Assessment of Haitian Mango Value Chain

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A participatory assessment of mango chain actors in southern Haiti

ASSESSMENT

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July 12–August 30, 2010

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ABBREVIATIONS AND ACRONYMS

3M: Mouvman Moun Mango, or Movement of Mango People (Haiti)

AER: Average Equivalent Rate

ANEM: Association Nationale des Exportateurs de Mangues, or National Association of Mango Exporters (Haiti).

AVSF: Agronomes et Vétérinaires Sans Frontières, or Agronomists and Veterinarians without Borders (France), http://www.avsf.org/

ASPVEFS: Association des Producteurs et Vendeurs de Fruits du Sud (Haiti), or Association of Fruit Producers and Sellers from the South.

CAPOSAC: Caisse Populaire Sainte Anne de Camp Perrin (Haiti)

CICDA: Centre International de Coopération pour le Développement Agricole (now AVSF)

CIAT: Centro Internacional de Agricultura Tropical, or International Center for Tropical Agriculture (Colombia), http://www.ciat.cgiar.org/

CRS: Catholic Relief Services (USA), http://www.crs.org/

FAO: Food and Agriculture Organization of the United Nations (Italy), http://www.fao.org/

FENAPCOM: Fédération Nationale des Associations de Producteurs pour la Commercialisation de la Mangue, or Federation for Mango Production and Commercialization (Haiti)

IQF: Individually Quick Freezing

MarChE: Market Chain Enhancement Project (Haiti), http://www.haiti-marche.org

MARNDR: Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural, or Ministry of Agriculture, Natural Resources and Rural Development (Haiti), http://www.agriculture.gouv.ht/

MT: Metric Tons

ORE: Organization for the Rehabilitation of the Environment (Haiti), http://www.oreworld.org/

USDA/APHIS: U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USA) http://www.aphis.usda.gov/

1 EXECUTIVE SUMMARY

This document is structured in three main parts. The first part provides an overview of the current mango market at the international and national level, as well as a description of the importance of agriculture and mango in Haiti. The next two parts are products of interviews and workshops with almost all of the actors of the mango chain in southern Haiti. These parts include a description of the mango chain for the region and its actors, constraints analysis and recommendations.

Priority was given to nine objectives that are considered strategic leverage points for three links in the chain. These objectives were prepared together with chain actors during constraints and solutions identification workshops. Each objective includes general activities that, if implemented, can facilitate improvement of the chain. Table 1 summarizes the constraints and objectives of the mango chain in southern Haiti.

Table 1. Summary of chain constraints and strategic objectives to address them

LINK IN THE CHAIN	CONSTRAINTS	STRATEGIC OBJECTIVES TO ADDRESS CONSTRAINTS
Production	• Lack of established mango fields • Insufficient technical support • Poor livestock management practices • High fruit fly infestation in mango areas	• Establish new mango fields • Evaluate technology packages • Reinforce technical support services • Promote livestock best practices • Extend fruit fly detection program and start control program
Transformation	• Poor harvest practices • Low skills in postharvest processing (non-ASPVEFS members)	• Increase the knowledge of producers and middlemen on best practices of harvest and post-harvest • Improve current coops infrastructure
Commercialization	• Scarce availability of local transportation	• Promote alternatives to improve local transportation • Seek new markets

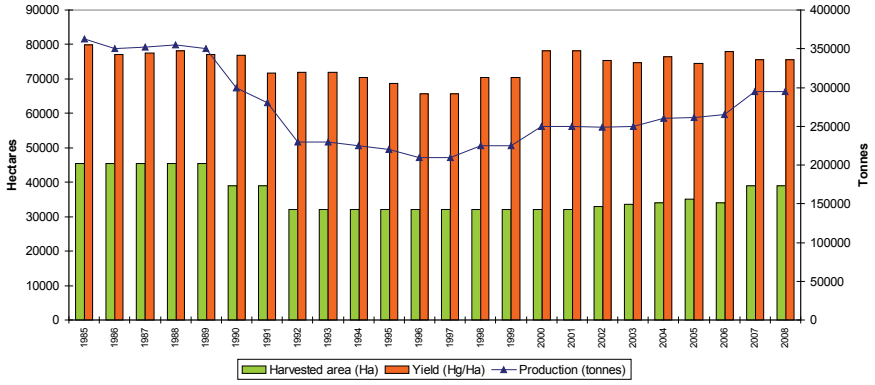
2 INTRODUCTION

CRS is in the process of developing strategies to support the recovery of Haiti after the devastating earthquake of January 2010. As part of this work, CRS in collaboration with CIAT, developed an assessment of the current state of Haitian coffee and mango chains. CIAT, together with CRS, partners and main chain actors during August 2010, worked to gather information in the field. This document is the final report of the assessment of the mango chain in southern Haiti.

3 RELEVANCE OF MANGO IN HAITI

Mango is the principal fruit grown in Haiti. According to FAO (2010), Haiti was among the top ten mango producing countries in the world until the late 1980's, and was also one of the top ten mango exporting countries until the early 1990's.

Figure 1. Mango production (FAO, 2010)



A wide range of varieties are grown in the country; some estimate more than 100 varieties (Bellande et al., 2008; JMB, 2005). Common commercial varieties are: Baptiste, Corne, Doudouce, Fil (rouge and blanc), Jean-Marie, Muscat, Blanc and Francisque[1]. Francisque is the only variety exported to the United States as it resists the hot treatment required by USDA/APHIS to avoid fruit flies in shipments. Francisque comprises 15 percent of total mango production in Haiti, however not all production is reaching overseas markets (about 25 to 33 percent of total production).

Traditional mango producing areas are Léogâne (West department), the Plaine de Cul de Sac, Arcahaie (West Department) and Cabaret (West Department), Artibonite, Central Plateau, Gros Morne (Artibonite Department), Northeast and Belladère (Central Department). Jacmel (Southeast Department) and Les Cayes (South Department) are considered new production areas to be developed, with a potential to produce 100,000 boxes/year (JMB, 2005).

Mango is a crop that thrives in dry and semi-humid zones (800 to 1200 mm rainfall) and attains best yields in altitudes around 400 m. a. s. l. in Haiti.

In 2007, Haitian mango imports were banned in the United States, due to the detection of infestation with fruit fly larvae (a phytosanitary restriction for all fruit exporting countries to the United States) in shipments. This decision threatened the mango industry and the economy of production areas due to the strategic importance of this commodity. The reopening of the U.S. market to Haitian mango imports was contingent on the implementation of a detection and control program in producing areas. This program is currently implemented by the MARNDR (Ministry of Agriculture, Natural Resources and Rural Development), ANEM and USDA/APHIS.

1 Mango Francisque has different names, including Francis and Madame Francique

Mango is a source of income for Haiti. There are currently several projects focused on supporting the mango chain in the country:

- The Mouvman Moun Mango, or 3M program, is an initiative to produce Fair Trade Certified™ mangoes. It encourages small producers in different regions to plant and protect more trees as they receive a premium price. Since the inception of the project, the harvest has been purchased by Whole Foods Market (WFM) and the certification process has been supported by WFM and volunteers.

- The Haiti Hope Project is aiming to develop the mango juice industry through a joint effort with public, private and non-profit sectors. Participants are The Coca-Cola Company, the Haitian Government, Technoserve and the IADB (MIF). This five-year project aims to increase mango production and revenue for at least 15,000 farmers. Project areas will be selected according to the current production quality and volumes. Preselected areas include: Gros Morne and Petite Rivière (Artibonite), Mirebalais (Bas Plateau/Plateau Central), and Léogane, Cul de Sac and Cabaret (West) (IADB, 2010).

