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# Value Chain Impact Assessment for Mango Value Chain



May, 2013

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# Data Page

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# Abstract:

This report discusses in detail the role of value chain stakeholders. Project partner farms are studied as objects of intervention and a comparative analysis is drawn of the farms which are operating on traditional techniques. Furthermore, the study provides an insight into existing channels of market with current trade practices in order to provide a holistic picture of overall export of Pakistani mangoes.



# Acronyms

ADB	Asian Development Bank
ADR	Alternate Dispute Resolution
AIP	Annual Implementation Plan
AMP	Award Management Plan
BEE	Business Enabling Environment
COP	Chief of Party
COTR	Contracting Officer's Technical Representative
DEDS	District Economic Development Strategies
EG	Economic Growth
EU	European Union
FATA	Federally Administered Tribal Areas
FLB	Fruit Logistica Berlin
FSN	Foreign Service National
FY	Fiscal Year
GDP	Gross Domestic Product
GIS	Geographical Information System
GOP	Government of Pakistan
HACCP	Hazard analysis and critical control points
IDP	Internally Displaced Person
IMF	International Monetary Fund
IT	Information Technology
IUA	Infrastructure Upgradation Agreement
KPCCI	Khyber Pakhtunkhwa Chamber of Commerce and Industry
KPK	Khyber Pakhtunkhwa
M&E	Monitoring and Evaluation
MGA	Mango Growers Association
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
PaRRSA	Provincial Reconstruction, Rehabilitation and Settlement Authority

PHDEC	Pakistan Horticulture Development and Export Board
RFP	Request for Proposal
SME	Small and Medium Enterprises
SMEDA	Small and Medium Enterprises Development Authority
SO	Strategic Objective
SOW	Scope of Work
TBD	To Be Determined
TFFs	Trout Fish Farms
US	United States
USAID	United States Agency for International Development
USG	United States Government
WB	World Bank

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# Executive Summary

## Global picture

Mango is a warm, tropical climate fruit. Pakistan is the 5th largest mango producing country in the world with annual production of 1.78 million tons. India, however, is leading on meeting the global demand by producing 16.34 million tons per annum.

In Pakistan, Sindh and Punjab provinces are the main mango growing/ producing regions. The Pakistani mango has many different types and they are very popular in the domestic and international markets.

Despite its huge potential, the mango sector is facing multiple challenges that range from postharvest losses to limited outreach in to high-end global markets. This study primarily focuses on the mango value chain and its related sub-sectors.

The role of value chain stakeholders is discussed in detail in this report. Project partner farms are studied as objects of intervention and a comparative analysis is drawn of the farms which are operating on traditional techniques. Statistical inference is used to highlight cost-benefit aspects. Furthermore, the study provides an insight into existing channels of market with current trade practices. In addition, a comprehensive analysis is conducted on the profitability aspect of the value chain process. In the end, an analysis on the local and global trade is included to provide a holistic picture of overall export of Pakistani mangoes.

## Regional Market Perspective

Pakistan's close geographical proximity to the Middle East is a significant variable which determines its competitiveness in this crucial export market. However, in the European markets, Pakistan's competitive threshold is relatively lower, due to the dominance of Brazil, Peru, China and Indonesia with their quality of fruit, extended shelf life, higher productivity, effective marketing, innovative packaging, reliable distribution networks and the ability to meet the international quality standard prerequisites. Pakistan, being the same size production country, as Thailand, Indonesia, Brazil and Mexico is struggling to keep and maintain pace with the competing exporters and matching innovations to capture European markets.

## Competitiveness Issues of Pakistani Mango Value Chain

There is a dire need to establish an institution or a formal set up to facilitate research and development on controlled atmosphere storage, shipping and export of different mango varieties. The cold chain is a very crucial component of the mango export process, but the standard operating procedures (SOPs) of cold chain for mango export are not very well defined and no institution is working on the development of cold chain parameters in Pakistan. The limited research and development work carried out by the University of Agriculture Faisalabad could not be properly disseminated to mango growers due to ineffective extension system.

Issues related to sanitary and phyto-sanitary are important areas of concern with regard to export activities. Most exporters and large scale traders are not aware of the importance and required standards for ensuring sanitary and phyto-sanitary. This aspect is usually not given due diligence by exporters and processors. It is damaging for the frequency of mango exports and acceptance of fruit, unless Pakistan complies with the quality and safety standards.

While food processing is expanding globally and provides for viable opportunities to experiment with innovation, Pakistan lacks adequate processing facilities in-house. The

locally assembled processing units do not produce reliable results, while imported units are expensive with higher operating costs, which ultimately impact net profits.

Grading and packing processes are also faced with similar challenges, coupled with lack of technology and suitable infrastructure in terms of design, material and presentation of pack areas or pack houses.

In highly competitive export markets, Pakistani mango quality is comparatively inferior and inconsistent, which subsequently fetches low prices for the fresh produce. This not only results in affecting the credibility of Pakistani mango, but also sabotages future export prospects and opportunities.

Like other components of mango value chain process, marketing is one area which is highly neglected, with contemporary global marketing practices being invariably ignored. In addition, seasoned professionals do not consider taking up jobs in the mango sector; they believe that it is not a good career move that leaves very limited marketing skill sets available in the sector. As a result, marketing is done most of the time on personal referrals, email inquiries and business to business (B2B), internet sites which obviously have a limited impact to grab business opportunities.

#### **USAID Firms Project Contribution**

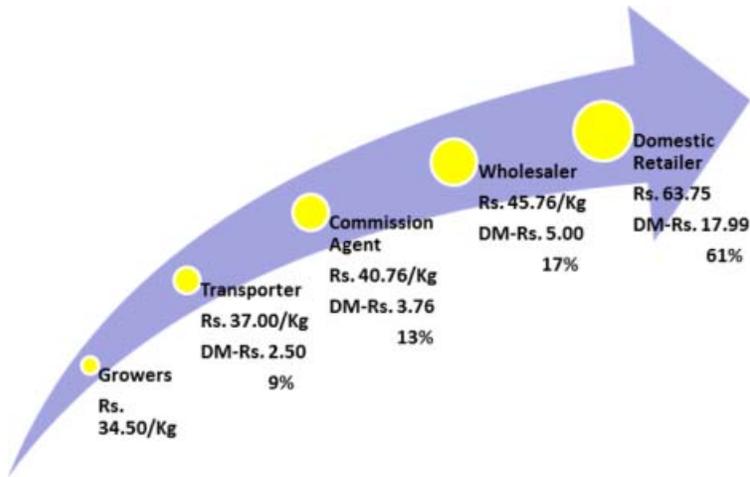
USAID initiated its Mango Muavan Program in October 2009 to address the major constraints in the mango sector. USAID focused on GlobalGAP certification as a unique opportunity that would enable farmers to adopt globally recognized practices for. GlobalGAP certification will further help make Pakistani mango more competitive in international markets.

In addition, USAID is taking strategic measures to upgrade on-farm infrastructure to streamline the processes and increase farm yields. Capacity building and transfer of modern knowledge to workforce resulted in improved post-harvest handling and time efficient processes. USAID is working to develop reliable market linkages locally and internationally so that proper representation of Pakistani mango can be ensured.

#### **Key Findings**

As the mango produce moves from farm to the end consumer, economic gains are generated at each stage of the value chain. There are some direct returns associated with the trade of the produce which result in shape of margins. In addition, employment is also generated at each stage of the activity.

The following trend represents five important value chain actors, and how cost drivers influence the final price at each actor level.



**Figure 1 Value Chain Actors**

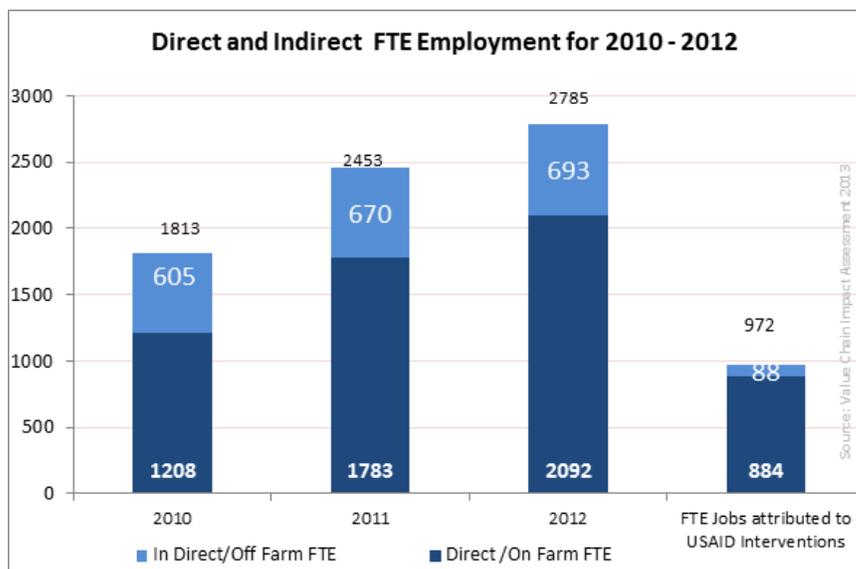
The table below elaborates the profit margins at each actor level involved in the mango value chain and costs involved at each actor level. Total cost of each intermediary was deducted from the gross margin to calculate the net profit margin.

**Table 1 The Profit Margins And Costs At Each Actor Level Involved In The Mango Value Chain**

		PKR/Kg	%
<b>Retailer</b>	Average Selling Price	63.75	
	Average Buying Price	39.50	62%
	<b>Gross Profit</b>	<b>24.25</b>	<b>38%</b>
	Other Costs	8.30	13%
	<b>Net Profit</b>	<b>15.95</b>	<b>25%</b>
<b>Wholesaler</b>	Average Selling Price	39.50	
	Average Buying Price	34.50	87%
	<b>Gross Profit</b>	<b>5.00</b>	<b>13%</b>
	Other Costs	2.50	6%
	<b>Net Profit</b>	<b>2.50</b>	<b>6%</b>
<b>Commission Agent</b>	Commission Earned	3.76	
	<b>Gross Profit</b>	<b>3.76</b>	<b>100%</b>
	Other Costs	1.88	50%
	<b>Net Profit</b>	<b>1.88</b>	<b>50%</b>
<b>Transporter</b>	Truck Rent	2.50	
	<b>Gross Profit</b>	<b>2.50</b>	<b>100%</b>
	Other Costs	1.35	54%
	<b>Net Profit</b>	<b>1.15</b>	<b>46%</b>
<b>Mango Grower</b>	Average Selling Price	34.50	
	<b>Average Cost</b>		
	Production Cost	8.04	55%
	Harvesting Cost	2.00	14%
	Packaging	4.60	31%
		<b>14.64</b>	<b>100%</b>
	<b>Gross Profit</b>	<b>19.86</b>	<b>58%</b>
	<b>Other Costs</b>		
	Transportation	2.50	43%
	Commission & other charges	3.31	57%
	<b>5.81</b>	<b>100%</b>	
<b>Net Profit</b>	<b>14.06</b>	<b>41%</b>	

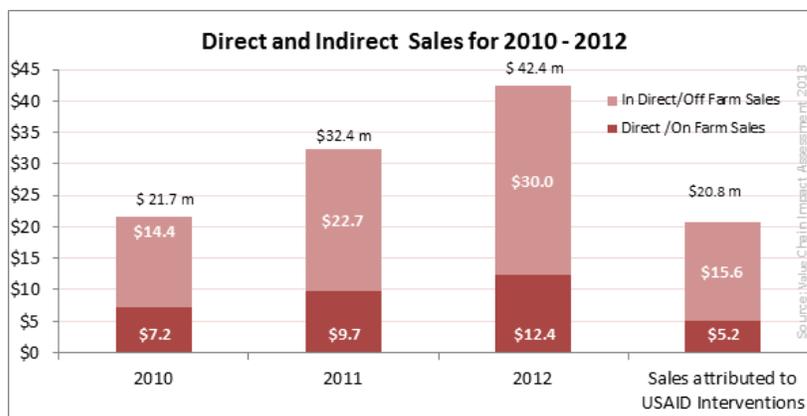
The value chain can be divided in two distinct activities: production and marketing. Labor involved in production and returns associated with that were directly calculated. For the purpose of estimation of FTE employment generation during marketing of produce, the labor activities were recorded from harvesting point till the produce is retailed to the consumers.

Employment opportunities have been divided in two categories: on-farm and off-farm opportunities. Direct or on-farm opportunities involve operations being performed at the farm from the production stage till the produce is sold to the first buyer. Indirect or off-farm opportunities are those which are a result of operations starting from the point of purchase till the produce is sold to the consumer or sent to the export point. FTE jobs attributed to USAID interventions are shown in the chart below:



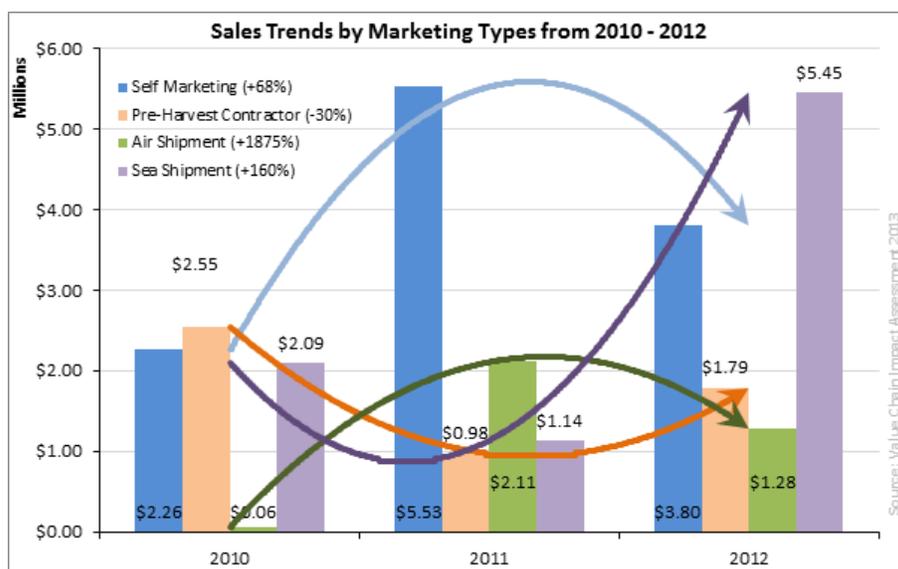
**Figure 2 Direct & Indirect FTE Employment**

Similarly, sales data has been divided in two categories i.e. direct and indirect sales. Direct or on-farm sales include total sales value of the produce received by the producer at the farm or the first selling point. The sales value of produce over and above the sale value of producer is called indirect or off-farm sale. Indirect sales can be calculated by multiplying the direct sales with sales multiplier. Performance of partner farms has been shown in the chart below:



**Figure 3 Direct & Indirect Sales**

Sales trends demonstrate the way the produce is sold or marketed. It has been observed during the study that there is a visible change in the sales trends during the period 2010 and 2012. Change in sales trends has been shown in the chart below:



**Figure 4 Sales Trend For Marketing Types**

### Conclusion

It has been concluded from the study that low mango productivity and low output of Mango in Pakistan is mainly due to traditional agricultural practices which are being followed over the decades and it is quite a tough task to drastically change the mindset of mango growers. In addition to this the key findings include:

- Low yields of mango are not fully translated into money value to the farmers.
- The estimated post-harvest losses are high up to 40 percent.
- There is a distribution margin of 61 percent, between the price paid by the consumer and the one received by the producer, in domestic market value chain.
- The indirect employment generated across the value chain (Labor Multiplier), in domestic market, is 0.41 FTE jobs as 10 MT of produce moves along the value chain from harvesting point to the point of consumption. Similarly the labor multiplier figures for export market, through air shipment are 0.16 FTE jobs per 3 MT produce and through sea shipment it is 0.96 FTE jobs per 21 MT of produce.
- Reliable processing facilities have to be established to increase volume of output from mango produce. Processing units bring innovation as well as help in reducing post-harvest losses.
- Despite being competitive in quality, Pakistani mango export is very low in volume. Situation can be improved by bringing in serious initiatives in terms of marketing, packaging, efficient supply chain processes and product quality.
- Pakistani mango is offered lower prices in export markets because of short shelf life, irregular deliveries, inefficient marketing and somewhat general perception about poor farming practices leading to food safety issues.
- Exporters are not enjoying good profitability from their mango trade with European markets due to high air cargo charges.
- Inadequate international market information and linkages are also a reason of limited export volumes.
- The Government does not take notable measures for the improvement of situation.

- Ironically, all the focus of farmers and traders remain limited to liquidate the core product to make immediate money on investment. This way value added product portfolio remains nearly off the shelf.
- Industries are reluctant to take chances with new product development with the fear of facing failure.
- There is very limited exposure of growers and farmers to trainings and workshops for learning purpose.



# 1. Introduction

## 1.1 Background

Pakistan's mango sector accounts for four percent of the world's total production and contributes USD 150 million per year to the country's GDP. According to USAID Firms Project's estimates, the 2006 to 2015 cumulative opportunity cost of market inefficiency in Pakistan mango exports is approximately USD 674 million. This opportunity cost offers the potential of being converted to earned revenue for the economy in Southern Punjab and Sindh.<sup>1</sup>

In order to realize the true potential of Pakistani mango sector, the U.S. government has committed to support and develop this very important sub sector through removing identified constraints, and strengthening key mango value chain players by enabling them to export quality produce to high-end international destinations at competitive prices.

## 1.2 USAID Firms Project and Mango Sector Development Initiative

The primary focus of the USAID Firms Project is to assist the mango sector of Pakistan to improve its service delivery and develop dynamic, internationally competitive private sector firms to accelerate sales, investment, and job growth. The value chain development component of the USAID Firms Project aims to work directly with businesses in select value chains and create a robust private sector.

The project has partnered with mango SMEs from Sindh and the Punjab to maximize their yields, improve product quality, and implement better handling and packaging techniques to reach new high value markets. Specific objectives of the mango sector intervention include increasing per acre yield of mangoes; on farm infrastructure development; improving fruit quality; on-farm processing to reduce pre and post-harvest losses; cold chain management, and increasing total quantity of mangoes exported to overseas markets for existing and new partner SMEs.

The specifics of the impact assessment are outlined in the sections below. These specifics are guided by the goals and relevant strategic objectives/intermediate results of the project as listed below.

Goal: Improved conditions for broad-based economic growth.

Program Purpose: Dynamic internationally and domestically competitive firms with accelerated sales, investment, and employment.

Intermediate Result 1: Enhanced competitiveness in project assisted firms in targeted value chains.

## 1.3 Purpose of the Study

This study aims to determine the range of contribution of mango sector programs to the two most important objectives of the USAID Firms Project i.e. increase in sales and employment. The contribution to sales and employment will primarily result from USAID Firms Project interventions in the fresh mango value chain as opposed to dried mango interventions which have initiated in year 2012.

The outcome level results are evident from the fact that mango program has generated significant economic activity on the selected mango SMEs. These results are, however, limited

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<sup>1</sup>Source: USAID FIRMS Project SOW for Mango Value Chain Study

and only represent the quantifiable economic gains of the partner farms that the project was directly engaged in through formal agreements and that they were able to report the required information back to the project. Furthermore, these results only show project contribution at the farm level, which represents a part of the wider mango value chain. It is evident that the project interventions not only had a ripple effect on the neighboring farms or non-partner farms, which were not engaged through formal agreements, but also impacted the packaging, distribution, retail end and other key players of the mango value chain.

The overall purpose of the impact assessment of this value chain is to document the nature, context and the extent of the impact realized in all aspects of mango value chain by estimating the increase in sales and employment.

## **1.4 Key Objectives of the Study**

The overall objective of the study is to conduct a value chain analysis of the mango sector with specific focus on measuring the full impact of the USAID Firms Project in different aspects of the mango value chain. For this purpose, the value chain analysis is expected to measure the forward and backward linkages (source of inputs and destination of output) and determine the value-added.

The assessment comprises of the following five steps to meet the key objective of the study:

1. Document the Value Chain for the Mango Sector in Pakistan.
2. Systematically listing USAID Firms Project's intervention in different aspects of the Mango Value Chain.
3. Acquiring information on the distribution of economic gains across the value chain by various players.
4. Calculating the impact of interventions in 2012 backwards in order to find out the impact on sales and jobs in 2011 and 2010. Also estimate the potential impact for the year 2013 and 2014.
5. Providing practical and realistic recommendations for future improvement of the program.

