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Strengthening Value Chains for Fruits and Vegetables in Punjab: Alternative for Faster Growth in Agriculture

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Shayequa Zeenat Ali
Dharvinder Singh
Sandeep Dixit
R S Sidhu

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ABSTRACT

The paddy-wheat monoculture induced a decelerating agricultural trend in Punjab which has been felt in the form of stagnation in output, deteriorating productivity, environmental degradation, declining farm incomes, de-peasantization and suicides by farmers. Shifting away from rice and wheat which are the most water intensive crops of the state and devoting more area under fruits and vegetables will help in increasing farm incomes, overall agricultural output and conserving water resources. In spite of increasing area under cultivation, production and consumption of fruits and vegetables Punjab faces many challenges which hinder the shift away from rice-wheat monoculture towards high value crops. Fruits and vegetables being highly perishable in nature require cold storage, special processing, transportation and marketing infrastructure. These have a bearing on the volatility of supply and hence prices of end products affecting the various stakeholders involved in the value chain. In light of the discussion above an in-depth analysis of issues affecting value chains of fruits and vegetables in Punjab is presented in this paper.

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Centers for International Projects Trust

910-911, Pragati Towers, Rajendra Place

New Delhi - 110008

T: +91-11 - 4056 5989

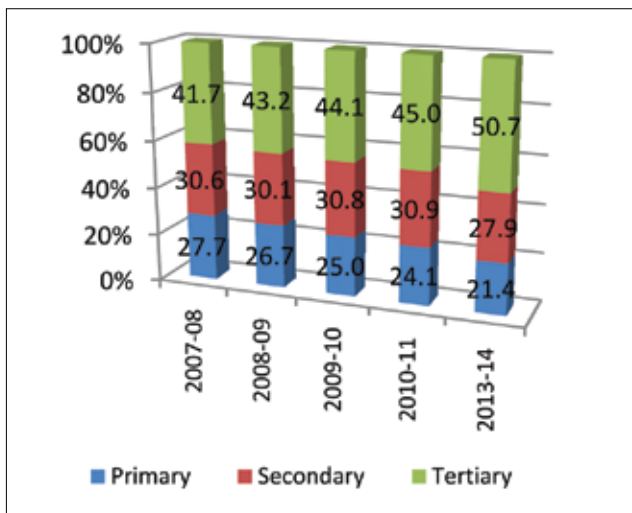
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1. Agricultural economy of Punjab

Being the cradle of the Green Revolution, Punjab achieved a very high rate of growth in agricultural sector in the decade and a half since the mid-1960s. The state continued to occupy the first rank in per capita income among the major states until 1992-93. In 1993-94, Maharashtra displaced Punjab's position and became the highest income state among the major Indian states. Currently Punjab is behind major states like Haryana, Maharashtra, Madhya Pradesh, Kerala and Tamil Nadu in per capita income (GOP, 2014) and actually ranks 13th among all the states. Agriculture, which accounts for a major share of the primary sector is the main source of livelihood to the rural population which comprises about 2/3rd of total population of Punjab. It has strong linkage with rural non-farm sector and creates indirect employment for a large number of skilled and semi-skilled workers for repair and maintenance of farm machinery, and marketing of inputs and agricultural produce, etc. The changes in Punjab's rank in per capita income among major states and its relative position vis-à-vis the all India average is explained by the behaviour of growth rates of the state domestic product. The share of the primary sector in the net state domestic product (NSDP) has been declining (Figure 1).

In the primary sector, the share of agriculture increased marginally till the 1970s but has since been continuously on the decline (Human Development Report, Punjab, 2004). Recent trends in sector-wise state income of Punjab shows

Figure 1. Recent trends in sectoral composition of GSDP in Punjab (in percentage)



that agriculture has been presenting diminishing shares to the primary sector (Figure 2). There's been a slight increase in the proportion of livestock and forestry and logging sub-sectors. Contribution of fishing and mining and quarrying remain negligible over time. The diminishing share of agriculture within the state, which is the source of earning for majority of its population, has a bearing upon the per capita income.

The green revolution brought significant changes in the cropping pattern of Punjab. The cropping pattern in the state at selected points over time given in the Figures 3, 4, 5 and 6 shows the establishment of paddy-wheat monoculture in the state over time. Area under rice has increased by leaps and bounds over the last three decades or so. Rice, occupied only 17.49 per cent of the gross cropped area in 1980-81. Acreage under the crop increased to over 26.86 per cent in 1990-91 and then rose further to around 32.89 per cent in 2000-01. In 2012-13 the area under rice covered 36.2 per cent of the gross cropped area. Wheat has consistently occupied about 42 to 45 per cent of the gross cropped area over the last three decades or so. The increase in wheat cultivation has been at the cost of gram, rapeseed and mustard, while that of rice has been obtained by shifting the area from maize, groundnut, millets and cotton (Singh et al, 2012).

The proportionate area under cotton in 1980-81 was 9.6 per cent of gross cropped area and increased to 9.34 per cent in 1990-91. After mid 1990s the area under cotton has been adversely affected due to inclement weather and pest attack, its share in GCA went down to 5.97 per cent in 2000-01. With introduction of Bt varieties area under cotton started increasing (Singh et al, 2012). It accounted for 6.11

Figure 2. Recent trends in composition of primary sector in Punjab (in percentage)

