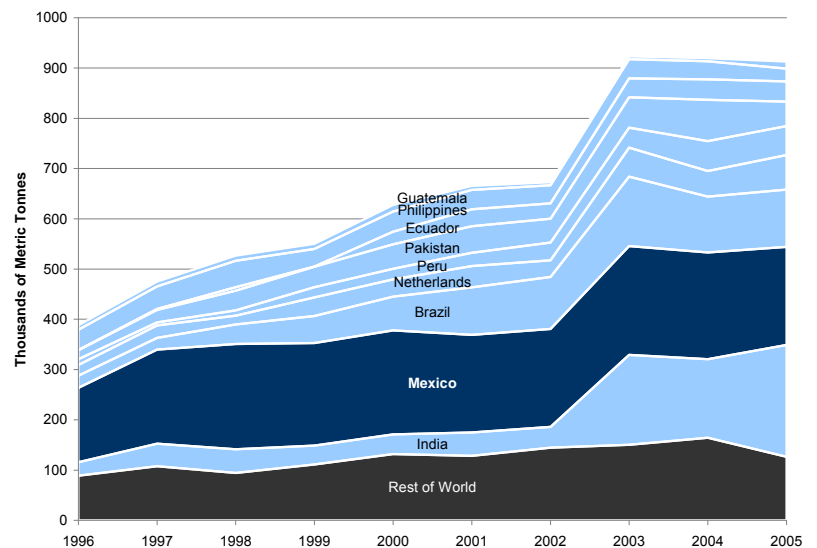
Over the past 40 years, the rate of growth in export volumes has been remarkable. From 1966-2005, world mango exports have grown from 7,200 MT to 912,000

FIGURE 1: WORLDWIDE MANGO



Source: FAOSTAT

FIGURE 2: WORLDWIDE MANGO EXPORTS



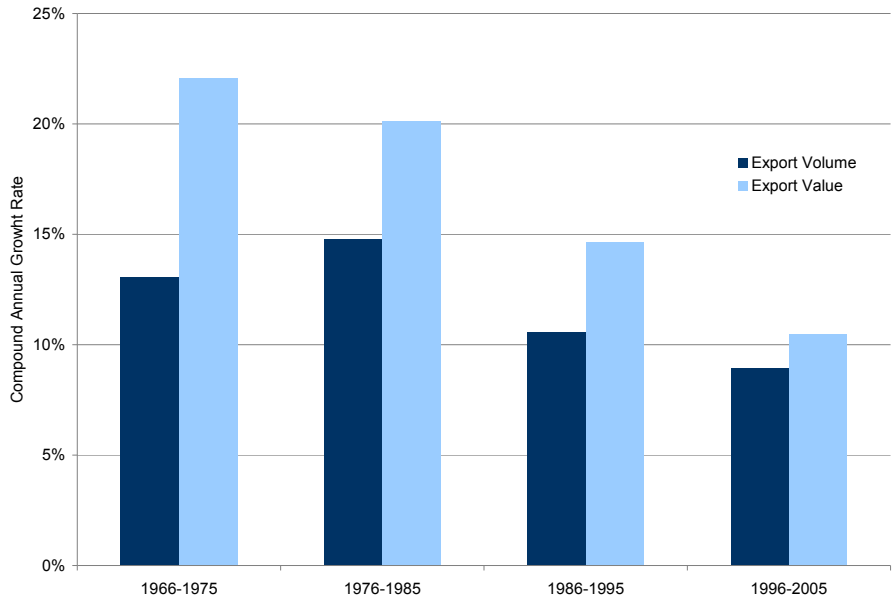
Source: FAOSTAT

<sup>1</sup> Including all varieties of mango.

MT, an annualized growth rate over this 40-year period of 13%. Growth in gross export values has also been impressive. Export revenues over the same period rose from just over US\$1 million in 1966, to US\$543 million in 2005, a compound annual growth rate of 17%.

Concealed behind these positive growth numbers, however, are some negative trends over the past ten years that have stripped much of the fun and profit from the export mango business. Figure 3 shows the volume growth trends over the 40-year period from 1966-2005, decade by decade, along side the gross value increases in the global mango trade over the same period.

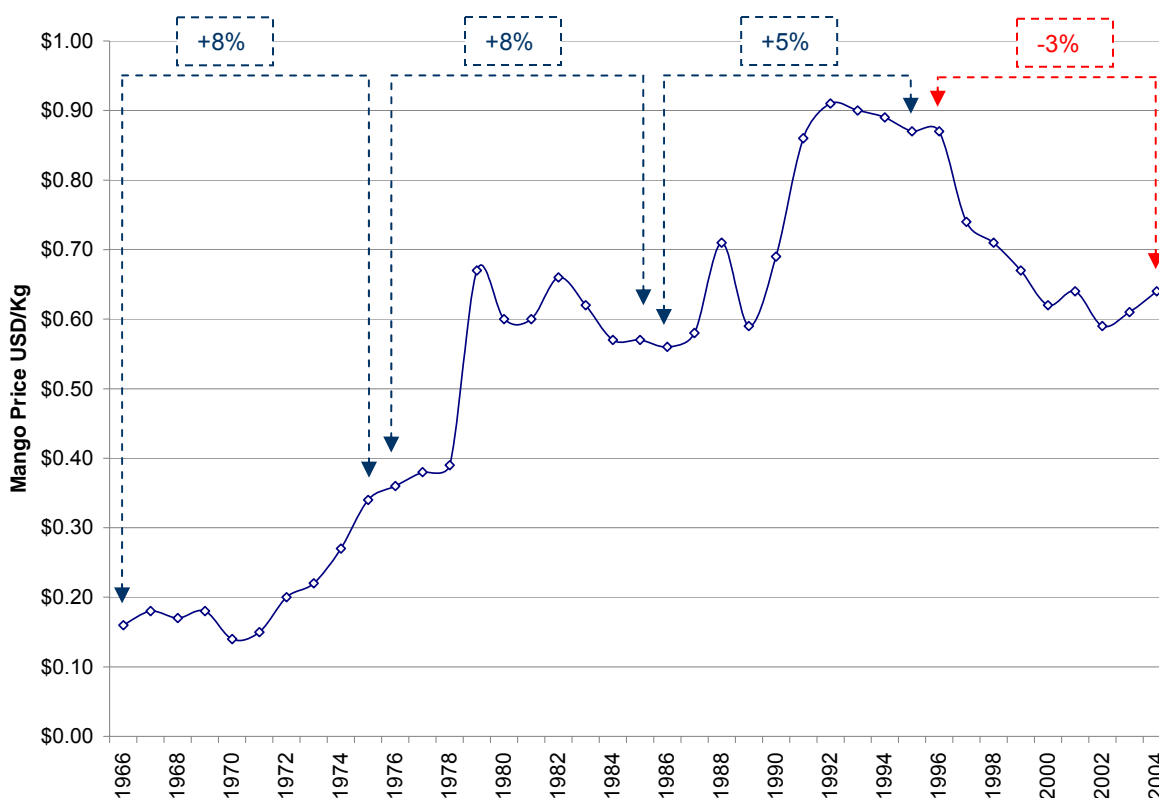
**FIGURE 3: MANGO EXPORTS: 10-YEAR ANNUAL GROWTH RATES (1966–2005)**



The decade from 1966-1975 saw compound annual growth of 13% in volume, and of 22% in revenues, leading to an aggregate 9% annual increase in unit revenues received. While volume growth during the decade from 1976-1985 continued to accelerate, reaching 15% per annum, gross value and unit revenue growth slowed to 20% and 5%, respectively. This trend continued through to the current period, with rates of growth in values coming more into line with rates of growth in volumes.

Figure 4 displays the trends in unit selling prices (showing annualized rates over 4 decade-long periods) that have accompanied this growth in the worldwide mango trade. This downward trend in selling prices dates back to 1997 when, after a six-year period when prices per kilo peaked in the \$0.86-\$0.91 (USD/kg) range, prices per kilo fell off dramatically, settling into the \$0.60-\$0.65/kg range in recent years.

**FIGURE 4: WORLD UNIT MANGO SELLING PRICES (USD/KG) & ANNUALIZED RATES OF INCREASE (1966–2004)**



Source: FAOSTAT

This phenomenon of declining unit prices appears to have affected all major western markets, as can be seen in Table 1. In France, Germany and Great Britain, prices have fallen steadily from 1997 through 2001 (2000 in the case of France).

**TABLE 1: WHOLESALE PRICES OF FRESH MANGO, MAJOR EU MARKETS DURING 5-YEAR PERIOD OF AGGREGATE PRICE DECLINES (1997–2001)**

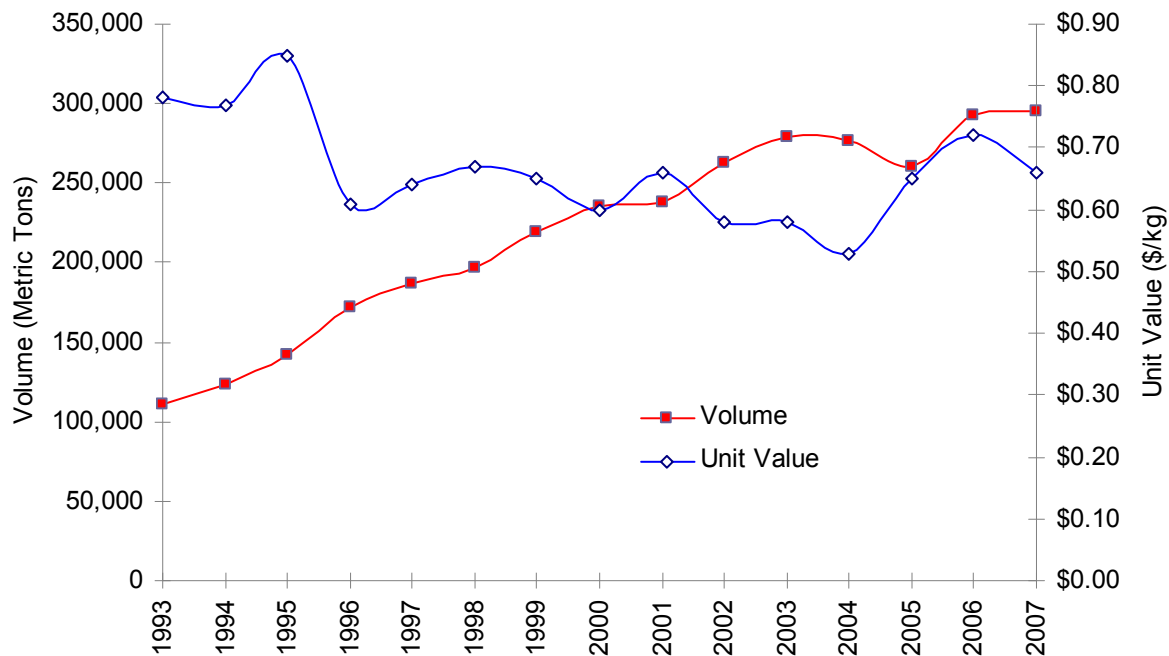
	1997	1998	1999	2000	2001	5-year % change
France (FF/Kg)	11.21	12.04	11.5	10.83	11.03	-0.3%
Germany (DM/Kg)	3.22	2.42	2.85	3.3	3.06	-1.0%
U.K. (£/Kg)	1.16	1.15	0.96	0.95	0.93	-4.3%

Source: FAO-Tropical Fruit Statistics, 2003

The United States market has been no exception to this trend. As shown in Figure 5 below, the past 15 years have seen US fresh mango imports grow at an annualized rate of 7%, while average unit values have declined at an average rate of 1% per annum. While prices recently have improved somewhat from their low point of \$0.53/kg in 2004, they remain well below the peak price of \$0.85/kg in 1995.

As global export volumes have expanded, the market for mangoes has progressively moved beyond its ethnic roots into the mainstream consumer markets. In the process, it has come to be seen as less of an exotic specialty item, and more of an everyday commodity. This commoditization of the fresh mango market has led it to lose the protection it enjoyed in its period as an ethnic commodity, supported by core consumers whose demand was highly inelastic. Instead, it is now fully subject to the same challenges of product loyalty and price competition as any other everyday commodity in the produce arena. Within this context, as with other commodities, success is largely dependent upon large scale, meeting minimum standards, low cost of operation, and product differentiation.

**FIGURE 5: US MANGO IMPORTS (MT) AND UNIT VALUES (USD/KG)**



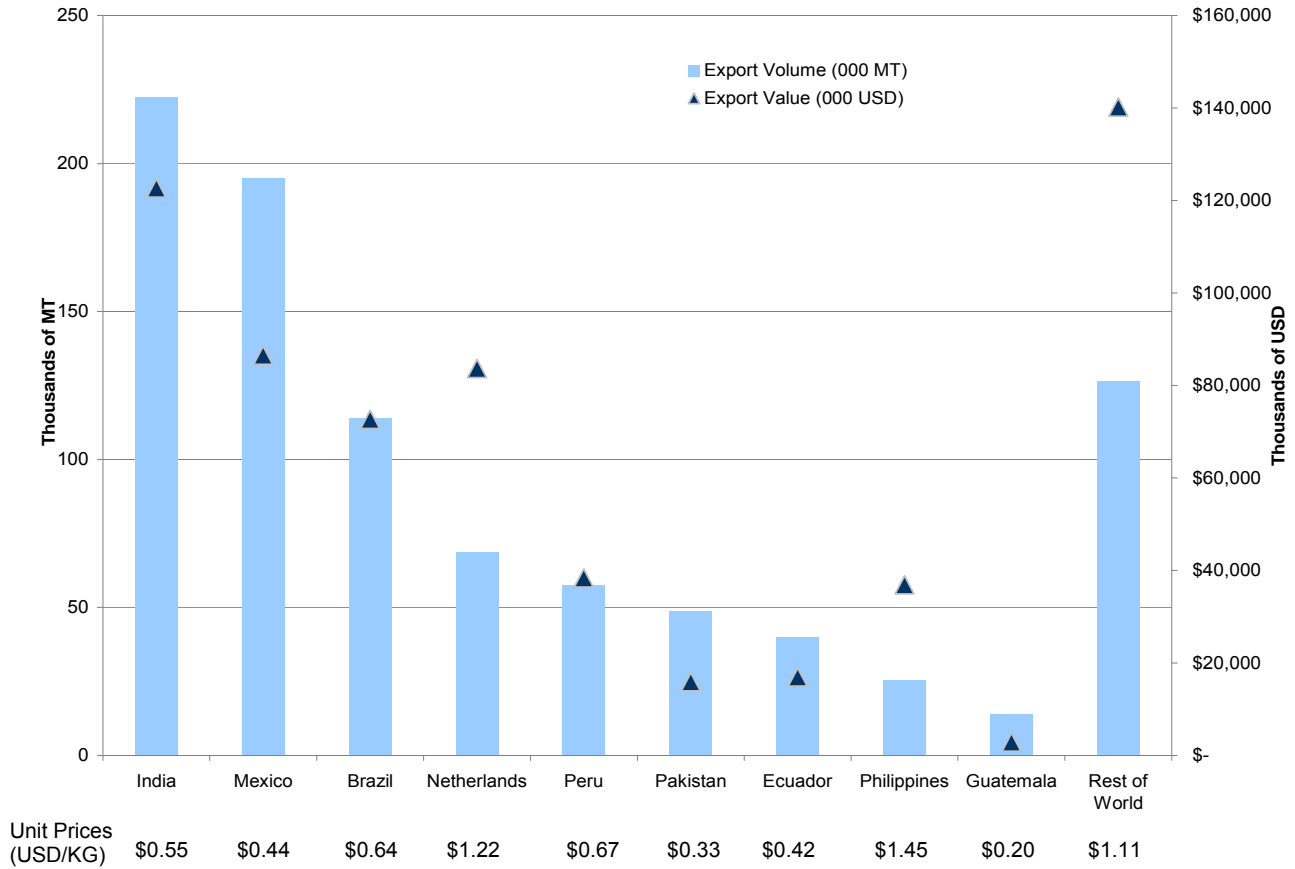
Source: USDA, Foreign Agricultural Service

Within this commoditized environment, there are still variety/origin combinations which have been able to sustain a differentiated identity. The Ataulfo from Chiapas and the Francique from Haiti into the United States market, the Carabao from the Philippines into Japan, the Chaunsa from Pakistan, as well as several of the Indian varieties (Alfonso and Banganapalli, among others) into the United Kingdom, still trade in limited volumes to an audience of ethnic “connoisseurs” who are prepared to recognize a premium value for a premium organoleptic experience.