## **1.5 Scope of the Study**

The USAID Firms Project acquired services of a team of two qualified individuals as short term technical consultants i.e. Agricultural Economist and Business Analyst to appraise the economic impact of USAID Firms Project's interventions in both fresh and dried mango value chains across various districts of the Punjab and Sindh. The consultants were expected to focus on the mango producing areas in the two provinces, with support from Lahore and Karachi offices for the majority of the study period, including frequent travel to other cities in order to interact with relevant stakeholders involved in the Mango Value Chain.

## **1.6 Methodology Adopted to Conduct the Study**

The following approach has been used to conduct the study:

- **Review of Reference Material**

All the relevant material, concept papers, proposals, baseline survey reports, M&E related documents, sales and employment trackers and project/strategy documents were reviewed to reveal the information regarding pre and post project interventions in the mango sector, different components of the USAID Firms Project Mango Value Chain development

program, best practices adopted during the implementation of the program and achievements of each component of the program.

- **Meetings with the Project Team**

Meetings with the project VCD Mango team, M&E team, senior management and other members of the project were held to collect the information on the inception, development and execution of the Mango program, best practices adopted during the implementation, major challenges faced by the program and strategies adopted to address these challenges.

- **Visit to selected partner farms**

Five partner farms, three in Punjab and two in Sindh, as listed below, were visited to get information regarding project interventions and their impact.

1. Lutfabad Fruit Farm, Multan.
2. Ali Tareen Farm, Lodhran.
3. JDW Orchards, Rahim Yar Khan.
4. Hyder Shah Fruit Farm, Tando Allah Yar
5. Mustafa Agriculture Farms, Thatta.

Interviews and discussions were held with the partner farms to get their views regarding project interventions, issues/problems faced during implementation, pre and post project interventions scenarios, impact of project interventions on increase in sales and employment and their future plans.

- **Visit to Fruit and Vegetable Wholesale Markets**

Five fruit and vegetable wholesale markets listed below were visited to study the mango value chain, stakeholders involved in the value chain and their roles.

1. Fruit and Vegetable Market, Multan.
2. Fruit and Vegetable Market, Rahim Yar Khan.
3. Fruit and Vegetable Market, Lahore.
4. Fruit and Vegetable Market, Karachi.
5. Fruit and Vegetable Market, Hyderabad

- **Meetings with Different stakeholders of the Mango Value Chain**

Interviews and focus group discussions were held with different stakeholders of the mango value chain which included farmers, pre-harvest contractors (*Bhekar*), transporters, commission agents (*Arhati*), wholesalers (*Pharia*), traders (*Ladania*), retailers, processors and exporters. Information regarding price structure and cost drivers, with respect to each stakeholder, was obtained to determine the distribution margin along the value chain.

- **Key Questions**

A questionnaire comprising of key questions was prepared and shared with the M&E and mango teams for review and their feedback was incorporated accordingly in the questionnaire. These key questions were used to collect information from different stakeholders of the mango value chain.

- **Economic Gain Estimation**

Economic gain along the value chain, as the produce moves from production point to the consumer, was also estimated by studying different activities at each stage.

- **Analysis of Financial and Employment Data**

Analysis of financial and employment data was conducted to determine the impact of project interventions on increase in sales and employment.

- **Interviews with Experts on Mango Value Chain**

Experts with vast experience and knowledge of mango value chain were also interviewed to get their views on issues, problems, suggestions and prospects pertaining to mango production, marketing and export.

- **Interviews with Vendors**

Processing line equipment, provided by the USAID Firms Project to the partner farms, was fabricated by the local vendors. Interviews of these vendors were also conducted to determine the impact of their involvement in the process, and on their capacity, sales and employment.

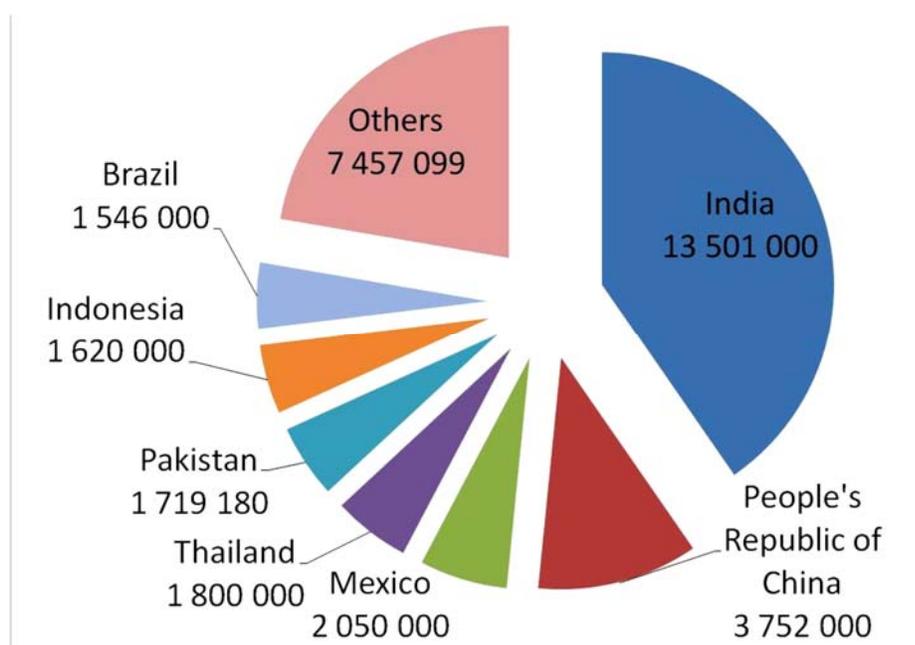
## **1.7 Study Period and Time lines**

The study commenced in October 2012 and was completed in April 2013.

## 2. Value Chain for the Mango Sector in Pakistan

### 2.1 Global Market

Fifty percent of the tropical fruits produced and traded worldwide are mangos that are grown in over 60 countries<sup>2</sup>The mango fruit grows well under (warm) tropical climates, with long and dry season (over three months) followed by sufficient rains. Although the total world mango production is over 35 million tons, most of it is locally consumed. Mango prices are declining in the world market with growing export volume, though prices fluctuate mainly depending on variety, size, origin and season. The largest mango producing countries can be seen in the chart below.

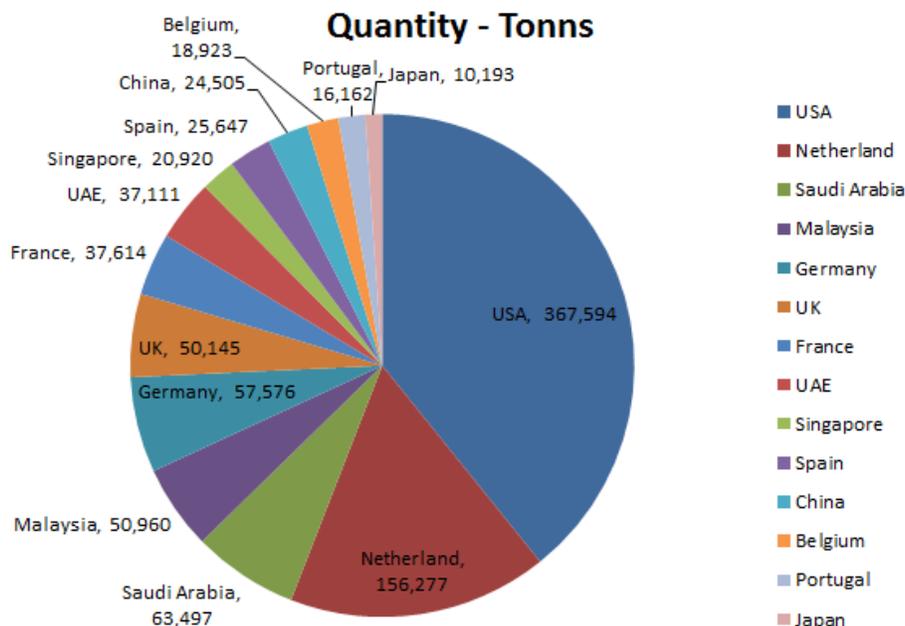


**Figure 5 Largest Producers in the World (Metric Tons)**

The above chart reveals that seven countries, including Pakistan, are producing over three quarters of the entire world's mango production, with India being the leading producer (over 47 percent). Interestingly, most mango producing countries still have the potential to further increase their production in response to increasing demand in view of the seasonality advantage of production cycles by countries in the northern and southern hemispheres.

Domestic, as well as export, mango markets are growing. The demand for mango throughout the world has been increasing, especially in the United States and in Europe, mostly as consumers in the developed world are becoming more aware of the tropical fruit and its many different uses. In the chart below, we see the largest importers of mango.

<sup>2</sup>Source: Food and Agricultural Organization of United Nations: Economic and Social Department: The Statistical Division (2007)



**Figure 6 Largest Importers (relative importance)**

The United States is the single largest importer: in 2011 it imported 367,594 Mt. Due to USA’s geographical distance from Pakistan and strong competition from South-American producers, the European and Middle-Eastern markets are more feasible and attractive for Sub-Saharan countries. It must be noted that the Netherlands in Europe and UAE and Saudi Arabia in the Middle East are redistributing the mango in their respective regions. There is no longer an international market for green skinned mango (Dodo, White Sofa, Keitt, etc). The European Union is among the list of countries with lowest mango consumption levels in the world, but the EU market is growing quickly. Between 2003 and 2007, annual consumption value increased by seven percent. As consumers are more familiarized with mango, preferences are shifting from nicely colored, fibrous varieties, towards less-fibrous varieties. The growing demand in Europe can be explained by mangoes’ exotic reputation, its healthiness (Vitamin A and C), energy (Carbohydrates) and helps maintain healthy blood sugar levels (Cholesterol-free). In the Middle East (especially in the United Arab Emirates) the religious ban on alcohol increases the demand for fruit juices, with mango often being the most popular fruit for juice.

The seasonality is a crucial factor in mango trade. The table<sup>3</sup> below shows that major mango growing countries from Northern Hemisphere are only producing mango during a particular time of the year, thus providing export opportunities for others countries during the rest of the year.

<sup>3</sup>Pakistan horticulture Development &Export Board, Mango marketing strategy (Lahore 2005)

## 2.2 Pakistan's Mango Sector: An Overview

Table 2 Major Mango producing Countries

Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Pakistan												
Philippines												
Mexico												
Malaysia												
Jamaica												
India												
Venezuela												
Guatemala												
Kenya												
Egypt												
Indonesia												
Brazil												
Australia												
Madagascar												
South-Africa												

Mangoes have been produced in this region for over two thousand years, and Pakistan is now the fifth largest producer in the world behind India, China, Thailand and Mexico. Officially, annual production is recorded at about 1.78 million tons (FAOSTAT, 2010 data), which fluctuates between 1.5 million tons (PHEDB) to 1.8 million tons (FAO). Pakistan is also a significant exporter of mangoes, with approximately 80,000 tons being exported annually, making it the third largest exporter in the world having a share of 7.60 percent in the total world export<sup>4</sup>. Small quantities are also used for processing.

Production is centered on two regions, the Punjab and Sindh, producing 67 percent and 32 percent of the total production, respectively. Harvest begins in Sindh in mid-May and finishes in the Punjab in late August, which may extend up to end September depending upon the climate conditions.

The principal varieties are Sindhri, which dominates the production in Sindh, and Chaunsa which dominates production in the Punjab. Other commonly grown varieties are Began Pali, Fajri, Langra, Dusehri, White Chaunsa and Anwar Ratol. All varieties grown in Pakistan are of Indian origin and are characterized by high brix and aroma, with Mon embryonic seeds. While both Chaunsa and Sindhri are considered by the industry as excellent varieties, Sindhri appears to have better post-harvest attributes for export markets.

The main domestic markets for mangoes are in large cities such as Lahore, Multan, Rawalpindi, Peshawar, Quetta and Karachi, with much of the produce going through central wholesale

<sup>4</sup>Source: CIA World Fact Book–2011 estimates

markets. The main export market is the Middle East, particularly the UAE. Other export markets are emerging in the EU, South East Asia and Eastern Europe.

Most farms in Pakistan have a mix of enterprises with very few producing only mangoes. Mango plantations (called 'Orchards') range in size from small two hectare holdings up to 400 hectares. The industry has a forward contract system where most farmers sell their crop at flowering or soon after to contractors acting on behalf of commission agents. Thus very few mango farmers in Pakistan are directly responsible for selling or marketing the mango crop at maturity and harvesting stage.

The industry faces a number of major challenges, particularly in post-harvest handling systems, where fruit losses of 30 to 40 percent are common and overall quality is drastically impacted. There is no cool chain management system in place. Ambient temperatures rise up to 50<sup>o</sup> C during harvest which is why fruit has a very short shelf life.

Periodic gluts occur in domestic markets with no capacity to store fruit, resulting in the heavy reduction of retail prices. The export market is facing similar challenges. Pakistan's mangoes have a reputation for being cheap and of poor quality, and exporters have a tendency to dump fruit in markets such as the UAE. Pakistani fruit sales reach the Pakistani and Indian expatriate communities in many export markets and it is not clear if substantial inroads are being made in the global supermarket trade.

In general, there is little evidence of a value-oriented approach towards supply chain management and the industry is concerned about the current low levels of returns for growers, making the crop unfeasible. Given this, poor mango tree management practices further reduce farmers' returns. The current key issues<sup>5</sup> within Pakistan's mango sector are:

- Mango is the second leading fruit crop produced in Pakistan. Annual production is 1.7-1.8 million tons, which makes Pakistan one of the five leading mango producers in the world. However, exports are limited and mainly targeted toward slow value ethnic markets.
- Pakistan is the third largest exporter in the world having a share of 7.60 percent of the total world export.
- There are no direct exports to high-value niche and retail super markets.
- Global trade data reveals that Pakistan's mangoes are fetching the lowest price in international markets.
- Factors leading to low price are poor quality, inappropriate handling and packaging, mango growers not meeting required international standards and certifications, and insufficient marketing and branding efforts.
- Poor farm management and agricultural practices.
- Little value addition such as dried mangoes, pulp and other by-products.

## 2.3 Mango Value Chain

Value chains encompass the full range of activities and services required to bring a product or service from its conception to sale in its final markets whether local, national, regional or global. Value chains include input suppliers, producers, processors and buyers. They are supported by

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<sup>5</sup>Source: Study carried out under the auspices of the Australia-Pakistan Agriculture Sector Linkages Program, May 2006

a range of technical, business and financial service providers. Value chains have both structural and dynamic components. The structure of the value chain influences the dynamics of firm behavior and these dynamics influence how well the value chain perform.

A value chain outlines the physical flows of production and commercialization and the enabling national and international institutional environment needed for an effective value chain development (contextual issues like trade agreements, national policy and regulatory environment and supporting markets, research and training and assistance). Roughly we can distinguish two types of chains; chains in which coordination is undertaken by buyers – ‘buyer driven’ – and those in which producers play the key role – ‘producer driven’.

Potential benefits are provided by value chains to both rural producers and urban consumers. The fact of the matter is that most goods are produced by a sequence of interlinked actors and activities. Producers are perhaps the most apparent manifestation of the value chain that’s why they receive the particular attention. Traders are equally important but they receive less attention.

A value chain also act as a supply chain – one in which the actors know each other well and form stable, long-term relationships. They support each other so they can together increase their efficiency and competitiveness. They invest time, effort and money to reach a common goal of satisfying consumer needs. That enables them to increase their profits.

A supply chain is a set of linkages between actors where there are no binding or sought-after formal or informal relationships except when the goods, services, and financial agreements are actually transacted. We are all part of a supply chain: as consumers, we buy mangos from a retailer who gets them from a wholesaler, who buys from a commission agent who gets from a producer. Servicing the supply chain itself are a multitude of other players: those who provide transport, processing, finance, packaging, quality control, book keeping, among others. There are also governments and private agencies that provide information on prices and quantities, which set the rules that govern the market, etc.

At each stage of the chain the price of the produce escalates, mainly because each actor in the chain adds to its value – by growing, harvesting, sorting, grading, packaging, processing, labeling, transporting, storing, and putting it on shelves for buyers. Each of these steps costs money, which the actor recoups by charging for the service.

## **2.4 Actors Involved in Mango Value Chain and their Functions**

Mango Value Chain includes the following actors:

- Nursery Developers
- Input Suppliers
- Growers
- Pre-Harvest Contractors
- Transporters
- Commission Agents
- Wholesalers
- Traders
- Retailers
- Consumers

- Exporters
- Processors

### Key Actors of the Fresh Mango Value Chain:



**Figure 7 Functions of Mango Value Chain Actors:**

A brief description of these actors, their roles and position in the value chain is given below:

#### Input Suppliers

Input suppliers play a significant role in the production of healthy and disease-free fruit through the supply of agro-chemicals, fertilizers, pesticides, weedicides, foliar sprays and other such materials required for the high yields and quality fruit production. Most of the mango producers expressed to not having much confidence and satisfaction over the services of the majority of agro-chemical input suppliers.

#### Nursery Developers

This is unfortunately the weakest link in the value chain since no certified planting material from registered nurseries is available to mango producers. The Government of Pakistan through its Federal Seed Certification and Registration Department is making efforts towards the availability of certified and quality planting material but there is still a considerable gap. More efforts are required to if the quality of produce is to be improved.

#### Producers

Producers undertake the production activities with over 90 percent of the producers selling the harvesting rights of their orchard to contractors. Selling time varies from just after the completion of harvest in August/September to the time when the fruit has almost attained its final shape in March/April. Only a small 10 percent of the producers are involved in marketing

the produce themselves, primarily with the expectation of better returns. Reasons for the dominance of the contracting system include immediate cash needs of the producer for preparation of the next season's orchard and to meet other personal expenses, risk factor, hassle involved in self-marketing, and lack of expertise in dealing with the labor and marketing of produce.

Terms of contracting out the orchard varies from owner to owner. If the orchard is contracted out just after the harvest, the production costs are born by the contractor and if it is sold at a later stage, the owner bears all the production costs. The owner and contractor mutually agree on a fixed price and one third of the total amount is paid in advance. Thereafter, prior to the start of harvest period, another one third of the fixed amount is paid and the final installment is paid when at least half of the produce has been harvested. Previous years' returns from orchard to the pre-harvest contractor are also an important factor to be considered in the evaluation of the orchard. If the contractor has earned a good profit from the orchard, the same contractor prefers to keep the orchard with an increase in the price and the deal is finalized instantly after completion of the harvest. However, in some cases the growers may not receive the full amount of the agreed price, and this has become a trend unfortunately. In particular, many contractors site adverse weather conditions as a reason for delaying payments or reducing the fixed price.

The contract duration varies from one to three years and is decided mutually between the producer and the contractor, mainly depending on the cash needs of the producer. The most common type of contract is one 'without management practices' i.e., all orchard management costs incurred up till harvest time are paid by the producer himself. The contract is normally for one year duration and the contractor simply picks and markets the fruit. The second type of contract includes the cost of 'pesticide spray' among all other responsibilities of the contractor. In this contractual agreement, all management costs are borne by the producer except the cost of pesticide spray. Finally the third type, contract includes 'all management costs', (costs include ploughing, inter-cultivation, application of inputs like fertilizer, and pesticide sprays) as part of the responsibility of the contractor. In this case, the contract is usually for more than two years.

### **Pre-harvest Contractors (Bekhar)**

The pre-harvest contractors (PHC) perform a key role in the marketing of fruits. Usually, they maintain a close contact with the commission agents in the wholesale and terminal markets as well as with the producers. While contracting an orchard, the PHCs estimate the total volume of production and make an assessment of expected costs to be incurred for supervision, harvesting, transportation, and marketing. The requirements for own domestic consumption, and payment in kind to the orchard-owner plus pre and post-harvest losses, are also the factors considered by the PHC before making an offer to the producer. Finance for payment to the producer is obtained from the commission agent and he is also taken into confidence regarding expected production and price of orchard before finalizing the deal. Marketing of produce is mostly controlled by the commission agent, providing the finance. The pre-harvest contractors operate in a climate of uncertainty and encounter all sorts of risks as they are solely responsible for the loss.

