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

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**Preliminary Report on the Growers' and Marketing Channel Surveys
(Chilli) in Sindh**

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Abstract

Pakistan, the world's fourth largest producer of chillies, but its share in global trade is much smaller, its exports held back by quality problems related to poor processing. We report here on results of surveys of farmers cultivating chilli in the districts of Umerkot and Mirpurkhas in Sindh, and the markets where they sell their produce. We find important differences related to farm size in output per land unit, cultivated varieties, the marketing channels used by producers, quality of product sold and prices received. Farmers are willing to explore new markets but they do not have the required skill or information to undertake such venture. Many farmers are forced to sell their harvests to contractors or commission agents who advance part of the price of their product before/during harvest, as they cannot afford the high cost of inputs and do not have access to formal financial institutions. We also find that small farmers do not (or cannot afford to) properly sort or grade their chillies which ultimately results in the lower price that they receive. Women are heavily involved in the cultivation process. However, they are totally absent in marketing and decision making. The survey reveals that there is demand for information regarding better farm management, training in modern chilli growing technology and access to formal credit among farmers and proving them with these facilities can increase productivity and help removing some of the inefficiencies present in this market. We did not find evidence that market intermediaries - the commission agents, wholesalers and retailers – charged excessive margins. But the majority of them agreed that the existing market infrastructure is inadequate to support a smooth trade of commodities.

Keywords

Horticulture, Chili, Farmers, Supply Chain, Pakistan

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Summary

Pakistan, the world's fourth largest producer of chillies, but its share in global trade is much smaller, its exports held back by quality problems related to poor processing. We report here on results of surveys of farmers cultivating chilli in the districts of Umerkot and Mirpurkhas in Sindh, and the markets where they sell their produce. We find important differences related to farm size in output per land unit, cultivated varieties, the marketing channels used by producers, quality of product sold and prices received. Our findings suggest that chilli farmers in Pakistan are less productive than some of the neighbouring countries. Even though the small farmers more productive than the medium and large farmers, they fetch comparatively lower prices in the market as they use different marketing channels. Small and medium farmers mainly sell their chillies through local trader or small commission agents, whereas, large farmers sell through large commission agents or online trading or sell directly to the exporters where both the price and the quality of chilli traded are higher. Farmers are willing to explore new markets but they do not have the required skill or information to undertake such venture. Many farmers are forced to sell their harvests to contractors or commission agents who advance part of the price of their product before/during harvest, as they cannot afford the high cost of inputs and do not have access to formal financial institutions. We also find that small farmers do not (or cannot afford to) properly sort or grade their chillies which ultimately results in the lower price that they receive. Women are heavily involved in the cultivation process. However, they are totally absent in marketing and decision making. Their wage is lower than the male labourers and they are subject to unethical behaviour from landlords. The survey reveals that there is demand for information regarding better farm management, training in modern chilli growing technology and access to formal credit among farmers and providing them with these facilities can increase productivity and help removing some of the inefficiencies present in this market.

The marketing survey, focused on the primary wholesale market, was conducted in the mundies of Kunri and Judho. We did not find evidence that market intermediaries - the commission agents, wholesalers and retailers – charged excessive margins. But the majority of them agreed that the existing market infrastructure is inadequate to support a smooth trade of commodities.

Introduction:

Pakistan is the one of the world's largest horticulture producing countries. In the last decade agricultural sector contributed about one fifth of its GDP and horticulture constituted about 5% of its agriculture. In 2015-16 it produced some 14.06 million tons of fruits, vegetables and condiments on 1.45 million hectares of land (Ministry of National Food Security and Research , 2016), whereas, total area under cultivation was around 23.2 million hectares (Ministry of Finance, 2016). The Government of Pakistan considers investing in horticulture as one of the potential source generating employment opportunities and growth of small producers (World Bank, 2015). However, due to various inefficiency in the process of harvesting, post-harvest handling and marketing coupled with inadequate infrastructure facilities, this sector suffers from huge wastage and is yet to achieve its full potential both in the domestic and international markets.

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

Like the other horticulture products in Pakistan, chilli suffers from low productivity, low quality, high wastage and low exports. The farmers use low yielding seeds. They do not have access to modern farming practices and techniques. High levels of aflatoxin are found in chili from Pakistan (above the international export standards). The EU allows up to 10 microgram

of Aflatoxin in chili, whereas a 2006 study found an average of 32.11 microgram aflatoxin in different chili samples collected from Pakistan (Patterson, 2006). About 10-12% of the produce is wasted due to poor post-harvest handling (Zahoor & Arocha, 2014). This is mainly caused by drying chilies on ground, which can be avoided using geotextile sheets while drying chilies in the sun.

There are several other impediments in the supply chain management. Previous studies (Zahoor & Arocha, 2014) show that commission agents have a significant share of market power. They provide loans to grower who are bound to sell the produce through them and often are charged a higher commission. Since commission agents profits depends on the volume of transaction there is incentive to increase margins by mixing different grades of chilies and keeping the moisture content high. This has serious implications for the level of aflatoxin and overall quality of chili that reaches the consumers. There is also a lack of direct relationship between growers and processors/exporters required to expand the export market.

The government of Pakistan and other national and international aid agencies have undertaken several projects to improve the production and marketing of chilli in Pakistan. USAID was in the process of building 588 solar dryers in Kunri to reduce the number of days required to dry the chilies from 8-10 days to 4-5 days under the project Agribusiness Support Fund. It projected a 20% growth in income for the chili farmers (Sindh Board of Investment). They also formed 100 Farmer Enterprise Groups and provided each farmer with 3 rolls of geotextile sheets and 19 plastic bins to help them efficiently drying chili and thereby reduce the post-harvest loss (USAID, 2013). GOP constructed 2 hot air dehydration units (at a cost of Rs192 millions) that can dry 30 tons of chili a day however, they have been closed in recent years. A spice company – National Food, with the help of MDF (MDF, 2016) and AUS AID are providing chili farmers geotextile sheets and an incentive of 14 cents/kg for producing

aflatoxin free chillies. They targeted to export 586 tons of chillies by 2016 directly from the farmers (Butt, n.d.).

Most of our findings are in line with the existing views in the literature. The surveys suggest that chilli farmers in Pakistan are less productive than some of the neighbouring countries. Even though the small farmers are more productive than the medium and large farmers they fetch comparatively lower prices in the market. Farmers are willing to explore new markets but they don't have the required skill or information to undertake such venture. Many farmers are forced to sell their harvest to commission agents or contractors, because they cannot afford the high cost of inputs and do not have access to formal financial institutions. Women are heavily involved in the cultivation process. However, they are totally absent in marketing and decision making. They also face lower wage and abuse from landlords. The survey reveals that providing information regarding better farm management, training farmers in modern chilli growing technology and giving them access to formal credit can increase productivity and remove some of the inefficiencies present in this market.

In contrary to the established notion about the middle men, we find that that the commission agents, wholesalers and retailers keep a very reasonable margin comparable to some other developing countries. Most of them are open about sharing market information among themselves. The majority also think that the existing market infrastructure is inadequate to support a smooth trade of commodities.

The rest of the report is organised as follows: section 2 presents a snapshot of chilli production, acreage and export scenario in Pakistan. Section 3 describes the surveys and the sample selection mechanism. Section 4 examines acreage and yields of different varieties of chillies; harvesting, aflatoxin management and other post-harvest practices adopted by farmers; describes the different marketing channels they use; and the cost, revenue and profits involved in chilli cultivation. It also investigates the depth or dearth of knowledge among chilli farmers

about the process of cultivation and marketing of chilli, the main challenges they face and illustrates the role of women in chilli production, processing and marketing. Section 5 describes the role played by local traders, commission agents, wholesalers and retailers in the supply chain, their way of trading, profit margins in chilli trade and the challenges they face. Finally, section 6 makes some policy recommendations based on our findings.