This type of intra-sectoral product differentiation does not appear to operate with respect to the ‘mass-market’ Florida mango varieties, such as the Tommy Atkins, Haden, Kent and Keitt varieties, which dominate the markets of the Western Hemisphere. It is these latter varieties which constitute the majority of exports from Mexico, Brazil, Peru, Ecuador and South Africa, as well as from the exporting countries of West Africa. The scale of export production, as shown in Figure 6, favors the four main Latin

American exporters (Mexico, Brazil, Peru and Ecuador), which together accounted for 45% of world mango exports in 2005 in terms of volume.

**FIGURE 6: PRINCIPAL MANGO EXPORTING COUNTRIES (2005)**



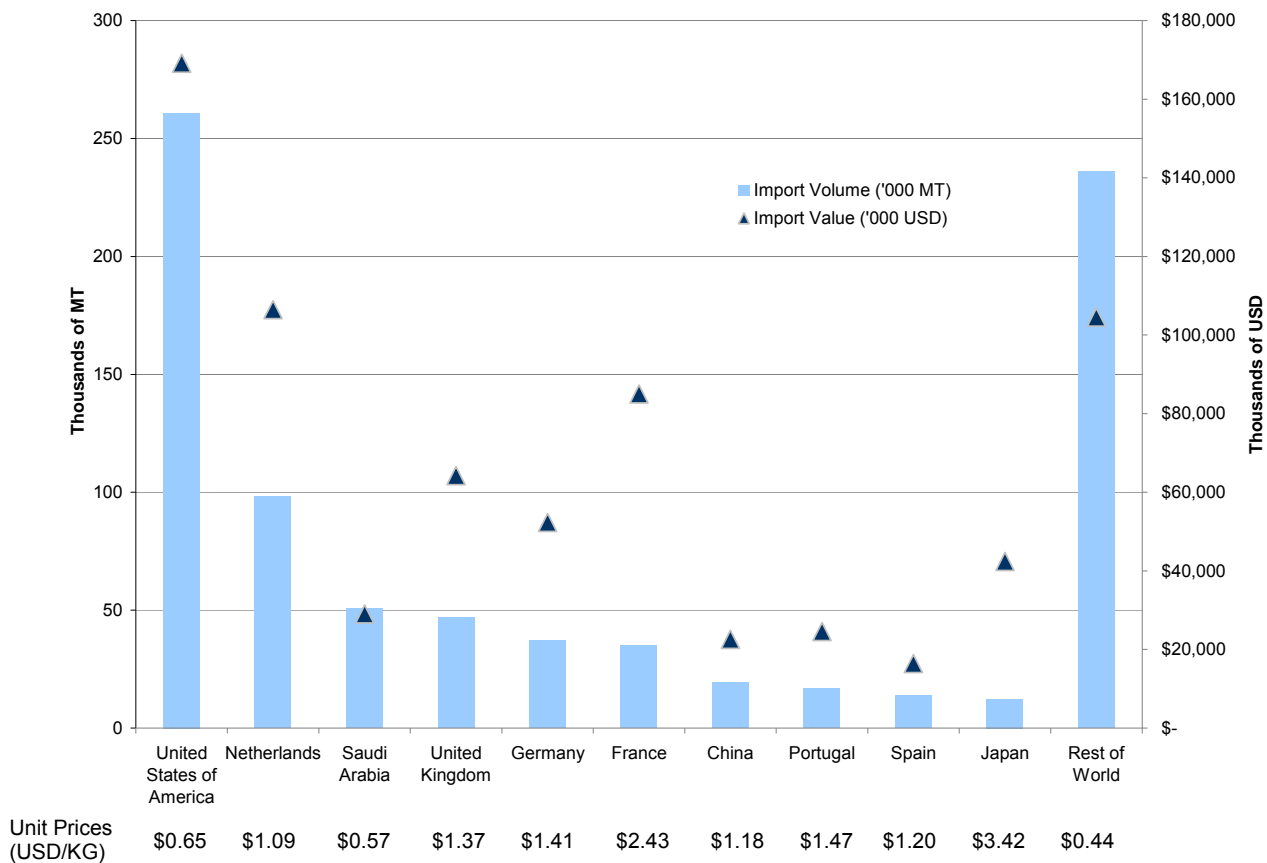
Source: FAOSTAT. Note: data for Philippines for volume and value s for 2004 (2005 unavailable)

Mexico ships from February through August. Brazil operates from September through November. Peru and Ecuador export from November through February, before handing the baton back to Mexico. Even with the overlapping supply calendars of the Latin American origins, there are occasional openings in Europe and North America when events delay the start or accelerate the end of a given country’s seasons. While these events can create sharp run-ups in spot prices, they are not predictable, nor do they form the basis for a sustainable market strategy.

## U.S. MANGO MARKET

US mango imports are examined in some depth here because, apart from the fact that there is reliable data available (not the case for the domestic market), Mexico is its main supplier and because exports generally represent the highest value attainable to producers from Chiapas. It is worth noting, however, that in interviews, some small *producers* indicated that they were getting better prices in 2008 selling into the national market. As shown in **Error! Not a valid bookmark self-reference.**, the United States is, by a healthy margin, the major importer of fresh mangoes in the world. In 2003, it accounted for 34% of global import volumes and 27% of global import values.

**FIGURE 7: PRINCIPAL MANGO IMPORTING COUNTRIES (2005)**



Source: FAOSTAT.

## U.S. MANGO MARKET

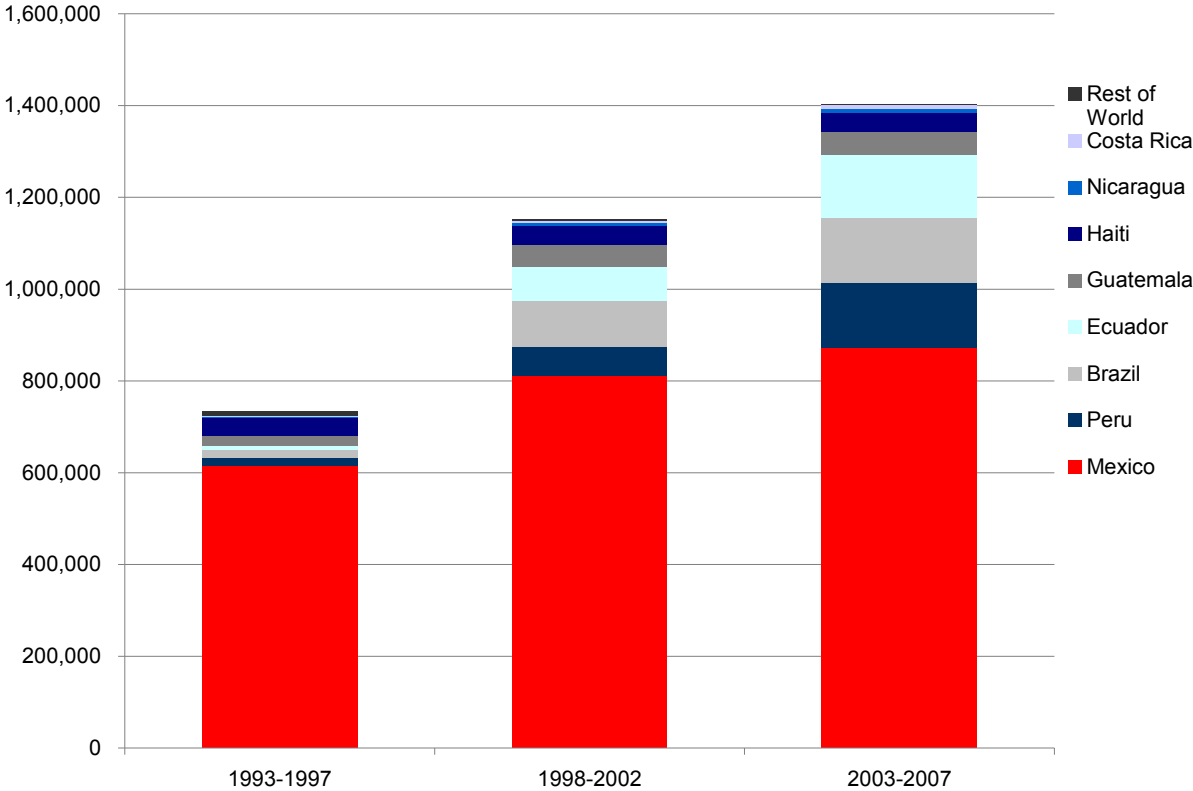
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**FIGURE 8: US MANGO IMPORTS BY COUNTRY (5KG CARTONS) (1993–2007)**



Source: USDA/FAS.

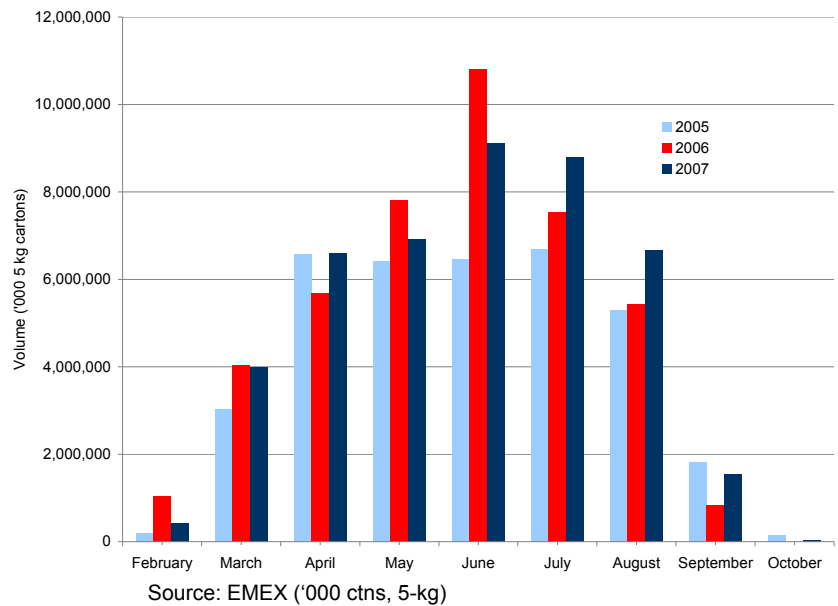
Over the past 15 years, US mango import volumes have grown at an annualized rate of 7.3%, while import values have increased at a rate of 6.1% per annum. The dominant source for mango imports into the United States is Mexico, which accounts for more than 60% of all mangos consumed in the United States. Although Mexican volumes over the past fifteen years have nearly doubled (from 94,000 MT in 1993 to 184,000 MT in 2007), its share of the US mango market has actually declined (Figure 8) over the same period from 85% in 1993 to 62% in 2007, with similar trends on an import value basis.

This decline in market share derives less from any failings on the part of the Mexican mango industry, than from the dramatic growth of counter-seasonal Southern Hemisphere origins (Brazil, Ecuador and

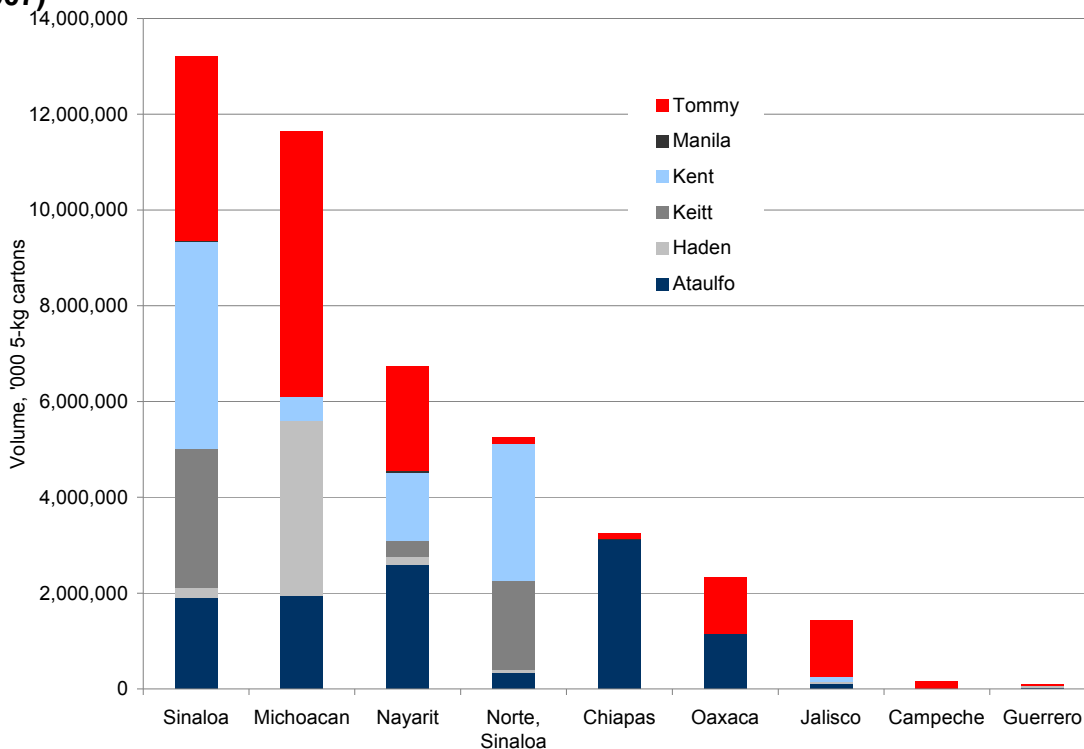
Peru) in response to year-round demand from consumers and supermarkets in the USA. While these three countries claimed only a 5% share of the US market on an aggregate volume of 6,000 MT in 1993, their share had risen by 2007 to 29%, on an aggregate volume of 85,000 MT.

Even with this onslaught from the Southern Hemisphere origins, Mexico still supplies the US market with over 60% of its fresh mangoes, dominating the market from March through September (Figure 9). The varietal distribution, divided by Mexican state of origin, appears in Figure 9. The leading variety is the Tommy Atkins (33% of all shipments), followed by Ataulfo (25%) and Kent (21%), with Keitts, Hadens and Manilas combining to make up the remaining 21% (with Manilas consumed primarily in domestic markets). In terms of states of origin, the two districts of the state of Sinaloa contribute 42% of all exports to the United States, with Michoacán a distant second place at 26%. Six other states (including Chiapas at 7% overall, but leading in Ataulfo exports) combine to make up the remaining 32%.

**FIGURE 9: MANGO EXPORTS BY MONTH (2005–2007)**



**FIGURE 10: MEXICAN MANGO EXPORTS TO THE US BY VARIETY, BY STATE / REGION (2007)**



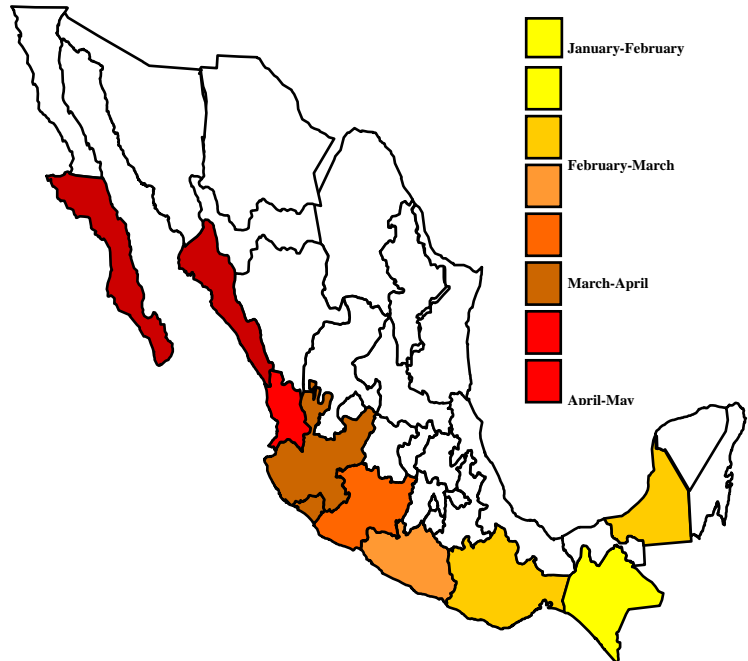
## MANGO PRODUCTION IN MEXICO

The national mango chain, for all varieties, involves an estimated 40,000 producers, generating an estimated 90,000 jobs directly and about 300,000 indirectly.<sup>2</sup>

The main mango producing areas are located on the Pacific regions (Figure 11) and production moves up the coast during the course of the season, which extends from January to September, reaching its highest point during the months of June and July. Prices often hit their highest point at the beginning of the year, benefiting producers in the states of Chiapas, Campeche, Guerrero and Oaxaca. From May to July, high production levels decrease prices.

