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

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**Preliminary Report of Marketing Channel Survey (Mangoes) in Rahim
Yar Khan and Multan. Information Collected from Growers and
Contractors.**

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Abstract

This reports preliminary results and observations on the supply chain and marketing issues including relationships between the various stakeholders (farmers, contractors, retailers, etc.), their respective profit margins and the stages through which mango flows from the farm to the consumer (marketing channels). It is based on information collected from interviews and discussions with a sample of selected mango growers and (pre-harvest) contractors in Rahim Yar Khan and Multan districts, two of the largest and most famous mango producing regions in Pakistan, during the peak mango season in July 2018. The preliminary findings suggest that the dominant system of mango marketing is the one where growers enter into pre-harvest contracts with contractors, who then sell their produce through commission agents. Often but not always entering into pre-harvest contracts and advance payment arrangements with them - and sometimes with exporters, is a stable system because it is attractive to all parties as it provides efficient methods for risk sharing and risk management. The relationships between contracting parties are informal but typically long term. But the system does not seem to provide incentives to growers to enhance quality or productivity, or acquire better skills and expertise, though there is some limited evidence of a quality premium being received by the contractors. As many growers as well as contractors consider mango as a part time occupation and a source of supplemental income, they are also unwilling to exert much effort on direct sales to wholesalers or exporters.

Keywords

Horticulture, Mango, Growers, Contractors, Pakistan

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1 Introduction

The primary objective of this research project is understanding and analysing the Supply Chain Management of mangoes in Pakistan with emphasis on the relationships between the various stakeholders (farmers, contractors, retailers, etc.), their respective profit margins and the stages through which the produce flows from the farm to the consumer (marketing channels).

The effectiveness of any supply chain depends on mutual relationships between the participants defined in terms of integrated behaviour, information sharing, cooperation, partnership building and maintaining long-term associations (Mentzer et al., 2001). The focus of this study is examining if such relationships are efficient or not, and if not then identify the likely causes, and whether the profit margins of the various players are based on their contributions to the value of the product or are a consequence of the market power that these participants have in the supply chain.

This preliminary report is based on information collected from mango growers and (pre-harvest) contractors in Rahim Yar Khan and Multan districts, two of the largest and most famous mango producing regions in Pakistan. The data collection was carried out during peak season in July 2018.

According to the Kharif Crops Final Estimates Data Book (2016-17) published by the Directorate of Agriculture, Punjab, the estimated area under cultivation of mangoes in the province declined marginally from 264320 acres (106965 hectares) in 2015-16 to 262023 acres (106035 hectares) in 2016-17. On the other hand, the estimated mango production increased from 1227951 tonnes to 1375028 tonnes during the same period. This is a 12% increase despite the above mentioned reduction in cultivated area. In 2016-17, Multan and Rahim Yar Khan had 77000 (31160) and 59400 (24038) acres (hectares) under mango production respectively. Further, during the same period Multan produced 419603 tonnes and Rahim Yar Khan 310391 tonnes of mangoes. These statistics make the two districts the largest in Punjab and Pakistan on both counts. Another important indicator is that mango production grew by more than 40% over a single year (from 2015-16 to 2016-17) in Rahim Yar Khan making it one of the fastest growing districts in terms of mango production in Punjab. The estimated yields per acre in these two districts are 5.45 tonnes and 5.23 tonnes respectively.

According to Bally (2006) mango trees “produce best in climates that have a well-defined, relatively cool dry season with high heat accumulation during the flowering and fruit development period”. The optimal growing temperature is between 24 and 27 degrees centigrade. Further, the ideal altitude for most commercially produced varieties is up to 600 meters and “mango grows best in full sun because its flowers are produced at the edge of the canopy (the outside of the tree) in full sun”. As for yield, Bally (2006) states that “Mango yields are generally low compared to other tropical and subtropical fruit species. The yields often reflect irregular annual bearing patterns, and they vary greatly from season to season. The yielding capacity of a tree is dependent on variety, tree, age, tree size, seasonal conditions, and previous cropping history. Typically yields are often less than 5mt/ha (2.2 t/ac) but can reach 20-30mt/ha (9-13.5 t/ac) in well managed orchards. Single trees can produce between 200 and 300 kg (440-660 lb) of fruit in heavy cropping years”.

The two districts seem to satisfy the environmental characteristics conducive to ideal mango production. For example, the mean annual temperature of Multan is 25.6 °C (19/32 °C : high/low) and that for Rahim Yar Khan is 26.2 °C (18.5/33 °C : high/low). In terms of altitude, Multan and Rahim Yar Khan have elevations of 122 and 80 meters respectively. Both regions get a lot of sunlight throughout the year with average annual rainfall of about 175 mm in Multan and 101 mm in Rahim Yar Khan. However, the average productivity in these areas are significantly less than those specified for “well managed farms” in Bally (2006), although they seem to be higher than the minimum yields. All the above mentioned features of the two districts make them ideal candidates for our study.

It is important to mention the limitations of this preliminary report; the sample is rather small (21 growers and 20 contractors); the sample is not randomly chosen since personal references were used to contact respondents due to their reluctance to give information to people they do not know or trust. Lastly, non-standardised measurement units are used by market participants (crates, maunds, etc). This is likely to affect the accuracy of our estimates, though we have incorporated all the information available and used reliable approximations for conversions and estimations.

2 Growers



2.1 Respondent Features

Twenty one landlords/growers were interviewed from two districts; Rahim Yar Khan and Multan during peak season (July 2018). An interesting aspect is that many of these growers considered mango farming a part time occupation; just five growers in our sample report that

mango farming is their full time occupation and main source of income. 16 out of 21 respondents, on the other hand, indicate that mango growing is not their full time occupation. Still, out of these, four consider farming as their main source of income.

Regarding respondents who are not full time mango growers, two have other farming businesses besides mangoes. Three are livestock farmers (out of these three, one is also an employee in private sector and another is also self-employed in non-agricultural sector). Three have their private businesses. Another three are employed in private sector while two are government servants. There is one instance each of self-employed in non-agricultural sector, pensioner and commission agent.

Most (11 out of 21) growers have a university degree. Two have attended secondary school or college (9-12 years of education) with another five having attended middle school and one primary school. One has a vocational diploma while one has no formal education. None has attended a madrassah.

Only two of our respondents are members of a union despite the existence of a “Mango Growers Association”. Both of these growers have been members of the Association for more than two years with one being the current president. The main benefits of being a member of the association, as indicated by one of these members, are greater availability of information, lobbying, and training & skills development. The other member is of the view that there is no significant benefit.

Out of the remaining 19, seven are aware that a growers association exists but still choose to be non-members. The main criticisms are that the Association is politicised, non-effective, time consuming and not needed. An important observation is that a majority of our respondents (12 out of 21) are either unaware that such an association exists or think that it is non-existent.

An overwhelming majority of the growers want to continue with their business in the future and only one indicates that he would not like to continue because the business generates insufficient income and that future prospects are not good. The most commonly cited reason for continuing with the business is that “it generates sufficient income”. Other reasons include “good future prospects”, “switching to another business is difficult either due to age” or “risks involved”, “mango growing is better/less risky/more convenient than growing other crops” and “a good source of supplementary income”.

2.2 Orchard Characteristics

More than half (11 of the 21) of the orchards are 30 or more years old. Consequently just four growers in our sample indicated that they have established the orchards themselves; 16 growers inherited the orchards from their fathers and grandfathers while one grower purchased the orchard from someone else. Out of these 17 growers, 8 have been in the business on their own for twenty years or more while the remaining 9 respondents became orchard owners in the new millennium.

All the growers indicated that the business will be taken over by their kith and kin (son, brother, etc).

With respect to ownership structure, 19 out of 21 orchards are sole proprietorships. Out of the other two orchards that are being run as partnerships, one is a partnership between brothers.

Our sample has a mixed representation of mango growers; there are three small sized growers (land holding less than or equal to 5 acres), twelve medium sized growers (land holding more than 5 acres and less than or equal to 25 acres) and six large sized growers (land holding more than 25 acres). The average orchard size is slightly more than 41 acres.

In terms of fruit bearing trees, the average is approximately 23 trees per acre mainly because many of the orchards in our sample were established quite a few years ago. Panhwar (undated) suggests that “In mid twentieth century, usually 40 x 40 feet (12 x 12 meters) was recommended in India and Pakistan and by 1980 it was realised that these trees did not meet even in 15 years and another tree at centre of square was planted”. It seems that now some growers are moving towards high density plantation (at least two respondents mentioned this). Panhwar (undated) estimates that “High density gives 10 times more yield than conventional densities in the first 10 years”.

Regarding yield, the following measures can be estimated from our sample

- Crates per acre = 785 approximately
- Crates per tree = 34 approximately
- Kgs per acre = 8090 approximately
- Kgs per tree = 350 approximately

A limitation of these estimates is that the size of crates varies from orchard to orchard and across geographical regions. For conversions, we have used 12 kg and 10 kg crates for Rahim Yar Khan and Multan respectively unless mentioned otherwise by the grower.

It is interesting that the yield (8.090 tonnes/acre) is closer to that specified for “well managed farms” in Bally (2006) and higher than that reported by the Directorate of Agriculture, Punjab in its Kharif Crops Final Estimates Data Book (2016-17). This might be because our yield estimates are based on gross production reported by the growers and do not account for wastage during harvesting. Further, the current season (2017-18) is generally considered as high yield in comparison with the previous season (2016-17) that is recognized as low yield in terms of mango production (in local dialect these are called *nar* and *maadi*; low and high yield seasons respectively). Of course another reason may be our relatively small sample size.

The most popular variety of mangoes in this region is chaunsa (mausmi/sufaid) followed by chaunsa (kaala/late), dusehri, sammar bahisht, sindhri and anwar retaul. Most of the produce in these regions is harvested during June and July, followed by August. Only one of our respondents indicated harvesting in May as well.

All orchards are irrigated by both canal water and tube wells. One grower indicated that the canal water is becoming scarce over time.

In general there is no interplantation on mango orchards. In one orchard small quantities of wheat are grown for personal use. Fodder is grown on two orchards and sugarcane on another two. In case of the later, one respondent indicated the share of mangoes as 80-85% while the second respondent reported a 60-70% share in the total produce.

Use of information technology by growers in their business is non-existent. Further, only three growers in our sample have reported recent innovations; two moving towards high density

plantation and one using trimming/pruning of trees to reduce wastage during harvesting. All of them are satisfied by the outcome of these innovations.

None of the respondents in our sample have crop insurance; 14 indicate that crop insurance is not available, four indicate that they are not aware if such a facility existed, two report that crop insurance is too costly and one is of the view that insurance is not required.