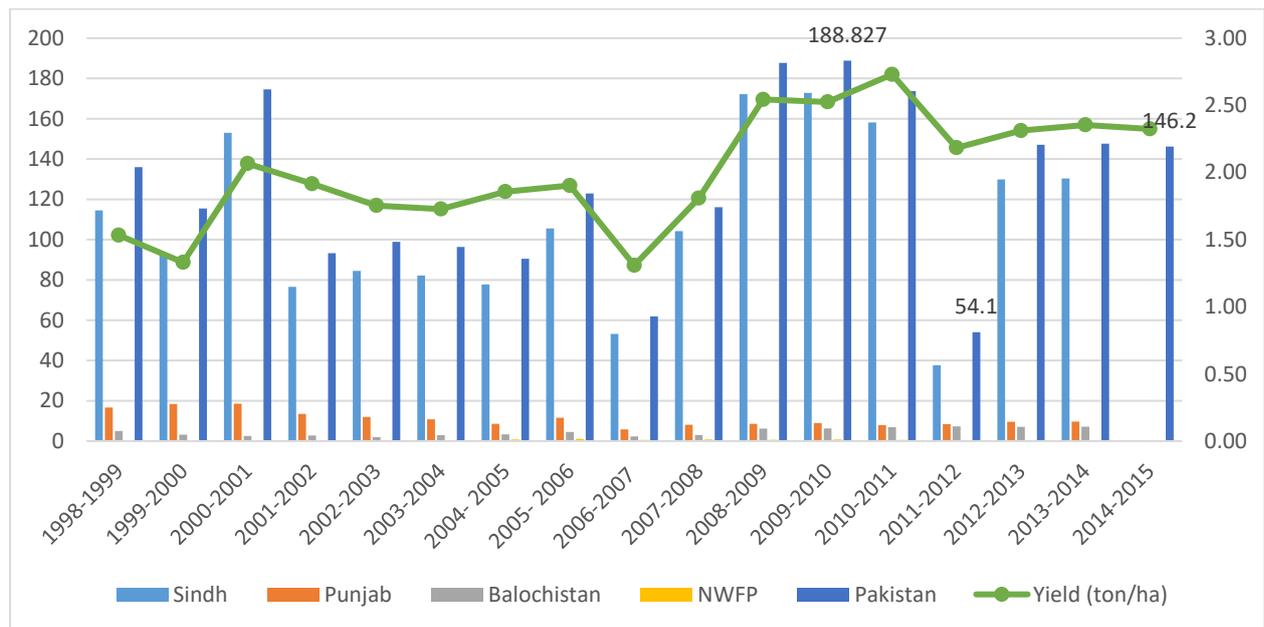
2. Chilli in Pakistan

Pakistan is the fourth largest producer of red chillies followed by India, China and Taiwan (FAO, 2018). In 2016 it produced about 3.41% of world's total supply of red chili. Sindh supplies about 85% of Pakistan's total production and Kunri (the chilli capital of Asia) produces about 55% of the total production in Sindh. The other major chili hubs in Pakistan are - Mirpurkhas, Sanghar, Badin, Tando, Muhammad Khan, Khairpur, Shikarpur and Ghotki. The major varieties produced in these different hubs are - Desi, Mexi, Nageena (mainly from Kunri), Talhari (mostly from Badin), Ghotki (from Ghotki and Khairpur), Dundicut or Longi (from Mirpurkhas)

The trend in chili production and acreage in Pakistan in the last two decades is presented in Figure 1 and Figure 2. Production declined in last the couple of years from around 189 thousand tons in 2010-11 to 146 thousand tons in 2014-15 with a sharp decline in 2011-12 to 54.1 thousand tons¹ (Ministry of National Food Security and Research , 2016). The decline in production in 2011-12 was mainly due to the decline in acreage under chili cultivation and partly due the decline in productivity.

¹ There are a few sources (Memon, 2015) that mention the same source but have different production and acreage statistics for year 2011-12. USAID (Zahoor & Arocha, 2014) reported that 24.7 thousand hectares were under chili cultivation in 2011-12 with a total production of 40.4 thousand tons.

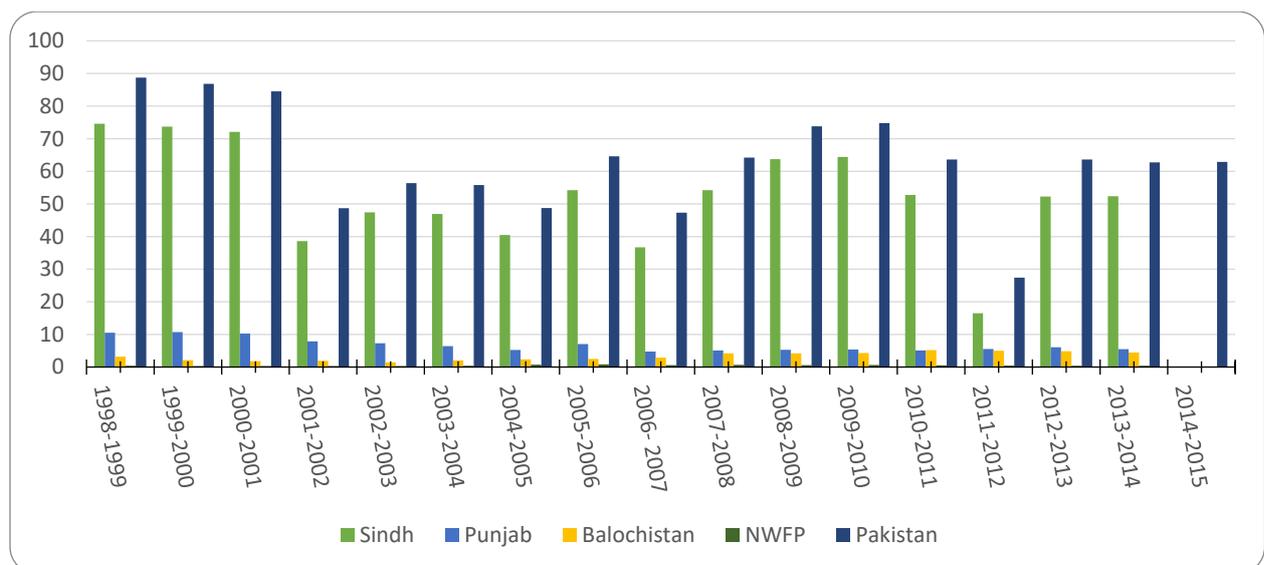
Figure 1: Production of red chillies in Pakistan (in '000 tons)



Source: Ministry of National Food Security and Research, Agricultural Statistics Pakistan.