Manila is the most produced variety in Mexico, and its main target is the domestic market since its shelf life is short, its handling is delicate and unlike the Ataulfo, it does not stand up to hot water treatment required in countries such as Japan, and the U.S.

FIGURE 11: SEASONALITY OF MEXICAN MANGO



Source: Leading Program for Mango Production System, Rural Development Ministry (SDR), SAGARPA, Chiapas. 2004.

## IMPORTANCE OF THE ATAULFO MANGO CHAIN IN CHIAPAS

Mango production is the sixth most important agricultural activity in the southeastern state of Chiapas in terms of cultivated surface, after corn, beans, coffee, sugar cane and cocoa.

Ataulfo production in Chiapas is concentrated (but not exclusive to) in the Soconusco coastal region in the southeastern part of the state. Although there are no recent verifiable production statistics covering Ataulfo production in Chiapas, producer organizations in the region indicate there are 18,000 hectares of Ataulfo mangoes in production in the state, yielding an average annual production in the neighborhood of 100,000 MT. With an estimated 5,800 growers engaged in Ataulfo production in Chiapas, this leads to an average production area of some 4.5 hectares per grower, within a range of less than 1 Ha to 1,500 Ha.

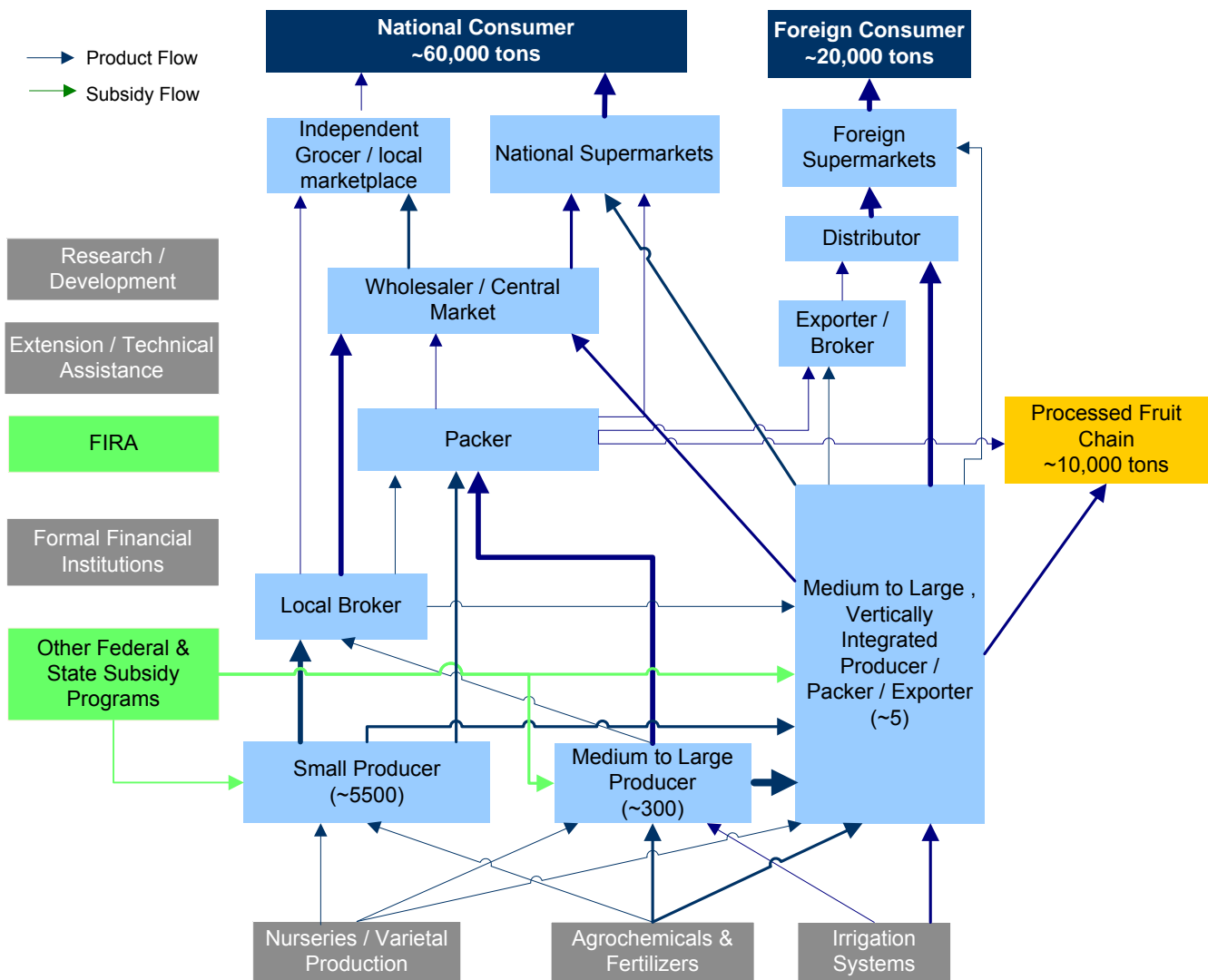
Environmental analyses indicate that the Soconusco region is important for **biodiversity**, in particular for the biodiversity that its coastal system of mangroves supports. The Ataulfo is a native species to the region and, as a perennial tree crop, can be, although not always is, cultivated at low environmental impact. Further analysis is recommended in Section 6 to understand current and potential impacts on biodiversity.

<sup>2</sup> Secretaría de Desarrollo Rural (SDR) "Plan Rector del Sistema-Producto Mango." Fomento económico de Chiapas, A. C. SAGARPA. Chiapas, México. 2004.

# VALUE CHAIN DESCRIPTION FOR ATAULFO MANGOES IN CHIAPAS

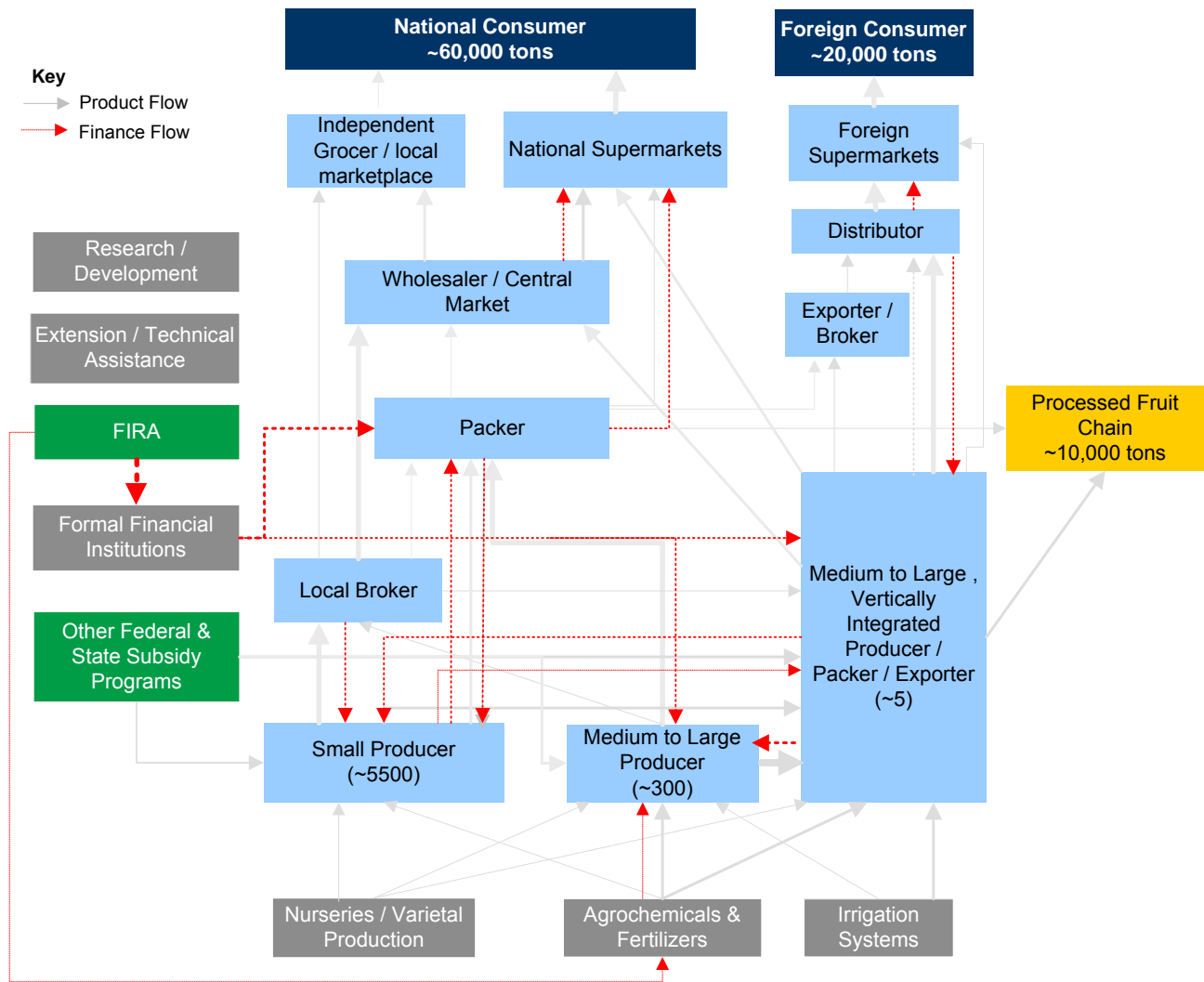
Figure 12 below illustrates the value chain dynamics observed in the field analysis, which are described in this section. The first chart shows product flows throughout the chain, as well as subsidy flows in green. Thicker arrows indicate higher volume flows through specific channels.

**FIGURE 12: CHIAPAS ATAULFO MANGO VALUE CHAIN**



Each part of this section addresses an aspect of the chain, with financial flows addressed within the broader analysis, and with formal financial services addressed in section 0. Figure 13 shows the financial flows observed in the field analysis (red dashed arrows) superimposed over the product flows (light grey) shown in the previous figure. The financial flows include both formal financial services provided by financial institutions (described in Section 4.7) as well as trade finance flows internal to the chain, described throughout Section 4 and synthesized in Section 5.1.5. Again, thicker arrows indicate more prevalent financing schemes observed in the field analysis.

**FIGURE 13: FORMAL AND INFORMAL FINANCIAL FLOWS IN THE CHIAPAS ATAULFO MANGO VALUE CHAIN**



## INPUTS AND NON-FINANCIAL SERVICES

At the level of **production inputs**, the Ataulfo mango chain in Chiapas includes suppliers of fertilizers, agrochemicals, tools, machinery, irrigation equipment, packaging materials, as well as nurseries for planting and grafting. The areas visited on the coast of Chiapas have access to inputs near production areas, as well as service providers for harvesting, pruning, spraying fertilizers and pesticides, technical audit services to verify compliance in the campaign against fruit flies, SAGARPA (Agriculture Secretary) approved phytosanitary checkpoints, installation of irrigation systems, and transport. Smaller producers tend to have very limited access to technical assistance, and as discussed below, extension services.

Some input suppliers as well as some buyers provide technical assistance to producers as part of commercial transactions (*embedded services*) that has real value. In other cases “assistance” amounts to an excuse to charge commissions. For larger producers, vendors of fertilizers, crop protection products, nursery stock and cartons, were found to be providing up to P100,000 of trade credit for up to 60 days.

Irrigation equipment providers show a general lack of interest in smaller growers as a potential market. Furthermore, there have been no serious efforts to demonstrate the benefit of irrigation to potential customers. One irrigation provider also indicated that local (state-wide) water sources being unfit for drip systems, at least not with currently available standard filters. Further analysis of this issue may be warranted, given the appropriateness of drip irrigation for smaller producers, as well as the more efficient use of water through such systems.

Packers access a wider range of service providers, including maintenance staff for hot water treatment equipment, electrical systems, refrigeration, mechanical equipment, pest control professionals, transport, and audits to ensure proper agricultural practices, among others.

## PRODUCTION

Although there is a lack of reliable data available on production in general, interviewees provided an approximate distribution for Ataulfo mango producers in Chiapas, outlined in Table 2. Of medium and large producers, at least 5 are vertically integrated, with three of them managing packing houses as well as stalls in the wholesale market in Mexico City, and at least two extended to mango distribution in the US and Canada.

Despite various problems and uncertainties producers express, particularly related to decreased productivity of Ataulfo trees without a rigorous understanding of what may be causing the decline (described in further detail in section 1.0 below), most Ataulfo growers in the Soconusco seem to have found ways of operating that permit them to generate sufficient margins to stay in the game. Of all the growers we met, only two spoke seriously of the prospect of losing their farms; in both cases, this was due to unfortunate commercial decisions leading to large uncollectible receivables, and not to production constraints (although declining productivity is a key issue for the sector as discussed below). Estimates of profitability per hectare ranged from a low of P500/ha (which still

**TABLE 2: MANGO PRODUCERS IN THE REGION BY SIZE**

Producer Size	Size of Plot	Estimated Number of Producers
Small Producer	<50 hectares	5,500
Medium Producer	51-100 hectares	260
Medium-large Producer	101-500 hectares	30
Large Producer	>500 hectares	10

represented a 30% return on sales of only P1,500/ha), to as much as P16,000/ha for the largest and most technologically advanced operations of conventional Ataulfo.

Although access to services through formal financial institutions is restricted in the case of producers, particularly small producers, trade credit options do exist within the chain for some producers. Figure 13 illustrates financial flows, including trade credit flows, between input suppliers and growers, and between buyers and growers in the form of advance payment for goods and services.

To finance orchard preparation and harvest, producers often access loans from packers. In some cases, formal loan contracts are written (sometimes only in English) for such advances whereas in other cases the loan is based on verbal agreement and informal documentation. The team observed loans that had zero nominal interest rate, but that tied the producer to less favorable conditions on sales than they otherwise would have attained. This amounts to an implicit (often high) fee on the loan. Another case had an explicit interest rate and no hidden commissions, with the loan to be paid in fruit at harvest.

Packers may also provide fertilizers or other inputs to producers on credit, after purchasing the inputs in bulk (at lower costs due to volume). In some cases the cost savings are passed on to growers, while in others, packers pocket the difference.

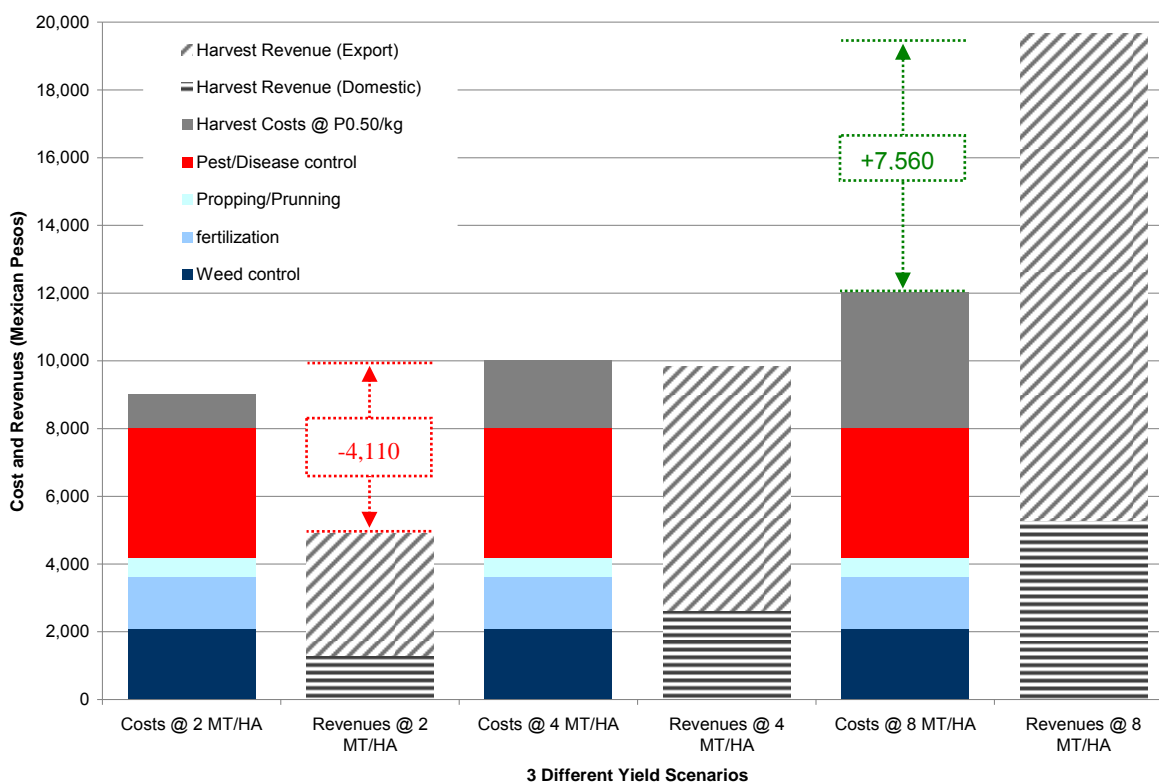
An important characteristic observed in trade credit flows is that they often flow both ways, from producer to packers at one level and from packers to importers and supermarkets at another at different stages during the season. That is to say, buyers demand financing from providers in the form of delayed payment as a sale condition.