- JMB S. A. (mango exporter), partnered with CHF International and USAID to build post-harvest and storage centers in two localities (Cameau and Saut d'Eau), aiming to train farmers on post-harvest practices, reducing losses and improving farmers' revenue.

4 MARKETS

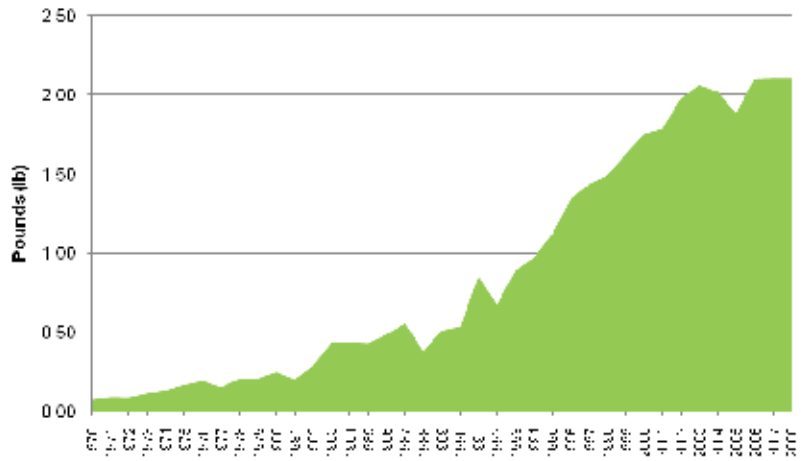
Mango is considered one of the most farmed tropical fruits in the world, accounting for approximately 50 percent of total fruit production (Jedele et al., 2003). According to FAO (2010), the main mango producers worldwide in 2008 included India (13,649,400 MT), followed by China (3,976,716 MT), Thailand (2,374,165 MT), Indonesia (2,013,123 MT) and Mexico (1,855,359 MT). Mango production is concentrated in developing or emerging countries. In developed countries such as the United States, mango production remains marginal (less than 3,000 tons were produced in 1999).

The top five mango importers worldwide in 2007 were the United States (295,321 MT), Netherlands (111,830 MT), United Kingdom (57,381 MT), United Arab Emirates (47,038 MT) and Germany (46,762 MT). The top mango exporters were: India (240,858 MT), Mexico (236,004 MT), Brazil (116,271 MT) and Peru (82,512 MT) (FAO, 2010).

Mexico is considered the principal mango supplier for the United States while Brazil and African countries supply Europe (Jedele et al., 2003). The demand for mango is growing in both developed and developing countries, leading to increased mango production and heavier competition among mango exporting countries (Jedele et al., 2003).

The U.S. per capita mango availability (proxy for mango consumption) sharply increased from 0.38 pounds in 1988 to 2.06 pounds in 2003 (USDA-ERS, 2010) (See Figure 2). This consumption growth has been guided by factors such as year-round fruit availability and lower prices (Evans, 2008).

Figure 2. United States per capita mango availability (USDA-ERS, 2010) \



The total volume of fresh imported mango in the United States varies throughout the year, with noticeably low supply levels that match with medium to high prices as shown in the period from September and December 2010 (Table 2). The period from April to June has the highest supply volumes and lowest prices compared to other seasons in the year. Exporters have identified the upcoming September-December window as an opportunity to reach higher prices by increasing their exported volumes to the United States during this season.

Table 2. Supply volumes behavior and expected average prices per month for imported fresh mango in the United States (USDA-AMS, 2010)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Low prices	Medium prices	Medium prices	Low prices			Low prices		Medium prices	High prices		Medium prices
2.50 USD/kg	2.86 USD/kg	2.97 USD/kg	2.38 USD/kg	2.53 USD/kg	2.52 USD/kg	2.11 USD/kg	2.18 USD/kg	2.74 USD/kg	3.41 USD/kg	3.00 USD/kg	2.73 USD/kg

Low supply level
Medium supply level
High supply level

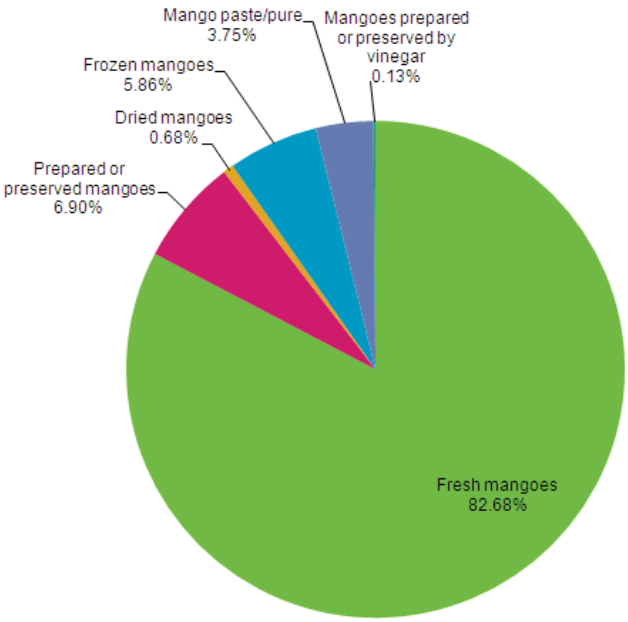
Range of prices

Low	2.11 – 2.55
Medium	2.56 – 2.98
High	2.99 – 3.41

Strategies for increasing exportable volumes during high price seasons vary widely, from modifying crop cultural practices (e.g., pruning, fertilizing, subjecting plants to water stress using flowering promoting products), to selecting plant varieties or geographical areas that allow early or extended harvests. JMB identified Léogâne (harvest time: October – December) and The Plaine de Cul de Sac (harvest time: November – February) as regions in Haiti with potential to benefit from these high price seasons (JMB 2005).

Fresh mango is the most imported mango-based product in the United States, followed by prepared or preserved mangoes, frozen mangoes, and mango paste/ pure and dried mangoes (Figure 3).

Figure 3. Distribution of mango-based imported products in the United States from 2005-2010 (USDA-FAS, 2010)

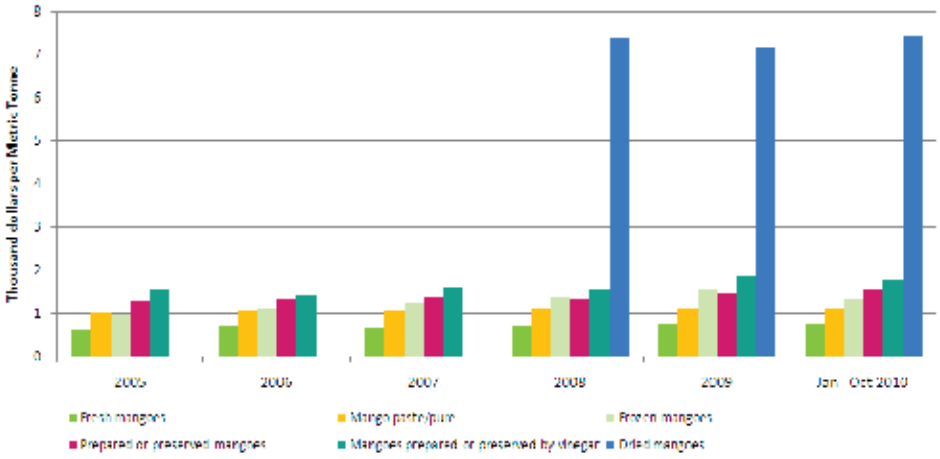


However, the added value of fresh mangoes is the lowest among all mango-based products. While a metric ton of fresh mango does not reach a thousand dollars at the port of entry to the United States, dried mango receives around 7,000 USD per ton (Figure 4). All other preparations surpass fresh mango prices by at least 55 percent.