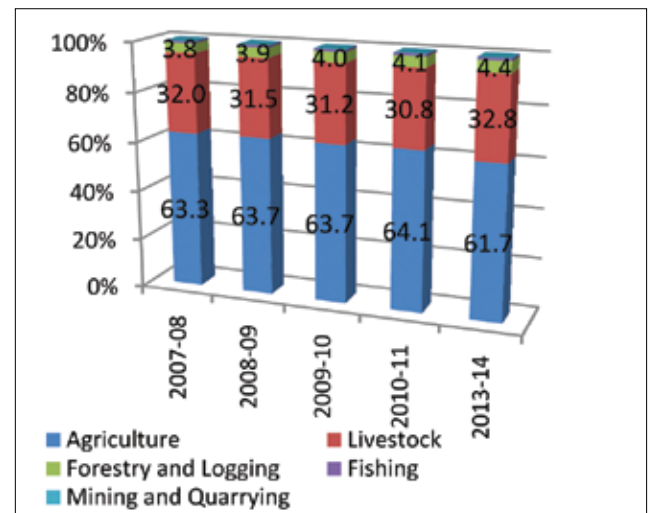


Figure 3. Cropping pattern in Punjab in proportion to GCA, 1980-81

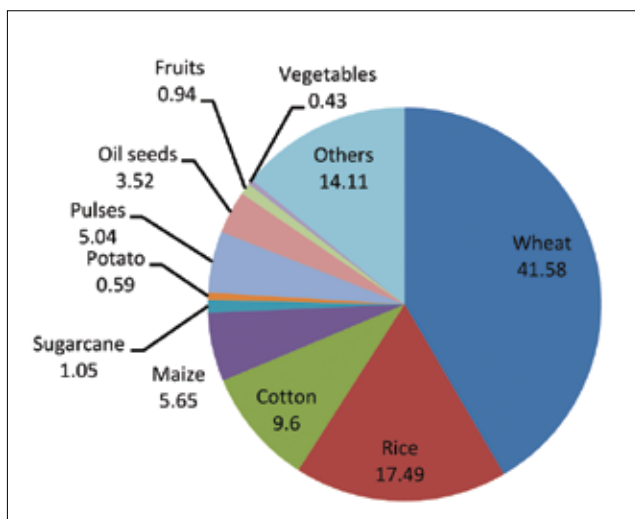
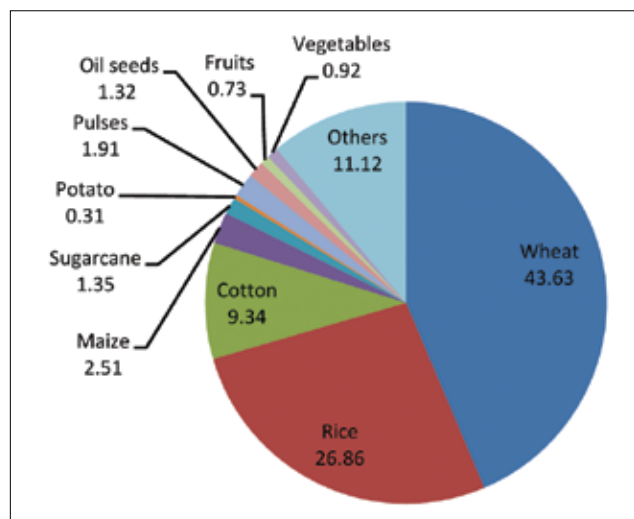


Figure 4. Cropping pattern in Punjab in proportion to GCA, 1990-91



percent in 2012-13. Area under potato has remained on the lower side but has gradually increased. Proportion of area under sugarcane fluctuated between 1 to 1.5 per cent approximately. Respective share of pulses and oilseeds in GCA has recorded a sharp decline from 5.04 and 3.52 per cent in 1980-81 to 0.82 and 0.65 per cent respectively in 2012-13. From 1980-81 to 2012-13, area under fruits have increased from 0.94 to 1.55 per cent and from 0.43 to 0.97 per cent for vegetables. Although negligible, it is noteworthy that the area under high value crops have increased in Punjab and can be seen as a discreet move towards diversification.

It can be concluded that imbalance in favour of two main cereals viz. rice and wheat in the cropping pattern has further sharpened despite all efforts on diversification of

state agriculture. This happened because of better relative profitability of these crops with minimum production and marketing risk as compared to other crops (singh et al, 2012).

The paddy-wheat monoculture induced decelerating agricultural trend in Punjab. Effective procurement and relatively more remunerative minimum support prices for the two crops also incentivise farmers to stick to this cropping pattern (Chand, 2003). All of this is leading to over-mechanisation and intensive use of inputs. Excessive use of chemical fertilizers and pesticides, decline in water table and increase in water logging, soil salinity, pollution etc. became the major problems in the state (Gill and Gill, 1990) the various consequences of which were felt in the form of:

Figure 5. Cropping pattern in Punjab in proportion to GCA, 2000-01

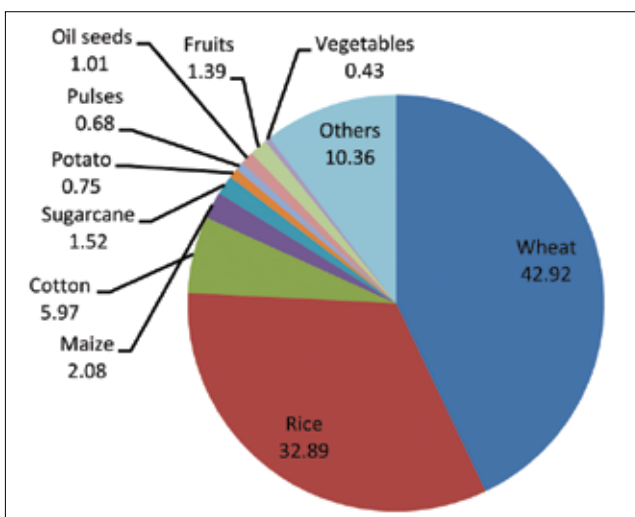
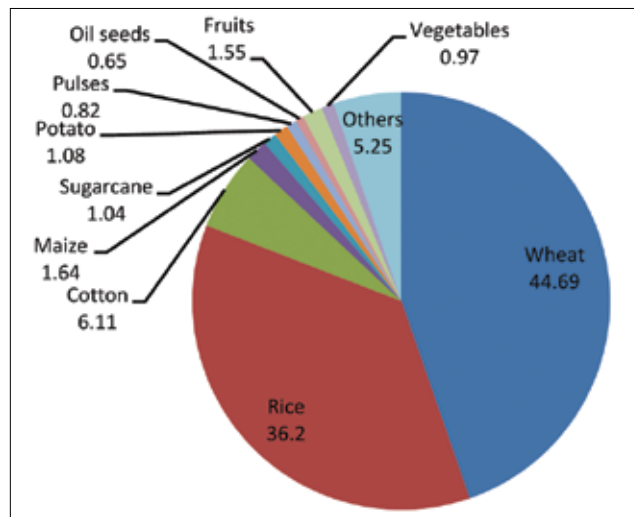


Figure 6. Cropping pattern in Punjab in proportion to GCA, 2012-13



(i) **Stagnation in output-** The impact of technology has slowed down in Punjab mainly due to soil fatigue resulting from over-use of ground water and leading to decline in fertiliser-use efficiency (Kumar and Singh, 2010). Cropping intensity in the state was 190 in the year 2012-13 (GOP, 2015). So, in spite of intensive agricultural practices, the output of crops is not increasing at the high rate it used to.