### **THREE PRODUCTION COST / RETURN SCENARIOS**

This section outlines three distinct production cost and return scenarios, each with its own assumptions, regarding costs, yields and market returns that are based on cases observed in the field analysis. Clearly, many other combinations of inputs, costs, yields and revenues exist, but these three scenarios illustrate combinations currently practiced in Chiapas for the production of Ataulfo mangoes, and provide a basis for sensitivity analysis of different approaches and yield fluctuations. Data tables and complete detail on assumed costs, prices and returns for each scenario are included in Annex A.

Scenario 1 models a conventional Ataulfo grower using agricultural practices based on the recommendations of INIFAP-Tapachula, and selling 60% of production into export channels (at P4.50/kg) and 40% into National channels (at an average of P1.10/Kg). Total costs, including harvesting, amount to P12,030/Ha at the 8,000 kg yield level. With this level of pre-harvest costs, a yield of 8 MT/ha would generate a favorable margin of almost P7,650/Ha, while a yield of 2 MT/Ha would generate a loss of P4,110/Ha. The break-even yield for this scenario is 4 MT/Ha.

**FIGURE 14: SCENARIO 1—INIFAP RECOMMENDED INPUTS, EXPORT & DOMESTIC COMMERCIALIZATION**

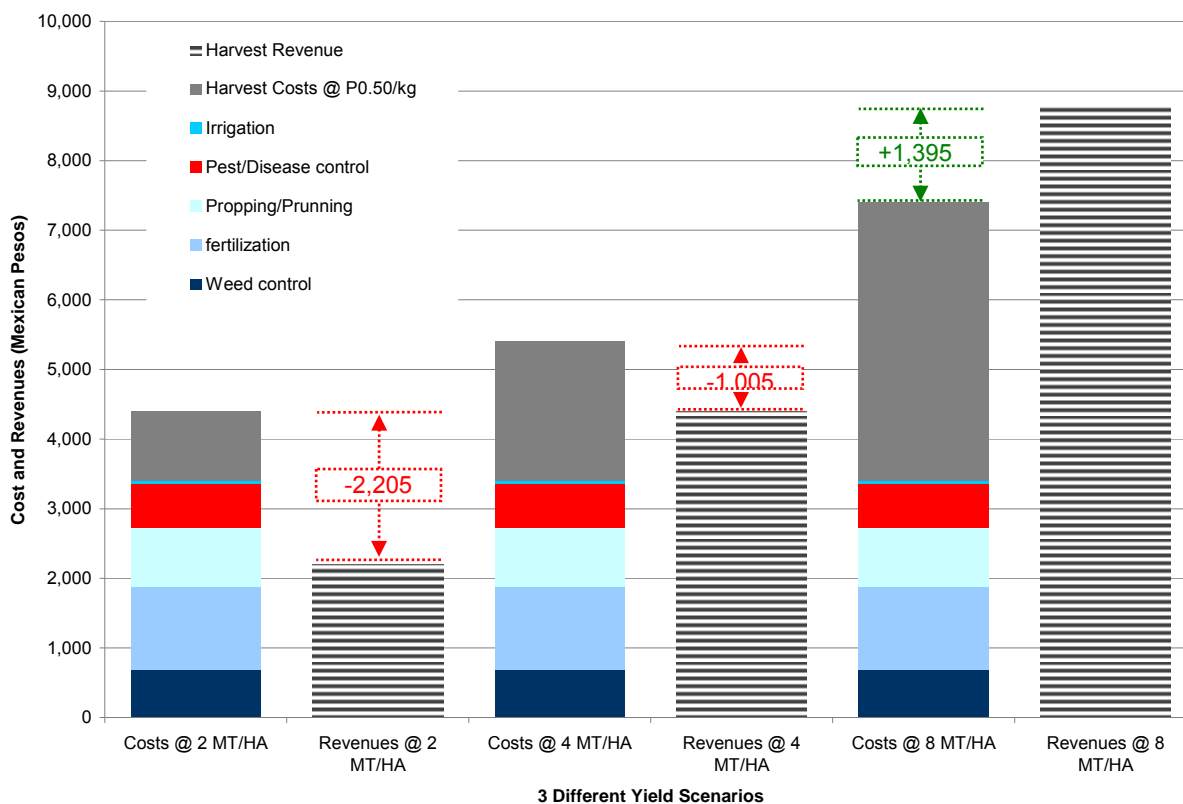


The second scenario is based on data received at the Ejido Alvaro Obregon, and describes costs and revenues for a 13 hectare orchard with irrigation, based on a selective package of inputs and field practices. Costs here are generally less per hectare than under the first scenario, particularly with regard to weed control, and pest/disease control. In both practices, chemical applications are substantially less, although hand labor practices remain in effect. Since the fruit from this orchard is sold to an intermediary (“coyote”) who pays cash at the farm gate for the entire harvest, any incremental revenue for the export portion of the production is captured by the intermediary, and the grower realizes **only the domestic price** for the entire harvest. The grower does, however receive payment upfront, without delay so there is a finance cost implicit in other forms of commercialization (especially for export and supermarket channels) that is avoided in this case (opportunity cost of the time value of money to the grower).

Total costs, including harvesting, amount to P7,500/Ha at the 8,000 kg yield level. With this level of pre-harvest costs, a yield of 8 MT per ha would generate a favorable margin of almost P 1,400/Ha, while a yield of 2 MT/ha would generate a loss of P2,205/Ha. The break-even yield for this scenario stands at 5.7 MT/Ha.



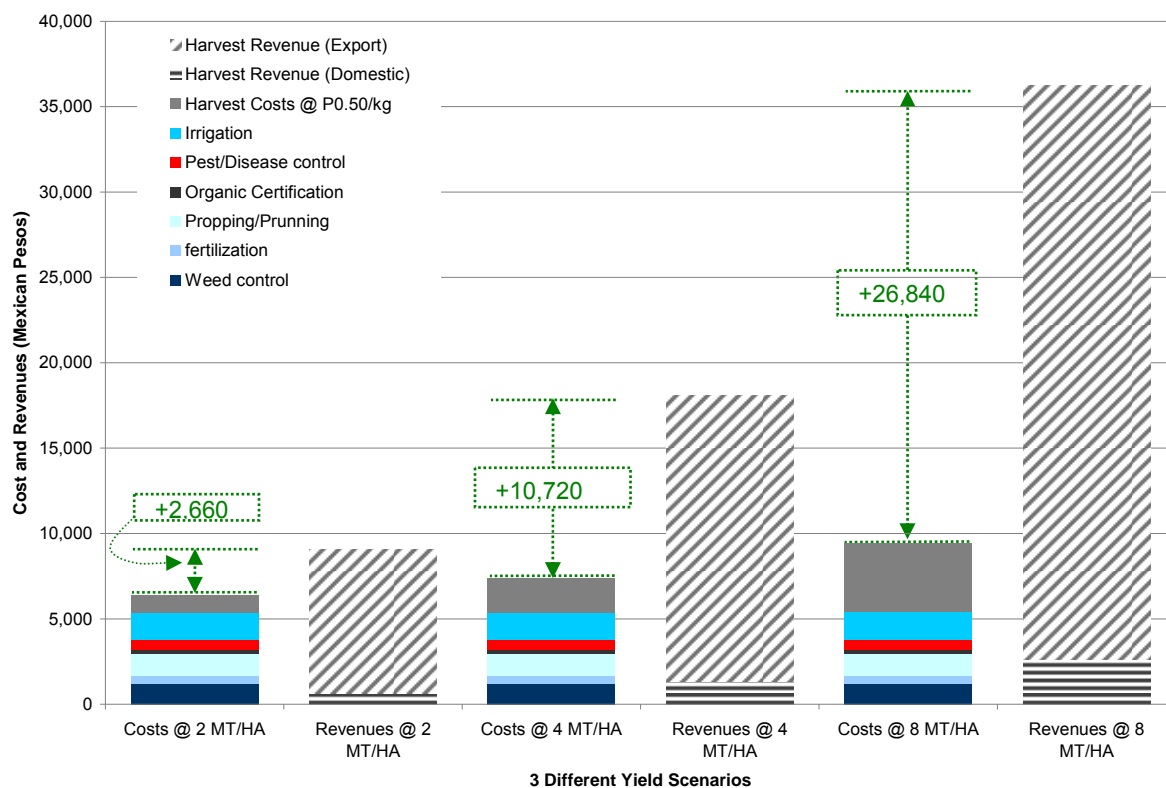
**FIGURE 15: SCENARIO 2—SELECTIVE INPUTS, DOMESTIC COMMERCIALIZATION, LOCAL INTERMEDIARY**



The third scenario provides the value chain depiction for an organic grower, farming 50 hectares. Since there are very few organic growers in Chiapas, and it would be impossible to ensure confidentiality for the limited number of large-scale organic growers in this type of analysis, we have chosen instead to present figures based on an analogous operation in the state of Nayarit. The values presented here have been reviewed with Chiapas organic growers, and are deemed to be representative for that origin as well. The most striking differences here reside in the export utilization, and in the revenue per kg. Because of the “demand-exceeds-supply” status of organic Ataulfos in the United States, organic growers are able to find export outlets for 70% of their total harvest. Moreover, this export volume is able to command a 30-35% premium over conventional prices.

The net result, in this scenario, is a cost of P9,400/Ha at the 8 MT yield level. With this level of pre-harvest costs, a yield of 8 MT/Ha would generate a favorable margin of almost P26,840/Ha, while a yield of 2 MT per ha would still generate a positive margin of P2,660/Ha. The break-even yield for this scenario stands at 1.4 MT per Ha.

**FIGURE 16: SCENARIO 3—CERTIFIED ORGANIC PRODUCTION, 70% ORGANIC EXPORT CHANNEL**



While organic Ataulfo production in Chiapas is limited, it is worth mentioning that there is one large grower in Tapachula with about 85 Ha of certified organic production who sells on consignment to a local certified organic packing plant. Some small producers, including 10 members of the local Fruit Producers Association of Mazatán (totaling about 40 hectares), are awaiting certification, another 15 to 20 small producers (with about 50 hectares) are in process of transforming to organic production, and others have shown interest.

The production and commercialization scenarios presented above highlight the importance of yields. Clearly, at high yields, all producers do well, even given the very different agricultural practices and pricing potential. Perhaps even more important than yields in determining returns, however, is access to attractive commercial channels. As scenario three shows, depicting certified organic production sold at a premium into the export market channel, returns can be positive even at very low yields where prices are high, as they are in the organic Ataulfo niche.

## PACKING

Packers may be owners of mango plantations, handle third party production from independent producers, purchase fruit already packed, or some combination thereof. To export Ataulfo mango to the markets in the U.S. and Japan, hot water treatment is required for phytosanitary compliance.<sup>3</sup>

Fruit destined for the US market must come from growing areas certified as having a low density of fruit fly infestation, and must also be subjected to the USDA/APHIS-PPQ protocol for hot water treatment before it can be approved for shipment. For field control procedures, the sector is under the control of the *Junta Local de Sanidad Vegetal de Fruticultores del Soconusco*, which is responsible to the Agriculture Ministry's *Departamento General de Sanidad Vegetal* for surveillance of pest populations throughout the 18,000 Ha of Ataulfo in Chiapas, and for aerial fumigation as needed. The first hot water treatment facility (at S.P.R. Asake) in the Soconusco entered operations in the late 1980's. At present there are 11 APHIS-approved facilities operating in the region, with capacity to process in excess of 16,000 MT per campaign.

Size, color, consistency and ripeness standards are important selection criteria for packing plants, although phytosanitary compliance is essential sector-wide to maintain market access. When inspectors find live fruit fly larvae, the fruit is confiscated and destroyed, and (ideally) traced back to the packer and orchard from which it came, assuming tracing data is available. The responsible orchard and/or packer are cut off from access to the US market for a short period. If larvae cannot be traced back to a specific area, or if the process for phytosanitary compliance is compromised, the region risks losing access to the US market. A market closure is unlikely when controls are in place and followed, but if it were to happen, it would cut off a major commercialization channel causing a glut in the domestic market and depressing prices.

Around 85 Ataulfo mango packers operate in the Soconusco region, including packing plants without hot water treatment, as well as packing with thermal treatment certified for US export. Table 3 shows the approximate breakdown of packing plants in the region, based on field review and interviews.

Export packing plants that the team visited export 50-90% of their volume to foreign buyers in the US, Canada and, to a much lesser extent, Europe. Some buyers provide advances (which is then sometimes on-lent to producers) prior to the

harvest season. Advances are paid off in fruit over the course of the harvest as buyers credit shipped fruit against loans made to packers. Once the balance is paid off, the packer is in effect advancing fruit to the buyer, who pays for the remainder of the fruit after final shipment. Packers reported payment terms on shipped fruit ranging from 21-60 days for export sales, which in most (but not all) cases were replicated with producers.

**TABLE 3: MANGO PACKING PLANTS IN THE SOCONUSCO**

Type of Packing House	Number of Packing Houses
Export	<ul style="list-style-type: none"> <li>• 11 to US</li> <li>• 5 to Canada</li> </ul>
Domestic distribution	<ul style="list-style-type: none"> <li>• 20 with formal infrastructure, packing about 65% of domestically distributed Ataulfo from Chiapas</li> <li>• 50 home-style, packing about 35% of domestic distribution.</li> </ul>
Organic Certified	<ul style="list-style-type: none"> <li>• 1 currently certified and functioning</li> </ul>

<sup>3</sup> At a temperature of 46°C during ninety minutes to kill the fruit fly maggot.

**Payment to producers** ranged from 8-15 days for domestic markets and longer, up to 60 days, for packing houses selling into export markets and supermarkets (basically sold on consignment in many cases), often including partial payment upon delivery. While some packers pay producers for the exact number of cases sold (some of whom require “*copete*” or over-packed cases, while others accept normal packing) others discount fruit (when practiced, 1 in 10 cases is commonly “discounted”).

Occasionally, foreign buyers have provided **investment loans** to packers to expand operations and increase the volume of fruit to which buyers get preferential access. In one case, after building a long-term commercial relationship, a foreign buyer provided long-term capital to upgrade and expand a packing house, with the loan paid off over time in mango exports. Although export packers generally have access to financial services (directly through banks and often backed by the government fund FIRA) these buyer-financed investment loans have filled gaps where bank loans were either unavailable or more costly.

## PROCESSING

Processors demand mangoes for production of juices, jams, nectars, canned mangoes, ice creams, concentrates and dehydrated fruit, among others. They generally require standard consistency, but are less demanding with regard to appearance, and tend to buy fruit that doesn’t necessarily meet standards of export packing plants.

Despite good volumes of production and a high-quality product for processing<sup>4</sup>, processors have a very limited presence in the region. There are two industrial-scale dehydrating plants in the region, including one organic certified plant, with many more cottage-scale drying facilities also in operation. There are no aseptic or retort juice or pulp facilities in the state.

There are several local craft companies that manufacture candy, liquor and other products with Ataulfo mango, but the scope of these small businesses are limited to the local market.

Some **trade finance** was found at this level of the value chain, where a foreign buyer provided long-term capital investment for improving organic fruit drying operations in order to meet market demand. Similar to the investment credit offered by an international buyer to a packer mentioned in the preceding section, the team observed one case of a buyer of organic dried mangoes that provided investment loans to expand drying operations.

## COMMERCIALIZATION

Based on discussions with growers and packers in the Soconusco region, fresh domestic distribution channels of distribution (sales to packers, intermediaries, wholesalers or retailers within Mexico) account for about 60%-70%, on average, of the sale of conventional Ataulfo mangoes produced in Chiapas. An additional 20% - 30% moves into export channels, almost all of which is sent to the United States and Canada.

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<sup>4</sup> The *Asociacion de Fruticultores del Soconusco* had an initial analysis conducted of regional Ataulfos that indicated favorable measurements in terms of Brix, fiber, and other qualities, as compared to other varieties. And juicing operations have expressed interest in establishing operations in the region.