Figure 4. The value of different mango-based products imported in the United States (USDA-FAS, 2010)

Dried mango imports in the United States are fulfilled mainly by The Philippines, Thailand and Mexico (Figure 5), reaching up to 5,000 tonnes per year.

Figure 5. U. S. dried mango imports (USDA-FAS, 2010)

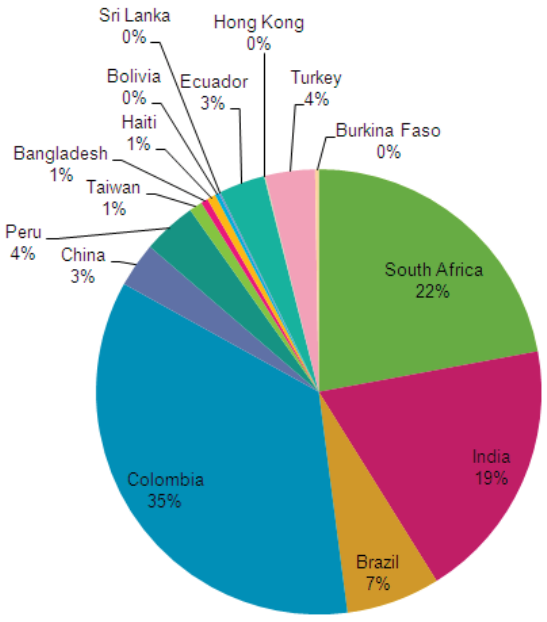


Other countries have also started to export dried mango to the United States, but in smaller volumes. Exports from Haiti account for about one percent of the total volume under this category (Figure 6).

Figure 6. Small volume exporters' participation in the U.S. market from 2008-2010 (USDA-FAS, 2010)

5 MANGO CHAIN ANALYSIS

Mango chain analysis is presented in two parts. The first part includes a brief description of the value chain according to the map generated through literature



review, interviews and workshops in the field. The second part includes a detailed description of each of the actors involved in this chain.

5.1 Mango chain description

The mango chain in southern Haiti has three types of producers. The first type of producer has surfaces between two and 10 ha planted with mango. They implement a moderate technological package using planting distances, pruning, and other techniques. These producers are mostly exporters attempting to increase their own supply and diaspora and are willing to invest in the agricultural sector. The second type of producer is associated and has less than two ha with low to null use of agricultural inputs such as pesticides and fertilizers. The third type of producer is non-associated and has less than two ha with low to null use of agricultural inputs. Yields among smallholders are between 5-10 dozen/tree/year and 70 -75 dozen/tree/year.

ASPVEFS (Association des Producteurs et Vendeurs de Fruits du Sud) – JMB circuit

Associated producers to ASPVEFS in the south are distributed along different areas. They are grouped in "cells" according to the distance between them. During harvest, the association pays farmers 0.5 USD/count (each count includes 12 mangoes). ASPVEFS buys fruit on the tree and its "cells" are in charge of all post harvest tasks (picking, catching, transporting, cleaning and classifying fruits). ASPVEFS pays each cell 0.24 USD per dozen they harvest and treat. ASPVEFS' cells classify mangoes into two categories: standard mangoes (intended for export) and second class mangoes. They use plastic crates to transport fruits from their post-harvest center to the exporter or their alternative distribution channels.

Standard mango is sold to JMB for 1.02 to 1.50 USD per dozen, and ASPVEFS rejects are negligible. ASPVEFS is not an exclusive supplier to JMB; in fact, southern Haiti represents a small fraction of mango production in the country. While southern Haiti offers around 10,000 dozen mangoes for export, the Plateau Central produces around 1,000,000 dozen per year. Francis is the exported mango variety due to its resistance to hot water treatment (required to access the U.S. market as a treatment against fruit fly). Mango is largely exported to U.S. fruit and vegetable wholesalers which re-distribute to supermarkets and local ethnic markets (predominantly Haitian and Asian markets).

ASPVEFS – Organization for the Rehabilitation of the Environment (ORE) circuit

Second class mangoes are taken to ORE's drying facility at Camp Perrin, where fruits are classified again. Less than 20 percent of fruits are considered unsuitable for drying due to over ripeness, rotting or excessive bruising. ORE only buys mangoes suitable for drying and ASPVEFS offers rejected mangoes on the local market. ASPVEFS sells mangoes at approximately 1 USD per dozen to ORE for dry processing.

Table 3. Costs of dry processing one dozen mangoes

INPUTS	PERCENT	COST
Raw material (mangoes)	17	1.00
Management	20	1.18
Labour	21	1.24
Packaging	9	0.53
Energy	33	1.94
Total	**100**	**5.88**

Source: Personal interview Mousson PIERRE

The drying facility has the capacity to process 250 dozen mangoes/week. The cost of processing one dozen mangoes is about 5.88 USD (Table 3). This facility operates from April to August, during the mango harvest. ORE is experimenting with drying other mango varieties as well as other types of fruits and vegetables (e.g., tomatoes, pineapples) but the supply of these products needs to be increased. Dried mango is packaged in 100g bags (about three fresh mangoes are required to produce 100g of dried mango. The retail price is 2.5 USD per bag and 1.88 USD per bag for wholesalers. The current distribution channel is the local market in Les Cayes.

Dried mango is the highest value mango product. It also generates temporary local employment at the production facility (where more women are involved in labor). However, producers are not currently receiving any difference in price whether they sell to exporters or processors. This may be due to current small scales or chain inefficiencies (lack of farmers' involvement in production improvement, harvest and postharvest activities).

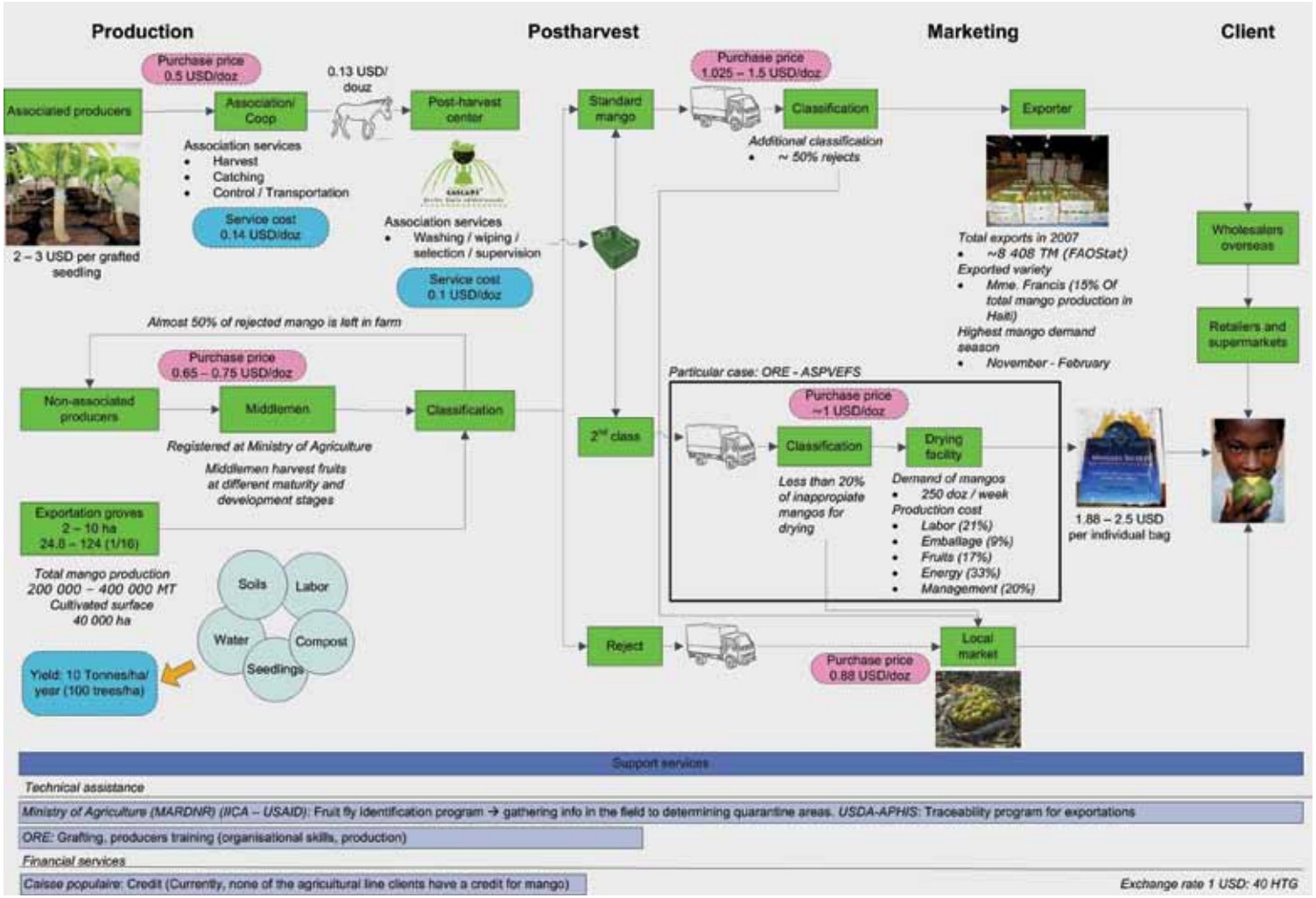
Non-associated producers–middlemen circuit