(ii) **Declining productivity-** The yield of rice-wheat cropping system is input based and the use of modern inputs in the Indo-Gangetic plains have already been used at a high level and exhausted. The organic sources of nutrients such as legumes are declining as they have been almost completely replaced by rice and wheat, over time. Therefore, further scope of increasing rice and wheat yield with further expansion of modern inputs and area seems remote (Kumar et al, 2000).

(iii) **Environmental degradation-** The intensive monoculture of wheat and paddy had a pernicious impact on the natural resource base of the state. Mekkonen and Hoekstra (2011) calculated the global water footprints for various crops. That for wheat and rice were calculated to be 1087 Gm³ per year and 992 Gm³ per year respectively and the same for vegetables was 300 Gm³ per ton, roots and tubers, 400 Gm³ per ton and fruits, 1000 Gm³ per ton. A relatively large total water footprint as a result of crop production is observed in the Indus river basin (117 Gm³ per year) and the Ganges river basin (108 Gm³ per year). The two basins together account for 25% of the blue water footprint related to global crop production where mostly rice-wheat

monoculture is practised (Chapagain and Hoekstra, 2011).

(iv) **Declining farmers' incomes-** Falling income added to the difficulties of poor cultivators who do not have enough cushion for adjustment (Eswaran and Kotwal, 2002). The size of marginal holdings makes them non-viable given the present technology of production in Punjab. When cost of production continues to increase while productivity stagnates in case of major crops, majority of the cultivators find themselves in a cash-strapped position.

(v) **De-peasantization and suicides by farmers-** The capital intensive mode of production, propagated by green revolution and employed for mostly rice and wheat turned out to be non-viable for the small peasantry and hence they are being involuntarily manoeuvred towards shifting away from farming. The strain of debt trap was so strong that of the total farmer suicides in Punjab from 2000-2008, majority were small and marginal farmers operating less than 2 ha of land (Singh and Bhogal, 2014)

Punjab needs to be pulled out of this crisis. High value crops are one such alternative. Increasing area under high value crops will not only help in increasing the farm incomes and overall agricultural output in Punjab but will also help in conserving water resources by shifting area away from rice and wheat which are the most water intensive crops of the state.

1.1 Fruits and vegetables scenario in Punjab

Like acreage, production of fruits and vegetables has also increased gradually over the last few years. During 2000-

Figure 7: Recent trends in production of fruits and vegetables in Punjab (in Lakh tonnes)

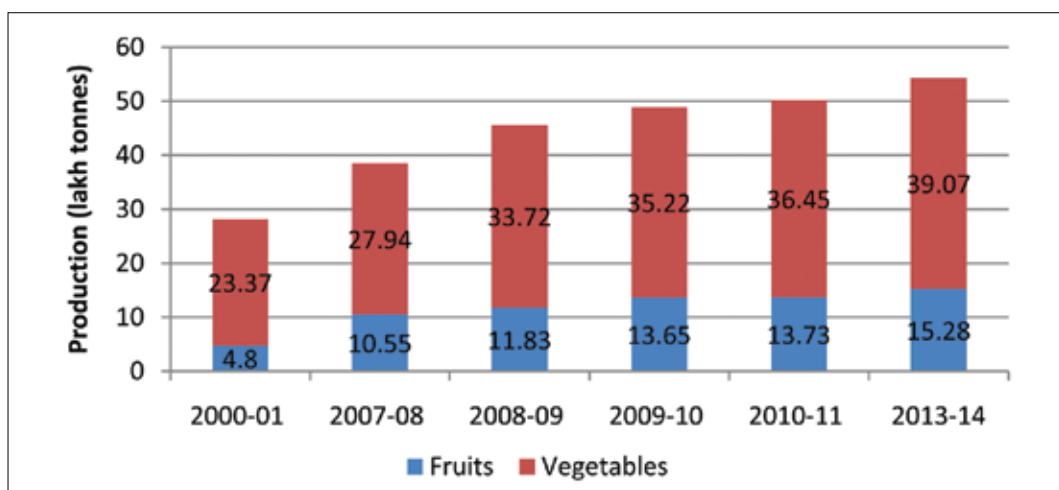


Table 1: Export of fresh fruits and vegetables, 2005-06 to 2009-10 (in Quintals)

Year	Export of fresh fruits and vegetables from Punjab	Export of fresh fruits and vegetables from India	Percentage contribution of Punjab to India's Fresh fruits and vegetables exports
2005-06	770	23576	3.3
2006-07	429	209722	0.2
2007-08	1057	23393	4.5
2008-09	2118	32888	6.4
2009-10	1038	31639	3.3

Source: Statistical Abstracts of Punjab, various issues and NAARM, Hyderabad

01, 28.17 lakh tonnes of fruits and vegetables were produced in Punjab and the production increased to 54.34 lakh tonnes in 2013-14 (Figure 7).

Punjab has made significant contributions to India's traditional agricultural exports (rice, wheat and cotton). It has remained an export-surplus state by being a major exporter in rice and wheat crops. Increased area and production under horticultural crops may also put Punjab in a stronger position in terms of horticultural exports. Table 1 shows that over 2005-06 to 2009-10 export of fruits and vegetables from Punjab has increased from 770 to 1038 quintals. Punjab's percentage contribution to India's total exports of fresh fruits and vegetables has been fluctuating over the same period. It was 3.3 per cent in 2005-06 and declined to 0.2 per cent in the next year, where as it kept increasing over the next two years. The percentage contribution again dropped back to its 2005-06 level in 2009-10. Given that area and production of fruits and vegetables have been increasing steadily, Punjab has the potential to increase its contribution towards the economy by way of exports.

The Government of Punjab had proposed to shift towards value-added, water light crops such as fruit and vegetables for 'Second Push in Punjab Agriculture and Allied Sectors' (Johl, 1986). The programme aims to create a voluntary shift in the cropping pattern, introduce income/employment-generating, productivity oriented programmes directly benefiting the farmers of Punjab and safeguard the valuable and scarce resources of land, water and environment from further deterioration. Increasing population, income, and urbanization, which are changing diets along with the use of food crops for biofuels, have contributed to increased food prices (Human Development Report, Punjab, 2004). In order to improve the life and quality of perishable products grown in Punjab, the state government has established a separate corporation namely, the Punjab Agri. Export

Corporation (PAGREXCO) with Punjab Mandi Board and Punjab Agro Industries Corporation. The PAGREXCO is dedicatedly promoting export of fruits and vegetables outside the country and also to the distant markets within the country in order to help the farmers realize better returns for their produce.

