

---

**Policy and Institutional Reforms to Improve Horticultural Markets in Pakistan  
(ADP/2014/043)**

**DRAFT REPORT 02/18**

---

**Draft Report on Mango Farm Survey in Sindh, Pakistan**

**Tehmina Mangan**

Professor

Sindh Agriculture University Tandojam

[t.economist@hotmail.com](mailto:t.economist@hotmail.com)

**Ummul Ruthbah**

Research Fellow

Centre for Development Economics and Sustainability Monash University

[ummul.ruthbah@monash.edu](mailto:ummul.ruthbah@monash.edu)

**Abstract**

Pakistan is the world's fourth largest producer of mangoes, but its share in global trade is much smaller, its exports held back by quality problems related to poor processing. We report here on results of surveys of farmers cultivating mangoes in Sindh. The findings of this study conform with most of the views found in existing literature. Our farmers lack the incentive for proper orchard management and disease control as contractors own the fruits – resulting in poor quality mangoes. This results from the system of divided responsibility in orchard management between the grower and the contractor. In order to reduce cost contractors often do strip harvesting, or hand-picking resulting in sap burn or blemishes on the skin which makes the mango look unattractive. Most often the fruits are not sorted. Fruits are usually transported in wooden boxes, which causes further damage. Our farmers are totally ignorant of any training facility or registration requirements. Most of them are reluctant to change their farming and marketing practices as well. Women's involvement in mango farming is minimal in our sample. The survey reveals that there is demand for information regarding better farm management, training in modern mango growing technology and access to formal credit among farmers and providing them with these facilities can increase productivity and help removing some of the inefficiencies present in this market.

**Keywords**

Horticulture, Mango, Farmers, Inefficiency, Pakistan

©2018 Tehmina Mangan and Ummul Ruthbah

*All rights reserved. This paper is intended for the early dissemination of research outputs in order to elicit comments and discussion only. No part of this paper may be reproduced in any form, or stored in a retrieval system, without the prior written permission of the author.*

## Contents

1	Introduction.....	4
3	Sampling .....	9
4	Findings .....	9
4.1	Household characteristics .....	9
4.2	Mango farming.....	10
4.2.1	Acreage .....	10
4.3	Marketing.....	11
4.3.1	Channels.....	11
4.3.2	Type of contracts.....	12
4.4	Harvesting .....	13
4.4.1	Timing.....	13
4.4.2	Post –harvest activities.....	14
4.5	Knowledge & information .....	14
4.5.1	Source .....	14
4.5.2	Compliance with Government regulation .....	15
4.5.3	Industry knowledge.....	15
4.6	Cost of farming .....	15
4.7	Risk perception and mitigation .....	16
4.8	Suggestions and expectaions.....	16
5	Concluding remarks .....	17
	References.....	17

## List of Tables

Table 1:	District wise mango yield rates (2013-14).....	7
Table 2:	Export of mangoes from Pakistan: Destination .....	8
Table 3:	Sampling distribution.....	9
Table 4:	Household characteristics .....	10
Table 5:	Acreage under mango production (in acre) .....	11
Table 6:	Marketing channel .....	12
Table 7:	Timing and types of Contract (% of farmers).....	12
Table 8:	Main motivation for using a contractor .....	13
Table 9:	Harvesting time and mechanism.....	13
Table 10:	Post harvesting activities (% of farms) .....	14
Table 11:	Source of information (% of farmers).....	14
Table 12:	knowledge regarding registration .....	15
Table 13:	cost of production (PKR/acre) .....	15
Table 14:	Events occurring at least once in the last three years.....	16

## List of Figures

Figure 1: Production of Mango in different provinces of Pakistan (1994-2015).....	5
Figure 2: Acreage under mango production in Pakistan (1994-2015).....	6
Figure 3: Share of Pakistan's mango in the world.....	7
Figure 4: Mango export from Pakistan .....	8

## 1 Introduction

Pakistan is the one of the world's largest horticulture producing countries. In the last decade agricultural sector contributed about one fifth of its GDP and horticulture constituted about 5% of its agriculture. In 2015-16 it produced some 14.1 million tons of fruits, vegetables and condiments on 1.5 million hectares of land (Ministry of National Food Security and Research , 2016), whereas, total area under cultivation was around 23.2 million hectares (Ministry of Finance, 2016). The Government of Pakistan considers investing in horticulture as one of the potential source generating employment opportunities and growth of small producers (World Bank, 2015). However, due to various inefficiency in the process of harvesting, post-harvest handling and marketing coupled with inadequate infrastructure facilities, this sector suffers from huge wastage and is yet to achieve its full potential both in the domestic and international markets.

The project, "Policy and Institutional Reforms to Improve Horticultural Markets in Pakistan", funded by the ACIAR, aimed at identifying the reasons behind market inefficiency in the horticulture sector and making plausible reform recommendations to help Pakistan achieve its potential in the domestic and international horticulture market. The project identified three major horticulture produce – mango, chilli and tomato to achieve these goals. As a part of the first objective of the project - to understand the structure and main features of the existing market system, we conducted several surveys of the growers and supply chain partners – commission agents, wholesalers and retailers/exporters. This paper is based on the survey conducted on the mango farmers in the province of Sindh.

