



USAID FIRMS PROJECT

Growing Gold on Trees

Pakistan Mango Sector Conference 2011

March 2011

This publication was produced for review by USAID. It was prepared by David Picha for an assignment commissioned by Chemonics International under the USAID Firms Project.



USAID FIRMS PROJECT

Growing Gold on Trees

Pakistan Mango Sector Conference 2011

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development, the United States Government or Chemonics International Inc.

Data Page

Contract Number: GBTI II Task Order No. EEM-4-07-07-00008-00

Contractor Name: Chemonics International, Inc.

Name of the Component: Private Sector Development (PSD)

USAID Technical Office: Office of the Economic Growth and Agriculture; USAID Pakistan

Date of Report: March 20, 2011

Document Title: Growing Gold on Trees - Pakistan Mango Sector Conference 2011

Author's Name: David Picha

Editing: Khan.A,Azeem, Sattar, A Nida, [Tahir,S.](#)

SOW Title and Work Plan &Action ID: SOW # 1510, Work Plan Level 24100, Action ID # 4526

Project Area: PSD (Mango Muavan Program)

Key Words: international trade, marketing, mango, production, postharvest care, Sindhri, S.B. Chaunsa, White Chaunsa, EU, USAID

Abstract:

An overview and summary of the USAID FIRMS Project mango sector activities and USDA-supported interventions were presented to industry stakeholders during a high profile 1-day Mango Conference entitled 'Growing Gold on Trees' held on January 4, 2011 in Islamabad. Project activities include grower training and technical assistance in production, postharvest care, on-farm cooling, cold storage, and packinghouse infrastructure improvement. Market opportunities were identified and producer-exporter-importer linkages were established for future penetration of Pakistani mango exports to UK and EU mainstream retail supermarkets.

The FIRMS Project air and marine container trial shipment results for 2010 were summarized and presented at the Conference. The PowerPoint presentation provided at the conference and a summary of the EU export market situation for Pakistani mangoes is included in this report.

Acronyms

CA	Controlled Atmosphere
EU	European Union
UK	United Kingdom
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

Table of Contents

EXECUTIVE SUMMARY	VIII
1. INTRODUCTION	1
1.1 OBJECTIVES	1
1.2 BACKGROUND.....	1
2. MANGO SHIPMENT	2
2.1 TRIAL SHIPMENTS	2
2.2 MANGO MARKETING IN THE EU.....	3
2.3 TRANSPORT CONSTRAINTS	3
2.4 DISEASE CONTROL NECESSARY	4
2.5 PACKAGING MATERIAL	5
2.6 MARKET PROMOTION AND CONSUMER EDUCATION:	5
3. CONCLUSION	6

Executive Summary

The USAID's Mango MUAVAN Program has helped mango growers add on-farm packinghouse equipment, blast chilling, and cold storage infrastructure. Multiple air and marine container trial shipments of mangoes were sent to leading UK and EU importers during the 2010 harvest season. Simultaneously, the project has implemented a Global GAP certification program and general mango production and harvesting training program. Nearly 1,500 farmers were trained in pre- and postharvest practices from all the major mango-growing areas in Sindh and Punjab. Additionally, information was disseminated and training provided to hundreds of mango growers after the devastating summer floods on how to minimize excess water damage to the mango trees.

Market opportunities were identified and producer-exporter-importer linkages were established for future penetration of Pakistani mango exports to mainstream retail supermarkets in the UK and EU. There are excellent market opportunities for Pakistani mangoes in the EU retail supermarkets, provided consistent supplies of high quality fruit can be delivered at a competitive price.

The FIRMS Project air and marine container trial shipment results for 2010 were summarized and presented at the Conference. The PowerPoint presentation provided at the conference and a summary of the EU export market situation for Pakistani mangoes is included in this report.

1. Introduction

1.1 Objectives

The overall objective of the Mango Conference was to inform the mango industry stakeholders from both the public and private sector on the past and future planned export market development activities of the USAID FIRMS Project. The individual objective was to prepare and give a comprehensive PowerPoint presentation at the Conference highlighting the success of the Mango MAUVAN Program and discuss the results of the mango trial shipments to the UK and the Netherlands. The PowerPoint presentation is included as Annex 1.

1.2 Background

The Mango Conference highlighted the U.S. government (i.e. USAID, USDA), Australian government, and Pakistani government activities and future plans to increase Pakistani mango exports to multiple destinations. The USAID FIRMS Project has begun providing growers and mango industry stakeholders with technology, training, and infrastructure to help increase the volumes of mango exports to a diversity of international destinations. The initial target has been to develop a large-scale UK/EU mainstream retail supermarket sector. In 2010, fruit shipments were sent by air and marine containers to four of the leading mango importers in the U.K. and the Netherlands.