Non-associated producers sell their fruit to middlemen on farms. Farmers pre-sell the harvest from the tree at prices ranging from 0.65 USD to 0.75 USD per count (each count contains approximately 12 mangoes). Middlemen harvest all fruits from the tree whether they are appropriately ripe or not. After picking all fruit, middlemen select and leave rejected fruits at the farm, paying only for the chosen mangoes (see a comparison of asked and real prices in Figure 8). Rejected fruits could be immature, over ripe, bruised or fly infested, with a low chance of commercialization. Mango losses may reach up to 50 percent of the total potential harvest. Mango is sold to exporters in Port-au-Prince (transportation is arranged with the exporter, and prices vary), however, at the export facilities, it is necessary to re-classify mangoes due to the inappropriate postharvest practices of middlemen (rejects account for around 50 percent). Rejected mangoes are sold to *madam sarah*s.

Exporters circuit

Few mango exporters and *diaspora* are establishing their own mango groves. Due to the outdated Haitian land registry, some exporters prefer to continue buying mangoes directly from producers. Harvest and postharvest practices need to be improved in order to increase the availability of mango for export.

Figure 7. Mango chain in southern Haiti



The support services identified in this chain are technical assistance, provided by the Ministry of Agriculture through the fruit fly identification program, and the ORE, which has been training farmers on organizational and grafting skills. Other service providers include agricultural inputs suppliers. *Agrotechnique* offers technical support to farmers in central regions of Haiti and *Darbouco* offers small tools, as well as tech support.

5.2 Mango chain actors

Mango chain actors include agricultural input providers, mango farmers, middlemen, smallholders associations, *madam sarahs*, exporters and services providers. Details of each actor and the most relevant typologies found in the assessment are provided below.

5.3 Agricultural inputs providers

These providers are responsible for the sale of agricultural inputs, such as pesticides, fertilizers, seeds and tools. Some offer technical support to their clients, particularly *Gerly distribution* (located in Les Cayes), *Darbouco* (located in Port-au-Prince) and *Agrotechnique* (located in Port-au-Prince), as part of their service. However, highly specialized support for mango farmers is not available.

Agrotechnique chiefly assists mango farmers in Artibonite and Plateau Central, offering technical support and grafted trees. Each mango grafted tree costs around 2 to 3 USD.

Currently, farmers dedicated to grow short-term crops (e.g., vegetables, beans and rice) are considered the most interesting market segment for inputs providers, due to their regular demand for inputs.

Under normal conditions, pesticides are imported from the Dominican Republic, as well as Venezuela and China, among other countries. During some periods, fertilizers are directly imported and subsidized by the Haitian government.

5.3.1 Mango farmers

In lowlands, mango is usually grown in association with other food crops (bananas, beans and other vegetables), while on hillsides it is grown with maize and millet. In the south, small mango groves are found across mountain ranges. The origin of mango stands is mainly from opportunistic seedlings and random seeding, rather than planned planting. There are few large mango groves in the country (*diaspora* and some exporters, such as La Finca and Fruits & Legumes, have started to establish mango fields of two to 10 hectares), but frequently, farmer producers own fewer than 10 mango trees spread across various plots of land. There is growing interest in planting Francisque mangoes in some regions (with the idea that on average each farmer should have 25 mango trees).

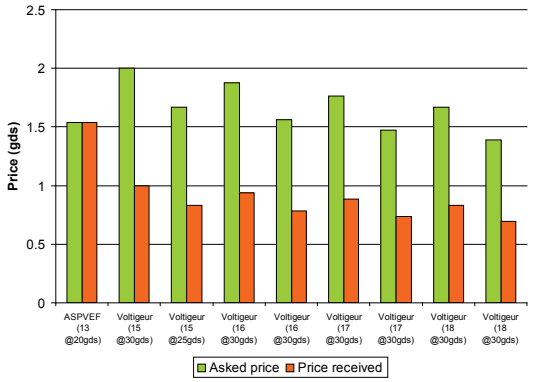
Due to inconsistencies in the Haitian land registry system, some exporters prefer to strengthen relations with farmer associations in order to achieve desired volumes of exports, rather than attempt to establish their own mango nurseries .

The main phytosanitary problems are caused by antrachnose, which reduces the availability of quality mangoes for export) and the fruit fly (a phytosanitary barrier

to enter the US market). Among farmers, the application of insect and disease management techniques is low or non-existent as are improved practices such as pruning. Mangoes are very tall trees and farmers do not use tools for harvesting. The mangoes are harvested by hand by people who climb the trees, a practice that is time intensive, inefficient and high-risk.

Farmers in the south can sell their harvest to ASPVEFS or *voltigeurs*. Harvest will not always be supervised when selling or pre-selling produce to *voltigeurs*, which increases the likelihood that unripe mangoes will be harvested and trees will be damaged. This could result in the loss of up to 50 percent of the harvest potential. Usually, relations between *voltigeurs* and farmers are strained. In addition, ASPVEFS and *voltigeurs* prices are quite different as shown in Figure 8.

Figure 8. Comparison between asked and actual prices for farmers, per mango unit, offered by ASPVEFS and voltigeurs (personal interview Jacques Willio Pierre, ASPVEFS)



5.3.2 Smallholders associations

As mentioned in the MarChe report (2009), there are 16 mango growers associations in the country located in all the important growing areas. As of 2009, six of them were under organic re-certification process and four were participating in the certification process for the first time.

Other producer organizations are Fair Trade certified™, such as FENAPCOM (Federation for Mango Production and Commercialization) a second level organization composed of several regional associations of smallhollders located all over the country. They work jointly with Whole Planet foundation and 3M (Mouvman Moun Mango).

ASPVEFS (Association des Producteurs et Vendeurs de Fruits du Sud)

ASPVEFS is a farmers association located in southern Haiti. Through training supported by ORE and AVSF, they have acquired skills in grafting and best practices for mango harvest and postharvest. In 2008, ASPVEFS had 725 members from four localities (Saint Jean du Sud, Aquin, Saint Louis and Camp Perrin) producing 91,400 dozens of mango.