Like the other horticulture products in Pakistan, mango suffers from low productivity, low quality, high wastage and low exports. Fruit quality is generally good but 30 to 40 percent of fruit gets wasted during post-harvest handling. There is a lack of modern storage facility; and postharvest treatment and transport mechanism is almost non-existent. Periodic gluts occur on domestic markets as the markets lack the capacity to store fruit. The export market faces similar challenges. In general, a value oriented supply chain mechanism is absent in the mango market in Pakistan and there are concerns that current returns for growers are unsustainable (Collins, Dunne, Campbell, Jhonson, & Malik, 2006). There are several other impediments in the supply chain management. Most market power is concentrated to commission agents (Mehdi, 2012). Besides, the lack of any direct relationship between growers and processors/exporters make the supply chain protracted.

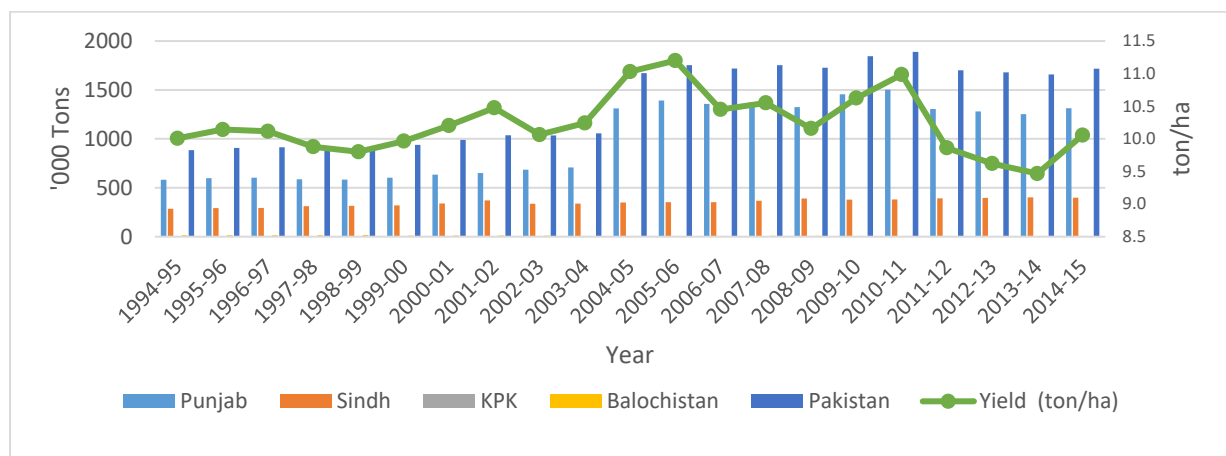
The government of Pakistan and other national and international aid agencies have undertaken several projects to improve the production and marketing of chilli in Pakistan. The ASLP (Australia Pakistan Agricultural Sector Linkage Program) project 2008, introduced better orchard management and harvesting practices by training farmers (Mehdi, 2012). In the second of the ASLP project trained farmers in improved pruning, irrigation, disease control and sanitation practices, such as heat treating mangoes (ACIAR, 2013).

The findings of this study conform with most of the views found in existing literature. Our farmers lack the incentive for proper orchard management and disease control as contractors own the fruits – resulting in poor quality mangoes. This results from the system of divided responsibility in orchard management between the grower and the contractor. In order to reduce cost contractors often do strip harvesting, or hand-picking resulting in sap burn or blemishes on the skin which makes the mango look unattractive. Most often the fruits are not sorted and when they are, sorting is done on ground exposing the fruits to soil borne contamination. Fruits are usually transported in wooden boxes, which causes further damage. Our farmers are totally ignorant of any training facility or registration requirements. Most of them are reluctant to change their farming and marketing practices as well.

The rest of this report is organized as follows. The next section describes the mango production, acreage and markets in Pakistan. Section 3 documents the sampling method adopted for this survey. Section 4 presents the main findings of our survey and finally section 5 makes concluding remarks.

## 2 Mango in Pakistan

Figure 1: Production of Mango in different provinces of Pakistan (1994-2015)