### **Harvesting Labor**

Harvesting labor works in the form of a group under the supervision of their head usually known as the 'Chairman' or 'Contractor' (*thakedar*). It includes general labor (harvesters), performing the functions of harvesting, transporting the produce to the packing place/pack house and, loading the truck upon completion of the process, sorters/graders, packers, nailing people and one or two persons for marking the crates. Each category of the harvesting labor is paid according to the skill required for its specific job. Packers are paid the maximum remuneration followed by sorters/graders, nailers and harvesters. The Chairman is paid a lump sum amount

for the season. An advance agreement is made by the producer/PHC with the chairman of the labor and an advance amount is paid. Mainly harvesting labor is hired on a salary basis but in some cases per crate rate is also agreed. Major source of labor is Multan and even for Sind orchards labor is hired from Multan/Muzzafargarh area. In this case fare for coming from and going back to Multan is also paid to the labor. If the labor is hired on a salary basis, provision of food, tea and other essentials is also the responsibility of producer/PHC hiring the labor and if the contract is made on per carte basis, the labor makes its own arrangements. Harvesting labor has a very important role in the mango value chain as the quality of produce and its shelf life largely depends on the way the harvesting labor performs its job. However, this is the most neglected part of the value chain.

### **Transporters**

Transporters are service providers and they do not own the produce. They transport the produce from the point of production or from one market to its destination market. Common mode of transport, used for domestic marketing, is a truck with loading capacity of about ten tons. In order to minimize the transportation cost, transporters also practice overloading. For export purposes, if the produce is to be packed on farm or in a pack-house in the producing area, it may be a container type depending on the mode of shipment (air or sea), traveling time, target market and other requirements.

### **Commission Agents (Arhti)**

Commission agents have a vital role in the value chain and perform the important function of linking sellers with the buyers. They have establishments at wholesale markets, and are equipped with modern communication facilities. They also provide food and lodging to the suppliers and buyers if needed. Commission agents maintain contacts with inter-regional wholesale markets and possess comprehensive and accurate information. They also serve as buying agents for exporters and processors, and offer a guarantee on the agreed quality of the produce to the buyers, and take responsibility of payment to the supplier. They perform their activities on a commission basis, and usually do not accept title of goods, when selling the produce brought by producers or contractors. But whenever they find some margin in the trade or if the total produce brought by suppliers is not auctioned, they themselves buy the produce at the prevailing price of the market.

The other important role played by the commission agents is providing finance to the PHC for the purchase of orchards with the condition that total produce of the orchard will be sold through them and commission, at an agreed rate, will be charged. Normally the PHC is not allowed to sell his produce in any other market, without the permission of the commission agent who had provided finance, even if price is better in other market. In such a case if the produce is sold in any other market, the PHC has to pay commission to the commission agent in the other market as well as to his financier and payment will be received by the commission agent providing finance. The frequency of this practice varies from person to person and from market to market and depends on the level of trust between the two parties. In case of loss to the PHC the commission agent accommodates him and provides finance during next season for the recovery of outstanding amount and the practice continues. Sometimes the advance amount is not recovered or the PHC may cheat the commission agent but the main interest of the commission agent is in the commission charged from the supplier at a rate of about 8-10 percent of the sale value of produce which is quite a handsome amount and covers all risks.

### **Wholesalers (Pharia/Masha Khaur)**

Mango is mainly harvested and sold in an un-ripened form at wholesale markets. The produce is auctioned in large lots which are beyond the requirement of retailers. Hence, wholesalers buy the lots in auction, carry the produce to their market, and re-pack the produce to improve its look, dispose of the damaged pieces, put in the ripening material (calcium carbide) and keep it

for about three days till the fruit is ripe. Thereafter, the fruit is displayed for sale to the retailers and other buyers with a profit margin. Usually they perform their business in wholesale and terminal markets, where they deal in several commodities such as fruits, vegetables, and other agricultural produce within interregional markets, and also supply produce to processing industries, exporters, and retailers according to the demand. Wholesalers also maintain contacts with commission agents in the wholesale market and retailers in the local area. They mostly buy from the commission agents on a credit basis, and make payment after the onward sale of the produce. Since wholesalers have a good understanding of the business, they are converted into commission agents with the passage of time.

### **Traders (Ladania)**

The produce is marketed in truckloads and the smaller markets do not have the capacity to absorb the full quantity. To maintain a regular supply of the produce, to these markets, produce lots are purchased in auction by the traders (Ladania) and is further marketed to surrounding smaller markets.

### **Retailers**

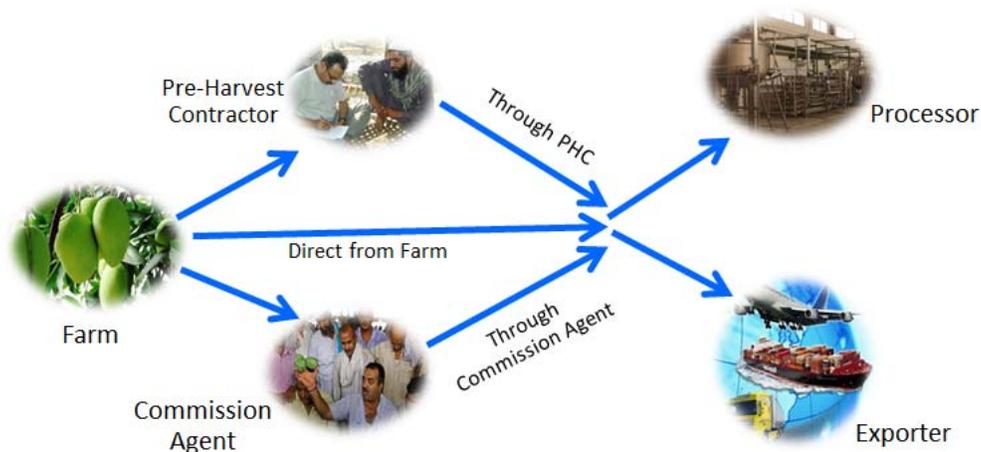
The retailer is the last link of the domestic marketing chain, and the marketing of fresh mango for consumption come to an end at this point. Retailers make their purchases of required quality and quantity mostly from the wholesalers whereas a few big retailers also make their purchases directly from commission agents. The quantity and quality depends on their business volume, selling place and type of customers. A small number of fruit retailers occupy shops in the main business places of the town. The majority of fruit retailers are selling from barrows (hand cart) consisting of a wooden platform mounted on four cycle wheels, Suzuki vans, and donkey carts. They move from street to street to offer fruit for sale. Moreover, a number of retailers are found standing at focal places of a town, particularly railway stations, bus stands, vicinity of courts, schools, and hospitals. Among fruit retailers there is a high degree of competition because the objective is to completely dispose of the purchased produce due to its perishable nature. Now, proper fruit and vegetable shops, exclusively established for these commodities, have started emerging in big towns. The departmental stores have also started establishing fruit and vegetable sections from where you can pick the quality of your choice. The prices in such shops/stores are a bit higher than market rates, but the quality of produce is also better. Retailers buy fruit from the wholesalers on a 24–48 hour credit basis.

### **Processors**

A very small portion of the produce is diverted towards processing to prepare value-added products which include mango pulp, jam, jelly, marmalades, pickles, chutneys, nectar, juices and squashes. Pulp is the major value-added product prepared from mango. Processors make purchases of their required quality, mostly from the wholesale market through a commission agent or wholesaler who acts as a buying agent for them. They set forth the requirement regarding variety, quantity and quality of produce and an agreed-upon amount is paid to the buying agent over and above the purchase price. Processors also visit the wholesale market to procure the produce at their own but this is practice is not a norm since the commission agent and wholesaler have a better knowledge about the quality of produce reaching the market from different sources. Quality of produce purchased depends on the type of product to be prepared and the targeted buyers/market but mostly D grade produce is procured for processing. Processors also contact the PHCs for the procurement of produce whenever there is a demand for a specific product variety prepared from a better quality raw material. In this case, the price is somewhat higher as compared to that in wholesale market. Mango pulp is also exported to different countries. During the study it was revealed that exporters face difficulties in competing with India in the international export market of pulp due to comparatively low prices of raw materials in India.



### Mango Value Chain for Processors and Exporters:



#### Exporters

Pakistan exports only about four-five percent of its total mango production. Exporters are an important part of the mango value chain as they are a link between the producers in the country and buyers in the overseas destination markets. Exporters procure the produce from different sources depending on the buyers' requirements, destination market and mode of transport, whether air or sea. If the produce is to be sold in the wholesale market of the export destination, like Dubai, there is not much attention on quality and produce is procured from the domestic wholesale market, mostly from Karachi. The study revealed that if any quantity of mangoes is left unsold in Karachi's wholesale market, it is dispatched to the Dubai wholesale market without consideration of quality or the prevalent supply and demand situation. This practice results in the crash of market prices.

In case the produce is to be supplied to some specific buyer in the destination market, it is procured as per the requirements of the buyer. The quality parameters include size and weight of the fruit, number of pieces per box, disease-free produce, damage and bruises and the quarantine requirements of the importing country. Any treatment like hot water, vapor heat or irradiation may also be conducted if it is a requirement of the buyer/importing country. Certifications such as GlobalGAP should also be obtained if necessary. Certification of the orchards, from where the produce is to be exported, is a requirement of retail chain stores in Europe. Traceability of the produce is also an important aspect to be kept in mind while exporting the produce to any foreign market. To meet the required quality standards, the produce is usually procured from the field. For this purpose, a contact is established with the producer or PHC, mostly through the commission agent, and a deal is finalized for the supply of required quantity. Price and quality parameters are also agreed. The commission agent works as a link between the exporter and producer/PH and his main responsibilities include the supply of produce of agreed quality to the exporter and guarantee of payment to the supplier. When trust develops between the exporter and producer/PHC, the role of commission agent is eventually eliminated and both the parties may strike a deal independently.

## 2.5 Characteristics of Mango Market<sup>6</sup>

- Mango available for human consumption from May till end of September.

<sup>6</sup>Source: National Agriculture Research Centre Survey

- Poor infrastructure, limited knowledge of handling, storing, transportation of mango and very limited cold storage facilities are available.
- The majority of poor quality (short shelf life) mango is retailed. There are six types of mango retail points namely street vendors/hawkers (selling up to 20 percent consumers); fruit shops (51 percent), Tuesday, Friday and Sunday bazaars (percent), roadside stalls (3percent), super markets (1percent) and food service (1 percent).
- A small proportion of mango (3 percent) is processed into value-added products such as mango pulp, jams, chutneys, dried mango, drinks and ice cream.
- Pakistan exports four-five percent of its mango production in the fresh form.
- During the last decade, Pakistani mango industry has been able to triple increase its total mango export revenue and this upward trend is expected to continue in the coming years.
- Main destination markets for the export of Pakistani mangoes are United Arab Emirates, Saudi Arabia, Oman, United Kingdom and a few European countries.

## 2.6 Mapping the Mango Value Chain

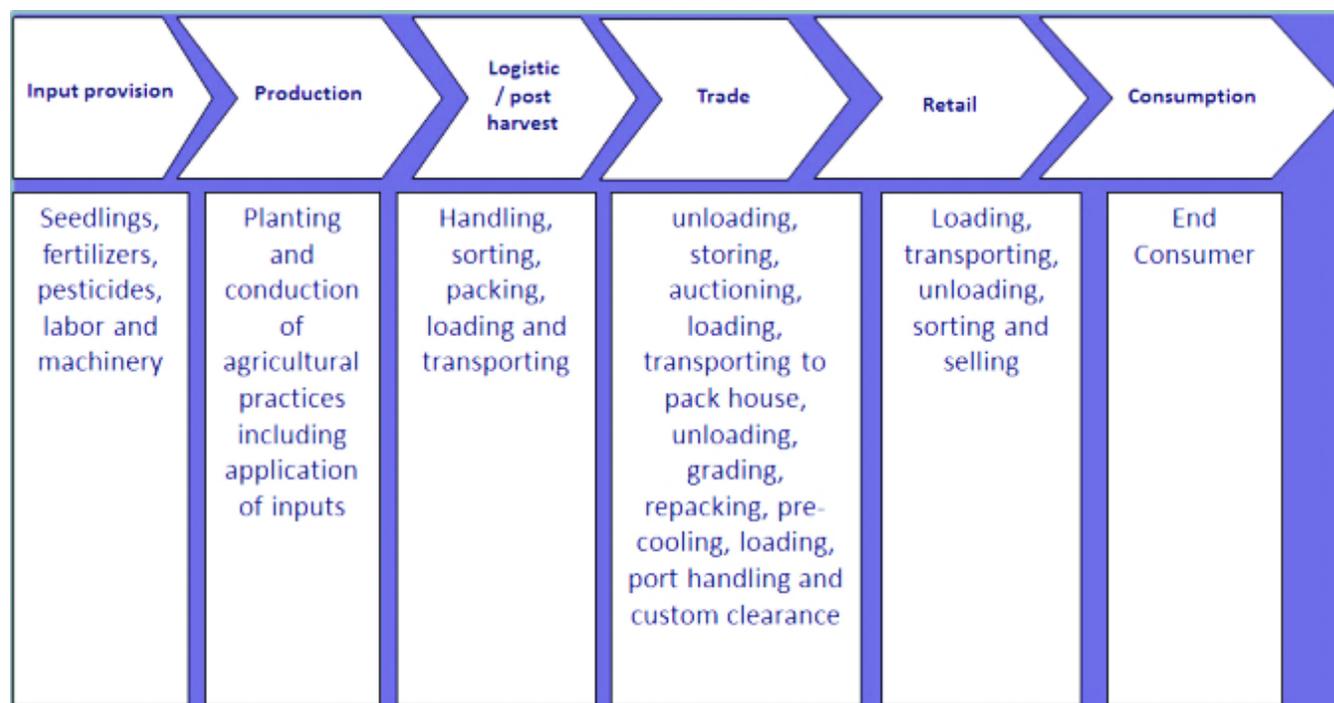
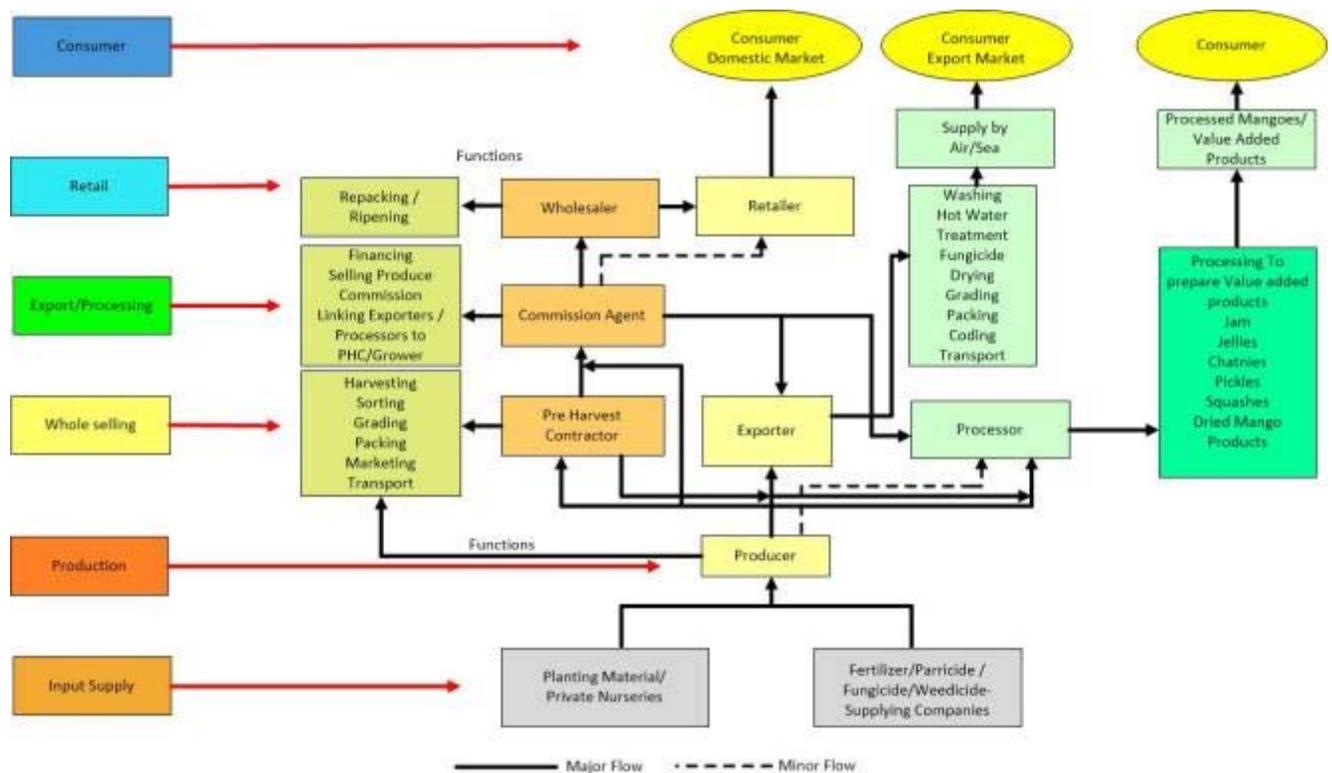


Figure 8 Mango Value Chain

## 2.7 Mango Sub-Sector Analysis and Development



## 2.8 Issues of Competitiveness in the Mango Value Chain

- Limited facilities for conducting research and development on controlled atmosphere storage, shipping and export of different mango varieties.
- Limited development of cold chain parameters of mango export.
- Research and development in mango is not properly disseminated to mango growers due to an ineffective extension system.
- Sanitary and Phytosanitary issues.
- Pakistan does not have adequate processing, grading, packing, and cold storage facilities.
- Pakistani mango has a global perception of having inferior and inconsistent quality, which fetches a lower price. Markets are becoming more conscious about good quality standards of the fruit.
- Sustainability of mango export to high-end market would be at stake until Pakistan effectively demonstrates compliance to quality and safety standards.
- Grading and packing standards for fresh produce are obsolete, and even these are not being implemented, which leads to inefficiency in the marketing system as the buyer does not have trust in the pack of produce due to mixing of poor quality of produce with good quality.

## 2.9 Key Mango Producing Areas of Pakistan



Figure 9 Key Producing Areas

## 2.10 Geographical Flow and Price Structure of Mango in Pakistan

There is a general perception that the price of a product increases as it is supplied to distant local markets and this increase in price is directly proportional to the distance. This may be correct in the case of manufactured goods where there is uniformity in the product, and also there is one supplier controlling the supply of a product at a particular price. In the case of agricultural products, there are some other issues associated with it which include:

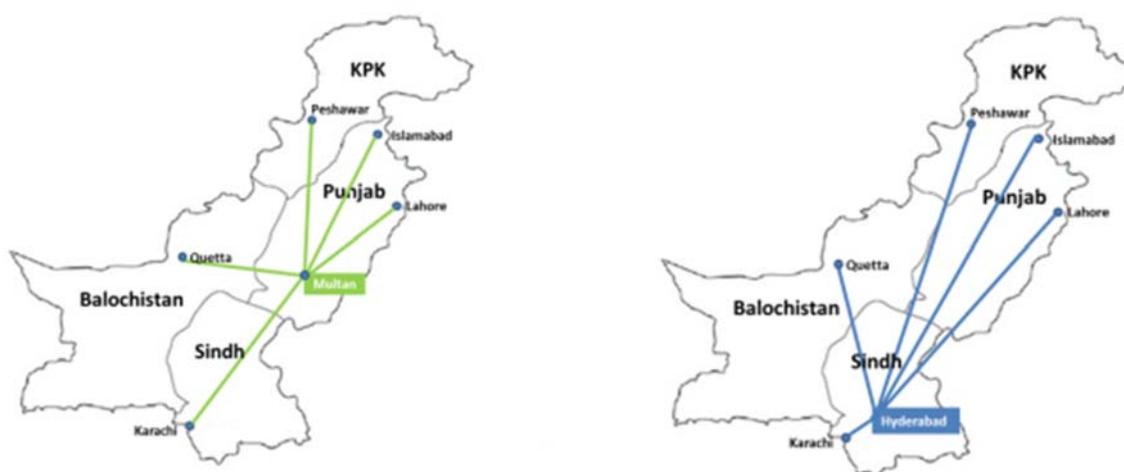
- The product is not uniform – there are no grading and packing standards.
- Product is perishable – It can't be stored beyond a certain limit.
- There are numerous suppliers – supply of the product can't be controlled or determined.
- Price is determined after the product reaches the market – price is determined by the buyers not the sellers.
- Quality of produce – price of the produce depends on quality of produce marketed to a specific market.
- Supply and demand situation, on a specific day plays a major role in determining the price of a product.