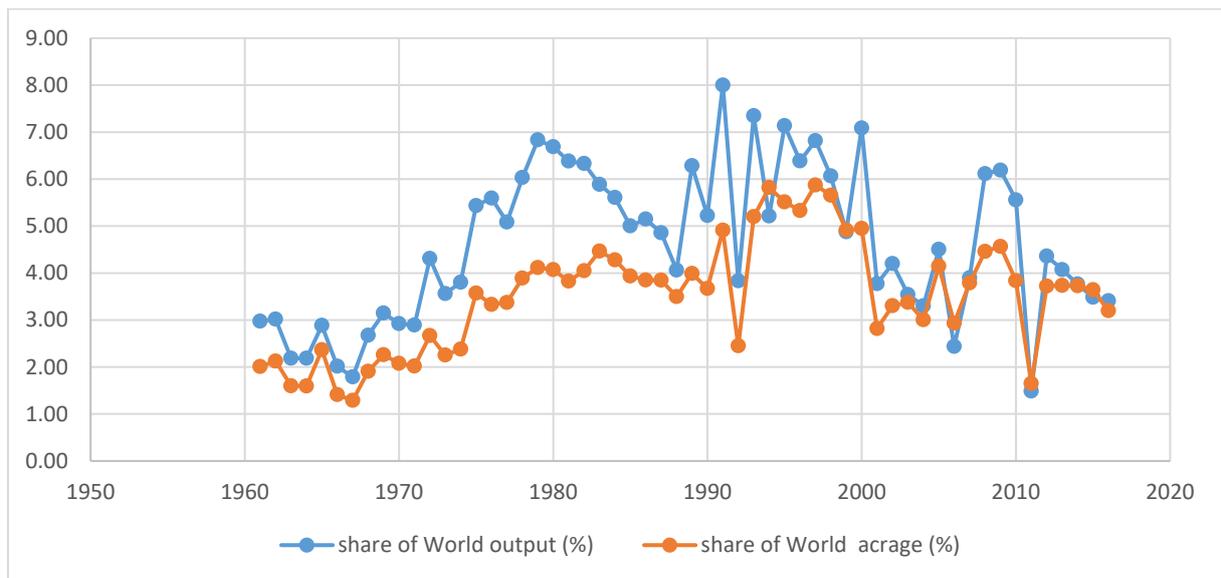
The productivity of chilli has increased in the last two decades from 1.5 tons per hectare in 1998-99 to about 2.23 tons per hectare in 2016-17 (Pakistan Bureau of Statistics, 2017). Productivity has increased mainly due to the increased production of hybrid chillies, however, it is much lower than those in China, Thailand and Sri Lanka (FAO, 2018).

Figure 2: Area under cultivation (in '000 hectares)



Source: Ministry of National Food Security and Research, Agricultural Statistics Pakistan

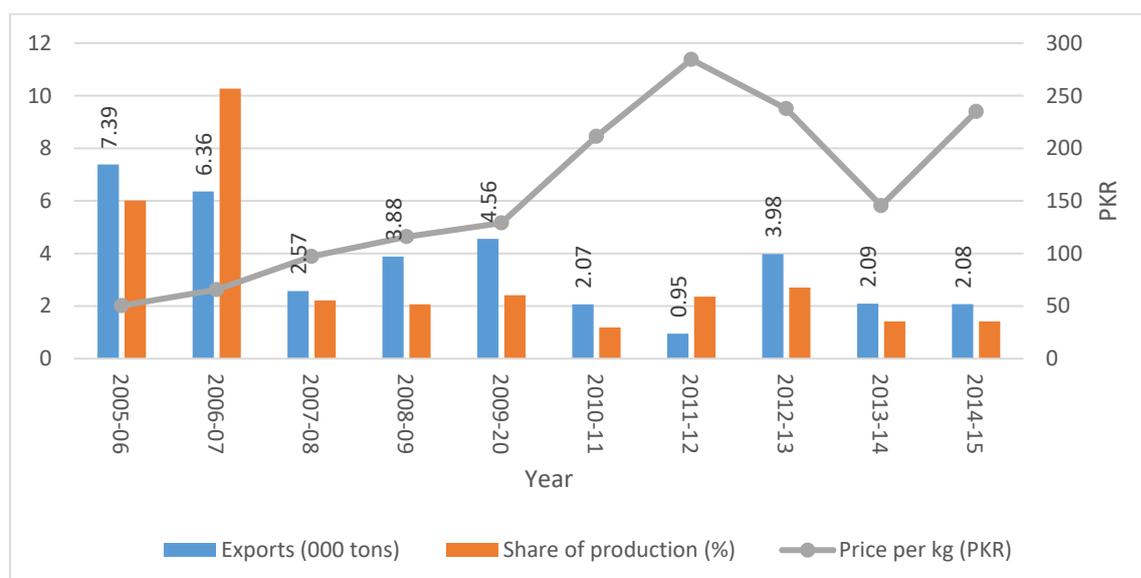
Figure 3: Chilli production and acreage in Pakistan



Source: FAOSTAT 2018

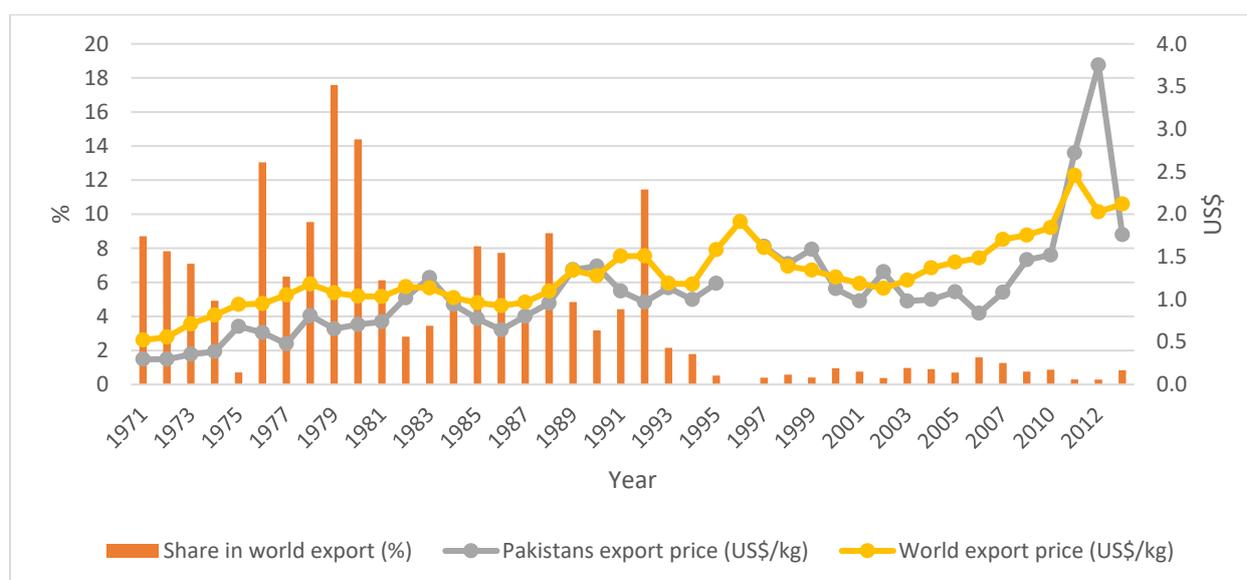
The share of Pakistan's contribution in world chilli production declined in the last decade along with its share of land under chilli cultivation. However, Pakistan seems to have a comparative advantage in chilli production as Pakistan's share of land under chilli cultivation has consistently been under its share of output over the last five decades – the yield rate in Pakistan is higher than that of the world (Figure 3). Despite this comparative advantage, Pakistan has not yet been able to capture a fair share in the world chilli export market. Exports of chilli from Pakistan decreased gradually over the last decade from 7.39 thousand tons in 2005-06 to only 2.08 tons in 2014-15 (Figure 4).

Figure 4: Export of red chillies from Pakistan



Source: Agricultural Statistics of Pakistan, Ministry of Food, Agriculture and Livestock, Government of Pakistan, Islamabad and Ministry of National Food Security & Research.

Figure 5: Share in world export



Source: FAOSTAT.

Pakistan mainly exports to the Middle Eastern countries (Saudi Arab, Bahrain, UAE etc.) Other major export destinations are Mexico, Senegal and USA (based on 2014-15 export destinations). One interesting feature is that the average export price of Pakistani dried red chili is lower than that of the Indian dried red chili. However India’s production is about ten times higher than that of Pakistan’s and India exports about 20% of its produce (Thamaraikannan,

Palaniapan, & Sengottuvel, 2011). This means the total quantity of chili exported by India is about 200% of Pakistan total production.