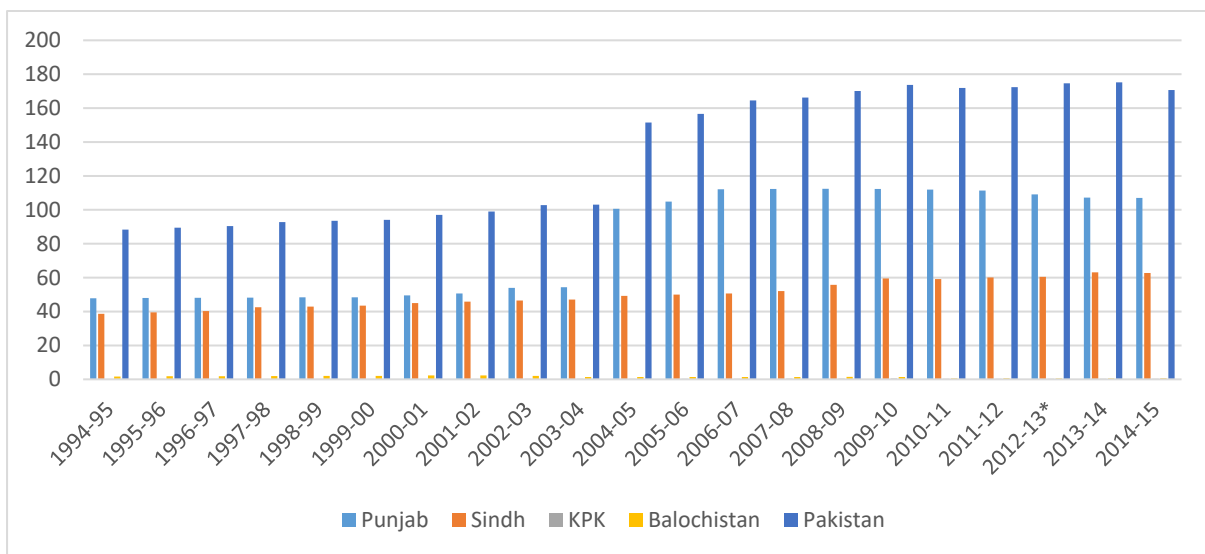


Source: Ministry of Food Security and Research, Provincial Crop Reporting Service Centres.

Mango is the second largest fruit crop in Pakistan following citrus. Pakistan is the fourth largest producer of mangoes in world (The Daily Records, 2017). In 2016 it supplied about 3.5% of the world’s total mango production ( FAO, 2018). Punjab and Sindh together produce about 98% of Pakistan’s total mango. The trend in mango production in different provinces of Pakistan over the last two and half decades is presented in Figure 1.

The acreage under mango production almost doubled over the last two decades from 88.3 thousand hectares in 1994-95 to 170.7 thousand hectares in 2014-15. Punjab accounts for 62% of mango acreage while Sindh accounts for 32%.

Figure 2: Acreage under mango production in Pakistan (1994-2015)



Source: Ministry of Food Security and Research, Provincial Crop Reporting Service Centres.

Even though the area under mango acreage increased monotonically over this period, production as a whole did not. As a result, the yield rate has also been fluctuating, reaching a peak of 11.3 tons/hectare in 2005-06, pluming to 9.5 tons/hectare in 2013-14 and then gradually increased to 10 tons/hectare in 2014-15. Notwithstanding, the average yield rate in Pakistan has been consistently higher than that of the worlds’ in the last two decades and a half as is indicated by Figure - 3. Pakistan’s share in world mango production has been above its share in world mango acreage since 1991.

Within Pakistan, Punjab enjoys the highest yield rate of mango followed by Sindh. Multan, Muzafar Garh and Rahim Yar Khan are the leading mango producing districts in Punjab. In Sindh, the districts of Mir Pur Khas, Sanghar and Tando Allah Yar produce most of the mangoes (Government of Pakistan, 2017). The production, acreage and yields in different districts of Punjab and Sindh are reported in Table -1. In 2013-14, Multan district produced

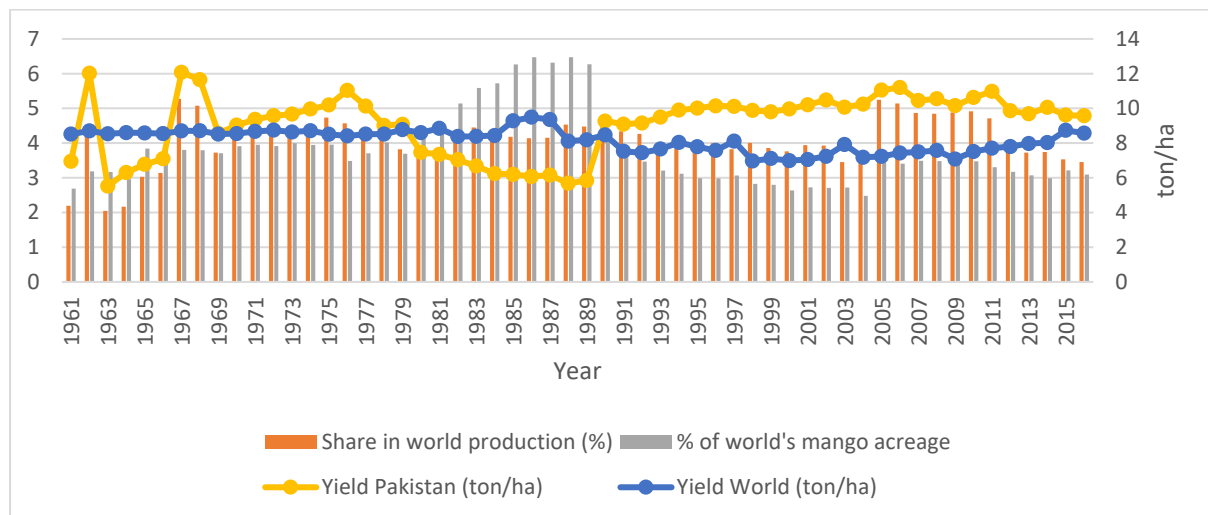
13.6 tonnes/hectare followed by Muzaffar Garh and Rahim Yar Khan with yield rated of 9.5 and 9.3 tons/hectares respectively. In Sindh, Sanghar is most productive district where farmers produced 7.7 tons of mangoes per hectare in 2013-14 (Government of Pakistan, 2014).