While the 20%-30% **export distribution** may serve to describe the state-wide industry as a whole, many of the integrated grower/packer/shipper organizations surpass this average. Indeed, the local INIFAP office indicated to us that a 40% export distribution was typical of many of the export-oriented facilities in the zone. In the case of organic production, moreover, this percentage could be expected to increase up to a level of 70% of the total crop, with only 30% moving into fresh domestic and processed channels as discussed in the scenario analysis in the preceding section.

One result of the success of Ataulfo exporters from the Soconsco is that much of the best fruit from the region appears to bypass domestic wholesale channels. The team found that in the height of the Chiapas Ataulfo season, the highest quality fruit in the domestic wholesale market in Mexico City markets came from Guerrero. Guerrero does not yet have hot water treatment plants to export directly, although interviewees in Nayarit indicated that this is being planned.

In addition to the key role in commercialization played by packers, outlined above, the most representative commercialization channels observed were:

- **Local intermediary.** The producer sells (either post harvest or on-tree in advance) to the local intermediary, who generally pays cash and delivers it to the main regional and local markets. The intermediary selects and sorts the fruit according to the different requirements of the domestic market, the foreign market or industry. Purchasing criteria include the basic phytosanitary conditions of the orchard and fruit ripeness. In this case, producers' transaction costs are relatively low, while opportunity costs can be high. An important aspect of this channel is the quick access to cash at a time of the year when producers tend to be highly illiquid. Therefore, liquidity, or lack thereof, can determine the channel into which fruit is sold.
- **Warehouse Owners at Traditional Wholesale Markets (Central de Abastos).** Warehouse owners buy fruit in large volumes and generally pay in cash. The fruit is channeled to retail markets. Wholesale markets, despite increasing importance of supermarkets, remain important supply centers for supermarkets, and are the main suppliers of public markets (*tianguis*) and other retailers. Traditional wholesale markets in Mexico's main metropolitan areas have been ceding influence to various new wholesale markets in secondary cities that previously depended on

### Supermarket Trends in Mexico

A recent study lead by Thomas Reardon (Michigan State University) and Julio A. Berdegue (Latin American Center for Rural Development) examines the growth of supermarkets in Mexico. Supermarkets grew slowly in Mexico during the 1980s, began to take off in the 1990s and in recent years have shown rapid sustained growth, reaching nation-wide coverage and gradually taking market share in the category of fresh fruits and vegetables. The five largest chains in Mexico—Wal-Mart de Mexico, Soriana, Comercial Mexicana, Chedraui and Gigante\*—have top-line annual growth of 20%, through a combination of new openings and sales growth through existing stores. Total sales are now roughly equivalent to twice the value of Mexico's food exports.

Supermarket chains are expanding their presence within large cities in the central and northern regions, while also growing in medium and small cities (with different models and smaller structures), having recently expanded into southeastern Mexico. In addition to differentiated structures, supermarket chains also are differentiating supply, quality, and pricing by branch based on local market characteristics.

In the US and Europe, supermarkets operated for many years before buying fresh fruits and vegetables directly from producers, but Mexican supermarkets are moving more quickly. While in the past supermarkets in Mexico obtained fresh fruits and vegetables mainly from wholesale channels, now they are complementing and gradually replacing that source through combinations of local intermediaries and producers.

Of particular relevance to small producers, the supermarkets are increasingly centralizing their procurement operations, either through their own distribution centers or by procuring directly from large producers. Although a large portion of fresh fruits and vegetables is still supplied by traditional wholesale markets, domestic and international trends, as well as interviews with warehouse owners in wholesale markets, suggest that this channel is declining in relative importance.

\* Soriana purchased Gigante in 2007, converting stores through mid-2008.

the biggest wholesale markets in the largest cities, and especially to supermarkets due to their business strategy to buy through local intermediaries or directly. In the domestic market, the traditional wholesalers are an important channel to supply fruit vendors, grocery stores, restaurants, supermarkets, hotels, industrialization plants, etc.

- **Supermarkets** in Mexico are becoming the main point of sale to consumers, increasingly taking control of traditional channels to set conditions and manage domestic channels. Supermarkets are gaining control of the **governance** of the fresh fruit and vegetable chains, and mango is no exception. Producers that market their fruit through packers linked to supermarket chains may have greater demand for their orchards going forward (if not greater bargaining power) as this channel takes market share from traditional channels. Given the increasing degree of influence supermarkets have on fresh fruit and vegetable chains in Mexico, the box at right offers a brief summary of supermarket trends in Mexico, and further details follow.<sup>5</sup>

Supermarket trends have important implications for the Ataulfo mango chain in Chiapas. Ataulfo producers that sell into supermarket chains in most cases sell through packing houses and (still) through the traditional wholesale markets, except in the case of the largest integrated grower/packers, a few of which maintain direct agreements with supermarkets (and in many cases may supply supermarkets from their stalls in wholesale markets). Conventional mango is one of Mexico's highest volume fruits, and Ataulfo is a favorite variety in the domestic market, so the ability to consistently meet volume and quality requirements is mandatory for supplying supermarkets.

One difference in requirements between domestic and international supermarket channels, however, is that (for now) **supermarkets operating within Mexico do not require traceability** of fruit back to its origin. This allows fruit from a broad range of producers, including small producers, to access this channel (whether they know it or not).

One large producer/packer mentioned that supermarkets take 45-60 days to settle payments, and that the margin earned on purchased, packed fruit sold to supermarkets was around 6-7%. Wal-Mart de Mexico indicated that it pays suppliers in 30 days, and that after six months of experience with a supplier, Wal-Mart may facilitate access to factoring services at a partner bank (including but not exclusive to Banco Wal-Mart) where 80% of the invoiced payment is made in 7 days, and the remaining 20% is paid 30 days later. The cost estimated for factoring (a flat commission charged on the value invoiced) ranged from of 0.8-3.0%, with the higher half of this range seemingly undesirable if the packer's margins in selling to supermarkets are as tight as mentioned above.

One export packer interviewed that might otherwise be interested in supplying supermarkets, indicated that payment terms eliminate this option since the packing house commits to pay producers in a week, and the packer does not have the liquidity to cover the time between paying producers and the 60 days that would pass between delivering fruit to a supermarket and receiving payment. **Again, as was witnessed among producers, illiquidity can determine the commercialization channel accessed.**

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<sup>5</sup> Reardon, Thomas; Berdegue, Julio A.; Echanove, Flavia; Cook, Robert; Tucker, Nancy; Martinez, Anabel; Medina, Ruben; Aguierre, Marx; Hernandez, Ricardo; Balsevich, Fernando; "Supermarkets and Horticultural Development in México: Synthesis Findings and Recommendations to USAID and GOM." USAID. August 2007.

International sales to supermarkets almost invariably flow through an import broker, but a couple of the Chiapas-based integrated producers also are established as brokers on the US side of the border. Supermarkets in the US and Canada prefer to deal with a small group of brokers that can supply their needs for all varieties of mango, year around. Brokers that are also vertically integrated back to production, tend to source from Mexico throughout much of Mexico's producing months, moving up the coast as the season advances, and then turning to other sources in South America as Mexico's production winds down.

According to Reardon, Berdegue, et al. purchasers at supermarkets indicate that small producers or groups of producers might have greater success is in providing **niche products** where lower volumes are demanded. Organic mangoes represent a niche where domestic demand (although small and limited to higher income areas) appears to be growing slightly faster than the supply that makes it into domestic chains, maintaining a premium similar to that for organic exports examined earlier. One supermarket interviewed showed real interest in expanding purchase of organic Ataulfo mangoes, but skepticism regarding domestic consumer's willingness to pay a 30% premium. The buyer further indicated that the supermarket would become much more aggressive in marketing organics around a 15% price premium.

While smaller producers may have comparative advantages in meeting niche demands, Reardon, Berdegue, et al find that supermarkets in general have no interest in working with large numbers of producers nor with their organizations, preferring to manage fewer relationships in meeting their needs. On the potential role of small producers in supermarket chains, the authors claim:

“In the long run, the rise of supermarkets in Mexico represents a serious challenge to the **asset-poor small farmer engaged in horticulture**. The bottom line is that the great majority of horticulture is made up of the large-volume products—and the cost and quality and competitive pressures induced by the supermarket revolution will sooner or later bear down on small holder horticulture over the areas of Mexico, first in the north, then the center, and finally the south. However, in the short-medium term, the expanded markets, quality differentiation, and price premiums represent obvious market opportunities.”<sup>6</sup>

The emphasis in the above paragraph is added because it suggests a potential role for long-term capital investment loans, which under certain circumstances (when the producer is linked to reliable buyers, for instance) may enable a producer to evolve from being asset-poor to being able to invest in upgrading production practices and conditions, post-harvest handling and infrastructure.<sup>7</sup>

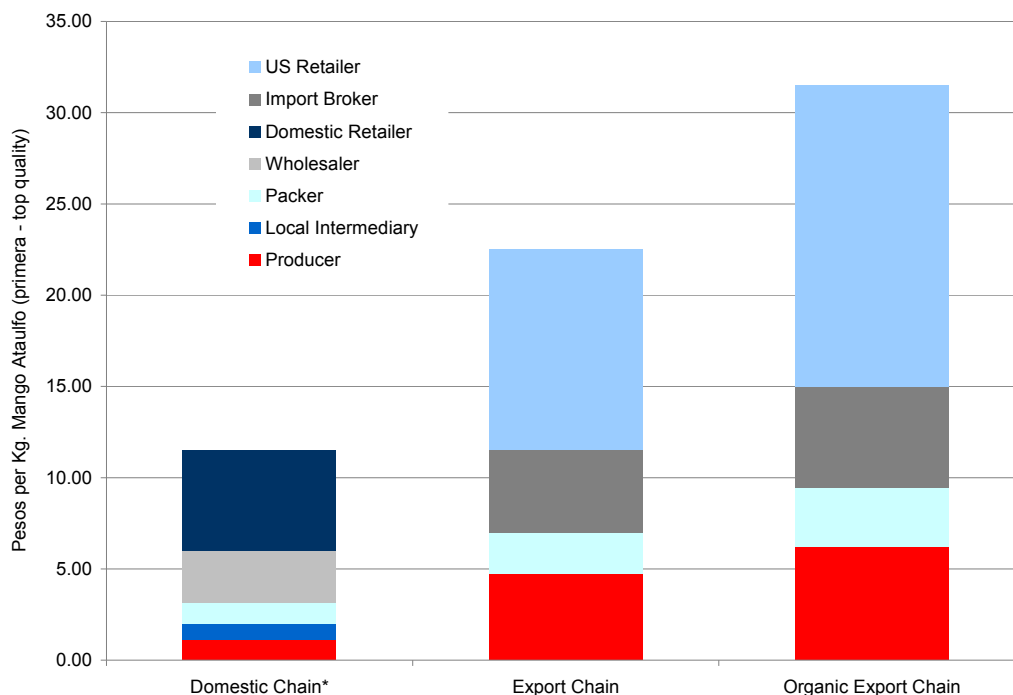
The supermarket study, focusing on guava producers in the state of Michoacán, found that 12% of households have access to formal financial services, and indicated that fixed capital assets are a primary determinant of access to competitive chains. However, the study found that access to loans *per se* was not a determining factors to access competitive channels. This suggests that while access to **working capital loans from financial institutions may not be a key success factor** for small producer success, the **lack of access to investment capital is a major constraint** because without it producers face difficulty in acquiring fixed assets that *are* success factors.

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<sup>6</sup> Reardon, Berdegue, et al. p. 27.

<sup>7</sup> See for example: González-Vega, Claudio; Chalmers, Geoffrey; Quiros, Rodolfo; Rodríguez-Meza, Jorge; “*Hortifruti in Central America, A Case Study about the Influence of Supermarkets on the Development and Evolution of Creditworthiness among Small and Medium Agricultural Producers.*” The Ohio State University, USAID. April 2006.

**FIGURE 17: DISTRIBUTION OF COMMERCIALIZATION VALUE, 3 ILLUSTRATIVE CASES**



## VALUE DISTRIBUTION ESTIMATES: 4 CASES

Figure 17 below shows 3 distinct cases observed in the field analysis with estimates of the percentage of value to the end consumer that is obtained at different stages in the chain. Given data limitations, especially the near complete lack of reliable data on prices in the domestic market, the calculations are based on a limited set of interviews at one point during the season and are presented here to illustrate cases observed. A more definitive calculation would require a much larger sample size over the course of the season at each level of the chain.

The first case represents a small producer that sells to a local intermediary (at P 1.10/kg), who pays cash and takes on commercialization and distribution risks, as well as costs related to transport. The intermediary then sells to the traditional wholesale market, which sells to domestic retailers. Larger integrated producer/packers are able to capture more of the final price (they also take on more cost and risk), selling directly to supermarkets. Although these are not representative of the majority of producers, they deserve mention since they sell high volumes of Ataulfo mango. In the two export cases shown, prices paid to producers are considerably higher (P 4.75/kg), with the organic producer realizing a 30% premium (P 6.20/kg) on sales, although payment is generally delayed as discussed above. Data used in this figure is presented in Annex A.

## FORMAL FINANCIAL SERVICES

Financial institutions in Chiapas appear to **lack a clear sense of the opportunities and risks involved in lending to the Ataulfo mango value chain**, despite the fact that this is a growing and competitive chain



with regional importance within Mexico, and despite growing competition among financial institutions that is driving a search for new market niches.

At the risk of over-simplification, formal financial institutions that might be interested in serving the Ataulfo chain can be grouped in four basic categories:

- **Banks**, which in the past have shown that they will lend to the chain only when they are able to do so without taking risk, nor using their own capital (see Figure 18: ). Banks could lend directly or indirectly, and could provide access to the payment system and to basic accounts at multiple levels of the value chain.
- **Agricultural finance companies**, a small (relative to the number of financial institutions in Mexico) but growing group that tends to specialize in financing crops (as opposed to the concept of financing the *diverse flows of households or growers*) based on scoring models determined by the agricultural lending fund FIRA, but few of these have significant experience to evaluate other flows and expenses, i.e. agricultural household analysis, and few operate outside FIRA schemes.
- **Microfinance institutions**, the best of which tend to understand rural household financial flows well, and may offer small farmers of various types their standard individual or group loan products (and in a few cases, savings), but generally have limited or no expertise in agriculture, and have products and lending methodologies originally designed for urban or semi-urban traders.
- **Credit unions** (*cajas*) which can offer savings products, but tend to be somewhat limited in their ability to measure agricultural cash flows and develop payment schemes around those flows, in stead tending to lend based on multiples of the savings a client holds at the credit union.

Banks and non-bank financial institutions in the main Ataulfo production areas in Chiapas (around Tapachula) maintain good overall presence and offer **accessible** deposit accounts, although they generally do not lend directly to producers, and what loan products do exist are not currently well adapted to the needs of the mango chain.

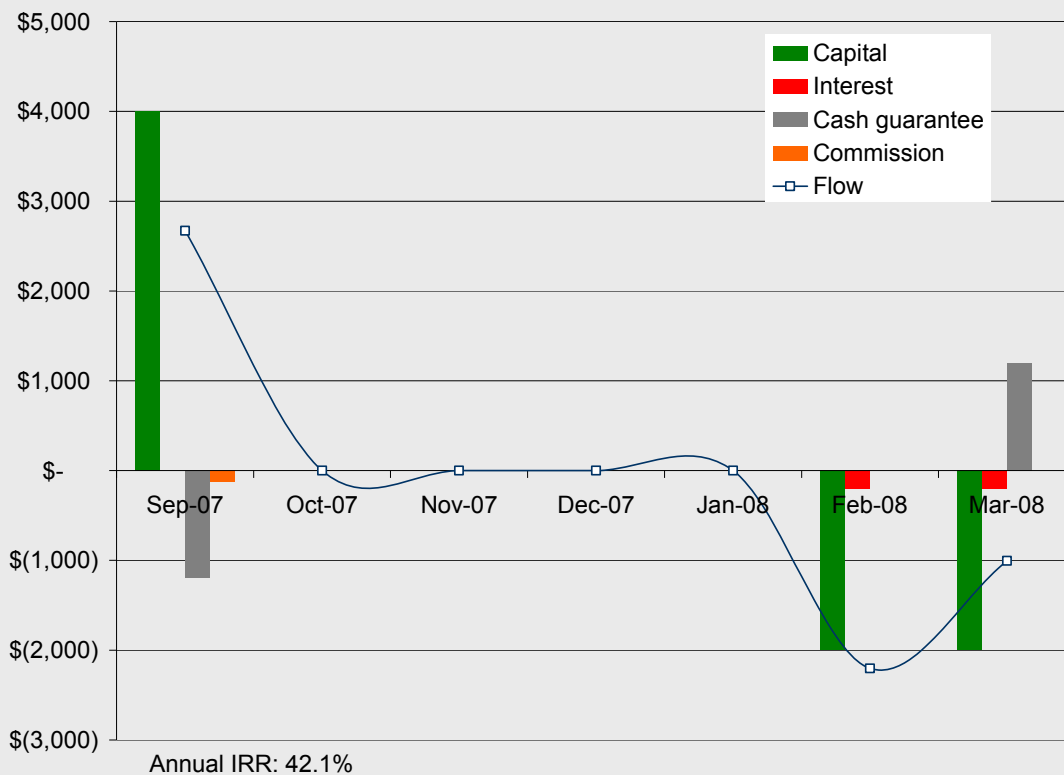
Financial institutions operating in the region have not developed the **capacity**, motivation and organizational culture to understand and respond to the needs of the chain, especially to the needs of the vast majority of its producers and their households (where business and family cash flows and financial needs mix, with important implications for financial service design). Furthermore, financial institutions *in general* still need to develop the capacity to measure and manage risk in lending to this chain. As discussed below, risk has generally been covered by a series of overlapping (mostly public sector) cash guarantees.