A feasibility study was also conducted to determine the best method for drying mangoes. Test samples of dried mangoes were sent to specialty food buyers in the U.S.

2. Mango Shipment

2.1 Trial Shipments

An initial 20-foot refrigerated (12° C) marine container shipment of S.B. Chaunsa and Fajri fruit was sent to the Netherlands during a 24-day transit and arrival period from mid-July to early August. Arrival quality of the fruit was fair. An estimated 70percent of the fruit arrived in potentially marketable condition after the 24-days at 12° C. Nearly all of the fruit was entirely green in skin color, although the pulp had softened considerably and the sugar content had increased to an average of 22° Brix. The importer was favorably impressed with the eating quality of the fruit. However, the skin surface appearance was dull and the soft pulp texture was a concern. The majority of mangoes marketed through EU retail supermarkets have a glossy surface appearance and very firm texture, but fewer flavors and a significantly lower sugar content compared to Pakistani mangoes. Varying amounts of bruising injury and mechanical injury to the skin was also noticeable on about 15 percent of the fruit upon arrival in the Netherlands. Significant anthracnose fungal decay was also apparent on about 15 percent of the fruit.

Unfortunately, significant peel darkening and further anthracnose decay occurred during the 7-10 day in-country ripening and marketing period following the arrival of the fruit. This was an undesirable characteristic which did not allow the fruit to be in a marketable condition for the mainstream supermarket retailers. The lack of yellow-gold skin coloration was also a concern and an undesirable characteristic for wholesale market buyers who sell mangoes to owners and clients purchasing fruit for ethnic grocery stores.

A second trial shipment of mostly SB Chaunsa and small amounts of Fajri were sent in a 20-foot refrigerated controlled atmosphere (CA) marine container to the UK over a 29-day transit and arrival period during mid-July to early August. The CA container was maintained at 12° C, with an atmosphere of 3.5 percent oxygen and 5 percent carbon dioxide. Arrival quality of the SB Chaunsa and Fajri fruit in the CA container was generally good, with the estimated 75 percent marketable fruit after the near month time period of transit at 12° C. The fruit were still entirely green in skin color, although the pulp had softened and the sugar content had increased to an average of 21-22° Brix. The importer liked the sweet flavor quality of the fruit, but the soft pulp texture was again a concern. Similar to the non-CA container trial shipment to the Netherlands, the majority of fruit did not ripen properly during the 7-10 day marketing period following the arrival of the fruit. The skin of most fruit developed noticeable grayish-brown mottling and discoloration and did not turn a normal yellow-gold color. The lack of fruit firmness coupled with the inability of the skin to ripen a uniform yellow-gold color were the major quality issues with this shipment. Anthracnose decay was very minimal in this trial shipment. However, the estimated percentage of marketable fruit fell below 50 percent in the 7-10 day period after fruit arrival.

A third marine container trial shipment of White Chaunsa mangoes was sent to the U.K over a 31-day transit and arrival period from mid-August to mid-September in a normal refrigerated container. The temperature was set at 13° C. Unfortunately, the temperature inside the marine container did not cool below 15° C during the entire transit period. This resulted in an undesirable acceleration of fruit ripening, significant postharvest deterioration, and poor fruit quality. The fruit were too soft upon arrival for retail marketing and significant amounts of anthracnose and stem end rot fungal decays were noticeable on many fruit. The grayish-brown

peel discoloration which developed on the fruit in the two earlier trial shipments at 12° C also occurred on some of the fruit sent at 15° C. Additional trial shipments will be necessary to determine the cause and remedy for the skin discoloration problem.

2.2 Mango Marketing in the EU

The vast majority of mangoes marketed in the EU are imported. There are no import tariffs or entry prices for mangoes in the EU. Mangos imported into the EU are procured by import companies who typically have a year-round purchasing program to supply their retail supermarket clients. They purchase mangoes from multiple countries and generally require large quantities of supply. Individual supermarket chains typically work with only one Import company in putting together their annual mango procurement program. In turn, the importer usually cannot sell mangoes to other competing supermarket chains. Importers of mangoes seek a long term relationship with their suppliers. They have stringent requirements for the quality of the fruit and the reliability of supply, based on the needs of their retail supermarket clients.

Proper postharvest handling practices are needed, along with the use of strong, protective cartons in order to provide the destination markets with consistent supplies of high quality firm fruit. The soft texture of the pulp is a concern among the export market buyers representing the large volume mainstream retail supermarkets. An acceptably firm fruit texture is required at the retail store level. The firmness of the Pakistani mangoes does not match those of Keitt, Kent, or Tommy Atkins, which are the leading cultivars produced in other countries and marketed internationally.