Table 1: District wise mango yield rates (2013-14)

District	Production (000 Tonnes)	Area (000 Hectares)	Average Yield (Tonnes/Hectare)
<b>Punjab</b>			
Multan	425.3	31.3	13.61
Muzaffar Garh	232.7	19.0	9.54
Rahim Yar Khan	226.6	24.3	9.29
<b>Sindh</b>			
Mir Pur Khas	79.3	13.2	6.02
Sanghar	60	7.8	7.70
Tando Allahyar	56.3	9.0	6.24
Hyderabad	54.3	7.3	7.44

Source: Govt. of Pakistan 2014, Crop, Area and Production Estimates by Districts 2013-14

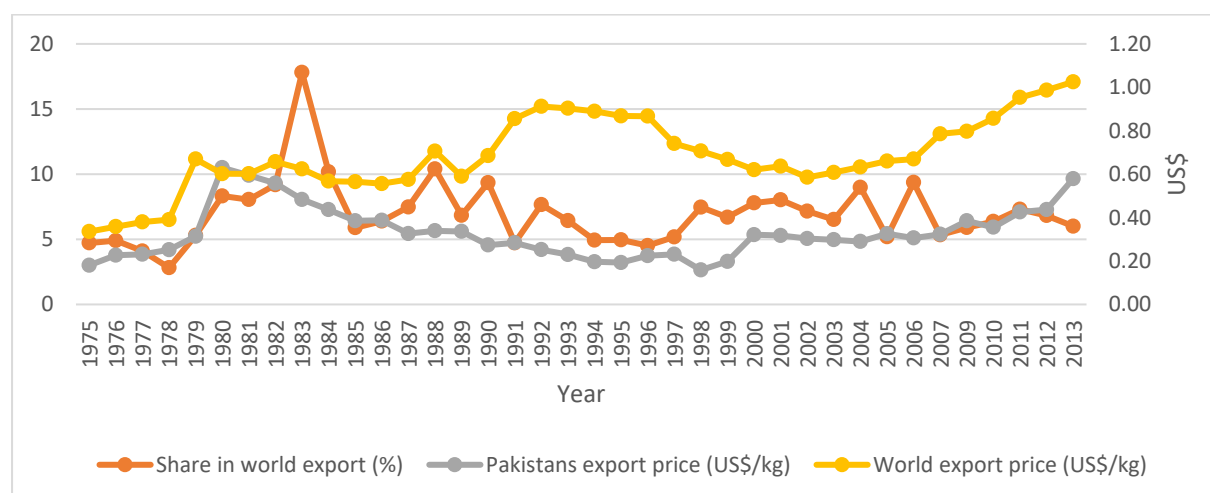
Figure 3: Share of Pakistan’s mango in the world



Source: FAOSTAT

In 2016 the size of world’s mango export market was USD 2.3 billion and Pakistan’s share in that was only 42.7 million (Internation Trade Centre, 2018). It seems that Pakistan’s share in the world market has declined since 2013. In 2013, Pakistan exported USD 57.2 million worth of mangoes while the size of the world market was USD 1.7 billion. The price of Pakistani mango in the world market has also been low (40%) compared to world’s average mango export price (FAO, 2018)

Figure 4: Mango export from Pakistan



Source: FAOSTAT. Note: The price of export are calculated from the quantity of export and value of export.

Pakistan's mango export market is highly concentrated in the Middle East (Government of Pakistan, 2015). In 2014 -15, 57% of total mango export was to UAE followed by Oman, United Kingdom and Saudi Arabia (Table 2).

Table 2: Export of mangoes from Pakistan: Destination

Country	Export Quantity (000 Tonnes)	Percentage Share	Export Value (Million Rs.)	Average Value (Rs./Kg)
United Arab Emirates	37.22	57.00	2114.50	56.81
Oman	6.26	9.58	365.50	58.36
United Kingdom	6.20	9.49	685.60	110.53
Saudi Arabia	4.67	7.16	436.00	93.35
Afghanistan	2.39	3.67	95.70	40.04
Qatar	1.21	1.85	131.31	108.30
Germany	1.06	1.63	138.60	130.17
<b>Total Exports</b>	<b>65.31</b>		<b>4627.00</b>	

Source: Government of Pakistan 2015; Fruit, Vegetable and Condiments Statistics of Pakistan

Farmers usually sell the orchards to contractors at the flowering stage. The main reasons are risk aversion (price fluctuations, quality and seasonality), lack of marketing knowledge. Contracts are usually for one to three years: The contractors are responsible for plucking packaging and bring the fruits to the *mandi*. This process leads to a conflict of interest between the contractor and the grower. On one hand, the contractor cares about the quality of fruit, not about sustainable orchard management and fruit quality (unless the contract is for a longer term). On the other hand, the farmer also has no incentive to engage in better orchard management practices or in fruit quality. This situation naturally results in sub-optimal quality and quantity of fruits in the long-run.



The commission agents act as middle-men between contractors and wholesalers. Sometimes they are also the contractors. When they are not the contractors, they provide loans to the contractors to make advances on the orchards. Wholesalers usually sell the fruits to retailers, exporters or processors.