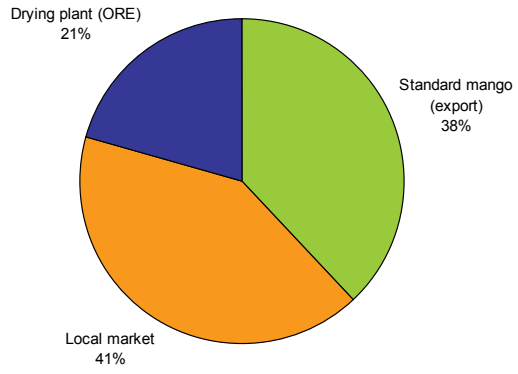
According to AVSF (2007), in 2006, communes d'Aquin, Saint Louis and Camp Perrin had a total of 3,000 mango growers, owning 17,000 mango trees of which 65 percent were productive. The 2006 supply was calculated to be up to 325,000 dozen. There were also 30,000 trees from other varieties, with a potential to be grafted with Francisque to produce at least 1,410,000 dozen (estimated yield = 30 dozen per tree).

ASPVEFS is currently participating in the Fair Trade and organic certification processes. They plan to export organic mango through JMB and Perry export and import.

ASPVEFS' main role is to market mangoes from harvest to exporter. The association buys mango directly from farmers. ASPVEFS manages a standardized count (which comprises 13 mango units) and tries to offer a constant price (20GDS/count). Once a farmer makes an agreement with ASPVEFS to sell his mangoes, ASPVEFS supplies its harvest team to carefully select ripe mangoes, harvest them, organize them in plastic crates and transport them to the conditioning center (where they wash and select harvested mangoes).

ASPVEFS has three main distribution channels:

Figure 9. ASPVEFS' participation in main distribution channels (personal interview Jacques Willio Pierre, ASPVEFS)



ASPVEFS classifies mangoes into two types: standard mango (for export) and second class mango. Prices received for standard class mangoes are around 40 to 42 gourdes/dozen. Standard mango is sold to JMB, with which they have a long-term (over 10 years) relationship. Presently, JMB is the only exporter buying mango from the association. ASPVEFS is recognized for their low percentage of rejects (almost negligible) due to their strong postharvest practices, however their volume is low (10,000 dozen) compared to producers in the Plateau Central (about 1,000,000 dozens). ASPVEFS has tried to work with other exporters, but often these other exporters fail to follow-through on commitments to provide transport at the moment of harvest.

Second class mangoes are mangoes that are inappropriate for international markets due to physical defects (bruises, malformations and spots). These mangoes are marketed with ORE and used to produce dried mango. ORE

selects which mangoes are suitable for producing dried mangoes, but as per an agreement between ORE and ASPVEFS, ORE tries to maximize the selection and thus rejects less than 20 percent. Prices are around 38 to 40 gourdes/dozen.

Finally, mangoes that do not meet quality requirements for exporting or dry processing reach local markets through local retailers and a local mango mini-store. Prices are around 35 gourdes/dozen

5.3.3 Middlemen

Middlemen (commonly known as *voltigeurs*), act as suppliers to mango exporters as some exporters do not manage direct relationships with producers. *Voltigeurs* usually have a network of collectors who buy mangoes from the tree. They manage cash advances to farmers year-round, and as a result, producers commit to sell their harvest at lower market prices.

Voltigeurs buy based upon a predetermined count comprised of 15 to 18 mangoes. They offer prices ranging between 25-30 gourdes per count of acceptable mangoes. However, they harvest all mangoes (ripe and unripe) and classify them after harvest, leaving rejects at the farm and paying only for mangoes they take (almost 50 percent of potential harvest loss is due to this practice).

This supply scheme is common in regions where farmers associations are not involved in commercialization or good postharvest practices.

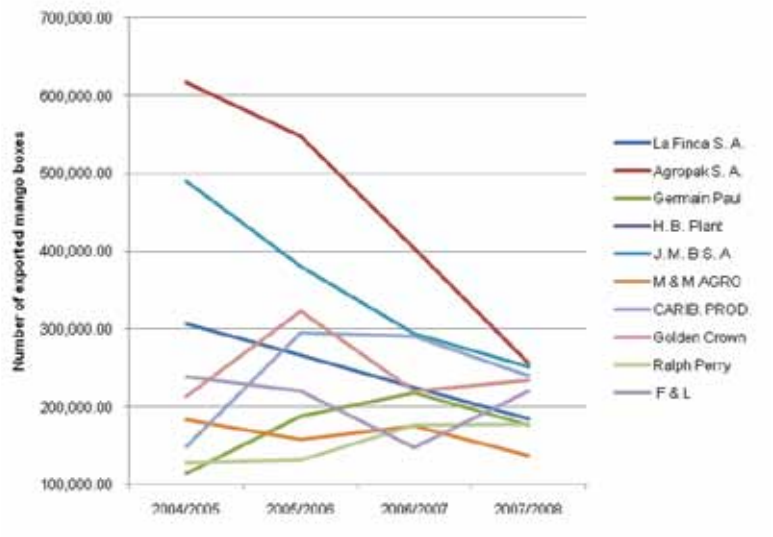
5.3.4 Madam sarah

Madam sarahs are the most common local market channel distribution in Haiti. These women act as retailers, selling the mangoes that are inappropriate for the international market (whether for quality or variety issues). The main challenge they face is reducing losses due to waste and other physical issues.

5.3.5 Exporters

The 10 major mango exporters in Haiti are associated under ANEM (Association Nationale des Exportateurs de Mangues). The association collects service fees for USDA/APHIS (hot water treatment). The following graph shows the exports per exporter from 2004 to 2008.

Figure 10. The amount of mango boxes exported from 2004 to 2008 (MARNDR, 2008)



As part of the assessment, ANEM's current director (José Pablo Sylvain) was contacted for an interview, but due to the increased interest in this chain since January's earthquake, his time is much in demand and it was not possible.

JMB S. A.

JMB is one of the major mango exporters in Haiti. They have been working with local fruit producers in several regions in the country; promoting the production of high quality mangoes and good postharvest practices. JMB is working with mango producers on locally adapted solutions for transportation (e.g., crate holders for donkeys), temporary processing and selection centers (appropriate tents and tables) and permanent fruit conditioning centers. JMB offers conventional and organic mango to the United States market.

At present, JMB has conditioned an Individually Quick Frozen facility (IQF), which will allow them to offer frozen pulp, cubes and halves, adding value to rejected mangoes. JMB is also expecting to process other type of fruit crops (e.g., papayas) in this new facility.

Ena DERENONCOURT

Ena DERENONCOURT, from Agrotechnique (agricultural inputs supplier) also exports mango, but instead of establishing direct relationships with producers, Derenoncourt procures mangoes from middlemen at prices around 1.5 USD/dozen.

5.3.6 Support services

5.3.6.1 Financial services providers

These providers provide credit to organized producers, associations, and individual farmers to enable them to produce mango. Few providers in the region have special

lines of credit targeting the agricultural sector. Others offer diverse, non-financial services. In 2010, annual interest rates in Haiti were approximately 30 percent.

Caisse Populaire – CAPOSAC

Located in Camp-Perrin, CAPOSAC was founded in 1949 as an initiative of a Canadian priest. The organization currently has assets worth 240,000,000 gourdes (approximately USD 6,000,000) and offers services to almost 13,000 people. Their services include currency exchange, current and savings accounts, money transfers, credits and check cashing.

CAPOSAC offers four lines of credit: consumption, commercial, construction and agriculture. There are several advantages of an agricultural credit. After repaying the whole credit, the client receives 20 percent of the total paid interests at a differential rate. The grace period before repayment is flexible and can be extended by a month, though the length depends on the type of crop grown, perennial or annual. The minimum credit loan is 2,500 gourdes (about USD 62.50) up to 750,000 gourdes (about USD 18,750).