Keeping in view the above-mentioned factors, the perception of increase in price with the increase in distance may be considered correct to a certain extent but cannot be accepted as a rule of thumb.

For the purpose of analysis prices of two varieties of mango i.e., Sindhri and S.B Chaunsa in eight different local markets, on a specific point of time, were obtained<sup>7</sup>. These markets include Hyderabad, Karachi, R. Y. Khan, Multan, Lahore, Rawalpindi/Islamabad, Peshawar and Quetta. Out of these eight markets, Hyderabad, R. Y. Khan and Multan are main mangos producing areas. As Sindhri is mainly produced in Sind while R. Y. Khan and Multan are main Chaunsa

**Figure 10 Sindhri vs Chaunsa**

S.B. producing areas in Punjab, geographical flow of Sindhri from Hyderabad and that of Chaunsa S.B. from R. Y. Khan and Multan, was observed.



Wholesale Market	Distance	Sindhri Mid Jun-12	Chaunsa S.B. Mid Jul-12	Chaunsa S.B. Mid Aug-12
Multan	0 km	Rs. 37/Kg	Rs. 40/Kg	Rs. 32/Kg
Lahore	349 km	Rs. 55/Kg	Rs. 65/Kg	Rs. 58/Kg
Peshawar	554 km	Rs. 45/Kg	Rs. 38/Kg	Rs. 40/Kg
Islamabad	565 km	Rs. 58/Kg	Rs. 63/Kg	Rs. 61/Kg
Quetta	624 km	Rs. 49/Kg	Rs. 38/Kg	Rs. 41/Kg
Karachi	936 km	Rs. 33/Kg	Rs. 55/Kg	Rs. 60/Kg

Wholesale Market	Distance	Sindhri Mid Jun-12	Chaunsa S.B. Mid Jul-12	Chaunsa S.B. Mid Aug-12
Hyderabad	0 km	Rs. 45/Kg	Rs. 52/Kg	Rs. 61/Kg
Karachi	163 km	Rs. 33/Kg	Rs. 55/Kg	Rs. 60/Kg
Lahore	1,122 km	Rs. 55/Kg	Rs. 65/Kg	Rs. 58/Kg
Peshawar	1,220 km	Rs. 45/Kg	Rs. 38/Kg	Rs. 40/Kg
Islamabad	1,323 km	Rs. 58/Kg	Rs. 63/Kg	Rs. 61/Kg
Quetta	2,590 km	Rs. 49/Kg	Rs. 38/Kg	Rs. 41/Kg

7

**Source:** Punjab Prices – [www.amis.pk](http://www.amis.pk)

Quetta Prices: Market Committee

Sindh Prices: [www.sindhagrmarketing.gov.pk/reports.php](http://www.sindhagrmarketing.gov.pk/reports.php)

Peshawar Prices: Fruit & Vegetable Market

Distances: [www.distancesbetween.com](http://www.distancesbetween.com)



Wholesale Market	Distance	Sindhri Mid Jun-12	Chaunsa S.B. Mid Jul-12	Chaunsa S.B. Mid Aug-12
Rahim Yar Khan	0 km	Rs. 50/Kg	Rs. 46/Kg	Rs. 57/Kg
Quetta	616 km	Rs. 49/Kg	Rs. 38/Kg	Rs. 41/Kg
Lahore	634 km	Rs. 55/Kg	Rs. 65/Kg	Rs. 58/Kg
Karachi	705 km	Rs. 33/Kg	Rs. 55/Kg	Rs. 60/Kg
Peshawar	813 km	Rs. 45/Kg	Rs. 38/Kg	Rs. 40/Kg
Islamabad	835 km	Rs. 58/Kg	Rs. 63/Kg	Rs. 61/Kg

Prices of these mango varieties in other main markets, as mentioned above, on a specific point of time, were obtained and are shown in the above figures. Sindhri prices, in different markets, with respect to Hyderabad market, were obtained for mid of June, 2012 and prices of Chaunsa S.B., with respect to R. Y. Khan and Multan markets, were obtained for mid of July and August, 2012 respectively. The markets for which daily prices were not available, monthly average prices were used for the purpose of analysis.

It is evident from the prices, shown above in three different figures, that price of a product may increase as it moves to distant markets and it is quite logical because there are costs associated with the movement of a product but it is not necessary because there are other factors, as explained above, which influence its price on a specific point of time. Actually the price of a product in a market, on a particular day, is the outcome of impact of all the factors explained above.

## 2.11 Reasons for the Geographical Flow of Mango in Pakistan

**Production time:** Harvesting starts early in Sindh (end April or start of May) whereas there is a longer time span in Punjab (end May to September). To meet domestic demand, different mango varieties keep on flowing from one geographical region (producing areas) to the other (consuming areas).

**Pricing:** Price is a major decision-making factor for suppliers to choose a target market. This is based on daily price monitoring and market trends prevailing at that particular day.

**Major markets:** The produce is mainly dispatched in bulk to major markets such as Lahore, Multan, Faisalabad, Islamabad, Bahawalpur, Gujranwala, Karachi, Hyderabad, Quetta and Peshawar. The fruit is then purchased by the traders (*ladania*) and further dispatched to the surrounding smaller markets.

**Exports:** Karachi, Lahore, Peshawar and Quetta are the major export areas in Pakistan.

**Varietal Preferences:** People of different geographical locations have their own varietal preferences. Large mangos such as *Sindhri*, *Fajri*, *Langra*, and *Black Chaunsa* are popular in Peshawar and Quetta while *Chaunsa S. B.* is preferred all across the Punjab and Karachi. Mango varieties such as *Anwar Ratol*, *Dusehri* and *Siroli* are preferred in the Punjab. Similarly, *Sindhri* is preferred across all parts of the country and due to its long shelf life, it is considered to be the best variety for export markets as well. Exporters also prefer to buy *Sindhri*, *Chaunsa S. B.*, *White Chaunsa*, *Sonera*, *Fajri* and *LalBadshah*.

**Freight Charges:** Suppliers keep a vigilant eye on the trend of freight charges. A rise in the freight charges for a specific market indicates that the demand of transport has increased, and this reflects on more people sending their produce to that market.

## 2.12 Critical Factors that Influence the Flow of Mango

Pakistan is the fifth<sup>8</sup> largest mango producer in the world with an annual production of 1.78 million tons, and exports of 0.0859 million tons at an average export price of 355 USD per metric ton valuing 30.56 million USD (2010). The export price of 355 USD/MT was the lowest among the twenty top mango exporting countries in the world while China obtained the highest export price of USD 2,690/MT. The huge difference in mango export price reflects on the low preference for Pakistani mangos in the international market. Three percent of Pakistan's total mango produce is diverted towards value-addition, mainly pulping. There are certain reasons behind the current state of affairs in the mango sector, and these are highlighted below:

### Market Dynamics

Marketing of mangos is largely dominated by the private sector. Production, harvesting, post-harvest and marketing systems are poorly developed and returns are distributed quite unevenly, with a maximum share for middlemen which leaves small amount for the producers. As a result of poor orchard management and traditional harvest and post-harvest practices, the quality of produce remains poor that leads to high harvest and post-harvest losses. Modern infrastructure for cold storage, grading, packaging, post-harvest treatment and transport is a weak link in the supply chain/value chain.

Furthermore, there are ON and OFF seasons of mango production due to which periodic gluts occur within the domestic market with no capacity to store fruit or divert it to value addition; heavy reduction in retail prices is common. Domestic market prices are highly influenced by trends in the export market. For instance, if a country declares its imports of Pakistani mangoes, this gives a boost to the prices in the domestic market.

In domestic marketing majority of the produce is routed through the traditional *mandi* system and alternate supply channels are almost nonexistent which leads to overburdening in the markets, and thus lowering efficiency in developed countries only a fraction of the produce is routed through established markets and the rest is routed through alternate supply channels. Grades and standards of size and quality are usually nonexistent within the domestic markets. The producer/PHC, marketing the produce, uses their own grades and standards depending on the quality of produce, type of target market and market acceptability. Even within a specific pack, the produce is not of uniform size and quality. The upper layer of the pack is of good quality fruits while the lower part produce is of inferior quality. This whole situation leads to lack of credibility in the marketing system, price comparisons are difficult and market performance can't be evaluated. The flow of reliable market information is poor which makes it difficult for the producers/PHCs to formulate an appropriate marketing strategy. The total harvested produce is usually marketed in the domestic market after it is categorized in different grades. The most common grades are:

- (a) VIP
- (b) Super
- (c) Special

Results indicate that a percentage of total produce results in 65 percent VIP, 20 percent Super and 15 percent Special grades. The type of grade is majorly dependent on the size of the fruit.

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<sup>8</sup>**Source:** Food and Agriculture Organization of United Nations: Economic and Social Department: The Statistical Division

The recovery of different grades varies from variety to variety and also from person to person. All grades are marketed in the domestic market. The Special grade is of lowest quality and is marketed to distant markets without considering the feasibility since all packs of produce bear the overheads equally. This category fetches the lowest price in the market and sometimes it does not even cover the cost of overheads. It is essential to divert this quality of produce to value addition but unfortunately there is little evidence of a value-oriented approach to supply chain management.

### **Stakeholders**

There are different stakeholders in the mango value chain and every stakeholder has a specific role to play. The overall performance of value chain is largely dependent on the behavior of all the stakeholders. There are different stakeholders in the value chain and their roles are described below:

### **Growers**

Mango growers in Pakistan do not usually harvest their own crops, relying instead on contractors. Both small or large Mango growers need better access to information, specific skills and training in orchard management and must implement Good Agricultural Practices, to ensure the quality of mangoes. Mango growers are relatively disempowered in the supply chain and would benefit from commercial alliances for skills development. Common practices of mango growers that can impact the quality of mango are:

- No tree pruning causes skin damage/rub from branches; increased disease inoculums and post-harvest rot development; and difficulty of harvest leading to bruising during harvesting.
- Poor pest and disease management practices leading to damages from insects (thrips and fruit fly); and diseased fruit (bacterial spot and post-harvest rot development).
- Poor fertilizer and irrigation practices leading to poor development of the fruit, which is unfit for long- term storage.

### **Pre-harvest Contractor**

Performance is of great importance as the produce starts its journey in the value chain and its shelf life mainly depends on the way the PHCs perform their operations. PHCs' operations are guided and financed by commission agents, and thus they have little authority to voluntarily change their present practices. Improving commercial linkages between contractors and other chain members would require the support and encouragement of commission agents. Contractor practices and activities that can have an effect on mango quality are:

- Poor tree management practices up to harvest.
- Poor harvesting techniques – fruit is often dropped from the tree if cut or hit by a pole, causing severe bruising to the fruit.
- Mango tree is harvested while the fruits on it still have not matured.
- The fruit is often placed in piles after the harvest until it is removed from the orchard. This can cause bruising, heating (accelerating ripening), and sap burn.
- Little or no de-sapping is practiced, resulting in major sap burn blemishes on the fruit.
- Poor grading and packing – this is usually carried out in the field or sometimes in open sheds on earth floors or under trees in the orchards. Fruit is sorted in piles and then packed in roughly nailed wooden crates lined with newspapers.

- Wooden crates are packed until they bulge and the lid is nailed on (called 'belly' packing). Damage occurs from punctures by the nails in the crates and when the fruit is pressed during transportation when crates are placed on each other.
- No cool chain practices are adopted as there are no facilities available, causing the mangoes to have a short shelf-life

### **Commission Agents**

Commission agents enjoy the most authority in the value chain, and any chain improvement strategy would depend on their support and involvement. Commission agents play an important role of linking the producers/PHC with the exporters and processors. They are considered an important part of the value chain as they perform many types of activities simultaneously including financing the PHC, linking the suppliers with the buyers, working as buying agents for exporters and processors, and providing services to the suppliers on a commission basis. Commission agents control the product and the information in the supply chain more than any other participant. Commission agents operate from wholesale markets, where the product is auctioned to wholesalers, who may then sort and re-grade the fruit before selling it (in the wholesale market) to buyers/retailers.

### **Wholesalers**

The role of wholesalers in the value chain is important but not dominant since they just procure the produce from the commission agent and after some value addition, sell it to the retailers with some margin. They purchase the produce in anticipation of the market demand, but this is not a large purchase since they do not have fruit storage capacity and there is also a problem of having access to working capital.

### **Processors**

Processors mostly purchase D grades of produce for processing. A very small percentage of the total produce is used for processing. Their role in the value chain is currently limited and yet there is a lot of scope for strengthening this by creating an enabling environment by diverting more produce towards value addition. Processors have expressed that they are seen as a dumping ground for lowest quality fruit whereas their requirement is for sound, fully matured mangoes for preparation of quality products. Improving commercial linkages with processors will require educating suppliers about processors' needs and their ability to pay for fruit that meets those needs.

### **Exporters**

Although only about four to five percent of the total mango produce is exported, the impact of these exports on the domestic market is very encouraging. The domestic market prices rise with the increase in export volume which leads to good returns for the producers/PHC. As a result, the producers/PHC feel more comfortable about investing in Good Agricultural Practices and better orchard management to enhance productivity and improve the quality of their produce. Grading and packing practices at the farm level are also improved as the demand increases for produce which meets export quality requirements and a premium price is received. The major export destinations for Pakistan's mangoes are the Middle East, the U.K. and Europe. A majority of the exports are consumed by expatriate Pakistanis and other Asian communities living abroad. In export markets, Pakistani mangoes are considered as low priced, low post-harvest quality having inherently healthy eating properties. Most fruit for export is sourced from commission agents, and it is graded and packed by hand with no other post-harvest treatment. Most exports are of low value product to Middle Eastern markets, notably Dubai. Many importers are Pakistanis living abroad. Exporter practices and activities that can have an impact on mango quality include:

- Poor knowledge and implementation of post-harvest practices such as heat treatment, disease control and storage
- Poor inventory management due to poorly developed market information systems
- Limited knowledge of markets and the customized demand for food safety and security.

### **Transporters**

Domestic transporters play a vital role in getting fruit from the farm to destination market. Commission agents order and control transport, most of which is on high-sided body trucks with a loading capacity of around seven tons. Overloading is a feature of the system, supposedly to reduce transport costs per unit, and market levies which are on a per truck basis. Transport practices and activities that can have an effect on mango quality are:

- Overloading of trucks – often pack 1,000 crates on a truck instead of 700 (truck capacity) causing the lower crates to crush.
- 60 percent of roads in Pakistan (particularly in rural areas) are roughly metalled and in dilapidated conditions for traffic movement. Trucks have very poor suspension systems leading to bruising and injury of fruit.
- Trucks are often uncovered, exposed to heat and direct sunlight leading to a shorter shelf life, due to acceleration in the respiration rate.

### **Climatic Conditions**

Climatic conditions also influence the quality of mango being produced. During prolonged cold weather the fruit does not flower properly, leading to less production. Similarly if there is a drastic weather change while the fruit has attained its shape, it may lead to fruit dropping, lowering the scale of production. Strong winds during the season also lead to the falling of immature and/or heavy fruit. Often, producers/PHC adds ripening material and dispatches it to the market for onward sale without considering its impact on fruit quality.

### **Government Policies**

The Government of Pakistan maintains a policy of substantially increasing export earnings, and has announced a five-pillar development strategy. Mango exporters could benefit under this strategy by gaining preferential access to newly negotiated markets (Iran was a classic example in 2005 and China is a current example), and benefiting from government investment in infrastructure and capacity building.

The Government of Pakistan is actively seeking to expand and support its export development activities. The Rapid Export Growth Strategy (REGS) is based on five pillars:

1. Improved market access.
2. Focus on neglected regions, e.g. Africa, Latin America and Central Asia.
3. Strengthened trade promotion infrastructure and international trade offices.
4. Improved skill development and productivity through training.
5. Provision of state-of-the-art infrastructure for processing and transportation.

Nevertheless, there are areas which require more attention from the Government of Pakistan, leading to policy framework for a conducive environment for mango export:

- Limited air space available to exporters during the mango season. Priority must be given to mango export keeping in view its short availability period and perishable nature.

- Short notice given to exporters regarding air space availability or cancellation of already booked air space at the last-minute when the consignment is ready to go.
- Many exporters complain about the limited cool storage space at the Karachi airport, where the produce is often left in the Tarmac area where ambient temperatures exceed 40° C.
- Handling/clearing at the Karachi port is not efficient and delays are common. Sometimes there are difficulties in locating a sufficient number of containers to meet the high demand.
- There is an in-depth pre-shipment inspection of mango consignments in order to prevent drug—smuggling cases and during this process, the crates are opened and left unattended at high temperatures which results in shortened shelf life of the produce.
- Many of the small vessels dispatching fruit to the Middle East are slow, inefficient and barely seaworthy, but continue to be used due to reduced cost.
- Open containers offer no protection or temperature control.
- Many exporters have no cooling facilities and rely on reefers.
- Insurance for Pakistan mango sea shipments is not available.
- There is no compliance to emerging international requirements (SPS measures).
- National grades and quality standards for domestic marketing.

## **2.13 Logistical, Informational and Distribution Function in Mango Value Chain**

### **Logistics**

Marketing logistics involve planning, delivering, and controlling the flow of physical goods, marketing materials and information from the producer to a market in order to meet customer demands while still making a satisfactory profit. Maintaining an organization's competitive edge means understanding and implementing an effective marketing logistics strategy regarding product, price, place and promotion. These four functions of marketing logistics help the organization reach out to its target customers.

### **Transportation**

Domestic transporters play an important role in getting fruit from farm to the agent in the destination market. Since over 90 percent of the mango orchards are sold by the producers to PHCs, who are financed by commission agents, the transportation function for domestic marketing is jointly controlled by the commission agents and PHCs. Transportation of produce is mostly carried out on high-sided body trucks with a normal loading capacity of around seven tons. Overloading is a common feature of the system, supposedly to reduce transport cost per unit, and market levies which are on a per truck basis. Usually 1,000 crates are packed on a truck instead of 700 (truck capacity) causing the lower crates to crush. Loading and unloading time takes approximately 2.5 hours. 60 percent of the road networks in Pakistan (particularly in rural areas) are in poor condition, causing delays during the transportation process. Trucks with basic suspension systems, traveling across long distances to reach the targeted market lead to impact injury of fruit. Loads are often uncovered, leading to shorter shelf life as the top layer boxes easily overheat, and may be damaged in case of rain. Small trucks such as Mazda and Shahzore are used in order to dispatch the produce from main markets to surrounding smaller markets.

A majority of mango exports from Pakistan channel through Karachi, and exports to distant markets such as Europe are done by air. However, sea shipments to Middle Eastern countries are common. Airlines providing international logistic services include PIA, Emirates and Singapore Airlines. Sea shipments are usually made in 40ft refrigerated containers. During the study, it was revealed that for long distance sea shipments to Europe refrigerated containers do not serve the purpose and create certain problems with respect to maintenance of the required temperature. Trade with Iran and Afghanistan is managed through road shipments, which is convenient and has given promising results. Some of the issues related to export shipments are:

- Inadequate cold chain infrastructure at pre-shipment stage.
- Limited knowledge and understanding of mango cold storage requirements.
- Consignments are sent at inappropriate temperatures.
- Limited space available in aircrafts and lack of cold storage facilities at airports.
- Inefficient clearing and forwarding practices.

### **Packaging**

Packaging plays an important role in export shipments. The key issues are:

- Lack of consistency among exporters.
- Exports to the Middle East are mostly in rough wooden crates.
- Carton design strength is low and airflow is inadequate for sea shipment.
- No moisture resistant material used for cartons.

### **Storage**

Mango, being a highly perishable commodity cannot be stored for long periods. The major purpose of storage is to enhance the shelf life of mango. In domestic marketing mango is harvested, transported and sold without the involvement of any cold chain and it completes its cycle from harvesting to consumption within six or seven days. For export purposes, mango is shipped by air without the establishment of any cold chain. However, during sea shipments to distant markets, a cold chain is essential after the harvesting and processing of produce so that it may reach the target market in an appropriate and acceptable form.