3. Survey

The horticultural marketing systems in Pakistan are inefficient and there is scope to improve the both the quantity and quality of the produce by modernising the supply chain. Available studies of the marketing systems are largely descriptive and not sufficiently detailed and rigorous to assess (and quantify) the extent of system inefficiencies and to identify the main sources of such inefficiency.

These surveys were the first step to assess the efficiency of the supply chain mechanism in chilli market. They were conducted to understand the growers' perspective and role of different middle men (local traders, commission agents, wholesalers and retailers) in the supply chain.

3.1 The growers' survey

3.1.1 Sample selection

The survey was carried out in two of the main chilli producing districts of Pakistan – Umerkot and Mirpurkhas. We selected one Tehsil from each of the districts – Kunri from Umerkot and Jhudo from Mirpurkhas. Pakistan Agriculture Council (PAC) operates in many of these chilli producing areas. To make the sample representative we selected one village where the PAC did not have its operation and two villages where farmers are registered with the PAC in the Kunri Tehsil. We also selected two villages from Jhudo Tehsil where farmers were not registered with the PAC. In total, in three of our five sample villages, farmers were not registered with the PAC.

From a population of 1200 households residing in these 5 villages we selected a total of 100 farmers – 20 from each village. The proportion of small (land ownership ≤ 12.5 acres), medium (land ownership 12.5 – 25 acres) and large farmers (land ownership ≥ 25 acres) are

47%, 27% and 26% respectively. Other studies² have found similar distribution of land ownership for farmers producing chilli in Pakistan (Hassan, Tabssam, & Iqbal, 2005). Khan et. al. (2017) find a distribution of 44.3%, 30% and 25.7% of small, medium and large chilli farmers in their study.

3.2 Marketing channel survey

3.2.1 Sample selection

The current marketing survey focuses on the agents in the primary wholesale market (mundi). We interviewed 10 local traders, 10 small commission agents, 10 big commission agents, 10 wholesalers (beuparies) and 10 retailers – 5 of each category from the mundies in Kunri and Judho. We therefore, have 50 market players in total in our sample.

4 Chilli farmers

4.1 Head of the household:

Farming is the main source of income for 89% of these households and 100% of the small farmers. 95% of the respondents are engaged in farming full time. The average family size in our sample is 10.28³ and the average age of the heads of the households is 49.45 years. All the heads in large farms in our sample can read and write (Table 1). However among the small farms 27% of the heads cannot read or write and the respective share among the medium farmers is 29.67%. 25% of the heads in small farms did not have any formal education and only 53.19% had a diploma or a university degree. The respective shares for medium and large farms where the head does not have any formal education are 7.41% and 15.38%; and the share of farms with heads with a diploma or university degree are 25.93% and 84.61% respectively. 89% of the heads are farmers themselves. Only 12% of the heads in small farms are agricultural labourer and 19.23% of the heads of large farm households are government service holders.

² The USAID (2013) report used a different classification. They defined farm size of less than 5 acres as small, farm size 5 -12.5 acres as medium and farm size > 12.5 as large.

³ According to the 2017 population census the rural household size is 6.8 (Pakistan Bureau of Statistics, 2018).

Table 1: Education and occupation of household head

	Small farms	Medium farms	Large farms	All
Education (%)				
Can read and write	72.66	70.37	100	79
No formal education	25.53	7.41	15.38	18
Diploma/university degree	53.19	25.93	84.61	54
Occupation (%)				
Farmer	87.23	100	80.77	89
Agricultural labor	12.77	0	0	6
Government service	0	0	19.23	5

4.2 Chilli production

4.2.1 Acreage

Chilli is the main crop cultivated during the Kharif season. During this season the small, medium and large farmers cultivate on average 6.72, 13.40 and 35.08 acres of land and approximately 71% of it is used to produce chilli. On average the small farmers cultivate Longi on 2.6 acres and Hybrid on 1.8 acres (Table 2). The medium farmers produce Longi on 4.4 acres and Hybrid on 4.1 acres. The respective acreage for the large farmers are 13.88 acres and 13.81 acres. On average small farmers produce Longi on 71% of their land in Rabi season, while medium and large farmers allocate 66% and 77% of their total Kharif area to chilli.

Table 2: Acreage and production (tons per acre) of chilli

	Small	Medium	Large	All
Longi				
Acreage	2.67 (1.30)	4.41 (0.84)	13.88 (6.88)	6.06 (5.93)
Productivity	1.14 (0.11)	1.05 (0.12)	1.06 (0.13)	1.1 (0.12)
Hybrid				
Acreage	1.83 (0.89)	4.11 (0.75)	13.80 (6.69)	5.56 (6.07)
Productivity	1.82 (0.08)	1.73 (0.1)	1.65 (0.09)	1.75 (0.11)

Note: Standard deviations are in the parenthesis.

4.2.2 Productivity:

The small farmer are slightly more productive than the medium and large farmers. On average a small farmer produces 1.14 tons of Longi and 1.825 tons of Hybrid per acre of land

(Table 2). The productivity of medium and large farmers per acre are 1.05 tonnes and 1.06 tonnes for Longi and 1.725 tons and 1.65 tons for Hybrid respectively. This is consistent with the findings of other studies on farm size and productivity in Pakistan and other developing countries (Mahmmod, Qasim, Khan, & Hussain, 2014; Sial, Iqbal, & Sheikh, 2012; Kiani, 2008; Heltberg, 1998; Carletto, Savastano, & Zeazza, 2013; Barrett, Bellemare, & Hou, 2009). Sial et al. (2012) find that in central Punjab productivity of small farms (farm size <125 acres) is on average 18.6% higher than that of large farms (farm size ≥ 12.5 acres)⁴. In another study, Kiani (2008) finds that small and large farms are more productive than the medium farms however, the differences in productivities are not statistically significant.⁵

Overall, productivity of chilli is low in Pakistan compared to other South Asian chilli producing countries. For example, in Sri Lanka yield rate was 2.08 tons/acre in 2015. With modern farming technology and new hybrid seeds the productivity could be increased up to 13 tons per acre (Field Crop Research and Development Institute, 2018).

4.2.3 Harvesting

Harvesting begins in August and continues until October. 65% of the large farmers and 26% of the medium farmers use permanent labor to harvest the crop, whereas, all the small farmers do the harvesting themselves with the help of some hired labor. On average chilli is picked 4-6 times during the season. About a quarter of the farms require 4 pickings and about a third of all types of farmers pick chillies 5 times a season.

4.2.4 Post-harvest practices

51% of the farmers report that their chillies are not sorted. Most of them are small farmers. Only 29.79% of the small farmers sort the good chillies into a separate grade and take them to

⁴ Some other studies show that this inverse relationship exists but not for all crops. Ahmad and Qureshi (1999) show that for rice and sugarcane the relationship is positive. Deriere and Jolliffe (2018), find that the inverse relationship is an artefact of reporting bias. Measurement error in self-reported production data is responsible for the inverse relationship, at least in case of Ethiopia.

⁵ We cannot test the statistical significance of the differences in productivity in our sample due to the small sample size.

the market separately (Table 3). 65% of the large farms separate the chillies with black spot. Chillies are dried for less than two weeks in our sample villages and packed in jute bags for transportation. 56% of the farmers do not have any knowledge of how the chillies are packed or processed after they are sold in the mundi.