They currently have 515 clients under agricultural credit, though none of them are producing mangoes.

FONKOZE

This organization was founded in Haiti in 1994 and has 41 offices in Haiti (including Les Cayes). It is recognized as Haiti's Alternative Bank for the Organized Poor and is the largest microfinance institution offering services to the rural poor in the country. The organization offers small loans, saving products, currency exchanges and direct deposits from overseas. The organization also offer non-financial services such as basic literacy instruction and basic life skills training (including training for business skills and sexual and reproductive health).

Fonkoze has four main credit programs:

- Chemen Lavi Miyò, an 18-month program to strengthen productive assets and asset management skills. It targets very poor people. After 18 months, program participants are expected to move into the small credit program or solidarity credit.
- TiKredi, the small credit program, is a six month lending program. It offers loans of $25 to $75 USD.
- Kredi solidè, solidarity credit, is a type of credit for groups of five to 10 individuals. Loans are $75 to $1,300 USD.
- Business Development, an individual credit program. The average credit for this program is $1,685 USD.

Table 4. Average loan size per loan program

LOAN PROGRAM	AVERAGE LOAN SIZE (USD) IN 2009
Chemen Lavi Miyò	No credit
TiKredi	$42
Kredi solidè	$221
Business Development	$1,685

5.3.6.2 Non-financial service providers

Organization for the Rehabilitation of the Environment (ORE)

ORE is a non-profit local organization located in Camp Perrin. ORE's team, comprised of technical management and support staff, includes up to 30 people, depending on the current activities and projects they are implementing. ORE promotes high value fruit tree grafting as a means to improve livelihoods and protect the environment. They also have extensive experience in propagating improved seeds, soil conservation techniques and farmer training.

ORE has a fruit drying facility at its headquarters where they currently dry mangoes from ASPVEFS. ASPVEFS brings mangoes not suitable to export (mangoes with spots, deformities) and ORE selects acceptable mangoes for drying (not too ripe, not bruised). Less than 20 percent is rejected and given back to ASPVEFS. Dried mangoes are produced during the harvest season (end of April to end of August), and ORE processes 250 dozen mangoes per week. Each dried mango package weighs 100g (about three fresh mangoes are needed to produce a 100g package). ORE is also interested in offering other types of dried products, such as papayas and tomatoes in the local market. ORE is currently testing drying with other mango varieties (to see if value can be added to these types of mangoes. Currently, they only regularly process Francisque.

Agronomes & Vétérinaires sans frontières (AVSF)

AVSF was established in 2004 as a merge between Vétérinaires Sans Frontières (VSF) and the Centre international de Coopération pour le Développement Agricole (CICDA). AVSF manages projects related to agricultural development around the world. They also raise funds and offer technical assistance according to the expertise required by the project.

AVSF has worked with ORE and ASPVEFS in postharvest improvement, encouraging farmers to plant grafted mango trees and supporting organizational strengthening.

Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural (MARNDR)

The MARDNR manages the national fruit fly control program (*Programme National de Détection et de Contrôle de la Mouche des Fruits*). With support from USDA and ANEM, the program has implemented a traceability system, in which fly traps are

installed each square kilometer and are inspected periodically to register current fly populations. Each square kilometer has a code corresponding to a geographical reference coordinate, which is taken into account at harvest (written on the harvest format) and allows exporters to keep track of the origin of mangoes, specifically whether they come from a quarantine zone.

Additional activities within the program include inspections at hot water treatment facilities with the aim of verifying that the treatment is well applied, identification and characterization of alternative host species for the fly, and sensitization activities with mango famers (principally to diffuse basic information related to the program).

To date, the program has helped determine quarantine zones (those that exceed the maximum amount of flies per trap), and supervise hot water treatment. However, there is not a program for controlling or detecting fruit flies at the farm level.

6 CONSTRAINTS ANALYSES

6.1 Production link constraints

6.1.1 Insuficient technical support

The technical support available is not sufficient for producers to manage their plots according to local conditions. This is due to a lack of resources for this service, low availability of human resources and high dispersion of mango producing farms.

6.1.2 Low Francisque mango tree density per farmer

Current plots under mango production are mostly very small areas competing with livestock, household infrastructure, and other food crops. A mango farmer usually has less than 10 trees under production, and in some cases, they are not Francisque. High land tenure fragmentation and elevated land prices do not enable farmers to expand their farm size.

6.1.3 Weak crop management techniques

At present, mango trees are frequently grown without applying any crop management techniques at all, therefore, trees reach heights that are difficult to harvest due to lack of pruning. There are high levels of incidence of fruit fly that reduce the volume of mango for export (this pest is not being well identified nor efficiently controlled at farm level, and it is usually identified at the moment of sale either at the association or when the fruit arrives to the exporter). Poor animal husbandry and lack of controlled breeding cause total or partial losses during the establishment of mangoes trees (livestock eat seedlings).

6.2 Postharvest link constraints

6.2.1 Poor harvest practices

Harvesters climb trees, harvest fruit and throw them to a “catcher” on the ground. This type of harvest practice deteriorates the quality of mangoes and reduces the available volume for export, whether fresh or dried. Furthermore,

non-associated farmers do not know the characteristics of fruits ready for harvest (harvest maturity), or they do not have access to other markets, so they allow middlemen to harvest all available fruits.

6.2.2 Skills in postharvest processing in mango growers associations

Low skill levels in mango postharvest management reduce the volume available for export. Technical support is still insufficient to build skills in some associations or productive clusters, as well as a general lack of financial resources to access and improve infrastructure. This is the case for producers outside the scheme of ASPVEFS.

6.3 Commercialization link constraints

6.3.1 Scarce availability of local transportation

Lack of efficient local transportation is one of the biggest bottlenecks for mango associations in terms of marketing. In order to transport mango from farms to collection centers, people must walk a long way to sell just a small fraction of their daily harvest (one person can carry around 3 – 4 dozen/trip, and each round trip may require more than an hour and a half). As a result, many farmers prefer selling their product to local middlemen who will harvest at the farm but at a lower price. This system results in the harvest of fruits at different states of ripeness, thus lowering total volume of mango for export and decreasing farmers' revenue, but eliminating the need for the farmer to spend time walking to and from the collection center.

6.3.2 Limited access to local and external markets (for dried mango)

Dried mango produced in the south is mainly distributed in Les Cayes. The drying facility capacity is currently underutilized (in all seasons including mango harvest). Furthermore, the demand in the immediate market area is greater than the supply, and as a result the dried mango is neither shipped to more distant internal markets nor exported.

7 RECOMMENDATIONS

We recommend increasing the current tree density per plot for Francisque (~200 trees per hectare), through a combination of old stands renovation using quality and disease-free grafts and by planting new grafted mango trees. ORE has strong experience in grafting high value trees and training farmers to produce their own. During the establishment of new grafted trees it is necessary to promote good livestock raising practices to avoid seedlings losses (free-range goats eat young trees and seedlings). Other important practices include pruning to keep mango stands at appropriate heights and aerated, and improved harvest and trees management to reduce risk for harvesters as well as damage to fruits.

In order to improve current harvest quality and quantity, it is important to generate and establish technical assistance services including training to local personnel, participatory development of technological packages adapted to local conditions with support of experts (e.g., CIAT, USDA, Fairchild Tropical Botanic

Garden, ORE), knowledge transfer to farmers, and the development of low cost methodologies and practices (e.g., traps, collection of fallen fruits, residues management) to control, detect and reduce fruit fly incidence at the farm level. According to ASPVEFS, only about 25 percent of the total amount of mango produced is free of antrachnose and pests.