### **Processing**

The mango season lasts for about four months in Pakistan and during this period it remains available to the consumers in fresh form in the shape of diverse varieties originating from different geographical locations. In order to meet consumer's demand, the mango should remain available different forms throughout the year, and thus processing activities are undertaken. There is a small but growing processing industry mainly preparing mango pulp and also other value-added products such as jam, jelly, marmalade, pickles, chutney, nectar, juice, squash, mango drinks and ice cream.

### **Communication Function**

Communication among different actors in the value chain is very important to understand each other's requirements, issues and concerns. There is a poor communication flow along the value chain. It prevents producers from receiving feedback from the market regarding quality, size, shape, packaging, degree of maturity of fruit and other consumer preferences. The average price information is generally available from the wholesale markets but in the absence of any packing grades and standards, this price can't be attributed to a specific quality of produce. This also impacts exports in the following ways:

- Lack of information regarding import market requirements of product quality, packaging and labeling makes it difficult for the producers/exporters to decide about the above mentioned matters while exporting the produce..
- Import market legislation on tariffs, SPS and other legal requirements to be met while exporting the produce to that market.
- International competitors and their strengths and weaknesses.
- International prices of different grades and qualities of produce.

The study has also revealed that there is an absence of market research on existing or potential export markets.

### **Distributional Function**

The produce passes through different actors/stakeholders, before it reaches the ultimate user, who performs different functions at stage of the chain. It is called distributional function which can be defined as a set of interdependent organizations involved in the process of making a product or service available for use or consumption by the consumer or business user. The poor quality of mangoes that reach the final consumer is a result of poor production and distribution functions coupled with inadequate handling, storage and transport systems.

## **2.14 Gender Issues**

Traditionally, men own and manage the mango farms but women are generally contracted for maintenance and post-harvest handling activities like packing, sorting, and grading etc. Female workers are normally hired on a daily wage rate basis during the harvesting season. Since traditional mango packing is a physically demanding activity, oftentimes male workers are preferred for the packing job. Mango sector has a huge potential to provide employment opportunities to female workers. They can be a good resource for sorting, grading and packing.

## **2.15 Conclusion**

A thorough study and stated findings reveal it clearly that low mango productivity and low output of Mango in Pakistan is mainly due to poor agricultural practices which are being followed over the decades and it is quite a tough task to drastically change the mindset of mango growers.

Low yields of mango are not fully translated into money value to the farmers. On the contrary, sometimes it causes farmers notable loss when it comes to Post-harvest losses. These estimated losses are high up to 40 percent that denotes only 60 percent of Pakistani mango production is contributing to country's agricultural economy. Such high portion of post-harvest losses is alarming and this situation needs to be responded on war footing basis.

The indirect employment generated across the value chain (Labor Multiplier), in domestic market, is 0.41 FTE jobs as 10 MT of produce moves along the value chain from harvesting point to the point of consumption. Similarly the labor multiplier figures for export market, through air shipment are 0.16 FTE jobs per 3 MT produce and through sea shipment it is 0.96 FTE jobs per 21 MT of produce.

Reliable processing facilities have to be established to increase volume of output from mango produce. Processing units bring innovation as well as help in reducing post-harvest losses.

Despite being competitive in quality, Pakistani mango export is very low in volume. Situation can be improved by bringing in serious initiatives in terms of marketing, packaging, efficient supply chain processes and product quality.

Pakistani mango is offered lower prices in export markets. This is primarily due to short shelf life, irregular deliveries, inefficient marketing and somewhat general perception about poor farming practices leading to food safety issues such as misuse/excessive use of fertilizers and pesticides and fungicides.

Exporters are not enjoying good profitability for their trade because for European routes air transport costs slash off a big chunk of exporters margin that result in lower profitability and leaving a discouraging sentiment for future business opportunities.

Inadequate international market information and linkages are also a reason of limited export volumes. Most of the traders operate on individual contact basis and they are not in habit of monitoring international prices on regular basis. Similarly, logistic trends are also neglected. On the other hand modern markets plan all these activities with reliable information and clinical precision. That is why they dominate the export market and enjoy better profitability.

In order to make the situation better, government do not take notable measures to support the growers and related tiers. However, government tried some short term initiatives but they could not create any significant impact and their results fade off after little time.

Ironically, all the focus of farmers and traders remain limited to liquidate the core product to make immediate money on investment. This way value added product portfolio remains nearly off the shelf. Industries are reluctant to take chances with new product development with the fear of facing failure. As a result, mango value added products could never catch the line beyond jam, jelly, pickle, candy products and juices/nectars up to some extent.

There is very limited exposure of growers and farmers to trainings and workshops for learning purpose. These activities also take place on a limited scale which hinders the growers to participate in big numbers. So impact created after such trainings remain insignificant and goes mostly unnoticed.



## 3. USAID Firms Project Interventions

### 3.1 Initial Strategy

USAID initiated its Mango Program in October 2009 to address the major constraints in mango production, handling and its marketing/export. The key focused areas were:

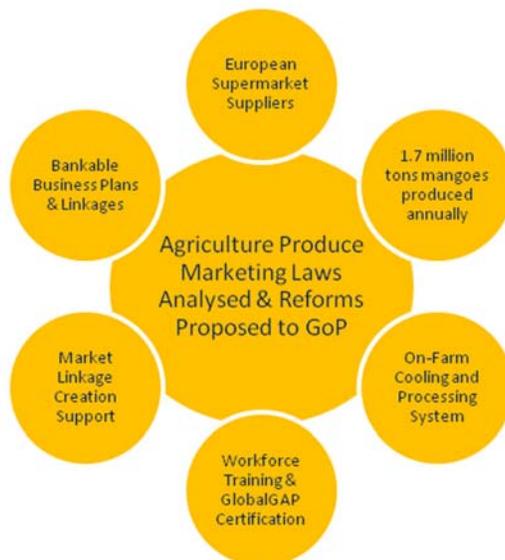
- GlobalGAP certification, on-farm infrastructure, workforce development and capacity building, market linkages and value-addition as major components of the Mango Value Chain development strategy.
- Supply of quality mangoes to high-end international market.
- Develop strategy for a viable and cost-effective means of transporting mangoes to international high value markets.

### 3.2 Fresh Mango Value Chain Development

The project assisted multiple firms with interventions designed for all aspects of the mango value chain (focused on supplying to high-end supermarkets in Europe and other international markets). These interventions in the mango value chain included:

- Providing materials and equipment to establish on-farm packing house infrastructure (processing lines and cooling equipment) to extend the fruit's shelf life for sea shipments to Europe and for disease control;
- Assisting farms with acquiring GlobalGAP (Global Good Agricultural Practices), and HACCP certification (a pre-requisite for entering European mainstream markets);
- Providing technical assistance directly to small farmers and extension workers in proper orchard care, harvesting techniques and pre and post-harvest trainings;
- Assistance for export marketing and funding of trial shipments to end markets in Europe;

The following diagram gives an outline of USAID Firms Project's interventions across the fresh mango value chain:



**Figure 11 Interventions in Mango Value Chain**

The main components of project intervention are described below:

**a. Training and Workforce Development**

The USAID Firms Project offers training programs for various players across the mango value chain including mango farmers, agriculture extension workers, exporters, and pack house workers. The objectives of these trainings include increasing the per acre yield of mangoes, improving fruit quality, improvement in tree health, vigor and longevity, reducing harvest and post-harvest losses, rejuvenation of orchards after super flood in the mango clusters, and increasing the total quantity of mangoes exported to overseas markets for current and new beneficiaries. To date, 96 trainings have been held through which more than 3,200 beneficiaries have been trained.

**b. Global Good Agricultural Practices (GlobalGAP) Export Standards/Certification**

The adoption of GlobalGAP practices is an important aspect of the food security program of the World Trade Organization (WTO). The project anticipates that GlobalGAP practices and certification will result in an approximate ten percent increase in the yield and 25 percent decrease in post-harvest losses, improving competitiveness and increasing sales of participating farmers. As a result of such interventions, farms will improve the quality of their produce, and decrease post-harvest losses, thereby increasing sales and profit. These improvements in quantity and quality also enable the farmers to extend their markets, exporting mangoes from Pakistan to high-end retail stores around the world. As of July 31, 2012, 27 mango farms have attained GlobalGAP certification.

**c. On-Farm Infrastructure Support**

The project's Mango MUAVAN Program four-year sector development strategy includes the delivery and installation of on-farm infrastructure, including a mango packing house with a processing line and cold storage equipment. The mango processing line serves to improve the cosmetic look/fruit quality of mangoes by processing the fruit through different stages which is vital for increasing the shelf life of mangoes for exports by sea. By the time the study commences the project will have 15 operational pack house facilities. However, not all will have started commercial operations. All 15 will operate commercially by the 2013 season.

**d. Export Promotion**

The project aims to provide continued assistance to mango farmers for commercial and trial shipments to international markets in order to develop mango market linkages. To date 10 trial shipments have been made by air and three by sea; three commercial shipments have been made by sea and one has been made by air. The project has also supported the participation of farmers and exporters in international fairs such as the Fruit Logistica, Berlin 2010, 2011 and 2012 as well as study tours to countries like Australia.

### **3.3 Dried Mango Value Chain Development**

The project aims to work on supply-side interventions to establish guidelines and parameters for the product development process. The objective of the interventions in dried mango sector is to standardize the production process for the export market in light of feedback received from the international and domestic markets. Standardization of the process will improve overall quality and output, increasing sales and competitiveness.

As part of this effort, the USAID Firms Project is supporting four dried mango processing facilities in Punjab and Sindh to reduce post-harvest losses, increase employment opportunities and maximize crop value. The project will also build the capacity of beneficiaries through technical assistance in areas related to the operation of equipment, product handling, drying and packaging requirements, as well as assisting beneficiaries in obtaining certifications to enter the international market.

### **3.4 Project Implementation Approach**

- Work with progressive mango farmers in the mango growing clusters of Pakistan.
- Assistance towards acquiring GlobalGAP certification to improve pre-harvest quality and give access to European markets.
- Workforce development and capacity-building for farmers, exporters and extension workers.
- Improve shelf life and the quality of post-harvest produce through on-farm mango pack houses.
- Proof of concept through trial shipments.
- Access to international buyers through trade shows and market linkages.

### **3.5 Challenges Faced by the Project**

The Mango Value Chain program was initiated to strengthen key players in value chain by enabling them to export quality produce to high-end international destinations at competitive prices. Different initiatives were taken by the project for this purpose and these included assisting farmers in achieving international certifications to make the produce eligible to enter high value international markets in Europe. Furthermore, the project developed on-farm infrastructure to prepare the produce as per quality requirements of the targeted markets, provided trainings on pre and post-harvest practices to build the capacity of the farmers in different aspects of production, processing, marketing and creating market linkages with potential buyers in the international market to successfully export the produce. The project faced certain challenges during the implementation of the program and these are elaborated below:

#### **GlobalGAP Certification**

- Only three of the selected 32 partner farms were previously GlobalGAP Certified.

- Newly-selected partner farms were not aware of the protocols of GlobalGAP certification and it was difficult to persuade them to acquire the certification.
- The partner farms did not have the capacity in orchard management record maintenance of the farm, as required for GlobalGAP certification.
- There were high expectations with respect to the reward of GlobalGAP certification.
- Cost sharing of certification and its sustainability.

### **Addressing the Challenges**

- Trainings on GlobalGAP certification were arranged to create awareness about the potential benefits of certification and the protocols of GlobalGAP certification.
- Training sessions on orchard management, good agricultural practices and record maintenance were conducted.
- To ensure the implementation of all required protocols, execution of good agricultural practices and record maintenance, Technical Field Officers (TFOs) were appointed by the project so that they may assist the partner farms in all abovementioned matters.
- Partner farms expected GlobalGAP certification to result in an increased demand of their produce that would subsequently fetch a premium price. Thus, the project staff emphasized that the outcome of the certification would be a gradual process involving other requirements such as processing and exporting the produce to high-end markets, where GlobalGAP Certification is an essential requirement, so that it may sell at a premium price. Furthermore, it was highlighted that the quality of the produce would improve as a result of implementing Good Agricultural Practices. This would also ensure a better price in the domestic market and processors would prefer their produce to prepare value-added products for export to high-end markets where GlobalGAP certified products get preferential treatment.
- Initially, the project bore the cost of certification and was concerned about the partner firms continuing with the GlobalGAP certification even after the completion of the project assistance. The project's concerns included training for partner firms' staff in orchard management, implementation of good agricultural practices and maintenance of records since the services of TFOs would not be a permanent feature. To ensure sustainability, the project created awareness about the potential benefits of GlobalGAP Certification, and trial/commercial shipments were sent to high-end markets as practical examples. A strategy was adopted to keep the partner farms involved in the implementation of all the protocols of GlobalGAP certification for increased capacity, and future sustainability of the program in the absence of TFOs.

### **Establishment of Pack-houses and Processing Lines**

- No formal on-farm pack-house/processing line in Pakistan is followed.
- Indigenous preparation of pack-house equipment.
- Dealing with the local vendors.
- Partner farms responsibilities.
- Timely completion of infrastructure.
- Grader did not work properly.

### **Addressing the Challenges**

- Previously, there were no formal on-farm pack-house facilities available in the producing areas and it was difficult to convince the farm owners to setup pack house facilities. The project Mango team was able to convince the partner farms about the effectiveness of pack-houses.
- Pack-house equipment was prepared indigenously with the aim of keeping the cost of equipment low so that if other producers/exporters are impressed with the process and want to follow the practices, cost of equipment should not be a barrier.
- Dealing with the local vendors was a tough job with regards to timely completion of the task and after sales service. The project team was able to manage the challenge by selecting suitable vendors for smooth sailing.
- It was mutually agreed that the pack-house equipment would be provided by the project and civil-related infrastructure would to be constructed by the partner farms. Timely execution of the task with agreed timelines was a big challenge as equipment can only be installed after completion of the civil -related work. There were certain delays in the completion of structure, sometimes due to unavoidable circumstances for partner farms. The project team was continuously in contact with the partner farms to extend further support for the timely completion of the task.
- Graders provided for automatic/mechanical grading of the produce did not work at the required level and extra labor was employed for manually sorting and grading of produce to prepare the shipments.

### **Market Linkages**

- Preparation of produce to make it acceptable for the high-end international market of Europe was an important aspect. This also involved linking the partner farms with international buyers to export their produce in a successful and financially feasible manner. Partner farms did not have the capacity to enter into such ventures otherwise.
- Due to security concerns prevailing in the country, international buyers were not ready to come to Pakistan in order to monitor the process.

### **Addressing the Challenges**

- In order to create market linkages, annual conferences on mango were arranged.
- A Foreign visit of producers and consultants to Fruit Logistica, Berlin was arranged by the USAID Firms Project.
- For domestic market coverage, partner farms were linked with modern retail chain stores like Metro, Makro, Alfateh, Suburban Fresh Mart and Hyperstar so that premium quality mangos may be supplied directly to these stores by avoiding the traditional *mandi* system.

### **Trial Shipments**

- Previously, mangos were exported to distant markets like Europe through air shipments. Sea shipments were used to be sent to Middle Eastern countries, which include Singapore, Malaysia, and Korea having a shipping period of 7 to 12 days. Hence, sending sea shipments to Europe, where the total time span, from harvest to consumption, ranged from 30 to 35 days, was a big challenge.
- Lack of established protocols for sea shipments of different mango varieties to distant high-end European markets.

- Lack of R&D component to develop protocols for sea shipment requirements of Pakistani mangos.
- Availability of quality packaging material (corrugated crates) for the packing of mangos remained a big problem. Available cartons had issues including lack of strength and absorption capacity and strength.
- Corrugated cartons of mangos were to be placed on the wooden pallets before loading in the container and there was a size mismatch. As a result, cartons were not able to sustain due to the weight of the upper cartons and collapsed.
- Unskilled labor for harvesting, processing and packing of produce resulted in harvest and post-harvest losses.
- Buyers and sellers expressed concerns regarding success of the venture.

**Addressing the Challenges**

- An international expert with relevant experience was hired to help in the successful completion of the task of trial shipment and to develop appropriate procedures.
- Corrugated cartons were imported from the UAE and subsequently got prepared from local vendors. Problems with respect to strength of the cartons kept on appearing and required steps were taken to sort out the issues.
- Labor training sessions on harvesting, processing and packing of produce was arranged in order to ensure the quality of the produce. Keeping in view the concerns of buyers and sellers, regarding success of the venture, all expenses related to shipments were borne by the project.

### 3.6 Project Achievements

**Table 3 Achievements**

Sr. #	Program Component	Geographical Outreach	Achievement (as of Dec 31, 2012) (outputs)	Economic Impact (outcomes)
1	Training & Workforce Development	Punjab & Sindh	103 trainings on Mango held. More than 3500 beneficiaries from 1500 plus farms trained.	27 mango farms achieved GlobalGAP certification.  More than 1500 firms from the mango sector have received trainings for workforce development (approximately 3518 participants including growers, extension workers, and exporters) in pre- and post-harvest orchard management and export market readiness.
2	Global Good Agricultural Practices (GlobalGAP) Export Standards/Certification	Punjab & Sindh	27 Farms received GlobalGAP certifications	4,000-plus acres of flood-affected mango orchards have been rehabilitated.
3	On-Farm Infrastructure Support	Punjab & Sindh	15 operational pack-house facilities	15 targeted mango farms have already completed mango pack house facilities, generating approximately 580 new jobs and additional sales of USD 4.35 million (including 4,000 plus tons of exports to the Gulf, US, and EU).
4	Export Promotion	Australia Germany, Netherlands, UAE, & USA,	13 Trial Shipments 4 Commercial Shipments 3 International Trade Fair Participations 1 Study Tour	Interventions in the mango sector have mobilized over USD 6 million worth of private sector investment.  3,000 plus jobs have been created (as of December 2012) in the various value chains supported by the project.

### 3.7 USAID Firms Mango Project at a Glance

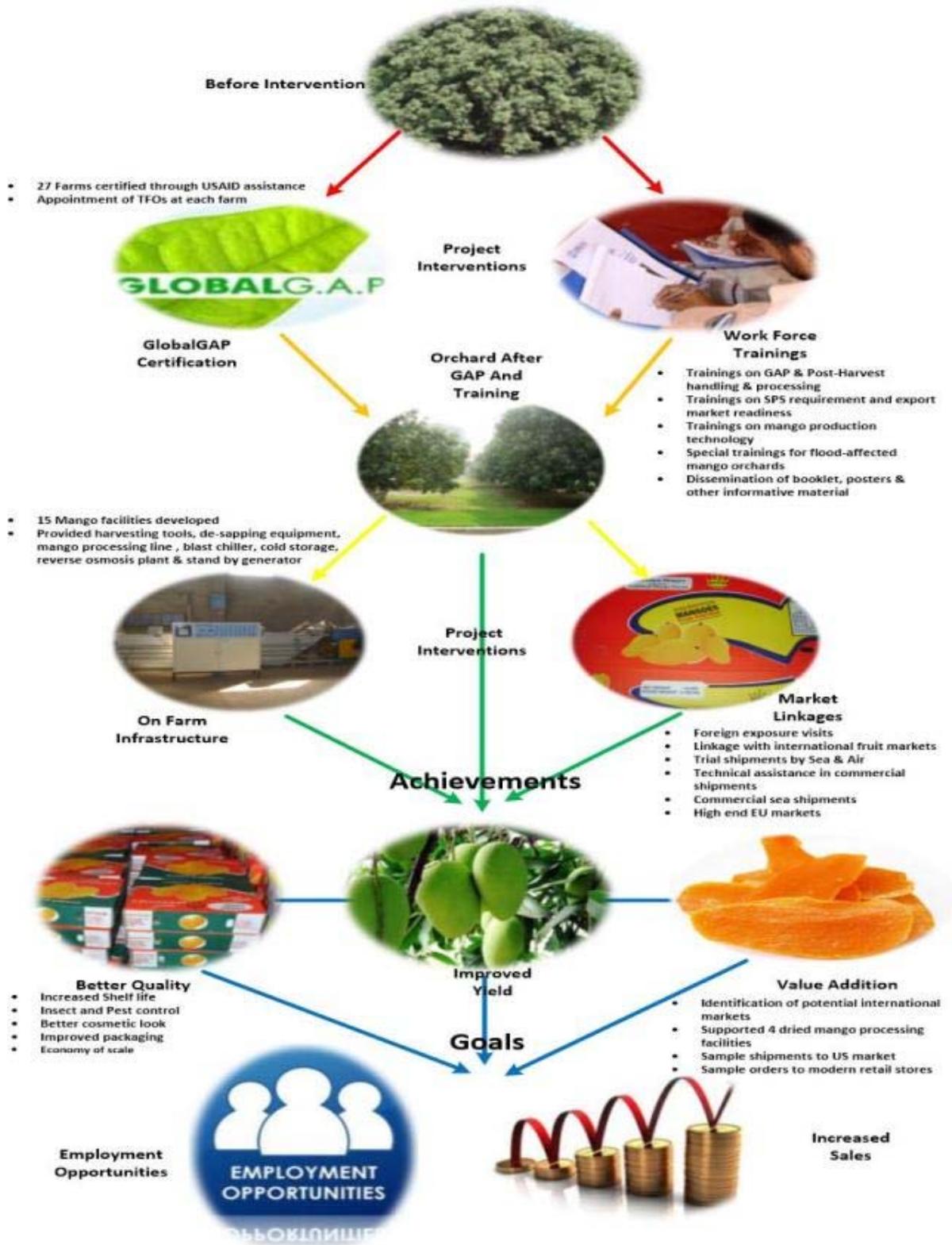


Figure 12 Summary

# 4. Distribution of Economic Gains across the Value Chain by Various Players

## 4.1 Price Structure and Cost Drivers

For the elaboration of each actor level profitability analysis, the data was collected from five partner farms (different farm sizes and experiences) located in the Punjab and Sindh provinces of Pakistan; each actor involved in mango value chain was also interviewed. In order to ensure the effectiveness of the interviews, questionnaires comprising of key questions were prepared before the start of the study. Both team members used the same template to collect data about the financial performance of implementation and management of the farms, and the corresponding economic outputs and related actors involved in the mango value chain.