Regarding financial arrangements, all the orchards are self-financed which is understandable as most of these are inherited. Also, the most commonly cited barrier to entry in this business is “capital requirement” due to high land prices followed by “high risk exposure” because of informal relationships, perishability of produce and natural disasters. Other barriers include skills/experience requirements, lack of institutional lending, linkages with other market participants, and relatively long wait time for new orchards (till trees mature and start bearing fruit).

With respect to suggested improvements, reliability of buyers (contractors) seems to be the major concern. Other suggestions include greater access to input suppliers, markets, and training opportunities/skills development & technical support. Expensive inputs are also mentioned a few times. There are a couple of respondents indicating that bank loan application process should be less difficult and that more government support (for example in the form of subsidised inputs) is needed. Interestingly environmental changes and slow R&D against diseases are also mentioned, although just once.

2.3 Marketing Channel

All but one of the respondents use a pre-harvest contractor to send their produce to the market. The only exception is where the grower himself is a commission agent and has direct access to the wholesale market. Consequently he sells the produce directly to the wholesalers. His business model is characterised by the following features:

- This grower can be classified as medium sized in terms of land holding (25 acres) with estimated seasonal production of 18000 crates (4500 maunds).
- The grower is responsible for all the crop related activities including irrigation, pruning, fertilizer and pesticide applications, harvesting, sorting and grading, packaging and transportation, and replacement plantation.
- Consequently his costs are much higher than the usual grower as he has to take care of marketing and selling his produce on his own.
- Further, he assumes higher risk as well as he is not transferring risks through contracting to the pre-harvest contractor.
- Unlike other growers who receive advance payments from the contractor, this grower extends credit to his buyers. However the duration of contract is very short (a fortnight in most cases). Such arrangements are undocumented (due to mutual trust) and as such add another risk for the grower.
- He collects information not only regarding the input prices but also prospective buyers and output prices.
- This grower earns above average profits but not the highest (he is ranked 6th in terms of profits per kg).

Out of the other 20 growers, 11 have a two year contract with the pre-harvest contractors, seven have a one year contract and two have a contract of more than two years duration. The main reason for the two year contract being the most popular arrangement is that, as mentioned above, mango production tends to fluctuate over alternate years. Thus both the growers and contractors tend to favour a two year contract to even out these fluctuations in output. On a passing note, 2017-18 is a high yield season.

Most of these contracts take place before flowering (11 out of 20) and at flowering (five out of 20). There are only a couple of instances each where the contract is made at fruit formation or fruit maturity.

The three most common criteria for selecting a pre-harvest contractor are “previous experience with the same contractor”, “offered the best price” and “good reputation”. One grower reports that he is stuck with the same contractor because of unpaid dues from previous season.

13 out of 20 growers meet at least two to three contractors before making a decision. In nine instances the contract is documented, mostly in the form of a judicial/stamp paper. For the remaining 11 cases when the contract is not documented, mutual trust is the most common reason. There is one instance each where either a third party guarantee is solicited or the contractor is unwilling to go for documentation.

The most important factor in determining the contract price is “current season’s crop condition”, followed by “highest price after negotiating with more than one contractor” and “prevailing prices in the area”. The contract price is mostly for the entire orchard or on a per acre basis. There is only one instance where the price is quoted per maund. However, output estimates are almost always based on estimated yield per tree. This is where experience is of utmost importance. The average contract price is approximately Rs. 187,000 per acre.

Moreover, all the respondents are able to charge a quality premium for their produce. This seems consistent with the findings of Badar et al (2016) who report that the participants in their study “desired to consume good quality mangoes and for that they expressed their willingness to pay extra. The low income group was ready to pay an extra PKR 5-10 per kg. The medium income group, female group and academic group indicated their willingness to pay PKR 10-20 per kg more. The higher income participants were even ready to pay an extra PKR 20 per kg if mangoes of their desired quality were available”. It seems that the signal regarding quality premiums has finally transmitted from the retail market to the growers¹.

Almost all the growers report at least 40% wastage at the flowering stage and at least 5% wastage up to and including the harvesting/packaging stage. However, this latter figure is significantly lower than that reported in some studies. For instance, Mazhar et al (2010) report that “58.8% ‘Sindhri’ and 87.7% ‘Chaunsa’ fruit had one or a combination of different disorders (bruising, physical damage, sap contamination) at harvest It is clear that most of the quality problems within the chain occurred at or around the harvest time and were related to harvesting at the incorrect maturity, under or over ripe fruit , poor grading, physical damage,

¹ See Mehdi (2012) for opposite findings; “the majority of growers who relied on the wholesale markets received no incentive to produce better quality mangoes from commission agents” (p.118) and “the aspirations of the growers that they would receive adequate rewards for their efforts to improve quality were not evident in the majority of cases” (p. 134).

high disease incidence, blemishes including sap burn and poor packaging”. This discrepancy indicates that either the respondents in our sample are unaware of what classifies as damage/wastage (see Mehdi (2012) who states that “growers a had poor understanding of quality losses such as uneven fruit maturity and colour, incidence of blemishes, rot and sap burn incurred as result of traditional post-harvest practices” (p.59)) or that a very strict criteria for judging damage/wastage has been used in previous literature.

The growers are always paid in cash as opposed to in kind. Further, in 17 of the 20 cases payment is made in two or three instalments (most commonly at the time of contract, before harvest, and mid to late harvest). In two instances where the orchard is contracted out at fruit maturity, full payment is received at the harvesting stage. As for the case where payment from previous season is due, seven instalments are agreed upon (the grower wants to receive an instalment after every 3-4 trucks have been loaded with produce by the contractor).

The most common reason given by growers for contracting out their orchards is convenience; it seems that the growers are not interested in making the effort of marketing their produce directly in the domestic or international markets. The next reason is “absentee landlord”; it might be that the growers either want to live in urban areas rather than on site or they do not have time to manage their product as many treat this as a part time occupation.

Eight respondents also indicate that it is less risky to use a pre-harvest contractor. Four mention that they have always done business through a contractor while another three report that they do not have funds to manage the produce on their own. There are a couple of instances each where the respondents feel that it is more profitable to enter into an arrangement with a contractor or that they don’t have direct access to the market.

The relationship between the grower and the contractor seems to be long term with 16 growers reporting that they have been dealing with the same contractor for more than one year (9 indicating that it is at least their 3rd year with the same contractor).

With respect to the maintenance and upkeep of the orchard, irrigation, pruning, fertilisation and replacement plantation are almost always the responsibility of the grower. 11 out of 20 growers are also responsible for pesticide application. Further, for all the instances where pesticide application is not the responsibility of the grower, the contract duration is two years or more. The average operating cost is approximately Rs 46,000 per acre per year.

Most growers (12 out of 20) want their contractors to adopt better harvesting practices. Reliability of the contractors, better price, and care towards the orchard/pre-harvest practices seem to be the next major concerns. There are also a few, who mention that contractors ask for concessions at the end of season based on compassion and sympathy. Four growers in our sample indicate that nothing needs to be improved regarding the contractors.

2.4 Profitability

All calculations in this section are based on the information provided by the growers. Regarding information on contract price, most growers in general are reluctant in disclosing the price they received from the pre-harvest contractor to a stranger. This is the main hindrance in using a random sample in this research; in order to get information that is reliable, at least to some extent, we needed to use references. There is also some hesitancy when the respondents are asked about their operating expenses and the orchard size. Similar to our experience with

commission agents, the main concern seems to be the belief that revealing this information may have tax repercussions. Also, often the growers are unavailable on the field once they have contracted out their orchards. Approaching them in their houses/*dairaas* is generally frowned upon unless through a reference. Nevertheless, we believe that the financial information we have collected is not only reliable but also representative as our sample consists of small, medium and large growers

Regarding operating expenses², the average expense per acre for the growers who sell their product through a contractor is approximately Rs. 46,000 per acre per year. For the grower who directly markets his product in the wholesale market, the operating expense, including packaging and marketing expense, is more than three times as much at Rs. 138,750 per acre per year.

A majority of these expenses relate to irrigation, pruning, fertilisation and replacement plantation. Pesticide application is carried out by 12 out of 21 growers. For other instances it is the responsibility of the contractor as per the advice of the grower.

As expected, the cost per acre is lesser for more productive orchards (a simple regression of cost/acre over kg/tree indicates a significantly negative relationship). Size of the orchard, on the other hand, has no bearing on cost/acre indicating an absence of economies/diseconomies of scale. Similarly, the district in which the orchard is located has no significant effect on cost/acre.

As mentioned above, there is a lot of variation in terms of the size of growers that we interviewed; the orchard size ranges from 3 acres to 325 acres. However, orchard size, as well as, number of fruit bearing trees in the orchard have no significant relationship with expected production³ (kg/tree) again supporting our earlier conclusion about returns to scale.

The price per acre ranges from Rs. 130,000 to Rs. 300,000. This price is inversely related to the size of the orchard and the number of fruit bearing trees at 5% level of significance. This might be because there are not many contractors that have access to funds for managing and marketing large amounts of produce. As a result large growers might be willing to accept lesser price in return for the convenience of dealing with a single contractor.

An important result is that expected productivity (kg/acre) has no significant bearing on the price per acre that the growers receive. This finding suggests that growers are not rewarded for more productive orchards. This explains why growers are almost never interested in adopting innovations and moving away from traditional farming for expected productivity gains as such efforts are likely to go uncompensated.

In what follows I report various measures of profitability (Total Profit, Profit per Acre, Profit per Crate and Profit per Kilogram). I also calculate Returns on Investment based on land prices plus price of trees as reported by the growers ($ROI = \text{Profit} / \text{Investment}$ required for purchasing land and planting trees). As mentioned earlier one grower in our sample sells his

² In cases where interplantation is present, the operating cost related to mangoes is calculated by multiplying the operating expenses for the entire orchard with the share of mangoes in total production as reported by the relevant grower.

³ As estimated by the grower.

produce directly in the wholesale market rather than using a contractor. His profit estimates are reported separately at the end of each table.