The overall condition and appearance of the fruit in the export market destination is another constraint facing Pakistani mango growers/exporters. Fruit shriveling, physical injury and bruising can commonly be observed. Peel shriveling can be minimized by cooling and proper temperature maintenance (12-13° C) of the fruit after harvest, coupled with a high relative humidity (90-95 percent) in the storage and transport environment. Physical injury and bruising damage to the fruit can be avoided by more careful harvesting and handling practices, along with the use of stronger and more protective packaging materials.

Another export market concern is the lack of uniformity of skin coloration after ripening. In many cases, the peel of Pakistani-grown mangoes does not turn a uniform yellow-gold color. Varying amounts of skin mottling, discoloration, and sap burn detract from the appearance of the fruit. A more uniform and better appearance of the fruit surface is required for penetration of the mainstream retail supermarkets in Europe. This will also hold true for future exports to the US and other demanding export market destinations. Retail export market channels invariably have much higher quality standards for appearance and fruit condition compared to mangoes sold in the domestic market.

2.3 Transport Constraints

The cost of transport to market is usually the single most expensive component in a mango export operation. Airfreight costs are significantly higher than sea freight transport. The minimal cost of transporting mangoes by air to Europe in 2010 was approximately 130 Rs/kg (subsidized rate on PIA). The airfreight rates using other Gulf region carriers were higher. In addition, transporting product on these carriers involves undesirable off-loading at the airlines hub location, followed by re-loading onto another aircraft. This is not recommended for highly

perishable fruit like mangoes. The high cost of airfreight, which must be pre-paid to obtain cargo space, leaves very little room for the exporter to negotiate with the buyer on market price. The net profit and/or export volume using airfreight is generally much less than using sea freight. In addition, there are no dedicated cargo carriers that have direct flights from Pakistan to Europe, which often limits the air freight volume to only several tons of mangoes per passenger aircraft destined for Europe.

The arrival price of Pakistani mangoes in the international market destination must be competitive with alternative supplying countries in order to justify large volume purchases by the retailers. This will require the use of marine transport, which is significantly less expensive than air freight. The cost per kg for refrigerated controlled atmosphere sea freighted mangoes from Karachi to southern England and/or Rotterdam is approximately 40 Rs/kg, depending on carrier and destination. Successful sea freight transport will allow Pakistani mangoes to be competitively priced with other supplying countries. Retailers will also be able to market them at in-store prices which are attractive to the middle class consumer, which in turn will result in large volume mango purchases by the mainstream supermarkets.

2.4 Disease Control Necessary

Anthracnose, caused by strains of the fungus *Colletotrichum gloeosporioides*, and stem-end rot, caused by various fungi (including species of *Dothiorella*, *Lasiodiplodia*, *Phomopsis*, and *Cytosphaeria*) are the two most common postharvest mango diseases in Pakistan. They are the principal decay agents responsible for fruit deterioration in all mango cultivars. These fungal diseases are widespread throughout all growing regions and must be managed prior to harvest in order to be able to provide export market destinations with consistent supplies of high quality fruit. As trees become older and larger, the losses from these diseases typically increase. An integrated program involving pre-and postharvest control measures is required to minimize losses. The incidence and severity of disease will always be higher in older trees and on fruit harvested from unsprayed trees.

The infection process by spores of these fungal organisms onto the fruit surface begins in the field long before harvest. The severity of infection is accentuated by pre-harvest rainfall. In order to minimize the incidence and severity of these two fungal diseases, it is imperative growers use proper pre-harvest cultural practices. This must include annual tree pruning to maximize sunlight infiltration and air movement within the tree, and multiple applications of pre-harvest crop protectant fungicides beginning at flowering and continuing until harvest. The fungicides must be applied during all stages of fruit development in order to prevent spore germination and mycelia growth. Without the adoption of these practices, it will not be possible to control these diseases and deliver consistent supplies of high quality mango fruit to the export market.

Various fungicides are effective in controlling mango diseases, including copper hydroxide, copper sulfate, copper oxychloride, mancozeb, pencozeb, thiram, captan, chlorothalonil, iprodione, prochloraz, thiabendazole, propiconazole, and azoxystrobin. However, growers may have to make 10 to 20 pre-harvest fungicide treatment applications during the growing season for the degree of control postharvest decay control required for the export market. Poor disease control may be related to inadequate spray coverage, inappropriate timing, or high amounts of rainfall during the growing season. Growers can reduce the risk of developing fungal resistance to these crop protectants by rotating the fungicides in their spray program. Also, it is essential to apply only those fungicides permitted in the export market destination and at the rate necessary to avoid exceeding the permitted residue limit tolerance. The fungicide applications will

significantly increase production costs. However, the alternative is to continue with the current pre-harvest production practices of only several or no pre-harvest fungicide applications and the inevitable high incidences of postharvest decay as the mango fruit ripen. The incidence and severity of postharvest decay intensifies as the harvest season progresses due to increasing humidity and eventual precipitation. Postharvest decay is generally less of a constraint in the early season exports of the Sindhri cultivar. The disease pressure is typically higher on SB Chaunsa, Fajri, and White Chaunsa cultivars as precipitation increases later in the mango harvest season.