### 3 Sampling

The sampling followed a multistage clustering method. From a list of mango producing districts (clusters) in Sindh two we selected randomly. They are Hyderabad and Tando Allahyar. From each district four villages were selected. Table 3 presents the sampling distribution. We selected 20 farmers from each of the sample villages. As a whole 44.4% of our sample farmers are small – own less than 12.5 acres of land, 35.6% are medium – own more than 12.5 but less than 25 acres of land and the rests are large famers owning more than 25 acres of land. This distribution is similar to the one found in another study conducted in Punjab under the same project (Ghafoor, Adeel, & Maqbool, 2018).

*Table 3: Sampling distribution*

Village:	Small farm	Medium farm	Large farm	Total
Ahmed Kaleri	13 65%	5 25%	2 10%	20 100%
Hosri	10 50%	9 45%	1 5%	20 100%
Jam Samoo	7 35%	7 35%	6 30%	20 100%
Mithu Khan Mirjat	8 40%	9 45%	3 15%	20 100%
Muhammad Khan Thebo	7 35%	6 30%	7 35%	20 100%
Noor Muhammad Baloch	6 30%	6 30%	8 40%	20 100%
Tajpur	9 45%	7 35%	4 20%	20 100%
Tando Qaisar	11 55%	8 40%	1 5%	20 100%
Total	71 44.38%	57 35.63%	32 20%	160 100%

## 4 Findings

### 4.1 Household characteristics

All the households in our sample live in their respective villages for at least 28 years. For 91.8% of them, their ancestors also lived in the same villages. 68% are involved in farming

since their ancestors and 63.5% of households inherited the business of mango farming. Only a small fraction of the households has been in farming for less than two decades. Farming is the primary source of income for 98.7% of these households.

The average family size in these villages is 8.4<sup>1</sup>. The family size declines with farm size and the large farm households have (statistically) significantly lower household size compared to the small and medium farms. There are also some variations in household size by villages and by districts, and the difference in the number of household members in Hyderabad and Tando Allahyar is statistically significant.

Table 4: Household characteristics

	Small farm	Medium farm	Large farm	Total	p-value 1	p-value 2	p-value 3
Household size	9.01 (0.34)	8.61 (0.30)	6.88 (0.45)	8.44 (2.71)	0.39	0.00	0.00
Age of the head	50.76 (1.34)	46.49 (1.64)	45.40 (1.48)	48.05 (0.90)	0.03	0.02	0.72
Education of head <sup>2</sup>	8.34 (0.72)	8.56 (0.81)	8.94 (0.77)	8.54 (0.45)	0.84	0.61	0.76
Engaged full time (%)	80.28	78.95	78.13	79.37			

Note: Standard errors are in the parenthesis. P-value 1 compares the means between small and medium farmers, p-value 2 between small and large farmers; and p-value 3 between medium and large farmers.

The average age of the head is 48.1 years. About one fourth of them in the small and medium farms cannot read or write. The respective share for large farms is only 6.3%. On average the heads have 8.5 years of education and there is no statistically significant difference among the small, medium and large farms in terms of education of the head of the household. Most of the household heads are involved in farming (95.7% of the small farms', 100% of the medium farms and 96% of the large farms'). Only 4 of the heads in our sample work either as agricultural wage labour or for the government.

## 4.2 Mango farming

The main varieties of mangoes produced in our sample villages are Shindri, Chausna, Dusehri and Langra. Some other uncommon varieties are Neelam, Sarooli and Anwar Retaul.

### 4.2.1 Acreage

On average farmers produce mango on 56.8% of their cultivable land (% of total land owned). Small famers have 4.7 acres of land under mango orchards, which accounts for 65.6%

<sup>1</sup> According to the 2017 population census the rural household size is 6.8 (Pakistan Bureau of Statistics, 2018)

<sup>2</sup> Madrasa education has been excluded as the years of education is not available for those who attended Madrasa.

of their total arable land. Medium farms produce mangoes on 6.4 acres (55.3% of arable land) and large farmers on 23 acres of land (41% of arable land owned). There is no significant difference in the number of fruit bearing trees per acres between small and medium farms. However, large farms have significantly lower number of trees per acre compared to small and medium farms.

All the farmers in our sample cultivate at least two varieties of mangoes. All of them produce Sindhri variety. 63 of them also cultivate Chausna. Only a fifth of them produce other varieties such as Langra or Dusehri. On average small, medium and large farms produce Sindhri on 3.4, 5.6 and 18.9 acres of land; and Chausna on 1.3, 1.8 and 9 acres of land respectively.

Table 5: Acreage under mango production (in acre)

	Small farm	Medium farm	Large farm	Total	p-value 1	p-value 2	p-value 3
Mango	4.7 (0.34)	6.38 (0.38)	23 (6.29)	8.98 (1.39)	0.00	0.00	0.00
% of arable land	65.56 (4.05)	53.55 (3.48)	41.54 (15.07)	56.83 (3.81)	0.06	0.05	0.26
Trees/acre	32.58 (0.58)	32.82 (0.85)	28.86 (0.81)	32.02 (0.45)	0.81	0.00	0.00
Sindhri	3.43 (0.26)	5.55 (0.32)	18.89 (4.67)	7.31 (1.05)	0.00	0.00	0.00
Chausna	1.25 (0.17)	1.84 (0.21)	9 (3.39)	2.17 (0.43)	0.04	0.00	0.00

Note: Standard errors are in the parenthesis. P-value 1 compares the means between small and medium farmers, p-value 2 between small and large farmers; and p-value 3 between medium and large farmers. The total acreage under Sindhri and Chausna production will not add up to total acreage under mango as some farmers produce more than these two varieties and not all of them produce both of these varieties.