Table 1: Total profit of mango growers

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Production (Crates)	Contract Price (Rs)	Operating Cost (Rs)	Total Profits (Rs)	
1	14	400	13,000	3,000,000	665,000	2,335,000	
2	25	562.5	30,937.5	5,500,000	687,500	4,812,500	
3	48	1320	33,000	7,200,000	2,760,000	4,440,000	
4	20	390	11,700	4,500,000	330,000	4,170,000	
5	3	64	2,080	800,000	150,000	650,000	
6	6	125	4,000	1,300,000	285,000	1,015,000	
7	10	200	8,500	2,250,000	500,000	1,750,000	
8	7	140	6,000	1,400,000	262,500	1,137,500	
9	10	240	7,500	2,250,000	400,000	1,850,000	
10	10	240	10,200	2,250,000	600,000	1,650,000	
11	3	62	2,000	750,000	135,000	615,000	
12	10	250	8,000	2,750,000	475,000	2,275,000	
13	5	125	4,000	1,500,000	175,000	1,325,000	
14	12.5	360	18,000	2,500,000	243,750	2,256,250	
15	9	355	7,400	2,000,000	450,000	1,550,000	
16	325	6500	260,000	55,000,000	13,812,500	41,187,500	
17	100	2900	101,500	13,000,000	4,250,000	8,750,000	
19	45	1500	44,000	10,125,000	2,500,000	7,625,000	
20	110	2000	52,000	22,750,000	5,500,000	17,250,000	
21	70	1450	37,700	16,450,000	4,550,000	11,900,000	
Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Sales (Crates)	Average Price June-July (Rs per crate)	Sales Revenue (Rs)	Operating Cost (Rs)	Total Profits (Rs)
18*	25	750	18,000	450	8,100,000	3,468,750	4,631,250

* The only grower in our sample selling his produce directly in the wholesale market

There is no significant effect of productivity (crates/tree) on the profits a grower earns again suggesting that higher productivity does not translate into greater profits for the grower. However, as expected, larger farmers are able to earn higher total profits and this relationship is statistically significant.

Figure 1: Relationship between profits and orchard size

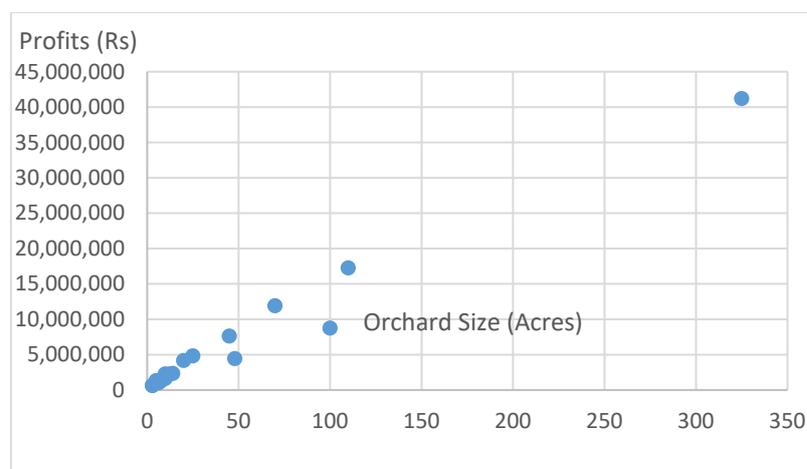


Figure 2: Relationship between profits and expected production

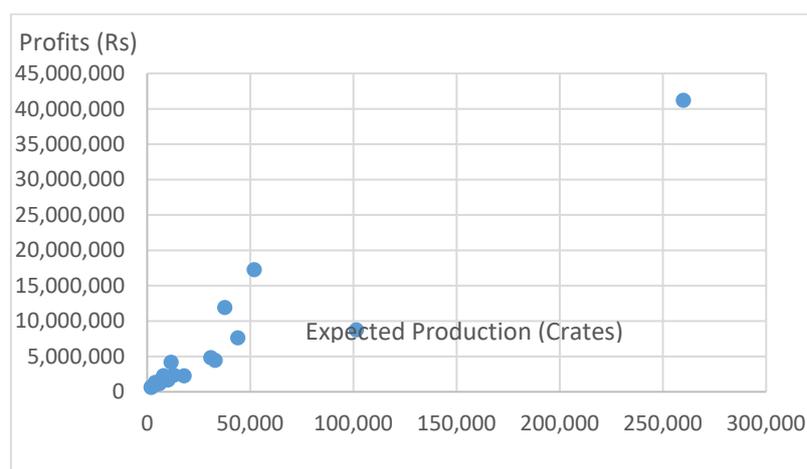


Table 2: Per acre profits of mango growers

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Production (Crates)	Contract Price/acre (Rs)	Operating Cost/acre (Rs)	Profits/acre (Rs)
1	14	400	13,000	214,285.71	47,500	166,785.71
2	25	562.5	30,937.5	220,000	27,500	192,500
3	48	1320	33,000	150,000	57,500	92,500
4	20	390	11,700	225,000	16,500	208,500
5	3	64	2,080	266,666.67	50,000	216,666.67
6	6	125	4,000	216,666.67	47,500	169,166.67
7	10	200	8,500	225,000	50,000	175,000

8	7	140	6,000	200,000	37,500	162,500	
9	10	240	7,500	225,000	40,000	185,000	
10	10	240	10,200	225,000	60,000	165,000	
11	3	62	2,000	250,000	45,000	205,000	
12	10	250	8,000	275,000	47,500	227,500	
13	5	125	4,000	300,000	35,000	265,000	
14	12.5	360	18,000	200,000	19,500	180,500	
15	9	355	7,400	222,222.22	50,000	172,222.22	
16	325	6500	260,000	169,230.77	42,500	126,730.77	
17	100	2900	101,500	130,000	42,500	87,500	
19	45	1500	44,000	225,000	55,555.56	169,444.44	
20	110	2000	52,000	206,818.18	50,000	156,818.18	
21	70	1450	37,700	235,000	65,000	170,000	
Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Sales (Crates)	Average Price June-July (Rs per crate)	Revenue / acre (Rs)	Operating Cost /acre (Rs)	Profits/acre (Rs)
18*	25	750	18,000	450	324,000	138,750	185,250

* The only grower in our sample selling his produce directly in the wholesale market

Profits/acre are negatively related to the orchard size indicating that smaller land holdings perform better in terms of relative (per unit) profitability. We suspect that this might be due to the abovementioned negative relationship between price/acre and size of the orchard rather than diseconomies of scale. Once again there is no significant effect of productivity on profitability of the growers.

As for the grower who sells his produce on his own, his profits per acre are significantly higher than the sample average (Rs. 146201/acre) and he is ranked 7th in terms of relative (per unit) profitability. Coincidentally the same grower is also ranked 7th largest according to land holding. He is ranked 20th in terms of productivity once again lending support to the finding that higher productivity goes unrewarded.

Further, profits/acre have no significant relationship with the number of fruit bearing trees per acre. What this implies is that, again, farmers with more productive orchards (in terms of density of fruit bearing trees) are not rewarded.

Table 3: Profits of mango growers (per crate)

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Production (Crates)	Contract Price/crate (Rs)	Operating Cost/crate (Rs)	Profits / crate (Rs)
1	14	400	13,000	230.77	51.15	179.62

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Production (Crates)	Contract Price/crate (Rs)	Operating Cost/crate (Rs)	Profits / crate (Rs)	
2	25	562.5	30,937.5	177.78	22.22	155.56	
3	48	1320	33,000	218.18	83.64	134.54	
4	20	390	11,700	384.62	28.21	356.41	
5	3	64	2,080	384.62	72.12	312.5	
6	6	125	4,000	325	71.25	253.75	
7	10	200	8,500	264.71	58.82	205.89	
8	7	140	6,000	233.33	43.75	189.58	
9	10	240	7,500	300	53.33	246.67	
10	10	240	10,200	220.59	58.82	161.77	
11	3	62	2,000	375	67.5	307.5	
12	10	250	8,000	343.75	59.38	284.37	
13	5	125	4,000	375	43.75	331.25	
14	12.5	360	18,000	138.89	13.54	125.35	
15	9	355	7,400	270.27	60.81	209.46	
16	325	6500	260,000	211.54	53.13	158.41	
17	100	2900	101,500	128.08	41.87	86.21	
19	45	1500	44,000	230.11	56.82	173.29	
20	110	2000	52,000	437.5	105.77	331.73	
21	70	1450	37,700	436.34	120.69	315.65	
Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Sales (Crates)	Average Price June-July (Rs per crate)	Revenue / crate (Rs)	Operating Cost /crate (Rs)	Profits/crate (Rs)
18*	25	750	18,000	450	450	192.71	257.29

* The only grower in our sample selling his produce directly in the wholesale market

Average profits per crate for the entire sample are Rs. 181 per crate. Compared to the average cost per crate of Rs. 62, this represents almost 300% of operating cost. The returns as a percentage of operating cost for the grower not using the contractor are significantly less than this average at 134%. These lesser returns support the traditional way of doing business by the growers; selling their produce through contractors rather than selling directly to the wholesale market. This grower understandably has the highest cost/crate, as well as, the highest price per crate in the sample due to selling directly to the wholesale market. However, his cost per crate is three times higher than the average while his price per crate is less than two times greater than the average (Rs. 243 per crate). It seems that marketing the produce in the wholesale market adds more to the cost than the revenues of the grower. Though, this result needs to be

treated carefully as we have only one such grower in our sample, it opens an interesting avenue for future research and policy implications.

Table 4: Profits of mango growers (per kg)

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Production (Kgs)	Contract Price/kg (Rs)	Operating Cost/kg (Rs)	Profits / kg (Rs)	
1	14	400	156,000	19.23	4.26	14.97	
2	25	562.5	309,375	17.78	2.22	15.56	
3	48	1320	396,000	18.18	6.97	11.21	
4	20	390	140,400	32.05	2.35	29.7	
5	3	64	24,960	32.05	6.01	26.04	
6	6	125	48,000	27.08	5.94	21.14	
7	10	200	102,000	22.06	4.9	17.16	
8	7	140	60,000	23.33	4.38	18.95	
9	10	240	90,000	25	4.44	20.56	
10	10	240	102,000	22.06	5.88	16.18	
11	3	62	24,000	31.25	5.63	25.62	
12	10	250	96,000	28.65	4.95	23.7	
13	5	125	40,000	37.5	4.38	33.12	
14	12.5	360	216,000	11.57	1.13	10.44	
15	9	355	74,000	27.03	6.08	20.95	
16	325	6500	2,600,000	21.15	5.31	15.84	
17	100	2900	1,015,000	12.81	4.19	8.62	
19	45	1500	440,000	23.01	5.68	17.33	
20	110	2000	520,000	43.75	10.58	33.17	
21	70	1450	377,000	43.63	12.07	31.56	
Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Expected Sales (Kgs)	Average Price June-July (Rs per kg)	Revenue / kg (Rs)	Operating Cost /kg (Rs)	Profits/kg (Rs)
18*	25	750	180,000	45	45	19.27	25.73

* The only grower in our sample selling his produce directly in the wholesale market

The average per kilogram price for the growers at the farm level is Rs. 23 (excluding the exception who receives a price of Rs. 45 from the wholesale market). The average cost per kilogram is approximately Rs. 6 (Rs. 19 for the grower who markets his produce himself) netting an average profit of greater than Rs. 17 (almost Rs. 26 for the exception).