Table 3: Post-harvest practices (%)

	Small	Medium	Large	All
No sorting	70.21	44.44	23.08	51.00
Separate good chillies	29.79	55.56	11.54	32.00
Separate chillies with black spot	0	0	65.38	17
Drying 1-2 weeks	100.00	100.00	100.00	100.00
Transported in jute bags	100.00	100.00	100.00	100.00
Post marketing packaging	55.32	33.33	80.77	56.00

4.3 Marketing:

4.3.1 Existing channels:

Table 4: Marketing channels (per 40kg Longi)

Type of farm		Small CA	Big CA	Online trading	Export/self marketing	Local trader	Total
Small	Quantity	228.19	0	0	0	69.23	297.42
	Price (PKR)	5734	-	-	-	5514	5682.79
Medium	Quantity	175.92	0	79.81	0		255.74
	Price (PKR)	6000	-	7284.61	-		6400.66
Large	Quantity	0	33.65	154.34	185.85		373.84
	Price (PKR)	-	7000	7846.15	8937.5		8312.53

Even though the productivity is highest for the small farmers, they fetch the lowest price for both varieties of chillies in the market (Table 4). On average a small farmer received Rs5687.79 for 40kg Longi and PKR4234 for 40 kg Hybrid. The respective average prices received by medium farmers were PKR6400 and PKR4462 and those of large farmers were PKR8312 and PKR4750. The large farmers on average received 46% higher price than the small farmers and 30% higher prices than the medium farmers for Longi. The price differentials

for Hybrid chillies are lower- 12.19 % higher than small farmers and 6.45% higher than medium farmers.

The main reason why large farmers capture a higher price for their product lies in the marketing mechanism. Small farmers sell their products through small commission agents and local traders whereas, the large farmers sell most of their produce through online trading or sell them to exporters. The medium farmers lie in between. They sell most of their products through small commission agents and a small amount through online trading. The price of chillies varies greatly across these markets. The average price of 40/kg Longi is PKR8937.5 in the export market, PKR7654.74 in the online trading market, PKR7000 in the mundi if selling through big commission agents and PKR.5850 if selling through a small commission agent. The lowest price is received from the local traders.

It is not clear why small and medium farmers do not switch to other marketing channels to secure higher prices of their products. It could be their lack of knowledge of other potential marketing channels. It could also be the quality of their produce that hinders their entrance into the high price markets. Table 3 shows that 70% of the small farmers do not sort their chillies. Small farmers use mainly family labour for harvesting and post harvesting activities and they probably cannot afford to hire labour to sort the chillies, even though they know that sorting would result in higher prices.

4.3.2 Exploring other marketing channels

87% of the small farmers think that it is difficult to switch to other marketing channels and only 12.77% of them have ever tried to use a channel different from the one they currently use. Even though they are getting a lower price compared to the medium and large farmers all of them are satisfied with their current marketing channel. Most of them believe that (87.23%) it is too risky to explore other channels and it's probably because they do not have the skills required to do so. The rest of the small farmers (12.77%) report that it is costly to prepare the

chilli for other markets. Similar patterns were found for medium and large farmers except for those selling in the export market.

4.3.3 Method of payments:

Only a small fraction of farmers get full payment at the time of sale (12.77% small farmers, 14.81% medium farmers and 30.77% large farmers). The rest get the price of their produce in split payments of cash and kind (mainly fertilizer). This also explains to some extent the finding that many (49%) of our sample farmers were forced to sell their product to the commission agents.

4.3.4 Revenue, cost and profits:

The per-acre cost of producing Longi is much lower than that of hybrid (Table 5). However, the productivity of hybrid chilli is much higher than that of Longi and is therefore slightly more profitable for farmers. On average the medium farmers have higher cost of production per acre compared to the large and small farmers. They also have the lowest revenue per acre (even though they fetch a higher price in the market than the small farmers). On average a medium farmer earns PKR114245.8 from an acre of Longi and PKR109986.1 from hybrid chillies. The profits of small and large farmers are PKR109284/acre and PKR114254.8/acre from Longi; and PKR113029.8/acre and PKR121469.2/acre from hybrid chillies.

One reason for medium size farms being the least profitable is their higher average cost of production. They use mostly hired labour for cultivation, harvest and post-harvest activities, whereas, small farmers use mainly family labour and large farmers use permanent labour which are less costly than hired labour. The average cost of harvesting, processing and marketing does not vary much across these three groups of farmers. However, the large farmers have the lowest cost (due to economies of scale) of land preparation, nursery preparation, transplantation, weeding and irrigation followed by small and medium farmers.

Table 5: Revenue, cost and profits per acre

	Small	Medium	Large	All
Longi /acre				
Revenue	168191.5 (20488)	159814.8 (19781.6)	168461.5 923041.8)	166000 (21123.6)
Cost	58907.45 (3798.2)	61175.93 (7994.5)	54215.77 (6308.1)	58300 (6352)
Production cost	38983 (4162.74)	42607.41 (8889.41)	35700 (5454.47)	39108 (6535.59)
Profit	109284 (20036.5)	98638.89 (32749.1)	114254.8 (20501.01)	107699 (21809.04)
Hybrid/acre				
Revenue	193297.9 (19554)	192500 (23101)	195288.5 (16360.4)	193600 (19660.4)
Cost	80268.09 (3895.2)	82513.89 (9520.6)	73819.23 (5616.8)	79197.75 (7076.4)
Production cost	48383 (4162.74)	52007.41 (8889.41)	45100 (5454.47)	48508 (6535.59)
Profit	113029.8 (20200.7)	109986.1 (24715.07)	121469.2 (17186.15)	114402.3 (21070)

Note: Standard deviations are in the parenthesis.

4.4 Market Information

4.4.1 Sources of information

Table 6: Source of market information (%)

	Small	Medium	Large	All
Radio/TV	0	0	0	0
Newspaper	0	3.7	34.62	10
Mobile	72.34	88.89	76.92	78.00
Trader	100.00	100.00	100.00	100.00
Neighboring farmer	100.00	100.00	100.00	100.00
Commission agents	0	0	19.23	5.00
Pesticide companies	0	44.44	69.23	30.00
Agricultural extension officer	38.30	88.89	88.46	65.00
Government website	0	0	0	0

Farmers' most important sources of market information are traders and neighbouring farmers. About three quarters of them also get information via mobile text messages. Only a small fraction (10%) of farmers get market information from newspaper (Table 6). Commission agents seem to play an insignificant role in this regard. Another important source of information is the agricultural extension officer (AEO). However, as AEOs mainly work with large and (or) better educated farmers (Davidson, Ahmed, & Ali, 2001) they are an important source of

information only for the medium (88.89%) and large (88.46%) farmers. The medium and large farmers also use the pesticide companies as a source of market information. Radio/TV and government websites play no role in providing marketing information to farmers.

4.4.2 Type of information

Farmers are mainly interested to receive information about new and better marketing channels for their produce. They are aware of the fact that they can get better prices if they can improve the quality of the chilli they produce and have information and contacts in those upper end markets. 80% of the sample farmers want to know how they can produce chilli for the export market, 40% of the farmers want information on aflatoxin management to improve the quality and about 70% of them want to have information on better marketing methods and contacts in those markets (Table 7). This implies that if they are provided with this information they would be willing to explore new and better marketing channels for their produce.

Table 7: Type of market information (% of farmers)

	Small	Medium	Large	All
How to produce export quality chilli	78.72	74.07	88.46	80.00
Better marketing	70.21	62.98	61.54	66.00
Contacts in other markets	72.34	66.67	69.23	70.00
Aflatoxin management	34.04	44.44	46.15	40.00

4.4.3 Knowledge of farmers

69% of the farmers do not know that they need to register as chilli growers with the PAC. The rest knows about the requirement but none of them are registered. 76% of the farmers are not aware of the marketing committee and 51.32% of them are small farmers (Table 8). Of those who are aware of the marketing committee, none is registered with them. 56% of them are not aware of any kind of training available in chilli production and processing. However among those who know about such training, all the small and medium farmers and 66% of large farmers have undertaken some formal training. The large farmers who did not participate in any training program but were aware of them thought that they were competent enough in

their trade and did not require any kind of training. Only 53% of the farmers took proper steps to control for aflatoxin. 61% of the large farmers, 66% of the medium farmers and 40.34% of the small farmers used temperature control and dried chillies on sheets to manage aflatoxin contamination. Even though not all the farmers in our sample took steps to control for aflatoxin, all of them agreed that it could secure better prices for their chillies.