As consumer demands related to safety, quality, convenience, and organic and processed foods increase, the gap between farm and consumer prices is widening. Supermarkets are emerging as a major stakeholder in food retailing (Singh and Singla, 2010). Collectively, these changes contribute to a paradigm shift in the way food is produced, processed and sold. In particular, the increased demand for safe, higher value and differentiated agricultural products has created opportunities for farmers and agribusiness entrepreneurs to transform commodities into products that are demanded by consumers. This change in food retailing has led to greater involvement of the private sector in agriculture and a focus on developing and improving agriculture value chains (AVCs) in terms of quality, productivity, efficiency, and depth (ADB, 2012). In spite of increasing area under cultivation, production and consumption of fruits and vegetables in Punjab, there are many challenges which hinder the shift away from rice wheat monoculture towards value added crops. In light of the discussion above an in-depth analysis of the issues affecting value chains of fruits and vegetables in Punjab is required.

2. What are value chains?

The sequence of steps and participants involved in the process from production to delivery of a product to market is called a value chain (Webber, 2007). A value chain is not identical to a supply chain. A value chain is about linkages generating value for the consumer. A supply chain is about processes of moving and

transforming commodities into products from producers to consumers. In commercial agriculture, the supply-chain focus is on producers and competitive advantage is derived from processes that improve efficiency and reduce costs. Farmers are generally isolated from consumers and products are “pushed” into the market place and move in a single transaction through the supply chain.

While a value chain is about generating value for the consumer, a supply chain is about logistics. The productivity, efficiency and depth of agricultural value chains (AVC) are important elements driving commercial agriculture and agribusiness. The premise for adopting a value chain approach is that higher financial returns can be realized through value-enhancing inputs than simply through supply chains. An AVC approach involves a shift in focus from producers to consumers. The competitive advantage in value chains is derived from inputs to supply chains that create value, as perceived by the consumer and result in backward and equitable flow of value (ADB, 2012).

The main advantages accruing to stakeholders of an effective value chain comprise being able to reduce the cost of doing business; increase revenues and bargaining power; improve access to technology, information, and capital; and, by doing so, innovate production and marketing processes to gain higher value and provide better quality to customers.

2.1 Traditional and modern value chains of high value crops in Punjab

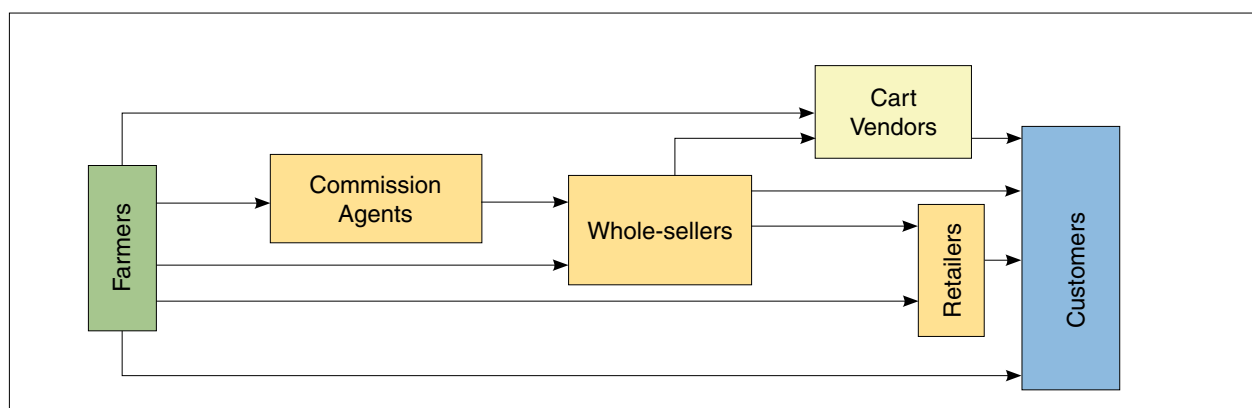
For the purpose of the study a survey was conducted for fifty farmers in order to map out traditional and modern value chains of high value crops (HVCs) in Punjab. Figure 8 outlines the traditional value chain

of HVC in Punjab. Players involved in this model are agents (commission agents), auctioneers, wholesalers, traditional retailer of all types (family run stores, roadside shops, pavement shops and cart vendors) apart from farmers and customers. Agents and wholesalers are traders in HVC value chain. Farmers are the cultivators of produce and source of fruits and vegetables. Fruit and vegetable farmers in Punjab are mostly small by land holding, yield volume of crop and are highly fragmented across geographical areas. In this traditional model, farmers sell their products to the customers mostly through various intermediate partners who pocket almost the entire price share in the market. The end product is mostly fresh and perishable catering to rural markets.

2.1.1 Salient features of a traditional fruits and vegetables value chain

- (i) The traditional value chain is basically just a marketing channel because value addition at any stage is negligible.
- (ii) On production front, most of the farmers growing high-value crops face input-related problems such as quality seeds, pest control materials and fertilisers. More than 57 per cent of the fruit growers were facing the problems of supply of spurious seedlings. Farmers faced the problem of shortage of labour force during peak season (Sidhu et al, 2008).
- (iii) The farmers growing fruits and vegetables face problems in having access to the information related to cultivation of these crops.
- (iv) Storage of fruits and vegetables is a problem due to their perishability. Traditional chains do not have much value addition and majority of the farmers usually do not have access to cold storages or processing units.

Figure 8: Traditional value chain of high value crops



- (v) Transportation from villages and hinterlands to far off urban centres is difficult for small and marginal farmers. Owing to relatively smaller volumes of their produce, transportation cost usually becomes high and erodes the overall profitability of the crops.
- (vi) Traditional value chains do not have facilities like grading and packaging of produce which add tremendous value to a product. Farmers said that they had to bear large grading and packing costs while selling the produce in the urban market. Farmers could sell only meager quantity to retailers due to high packing and transportation cost.
- (vii) Large farmers were reluctant to go for direct sale to ultimate consumers due to shortage of manpower and longer time required for marketing of the produce in this manner. Middlemen play a major role in these traditional chains because they handle activities like assembling of produce in bulk from various small farmers, weighing and transportation. Hence, they have the ability to pocket a high market margin.
- (viii) On marketing front, lack of market information was reported as the major problem confronted by fruit and vegetable growers of the study area. The price in the market abruptly changes with the arrivals in the market. Whenever there is glut in the market, the prices comes down and farmers find it very difficult to sell their produce at remunerative prices in the market. Small farmers are most severely hit

followed by medium and large farmers during such situation. Therefore, most of the fruit growers had to sell their orchards to the pre harvest contractors.