The estimated total quantity produced as reported by the growers in our sample is 7,018,235 kilograms or 7,018 tonnes (175,500 maunds approximately) during the 2018 season. The figures for total mango production for 2018 are not available at the time of preparation of this report, however, the mango production in Punjab for 2016-17 is 1,375,028 tonnes (Kharif Crops Final Estimates Data Book, 2016-17). It turns out that the 21 growers we interviewed report producing more than 0.5% of this amount. Similarly in terms of land holdings, our sample controls more than 0.3% of the total area under mango production (262023 acres) in Punjab. In our opinion, these numbers suggest that our sample is large enough to be a reasonable representation of mango growers in the province.

Table 5: Returns to investment for mango growers

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Purchase Price Per Acre (Rs)	Price per Plant (Rs)	Investment Requirement (Rs)	Total Profits (Rs)	ROI
1	14	400	2,500,000	400	35,160,000	2,335,000	6.64%
2	25	562.5	3,000,000	425	75,239,062.5	4,812,500	6.40%
3	48	1320	1,800,000	450	86,994,000	4,440,000	5.10%
4	20	390	2,000,000	300	40,117,000	4,170,000	10.39%
5	3	64	2,000,000	383.33***	6,024,533.12	650,000	10.79%
6	6	125	2,000,000	350	12,043,750	1,015,000	8.43%
7	10	200	3,000,000	400	30,080,000	1,750,000	5.82%
8	7	140	2,135,191**	383.33***	15,000,000	1,137,500	7.58%
9	10	240	2,000,000	400	20,096,000	1,850,000	9.21%
10	10	240	1,750,000	383.33***	17,591,999.2	1,650,000	9.38%
11	3	62	1,825,411**	383.33***	5,500,000	615,000	11.18%
12	10	250	2,000,000	400	20,100,000	2,275,000	11.32%
13	5	125	2,000,000	400	10,050,000	1,325,000	13.18%
14	12.5	360	2,000,000	300	25,108,000	2,256,250	8.99%
15	9	355	4,000,000	375	36,133,125	1,550,000	4.29%
16	325	6500	5,500,000	400	1,790,100,000	41,187,500	2.30%
17	100	2900	6,000,000	400	601,160,000	8,750,000	1.46%
19	45	1500	22,500,000	383.33***	1,013,074,995	7,625,000	0.75%
20	110	2000	2,250,000	383.33***	248,266,660	17,250,000	6.95%
21	70	1450	2,000,000	400	140,580,000	11,900,000	8.46%
18*	25	750	5,000,000	350	125,262,500	4,631,250	3.70%

Grower #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Purchase Price Per Acre (Rs)	Price per Plant (Rs)	Investment Requirement (Rs)	Total Profits (Rs)	ROI
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* The only grower in our sample selling his produce directly in the wholesale market

** Estimated value

*** Average price for the sample used for estimation

In the above table returns on investment are calculated as profits as a percentage of investment required to establish a similar orchard based on price per acre of land and price per plant as reported by the grower, i.e., $ROI = \text{Profit} / \text{Required Investment}$.

The average purchase price of land for our sample is above Rs. 5,000,000 per acre. The modal value is Rs. 2,000,000. The significant difference seems primarily due to grower # 15 who reports that the land price is Rs. 22.5 million per acre (more than 11 times the mode) as his orchard is adjacent to a newly developing housing society. Due to this his returns on investment are also lower than those for the average grower in our sample that stands at 7.25%.

The return on investment is negatively related to orchard size at 5% level of significance. Expected productivity (kg/tree) on the other hand has no significant impact on ROI.

Lastly, for the grower selling directly to the wholesale market ROI is significantly less than the sample average; he is ranked 18th in our sample of 21. One important caveat is in order, while calculating returns on investment we only consider operating profits and do not account for capital gains/losses due to appreciation of land prices over time.

3 Contractors

3.1 Respondent Features

Twenty pre-harvest contractors were interviewed mainly from two districts of South Punjab; Rahim Yar Khan and Multan during peak season (July 2018). Similar to the growers, many of the contractors in our sample consider mango contracting a part time occupation; nine contractors in our sample indicate this as their full time occupation and nine as their main source of income. Out of the 11 respondents that indicate that mango contracting is not their full time occupation, one considers the business as their main source of income.

Regarding respondents who are not full time mango contractors, five are also farmers (one of them is also a livestock farmer). Three have their private businesses (two classify themselves as self-employed in non-agricultural sector while one categorises himself under “other”). Another two are employed in the private sector, and one is a government employee.

Just two contractors have a university degree. Most (8 out of 20) respondents have attended secondary school/college (9-12 years of education). Four have attended middle school and two primary school. Four have no formal education. None has a vocational diploma or attended a madrassah.

None of our respondents are members of a union. Sixteen indicate that such a union is non-existent while the remaining four are unaware if such a union exists. One of the contractors who said that union is non-existent indicated that there was no need for such a union.

Only one respondent in our sample indicates that he would not like to continue because he thinks that the future prospects are not good. Nineteen contractors, on the other hand, want to continue with their business in the future. The most commonly cited reason for continuing with the business is that “it generates sufficient income”. The other major reasons include “good future prospects” and “switching to another business is too risky”. Next in order are “don’t know what else to do”, and “switching to another business is difficult either due to age” or “finances”. There is one mention each of “mango contracting is better than other crops” and “find it interesting”.

3.2 Business Characteristics

The year in which the business is established is almost uniformly distributed over the years; one in 1950s, four in 1970s, three in 1980s, three in 1990s, five in 2000s, and four in 2010s. Exactly half of these businesses are 20 or more years old. However, a majority of contractors (12 out of 20) established the business on their own, unlike the growers who mainly inherit their orchards. For the remaining eight, seven inherit the business from their fathers or grandfathers while one is in partnership with his brother. Further, seven of these eight respondents are in the business for 15 years or less.

Although it is generally accepted that mango contracting requires a lot of experience and skills to form estimates about production, orchard condition etc., surprisingly 13 out of 20 respondents have not received any training prior to entering the business. The remaining are mostly trained by fathers or brothers.

Regarding ownership structure, 14 out of 20 businesses are sole proprietorships. Out of the other six businesses that are being run as partnerships, two are partnerships between brothers.

As has been usually the case with other market participants, use of information technology by contractors in their business is non-existent; all respondents just use mobile phones for their dealings. Moreover, just five contractors in our sample report recent innovations in the way they conduct business. For three this innovation is limited to putting mattresses on the ground during harvest to reduce wastage. One reports pruning to keep the trees to a shorter height again to reduce wastage and one mentions improved harvesting methods. All of them are satisfied by the outcome of these innovations.

None of the respondents in our sample have crop insurance; 16 indicate that crop insurance is not available (according to four of these insurance is not required even if it existed), three indicate that they are not aware if such a facility existed. Also, one is of the view that insurance is not required.

Regarding financial arrangements, nine of the 20 contractors use their own funds to conduct business. Eight contractors take advances from commission agents while one uses both his own finances and advances from the agent in equal proportions. Just two respondents report obtaining a loan from a financial institution to finance their activities. The most common reason for obtaining advances or loans is to “secure ones position as a buyer/seller”. One contractor mentioned that he has to “pay commission anyways so why not take advance” from the commission agent. One also mentioned taking advances for household consumption.

Most of these advances/loans are on a seasonal basis up to a maximum of one year. The amount advanced/lent is decided mostly after the assessment of current year's crop condition. Some of the times it is based on land holding/area under crop, previous year's production and prevailing practices in the region. There is a single mention of "product variety" being used as a criterion.

An important observation, and this by the way is also a confirmation of our finding from commission agents' interviews, is that no explicit financial charges are imposed by commission agents on the advances they make to the contractors. The two instances where a loan is taken from a financial institution, an interest rate of 24% and 25% per annum is charged from the contractor.

Further, the arrangements between the commission agent and the contractor are not documented in any of the cases and mutual trust seems sufficient for advancing money. Loans from financial institution, as expected, are given after legal documentation on a judicial/stamp paper.

Loans from financial institutions are taken as a single payment. Advances, on the other hand, are taken in two or three instalments. The common stages are "at the time of contract", "Before/Start of harvest", and "Mid/Late/Before last harvest". The amount advanced or lent obviously depends on the scale of the business. If we use this as a classification then three contractors are advanced less than Rs. 5 million, three between Rs. 5 million and Rs. 10 million, and another three more than Rs. 10 million. The two contractors that use bank loans borrow Rs. 1 million and Rs. 5 million respectively.

14 respondents report that they maintain a record of their transactions and use it for future decision making. However, none of them shares this information with other contractors. All of the six respondents who do not maintain records think that there is no need to do this.

All the contractors collect and use market information for their decision making. The main source of this information is commission agents or contractors' representatives at the commission agents' offices. This is followed by other contractors. Very few get this information from government and farmers.

Wholesale prices seem to be the most commonly sought information followed by contract prices of orchards and expected production in the region. Retail prices, new developments in mango production, prospective farmers/sellers, expected national production, and feedback of commission agents on packaging etc are much less important.

Regarding barriers to entry, experience/skills, high risk exposure and capital requirements are the top three hurdles. Harvesting skills, linkages with other market participants and lack of financing by banks are just mentioned by a couple of contractors. 13 of the 20 respondents are of the view that the number of mango contractors in the market has not changed over the last few years. According to two this is because the entry and exit numbers are the same. Seven contractors, on the other hand, indicate an increase in numbers and four of these think that this has had an adverse effect on profits.

3.3 Contract Features

Most contractors (15 out of 20) are in contract with one farmer in a season. Four have a contract with two and one with three farmers. We ask these latter respondents to think of the farmer that they do most business with while responding.

Twelve contractors have informal relationship with the farmers. A majority of contractors have a two year contract (this was also indicated by the farmers above) followed by one year contract. Just two have contracts of more than 2 years duration. Almost all the contracts are carried out before the flowering stage with just one undertaken at the flowering stage.

The contractors indicate that good reputation is the most important criteria for selecting a farmer followed by previous experience with the same farmer. Only six respondents mention lowest price as the basis of selection of a particular farmer. Even more surprisingly, quality is mentioned only by one contractor. Other mentionable factors include personal relationships with the farmer and product variety.