During field visits it was reported that most of the farmers still do not manage their mango farms optimally and hence obtained low average yields and returns. It is a norm that majority of the farmers prefer to sell their farms to pre-harvest contractors in order to get instant cash returns. Consequently, pre-harvest contractors only focus on the production, do not manage the farms properly and are also not prepared to adopt GAP. However, the implementing partners have realized they can get better financial benefits by adopting good agriculture practices and self-marketing of their produce. Majority of the partner farms' owners have been investing more on their farms and are confident that they will get a good batch from the modern farming techniques.

Differences between prices of two market levels are called marketing margins and are commonly used to examine the differences between the producer and consumer prices for the same quantity of a commodity. Marketing margins represent the price charged by market intermediaries for the services provided, including buying, packing, transportation, storage, and processing. Under competitive market conditions, market margins are the result of the demand for marketing services and are equal to the minimum cost of services provided plus normal profit. Normally such type of analysis is conducted during mango season when the actual trade of mango is in progress so that required information could be obtained at the point of transaction/activity.

Keeping in view the requirement of the study, full efforts were made to obtain the information in a realistic manner which was also cross-checked from different available sources. Even during the season it is very difficult to come up with a unique solution for the price to be used. There are many complications in formulating standard prices, which can be summarized as: (a) day-to-day variation in prices, (b) varietal differences, (c) grade differences, (d) price variation over the season, (e) basis for averaging the various grades and varieties, and (f) price differences in consumption and production areas. Furthermore, all the actors in the value chain were visited in the producing areas and in different markets of Punjab and Sindh. Information regarding purchase and sale prices, costs, and services/activities were obtained at each actor level of the value chain. Price and quantity of a pack keeps on changing on a daily basis and from market to market which are influenced by many factors - supply and demand being the most important one. More emphasis was given on obtaining the information regarding price structure and cost drivers to reach a logical conclusion to estimate the costs and margins of the intermediaries in

percentage terms which could be applied, irrespective of price of the commodity, at any point in time to evaluate the situation. The price of mango was collected on the basis of a crate weighing 10 KG as most of the marketing cost operations are based as per the crate. The per KG price and costs were calculated to estimate the margins, since retail selling is normally done on this basis. In order to estimate the sale price of produce, the recovery ratio of different grades of harvested produce, as presented in the tables above was considered to be the basis of representative information. The information collected was cross-checked from different actors of value chain as the selling price of one intermediary is the buying price of the other and within market different intermediaries knows the nature of operations, their costs and normal range of margins.

**Table 4 Profit-Cost Analysis**

		PKR/Kg	%
<b>Retailer</b>	Average Selling Price	63.75	
	Average Buying Price	39.50	62%
	<b>Gross Profit</b>	<b>24.25</b>	<b>38%</b>
	Other Costs	8.30	13%
	<b>Net Profit</b>	<b>15.95</b>	<b>25%</b>
<b>Wholesaler</b>	Average Selling Price	39.50	
	Average Buying Price	34.50	87%
	<b>Gross Profit</b>	<b>5.00</b>	<b>13%</b>
	Other Costs	2.50	6%
	<b>Net Profit</b>	<b>2.50</b>	<b>6%</b>
<b>Commission Agent</b>	Commission Earned	3.76	
	<b>Gross Profit</b>	<b>3.76</b>	<b>100%</b>
	Other Costs	1.88	50%
	<b>Net Profit</b>	<b>1.88</b>	<b>50%</b>
<b>Transporter</b>	Truck Rent	2.50	
	<b>Gross Profit</b>	<b>2.50</b>	<b>100%</b>
	Other Costs	1.35	54%
	<b>Net Profit</b>	<b>1.15</b>	<b>46%</b>
<b>Mango Grower</b>	Average Selling Price	34.50	
	<b>Average Cost</b>		
	Production Cost	8.04	55%
	Harvesting Cost	2.00	14%
	Packaging	4.60	31%
		<b>14.64</b>	<b>100%</b>
	<b>Gross Profit</b>	<b>19.86</b>	<b>58%</b>
	<b>Other Costs</b>		
	Transportation	2.50	43%
	Commission & other charges	3.31	57%
	<b>5.81</b>	<b>100%</b>	
<b>Net Profit</b>	<b>14.06</b>	<b>41%</b>	

The table above elaborates the profit margins and costs at each actor level involved in the mango value chain. In addition, a breakdown of all the costs incurred by each intermediary has also been presented. Total cost of each intermediary was deducted from the gross margin to reach the net profit margin. The production, harvesting and packing costs of mango producer were estimated at PKR 8.04, 2.00 and 4.60 per KG resulting in a total of PKR 14.64 per KG. On deduction of these costs from the average selling price of rupees 34.50, producer received PKR 19.68 as gross profit and when transportation cost and commission and other charges were deducted from gross profit, producer received PKR 14.06 as net profit. Similarly, the transporter

received PKR 2.50 and PKR 1.35 as gross margin and net profit respectively, and the commission agent received PKR 3.76 and PKR 1.88 as gross and net profit respectively. The wholesaler and retailer received PKR 5 and PKR 24.25 per KG as gross profit and PKR 2.50 and 15.95 per KG as net profit respectively. Detail of all the costs has been shown in the below table. In case the producer sells the orchard and PHC enters the chain, the return previously received by the producer, by selling the produce directly in the wholesale market, is shared by the two. In this case, the producer gets a gross margin of PKR 18 per KG and PHC receives PKR 16.50 as gross margin.

**Table 5 Price Structure & Cost Drivers (Sea and Air)**

PRICE STRUCTURE AND COST DRIVERS - SEA SHIPMENT				PRICE STRUCTURE AND COST DRIVERS - AIR SHIPMENT			
		PKR/Kg	%			PKR/Kg	%
<b>Exporter</b>	Average Selling Price	150.00		<b>Exporter</b>	Average Selling Price	279.00	
	Average Buying Price	40.50	27%		Average Buying Price	40.50	15%
	<b>Gross Profit</b>	<b>109.50</b>	<b>73%</b>		<b>Gross Profit</b>	<b>238.50</b>	<b>85%</b>
	<b>Other Costs</b>				<b>Other Costs</b>		
	Packaging	16.75	36%		Packaging	15.00	8%
	Freight Forwarding & Clearing	1.00	2%		Freight Forwarding & Clearing	1.25	1%
	Pallet and other charges	2.20	5%		Pallet and other charges	1.70	1%
	Labour charges	2.00	4%		Labour charges	2.00	1%
	Inland Transportation	3.12	7%		Inland Transportation	1.90	1%
	Sea Freight charges	21.43	46%		Air Freight charges	161.00	88%
	<b>46.50</b>	<b>100%</b>		<b>182.85</b>	<b>100%</b>		
<b>Net Profit</b>	<b>63.00</b>	<b>42%</b>	<b>Net Profit</b>	<b>55.65</b>	<b>20%</b>		
<b>Transporter</b>	Inland Transportation	3.12		<b>Transporter</b>	Inland Transportation	1.90	
	<b>Gross Profit</b>	<b>3.12</b>	<b>100%</b>		<b>Gross Profit</b>	<b>1.90</b>	<b>100%</b>
	Other Costs	1.68	54%		Other Costs	1.03	54%
	<b>Net Profit</b>	<b>1.44</b>	<b>46%</b>		<b>Net Profit</b>	<b>0.87</b>	<b>46%</b>
<b>Mango Grower</b>	Average Selling Price	40.50		<b>Mango Grower</b>	Average Selling Price	40.50	
	<b>Average Cost</b>				<b>Average Cost</b>		
	Production Cost	8.04	50%		Production Cost	8.04	50%
	Harvesting Cost	2.00	12%		Harvesting Cost	2.00	12%
	Processing Cost	6.00	37%		Processing Cost	6.00	37%
		<b>16.04</b>	<b>100%</b>			<b>16.04</b>	<b>100%</b>
	<b>Gross Profit</b>	<b>24.46</b>	<b>60%</b>		<b>Gross Profit</b>	<b>24.46</b>	<b>60%</b>
	Other Costs	0.50			Other Costs	0.50	
<b>Net Profit</b>	<b>23.96</b>	<b>59%</b>	<b>Net Profit</b>	<b>23.96</b>	<b>59%</b>		

In case of supply channel of traditional mango to the international market, two scenarios have been developed i.e. export of mangos by air and sea shipments.

A major part of the produce is marketed in the domestic market and only 4.66 percent (2010 data) is exported to different countries. The major export markets include Middle East, particularly the UAE and UK. Other export markets are emerging in the EU, Far East, SE Asia and Eastern Europe. Due to the extreme perishable nature of the fruit, air shipments are a common mode of transport to distant markets while sea shipments are sent to nearby markets where the total cruising time ranges between 10 and 12 days. The USAID Firms Project has made an effort to send sea shipments to high-end European markets and some trial and commercial shipments were sent successfully during 2011 and 2012. Sindhri variety proved to

be the most suitable for sea shipment while S.B. Chaunsa and White Chaunsa also have a similar potential provided the protocols and parameters are further refined. Sea shipments are the cheapest way of transporting fruit to distant markets and it increases the competitiveness of Pakistani mangos in these markets, providing more incentives to the exporters. Although the fruit, for export purpose, is procured by the exporters through different supply channels in the country but in the present case direct purchase of mangos, by exporters from the farmers, has been studied. The above table elaborates the prices and all the costs incurred by the producer and exporter at different points of movement of the produce. Total costs have been deducted from the sale price to reach the net profit margin. At the producer level, production, harvesting and processing costs have been estimated to be PKR 8.04, 2.00 and 6.00 per KG respectively. After deducting these costs from the average selling price of PKR 40.50 the producer received PKR 23.96 per KG as gross profit and after deduction of other costs of PKR 0.50 the producer received a net profit of PKR 23.96 per KG; this is valid for both air and sea shipments.

In case of sea shipments the exporter paid a purchase price of PKR 40.50 per KG and after deduction of this purchase price from its sale price of PKR 150, the exporter received a gross margin of PKR 109.50 per KG. The exporter also incurred other costs of packaging, freight forwarding and clearing, pallet charges, labor charges, inland transportation and sea freight charges amounting to PKR 16.75, 1.00, 2.20, 2.00, 3.12 and 21.43 respectively. When these costs were deducted from the gross profit, the exporter received a net profit of PKR 63 per KG.

In case of air shipment the purchase price of exporter was the same i.e., PKR 40.50 per KG, as in case of sea shipment, while the sale price was PKR 279 per KG (10.5 Euros per four KG box-10.5 Euros per five KG boxes) which results in a gross margin of PKR 238.50 for the exporter. This sale price does not remain fixed throughout the season; when there is less supply, the price remains high and air shipments are feasible. With the season changing, the market price starts declining due to increased supply and as the sea shipments start arriving, the market price further declines. During air shipments the cost drivers are almost the same with a small variation in amounts. The major difference between air and sea shipments is of freight charges which are PKR 21.43 per KG in case of sea shipment and PKR 161 per KG in case of air shipment. Other costs have been estimated to be PKR 182.85 per KG, resulting in a net profit of PKR 55.65 per KG for the exporter. The price of the produce and cost drivers are under the influence of many factors and keep on changing. These margins have been calculated on the basis of information collected during the study and are subject to change depending on various cost drivers or the price of the produce.

## 4.2 Distribution Margins

The tables below represent five important supply channels, the price structure (the way how each actor and for each actor, each cost contributes to the final price) and the cost drivers (the kinds of costs that contribute more to the increasing of the final price, actor after actor)

The tables below explain the typical domestic supply chain scenario: Distribution Margin (DM) increases at each actor level and the ultimate price reached at optimum value passes through different channels of the mango value chain. In this regard, two scenarios have been built i.e. structure of supply chain in case of self-marketing and farm sold to pre-harvest contractor. In case of self-marketing, the absolute cash margin of producer was calculated on the basis of sale price of one KG of produce in the wholesale market. If the farm is sold to the PHC the absolute cash margin of producer was calculated as the sale price of the orchard per KG harvested by the contractor. The Distribution Margin of contractors is calculated by deducting the purchase price, sale price and commission per Kg on its sale value. The Distribution Margin of commission agents is the commission on sale revenue. Similarly the distribution margins of wholesalers and retailers were calculated on the basis of their purchase and sale prices.

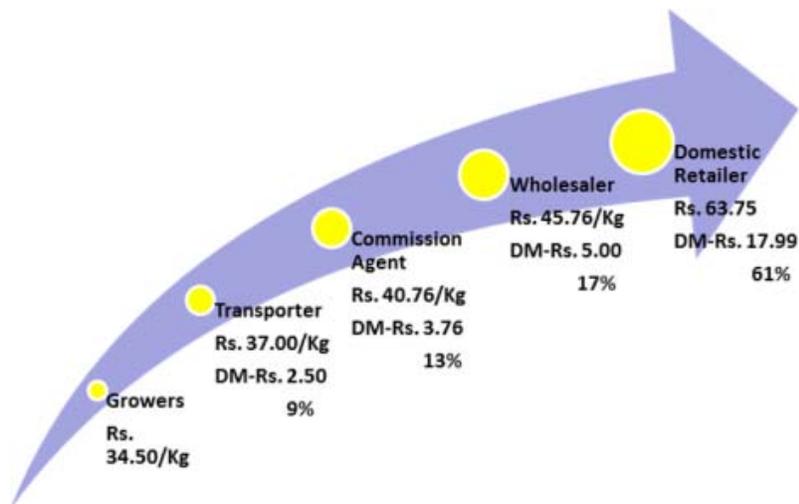


Figure 13 Typical domestic mango supply chain – Self Marketing

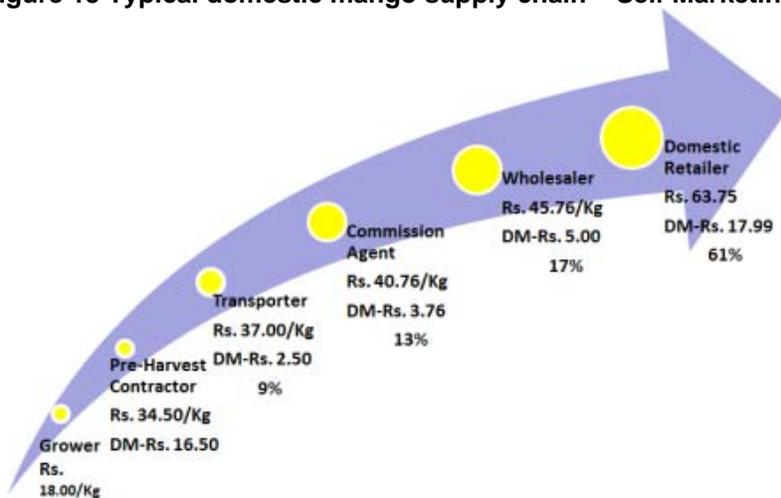


Figure 14 Mango Supply Chain – Farm Sold To Pre-Harvest Contractor

There is a general perception that intermediaries involved in the marketing of agricultural produce take away a major share of the total profit. In order to get a better understanding of the scenario, distribution margins for each market intermediary have been estimated. The distribution margin or price spread is the difference between the price paid and received by each specific market intermediary.

As shown in the tables above, the retailer received a maximum share of 61 percent in the distribution margin while the wholesaler, commission agent and transporter received 17 percent, 13 percent and 9 percent share in the distribution margin respectively. The retailer’s share in the distribution margin is calculated on the assumption that the total produce purchased by him is sold at a given price. However, in reality the retailer is the last owner of the produce and has to bear all kinds of losses, since produce left unsold fetches a much lower price the next day.

In addition, two scenarios have been developed i.e. structure of supply chain in case of exports by air and through sea shipments. The chart below explains the typical export supply chain scenario and how the Distribution Margin (DM) increases at each actor level and the ultimate price reached at optimum value passing through different channels of mango value chain. The chart below explains the typical export supply chain scenario and how the distribution margin

(DM) increases at each actor level. It also explains that how the ultimate price reached at optimum level after passing through different channels of mango value chain.

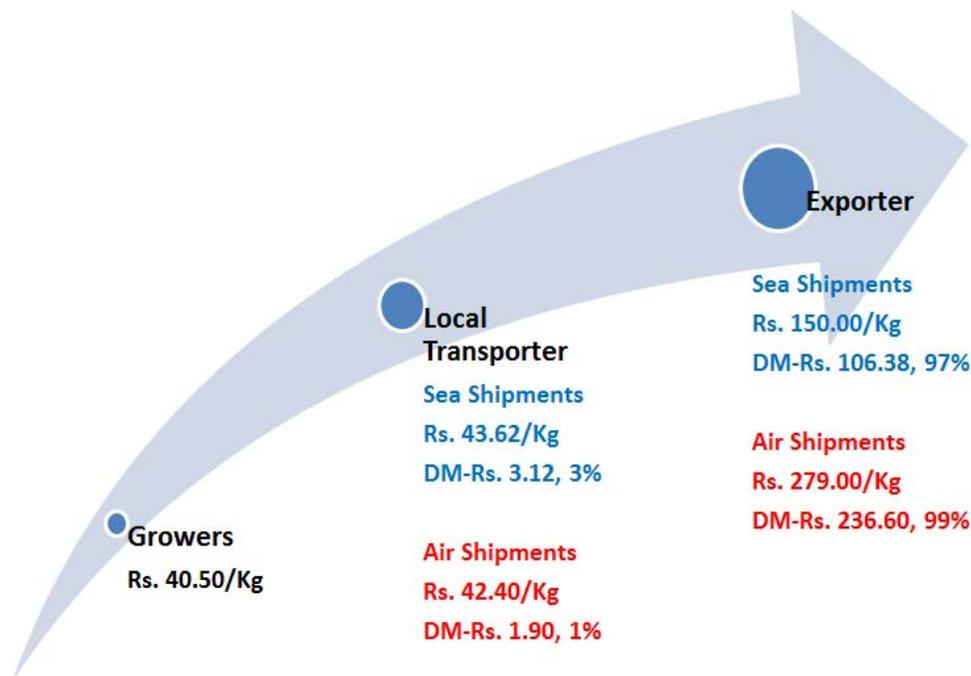


Figure 15 Distribution Margins in Export Supply Chain of Mango

### 4.3 Adoption of Good Agriculture Practices and Profit Margins

Discussions with selected partner farms and other related actors of the mango value chain revealed that farm owners who are following international standards and modern techniques of farm management gain from better profit margins as compared to those who are still managing their farms in a traditional manner. A comparison of returns to the mango producer, self-marketing the produce, with the one selling orchard to the PHC, is given below. The data and figures used in the analysis have been derived from the key questions asked to different actors involved in mango value chain including pre-harvest contractors.