Still, despite a track record of near indifference to the needs of the mango value chain, financial institutions are increasingly motivated to serve agricultural chains, including producers. Also, the Mexican financial institutions are increasing their search for new and promising niches, as can be witnessed in the rapid growth in microfinance, and in the increasing number of financial institutions seeking to serve agricultural chains. There appears to be a strong **business case** for financial institutions to find, understand, and serve actors in **potentially competitive chains** such as the Ataulfo chain in Chiapas.

## FIGURE 18: EXAMPLE OF A FIRA-BACKED BANK LENDING TO GROWERS THROUGH PACKING HOUSES

In this scheme, the packer, the grower, or some combination of the two, establish a 30% cash guarantee that is deposited in the bank, FIRA puts up a 63% guarantee, and the bank ends up taking 7% of the risk (although it often obtains additional guarantees such as property, plant or equipment). The bank then accesses FIRA (100% public) funds, lends to the packing house, which has a single loan contract with the bank with the understanding that it then on-lends to growers for the season at 4,000 pesos (a little more than US \$400) per hectare, beginning in September, with payment to be made in mangoes during harvest in February and March.

The nominal interest on loans observed was 1.7% per month, or 20% annual, plus an access commission (*comisión de disposición*) of 3.22% each time the packing house accesses the overall line to on-lend. Assuming that the line was accessed only once (although one packing house reported accessing the line multiple times, significantly elevating costs), that all payments are made on time, and the full guarantee is returned at the end of the cycle, the cash flows depicted below result in an annual internal rate of return (approximating an effective interest rate) of 42.1%.



Partly because of an historic absence of formal financial intermediation, many chain actors (especially small growers) show limited awareness and financial **acumen**. There appears to be little awareness regarding when and how financial services might support or restrict non-financial options and decision-making in selecting commercialization channels into which to sell their fruit, or in supporting longer-term investments (further restrained by the uncertainty surrounding productivity as discussed in section 0).

It is worth noting that the public finance company, Financiera Rural, is developing products for the sector. The public rural and agricultural trust fund FIRA showed strong interest in the sector and an intention to continue providing lines of credit. Also, the AFIRMA project has had discussions with private financial institutions that show interest in the chain.

The most common variation of formal financial services observed in the Ataulfo chain involved government-backed and subsidized (FIRA) lending from commercial banks to packing houses, a detailed example of which is provided in Figure 18. The cash flows, including the cash guarantee, are calculated to give a sense of the cost to borrowers of this type of loan. This may be useful as a point of reference for financial institutions interested in serving producers in this chain.

Note that in this case, as is common in agricultural lending in Mexico, the commercial bank takes only 7% of the risk, uses none of its own capital, and obtains operational subsidies. Under such conditions, the bank's ability to measure and manage agricultural and business risks and costs is considerably less relevant than its ability to understand and manage the subsidy scheme.

With limited access to financial services, a significant demand for short-term credit, and predominant trade financing provided by chain actors for whom financing is not their core business, there may be interesting opportunities for financial institutions to offer services to various actors within the Ataulfo mango value chain, but they would require understanding of chain dynamics, including costs, revenues, and risk, in order to design appropriate financial services for the sector.

# SECTORAL ASSESSMENT – ATAULFO MANGOES IN CHIAPAS

For a sector that has long benefited from a broad array of competitive advantages, the spirit of crisis which reigned across much of the Ataulfo mango sector in Chiapas during two field visits in spring 2008 came as a surprise. While the chronic concerns in the region revolve around production problems of indeterminate scope and origin, there was acute concern about the ability of the US and Mexican markets to pay a price commensurate with a relatively brief harvest period, followed almost immediately thereafter by an equal concern about excess packed inventories both in the local packing houses and in the destination markets. This swing from one day to the next between under-supply issues and over-supply issues highlights the lack of basic information in the region as regards crop size, harvest progress, packed volumes, and market conditions at destination. The second half of this section addresses these concerns and other shortcomings, after first describing the sector's strengths.

## STRENGTHS

### BIRTHPLACE OF THE ATAULFO

In a 2004 article<sup>8</sup>, Professor Magallanes-Cedeno of the *Universidad Autonoma de Chiapas* writes:

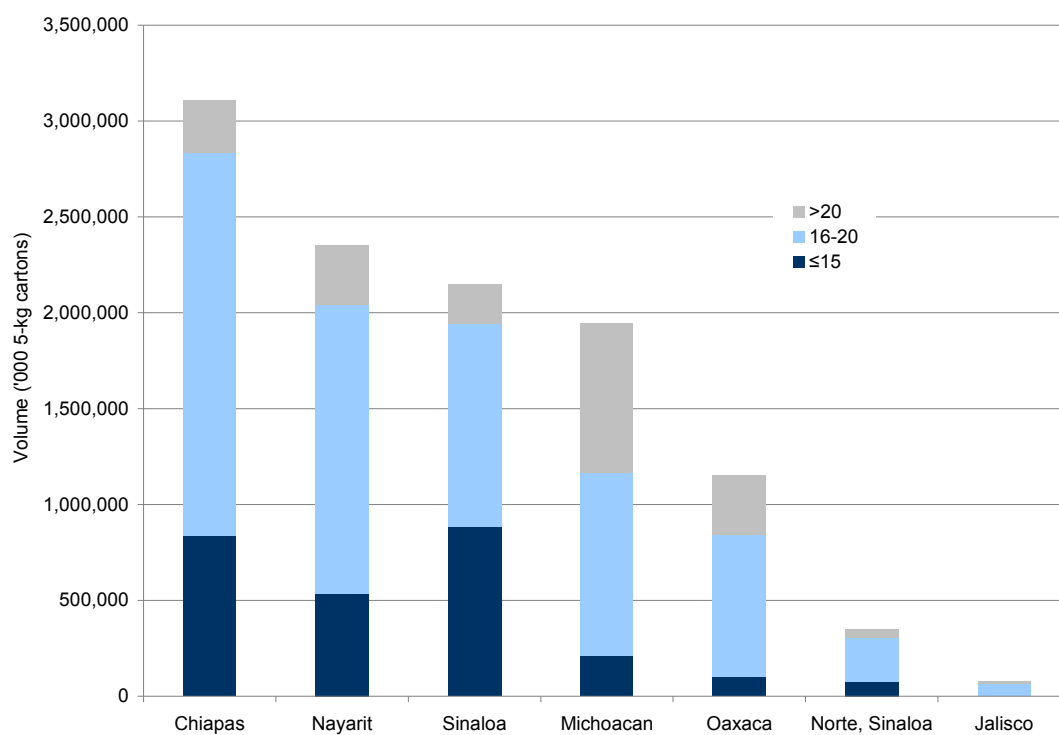
*“The Ataulfo cultivar of mango was discovered at the end of the 1950s in Chiapas, when Hector Cano, a coffee technician looking for alternatives to diversify the agriculture in the region, found a group of mango trees bearing attractive, gold colored fruits in the backyard of Mr. Ataulfo Morales’s house in Tapachula. Commercial Ataulfo production began in the 1960s, spawning a development that now reaches 18,000 hectares planted in the Soconusco region of the state. Production is estimated to average 100,000 MT per year.”*

While Chiapas occupies a relatively minor place in overall Mexican mango production (100,000 MT out of a total 2,030,488 MT) and exports (16,200 MT out of a total of 220,500 MT), it leads the country both in the production and the export of the Ataulfo variety. Although Ataulfo mangoes are now grown commercially in at least seven Mexican states, Chiapas remains the volume leader both in total production, and in export volumes to the United States with 28% of the US market. Figure shows that, among states with commercial production of the Ataulfo variety, Chiapas has a size advantage over the industry average, in terms of the mangoes it exports. Since larger sizes correlate closely with higher unit prices in the Ataulfo category, this size advantage connotes a revenue advantage for Chiapas Ataulfo production.

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<sup>8</sup> Professor Magallanes-Cedeno, *Universidad Autonoma de Chiapas, Acta Horticulturae* of the International Society for Horticultural Science, Volume 645, 2004.

**FIGURE 19: ATAULFO EXPORTS TO THE US BY STATE AND FRUIT SIZE (2007)**



Source: EMEX

### SEASONALITY

The Chiapas Ataulfo is generally the first Mexican mango of the season to enter into production (along with parts of Oaxaca and Guerrero). While researchers tell us that harvest would normally begin in April, a number of techniques have been developed which allow the fruit to reach maturity as early as the second half of February. Since this period is also the final phase of the Southern Hemisphere supplies which originate in Ecuador and Peru, the initial shipments of Ataulfo generally arrive into the domestic and export marketplaces at a time when stocks are low, and prices are strong. It is worth noting that although early shipments of Ataulfos from Chiapas are rewarded with a price premium, one packer expressed concern regarding what they considered the lower quality of these early shipments and the potential impact on the reputation of the variety.

### COMPLIANCE WITH PHYTOSANITARY REQUIREMENTS

Interviews with APHIS personnel in the district, and at the Texas point of entry, lead to the conclusion that the systems and infrastructure in the Soconusco are more than adequate to provide for smooth and uninterrupted flows of fruit from complying orchards and packing sheds through to export markets. Exporting packing houses require the ability to trace any fruit fly larvae to the orchard from which it

originated, and this is generally done through basic record keeping on deliveries, and in some cases using basic database software.

## MARKET ACCEPTANCE

The Ataulfo mango from Chiapas also benefits from the organoleptic advantages typical of the variety. Its golden color is unusual and attractive, providing immediate differentiation from the ever-present Florida varieties (Tommy Atkins, Haden, Kent, Keitt) in retail displays. Its peel is thin, its seed is small, its brix is high, and its fiber content is appreciably less than the Florida counterparts. More importantly, this combination of advantages translates into a preferential price position in the marketplace. Over the past six years, the prices paid in the US market for Ataulfo mangoes have consistently out-paced those of the other four high-volume mangoes consumed in the market (Table 4).

**TABLE 4: US PRICES, MEXICAN MANGO IMPORTS, BY VARIETY (2002–2007)**

	Ataulfo		Haden		Keitt		Kent		Tommy	
	Low	High	Low	High	Low	High	Low	High	Low	High
2007	\$4.85	\$5.82	\$3.71	\$4.50	\$2.68	\$3.08	\$2.70	\$3.17	\$3.44	\$4.12
2006	\$5.20	\$6.15	\$3.30	\$3.79	\$3.13	\$3.74	\$2.62	\$3.21	\$3.16	\$3.65
2005	\$5.50	\$6.05	\$3.71	\$4.16	\$3.33	\$3.97	\$3.00	\$3.50	\$3.34	\$3.86
2004	\$4.39	\$5.16	\$3.15	\$3.71	\$2.33	\$2.72	\$2.15	\$2.47	\$2.69	\$3.18
2003	\$4.82	\$5.87	\$3.58	\$4.29	\$2.67	\$3.21	\$2.66	\$3.13	\$2.88	\$3.48
2002	\$4.98	\$6.19	\$3.52	\$4.11	\$3.56	\$4.23	\$2.95	\$3.56	\$3.13	\$3.75
AVG	\$4.96	\$5.87	\$3.50	\$4.09	\$2.95	\$3.49	\$2.68	\$3.17	\$3.11	\$3.67
Season	Feb -Jul/Aug		March-June		Jul/Aug-Sep		Jun-Sep		Mar - Aug	
Competitive Price Basis	100%	100%	71%	70%	60%	59%	54%	54%	63%	63%

Source: USDA/AMS/Federal-State Market News Service

The six-year average prices for Ataulfos have run 30% higher than Hadens, 37% higher than Tommys, 40% higher than Keitts, and 56% higher than Kents. While prices fluctuate from season to season, the relative price advantages which the Ataulfo variety enjoys appear to be quite durable.

## EXISTING TRADE CREDIT NETWORK

Conventional credit relationships with private commercial banks are no more common for Soconusco Ataulfo growers or packers than for other agricultural activities in Mexico. Where such relationships exist, they almost invariably involve FIRA as the underwriter of the transaction, and tend to be concentrated among the largest companies along the size spectrum, particularly packing houses which in some cases on-lend to certain producers. As described previously, there are other sources of credit which serve to alleviate short-term liquidity squeezes which occur along the course of the mango season, as well as instances of long-term investments or cash infusions. Such financing comes from several sources:

- **Vendor Financing:** On a selective basis in the mango sector, suppliers of fertilizers, crop protection products, nursery stock and cartons, who provide credit for the purchase of inputs for up to 60 days. Input suppliers often access FIRA funds to offer such credit.

- **Intermediary Financing:** Informal intermediaries (often referred to as “coyotes”) purchase crops from small producers in advance, paying cash and offering prices below what growers could likely attain selling directly to packers. Although they sometimes have a negative reputation (sometimes deserved) these intermediaries do take on certain costs and risks and do offer liquidity to growers, albeit often at a high price.
- **Packer Financing:** Packers provide pre-harvest advances to growers (sometimes as cash, sometimes as inputs), in return for a commitment to deliver the crop to the packing shed, on either a firm or consignment basis. Some advances are interest-free, while others bear interest of up to 1.5% per month. One packing operation spoke to us of loaning out up to P10 million to its growers during the course of the growing season, with 80% of its growers receiving some sort of advance. Others indicated their customers start the season with advances, then deduct the value of the advances against deliveries during the course of the season.
- **Buyer Financing:** In some rare instances, buyers in the US and Canadian markets may advance the costs of carton and packing materials, plus harvesting, packing and trucking costs, before the fruit is ever harvested. During the 1990s, one US multinational routinely advanced up to US \$ 700,000 per campaign to a packer in order to secure steady supplies.
- The team observed two instances of buyers making **investment loans**: a large fresh fruit packing shed, and a dried fruit processing facility—whose seed capital had been provided by offshore receivers. In each case, these receivers remained the principal importers for each of the operations they had funded.

Trade finance has important benefits including, most notably, the simple fact that **it often exists as an option where services from financial institutions do not**. But it also has certain drawbacks in terms of **limiting choices**, or **sub-optimizing commercialization and other choices** because of a lack of external capital available to the producer or to the chain as a whole. Some of the key benefits and drawbacks observed are outlined in Figure 19 below, which considers the most common case of financial flows from packing houses to growers.

#### **Agricultural Trade Blue Book and Mexico**

In US fruit markets, where trade credit of various types is very common, the Agricultural Blue Book captures useful information on businesses operating in agricultural trade. This online database houses user-reported information on experience with buyers and suppliers by chain. Although many Mexican exporters are included in this database, helping US buyers to take more informed decisions on which partners are good risks within Mexico, no similar mechanism exists within Mexico.