12 contractors meet two or more farmers before entering into a contract with two meeting as many as ten. 11 of the 20 respondents report documenting the contract, mostly in the form of a judicial/stamp paper. All of the remaining nine indicate that they do not document the contract with the farmer due to mutual trust.

Understandably the contract price is almost always based on the current crop condition/fruit formation. Three mentions are made of “based on previous year’s production” and “prevailing prices in the region”. Just one contractor selected a farmer on the basis of lowest price after negotiating with more than one farmer.

The contract price is usually specified for the entire orchard or on a per acre basis. Although there is only one mention of price being stated on a per tree basis, however, production estimates are usually based on “expected output per tree”. The average contract price is approximately Rs. 184,000 per acre which is consistent with the Rs. 187,000 reported by the growers previously.

For our sample, the price is always paid in cash and never “in kind”. The payment is made in two or three instalments (Time of contract/End of season for next year, Before/Start of harvest, Mid/Late/Before last harvest). There is one instance of paying the farmer at the time of signing the contract. All the contractors are willing to pay quality premium, although as mentioned above, only one actually uses quality as a selection criterion when choosing a farmer.

Contractors usually have a long term relationship with the farmers; eighty percent of those in our sample have been dealing with the same farmer for more than one year with sixty percent for three years or more. Just four respondents indicated that it was their first year with a particular farmer. The existence of long term relationships is understandable as such relationships are usually informal and are commonly based on mutual trust.

Seven of our contractors manage less than 10 acres, six between 10 and 30 acres, and seven more than 30 acres. Thus we have a fairly even representation of mango contractors ranging from small to medium to large. The average orchard size managed by these contractors is slightly more than 44 acres.

In terms of fruit bearing trees, the average is a bit more than 23 trees per acre. This is consistent with the numbers reported by growers. Again there are a couple of instances where contractors report managing orchards with high density plantation.

We calculate the following yield measures from our sample of contractors

- Crates per acre = 920 approximately
- Crates per tree = 39 approximately
- Kgs per acre = 10034 approximately
- Kgs per tree = 428 approximately

Again our estimate of the yield (10.034 tonnes/acre) is within the range specified for “well managed farms” in Bally (2006) and higher than that reported by the Directorate of Agriculture, Punjab in its Kharif Crops Final Estimates Data Book (2016-17).

We would like to reiterate that the size of crates varies from orchard to orchard and across geographical regions, and that for conversions we have used 12 kg and 10 kg crates for Rahim Yar Khan and Multan respectively unless mentioned otherwise by the contractor.

Further, as can be seen, yields reported by contractors are consistently higher than those reported by the growers above. One reason for this might be that our sample for growers has a relative overrepresentation of Rahim Yar Khan district as compared to the sample for contractors (67% vs 60%). However, a simple regression of expected production over the district dummy does not yield a significant effect. The other plausibility is that contractors tend to overestimate productivity, or conversely, the growers tend to underestimate productivity. If that is indeed the case and assuming that actual productivity lies between the two estimates, then both will gain from trade (as $WTP > WTS$).

With regards to varieties, all the orchards have Chaunsa varieties (sufaid/mausmi, kaala/late, Sammar Bahisht etc). The second most planted variety is Dusehri, followed by Sindhri and Anwar Retaul. Mostly harvesting takes place in June and July, followed by August and May.

Almost all the contractors report 40% or more wastage at the flowering stage and 5% or more wastage at the harvesting/packing stage. These numbers are consistent with those indicated by growers above.

Besides harvesting, sorting, grading, packaging, post-harvest handling and treatment, and transportation, some contractors are also responsible for pesticide application and fertilisation (17 and 9 respectively). Three are also responsible for irrigation.

As far as suggestions for improvements with reference to the farmer are concerned, more care towards the orchard/pre-harvest practices and lower contract price are the two top concerns. Other recommendations include greater reliability, more information provided by the farmer about the quantity and quality of the produce, more involvement in maintenance, and more compassion in case of losses/financial hardships. Four respondents think that nothing needs to be improved.

3.4 Marketing Channel

All the contractors primarily sell their produce through the commission agents. One contractor sold 30% of the produce to an exporter during the current season. His transactions with the exporter are characterised by the following features:

- The nature of the contract with the exporter is informal.
- The relationship with the exporter is essentially short term (a week) with the agreement made at fruit maturity. Advance payment is given a couple of days before the produce is harvested. The price is based on international prices relative to domestic prices. Further, the agreement is not documented due to the very short term nature of the transaction.
- The contractor, in this instance, sold 1400 maunds (as mentioned above this accounts for almost 30% of his total sales) at a price of Rs. 2400/maund to the exporter. He is of the view that he is able to charge a quality premium from the exporter.
- This contractor can be classified as medium sized in terms of orchard size (26 acres) with estimated seasonal production of 15600 crates (4700 maunds approximately).
- The Rahim Yar Khan based contractor reported that the exporter is from Multan.
- This contractor earns the highest profits per kg. In fact his profitability is almost 1.5 times as much as the next highest contractor and more than 2.5 times the sample average.

The most common reason for selling the produce through a commission agent is convenience. Not having access to other market participants (wholesalers, retailer, etc) is the next major reason followed by “have always done it through a commission agent”. Four contractors also think that it is less risky if a commission agent is involved. There is just one mention each of greater profitability, bank loans being too costly, and switching to another marketing channel being difficult/more costly.

13 of the 20 respondents engage with a single commission agent at a time. For the other seven, five deal with two, one with three and another one with four agents. Again we ask these latter respondents to think of the agent that they do most business with while responding to our questions.

The most common criteria for selecting a commission agent is “previous experience with the same contractor”, followed by “good reputation”. Five contractors each cite “personal relationships” and offered the best terms of trade” as their motives behind opting for a particular agent. Only one reports that he selected the commission agent who offered to charge the least commission rate. Again this is not unexpected given that most commission agents have a tendency to stick to the prevailing rate in the market.

Further, 11 contractors do not meet more than one agent before making their decision. This is most probably because, as mentioned above, most contractors like to stick with the same agent over the years. For the remaining nine, four meet 2-3 agents, while five meet three or more agents before entering into a contract.

Once again, the relationship between the contractors in our sample and the commission agents is informal. The contract duration is mostly limited to one season/one year, however there are two instance where this duration is for two or more years. Three indicate that they do

not pledge their produce as they do not take any advances from the agents. Another mentioned that he does not pledge the produce so that he can sell through the agent offering to charge the lowest commission rate.

Nine contractors enter into an agreement with the commission agent before flowering, two at fruit maturity, while another nine do not need to enter into an agreement as they have not taken any advances from the commission agent and are relying on their own funds. The agreements, when entered into, are never documented and mutual trust is cited as the reason for non-documentation.

Most contractors have a long term relationship with the commission agents; 16 contractors in our sample have been dealing with the same agents for more than a year with 12 relationships extending over five or more years.

The produce is always sold through auctions in the wholesale market. These auctions take place within a day of the arrival of produce in the market. This is often necessitated by the perishable nature of mangoes. One contractor mentioned that, for the Islamabad/Rawalpindi market, carbide is applied and the produce is kept at the orchard for 24 hours after packaging, with transportation taking another 36 hours from south Punjab. According to him the customers in that market require the fruit to be close to ripening at the time of sale.

12 contractors reported that either they themselves or a representative is present at the auction. The accounts are settled mostly within a day after the auction with the final clearances taking place at the end of the season.

Nine contractors pay 7% commission on sales to the agents while six pay 10%. Two contractors pay both 7% and 10% on different transactions. This difference is because the commission rate in Karachi is higher than that in Lahore and other Punjab markets. There are three instances where contractors are paying lower than the market rate. All of them have one thing in common; they have not taken advances from the commission agents. However, six other contractors who have not taken advances are still paying the market rate. Nevertheless this trend indicates that there may be some limited opportunities available for contractors to negotiate with the commission agents on the charged rates. Moreover, a majority of contractors is of the view that the commission rates are decided by the agents' union with just two mentioning that market mechanisms determine these rates.

The contractors in our sample collectively sell more than 753,500 crates to the wholesale markets through the commission agents. In terms of weight this turns out to be 8225500 kgs. Another 56000 kgs are sold to the exporter. That makes a total sales of approximately 8281500 kgs. Relative to amount produced (8834650 kgs) this represents an average wastage of approximately 6.25% at the harvesting/packaging stage which seems consistent with the wastage reported by our respondents.

All the contractors think that the wastage between harvest and sale is negligible (0-2%). Further, all of them are also of the view that they are able to charge quality premium in the wholesale market.

An important observation is that almost half of the contractors feel that nothing needs to be improved regarding the commission agents. The remaining contractors mostly want agents to charge a lesser commission rate, and to some extent, greater reliability and more information

from the commission agent about market price, preferences of the buyers, etc is sought. There are single instances where “unfair dealings”, “better price for the produce” and “discouraging sales through private negotiations” are mentioned. Thus it seems that contractors, in general, are content with the ongoing marketing channels and arrangements, with the only major concern being the higher commission rates.

3.5 Profitability

All calculations in this section are based on the information provided by the contractors. One limitation that we face is that the information is collected in July and consequently information on expected sales price in August is unavailable. Harvesting, on the other hand, extends into August. Thus, a part of sales is expected to occur in that month. Our revenues are based on the average price of May, June and July, while the quantities are spread over May, June, July and August.

Regarding operating expenses, these expenses include expenses on orchard upkeep (pesticide application, fertilisation, etc) and the costs associated with harvesting, packaging, treatment and transportation of the produce. The average operating expense per acre for the contractors is approximately Rs. 97,000 per acre per season. Alternatively, in terms of crates, this expense turns out to be Rs 105 per crate.

Other expenses for the contractor include the commission paid to the agent (commission rate times sales revenue) and the contract price (Rs. 184,000 per acre on average as mentioned above) paid to the grower. Further, for the contractors (contractors 3 and 5) who have borrowed money from banks and pay financial charges, we include this as interest expense (calculated on a six month period). The total cost is calculated in the following table as the sum of all these expenses.