Moreover, JMB has identified potential areas to expand mango Francisque, according to environmental and physical parameters. A complete environmental characterization of the region and further validation of experts and JMB would make it possible to identify homologue areas to expand the crop. Meanwhile, Saint Louis du Sud and Aquin (Southern Department) are mentioned by JMB as potential for growing Francisque.

Creating new low cost systems/tools (e.g., basket, containers) to collect and transport fruits from farm to postharvest centers will enable farmers and associations to partially reduce post-harvest losses during transportation. At the Plateau Central, JMB and mango farmers have developed low cost innovations to enhance the shelf life of mangoes through support systems for carrying crates on donkeys to avoid bruising and basic infrastructure (tents and tables) for collecting and selecting mango in remote areas. These types of innovations could be adapted and improved for the south. We suggest creating, together with JMB, producers associations and technology suppliers (e.g., research institutes, universities) and an enabling environment so these types of innovations can be developed among chain actors. Further, training farmers and middlemen on good postharvest practices (e.g., the use of trays and containers suitable to handle mango and prevent fruits piling) will help to decrease current losses in the field. Finally, it will also be important to define and disseminate quality standards (e.g., harvest maturity, fruit size, fruit sanitation) required by each market, using friendly approaches (e.g., graphic posters including photographs).

Mango producers are spread all over the region and means of transportation are scarce. Promoting and evaluating alternatives to improve local transportation could allow farmers associations to collect mangoes at the farm level. Currently, local transportation for agricultural products is a gap in the market, therefore, possible alternatives to fill this gap might include: foster local business creation for transportation, involve current transporters to improve coverage, and promote alliances between transporters and farmers' associations. At the association level, decisions on acquiring machinery and equipment to fulfill the lack of local transportation services should be based upon internal financial analyses. However, if the association is planning to acquire this equipment to offer a local transportation service, whether for mangoes or other products, feasibility and market studies should be completed (the latter study should look at both local and regional transportation services).

Beyond identifying potential new clients, a participatory rapid market study for fresh mangoes should be carried out. Organizational and business management strengthening (leadership, duties, rights, strategic planning, organizational chart, accounting, taxing and finances), based upon the current status of the association is also recommended.

Dried mango is adding value to producers' organizations. However, to increase available volumes of this product, it is necessary to: (1) foster alliances with specialized supermarkets interested in Haitian mango under inclusive business models (e.g., Whole Foods), (2) promote the creation of fruit drying businesses in alliance with strengthening farmers' organizations and/or private businesses, and (3) improve the current quantity and quality of mango produced in the region.

We suggest focusing on two types of beneficiaries: mango producers and associated *madam sarah*s. Strengthening associated groups of *madam sarah*s in urban areas will allow the development of a new distribution channel for rejected/third class mangoes, enabling producers to sell this type of mango directly to organized *madam sarah*s, reducing their raw material price and improving revenues.

JMB is finishing the expansion of their facilities where frozen mango will be produced under IQF process for the mango pulp market. Mangoes used for this product will be those that do not fill the requirements for export, such as small and bruised mangoes.

GLOSSARY

Antrachnose Plant disease that affects stems, leaves, fruits or flowers of the host plant. Conspicuous symptoms in mango are black and sunken lesions, leading to low yields, premature fruit fall and low quality fruits.

Diaspora Haitians living abroad

Francis Mango variety, also known as Madame Francique or Francisque. It is the most exported variety in Haiti, due to its capacity to resist hot water treatments (required by U.S. market).

Harvest maturity Optimum stage of maturity to harvest a particular product.

Madam Sarah Female retailer who sells mangoes (or other basic products) in the local market that are unsuitable for expert. *Madam Sarahs* usually use flat baskets to display mangoes for sale.

Shelf-life The given length of time for a perishable product before it is considered unsuitable for sale or consumption.

Voltigeur A low-level middleman acting as a retailer in the local market.

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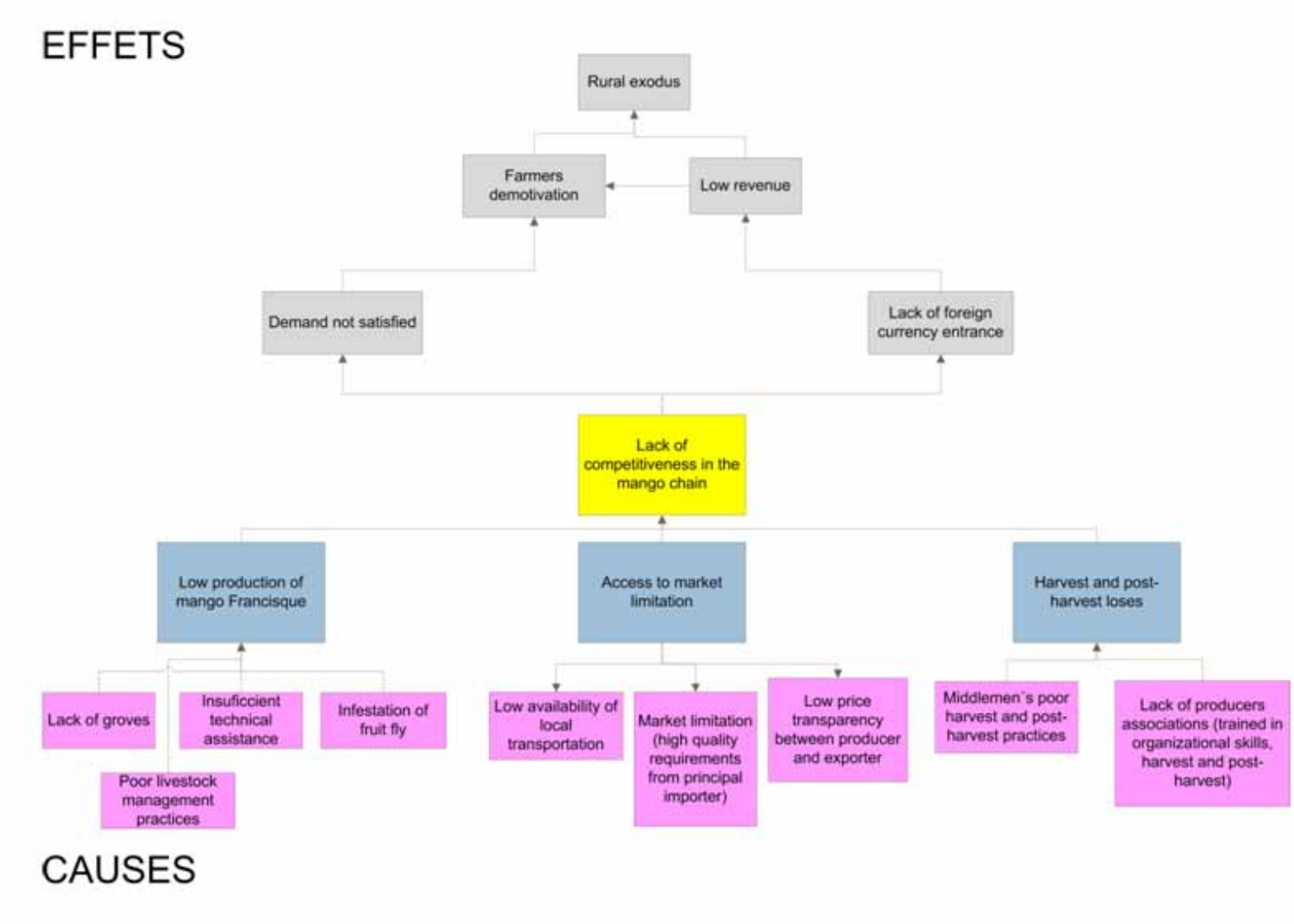
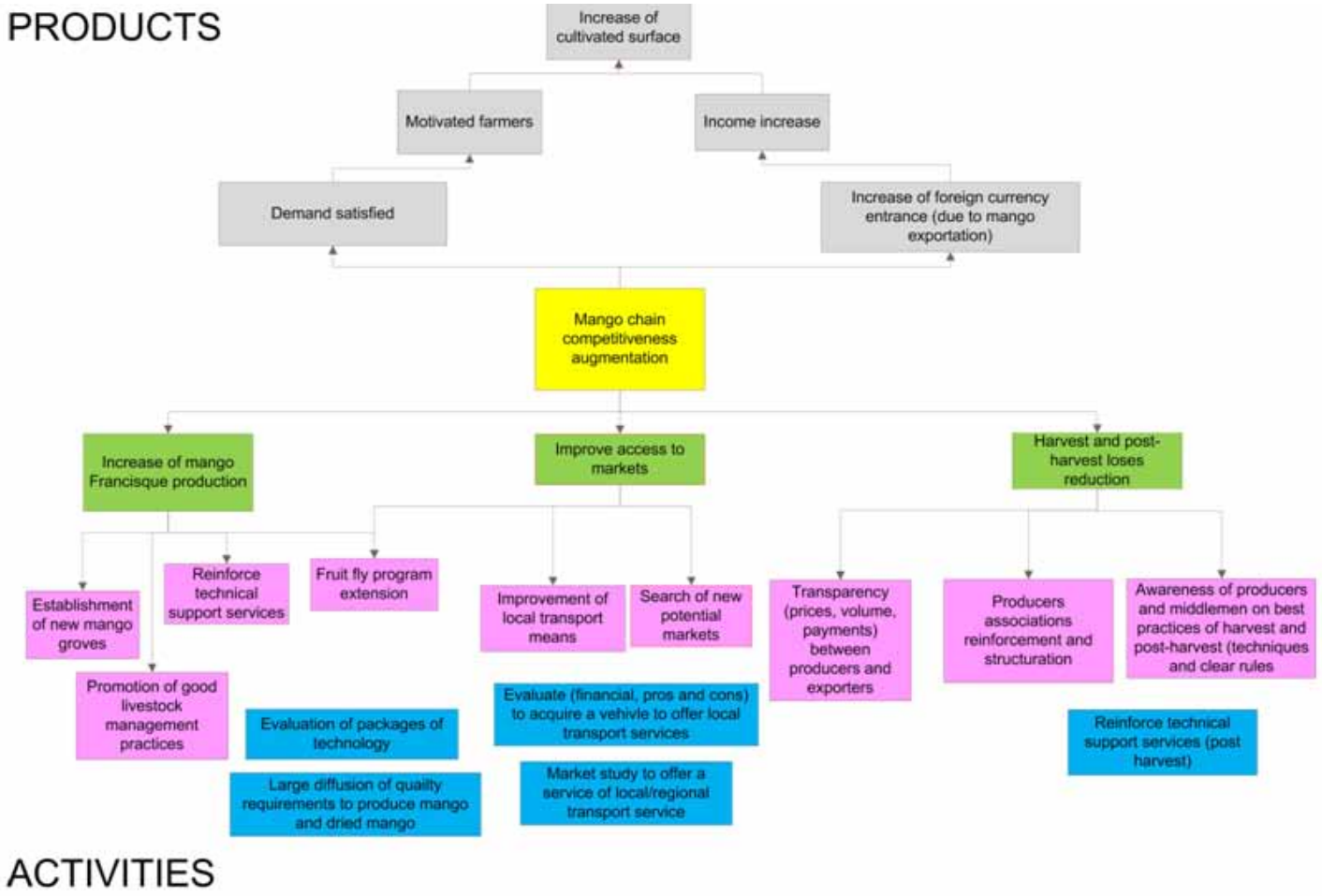
ANNEX 1