- (ix) Credit facilities were also found to be unsatisfactory. Crop insurance was not available.

In the modern value chain (Figure 9) the main players are farmers, organized retailers, and customers. Here the farmers are mainly contract farmers or those that are leased land for farming.

Farmers' produce is accumulated in consolidation centres or by commission agents. Value is added in each step in the form of storage for sale at a time when prices are better for processing. Supply of produce, either in fresh or processed form, is steady throughout the year in the modern value chain because of existence of cold chains. Products are either transported to hubs inside the city or sold to customers through retailers in mandis or super markets. Some produce especially fresh is also sold to domestic consumers through wholesalers, who in turn, sell it to vendors from whom consumers buy.

2.1.2 Salient features of a modern fruits and vegetables value chain

- (i) The chain is more organised with little role for the commission agents. Retail sale is mostly done through retail stores owned mostly by corporates. The customer base is mostly urban. It caters to the market in the state, other states and also exports.
- (ii) The end products here undergo at least a minimum

Figure 9: Modern value chain of high value crops

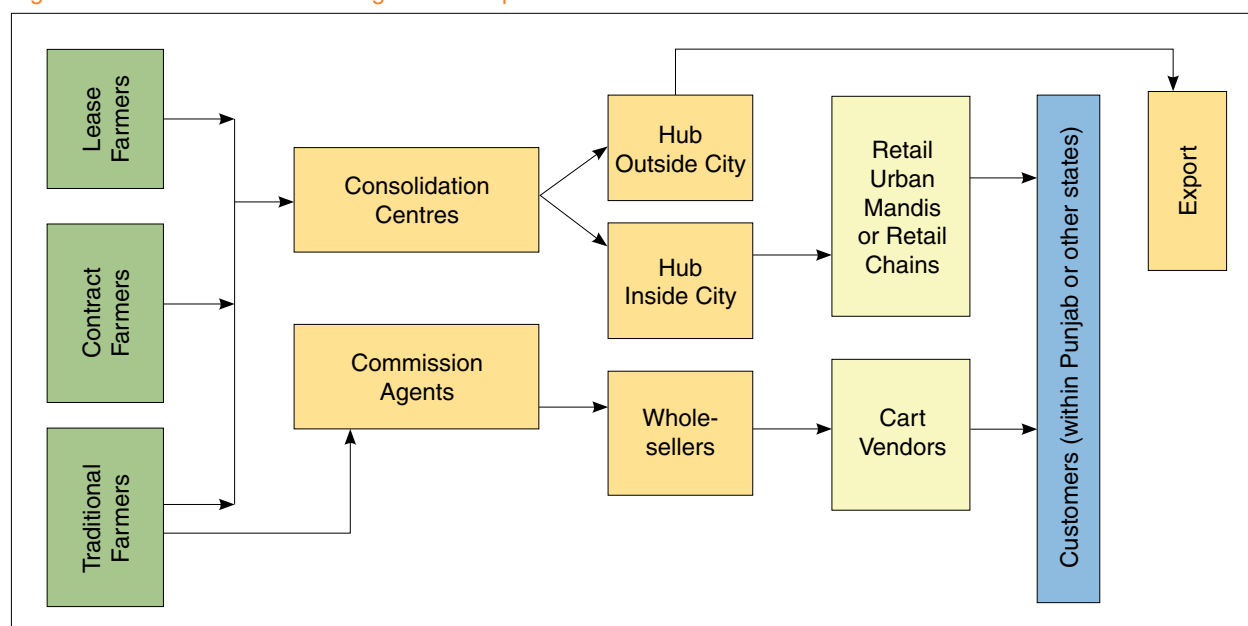


Table 2: Advantages and disadvantages of modern agricultural value chains

Advantages	Disadvantages
Increased employment in modern retailer outlets and in their dedicated supply chains	Higher investments are necessary for some crops and infrastructural development of modern value chains.
Improvement in food quality as farmers follow good agricultural practices (GAP) and consumers receive better value foods	If and when traditional wholesale markets are superseded by modern distribution sector the former may become cheap clearing houses for low quality produce.
Modern distribution outlets now focus on leaner supply chains to attract all types of consumers bringing down consumer retail prices	Grading of agricultural produce which is very important in modern value chains is difficult and markets in developing regions are still not very adept at it.
General development of agri-business farms to supply the modern distribution sector and export markets	There is a danger of small and marginal farmers being squeezed out of the value chains due to their inability to produce sufficient amounts of required quality
There is transfer of technology from contracting agencies to farmers which aid in improving their technological knowhow.	Contract farmers often have grievances against contracting agencies with regards to transparency or the lack thereof. Also there is a risk of crop failure after high investments in non-traditional crops.

Source: Cadilhon et al, 2006

level of processing. This adds value to the product and requires a sophisticated system of delivery which includes storage facilities like warehouses, cold storage units, processing units, packaging services, laboratory testing facilities, market intelligence, transportation etc. Storage receipts are linked to credit too.

- (iii) The modern value chains ensure that post-harvest losses are minimum and thereby improve farm incomes, create food security and alleviate poverty.
- (iv) These value chains also create employment at each stage of value addition.
- (v) Farmers associated with retail chains or contracting agencies have access to technology, best quality

inputs, grading facilities, weighment of produce before sale to agent, weather insurance and a guaranteed market.

Contract farming is definitely an element that adds to the value of a traditional value chain and aids in scaling up operations. However, it has its pros and cons which are presented in Table 2.