A postharvest hot water treatment can also be very effective in reducing the amount of postharvest fungal decay. The treatment consists of submerging the fruit at 52° C ($\pm 0.5^\circ$ C) for at least 3-5 minutes prior to packing. A 100 ppm concentration of thiabendazole, prochloraz, or fludioxonil fungicide added to the 52° C hot water has a synergistic effect and will improve the control of postharvest decay. The exact time for optimal decay control may differ according to cultivar, time of harvest, and fruit harvest maturity stage. Further on-farm trials will be necessary in order to optimize the postharvest hot water and fungicide treatment protocol.

2.5 Packaging Material

Strong, well-ventilated, 4-kg open-top cartons are required for mangoes intended to be exported to mainstream retailers in Europe and other international destinations. This style of carton allows for rapid removal of field heat from the fruit after harvest, which is typically in the 36-42° C temperature range. The cartons must have at least 275-lb test force test strength in order to tolerate stack heights of up to 20 layers of cartons on a pallet, without carton collapse. Strong cartons, particularly if supplemented with cell-pack liners placed inside and on the bottom of the carton, will offer maximum protection to the fruit. This will minimize bruising, vibration injury, and skin abrasion during transport of the mangoes to their market destination. The result will be a better appearing mango upon arrival. A Styrofoam sleeve wrapped around each fruit may also be needed to optimize fruit protection for some high-value destination markets.

2.6 Market Promotion and Consumer Education:

Skin color is not the best indicator of maturity, ripeness, or edible quality in most mango cultivars, particularly those grown in Pakistan. Point-of-sale educational materials are needed to inform consumers about the excellent flavor and quality of green-skinned Pakistani mangoes. Consumer awareness in Europe must be developed that green-skinned mangoes can be ready-to-eat. Promotional activities and in-store tasting are also necessary to educate consumers on the excellent flavor, sweetness, and quality of Pakistani mangoes. Consumers must be educated about the superior sweetness and eating quality of soft and ready-to-eat green-skinned S.B. Chaunsa compared to other main green-skinned mango cultivars like Keitt and Kent.

3. Conclusion

The USAID FIRMS Project, in cooperation with private and public sector stakeholders, has made significant progress in strengthening the Pakistani mango sector since implementation efforts began over a year ago. The Mango Conference brought together the key stakeholders and beneficiaries to review the mango sector development activities, discuss successes and constraints, and continue efforts to strengthen the competitiveness of the industry. The most noteworthy achievements of the USAID FIRMS Project include: 1) the initiation of improved on-farm packinghouse equipment and cooling/cold storage infrastructure; 2) the establishment of multiple market linkages between Pakistani growers/exporters and the leading mango importers in the U.K. and E.U. who procure fruit for the major supermarket chains; 3) trial shipments by air and sea to these importers; 4) Global GAP certification of multiple mango farms; 5) grower training and technical assistance in proper mango production and harvesting practices. These achievements are very positive accomplishments for the long-term expansion of the Pakistani mango industry.

Continued improvements will have to be made along the entire supply chain in order to penetrate the high volume European supermarket trade with consistent supplies of high quality mango fruit that is required by the importers and retailers. It will be necessary for the FIRMS Project mango sector development team to work closely with all links in the Pakistani mango supply chain and overcome the existing pre- and postharvest constraints to consistent arrivals of high quality fruit.

The most important improvements required are annual tree pruning and size maintenance to allow for good internal canopy penetration of pre-harvest fungicides, regular applications of the proper pre-harvest fungicides to reduce the inoculum level of anthracnose and stem-end rot fungal diseases, careful harvesting and handling practices to avoid bruising and mechanical injury of the fruit, thorough de-sapping to prevent latex burn of the peel, forced air cooling and cold storage infrastructure to remove the fruit field heat as soon as possible after harvest, maintenance of the cold chain during temporary on-farm storage and transport of the fruit to the destination market, and strong, well-ventilated packaging to eliminate physical injury to the fruit.

There are excellent market opportunities for Pakistani mangoes in the UK and EU retail supermarkets, provided consistent supplies of high quality fruit can be delivered at a competitive price. The USAID FIRMS Project will continue to facilitate trial shipments and market linkages between growers/exporters and potential mango importers in the UK and EU. Additional export market destinations will include UAE, Gulf countries, Singapore, Malaysia, Indonesia, Hong Kong, China, Australia, and North America in the future harvest seasons. Sea freight is the mode of transport that will allow for large volumes of Pakistani mangoes to be exported and landed in the destination country at competitive prices.

USAID Firms Project

info@epfirms.com