**FIGURE 20: KEY BENEFITS AND DRAWBACKS OF TRADE FINANCE AMONG PACKERS AND GROWERS**

	Benefits	Drawbacks
Packing House	<ul style="list-style-type: none"> <li>• Help ensure volume requirements to run operation profitably, and meet buyer requirements</li> <li>• Repayment risk (from growers) reduced since packer is a “natural retainer” of loan payments discounted from delivery of fruit (although this can deteriorate where “side-selling” is common)</li> </ul>	<ul style="list-style-type: none"> <li>• Lending is not necessarily the best use of scarce capital, especially in a growing sector</li> <li>• Lending generally is not part of a packing house’s core business</li> </ul>
Grower	<ul style="list-style-type: none"> <li>• It generally <i>exists</i> as an option, where other forms of credit often do not</li> <li>• Repayment schedules are well adjusted to the agricultural cycle</li> <li>• Nominal interest rate (if there is one) is often lower than third party lenders</li> </ul>	<ul style="list-style-type: none"> <li>• Generally limited to short-term working capital</li> <li>• Can limit commercialization options</li> <li>• A single actor (packer) normally has exclusive access to a producer’s credit history</li> <li>• Full cost (including fees, transaction costs and impact of lower sale price) is unclear, hard to calculate, and can be greater than external credit</li> </ul>

## PUBLIC SECTOR SUPPORT

In addition to the short-term liquidity and long-term capital sources mentioned above, there are also government programs that cost-share additional investments. Although a discussion of all the various government initiatives is outside the scope of this report, the most important of those observed in the field were:

- **PROCAMPO:** A multi-faceted SAGARPA program, one of whose features is designed to encourage farmers to make a transition out of sorghum or rice and into mango. This program provides additional assistance in the acquisition of irrigation systems, and also subsidizes the costs of the diesel and electrical power required to run the system
- **Irrigation:** The *Comisión Nacional de Agua* pays up to 50% of the cost of an irrigation system, with costs capped at a maximum of P15, 000/ha. Likewise, the State of Chiapas pays up to a maximum of 25% of a system, with a ceiling of P7, 500/ha. Since a typical irrigation system costs P48,000/ha, even with maximum contributions from the federal and state governments, growers are generally required to fund at least 53% of the total expenditure. Given the high degree of difficulty in qualifying for the Chiapas State portion, many growers proceed with only the CNA portion, and fund the remaining 69% of the project costs from their own resources. Because of the cost share requirement under the terms of this subsidy and the tendency for large scale systems, the subsidy is regressive in the sense that it tends to benefit well established, larger producers that have the capital (and/or ongoing access to affordable long-term credit) to cover the remaining amount.
- **Organic Certification:** SAGARPA funds 50% of the annual cost (P25,000) for organic certification.

Overall, support to the sector is positive, with laudable intentions. However, further review of subsidy schemes may be warranted to determine whether they accomplish their stated goals. For instance, it is unclear whether subsidies such as those for irrigation and organic certification intentionally skew access



to subsidies towards the largest, most connected members of the chain, or whether this is just an unintended consequence of designs that could be reassessed and adjusted.

## WEAKNESSES

### DECLINING PRODUCTIVITY

Estimates on the possible causes of declining productivity of the Ataulfo in Chiapas vary widely, and the official statistics which would normally be used to clarify the situation are non-existent. Still, there appears to be a general agreement throughout the sector that there is a crisis in terms of yield per hectare in the Ataulfo sector in the Soconusco. Quoting again from Professor Magallanes-Cedeno,

*“The average yield of mango in Chiapas ranged from three to ten tons per hectare during the first half of the decade of 1990. A record yield of 13 tons per hectare was obtained in 1995; therefore, when in 1996 the average yield of mango dropped to two tons per hectare, growers became concerned.”*<sup>9</sup>

Once again, in 2008, growers have become concerned. Some industry veterans cite initial yields of 12 MT/ha in previous years, and ask why the same trees are only producing 2-3 MT/ha today. Others define “good old days” as 4 MT/ha, as they attempt to recover their costs on yields of 1.5 MT this campaign. Some contend that their yields are 6 MT/ha, but that their neighbors will be lucky to harvest 50 *rejas* (1.5 MT) per ha. While conversations with 10 growers normally produce 11 different estimates of the gravity of the productivity problem, few deny that the problem exists. Just as there are many estimates of the degree of the productivity crisis, so too are there a multitude of theories concerning its causes:

- **Poor Soils:** The production of cotton in the region over the course of generations has left the soils completely spent in terms of nutritive content.
- **Planting Materials:** There has been no quality control in terms of the selection of bud wood used to propagate new orchards. Too often the choice was made based on wood and foliar development, rather than on fruit production. As a result, today’s trees are producing too much wood, and not enough fruit.
- **Poor Fertilization:** One fertilizer supplier, whose recommendation calls for 10 kg of NPK per tree, has calculated that the average application in the Soconusco is only 700 grams per tree, 93% less than the recommended dosage. This is clearly linked to the low propensity to invest while yields are so low, which can result in a vicious cycle.
- **Irrigation:** Trees are not getting the right amount of water (too little during dry periods, and too much because of lack of drainage at other times). As a means of comparison, of 7,000 ha of bananas in the Soconusco, 90% have modern irrigation systems, whereas of the 18,000 ha of Ataulfos in the region, only 10% have irrigation.
- **Pollination:** The same aerial applications of Malathion which are keeping the Mexican fruit fly population under control are also killing off the bees and other flying insects that serve as pollinators for the mango flowers. **At the AFIRMA-sponsored sector workshop, a major producer and packer in the region, with decades of experience in Ataulfos, indicated that experiments with**

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<sup>9</sup> Ibid.

**intercropping other varieties along with Ataulfo is helping cross-pollination and boosting yields,** an experience that merits scientific testing.

- **Tree Density:** There are too few trees per hectare, leading to too much vegetative vigor per tree, and not enough fruit growth. Typical density in the Soconusco is 40 trees per ha. It's said that, in Guerrero, there are now 6,000-7,000 ha of young Ataulfo trees, planted at 70-100 trees/ha, with yields per hectare as high as 14 MT.
- **Inadequate Pruning:** Some say that light penetration must be at least 40% in order to ensure good fruit sets and development. Pruning patterns in Chiapas do not even approach this level of openness.
- **Irrigation Patterns:** Even where adequate volumes of water are made available to the trees, too often water is applied to the base of the trees, where it's not needed, instead of to the extremes of the canopy, where it does the most good.
- **Bloom Induction:** Soconusco Ataulfos want to produce in April and May, but growers and packers want to reach the markets much earlier. The bloom induction techniques used to accomplish this advance into February and March are effective as to the calendar, but at a significant cost in terms of production.
- **Lack of Extension Services:** SAGARPA discontinued its field extension services some twenty years ago. This has served to dissipate the knowledge base, and to generate a broad range of contradictory practices in the region.
- **Weed Management:** Throughout the region, weed control is accomplished with tandem disc harrows. Most of the secondary roots, which play a major role in water and nutrient absorption, are quite close to the ground surface, and hence susceptible to serious damage from this type of agricultural practice.
- **Tired Trees:** The theory here is that the production units now in place in the Soconusco, though once capable of generating 12-14 MT/ha, are approaching the end of their useful lives, accompanied—logically enough—by ever-deeper declines in unit productivity.

While any of these causes (or likely some combination thereof) may be correct under a given set of circumstances, the bottom line is that the necessary scientific studies have not been conducted with systematic experimentation and dissemination of results. Given low levels of production witnessed, this need for basic research amounts to a critical issue for Ataulfo production in Chiapas.

## MARKET INFORMATION

The crop and market information systems in the region appear to be driven more by hearsay and rumors than by fact. In the absence of realistic projections of crop size, competitive market conditions, harvest schedules and packing shed activity, growers base their harvesting decisions on speculation as to potential moves in distant markets, rather than on factual market appraisals. In particular the sector is lacking the following basic market information:

- Regular pre-harvest accumulation of estimates regarding expected crop size, fruit size distribution or timing of fruit flow during the season.
- Routine production data normally provided by the SAGARPA offices in each state (see Annex A for the schedule from Nayarit as an example) but unavailable in Chiapas.

- Daily or weekly tracking of flows of fruit from orchards to packing plants, or from packing plants to domestic and export markets; with no such data for prior seasons, it is impossible to develop a reasonable perspective on the progress of the campaign, or to determine whether movement is ahead, even with, or behind the seasonal average.
- Daily or weekly monitoring of price fluctuations in the principal domestic or North American export markets, despite the fact that such information is readily available from each of the principal central market associations across Mexico, or from the Agricultural Marketing Service of the USDA for the United States and Canada.

In short, there is no market leadership. While highly integrated producers are able to access market information and set terms and conditions when buying and selling fruit, including sales to supermarkets in some cases, most producers lack access to critical market information. There is no transparency as to price or movement, no reliable basis on which growers and packers can plan their harvesting and packing operations, nor is there a reliable benchmark against which marketers can assess their pricing mechanisms. While this lack of information is harmful to the small and medium growers and packers, it also exerts an adverse effect on the largest and most vertically-integrated operations as well. The largest such operation probably controls less than 15% of the state's Ataulfo crop. In the absence of reliable information regarding the disposition of the remaining 85% of the crop during the course of the season, this organization's ability to manage its pricing and flow of fruit to market is severely compromised. Clearly, the same holds true for all of the other, smaller packers and growers in the chain as well.

### **ACCESS TO FORMAL FINANCIAL SERVICES**

While there is some liquidity within the chain, as described earlier, it is generally supplied either by vendors, whose primary interest lies in selling their products, or by packers, whose primary interest lies in adding fruit to their throughput, or by receivers or importers, whose primary interest lies in securing finished product on favorable terms. Access to formal sources of financing, on the other hand, is limited, and when available, it is often expensive, highly restrictive, or both.

As with many agricultural activities, costs are absorbed for 9-10 months of the year, in anticipation of the 2-3 months when revenues can be generated. Where there is little or no transparency of terms and conditions, where credit can be extended or withheld without any clear justification, and where those most in need are generally those least served, this lack of access to quality credit is a serious constraint that can limit options for improving production, or commercialization, or both.

Under the right circumstances, formal financial services can address some of these challenges. But banks in particular and financial institutions in general in Mexico have been reluctant to lend their own funds to agricultural activities, especially those involving small producers due to perceived and real risks and high transaction costs, and the Ataulfo chain is no exception.

Still, recent trends discussed above suggest this could be changing. While approaches and learning curves in expanding access to formal financial services necessarily vary by institution, consideration of the Mexican financial services market presents opportunities for financial institutions with the appropriate structures and incentives to lend to the Ataulfo value chain in Chiapas.

## **LACK OF RESEARCH INITIATIVES**

Many growers complain about the absence of clear recommendations as to practices they should follow to improve productivity. The foremost agricultural research facility in the region, INIFAP, which sponsors good plot-based research, but there is general lack of communication of results to growers in an ongoing way, and the agricultural practices manual for Ataulfo has not been updated since 1993. Fundación Produce, the grower association responsible for channeling government resources to fund commodity-specific research projects, has received research proposals to examine productivity challenges, but the cost estimates (on one occasion as high as US\$3.2 million) had been too high.

In discussions with providers of irrigation equipment, fertilizers and crop protection products, these providers were uniformly unable to specify benefits to justify the expenditures involved in the use of their products. When asked, none would claim positive verifiable effect on yield, fruit size, plant vigor, soil health or fruit quality, deferring to manufacturers recommendations (from Israel, America, Europe) and focusing on the product's availability, if not its efficacy.

## **LACK OF FIELD EXTENSION SERVICES**

Even if there were effective and credible recommendations regarding agricultural practices based on serious research efforts and field-tests to confirm effectiveness, there is a significant gap in the delivery of such information to the field level. Without extension agents in the field, demonstrating the proper techniques with as much persistence and patience as such technology transfers often require, the practices will have no material effect, and the problems will remain unsolved. The only such service currently offered in the region comes from Victor Palacio of INIFAP, whose life work appears to be focused on improving mango productivity in the Soconusco. Unfortunately his time is primarily devoted to the management of test plots and varietal trials, and only secondarily to the dissemination of research findings to Ataulfo producers in Chiapas. Many more hands and far more resources would be required to transfer any new technology (even if this involved simply reinforcing existing technology) throughout the sector.

## **LOW PROPENSITY TO INVEST**

Farmers are accustomed to uncertainty, and generally do a good job of calculating their risks and aligning their investment strategies accordingly. This holds particularly true for risks involved with weather, transportation and markets. In the Ataulfo sector in Chiapas, these calculations are particularly difficult, given the uncertainties with respect to productivity trends and the lack of market transparency. Not surprisingly, the response of many producers to these augmented uncertainties is to restrict investments until the situation becomes clearer.

This affects both short-term and long-term investment decisions. In the short term, the greater the uncertainties with respect to yields or market prices or credit, the less likely growers are to invest in the fertilizers, crop protection products, and extra field labor (for pruning, for example) for that season's crop. In the long term, fundamental concerns about unexplained productivity problems discourage the capital investments required for installation of irrigation systems, and the conversion to high-density populations or other upgrades. This reluctance to invest in good agricultural practices and infrastructure, contributes to a downward cycle of lower yields generating lower revenues and further restricting inputs.

Despite the prevailing sense of uncertainty, it is important to mention that the authors in the course of their field work found no indication of slack demand for Ataulfos in any of the various domestic or

international market channels reviewed. Considering that demand appears strong and growing, the low propensity to invest further underscores the need for basic research and extension services.

# UPGRADING OPPORTUNITIES

AFIRMA and USAID held a participatory workshop in Tapachula in May 2008 with a full range of private sector value chain actors as well as public sector agencies and universities involved to differing extents in supporting or analyzing Ataulfo production and commercialization in the region. The workshop served to improve upon this analysis, to prioritize common constraints, to share information across different types of chain actors, and to prioritize opportunities for upgrading. Below are the priority opportunities based on the workshop and the team's analysis.

## PRODUCTION

- The first and foremost is research to determine root causes of **declining productivity** and approaches to mitigate these trends. The official research agency has been reluctant to take on this project without a major commitment (several million dollars) of resources. Facilitating intervention, with limited injection of resources, might be sufficient to jumpstart research. Field trials conducted by less emotionally involved third parties (Israel, USA, France) might be another approach to circumventing the logjam.
- Upon researching optimal conditions for Ataulfo production, develop and disseminate (including training) an **updated set of recommended Ataulfo agricultural practices** to improve general production in the region, increasing Chiapas' competitive advantage in a mango variety with strong demonstrated market demand.
- Additionally, while conversion to certified organic production presents an opportunity for producers and other chain actors to obtain higher prices (+30-40%) there is no publicly available set of recommended agricultural practices for producing organic Ataulfo in Chiapas. This is a substantial gap considering not only the excellent market opportunities for organics, but also the fact that knowledge of how to administer organics is even more crucial to success than with conventional production. Therefore research and development of **organic-specific recommended agricultural practices for Ataulfo in Chiapas** would facilitate effective conversion for producers interested in doing so.
- Following rigorous research of productivity conditions, certification of **official Ataulfo nursery operations** may be a logical next step to mitigate one of the potential factors for reduced productivity. Such an initiative would ensure the correct genetic inputs for Ataulfo trees.
- In the event that research findings showed a clear relationship between irrigation, or fertilization, or other agricultural practices, or increases in tree population per hectare, or intercropping with other varieties or crops for cross-pollination, this could trigger an increased commitment to re-invest in production areas (and possibly a related increased demand for financial services). For example, in the case of **irrigation and drainage**, once conditions are identified for the Soconusco region, there may be an opportunity to facilitate lower cost irrigation/drainage systems for producers. The first step would likely involve coordinating trials with contributions from a producer, an irrigation company, and CONAGUA. Subsequently, there may be an opportunity to work with local financial institutions to develop financial products that would facilitate the purchase of such services.

- In connection with the environmental importance of the Soconusco region, work with local environmental specialists to evaluate the proposed mango production area along the Soconusco coast in Chiapas to determine potential strategies for **addressing biodiversity threats**. The evaluation should address current production techniques and how they impact the Soconusco watershed and coastal mangroves, as well as production adjustments that would mitigate critical threats to the region's ecosystems going forward.

## COMMERCIALIZATION

Given the Ataulfo’s highly favorable characteristics, options for industrial use of Mango (possibly including investment options, business plan, and market linkages) may include:

- **Dehydration plants.** While there are several such plants operating in the Soconusco, there may also be sufficient demand for conventional or organic dehydrated mango products to justify expansion of existing facilities, or establishment of new operations.
- **Mango pulp processing facility,** of which there are none in the region, despite the prospects of strong market support for an Ataulfo pulp product. With its unusual combination of high Brix, low fiber, and bright golden color, Ataulfo pulp would seem to fit into the same premium class as the Alfonso variety from India. As the chart below indicates, aseptic Alfonso pulp enjoys a significant price advantage over other mango varieties. Were Ataulfo able to position itself at the same upper-end of the consumer preference map, this could represent an attractive by-product channel for the Chiapas mango sector.