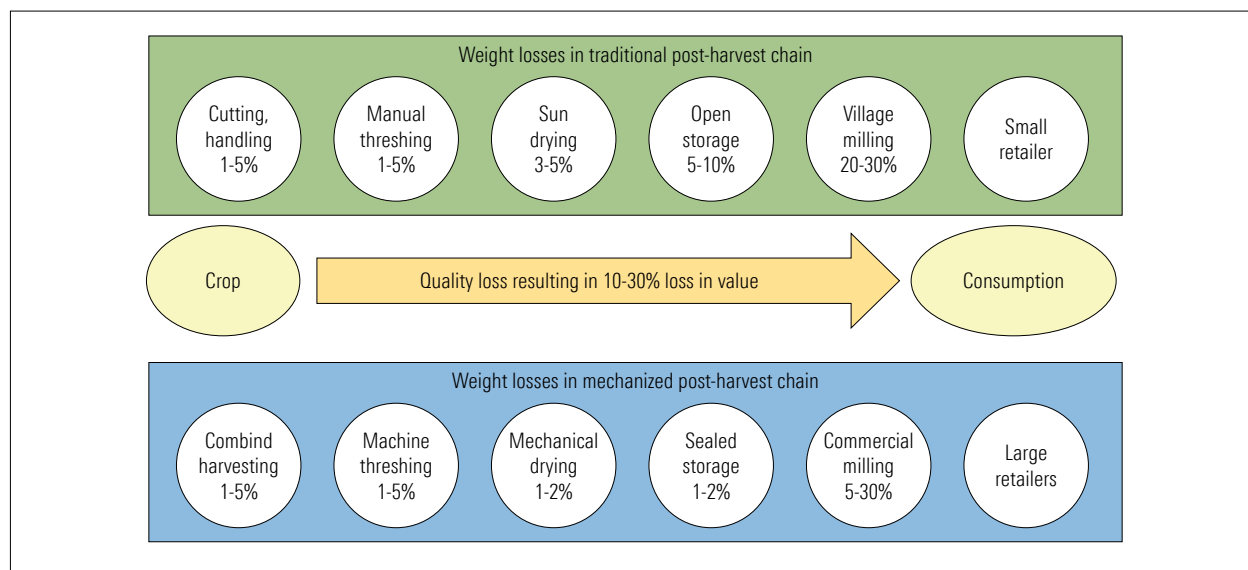
2.2 Important elements of fruit and vegetable value chains in Punjab

There are various elements in a value chain for fruits and vegetables which could create an enabling environment for the stakeholders to function and their absence could obstruct the flow of products from the producer to the consumer (Table 3).

Table 3. Important functions and enablers for effective value chains

Functions	Enablers
Integration	It is important for the producer, commission agents, processors, those involved in storage, financiers, insurance agents, transport agencies, wholesalers, retailers, corporate and government bodies to be in sync with each other.
Value Addition	Processors and Packaging are the two most important elements that add value to high value crops.
Infrastructural Development	Pack houses, cold chains, processing plants, transport agencies and markets for disposal of products.
Market Development	Mandis, pack houses and export zones
Research and Development and Extension	State and Central Universities, corporate and government organisations with R & D wings, Krishi Vigyan Kendras, extension agents.

Figure 10: Traditional versus mechanized post-harvest chain



Source: (Hodges, Buzby, and Bennett, 2011)

Some important issues affecting the proper functioning of in agricultural value chain are discussed below

2.2.1 Integration

Apparently 95 per cent of the sale of fresh produce happens through traditional value chains (Pandey et al, 2010). Different stakeholders of the value chain namely, farmers, wholesalers, processors, retailers, etc work more or less in isolation. The concepts of collaborative demand forecasting and production planning in the backend with information sharing is missing in these value chains causing many inefficiencies in the system. Even regulated markets do little to integrate various stakeholders. A commodity moving from one state to another attracts mandi fee every time it enters a new regulated market. Various studies show that farmers get only 35-40 per cent of the retail price paid by consumers and rest is retained by the middlemen.

2.2.2 Post harvest losses

The post harvest loss in fruits and vegetables is around 40 per cent due to lack of proper storage, handling and processing facilities and lack of marketing channels (Pachouri, 2012). The huge losses are also due to the poor handling of perishable commodities which usually pass through six to seven middlemen before they reach the final consumer (Gandhi and Namboodiri, 2006; Pandey et al 2010). For instance, in the year 2004, 8.5 per cent (about 6 lakh tonnes) of the mustard crop in Punjab was lost due to poor post-harvest management bringing down the actual output from 68.5 lakh tonnes to 62 lakh tonnes (MRPC, 2004). Hodges, Buzby and

Bennet (2011) compare losses accrued due to traditional post harvest practices to modern or mechanised ones, and conclude that larger losses are incurred in less developed value chains (Figure 10). Moreover, the products of the traditional post-harvest chain cater to the demands of a small retailer. Only modern or mechanised post harvest chains have the capacity to provide enough produce to large retailers.

2.2.3 Processing and value addition

Despite being the leading agrarian state of country, Punjab is way behind in food processing/value addition industry. The agro industry leans more heavily towards grain processing like rice milling, flour mills, oil mills and cotton ginning. Processing houses set up by PAGREXCO for export in the state can handle 20 MTs per hour Citrus fruits & 10 MTs per hour of other fruits & vegetables, the plants are designed to process “C” & “D” grade Kinnows (of odd size and shape) & debitter their juice. These processing houses have the capacity to extract juices of other fruits & vegetables such as, tomato, carrots, pomegranate, papaya, guava, pears, pumpkins, melons, gourds, mangoes, litchis, amla, aloe vera. Specific processed products that are produced from horticulture sector in state include tomato paste, potato chips, juices, jams, chutney, pickles, murabbas, frozen vegetables, etc. Moreover, a particular variety of fruit or vegetable which is excellent to eat fresh (table purpose) is not necessarily good for processing. For instance in case of tomatoes, Punjab Ratta variety is good for processing and Pusa Rohini for long distance transport due to its longer shelf life. Due to climatic

conditions, the fruits and vegetables production in state is characterized by short harvesting seasons and high productivity. Hence the viability of processing plants handling only one type or variety of fruits/vegetables becomes limited and ultimately becomes uneconomical. Punjab Agro Juices Limited (PAJL) was established in 2006 with aim to add value to horticultural crops and provide opportunity to farmers for selling their produce at competitive basis.

2.2.4 Cold chains

An important requirement for strengthening value chains for fruits and vegetables is that of cold storages. The fruits and vegetables being highly perishable need storage under controlled conditions to losses and enhance the farmers' gains. Therefore, cold storages are of utmost importance for efficient functioning of fruit and vegetable value chains. Punjab has a capacity of 12,52,295 MT of cold storage, out of which 96.7 per cent are privately owned and the rest by co-operatives. Out of all these cold storages, 89.2 per cent of the space is exclusively for potatoes, 9.9 per cent under multi-purpose category and the negligible remainder of 0.8 per cent is for milk (Agmarknet, GOI). This sheds light on the fact that the cold storage facilities are not equitably distributed for fruits and vegetables other than potatoes.