Problem tree



ANNEX 2

Solution tree



ANNEX 3

Strategic objectives and recommendations obtained with workshops participants

Strategic objectives for the production link

Establish new mango orchards

- Cultivate mango orchards in high potential areas in the south. Supply quality seeds/grafted trees.

Reinforce technical support services

- Transfer knowledge to farmers regarding the management of technology packages adapted to local conditions.
- Train specialized technicians in mango management for technical assistance in the field.

Promote livestock best practices

- Raise public awareness in mango producing areas regarding damage caused by free-ranging livestock.

Extend the fruit fly detection program and start a control program

- Reinforce the program of fruit fly detection.
- Develop plans to detect and control fruit fly at the farm level.

Strategic objectives for postharvest link

Awareness of producers and middlemen on best practices of harvest and post harvest

- Train producers and middlemen in best harvest practices with a focus on preserving fruit quality.
- Provide appropriate packaging solutions for transport adapted to local conditions.

Improve current co-ops infrastructure

- Improve current infrastructure used for fruit collection and selection

Strategic objectives for commercialization link

Promote alternatives to improve local transportation

- Promote and evaluate alternatives to improve local transportation to allow farmer associations to collect mangoes at the farm level. For example, local transportation for fruits could be considered as a gap in the market, therefore, possible alternatives might include: foster local business creation for transportation, involve current transporters to improve transport coverage, and promote alliances between transporter and farmers' associations.

Seek new markets

- Identify potential new clients for marketing mango (for example, Canada, which does not have the same high requirements for importing mangoes as the United States). However, it is important to note that some exporters are not currently interested in this market, due to the fact that payments are often delayed.

Recommendations

The following recommendations were not directly reflected in the problem tree, however they were included due to their importance in assuring adequate generation and distribution of value in the chain.

Recommended strategic objectives for the production link

Establish new mango fields

Fostering mango as a crop is key to increase current volumes available in the region. Potential areas for growing mango Francisque variety must be identified. Altitude, other environmental and physical parameters, as well as accessibility must be taken into account in this characterization. This process should be carried out with JMB (exporter) and ORE, since they have already identified some interesting areas to expand the crop (e.g., Saint Louis du Sud, Aquin).

Evaluate technology packages

Evaluating technology packages together with producers using participatory approaches can generate positive effects in the expected increase of exportable volumes. These packages should include:

- Practices such as early pruning to keep mango stands at manageable heights. This will improve harvest and trees management, reduce risks for harvesters, and reduce mechanical damage to the fruit.
- Locally adapted techniques (such as traps) to manage main diseases (such as antrachnose. According to ASPVEFS statistics, about 25 percent of the total amount of produced mango is free of antrachnose) and pests (such as fruit fly).

Recommended strategic objectives for the postharvest link

Train producers and middlemen in best harvest and postharvest techniques

This activity should be carried out with JMB (exporter) as they have co-developed some good initiatives with mango producers in other regions, such as crates' adapted to donkeys, and low cost postharvest infrastructure.

- Diffuse widely among producers and middlemen information about quality standards required for exporting fresh and dried mango.

- Offer relevant training to achieve quality standards.
- Develop and apply best postharvest and harvest techniques using participatory approaches.

Recommended strategic objectives for the commercialization link

Improve local transportation services

Decisions on acquiring machinery and equipment to fulfill the lack of local transportation services should be based upon internal financial analyses at the association level.

However, if the association is planning to acquire this equipment to offer a local transportation service, the following steps are recommended:

- Feasibility study on vehicle acquisition for local transportation services.
- Market study on local and regional transportation services.

Seek new markets

Beyond identifying potential new clients, a rapid market study should be done with the participation of co-op members. To achieve this, following activities of organizational and business management strengthening should be carried out, based upon the current status of the association.

- Characterize mango producers associations.
- Prioritize associations and networks.
- Organizational strengthening: leadership, duties, rights, strategic planning and organizational chart.
- Develop a marketing plan together with the associates of each co-op (for all prioritized associations).
- Strengthen associations members in the following topics: accounting, taxing and finances.

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