Table 8: knowledge of farmers (%)

	Small	Medium	Large	All
Does not know about registration requirement	70.21	77.78	57.69	69.00
Not aware of a marketing committee	82.98	66.67	73.08	76.00
Not aware of training program	57.45	66.67	42.31	56.00
Have training	42.55	33.33	38.46	39.00
Aflatoxin management – pesticide	25.53	0	0	12
Aflatoxin management – drying on sheets	40.43	66.67	61.54	53.00

4.5 Credit and other challenges

4.5.1 Source of credit

43% of our sample farmers use previous years proceeds from chilli farming to finance the cost of current year’s chilli production. Almost half of them also borrow from other sources. It is quite interesting to find that none of the farmers, no matter what the size is, borrows from formal financial institutes. 46% of all farmers borrowed money. The following table presents a distribution of the source of funding for our sample farmers who borrowed money to finance the cost of cultivation.

Table 9: Source of funding (%)

	Small	Medium	Large	All
Proceeds from previous year	38.30	33.33	61.54	43
Borrowed from:				
Trader	6.25	9.53	55.56	17.39
Friends/family	31.25	0	0	10.87
Money lender	62.50	28.57	44.44	43.48
Other family income	0	42.46	0	19.57
Other source	0	19.05	0	8.7

4.5.2 Challenges faced

The most pressing challenges faced by farmers are the shortage of water and lack of training on better marketing methods. All the small and medium farmers suffer from these two

problems, whereas only 76.92% of the large farmers reported them as problems. This is consistent with the fact that in these areas water is controlled by the large farmers (Tariq & Kakar, 2010; Bandaragoda, 1998). 84.00% also reported that there is a dearth of information on better marketing mechanism (Table 10).

About half of all the sample farmers reported that they were forced to sell their produce to the commission agents because the commission agents provided them with inputs. They could not afford to buy the inputs themselves. 54% think that the commission agents keep a high margin. This same farmers believe that the lack of storage facilities encourages this kind behavior of the commission agents.

The other issues faced by farmers were aflatoxin and other diseases of chilli plants and weather shocks. 64% of the farmers reported the lack of security (insurance) against the weather risk as one of the main challenges they faced.

Table 10: Main challenges faced by farmers (%)

	Small	Medium	Large	All
High cost of inputs	53.19	48.15	42.31	49.00
Forced sale to CA	53.19	44.44	46.15	49.00
High margins of CA	61.70	48.15	46.15	54.00
Shortage of water	100.00	100.00	76.92	94.00
Aflatoxin and other diseases	68.09	48.15	42.31	56.00
Lack of crop insurance	70.21	48.15	69.23	64.00
Lack of training on better marketing	100.00	100.00	76.92	94.00
Lack of information on better marketing	95.74	88.89	37.69	84.00
Lack of storage facilities	61.70	48.15	46.15	54.00

4.6 Women's role in chilli production

A large fraction of chilli farmers in Pakistan are small land owners. These farmers are sharecroppers who use female family labour or hired female labour for preparing the land, transplanting, weeding and picking the harvest (MDF, 2016). There is scope to improve welfare of these women involved in chilli cultivation through better pre and post-harvest practices.

4.6.1 Farming

Table 11: Participation of female family labor (members) in chilli cultivation (%)

Activities	Small	Medium	Large	All
Land preparation	19.15	11.11	0	12.00
Nursery maintenance	100	88.89	46.15	83.00
Harvesting/picking	100	92.59	80.77	93.00
Grading	100	96.30	100	99.00
Processing	19.15	11.11	0	12.00
Irrigation and watering	12.77	0	0	6.00
Sowing	0	7.41	0	2.00
Weeding and pest control	0	18.52	0	5.00

Women are heavily involved in the production of chillies. However, their role is limited to segments that do not require intensive physical labour. In our sample only 12% of the households had one female member working in land preparation and 9% had 3 women working on the same (Table 11). All of them are from either small or medium farms. Women are mostly involved in nursery preparation, harvesting and sorting/grading chillies. In 99% of the households grading was done by females. 93% of farmers used one female member for picking and 9% had at least 3 female household members involved in picking chillies. 83% of the farmers in our sample used female labour for maintaining the nursery. All the small farms employ at least one female member in the nursery while women are involved in maintaining nursery only in 46% of the large farms. Only a small number of medium farmers use female labor for sowing, weeding and pest control. 12.77% of the small farmers employ female members for watering plants. In some of the small and medium farms women are also involved in making chilli powder (processing) for commercial purposes. Women, however, do not take part in drying chilli.

4.6.2 Marketing

Even though 84% of the farmers reported that women could engage in marketing activities like processing and packing, only 12% of our sample households had any female member involved in processing chilli for making powder for commercial purposes.

4.6.3 Decision making

Women are completely absent in the farming decision making process. Even though they play a significant role in the production process they do not have any voice when it comes to taking decisions regarding plantation, maintenance or marketing. Very few had any formal training in chilli cultivation.

4.6.4 Problems faced by female labour

Even though women are substantially engaged the process of cultivating and harvesting chilli, they face severe discrimination. 82% of the households reported that women's daily wage is 20% less than that of the male wage. They also have to deal with unethical behaviour from the landlords. 80% of the households think that the landlords are abusive towards women. Two thirds of them also suffer from diseases (itchy hands) from picking hybrid chillies. About half of them think that there are no training and capacity building facilities for women in this sector. 79% of respondents believe that they would be able to get involved in the marketing process if they had training and better infrastructure (Table 12).

Table 12: Issues/challenges faced by female workers (%)

	Small	Medium	Large	All
Low wages	100	85.19	46.15	82
Unethical behavior of landlords	100	85.19	38.46	80
Itching from picking hybrid chillies	93.62	55.56	26.92	66
Lack of training and capacity building	61.70	48.15	42.31	53

5 Marketing survey

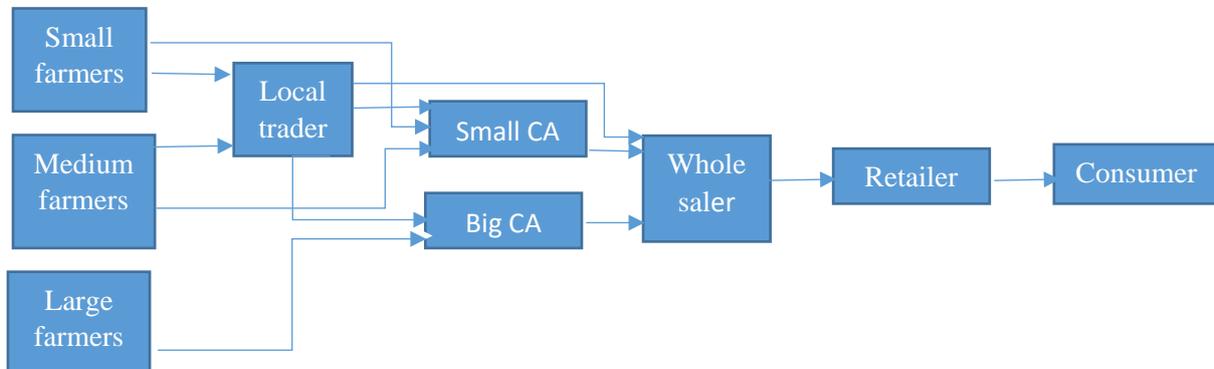
5.1 The market players

Most of the farmers in our sample sell their products in the mundi. There are four types of market players in the mundies – local traders or contractors, commission agents (small and large), wholesaler and retailers.