Table 6: Cost of business (Contractors)

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Operating Cost (Rs)	Contract Price (Rs)	Com .Rate	Commissio n Expense	Total Cost (Rs)
1	6	100	343,500	300,000	10%	97,375	740,875
2	125	2900	12,100,000	31,000,000	8.5%	4,781,250	47,881,250
3**	44	1040	5,540,000	8,000,000	6%	1,475,000	15,640,000
4	4	85	302,000	500,000	5%	62,833	864,833
5**	8	200	1,135,000	1,300,000	10%	450,000	3,005,000
6	75	1875	10,000,000	12,500,000	10%	3,500,000	26,000,000
7	7	150	800,000	1,400,000	8.5%	257,125	2,457,125
8	10	250	1000,000	2,000,000	10%	487,500	3,487,500
9	10	240	930,000	1,800,000	10%	420,000	3,150,000

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Operating Cost (Rs)	Contract Price (Rs)	Com .Rate	Commissio n Expense	Total Cost (Rs)
10	7	325	1,580,000	2,100,000	10%	715,000	4,395,000
11*	26	520	2,506,700	3,800,000	7%	735,021	7,041,721
12	9	355	500,000	2,000,000	3.5%	131,250	2,631,250
13	250	4800	28,125,000	43,750,000	7%	8,190,000	80,065,000
14	30	900	1,800,000	6,000,000	7%	1,010,625	8,810,625
15	7	120	280,000	1,000,000	7%	151,200	1,431,200
16	62.5	1000	2,343,750	8,500,000	7%	1,575,000	12,418,750
17	100	2500	7,000,000	20,000,000	7%	3,780,000	30,780,000
18	25	450	2,560,000	2,000,000	7%	490,000	5,050,000
19	50	1875	3,000,000	9,375,000	7%	2,625,013	15,000,013
20	25	937.5	3,300,000	4,500,000	7%	1,155,000	8,955,000

* The only contractor in our sample selling a part of the produce directly to the exporter
** Interest expense is included in the Total Cost of these contractors

Cost per acre for our sample is Rs. 317,780 per acre while cost per crate is Rs. 369. As opposed to growers, the cost per acre is higher for more productive orchards (a simple regression of cost/acre over kg/tree indicates a positive relationship at 10% level of significance). This is as expected since the more the produce, the more labour and materials are required for harvesting and packaging. Size of the orchard, on the other hand, again has no bearing on cost/acre indicating an absence of economies/diseconomies of scale. Similarly, the district in which the orchard is located still has no significant effect on the cost/acre.

As with growers, there is a lot of variation in terms of the size of contractors in our sample; the orchard size ranges from 4 acres to 250 acres. However, orchard size, as well as, number of fruit bearing trees in the orchard have no significant relationship with expected production⁴ (kg/tree) again supporting our earlier conclusion about returns to scale.

The contract price ranges from as low as Rs. 50,000 per acre to as much as Rs. 300,000 per acre. However, the expected productivity (kg/acre) has no significant impact on the contract price per acre that the contractors pay. This finding lends support to our earlier result that growers are not rewarded for more productive orchards.

Next I report various measures of profitability (Total Profit, Profit per Acre, Profit per Crate and Profit per Kilogram). I also calculate Returns on Investment based on the investment required to establish a similar business as reported by the contractors (ROI = Profit / Investment requirement).

⁴ As estimated by the contractor.

Table 7: Profits for mango contractors

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Average Price per crate (Rs)	Quantity Sold (crates)	Sales Revenue (Rs)	Total Cost (Rs)	Total Profit (Rs)
1	6	100	475	2050	973750	740,875	232,875
2	125	2900	625	90000	56250000	47,881,250	8,368,750
3	44	1040	491.67	50000	24583333.3	15,640,000	8,943,333.33
4	4	85	483.33	2600	1256666.67	864,833	391,833.67
5	8	200	500	9000	4500000	3,005,000	1,495,000
6	75	1875	583.33	60000	35000000	26,000,000	9,000,000
7	7	150	550	5500	3025000	2,457,125	567,875
8	10	250	650	7500	4875000	3,487,500	1,387,500
9	10	240	600	7000	4200000	3,150,000	1,050,000
10	7	325	550	13000	7150000	4,395,000	2,755,000
11*	26	520	900	11667	13860300	7,041,721	6,818,579
12	9	355	500	7500	3750000	2,631,250	1,118,750
13	250	4800	650	180000	117000000	80,065,000	36,935,000
14	30	900	525	27500	14437500	8,810,625	5,626,875
15	7	120	450	4800	2160000	1,431,200	728,800
16	62.5	1000	500	45000	22500000	12,418,750	10,081,250
17	100	2500	450	120000	54000000	30,780,000	23,220,000
18	25	450	500	14000	7000000	5,050,000	1,950,000
19	50	1875	562.5	66667	37500187.5	15,000,013	22,500,174.5
20	25	937.5	550	30000	16500000	8,955,000	7,545,000

* The only contractor in our sample selling a part of the produce directly to the exporter. The revenue from that transaction has been added to his Sales Revenue.

There is a positive effect of productivity (crates/tree) on the profits a contractor earns albeit at 10% level of significance. Thus, contractors managing more productive orchards are better off in terms of overall profitability. This is an important result since earlier we find that the expected productivity has no relationship with the contract price per acre that the contractors pay. Taken collectively this indicates that contractors are unwilling to share the rewards of higher productivity with the growers. Higher productivity does not translate into greater profits for the grower. Again larger contractors are able to earn higher total profits and this relationship is statistically significant

Figure 3: Relationship between profits of contractors and orchard size

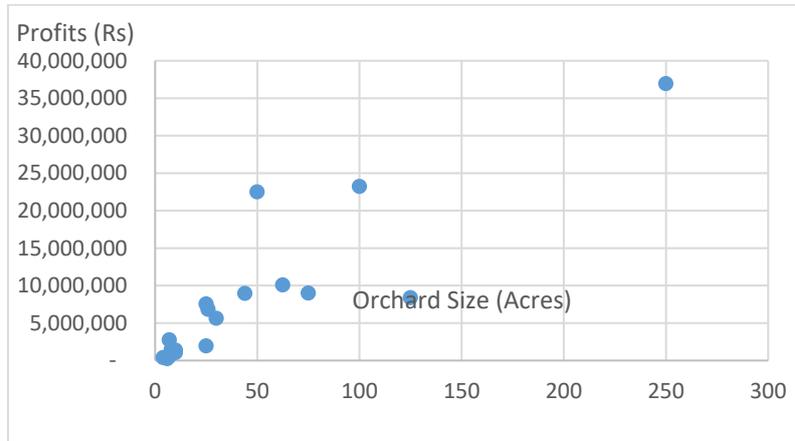


Figure 4: Relationship between profits of contractors and expected production

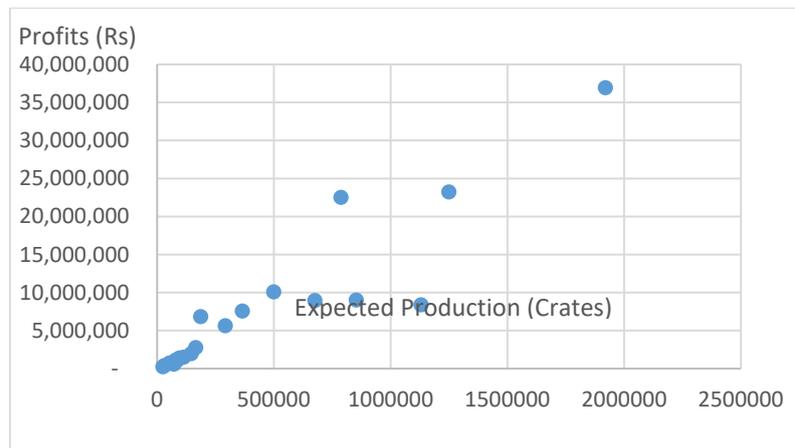


Table 8: profits of contractors (per acre)

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Sales Revenue (Rs)	Total Cost (Rs)	Revenue / acre (Rs)	Cost / acre (Rs)	Profit / acre (Rs)
1	6	100	973750	740,875	162291.67	123,479.17	38,812.5
2	125	2900	56250000	47,881,250	450000	383,050	66,950
3	44	1040	24583333.3	15,640,000	558712.12	355,454.55	203,257.57
4	4	85	1256666.67	864,833	314166.67	216,208.25	97,958.42
5	8	200	4500000	3,005,000	562500	375,625	186,875
6	75	1875	35000000	26,000,000	466666.67	346,666.67	120,000
7	7	150	3025000	2,457,125	432142.86	351,017.86	81,125
8	10	250	4875000	3,487,500	487500	348,750	138,750

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Sales Revenue (Rs)	Total Cost (Rs)	Revenue / acre (Rs)	Cost / acre (Rs)	Profit / acre (Rs)
9	10	240	4200000	3,150,000	420000	315,000	105,000
10	7	325	7150000	4,395,000	1021428.57	627,857.14	393,571.43
11*	26	520	13860300	7,041,721	533088.46	270,835.42	262,253.04
12	9	355	3750000	2,631,250	416666.67	292,361.11	124,305.56
13	250	4800	117000000	80,065,000	468000	320,260	147,740
14	30	900	14437500	8,810,625	481250	293,687.5	187,562.5
15	7	120	2160000	1,431,200	308571.43	204,457.14	104,114.29
16	62.5	1000	22500000	12,418,750	360000	198,700	161,300
17	100	2500	54000000	30,780,000	540000	307,800	232,200
18	25	450	7000000	5,050,000	280000	202,000	78,000
19	50	1875	37500187.5	15,000,013	750003.75	300,000.26	450,003.49
20	25	937.5	16500000	8,955,000	660000	358,200	301,800

* The only contractor in our sample selling a part of the produce directly to the exporter. The revenue from that transaction has been added to his Sales Revenue.

Profits/acre accruing to the contractors are not related to the orchard size indicating that the scale of the contractor has no role in terms of relative profitability. Further there is an insignificant effect of productivity on (per unit) profitability of the contractors.

The contractor who sells part of his produce to the exported has significantly higher profits per acre than the sample average (Rs. 171172/acre) and is ranked 4^h in terms of relative (per unit) profitability.

Another important comparison is between contractors who obtain advances from, and hence pledge their produce with, a commission agent and those who use their own funds or borrow money from a financial institution. In our analysis, one contractor who uses both his own funds and advance from the agent in equal proportions is treated the same as those who have taken an advance. A regression of profits/acre on “source of funds” dummy indicates no significant relationship. Given the opportunity cost associated with using one’s own funds or borrowing from the bank, it seems that taking an advance from the commission agent, even when it reduces the freedom of selling the produce elsewhere, is a better option in terms of marketing channels. In other words, we have some preliminary evidence that the traditional business model where contractors obtain finances from the commission agents is not necessarily less efficient than the more contemporary approach of using own funds or bank loans.