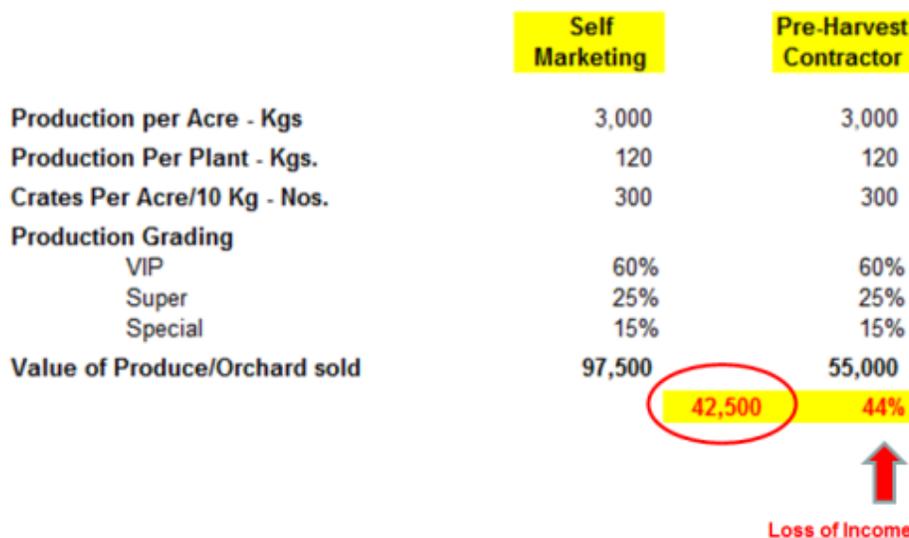
	Progressive Farmer	Average Farmer	Variance	
			PKR/Kgs	%
Production per Acre - Kgs	5,000	3,000	2,000	40%
Production Per Plant - Kgs.	200	120	80	40%
Crates Per Acre/10 Kg - Nos.	500	300	200	40%
<b>Production Grading</b>				
VIP	70%	60%		10%
Super	20%	25%		-5%
Special	10%	15%		-5%
Total Sales per Acre	172,500	97,500	75,000	43%
<b>Farm Management - Per Acre</b>				
Production Cost	40,200	21,500		
Harvesting Cost	10,000	6,000		
Packing	23,000	13,800		
Transportation	12,500	7,500		
Commission & others	16,525	9,375		
	102,225	58,175	44,050	43%
<b>Net Profit to Grower - Per Acre</b>	<b>70,275</b>	<b>39,325</b>	<b>30,950</b>	<b>44%</b>

**Figure 16 Comparison of practices undertaken by Progressive Farmers**

The chart above reflects that better production, proper grading of produce and increased profit margins are the results of good agriculture practices. Adoption of good agriculture practices may lead to an increase in the overall cost of farm management but it leads to high yields, improved quality and better profit margins.

#### 4.4 Analysis of Marketing Strategies

During field visits and interviews with different actors involved in the mango value chain, it was revealed that there are two types of practices commonly used by the farm owners i.e. farm managed, operated and marketed by owner himself and farm sold to re-harvest contractor at either the maturity stage or just after the harvesting season.



**Figure 17 Comparison of Farms managed by Farm owners and Pre-Harvest Contractors**

The chart above indicates that there is a gap in the sales value if the farm is not managed and marketed by the owner. Through self-marketing there is always potential to sell the produce at a premium price by making use of latest marketing techniques and processing lines. On the other hand, pre-harvest contractors only use the traditional way of selling the produce through commission agents.

### 4.5 Economic Gain for Vendors

Cold stores, blast chillers and processing line equipment were provided to the partner farms by the USAID Firms. For the purpose of preparation and supply of required equipment local vendors were identified by the project team and were provided with the necessary details and specifications. Two types of vendors were selected for the purpose, one for the supply of cold stores and blast chillers and the other for complete processing line equipment. Processing line equipment for mango was being prepared indigenously for the first time in the country. Meetings with vendors were conducted to determine the impact of their involvement in the process on their capacity, exposure and employment generation. It was revealed that there is a fair degree of impact in all the three areas as mentioned above.

#### A Case Study Of Processing Line Equipment Supplier

A scientific business concern established in 1988, situated in Faisalabad and having vast experience in manufacturing of instruments and machinery for fruit processing, quality control, research laboratories, hospitals and other different types of industrial use equipment. Mango processing line equipment (Hot Water Treatment) was prepared for the first time by the firm. A visit of the industry was conducted to observe the impact of its involvement in the preparation and supply of processing line equipment on the capacity of firm, employment generation and its exposure to new ideas and products. A detailed description is given below.

**Table 6 Processing Line Equipment**

Sr. No.	Area of Impact	Impact Description
1.	Capacity Enhancement	After the firm’s involvement in the preparation of processing line equipment, now it has developed expertise in the manufacturing of Hot Water Treatment equipment of different durations and capacities, operating at different temperatures, portable as well as continuous conveyer type units. Furthermore, it has also become capable of preparing Vapor Heat Treatment units to meet the demand of multiple

Sr. No.	Area of Impact	Impact Description
		<p>buyers planning to export fresh mangos to the countries where there is a demand for such type of treatment. A representative of Technology International reported that the enhancement in capacity of our company our client list has increased and we are being approached by variety of clients which include different development project people working in value chain of fruits and vegetables, universities, research institutes, farmers and exporters.</p> <p>The firm has become involved in mango processing and successfully prepared a product called Mango Roll Ups for which market tests have been conducted successfully. IFS Certification for the product has also been obtained and Metro Cash &amp; Carry has placed orders for the supply of this product. Machinery for the preparation of this product including pulpers, dryers and other equipment has been manufactured in-house. Large retailers such as Hyperstar and Al-Fateh have also approved the product for placement on their shelves.</p>
2.	Employment Generation	<p>Technology International reported that before the start of this assignment there were about 30 people working on a permanent basis in this unit. During the assignment, 20 additional workers were employed for one year and after the completion of assignment. 10 have been retained as the scale of business has increased.</p>
3.	Exposure	<p>Since the mango processing line equipment was being prepared for the first time, the firm faced many issues during the process, mostly related to the performance of the equipment; for instance mango graders could not work at the required level. A lot of R&amp;D was also conducted by the firm to improve the working of the equipment. It motivated the management of the firm to visit international exhibitions/trade fairs to understand the equipment and acquire necessary first-hand information. A visit to the Fruit Logistica Trade Fair in Berlin was organized for this purpose. Consequently, a Validation Program System for checking, recording and maintaining the temperature of Hot Water Treatment equipment was imported from Japan. It improved the accuracy and reliability of the system.</p>



# 5. Impact of USAID Firms Project’s Mango Program Interventions

## 5.1 Mango Production Trend Analysis

### Mango Production Trend Analysis<sup>9</sup>

	Base Line (2009)	YEAR 2010			YEAR 2011			YEAR 2012		
	Production	Production	Variance		Production	Variance		Production	Variance	
	Tons	Tons	Tons	%	Tons	Tons	%	Tons	Tons	%
All Pakistan Level	1,728,000	1,846,000	118,000	7%	1,888,000	42,000	2%	1,699,000	(189,000)	-10%
	1,728,000	1,846,000	118,000	7%	1,888,000	42,000	2%	1,699,000	(189,000)	-10%
Partner Farms	16,212	16,405	193	1%	18,548	2,144	13%	16,996	(1,552)	-8%

Figure 18 Production Trend Analysis

The USAID Firms Project began its field activities during 2010. Partner farms were selected and field force (Technical Field Officers – TFOs) were employed to provide necessary guidance and facilitate the partner farms in the implementation of good agricultural practices and proper record keeping. Pruning of mango trees was undertaken to bring the plants and orchards in proper shape as per international best practices. Initially, this resulted in less production.

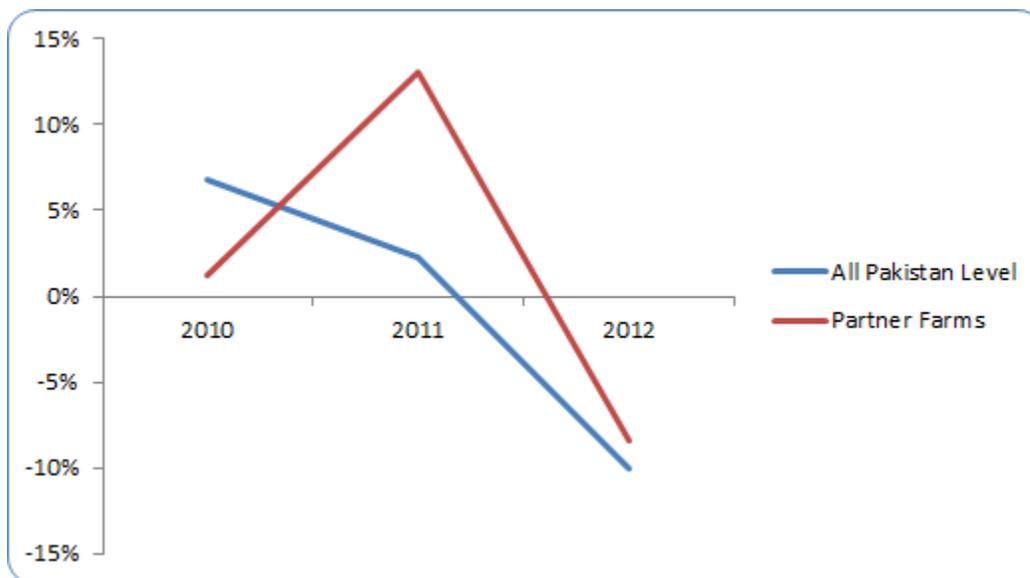


Figure 19 Production Trend

The mango production variance analysis and trend chart above shows that there is an increase in mango production by seven percent in 2010 whereas the increase in production of partner farms is only one percent. During 2011, all Pakistan production increased by five percent while partner farms experienced an increase in production by 13 percent. This is a result of good agricultural practices undertaken by the partner farms. In 2012, there was a dip in production as compared to 2011, due to unfavorable weather conditions at all Pakistan level as well as for

<sup>9</sup>Source: Pakistan Economic Survey 2011-2012

partner farms. The drop in production at all Pakistan level was 10 percent while it was eight percent for partner farms. Again the comparatively lower drop in production at partner farms level was because of adoption of good agricultural practices due to which the impact of unfavorable weather conditions was less.

## 5.2 Employment Generation and Economic Gain across the Value Chain

As the produce moves from its production point to the consumer or to any export market, an economic activity is generated at each stage of the value chain. There are some direct returns associated with the trade of the produce which result in the shape of margins which have been discussed above. In addition, employment is also generated at each step to carry on different activities which result in economic gains for all participating people. An activity-wise analysis and economic gains associated with each activity for domestic market as well as for export via air or sea shipments have been presented in the tables below:

### 5.2.1 Employment Generation – Domestic Market

Man Days Required	Man Days	PKR
Harvesting, packing and loading on truck	50.00	25,000
Preparation of crates	5.00	2,500
Transportation to wholesale market	3.50	1,750
Unloading at wholesale market	5.00	2,500
Auction by Commission Agent	0.50	250
Transportation to wholesaler premises	6.00	3,000
Re-packing and adding ripening material	5.00	2,500
Selling by Wholesaler	2.00	1,000
Transportation to the collection point (Nigrani) by retailer	6.00	3,000
Collection point charges (Nigrani)	4.00	2,000
Transportation to the retail shop	16.67	8,333
Selling by Retailer	4.00	2,000
<b>Total Man Days</b>	<b>107.7</b>	<b>53,833</b>

#### Figure 20 FTE Employment Calculation for Domestic Market - Consignment Size 10 tons

For the purpose of analysis, a quantity of ten tons of produce was considered as the basis of estimation of employment. The reason for making 10 tons of produce as the basis of estimation is that in domestic marketing one truckload carry ten tons of produce or 1,000 crates of 10 KG each. All other activities are undertaken accordingly. For example, 50 persons of harvesting labor work for the whole day to harvest, sort, grade, pack and load 1,000 crates of 10 KG each. For analytical purposes, the labor input was estimated in man days. It means 50 man days are required to complete the above-mentioned activity. Similarly, labor involved in all other activities such as preparation of crates, transportation to wholesale market, unloading, auctioning, carrying to wholesaler's premises, repacking, wholesaling, onward transportation to collection and retailing point and retailing have also been estimated in man days. The table above shows that when 10 tons of produce moves along the value chain, from harvesting to the consumption point, employment equal to 107.7 man days is generated. When these man days are converted into jobs, as per the assumptions made, it becomes equal to 0.41 jobs. This means that 0.41 jobs for a year is created as 10 tons of produce moves along the value chain and it generates an economic gain for all the participants equal to PKR 53,833.

In 2012, a total quantity of 20,316 tons was sold by the partner farms out of which 72 percent (14,641 tons) was sold in the domestic market resulting in creation of 600 jobs across the value chain, from the point of harvesting till retailing, and generating an economic gain worth PKR 108 million for all the participants of the value chain.

### 5.2.2 Employment Generation – Export Market (Air Shipment)

Mango is exported through air or sea shipments. For air shipment quantity of consignment is not fixed. It depends on the requirement of buyer and availability of cargo space. Quality of produce, weight and size of pack and number of pieces in a pack also depends on the requirement of buyer. The process of harvesting and preparation of consignment is started keeping in view the buyers' requirements as explained above. As the total harvested produce is not exported, because it does not meet the requirements of buyer, so a part of produce is selected for the purpose of export and the remaining part is marketed in the domestic market. In the present analysis it has been assumed that 35 percent of harvested produce is selected for export. Harvesting operation of the whole produce is performed by the same labor so 35 percent of the harvesting labor involved is allocated to air shipment for analysis. A lot of care is taken in harvesting and preparing the produce for export as the freight charges are very high and much more than the cost of produce.<sup>10</sup>

FTE Employment Calculation for Air Shipment - Consignment Size 3 tons

Description of Activities	Man Days	PKR
Harvesting, sorting, grading, deshaping and transporting to pack house	23.4	511,725/-
Processing and collecting the produce for initiating ripening	8	4000/-
Cleaning, packing and weighing the produce	4	2000/-
Stamping/coding and strapping	2	1000/-
Inland transportation to airport	3	1500/-
Custom clearing, ANF and Quarantine inspection & loading on the plane	1	500/-
<b>Total</b>	<b>41.45</b>	<b>20,725/-</b>

### 5.2.3 Employment Generation – Export Market (Sea Shipments)

For the purpose of analysis a quantity of three tons is made basis of estimation of employment generation and economic gain across the value chain. Detail of activities performed in the preparation of consignment is given in the table above. It has been estimated that 41.45 man days are required from the point of harvesting up to loading on the plane, for a consignment that weighs three tons which results in the shape of economic gain of PKR 20,725/- to all the participants of the value chain. When 41.45 man days are converted into FTE it becomes 0.16 (employment multiplier per three ton consignment of air shipment). In 2012 out of a total of 5675 tons of mangoes exported by partner farms, 1078 tons (19 percent) were exported through air shipments which result in the shape of 57 FTE employments and an economic gain of PKR 10.35 million to all participants involved in the value chain.

<sup>10</sup>Source: Value Chain Impact Assessment for Mango Sector - 2013

### 5.2.3 Employment Generation – Export Market (Sea Shipments)<sup>11</sup>

FTE Employment Calculation for Sea Shipment - Consignment Size 21 tons

Description of Activities	Man Days	PKR
Harvesting, sorting, grading, desaping, and transporting to pack house	164.15	82,075/-
Processing/HWT, collecting & grading	28	14,000/-
Packing	7	3500/
Weighing	7	3500/-
Stamping/coding and strapping 3500/-	7	
Palletizing	14	7000/-
Loading/shifting to blast chiller and cold store 7000/-	14	
Inland transportation to port	4.5	2250/-
Custom clearing, ANF and Quarantine inspection & loading on the ship	1.5	750/-
<b>Total</b>	<b><u>247.15</u></b>	<b><u>123575/-</u></b>

During sea shipments mango is exported in refrigerated containers or Controlled Atmosphere containers of different capacities. In the present analysis, a consignment of 21 tons was exported through a 40 feet container. Details of activities performed in the preparation of the consignment have been given in the table above. Man days required performing each activity and economic gain associated with the activity as given in the table. In case of air shipments, the quality parameters of produce for sea shipment are also agreed between the exporter and importer. The recovery of produce for export through sea shipment has been assessed to be higher than that for air shipment which has been assumed to be 70 percent of total harvested produce. The remaining 30 percent produce is marketed in the domestic market.

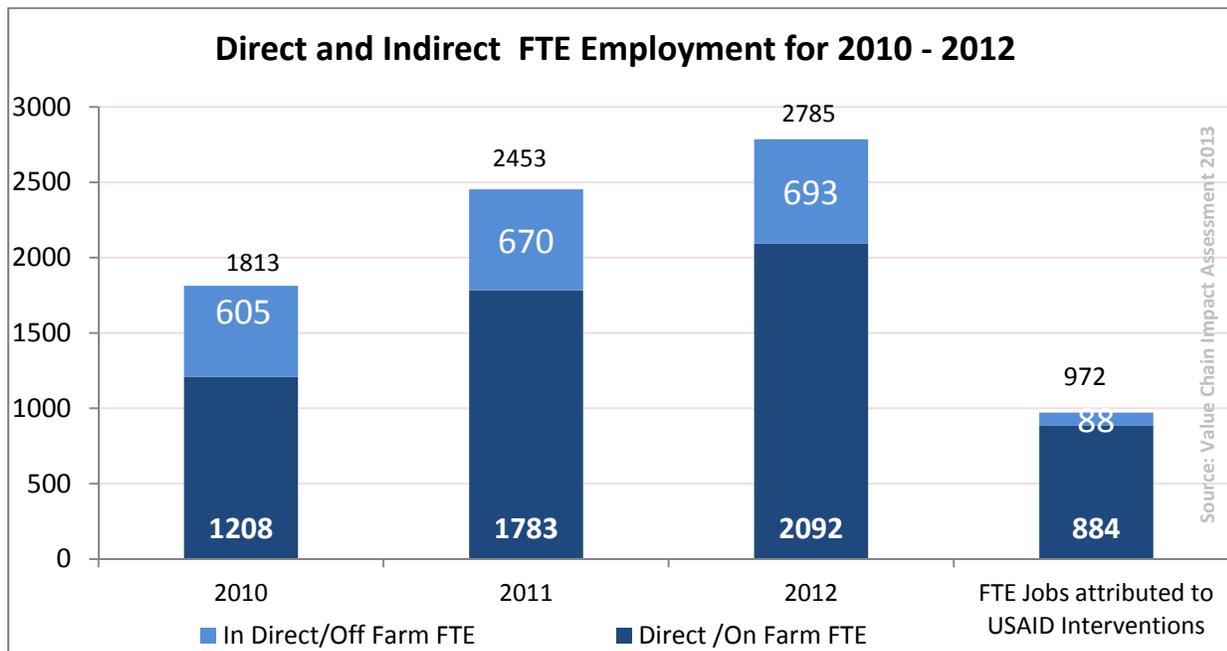
It has been estimated that 247.15 man days are required from the point of harvesting up to loading on the ship for a consignment of 21 tons which results in economic gain of rupees 1,23,575/- for all the participants of value chain. When 247.15 man days are converted into FTE it becomes 0.96 (employment multiplier per 21 ton consignment of sea shipment). In 2012, out of a total of 5675 tons of mangoes exported by partner farms, 4597 tons (81percent) were exported through sea shipments which result in 210 FTE employments and an economic gain of PKR 37.80 million for all participants involved in the value chain.