Local traders or contractors buy the chillies from the farmers during the season and sell them to the commission agents. The commission agents are brokers who facilitate the sale and purchase of chillies between farmers/local traders and wholesalers/other commission agents.

The beuparies or wholesalers operate between primary wholesale market and secondary markets (retailers, processors, exporters).

The supply chain studied in our market survey can be illustrated by the following diagram:



5.1.1 Education

Table 13: Level of education of agents (%)

Education	Local trader	CA small	CA large	Wholesaler	Retailor	Total
No formal education	10	0	20	10	20	10
Primary (1-5 years)	0	0	0	10	0	1.67
Middle school (6-8 years)	0	10	0	30	10	8.33
High school/college(9-12 years)	60	60	60	30	70	58.33
Diploma/vocational training	0	0	0	0	0	1.67
University degree	30	30	20	20	0	20

Only 10% of the agents in our sample did not have any formal education. 58% had 9-12 years of education and 20% had university degree (Table 13).

5.1.2 Membership in a market group

Only 20% of the market players are members of any market group/cooperative/committee. Most of them are commission agents. 50% of the large commission agents and 30% of the small commission agent belong to a committee. Most of those who are members of any committee report that the member have better access to information. Of those do not who belong to any group, 60.61% are not aware of any such group and 30.30% think that the committees are ineffective.

90% of the market players are not willing to switch to any other occupation. 81.82% of them are satisfied with the income the current occupation generates and 10.91% think that they are too old to start a new occupation.

5.1.3 Nature of business

Table 14: Nature of business (%)

	Local trader	CA small	CA large	Wholesaler	Retailor	Total
Owns the business	90	70	55.56	50	60	65.31
Business on owned premise	40	20	11.11	14.29	30	23.91
Use mobile/landline	100	90	70	100	90	90
Use internet/email	10	0	20	40	30	20
Use computer/printer	10	10	10	20	30	16
Have more than 10 employees	50	40	70	60	- ⁶	60
Start-up cost > PKR25,00,000	0	40	80	30	70	56
Deals in other products	10	30	60	80	40	44

65% of the business are sole proprietorship and the rests are partnership (Table 14).

However, most of the business (76.09%) are operated from rented premises. Almost all of them use either mobile or landline regularly to conduct business. The use of computer and internet very limited. Only 16% of the market players in our sample use computer and 20% use internet/email in their day to day operation.

At least⁷ 60% of the businesses have (both permanent and casual) 10 or more employees. 44% of them deals in products other than chilli. 56% of the businesses require an initial investment of more than PKR25,000,00⁸.

The pick season for chilli in Kunri and Judho are July-August. Commission agents primarily buy chillies directly from farmers. A small number buy from pre-harvest (28%) and local contractors (8%). Retailers mainly buy chillies from wholesalers (60%) (Table 15).

⁶ The data we have on the number of employees in the retail shops is incomplete. We are looking further into it.

⁷ Of the 50 market players in our sample we have employment information for only 36 operations.

⁸ The median start-up cost in our sample.

Table 15: Supply chain: sellers (%)

	Local trader	CA small	CA large	Wholesaler	Retailor	Total
Farmers	100	80	60	90	30	72
Pre-harvest contractor	40	60	30	10	0	28
Local contractor	0	10	0	30	0	8
Wholesaler	0	0	0	0	60	12

Local traders have two types of buyers of their chillies – commission agents (62.5%) and wholesalers (37.5%), whereas, commission agents mainly sell their products to wholesalers and exporters (77%-87%) (Table 16). A small fraction (11.11%) of small commission agents resale to big commission agents. Wholesalers' target buyers are exporters (40%), and other wholesalers (30%). A small number of wholesalers and retailer also sell to processors. Consumers buy chilli only from the retailers.

Table 16: Supply chain: buyers (%)

	Local agent	CA small	CA large	Wholesaler	Retailor	Total
Consumers	0	0	0	0	66.97	11.11
Wholesalers	37.5	44.4	50	30	0	25.93
Retailers	0	11.11	0	10	0	3.7
Processors	0	0	12.5	10	11.11	5.56
Exporters	0	33.33	37.5	40	22.22	22.22
Other commission agents	62.5	11.11	0	10	0	31.48

5.2 Profit margins

On average a local trader deals in 292 maunds⁹ of chilli in a season with an average purchasing price of PKR6000/maund and average sale price of PKR6235/maund. A small commission agent deals in 1202.5 maunds of chilli, whereas, a big commission agent in 14300 maunds. The average purchasing and selling price per maunds are PKR 6300 and PKR6545 for small commission agents and PKR6410 and PKR 6655 for big commission agents. The corresponding figures for wholesalers and retailers are PKR6410 and PKR6710 for 4300 maunds of chilli and PKR6110 and PKR7330 for 7.2 maunds respectively.

⁹ 1 maund = 37.3242 kg.

We have the annual operating cost of each of these businesses. However, we don't have any information on the share of chilli in the total trading volume of these businesses. Table 17 presents the absolute margins (per maunds) from chilli trade for different imputed shares of chilli in total operating costs. It appears that if chilli constitutes 10% of total trading, a local trader on average earns a margin of PKR 223.64 per maund, a small commission agent earns PKR 232.46 per maund, a large commission agent earns PKR239.59 per maund, while a wholesaler earns a margin of PKR 304.20 per maund. Among these marker players the retailer has the highest margin – PKR342.09/maund.

The profit margins of local traders, small commission agents, large commission agents and wholesalers increases as the product moves up the supply chain, however, the extent of these margins seems quite reasonable considering the risk involved. They are also comparable to profit margins found in other countries (Food Security Technical Secretariate, 2011). Since we do not have data on the share of chilli in the total trading volume for each of these links in the distribution chain, it is difficult to calculate the profit margin of the retail supply chain as a whole. We find that the average difference between the price at the farm gate and that of the final sale price is 18.14% in our sample. Similar results were found for chilli supply chain in India (Rajur & Patil, 2015). Attributing 10% of the operating costs to chilli makes the profit margin of the retail supply chain 16.41% while it reduces to 9.66% if chilli constitutes 20% of the total trade volume of these businesses. Studies have shown that in Australia the profit margin of the retail supply chain is around 10% (D'Arcy, Norman, & Shan, 2012). Rajur and Patil (2015) find that in Karnataka it was around 12% for chilli.

Table 17: Cost, revenue and margin

	Local trader	CA small	CA large	Wholesaler	Retailor	Total
Purchases (in maunds) this year	292.5 (206.8)	1202.5 (512.13)	14300 (11355)	4300 (4077)	7.2 (3.7)	4020.44 (7491.3)

Purchasing price/ maunds (PKR)	6000 (200)	6300 (216)	6410 (504.3)	6410 (250.33)	6504 ¹⁰ (369.53)	6246 (356.26)
Sale price/maunds (PKR)	6235 (171.67)	6545 (238.57)	6655 (492.41)	6720 (225.1)	7330 (421.77)	6697 (482.6)
Operating cost (annual)	28308 (17209.29)	145795 (78519.2)	569840 (354254)	120990 (97157)	46485.7 (93006.6)	190951.7 (265395)
Margin/maunds						
At 10% operating cost	223.64 (56.71)	232.46 (112.60)	239.59 (58.06)	304.20 (76.01)	342.09 (784.61)	263.68 (295.26)
At 20% operating cost	212.28 (61.31)	219.92 (109.08)	234.17 (56.42)	298.40 (75,10)	-140.39 (1657)	194.35 (618.7)
At 30% operation cost	200.91 (66.60)	207.38 (105.75)	228.76 (54.97)	292.59 (74.75)	-622.87 (2568)	105.02 (980.52)
At 50% operating cost	178.19 (78.65)	182.29 (100.02)	217.93 (52.68)	280.99 (75.73)	-1587 (4413)	-53.63 (1722)
Profit margin						
10% operating cost	3.3	3.53	3.63	4.58	4.70	3.95
20% operating cost	3.41	3.34	3.54	4.45	-1.54	2.90
30% operating cost	3.23	3.14	3.46	4.37	-7.78	1.86
50% operating cost	2.86	2.76	3.30	4.19	-20	-0.23

Note: Profit margins are calculated as % of the final sale price.