**TABLE 5: PRICE OF MANGO PULP AND JUICE IN EUROPEAN UNION (DECEMBER 2007)<sup>10</sup>**

Type of Mango Juice	Price (USD/t)	Origin
Aseptic purée, Alfonso, Brix 16	\$1,650	India
Aseptic Concentrate, Totapuri, Brix 28	\$1,400	
Aseptic Purée, Magdalena, Brix 14	\$940	Colombia

Improved information and transparency along the chain, including:

- **Basic data collection** at the field level to gain a better understanding of the dimensions of each crop, across the entire region, and perhaps across the national canvas as well.
- **Transparency in the flow of product to market,** as regards destination pricing, inventories at each step along the distribution chain, and general competitive conditions in the national and international markets where the Ataulfo mango is sold. Essentially, this would entail the following mechanism: each day, each packer would compile its raw fruit inventories, cartons (*rejas*) packed during the day, packed fruit inventory, and export and domestic volumes shipped. Likewise, each wholesale market would report volumes received, volumes sold, and unsold inventories each day. Finally, USDA/FAS would supply daily imports at each major border crossing for the day, and USDA/AMS would describe average daily movement and sales prices for the day. The starting point would be the overall crop estimate for the state, adjusted periodically throughout the season.

<sup>10</sup> Source: UNCTAD Market News Service for bulk-packed fruit juices – Geneva, EU.

- Such market **information** should be **consolidated in a single location** – Potentially the Producers Association (*Asociación de Fruticultores del Soconusco*), with its 2,800 member producers, including integrated producers that also participate in packing, wholesale, export, and or foreign distribution, and then made available on-line.
- Certifications for **Good Agricultural Practices (GAP)**, **organic** or fair trade all carry the promise of preferential status in export markets, but local growers appear unaware of how to access these programs, or of what they involve. Accessible financing for the additional expenses leading up to certification may heighten grower interest in such programs.

## FINANCE

Financial services could improve upon the current dynamics among value chain actors, permitting competition for product on commercial bases, rather than on the basis of private information and dependence for credit as is sometimes the case. In the Ataulfo chain, advances are made not because the packing house or buyer is in the financial service business, rather because they need to ensure volume of fruit necessary to run the operation. Some actors in the chain, especially producers but also some packing houses, may welcome an expansion of access to financial services and capital across the chain, while others that maintain dependent suppliers that can be paid prices well under market prices would be unlikely to accept such an approach. The main finance-related opportunities identified are:

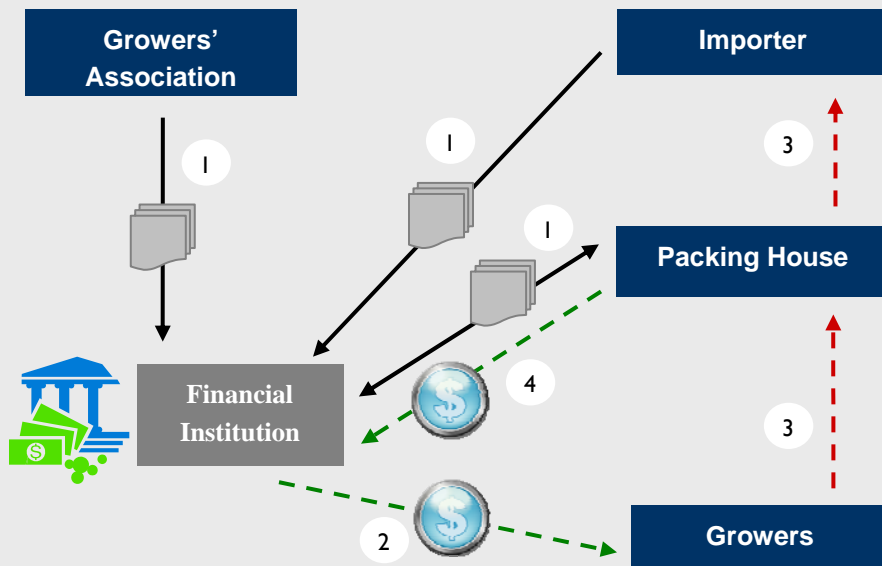
- Document key chain dynamics relevant to financial institutions in a **briefing note for private sector financial service providers**, outlining basic opportunities and risks in lending within the Ataulfo mango chain, distilling the aspects of the value chain analysis most relevant for providing services (cost information, returns, etc. as outlined in the full value chain report) and providing recommendations for the design of financial services.
- **Coordinate with other initiatives** and actors interested in financing the sector, including MFIs and public actors such as FIRA and Financiera Rural.
- Help research the feasibility (both demand and supply) of **long-term finance for investment** and upgrading for multiple actors in the chain, including growers (irrigation, organic conversion, etc.), packing houses (facility upgrades, new lines of business like processing plants, etc.) and others such as cooperatives and/or growers' associations.
- **Link the sector to financial institutions** interested in piloting an initiative in this chain (and demonstrate the potential of the approach). One general scheme that appears to have some promise based on interviews with producers, packers and buyers, and which AFIRMA could assist in trying, is presented in
- Figure 20 below.
  - As a potential basis for starting such a linkage, **some packing plants have data on producers that could support financial decisions** as a result of their own business processes and their need to show traceability of exported fruit. Several packing plants expressed a **willingness to share such information with qualified financial institution**, provided that (1) this did not represent a competitive disadvantage for them vis-à-vis other packers, and (2) they were able to retain their traction with their growers while others did the financing. Such traceability information may include:



- hectares in production
- application of inputs
- type of production (organic vs. conventional)
- yields, segmented into size, quality and type of production
- prices paid to producers
- history of phytosanitary compliance (especially information on any cases of fruit fly infestation)

**FIGURE 21: ONE POSSIBLE SCHEME FOR USING VALUE CHAIN INFORMATION TO DESIGN FORMAL FINANCIAL SERVICES**

In this general scheme: 1 value chain actors provide information to a financial institution, which 2 uses this information along with information itself obtains on growers to measure and manage risk, design products, and offer financial products and services. Growers then 3 deliver fruit to the packing house which pays the producer and pays down the loan, as agreed and 4 the packing house pays the bank and delivers fruit.



This might constitute an **excellent starting point for motivated financial institutions** capable of lending to this chain. Obviously such data would be a starting point, and in the case of small producers, there is no separation of family and farm/business cash flows, it would be advisable to adapt lending technologies that include household cash flow analysis to evaluate loan repayment capacities, making it possible to manage risks (without excessive guarantee requirements) and to base lending on more than parametric models of hectares and yields through the FIRA scheme.

- Work with financial institutions to develop products, technologies, and business models to address the needs of mango producers, building on lessons learned in value chain finance (such as structuring repayment schemes through buyers, adjusted to production cycles) and in agricultural microfinance methodologies (such as analyzing household cash flows as part of the credit decision). Key aspect to consider in such an approach include:
- **Portfolio diversification**, in terms of **sub-sectors, geography** (and services offered) to avoid concentration of risk in highly covariant areas and in periods during the production cycle.
- Means for lowering **operational costs** without sacrificing information and controls necessary to measure and manage risk, especially in lending to growers. For microfinance institutions in particular, it is important to recognize that percentage returns for mango growers tend to be lower than for urban traders (for which microfinance product and operations were originally designed). This suggests that **interest rates** should be lower than what is typical in microfinance in Mexico for credit to contribute to development.
- Related to the last point, the **full cost of trade credit** is often well above nominal costs, so sensitivity to interest rates may not be as severe as would appear at first review. Financial institutions might help clients calculate the real costs of the trade credit they do receive and determine together whether the financial institution can improve on those costs.
- **Leverage the relationships with value chain actors** and their deep knowledge of the needs, cycles, and histories of buyers and suppliers to develop structured financial products adaptable to these characteristics and to manage risk in doing business with chain actors.
- **Learn** from experience with agricultural lending in Mexico (knowing chain dynamics) and MF lenders (diversified household cash flow analysis) to find an appropriate hybrid methodology.
- **Business models** and organizational designs that **apply experience gained in mangoes to develop expertise** in other tree fruits, or **other chains that show some similar characteristics** (e.g. the role of packing houses), or where lessons can be applied.

## POLICY

In discussion with the sector at the workshop that AFIRMA held to present and verify results from this study, a number of policy-level constraints were highlighted, leading to the following recommended actions which ideally could be addressed through a joint public-private response:

- **Collaborate with public sector actors** looking to increase their presence and improve their impact in the sector, such as Financiera Rural and FIRA, to work together to inform design of products and programs.
- Examine **irrigation subsidies** available to mango producers on three levels:
  - Identify and address the policy limitations for the expansion of drip irrigation, including policies related to water supply.
  - Address the potentially regressive nature of irrigation subsidies
  - Identify means to make the process of applying for and receiving any such subsidies transparent and with third-party oversight.
- **Facilitate information sharing** on the various initiatives recommended above, beginning with making basic production and market information readily available to the sector and to policy makers.
- Finally, the sector led by the phytosanitary board and the producers' association must continue to improve coordination across the chain and with the public sector on **compliance with phytosanitary requirements**. This is especially important for the US market access since any shut-down at that border has major negative impact on prices in all commercialization channels given the volume that is then directed to the local market. Any approach here should further take into account the need for specific measures for compliance among the small but potentially increasing group of organic producers to meet requirements **without compromising their organic certification**.

**TABLE 6: SUMMARY OF UPGRADING OPPORTUNITIES AND SECTOR ACTIONS**

	<b>Production</b>	<b>Commercialization</b>	<b>Finance</b>	<b>Policy</b>
Collaboration	<ul style="list-style-type: none"> <li>• Research to determine root causes of declining productivity and approaches to mitigate, including extension services</li> <li>• Research and Development for an updated technological package</li> <li>• Certification of Official Ataulfo Nursery operations</li> </ul>	<ul style="list-style-type: none"> <li>• Analysis of options for Industrial use of Mango (possibly including investment options, business plan, and market linkages)</li> </ul>	<ul style="list-style-type: none"> <li>• Linking packing sheds to financial institutions for financing small producers</li> <li>• Link to Financiera Rural (ALCAFIN Program), build on links to FIRA</li> <li>• Work with MFIs to develop relevant products adjusted to the needs of mango producers</li> </ul>	<ul style="list-style-type: none"> <li>• Work with FIRA to review Mango portfolio, experience, conditions, and needs going forward</li> <li>• Identify and address limitations for drip irrigation (cross-sectoral)</li> <li>• Continue joint action to reduce the risk of shut-down due to phytosanitary non-compliance</li> </ul>
Information	<ul style="list-style-type: none"> <li>• Recommended agricultural practices for organic production</li> <li>• Examine options for lower cost Irrigation/drainage</li> <li>• Coordinate trials with producers, irrigation companies, Conagua, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Price information along the chain</li> <li>• Linking to and Consolidating information sources in a single location</li> <li>• Organic certification</li> </ul>	<ul style="list-style-type: none"> <li>• Briefing note for private sector financial service providers</li> <li>• Publicize financing opportunity with MFI partners &amp; non-partners</li> </ul>	<ul style="list-style-type: none"> <li>• Information sharing and transparency of public programs</li> </ul>

# ANNEX A DATA TABLES

## Production Scenarios

Scenario I	Pricing		Export	Domestic		
	Price MXP/KG		4.5	1.1		
	%		40%	60%		
Costs / Revenues	Costs @ 2 MT/HA	Revenues @ 2 MT/HA	Costs @ 4 MT/HA	Revenues @ 4 MT/HA	Costs @ 8 MT/HA	Revenues @ 8 MT/HA
Weed control	2,100	0	2,100	0	2,100	0
fertilization	1,506	0	1,506	0	1,506	0
Propping/Prunning	590	0	590	0	590	0
Pest/Disease control	3,834	0	3,834	0	3,834	0
Harvest Costs @ P0.50/kg	1,000	0	2,000	0	4,000	0
Harvest Revenue (Domestic)		1,320		2,640		5,280
Harvest Revenue (Export)		3,600		7,200		14,400
<b>Net revenue</b>	<b>-4,110</b>		<b>-190</b>		<b>7,650</b>	
MT / HA	2		4		8	

Scenario 2	Pricing		Export	Domestic		
	Price MXP/KG		4.5	1.1		
	%		0	100%		
	Costs @ 2 MT/HA	Revenues @ 2 MT/HA	Costs @ 4 MT/HA	Revenues @ 4 MT/HA	Costs @ 8 MT/HA	Revenues @ 8 MT/HA
Weed control	680	0	680	0	680	0
fertilization	1,200	0	1,200	0	1,200	0
Propping/Prunning	840	0	840	0	840	0
Pest/Disease control	630	0	630	0	630	0
Irrigation	55	0	55	0	55	0
Harvest Costs @ P0.50/kg	1,000	0	2,000	0	4,000	0
Harvest Revenue		2,200		4,400		8,800
Harvest revenue (Export)		0		0		0
<b>Net revenue</b>	<b>-2,205</b>		<b>-1,005</b>		<b>1,395</b>	
MT / HA	2		4		8	

Scenario 3	Pricing		Export	Domestic			
	Price MXP/KG		6.0	1.1			
	%		70%	30%			
	Costs @ 2 MT/HA	Revenues @ 2 MT/HA	Costs @ 4 MT/HA	Revenues @ 4 MT/HA	Costs @ 8 MT/HA	Revenues @ 8 MT/HA	
Weed control	1,200	0	1,200	0	1,200	0	
fertilization	450	0	450	0	450	0	
Propping/Prunning	1,300	0	1,300	0	1,300	0	
Organic Certification	250	0	250	0	250	0	
Pest/Disease control	600	0	600	0	600	0	
Irrigation	1,600	0	1,600	0	1,600	0	
Harvest Costs @ P0.50/kg	1,000	0	2,000	0	4,000	0	
Harvest Revenue (Domestic)		660		1,320		2,640	
Harvest Revenue (Export)		8,400		16,800		33,600	
<b>Net revenue</b>	<b>2,660</b>		<b>10,720</b>		<b>26,840</b>		
MT / HA	2		4		8		

### Value Distribution Scenarios – prices in MXP per Kg.

	Domestic Chain*	Export Chain	Organic Export Chain
Producer	1.10	4.75	6.20
Local Intermediary	0.88		
Packer	1.19	2.25	3.25
Wholesaler	2.83		
Domestic Retailer	5.50		
Import Broker		4.50	5.55
US Retailer		11.00	16.50
total	11.50	22.50	31.50
Percentage of final value			
Producer	10%	21%	20%
Local Intermediary	8%	0%	0%
Packer	10%	10%	10%
Wholesaler	25%	0%	0%
Domestic Retailer	48%	0%	0%
Import Broker	0%	20%	18%
US Retailer	0%	49%	52%
total	100%	100%	100%



## Nayarit Production Schedule

RAINFED

DISTRITO, MUNICIPIO	SUPERFICIE SEMBRADA	SUPERFICIE COSECHADA	PRODUCCION OBTENIDA	RENDIMIENTO OBTENIDO	PRECIO MEDIO RURAL	VALOR DE LA PRODUCCION
DELEGACION NAYARIT						
CULTIVO : MANGO						
VARIEDAD : ATAULFO						
AÑO AGRICOLA : 2003						
ACAPONETA TECUALA	195	195	1560	8.00	1825.00	2847000
COMPOSTELA BAHIA DE BANDERAS	12	12	117	9.75	1300.00	152100
COMPOSTELA COMPOSTELA	1743.5	1280	19400	15.16	1400.00	27160000
TEPIC SAN BLAS	718	718	7898	11.00	2400.00	18955200
TEPIC TEPIC	58	58	667	11.50	2400.00	1600800
<b>Total: (Sin Asociados)</b>	<b>2726.5</b>	<b>2263</b>	<b>29642</b>	<b>13.10</b>	<b>1710.92</b>	<b>50715100</b>
	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
	<b>234%</b>	<b>282%</b>	<b>242%</b>	<b>86%</b>	<b>119%</b>	<b>287%</b>
<b>AÑO AGRICOLA : 2007</b>						
ACAPONETA TECUALA	195	195	1950	10.00	2000.00	3900000
COMPOSTELA BAHIA DE BANDERAS	5.25	5.25	21	4.00	800.00	16800
COMPOSTELA COMPOSTELA	2547	2547	34385.5	13.50	1300.00	44701150
TEPIC NAYAR EL	1	1	9	9.00	1390.00	12510
TEPIC SAN BLAS	2789.13	2789.13	28170.21	10.10	2582.30	72743933.3
TEPIC TEPIC	796.71	796.71	7648.42	9.60	2595.39	19850632.8
TEPIC XALISCO	48.5	48.5	436.5	9.00	2515.28	1097919.72
<b>Total: (Sin Asociados)</b>	<b>6382.59</b>	<b>6382.59</b>	<b>72620.63</b>	<b>11.38</b>	<b>1959.81</b>	<b>142322946</b>
	<b>234%</b>	<b>282%</b>	<b>245%</b>	<b>87%</b>	<b>115%</b>	<b>281%</b>