Most of the farmers sell their orchards to the contractors or commission agents before harvesting. Therefore, they were unable to provide any information on the yield rates.

56.3% of the farmers in our sample practice intercropping. They mainly produce Barseem. 52.2% of them are small farmers, 28.9% are medium farmers and the rests are large farmers.

### 4.3 Marketing

#### 4.3.1 Channels

Only 4.8% of our sample farmers (partially) sell the mangoes themselves, 95.2% use pre or post – harvest contractors or commission agents to send the fruits to the wholesale market<sup>3</sup>. 65% of them use only one marketing channel and 75% of the farmers are unaware about the whereabouts of their fruits once they leave the orchards.

<sup>3</sup> We do not have information on marketing channels used by 34 of our sample farmers. However, their response later in the survey imply that they use either pre or post-harvest contractors for marketing their fruits.

Table 6: Marketing channel

	Small farm	Medium farm	Large farm	Total
Self-marketing	5 (8.20)	0 (0.00)	1 (5.56)	6 (4.76)
Pre or post-harvest contractors/CA	56 (81.80)	47 (100.00)	17 (94.44)	120 (95.24)
No knowledge of fruit destination	56 78.87	47 82.46	17 53.13	120 75.00
Used one marketing channel	51 (71.87)	36 (63.16)	17 (53.13)	104 (65.01)

Note: shares of different farm types (%) are provided in the parenthesis.

#### 4.3.2 Type of contracts

Most of the orchards are contracted for at flowering. In our sample 82.9% of the small farmers, 82.5% of the medium farmers and 53.1% of the large farmers contact their orchards at flowering while a fourth of all farmers do so before flowering. The duration and nature of these contracts vary by farm size. Most (78.6%) of these contracts are only for one season, while this share is much larger for medium and large farms. This may reflect the better negotiating ability of medium or large farmers or their lower search cost. In three fourth of these contracts with the small and medium farms the contractor is responsible for overall orchard management. In case of large farmers. Half of the contracts (54.8%) entails the farmers to be in charge of orchard management. As a whole, in 24.2% of the cases, the owner is responsible for groove management and for the rest the contractor only takes care of the trees.

Table 7: Timing and types of Contract (% of farmers)

	Small farm	Medium farm	Large farm	Total
Before flowering	17.14	17.54	46.88	23.27
At flowering	82.86	82.46	53.13	76.73
Duration: 1 year	67.14	89.47	84.38	78.62
Contractor in charge of groove management	77.14	75.76	45.16	66.67
Contract is documented	50.00	31.58	46.88	42.77
Contract documented on stamp <sup>a</sup>	82.86	83.33	66.67	79.41
Contract based on mutual trust <sup>b</sup>	70.83	90.91	76.67	78.95
Criteria for selection of contractor				
Past experience	54.92	42.10	6.25	40.62
Price	4.22	10.52	21.87	10.00
After meeting a few of them	39.43	43.85	65.62	46.25
Payments mechanism				
Payments based on crop condition	71.83	68.42	62.50	68.75
Split payments in cash	97.18	96.49	93.75	96.25
Full advanced payment at signing	0.00	3.51	6.25	2.50

<sup>a</sup>Of those that are documented. <sup>b</sup>Of those that are not documented.

Only 42.8% of these contracts are documented. Of all the documented contracts, 79.4% are on a stamp, while 79% of the undocumented contracts are based on mutual trust. One

probable reason for such a high proportion of undocumented contracts is that the incidence of default on the part of a contractor is very low. Only 15% of the farmers reported that they have previously experienced defaults but not very often.

Farmers sometimes (46.3%) choose the contractor from a pool of contractors only after meeting them. 40% base their decisions on past experience and 10% of the price of the orchard. Only 5% of the farmers select contractors based on their reputation. Farmers rarely get full payments for their orchards during signing of the contracts. Most of them received split cash payments. The incidence of payments in both cash and kind is very low (1.3%) in our sample. In most cases value of the orchard (price) is determined on the basis of the crop condition.

Table 8: Main motivation for using a contractor

	Small farm	Medium farm	Large farm	Total
Convenience	11.26	10.52	0.00	8.75
Profitable	12.68	12.28	0.00	10.00
Always used a contractor	7.04	5.26	0.00	5.00
Motivated by a contractor	77.46	63.15	53.125	67.75

8.8% of farmers reported that they use a contractor because it was convenient. 10% think that using a contractor is more profitable than doing marketing themselves, and 76.8% were motivated by a contractor to use this marketing channel.