Most the accounts (61.41%) are settled within two days of the sale/auction. All the farmers reported that its takes about 2 weeks to get the full payments on their sales. However, there is a large gap between the time the buyers settle accounts with the respective market players and the time they (the market players) settle accounts with their sellers.

Table 18: Time buyers take to settle account

	Local trader	CA small	CA large	Wholesaler	Retailor	Total
Same day	12.5	20	40	40	77.78	31.58
Next day	50	20	10	10	0	14.04
In two days	0	30	30	10	22.22	15.79
In a week	25	20	20	30	0	15.79
In two weeks	12.5	10	0	10	0	22.81

¹⁰ This is a weighted average of the selling price of farmers and of wholesalers. We generate the purchasing price for retailers in this way as the survey does not have complete information on their purchasing price and our sample retailers purchase chilli from farmers (30%) and wholesalers as is reported in Table 15. We are exploring this issue further.

Table 19: Time agents take to settle accounts with sellers

	Local agent	CA small	CA large	Wholesaler	Retailor	Total
Next day	55.56	40	14.29	0	66.67	35.56
In two days	11.11	10	57.14	20	11.11	20.00
In a week	33.33	40	14.29	30	0	24.44
In two weeks	0	10	14.29	50	22.22	20

5.3 Knowledge and information

5.3.1 Record keeping

Table 20: Record keeping (%)

	Local agent	CA small	CA large	Wholesaler	Retailor	Total
Maintains records	90	100	90	90	70	88
Use record in future decision making	100	100	100	100	57	93
Share this with others	40	60	40	50	10	44

It should be noted that almost all of the traders, commission agents, wholesalers and retailers in our sample (88%) maintain records of their transactions and 93% of them use these records for future transaction decisions. Most of the players (50% of the commission agents and wholesalers and 60% of the local traders) share this information with others.

5.3.2 Source of information

All the players in the mundi keep trace of the retail price of chilli. The commission agents, wholesalers and retailers seek information on market demand as well since it affects their business directly. They seem less interested in prospective sellers, which is consistent with the type of relationship they have with existing sellers. Most of the market players in sample report that they have long term relationship with their existing sellers (for at least two years) and they (62%) choose their sellers on the basis of personal relationship, previous experience or reputation and reference. 46% of the traders do business on mutual trust or personal guarantee without any form of written contract. Only 14% of them choose sellers on the basis of the quality of the chilli or terms of trade.

It is interesting that only 6% of them want farmers/contractors to be financially less dependent on them. They, naturally don't want to let go the negotiating power this dependence begets. They also seem not concerned about the pre or post harvesting practices of farmers that can improve the quality of the chilli. This in turn, propagates the sub-optimal behaviour of the farmers, specially, small and medium ones', who do not sort or dry their chillies properly as there is no demand for better quality chilli in the wholesale market.

Table 21: Source and type of market information

	Local agent	CA small	CA large	Wholesaler	Retailor	Total
Source of information:						
Farmer	30	0	60	30	40	32
Contractors	20	80	30	50	10	38
Fellow CA	70	40	40	50	0	60
Wholesaler	20	40	90	30	40	44
Type of information						
Retail price	100	80	80	100	90	90
Market demand	10	60	90	60	90	62
International price	0	0	10	50	0	12
Prospective sellers	10	20	20	10	0	12

The principal source of information for all these market players are the fellow traders or commission agents. This is consistent with the findings of the previous table which shows that many of these market players not only keep regular records of their transactions but also share these records with others. Many of them (32) collect price and demand information from the farmers as well.

5.4 Market facilities

On average most of the agents are satisfied with the storage facilities in the mundies and not many of them have complains about the allocation of trading floor or office space. However, these mundies lack proper waste disposal mechanism and the traders are not satisfied with the general hygiene condition. There is also problem with overall security. The roads and parking facilities are not adequate to accommodate a smooth trading of commodities. 50% of the traders

are not satisfied with the banking facilities in the mundi and overall 36% of them have complains against the market committee.

Table 22: Satisfaction with market infrastructure

	Local agent	CA small	CA large	Wholesaler	Retailor	Total
Trading floor	50	40	80	40	50	52
Shop/office space	50	40	90	50	50	56
Storage	80	90	80	50	50	70
Waste disposal	0	0	10	10	0	4
General hygiene	10	90	50	40	40	62
Security	50	40	60	20	0	34
Roads/infrastructure	80	90	40	30	0	48
Access for buyer	90	90	80	50	40	70
Access for vehicles	10	40	60	30	10	48
Loading facilities	50	40	80	30	50	50
Banking facility	90	40	60	30	30	50
Parking facility	40	30	40	10	10	26
Electricity food and others	60	90	40	30	10	46
Auction/trading	0	0	0	0	0	0
Market committee	60	80	90	40	50	64

6 Summary and policy implications:

- The surveys provide some key insights into lives of chilli farmers in Pakistan, their attitudes and perspectives on their current situation, their level of knowledge and the challenges they face. It also confirms and challenges some of the existing views and beliefs about the existing retail supply chain mechanism.
- The farmers in our sample villages produce two varieties of chillies – Longi and Hybrid. Even though the yield of Hybrid is higher than that of Longi, it is still lower than the other kinds of hybrid chillies available. Use of higher yielding varieties coupled with modern farming technique could increase production as a whole.
- Small farmers are more productive than the medium or large farmers. They usually sell their products to the small commission agents who also provide them with inputs. This forces these small farmers to sell their crops to these commission agents and they therefore, have little

command over the price they receive. They also suffer the most from Aflatoxin contamination and scarcity of irrigation water.

- A few of our sample farmers sell their products through online trading and to the exporters. However these marketing channels are available only to the large farmers. Small and medium farmers cannot access these markets mainly because they don't have the required information or contacts in these markets. They also lack the skill and resources required to produce the high quality chilli these markets demand.
- Most of the farmers know that they could get better price for their product and they are well aware of their limitations. Providing training to small and medium farmers on better farm practices (Aflatoxin management, sorting and packing) could improve the quality and quantity of chilli they produce. It is also necessary to provide them with cheap credit to help them to purchase the required inputs. This would reduce the incidence of forced selling and help them to negotiate a better price for their produce.
- Women are largely underrepresented in the economic sphere of Pakistan. This is also true in the case of chilli cultivation. Even though women share a significant share of the responsibility in the cultivation, harvesting and post-harvesting activities, they don't have any decision making power. They are completely absent from the marketing process. Their wage is low and they are also the target of abuse and unethical behaviour of the landlords. There is scope to improve the quality of the lives of these women (alongside the quality of chilli they produce) by providing them with training in picking and sorting.
- Our findings debunk the myth of excessive profit margins kept by the middle men. The market appears to be fairly competitive and none of the players seem to have iniquitous market power. The commission agents have some negotiating power over the farmers and local traders/contractors as they advance a share of the purchasing price. However, they seem to fill in a vacuum created by the farmers' lack of access to any formal source of credit. Many of the

sample farmers had to borrow from various sources to finance the production cost. However, none of them borrowed from any formal financial institute.

- The existing market infrastructure can be improved to facilitate smoother transportation of products and can further decrease the cost of distribution by reducing waste.

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