Moreover, there is a highly significant positive relationship between profits per acre and the number of fruit bearing trees per acre. This is in line with the abovementioned finding that higher productivity (now being measured in terms of plant density) leads to greater profitability

for the contractors. More specifically, there are four contractors in our sample that are managing orchards with a plant density of greater than or equal to 35 plants per acre and 16 contractors for whom it is less than 35 per acre. The profits per acre for the former are more than 2.5 times as much as the latter. The plant density, on the other hand, for the former is just 1.8 times greater than that for the latter. So it seems that increasing the plant density has a more than proportionate effect on profitability of the contractors.

Table 9: Profits of contractors (per crate)

Contractor #	Expected Sales (Crates)	Number of Fruit Bearing Trees	Sales Revenue (Rs)	Total Cost (Rs)	Revenue / crate (Rs)	Cost / crate (Rs)	Profit / crate (Rs)
1	2050	100	973750	740,875	475	361.4	113.6
2	90000	2900	56250000	47,881,250	625	532.01	92.99
3	50000	1040	24583333.3	15,640,000	491.67	312.8	178.87
4	2600	85	1256666.67	864,833	483.33	332.63	150.7
5	9000	200	4500000	3,005,000	500	333.89	166.11
6	60000	1875	35000000	26,000,000	583.33	433.33	150
7	5500	150	3025000	2,457,125	550	446.75	103.25
8	7500	250	4875000	3,487,500	650	465	185
9	7000	240	4200000	3,150,000	600	450	150
10	13000	325	7150000	4,395,000	550	338.08	211.92
11*	16334	520	13860300	7,041,721	848.56	431.11	417.45
12	7500	355	3750000	2,631,250	500	350.83	149.17
13	180000	4800	117000000	80,065,000	650	444.81	205.19
14	27500	900	14437500	8,810,625	525	320.39	204.61
15	4800	120	2160000	1,431,200	450	298.17	151.83
16	45000	1000	22500000	12,418,750	500	275.97	224.03
17	120000	2500	54000000	30,780,000	450	256.5	193.5
18	14000	450	7000000	5,050,000	500	360.71	139.29
19	66667	1875	37500187.5	15,000,013	562.5	225	337.5
20	30000	937.5	16500000	8,955,000	550	298.5	251.5

* The only contractor in our sample selling a part of the produce directly to the exporter. The revenue and sales from that transaction has been added to his Sales Revenue and quantity sold.

Average profits per crate for the entire sample are approximately Rs. 199 per crate. Compared to the average cost per crate of Rs. 369, this represents 54% of the cost. The returns

as a percentage of operating cost for the contractor who sells a part of the produce to the exporter are significantly higher than this average at 97%. These higher returns imply that contractors may be better off exploring new marketing channels for their produce rather than solely relying on commission agents. The reason is that selling the produce to the exporters adds more to the revenue than the cost of the contract. Again, this result needs to be treated carefully as we have only one such contractor in our sample, however it is an interesting research opportunity and policy direction.

There is no evidence of a significant relationship between per crate profits and source of funding, lending support to our earlier finding mentioned above.

Table 10: Profits of contractors (per kg)

Contractor #	Expected Sales (Kgs)	Number of Fruit Bearing Trees	Sales Revenue (Rs)	Total Cost (Rs)	Revenue / kg (Rs)	Cost / kg (Rs)	Profit / kg (Rs)
1	25625	100	973750	740,875	38	28.91	9.09
2	1080000	2900	56250000	47,881,250	52.08	44.33	7.75
3	650000	1040	24583333.3	15,640,000	37.82	24.06	13.76
4	31200	85	1256666.67	864,833	40.28	27.72	12.56
5	108000	200	4500000	3,005,000	41.67	27.82	13.85
6	780000	1875	35000000	26,000,000	44.87	33.33	11.54
7	66000	150	3025000	2,457,125	45.83	37.23	8.6
8	90000	250	4875000	3,487,500	54.17	38.75	15.42
9	84000	240	4200000	3,150,000	50	37.5	12.5
10	156000	325	7150000	4,395,000	45.83	28.17	17.66
11*	140004	520	13860300	7,041,721	99	50.3	48.7
12	75000	355	3750000	2,631,250	50	35.08	14.92
13	1800000	4800	117000000	80,065,000	65	44.48	20.52
14	275000	900	14437500	8,810,625	52.5	32.04	20.46
15	48000	120	2160000	1,431,200	45	29.82	15.18
16	450000	1000	22500000	12,418,750	50	27.6	22.4
17	1200000	2500	54000000	30,780,000	45	25.65	19.35
18	140000	450	7000000	5,050,000	50	36.07	13.93
19	666670	1875	37500187.5	15,000,013	56.25	22.5	33.75
20	360000	937.5	16500000	8,955,000	45.83	24.88	20.95

Contractor #	Expected Sales (Kgs)	Number of Fruit Bearing Trees	Sales Revenue (Rs)	Total Cost (Rs)	Revenue / kg (Rs)	Cost / kg (Rs)	Profit / kg (Rs)
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* The only contractor in our sample selling a part of the produce directly to the exporter. The revenue and sales from that transaction has been added to his Sales Revenue and quantity sold.

The average per kilogram price the contractors receive from the wholesale market is Rs. 52 (excluding the contractor who sells a part of the harvest to exporter. He receives a price of Rs. 99 per kg on average). The average cost per kilogram is approximately Rs. 34 (Rs. 50 for the contractors selling to exporters) netting an average profit in excess of Rs. 18 (almost Rs. 49 for the exception).

The estimated total sales as reported by the contractors in our sample is 8,225,499 kilograms or 8,225 tonnes (205,640 maunds approximately) during the 2018 season.

Table 11: Returns on investment (Contractors)

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Source of Financing	Investment Requirement (Rs)	Total Profits (Rs)	ROI
1	6	100	Self	600,000	232,875	38.81%
2	125	2900	Commission Agent	10,000,000	8,368,750	83.69%
3	44	1040	Financial	4,250,000	8,943,333.33	210.43%
4	4	85	Self	450,000	391,833.67	87.07%
5	8	200	Financial	500,000	1,495,000	299.00%
6	75	1875	Commission Agent	7,500,000	9,000,000	120.00%
7	7	150	Self	1,000,000	567,875	56.79%
8	10	250	Commission Agent	1,000,000	1,387,500	138.75%
9	10	240	Commission Agent	1,000,000	1,050,000	105.00%
10	7	325	Self	2,500,000	2,755,000	110.20%
11*	26	520	Self	3,000,000	6,818,579	227.29%
12	9	355	Self	650,000	1,118,750	172.12%
13	250	4800	Commission Agent	10,000,000	36,935,000	369.35%
14	30	900	Commission Agent	3,000,000	5,626,875	187.56%
15	7	120	Self	1,250,000	728,800	58.30%
16	62.5	1000	Self	10,000,000	10,081,250	100.81%
17	100	2500	Commission Agent	7,500,000	23,220,000	309.60%
18	25	450	Self	2,500,000	1,950,000	78.00%

Contractor #	Orchard Size (Acres)	Number of Fruit Bearing Trees	Source of Financing	Investment Requirement (Rs)	Total Profits (Rs)	ROI
19	50	1875	Commission Agent	5,000,000	22,500,174.5	450.00%
20	25	937.5	Commission Agent	3,500,000	7,545,000	215.57%

* The only contractor in our sample selling a part of the produce directly to the exporter.

In the above table returns on investment are calculated as profits as a percentage of investment required to establish a similar orchard as reported by the contractor, i.e., $ROI = \text{Profit} / \text{Required Investment}$.

The last column indicates that the estimated returns on investment are staggering as compared to the growers that we have interviewed. For instance, the average ROI for the contractors is 200% compared to approximately 3% for the growers. The main reason seems to be that the contractor has a relatively small amount of his own funds invested in the business relative to the sales volume. This is especially true when the contractor takes advances from the commission agent or a loan from the bank; contractors who use their own funds earn 112% as compared to 238% and 220% accruing to contractors taking advances from agents and bank loans, respectively.

Our assertions regarding investment requirements are further supported by the finding that investment requirement per acre for contractors is Rs 85,400 while for growers it stands at Rs 5,167,575. Thus investment requirements for growers is 60 times that for contractors while their ROI is 37 times less.

Nevertheless, the return on investment is positively related to orchard size at 5% level of significance. Again, similar to the growers, expected productivity (kg/tree) has no significant impact on ROI.

4 Conclusion

4.1 Main Results

Based on the information gathered from growers and contractors in Punjab, following are our main findings. It is important to note that the responses of growers and contractors seem to be consistent across most categories lending support to the validity of our analysis.

1. A majority of our growers consider mango farming a part time occupation and not their main source of income. Similarly, more than half the contractors in our sample indicate that mango contracting is not their full time occupation.
2. The main reasons given by growers for contracting out their orchards rather than selling their produce directly in the market are “convenience” and “absentee landlord”.

The top reasons cited by contractors for selling the produce through a commission agent are “convenience”, “not having access to other market participants (wholesalers, retailer, etc)” and “have always done it through a commission agent”. Four contractors also stated that it is “less risky” if a commission agent is involved.

Given these factors, and that many may not have time to manage their product on their own as this as a part time occupation for them, it seems that growers and contractors are not very interested in making the effort to market their produce directly in the domestic or international markets.

Another important consideration may be related to risk management: by using the existing marketing channel the growers might be able to mitigate risk (both associated with supply and demand) by transferring that risk to the contractors, who in turn try to transfer this risk to the commission agents (by obtaining advances and securing a stable point of sale in the market).

3. Further, in case of contractors, there is no significant relationship between profitability (profits/acre) and “source of funds”. Given the opportunity cost associated with using one’s own funds or borrowing from the bank, it seems that taking an advance from the commission agent, even when it reduces the freedom of selling the produce elsewhere, is a better option in terms of marketing channels. (Note that according to the contractors and commission agents we interviewed there are no explicit financial charges on the advances made by agents to the contractors).

In other words, we have some preliminary evidence that the traditional business model where contractors obtain finances from the commission agents is not necessarily less efficient from their point of view than the more contemporary approach of using own funds or bank loans. As one contractor in our sample mentions, he has to “pay commission anyway so why not take advance” from the commission agent.

4. A majority of the growers want to continue with their business in the future because “it generates sufficient income”, has “good future prospects”, and because “switching to another business is difficult either due to age” or “risks involved”.

Similarly, almost all (nineteen) contractors also want to continue with their business in the future and the most common reason for continuing with the business is that “it generates sufficient income”.