### 5.2.4 Direct and Indirect FTE Employment for 2010 – 2012

This section deals with the performance of partner farms with respect to creation of FTE employment opportunities covering the period from 2010 to 2012. Employment opportunities have been divided in two categories. The first is direct or on-farm and the other is indirect or off-farm opportunities. Direct or on-farm opportunities involve operations being performed on the farm from the production stage till the produce is sold to the first buyer. Indirect or off-farm opportunities are those which are a result of operations starting from the point of purchase till

<sup>11</sup>Source: Value Chain Impact Assessment for Mango Sector - 2013

the produce is sold to the consumer or up to the export point. A graphical presentation of the situation has been made in the chart below:



**Figure 21 FTE Employment**

In 2010 there were 1813 total FTE employment opportunities at partner farms, 1208 direct or on-farm and 605 indirect or off-farm. These opportunities increased to a total of 2785 in 2012, 2092 on-farm and 693 off-farms as a result of the USAID Firms Project’s interventions. The net increase in on-farm and off-farm employment opportunities has been estimated to be 884 and 69 respectively making a total net increase of 953 FTE jobs which can be attributed to the USAID Firms Project’s interventions.

### 5.3 Mango Sales Data Variance Analysis - 2009-2012

	Base Line (2009)		YEAR 2010			YEAR 2011			YEAR 2012		
	Sales		Sales	Variance	Sales	Variance	Sales	Variance	Sales	Variance	
	US\$		US\$	US\$ %	US\$	US\$ %	US\$	US\$ %	US\$	US\$ %	
Punjab	6,283,313		6,261,902	(21,412)	0%	8,608,344	2,346,442	37%	9,507,018	898,674	10%
Sindh	796,313		702,082	(94,231)	-12%	1,136,025	433,943	62%	2,720,212	1,584,187	139%
	7,079,626		6,963,984	(115,643)	-2%	9,744,369	2,780,386	40%	12,227,230	2,482,861	25%

**Figure 22 Data Variance Analysis**

Sale value is an outcome of quantity sold and price at which the produce is sold. In 2010, the sale value of partner farms dropped by two percent as the project activities were just beginning and the production remained unchanged in 2009. The partner farms in Sindh experienced a drop in sale value (-12 percent) as compared to Punjab partner farms (0 percent) due to the traditional practices implemented. In 2011, the cumulative sale value of all the partner farms increased by 40 percent. Partner farms in Sindh experienced an increase of 62 percent while Punjab partner farms documented an increase of 37 percent. The reason of more contribution in sale value by the Sind partner farms was that there was more room for improvement while the

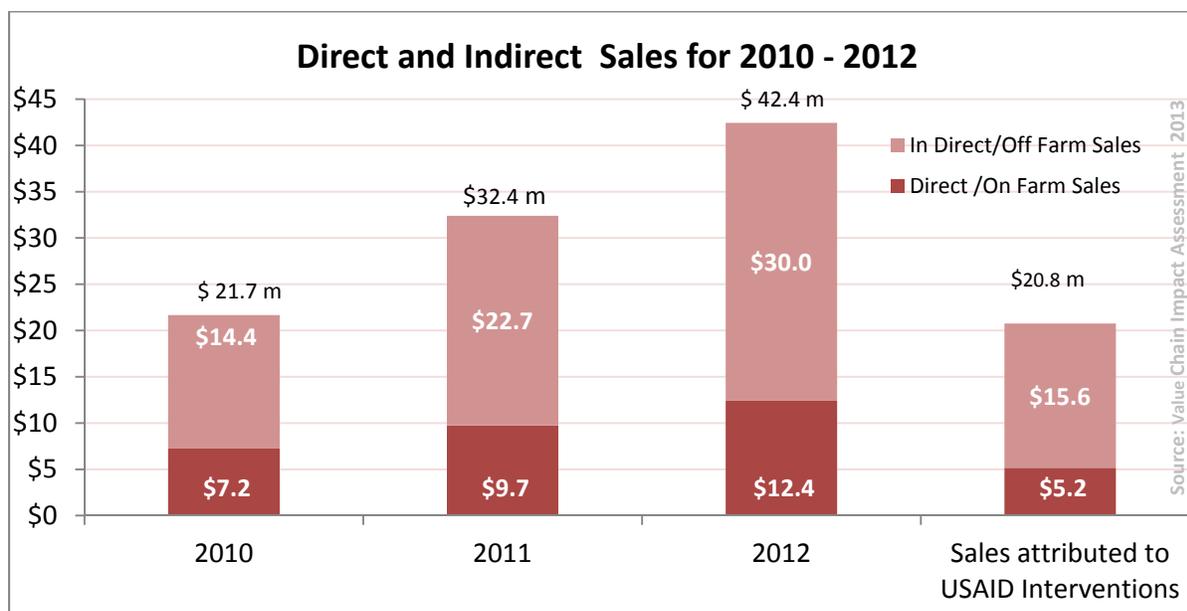
Punjab partner farms were already performing at a somewhat better level. There were two reasons of this increase in sale value in Punjab and Sindh. One was the increase in production by 13 percent in 2011 at all farm level and other was better marketing strategy and diversion of more produce towards export.

In 2012, there was an increase in sale value by 25 percent. The increase in sale value in case of the partner farms in Sindh was higher (139 percent) while 10 percent for partner farms in the Punjab. This increase in sale value appears to be more impressive due to the drop in production by eight percent in 2012 for all partner farms. This was due to an off season effect and unfavorable weather conditions at the time of flowering and fruit setting. Upon review of the sales tracker discussions with the partner farms during field visits, it was revealed that this increase in sale value was due to the following factors:

- Better marketing strategy.
- Improvement in quality fetching a better price in local and export markets.
- Increased volume of exports.
- Obtaining better export prices.
- Direct sale to exporters at reasonably better prices.
- Commercial use of pack house facilities.
- Exporting produce of other farms after processing.
- Corporate marketing of fruit in consumer packs fetching good prices and setting new trends.

**5.3.1 Direct and Indirect Sales for 2010 - 2012**

The section below highlights the performance of partner farms (before and after the USAID Firms Project’s) interventions, between 2010 and 2012. Sales are divided in



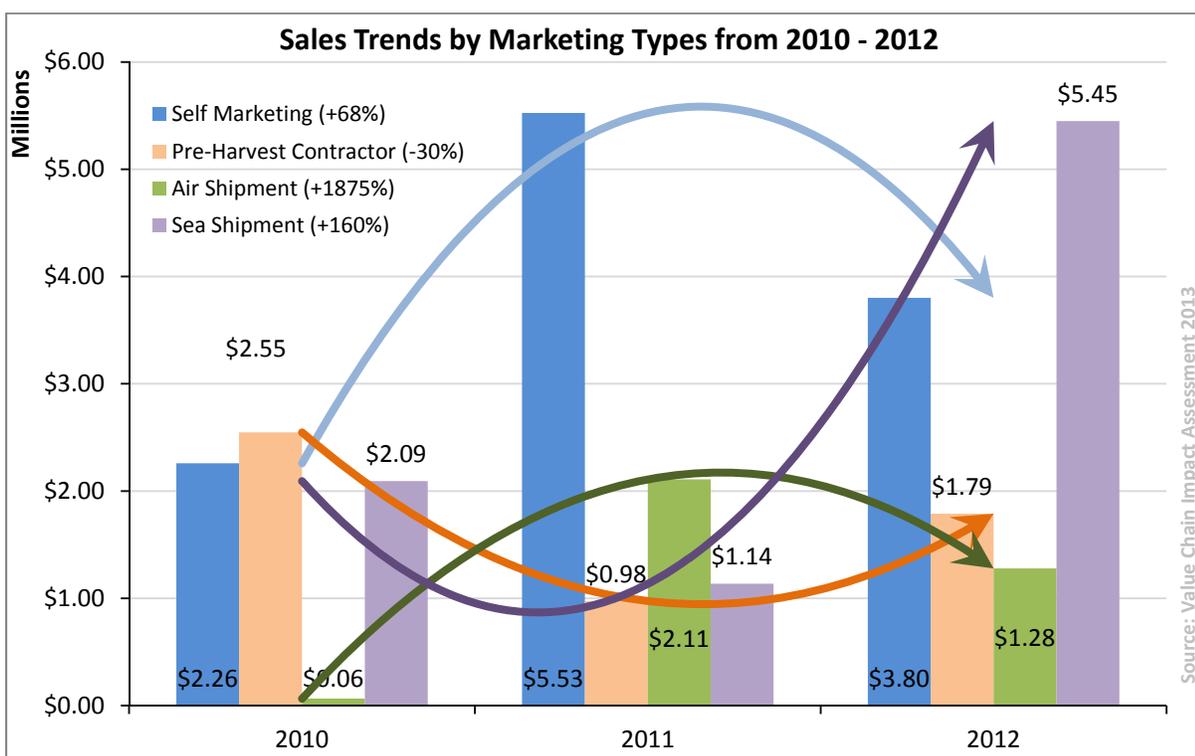
**Figure 23 Direct-Indirect Sales**

two categories – direct or on-farm sales and indirect or off-farm sales. Direct or on-farm sales include total sale value of produce received by the producer at farm gate or at first selling point. As the produce moves along the value chain there is an increment in its sale value till it reaches the consumer in domestic market or is sold to an importer in the destination market. The sale value of produce over and above the sale value of producer is called indirect or off-farm sale. Performance of partner farms in this regard has been shown in the above given chart.

Above graph shows that in 2010 the total sale value of produce was of USD 21.7million out of which direct sales were of USD 7.2million and indirect sales were of USD 14.4m. Against that in 2012 the total sale value of produce was of USD 42.4million with direct sales of USD 12.4million and indirect sales of USD 30 million. It gives a total net increase of USD 20.8m in sales with USD 5.2million direct and USD 15.6million indirect sales in 2012 over and above the sales in 2010 which is the result of Project's interventions at mango partner farms.

### 5.3.2 Sales Trends by Marketing Types from 2010 - 2012

Sales trends demonstrate the way the produce is sold or marketed. It has been observed during the study that there is a visible change in the sales trends during the period 2010 and 2012. Change in sales trends has been shown in the chart below:



**Figure 24 Sales Trend By Marketing**

Trends in the above graph reflect that in 2010 the sale value of produce sold through self marketing was USD 2.26million which increased to USD 3.80million in 2012 reflecting a 68 percent increase over 2010. Similarly, in 2010 value of produce sold to re-harvest Contractor (PHC) were USD 2.55 million which came down to USD 1.79 million in 2012 – a -30 percent decrease. This happened because producers would sell their orchards to the PHC. They were motivated and convinced by the project staff to self market their produce which resulted in higher returns for them.

The change in trend, with respect to exports, shows that in 2010 sale value of exports through air shipments, was USD 0.06 million which increased to USD 1.28 million in 2012 – a 1,875

percent increase, while the sale value of exports through sea shipments in 2010 was USD 2.09 million which increased to USD 5.45 million in 2012 – a 160 percent increase. This increase in direct sales and exports over the period from 2010 to 2012 became possible because of project's interventions.

## 5.4 Projections for sales, production and jobs: 2013-2014

	P R O J E C T I O N S					
	YEAR 2013			YEAR 2014		
	Production Tons	Variance Tons	%	Production Tons	Variance Tons	%
Punjab	13,023	415	3.3%	13,060	37	0.3%
Sindh	4,531	143	3.2%	4,542	11	0.2%
	17,554	558	3.3%	17,602	48	0.3%

Figure 25 Projected Production

An analysis was carried out to measure the impact of the USAID Firms Project's interventions on the production of mangoes. A conservative estimate for the year 2013 shows an increase of 3.2 percent in mango production over 2012. See tables below for data on Sindh and the Punjab partner farms for years 2013 and 2014.

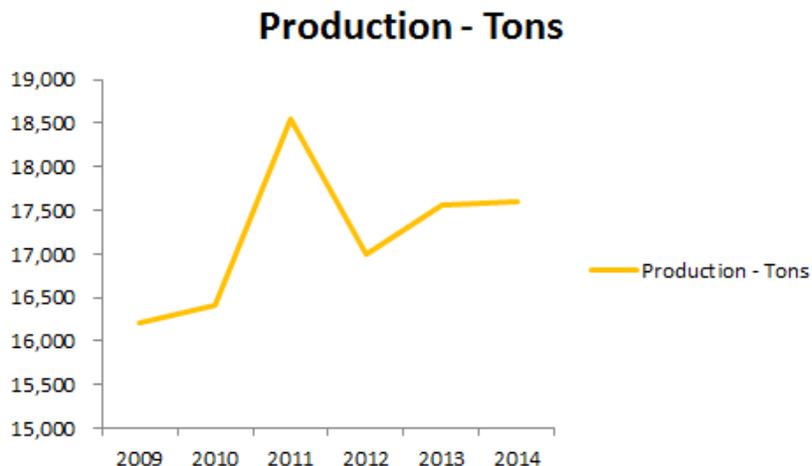
Two variables have been taken into consideration for estimating the growth of production: effect of season on the production and efforts to reduce post-harvest losses. The production of the partner farms will increase by around 558 tons, over their production in 2012. These estimates are again very conservative and suffice the minimum growth expected because of the two variables.

	Y E A R 2 0 1 3									
	Farm Data			On Season Effect		Post-Harvest Losses		Total Increase in Production		Expected Production Tons
	2012 Production Tons	Orchard Area Acres	Post-Harvest Losses Tons	Increase in Production %	Tons	Reduction in Post-Harvest Losses %	Tons	%	Tons	
Punjab Farms	12,608	2,831	744	3%	378	5%	37	3%	415	13,023
Sindh Farms	4,389	1,257	217	3%	132	5%	11	3%	143	4,531
Grand Total	16,996	4,088	961		510		48		558	17,554

Figure 27 Mango Production- Punjab and Sindh Farms

The year 2014 will see a slump in production due to off seasonal effects, but it will be offset by increased reduction in post-harvest losses resulting in a nominal growth of 0.3 percent in the year 2014.

The overall production scenario can be seen from the following trend line chart:



**Figure 28 Production Tons**

An attempt has also been made to assess the increase in sales for the years 2013 and 2014. Only major variables impacting the sales have been taken into consideration. The factors are:

1. Increase in overall production: As already explained above.
2. Use of modern marketing techniques: The partners are expected to use modern techniques for marketing use such as consumer packages for corporate customers, supply of produce to modern retail stores of the country and processing of B grade produce are the main variables that are planned to be used by the partners, thus increasing sales.
3. Increase in exports due to utilization of processing lines, which were not available earlier.
4. Use of Good Agriculture Practices. This will improve the overall quality of produce fetching better prices.

Farm Data		Y E A R 2 0 1 3											Expected Sales US\$
		Production		Marketing		Exports		Selling Rate		Total Increase in Sales			
2012 Production Tons	2012 Sales US\$	Overall Increase in Production %	US\$	Modern Marketing Techniques %	US\$	Increase in Exports %	US\$	Better Quality %	US\$	%	US\$	%	US\$
Punjab Farms	12,608	9,507,018	3%	309,245	1%	95,070	2%	190,140	1%	95,070	7%	689,525	10,196,543
Sindh Farms	4,389	2,720,212	3%	86,999	1%	27,202	2%	54,404	1%	27,202	7%	195,808	2,916,020
<b>Grand Total</b>	<b>16,996</b>	<b>12,227,230</b>		<b>396,244</b>		<b>122,272</b>		<b>244,545</b>		<b>122,272</b>		<b>885,333</b>	<b>13,112,563</b>

**Figure 29 Production of Mangoes - Punjab & Sindh**

As a result of the above stated factors, sales are expected to be increased by USD 0.89 million in 2013 and by USD 0.56 million in 2014 as shown in the table below. The reason for a slight decrease in sales in the year 2014 is due to the seasonal variation factors impacting production.

	P R O J E C T I O N S					
	YEAR 2013			YEAR 2014		
	Sales	Variance		Sales	Variance	
	US\$	US\$	%	US\$	US\$	%
Punjab	10,196,543	689,525	7%	10,630,217	433,674	4%
Sindh	2,916,020	195,808	7%	3,038,451	122,431	4%
	13,112,563	885,333	7%	13,668,668	556,105	4%

Figure 30 Projection

The six years sales trend can also be seen in the chart below:

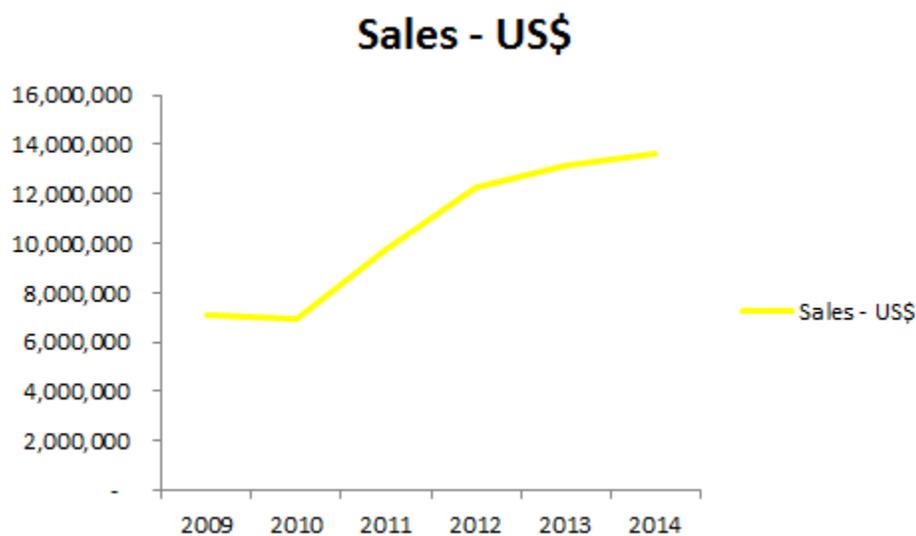


Figure 31 Tentative Future Employment Growth

	Y E A R 2 0 1 3					Expected Employees Nos.
	Farm Data 2012 Employees Nos.	Expected Increase in Production Tons	Production Tons	Expected Increase in Employment		
				Man Days	No. of Jobs	
Punjab Farms	777	415	13,023	83.09	250	1,027
Sindh Farms	396	143	4,531	28.50	87	483
Grand Total	1,173	558	17,554	111.59	338	1,510

Figure 32 Employment Trends

As mentioned in point 5.2 above, for every increase in 10 tons of produce there will be an increase in jobs too. 50 man days will be required for harvesting, packing and loading on truck for 1,000 crates of 10 KG each. Similarly 57.7 man days will be required for labor involved in all other activities like preparation of crates, transportation to wholesale market, unloading, auctioning, carrying to wholesaler's premises, repacking, wholesaling, onward transportation to

collection and retailing point, and retailing. This indicates that when 10 tons of produce moves along the value chain, from harvesting to the consumption point, an employment equal to 107.7 man days is generated.

Considering the above assumptions, it is estimated that employment will be generated as there will be an increase in production. As a result of increased production in 2013, it is expected that 338 more jobs will be generated in 2013 at the farm level and around 389 extra jobs will be generated among the other value chain actors. Similarly, there will be an upward trend in production too.



## 6. Recommendations for Future Improvement

- Outcome of all the shipments, (trial as well as commercial), by partner farms should be shared with the other partners to make them understand the potential benefits associated with export of mangoes.
- Financial benefit analysis of export shipments should be shared with all the partner farms and other beneficiaries.
- International markets should be reached out with a highly focused and professional approach. There must be a considerable pool of international buyers so that exporters learn about different market behaviors and allow the export process to continuously grow as well.
- Market strategy should be developed to provide necessary information and guidelines to partner farms to so that they can market their produce in a profitable manner and as per the requirements of the customer.
- Nearby international markets like Malaysia, Singapore, Bangladesh etc, must also be tapped into, particularly for the export of Chaunsa S.B., due to its large production and associated perishable nature which doesn't allow for sea shipment to long distance destinations.
- Partner farms and other related stakeholders should be provided assistance in preparation of financially viable business plans. In order to have effective results, seminars on business planning and development should be arranged for the beneficiaries.
- Small and cost effective pulping units should be installed in the mango cluster areas to utilize the low grade produce, which is suitable for human consumption but does not earn profitability because of presentation pitfalls.
- Trainings should be conducted for partner farms to enhance their capacity to prepare appropriate marketing strategy independently for successful marketing of all the grades of their produce.
- Availability of graders in the pack houses is necessary to meet the buyer's grading requirement of size, weight, number of pieces in a specific weight, uniformity of a lot, and hence, pack houses should be equipped with graders for accuracy.
- All relevant Government departments may be sensitized to amend the policies with respect to exports of fruits and vegetables of high perishable nature and declare these products as 'priority products'. Thereafter, fruits like Mango will get preferential treatment during forwarding, clearing, customs and handling, and Anti-Narcotics Force surveillance processes and when air cargo space is required.





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