#### 4.4 Harvesting

##### 4.4.1 Timing

Harvesting begins in May and continues until June. The contractors use hired labour to do the job. They use lasso to pick the mangoes (76.9%). Almost a quarter of the orchards are harvested by hand

Table 9: Harvesting time and mechanism

	Small farm	Medium farm	Large farm	Total
Harvest in May	100.00	100.00	100.00	100.00
Harvest in June	94.37	98.25	90.62	95.00
Harvested by contractors' labour	80.28	87.72	53.12	77.50
Harvested by neighbouring farmers	8.45	10.53	25.00	12.50
Harvesting method				
By hand	47.89	3.51	31.25	28.75
Lasso	83.10	82.46	53.13	76.88
Ladder	4.23	0.00	3.13	2.50

#### 4.4.2 Post –harvest activities

Mangoes are best transported in plastic crates. Carrying them in wooden crates is responsible for most of the wastages. However, mangoes are transported in wooden boxes from most of the farms (78.8%) in our sample. They are not sorted in many cases. Good mangoes are sorted and transported separately from 34.4% of the farms. Only 3.8% of the farms separate the damaged mangoes. However, farmers do not have any control on sorting or grading the fruits. It depends on the contractors. Only a small amount of mangoes leave the farms immediately after the harvesting. In 28.8% of the farms they remain on the farm for another 24 hours. No information on temperature control or other treatments required to increase the longevity of the fruits were collected.

Table 10: Post harvesting activities (% of farms)

	Small farm	Medium farm	Large farm	Total
<b>Transportation during harvest</b>				
Carried in wooden crates	85.92	82.46	56.25	78.75
Carried in plastic crates	4.23	0.00	3.13	2.50
<b>Sorting/grading</b>				
Good mangoes are separated	39.44	36.09	21.87	34.37
Damaged ones are separated	2.82	5.26	3.11	3.75
Depends on the contractor	47.89	47.37	34.37	45.00
<b>Duration mangoes stay on farm</b>				
Leaves immediately	7.04	0.00	3.13	3.75
24 hours	33.81	35.09	6.25	28.76
Depends on the contractor	47.89	47.37	34.37	45.00

#### 4.5 Knowledge & information

##### 4.5.1 Source

Table 11: Source of information (% of farmers)

	Small farm	Medium farm	Large farm	Total
Radio/TV	26.76	35.09	43.75	33.12
Newspaper	28.17	40.35	43.75	33.62
Mobile text messages	15.49	17.54	46.87	22.50
Trader	8.45	10.53	28.12	13.12
Neighbouring farmer	97.18	100.00	100.00	98.75
Growers' organization/Government official/website	0.00	0.00	0.00	0.00

The main source of market information for farmers are their neighbours. About 33% of the farmers also receive information from Radio/TV and newspaper, while 22.5% use mobile text messaging system. The growers' organization or government official/website are totally ineffective in providing market information, at least, among our sample farmers.

#### 4.5.2 Compliance with Government regulation

Table 12: knowledge regarding registration

	Small farm	Medium farm	Large farm	Total
Nor aware of registration requirement	38.03	45.61	21.87	37.50
Aware but have not registered	49.30	42.11	34.37	43.75
Not aware of market committee (MC)	33.80	45.61	18.75	35.00
Aware of MC but haven't registered	54.93	42.11	37.50	46.87
Not aware of training facility	88.73	87.78	56.25	81.87

The knowledge about registration with the government or market committee as a mango grower is very sparse among the farmers. Only 43% of them know that they are required to register with the government but none of them ever registered. The scenario is similar in case of registration with a market committee.

#### 4.5.3 Industry knowledge

81.9% of the farmers are not aware of any training facility on mango orchard management of marketing. None of the farmers ever undertook any kind of training involving mango. They are not aware of the ASLP (Agriculture Sector Linkage Project) codes of practice. This project (both Phase I and II) has achieved marvelous milestones in the mango growing regions of Punjab and Sindh provinces during the span of 2006 to 2015. This is reflected in the other study conducted in Punjab under this project. About 39% of the sample farmers in that study reported to have benefited from ASLP code of practices (Ghafoor, Adeel, & Maqbool, 2018). However, in our sample in Sindh any knowledge about ASLP codes of practices is totally absent.

#### 4.6 Cost of farming

To establish a new mango orchard, farmers initially incur high costs associated with land preparation, planting material, fertilizer, pesticides, irrigation, sanitation and pest and disease control during the first three years. 141 farmers in our sample developed a new orchard in the past three years. On average, the cost of land preparation was PKR 17191. The cost of seedling varied between PKR50/plant to PKR140/plant depending upon the variety of mango. The average cost of fertilizer was PKR9335.7. The cost of irrigation, weed control and other incidental costs are reported in Table 13.

Table 13: cost of production (PKR/acre)

	Small farm	Medium farm	Large farm	Total
Preparation				
Land	14180.33 (2555.77)	23910.71 (4166.04)	9166.67 (618.74)	17191.49 (2040.64)

Fertilizer	10000 (307.16)	9017.86 (169.97)	8416.67 (420.99)	9335.71 (171.63)
<b>Orchard Maintenance</b>				
Fertilizer	18333.33 (1666.67)	17166.67 (1661.66)	18333.33 (1666.67)	17312.5 (897.76)
Weed control	673.91 (28.96)	556.52 (23.37)	925 (236.60)	661.11 (40.30)
Irrigation	4000 (0.00)	4035.71 (35.71)	00.00	4022.73 (22.72)
Inter-culturing	6545.46 (1370.89)	3833.33 (144.34)	4777.78 (1325.79)	5155.172 (677.81)
Government fees	700	700	700	700

66.7% of our sample farmers lease out their orchards and the contractors are solely responsible for orchard management. Therefore, these farmers do not incur any cost of maintenance. The maintenance costs reported in Table 8 are for farmers who either do their harvesting themselves (do not lease out the orchards) or who share the responsibility of maintaining the orchard under their contracts.