5. The relationship between the grower and the contractor seems to be informal but long term; a way to mitigate risk perhaps. Similarly most contractors have a long term relationship with the commission agents which probably ensures stable sales. Adding legality and formality may increase transaction costs if the current informal setup is already working efficiently.
6. The top three criteria used by growers for selecting a pre-harvest contractor are “previous experience with the same contractor”, “offered the best price” and “good reputation. The contractors, on the other hand, indicate that “good reputation” and “previous experience with the same farmer” are the most important criteria for selecting a grower. Very few respondents mention lowest price as the basis of selection. Similarly, the most common criteria for selecting a commission agent is “previous experience with the same contractor”, followed by “good reputation”.
7. The only major statistics where responses of growers and contractors do not match are the yield estimates; yields reported by contractors – who do the actual harvesting - are consistently higher than those reported by the growers. Perhaps contractors tend to

overestimate productivity, or growers tend to underestimate productivity, or both. If that is the case then willingness to pay for an orchard will be greater than willingness to sell. Consequently, both will gain from trade (as long as $WTP > P > WTS$).

8. All the contractors collect market information. The main source of this information is commission agents themselves or contractors' representatives at the commission agents' offices, followed by other contractors. Very few get this information from government or farmers.
9. Use of information technology by growers and contractors in their business is non-existent.
10. Only three of the 21 growers in our sample reported any recent innovations (high density plantation and pruning). Similarly, only five of the 20 contractors have had any innovations and even for most of them this has been limited to putting mattresses on the ground during harvest to reduce wastage. However, all of them are satisfied by the outcome of these innovations.
11. None of the 41 respondents have crop insurance; 30 indicate that crop insurance is not available, and seven indicate that they are not aware if such a facility existed.
12. The most commonly cited barrier to entry by growers is "capital requirement" mainly due to high land prices. This is followed by "high risk exposure". Less difficult process of bank loan application is also mentioned but not frequently.

For contractors the top barriers to entry are experience/skills, high risk exposure and capital requirements. Harvesting skills, linkages with other market participants and lack of financing by banks are rarely mentioned.

13. Although it is generally accepted that mango contracting requires experience and skills to form estimates about production, orchard condition etc., most contractors have not received any training prior to entering the business. Any training has been by fathers or brothers.
14. There are a couple of respondents who appear rather 'unique' in our sample:
 - a. One grower is himself a commission agent and has direct access to the wholesale market. As compared to the remaining growers;
 - i. His costs are much higher as he has to take care of marketing and selling his produce on his own.
 - ii. He assumes higher risk as he is not transferring risks through contracting.
 - iii. This grower has to extend credit to his buyers in the wholesale market. Although the duration of contract is very short, such arrangements are undocumented and consequently add another risk factor.
 - iv. He earns above average profits but not the highest (An average profit of Rs 26/kg as compared to Rs. 17/kg for the sample).

- v. On the other hand, average profits per crate for the entire sample are approximately 300% of operating cost. The returns as a percentage of operating cost for the grower not using the contractor are significantly less at 134%.
- b. One contractor who sells a part of his output (30%) directly to an exporter;
 - i. Earns the highest profits per kg. In fact his profitability is almost 1.5 times as much as the next highest contractor and more than 2.5 times the sample average.
 - ii. Earns higher profits per acre than the sample average and is ranked 4th in terms of relative (per acre) profitability.
 - iii. The average profits per crate for the entire sample are approximately 54% of the cost. The returns as a percentage of operating cost for the contractor who sells a part of the produce to the exporter are significantly higher at 97%.

Thus we have two different sets of incentives for the grower and the contractor. For the grower, the lesser returns coupled with additional risks support the traditional way of doing business by the growers, i.e., selling their produce through contractors rather than selling directly to the wholesale market.

For the contractor, higher returns and different profitability measures relative to the sample imply that contractors may be better off exploring new marketing channels for their produce rather than solely relying on commission agents. The reason is that selling the produce to the exporters likely adds more to the revenue than the cost.

These observations need to be treated carefully as we have only one exception of each type in our sample.

- 15. Although, for the grower, the cost per acre is lesser for more productive orchards, expected productivity (kg/acre) has no significant bearing on the price per acre that the growers receive. This finding suggests that growers are not rewarded for more productive orchards.

Similarly, there is no significant effect of expected productivity (crates/tree) on the profitability of growers again suggesting that higher productivity does not translate into greater profits for the grower.

Profits/acre also have no significant relationship with the number of fruit bearing trees per acre. What this implies is that, again, farmers with more productive orchards (in terms of density of fruit bearing trees) are not rewarded.

All the above results are helpful in explaining the absence of innovations (including high density plantation, pruning, etc) and reluctance in moving away from traditional farming for expected productivity gains as such efforts are likely to go uncompensated.

- 16. With respect to contractors, those managing more productive orchards are better off in terms of overall profitability. On the other hand, expected productivity has no relationship with the contract price per acre that the contractors pay. Taken collectively

this indicates that contractors are unwilling to share the rewards of higher productivity with the growers and that higher productivity does not translate into greater profits for the grower.

As for per unit profitability, there is an insignificant effect of productivity on profitability/acre of the contractors.

However, as opposed to the case of growers, there is a significantly positive relationship between profits per acre and the number of fruit bearing trees per acre. This is in line with the abovementioned finding that higher productivity (now being measured in terms of plant density) leads to greater profitability for the contractors.

17. All the growers and contractors indicate that they are able to charge a quality premium for their orchard/produce. However, we are unable to substantiate this claim in case of growers. One measure of orchard quality is productivity but as discussed above productivity has no relationship with the orchard price received by the growers. There is limited evidence of quality premium being received by the contractors; the contractor selling to exporters receives a higher price for his produce. This may be due to the international demand for higher quality mangoes.
18. We do not find any evidence of economies/diseconomies of scale for either growers or contractors; size of the orchard has no bearing on cost/acre.
19. In terms of returns on investment, expected productivity (kg/tree) has no significant impact on ROI of the growers. More importantly, for the grower selling directly to the wholesale market ROI is significantly less than the sample average. We get similar results for the contractors in that expected productivity is again insignificant.
20. Most growers want their contractors to adopt better harvesting practices. Conversely, according to contractors, growers need to be more careful towards orchard upkeep and pre-harvest practices. High contract price is the other major concerns. Further, almost half of the contractors feel that nothing needs to be improved regarding the commission agents; the only major concern being the higher commission rates. Thus, in general, contractors seem to be satisfied with the ongoing marketing channels.

4.2 Preliminary Observations

1. Reluctance of growers in adopting modern farming practices, such as high density plantation, pruning, and improved crop management through fertilisation and pesticide application, has often been blamed for low productivity and lack of quality of Pakistani mangoes relative to other major mango producing countries. Our data indicates that the reason behind this attitude is that increases in farm productivity goes unrewarded in terms of profitability.

Further, contractors do get the benefits of greater productivity in the form of higher profits, however, they are not willing to share/transfer these additional profits to the grower.

Our conjecture is that unless the market mechanism somehow rewards growers for increased productivity it is futile to expect any significant changes in orchard

management and farming methods. Further, any projects/assistance aimed at permanently increasing farm productivity are likely to have limited success.

2. The other issue is that both growers and contractors are seemingly unwilling to let go of their existing marketing channels. Many of the respondents in our study consider mango as a part time occupation and a source of supplemental income. Convenience, absentee landlordism, lack of access to other market participants and convention, all seem to contribute to this attitude.

Given these predispositions, growers and contractors may not be willing to make the effort of marketing their produce directly in the domestic or international markets.

This argument is further supported by our finding that most growers and contractors think that their business generates sufficient income. Similarly “previous experience with the same participants” always takes priority over “best price” when choosing trading partners. In such circumstances, where market participants seem content with their existing situation, policy makers have their work cut out for them.

3. Moreover, the existing channels seem to be efficient, or at least successful, in mitigating risk for the growers, as well as, contractors. This is especially important since crop insurance is yet to establish itself as a viable alternative. An interesting aspect is that crop insurance schemes are available to some extent (ZTBL, Bank of Punjab, Government of Punjab Takaful Scheme, etc), most respondents in our sample are unaware of their existence. A couple who are aware of this facility consider it to be costly.

Another feature of the existing market chain is that it seems to be sufficiently capable of generating the requisite finances. For instance, as mentioned above, there is no significant relationship between contractor’s profitability and “source of funds”. Our guess is that the additional cost of bank loans / opportunity cost of using one’s own funds exceeds the costs associated with pledging the produce with a commission agent. In such a situation, taking an advance from the commission agent is apparently a better alternative.

Thus, at this moment in time, institutional provision of financial services is unable to provide the market participants with enough incentives to switch from their existing arrangements. The matters are further complicated by the perceptions that such arrangements, besides being more costly, also involve demanding application procedures and unnecessary formalities.

4. Another complication in this respect is that market participants are accustomed to informal relationships including financial arrangements. Introducing legalities and formal mechanisms to mitigate risk, without which participation of the financial sector is unlikely to happen, may increase transaction cost if the current informal setup is already working efficiently.

Coupled with the market structure where there is a necessary role of commission agents in the sale of produce, it is improbable that the involvement of financial institutions in this market will be demand driven. In other words, banks and insurance companies will need to take initiative in terms of developing appropriate financial instruments and

procedures appropriate for this market. It may prove to be a daunting task specially when dealing with the contractors who, in many cases, have no significant assets to serve as a guarantee.

5. Whatever limited evidence on the success of alternative marketing channels we have is far from unanimous. The grower who has direct access to the wholesale market, although grossing above average profits, earns lesser returns with additional risks than other growers selling their produce through contractors. On the other hand, the contractor who sells 30% of his mangoes to an exporter not only has the highest profitability but also the highest returns.

Thus, saying that the alternative marketing channels are always better than the existing ones seems premature and warrants further research. At the risk of being repetitive we must again mention that this particular result needs to be treated with caution as there is only one case of each type in our sample.

6. There is no systematic market information system, or at least most market participants are unaware that such a system is available (<http://www.amis.pk> is one such system). Consequently, participants have to rely on each other for provision of information which is likely to give rise to conflicts of interest. We suspect that introduction and success of an online MIS is not likely to be demand driven as the usage of information technology at any stage of this market is 'virtually' non-existent (no pun intended).
7. Pre-harvest Orchard management, contracting, harvesting, packaging and post-harvest management of produce, to name a few, require skills and expertise. However, there is no concerted effort at any level to instil these skills. Very few market participants receive any sort of training, and even those who do, do so informally (usually through learning by doing or family members). A few of the respondents in our sample have mentioned that the number of contractors has not changed over time because entries and exits are roughly equal. One reason for hasty exits may be because unskilled/inexperienced entrants are more likely to face losses and shut business. We believe that one avenue where government intervention may have immediate impact is provision of requisite skills particularly to growers and contractors.

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