2.2.5 Pack-houses

In 2012, Punjab Agri Export Corporation Limited (PAGREXO) commissioned projects to set up five pack-houses for grading, sorting, packaging agricultural and horticultural products in the state and for providing facilities for distant marketing and export of fruits and vegetables. Each pack-house was to be spread over half an acre and would act as collection centre for fruits and vegetables. They were to be located in Fruits & Vegetables growing clusters like Patiala, Sangrur, Ludhiana, Ropar etc, having facilities like washing-waxing-grading-packing, pre-cooling & cold storage. The government also established a permanent perishable cargo centre at Guru Ramdas Jee International Airport, Amritsar for storage of fruits and vegetables while export. It would have mechanical grading and sorting line, pre-cooling chamber, cold storage, a reefer van and a pick-up van. The sites for the location of fruit and vegetable pack house centres was identified based on the progressive growers in the area, area under cultivation, potential for increase in area under fruits and vegetables, access to markets and efforts made towards distant marketing and exports. The farmers in these locations were already marketing their produce

in the neighbouring market yards or supplying to the retail chains located close to the growing areas but because of lack of proper transport arrangements, they were unable to sell their produce to the distant markets (Business Standard, November 2012).

2.2.6 Transportation

Nakro and Khiki (2006) found that produce in form of fresh vegetables was sold by majority of the growers to the wholesale dealers in the nearby towns/cities as it was the easiest and quickest method of disposal of highly perishable produce mainly because of the problems related to storage, marketing and transport. The estimated transportation cost of fruits and vegetable crops as per the study was between 18-28 per cent of the total input cost, which was quite high.

2.2.7 Research and development

In order to push diversification in agriculture sector, Punjab must focus on research & development, extension & training services, post-harvest management, distribution & marketing channels. The National Horticulture Mission does the same and its major objective is to double the production & productivity of horticulture crops. There is an end-to-end approach under mission covering production, post harvest management, processing and marketing to assure appropriate returns to growers/producers; Promote Research and Development (R&D) of technologies for production, post-harvest management and processing in potential belts/clusters; Enhance acreage, coverage, and productivity in potential belts clusters. To achieve the objectives and goals of NHM, Strategy and Road Map has been prepared for next 3 years (Ministry of Agriculture, 2013).

2.2.8 Extension services

The delivery of technology package generated by the University/Institute to the farmers is basic to improve the rate of adoption of technology and productivity of agriculture. Demonstrations should be arranged at farmers' fields to convince them about the useful-needs of new technology so that they may adopt the same. For this purpose, a well planned programme should be prepared and necessary funds provided. The extension services in the crop sector including horticulture have not kept pace with the knowledge needs of the farmers (GOP, 2013). Extension services are also provided by private companies but their major objective is to promote their own products. Thus Public-Private-Partnership (PPP) in the delivery of services should be promoted for

convergence and sharing of resources.

The State Department of Horticulture as well as extension services of Punjab Agricultural University play lead role in dissemination of research findings and recommendations among the farming community of Punjab, who quickly respond through adoption of the same. District level camps are organized both in Kharif and Rabi season by department where experts/scientists educate the field staff as well as progressive farmers about the latest scientific crop production/management technologies. There are 20 Krishi Vigyan Kendras (KVK) in Punjab. Farm literature of PAU is being sold from KVKs for the benefit of farmers. The monthly magazines such as Progressive Farming (English), Changi Khedi (Punjabi), Package of Practices in respect of Kharif and Rabi vegetables and fruit crops.

2.2.9 Investment

Investment in horticultural development in Punjab is taking place from private and government sources. For instance, the Punjab Enabling Environment Project under the leadership of USAID, will develop and implement a set of activities that will result in significant policy reforms, capacity building of sector associations, and investments in Punjab to support the government, private sector and civil society organizations in improving livestock, dairy and horticulture value chains.

The Centrally Sponsored Scheme of National Horticulture Mission (NHM) is being implemented in 16 districts on a Mission mode approach to address all the issues related to holistic development of Horticulture in the State since 2005-06. The programme in the State of Punjab is being implemented by the State Horticulture Development Society through District Mission Committees involving farmers, Societies, NGOs,

Grower Associations, SHGs, State institutions etc. The districts covered under the programme include Firozpur, Bhatinda, Muktasar, Amritsar, Hoshiarpur, Gurdaspur, Kapurthala, Ludhiana, Jalandhar, Patiala, Fatehgarh Sahib, Taran Taran, Faridkot, Nawasahar, Sangrur and SAS Nagar Mohali. The focus crops identified under the programme includes Citrus, Guava, Ber, Pear, Grapes, Litchi, Flowers, Spices and Aromatic plants. During 2005-06 to 2011-12 an amount of Rs. 186.21 crore was released to Punjab from the centre and the state had reported an expenditure of Rs. 180.03 crores till March 2012. An allocation of Rs. 74 crore was approved by including GOI share of Rs. 62.9 crore for Annual Action Plan 2012-13. Funds to the tune of 57.9 crore was released during the same fiscal year out of which an expenditure of Rs. 42.09 crore was reported. Hence, expenditure on horticulture has shown an increasing trend (Table 4).

2.2.10 Market development

Domestic: The Punjab State Agricultural Marketing Board is the nodal agency in charge of controlling and supervising the purchase, sale, storage and processing of agricultural produce and the establishment of markets for agricultural produce in the state. There are 145 Agricultural Produce Market Committees (APMC) in Punjab with 139 Principal Yards and 275 Sub Market Yards attached to them. In addition, about 1600 purchase centres for Wheat in Rabi and 1514 centres for Paddy in Kharif season are operational to facilitate marketing of these produces. The farmers of Punjab do not have to cover more than 7-8 km distance for the sale of their produce. There are about 90 markets for marketing of Fruits and Vegetables in the state, out of which about 20-22 are relatively large. Ludhiana, Jalandhar, Hoshiarpur, Amritsar and Gurudaspur are

Table 4: Year wise details of outlay, funds released and expenditure under NHM in Punjab

Year	Outlay	Release	Expenditure
2005-06	60.74	28.69	6.97
2006-07	59.74	11.59	17.75
2007-08	68.54	24.10	17.14
2008-09	78.02	14.12	25.48
2009-10	38.54	25.78	36.09
2010-11	42.50	35.00	37.03
2011-12	46.75	47.02	39.57
2012-13	62.90	57.90	42.09

Source: National Horticulture Mission, 2013, Ministry of Agriculture

the major markets for fruits and vegetables. Punjab also introduced concept of Apni Mandi in line of the “Saturday Market” prevalent in UK and USA. “Apni Mandis” is designated market where farmers/ growers sell their produce especially fruits & vegetables directly to the consumers. With the elimination of middleman, the net profit is shared by the producers and the consumers. Besides this consumers also get fresh items of produce which they want. Currently there are 76 Apni Mandis functional in the state.