#### 4.7 Risk perception and mitigation

Table 14: Events occurring at least once in the last three years

	Small farm	Medium farm	Large farm	Total
Climate related events	40.84	45.61	34.38	41.26
Pest and disease outbreak	35.21	45.61	31.25	38.13
Poor market price	43.66	42.10	40.63	42.50
High cost of inputs	39.43	42.11	31.26	38.75
Health shock	38.02	31.58	28.13	33.75
Insecurity of tenure	7.04	1.75	12.51	6.26

Mango farmers face several challenges in their farming endeavour. When asked whether any of the events reported in Table 14 occurred at least once in the last three years, 42.5% ranked poor market price as the most severe shock they experienced. 41.3% was affected by bad weather. About 38% suffered from pest and disease outbreak and high input cost, while 33.8% had a health related shock. 94% of those affected by a climate shock and 38.2% of those who experienced poor market price, sought government assistance and 73.1% changed their farming practice in response to pest and disease outbreak. 76% of the farms affected by any kind of health shock diversified their farming activities.

#### 4.8 Suggestions and expectations

Farmers want to increase their profit from mango and they are aware of the fact that better packing and marketing mechanism can help to achieve this goal. According to them,



proper grading (12.5%) and better packaging of the mangoes can result in improved marketing. They also require cheap credit (9.4%) and storage facilities (6.9%). 32.5% think that producing good variety of mangoes (32.5%) can increase profit. The other factors conducive for mango farming are credit (15%) and storage facilities (22.5%).

There are several steps that the mango farmers think the government can take to help them with their marketing. These are – providing training (11.9%), building infrastructure (14.4%) and managing the water problem (38.1%)

## 5 Concluding remarks

Sindh is the second largest mango producing province in Pakistan where, Tando Allahyar and Hyderabad are the third and fourth largest districts in terms of acreage and production (AMIS, n.d.). Average productivity in Sindh (6.4 tons/hectare) is much lower than that in Punjab (11.7 tons/hectare). The farmers in our sample are not involved in the harvesting of the crops as most of the orchards are sold to the contractors on or before flowering, and it is the contractors who organise harvesting. They also seem to be less knowledgeable than farmers surveyed in Punjab (Ghafoor, Adeel, & Maqbool, 2018). None of them is aware of the ASLP codes of practice. None of them had any training on mango farming, harvesting or marketing. Further investigation is required to figure out the reasons behind the farmers' attitudes towards mango farming.

## References

- ACIAR. (2013). *Agriculture Sector Linkages Program Phase II: Mid-term Review*.
- ACIAR. (2013). *Improving market opportunities for mangoes in Pakistan*.
- AMIS. (n.d.). *District-Wise Area and Production of Mango*. Retrieved from AMIS: <http://www.amis.pk/Agristatistics/DistrictWise/2012-2014/Mango.html>
- Collins, R., & Iqbal, M. (2010). Integrated post harvest, marketing and supply chain system for sustainable industry development: the Pakistan mango industry as work in progress. *Acta Horticulture*, 895, 91-107.
- Collins, R., Dunne, T., Campbell, J., Johnson, P., & Malik, A. (2006). *A Constraint Analysis of Mango Supply Chain Improvements in Pakistan*. ACIAR.
- FAO. (2018, March 13). FAOSTAT.
- Ghafoor, A., Adeel, A., & Maqbool, A. (2018). *Draft Report of Mango Farm Survey in Punjab Pakistan*. Project on Policy and Institutional Reforms to Improve Horticulture Markets in Pakistan (ADP 2014/043).
- Government of Pakistan. (2014). *Agricultural Statistics Pakistan 2013-14*. Islamabad: Ministry of National Food Security and Research.

- Government of Pakistan. (2015). *Fruit, Vegetable and Condiment Statistics of Pakistan 2014-15*. Islamabad: Ministry of National Food Security and Research.
- Government of Pakistan. (2017). *Fruit, Vegetables and Condiment Statistics of Pakistan 2014-15*. Islamabad: Ministry of National Food Security and Reserach.
- Internation Trade Centre. (2018, March 13). Trade Map, Trade Statistics for International Business Development.
- Mehdi, M. (2012). *Evaluating the effecitveness of a "whole of chain" approach in rural inducsty development in developing countries: a case study of Pakistan mango industry*. The University of Queensland.
- Ministry of National Food Security and Research . (2016). *Fruits Vegetables and Condiments Statistics of Pakistan 2014-15*. Islamabad: Government of Pakistan.
- Ministry of Finance. (2016). *Pakistan Economic Survey 2015-16*. Government of Pakistan.
- Pakistan Bureau of Statistics. (2018). *Block Wise Porvincial SUmmary Results of 6th Population and Housing Cesnsus - 2017*. Pakistan Bureau of Statistics.
- The Daily Records. (2017, December 9). Top 10 Largest Mango Producing Countries In The World.
- World Bank. (2015). *Project Appraisal Document on a Proposed Credit in the Amount of SDR 49.4 Million to the Islamic Republic fo Pakistan for a Sindh Agricultural Growth Project*. Washington D.C.: World Bank.