Export: With a view of promoting agricultural exports from the country and remunerative returns to the farming community in a sustained manner, the concept of the agri export zones (AEZ) was floated in 2001 by GOI. These zones have been set up for end to end development for export of specific products from a geographically contiguous area. The Central Government has sanctioned 60 AEZs comprising about 40 agricultural commodities, spread across 20 states in the country.

Punjab’s farmers are exporting vegetables with a GlobalGap certification, a declaration of better produce and a promise of higher profit. The certificate is an acknowledgment of a good agricultural technique and has so far been given to four to five Punjab farmers, with some other aspirants in queue (Indian Express, March, 2014). It is important in light of the rejections faced by Indian export consignments of agriculture produce and processed food by the US and the European Union (EU) (Tribune India, 2003). The reasons cited varied from presence of pesticide residues in grapes beyond permissible levels under the EU food laws to the presence of non-permissible artificial colour. In the case of the US, it was ethnic foods such as pickles and preservatives, ayurvedic supplements and tonics that were rejected on account of bad labelling, unexplained process of manufacture and presence of unknown or unapproved substances in the products. Corporate houses like FieldFresh, some Namdhari farmers and a group of potato farmers in Jalandhar, too, have the Global Gap certification.

2.3 Contract farming and value chains

A major subset of value chain development work is concerned with ways of linking producers to companies, and hence into the value chains. The great bulk of agricultural value chains involve sales to companies from independent farmers. Such arrangements

frequently involve contract farming in which the farmer undertakes to supply agreed quantities of their produce, based on the quality standards and delivery requirements of the purchaser, often at a price that is established in advance.

Contract farming is a written commitment or an agreement made between the farmer and the buyer for cultivation and sale of specific quality, quantity, grade, and variety of commodity at predetermined price (FAO, 2008).

Contract farming involves agricultural production being carried out on the basis of an ‘agreement’ between the buyer and farm producers. Sometimes it involves the buyer specifying the quality required and the price, with the farmer agreeing to deliver at a future date. More commonly, however, contracts outline conditions for the production of farm products and for their delivery to the buyer’s premises. Companies often also agree to support the farmer through input supply, land preparation, extension advice and transporting produce to their premises.

2.3.1 Findings from survey of contract farmers

For the purpose of this study’s objective to map traditional and modern value chains in Punjab focussed group discussions were held with traditional and contract farmers in Ludhiana, Patiala and Sangrur districts. There are various ways in which contract farming affected the farmers and other stakeholders in the value chain and they are listed below (Table 5).

Although contract farming helped developing the value chain it was not without its problems. These issues lead to ruffles in the chain between various stakeholders which need to be ironed out if the fruits and vegetable value chains are to function smoothly. Some of the grievances cited by farmers and contracting agencies during the focussed group discussions conducted by CIPT are mentioned below:

- (i) Farmers felt that agents favoured their own kith and kin when giving out contracts or inputs.
- (ii) The agreements apparently had a lack of transparency in them.
- (iii) Both firms and farmers breached contracts when market conditions provided arbitrage opportunities. Firms rejected more contracted produce on quality grounds when market prices dipped below contracted prices and farmers engaged in side-

Table 5: Contract farming and its impact on various stake-holders

Particulars	Impact on stake-holders
Access to inputs	The agreement includes supply of seeds, fertilizers, pesticides, credit, farm machinery, technical advice, extension etc., or may involve only the supply of hybrid seeds and marketing of produce. This reduces the risk of non-availability of raw material
Supply of products across the chain and finally to the end consumer	Contract farmers ensure steady supply of products, be it to the wholesaler, processor, retailer or consumer
Impact on Prices	Steady supply of goods reduces volatility of prices
Impact on quality of products	Since farmers are supplied with quality inputs, the products are of good quality too.
Access to information	New technological knowhow, information about market and findings from research and development are imparted to the farmers by the contracting agencies
Product differentiation	Contracting agencies provide inputs and facilities to cultivate varieties which are for table as well as processing purposes.
Access to infrastructure	Contracting agencies often provide facilities like grading of produce, lab testing and an assured market which the farmer may have not been able to afford on his / her own.
Access to credit and insurance	Farmers are often tied up with credit and weather insurance agencies with the help of their contracting agencies.

selling in open markets when market prices rose higher than contract prices.

- (iv) Fear of crop failure and the absence of crop insurance was another factor due to which farmers did not want to grow high value crops. There was also a general feeling that weather insurance agencies does not provide a fair assessment of the weather risk and thereby the farmers do not get a remuneration of the premium invested.

2.3.2 Case Studies of Field Fresh and Pepsico

Corporates like Field Fresh and Pepsico have made their presence felt in Punjab by investing in fruits and vegetables in case of the former and specifically potato in case of the latter. Contract farming not only aims at following global/good agricultural practices GAP but gives importance to things like traceability which increases the reliability of the end product. A lot of the produce is exported due the presence of contract farmers and their better practices.

Executives from Pepsico India and Fieldfresh foods private limited were also interviewed. Pepsico India has a “360 degree farmer connect program” in potato which apparently transformed the lives of small and marginal farmers across India. In Punjab they contract out to a large farmer base for producing potato chips.

They have an assured buy back of produce at pre-agreed prices, which insulated farmers from open market fluctuations. They supply high quality planting material, including its proprietary advanced seed varieties. They offer advanced plant protection program and technical knowhow developed in collaboration with leading agri-input companies like Dupont, Bayer and BASF. They also provide soft loans to farmers through national level tie-up with the State Bank of India facilitate weather insurance in partnership with leading insurance companies to protect farmer incomes.

For fresh vegetables, FieldFresh Foods has an Agriculture Centre of Excellence (ACE) at Ladhowal in Punjab, which is one of the largest agricultural R & D facilities of its kind and is spread over 300 acres with a state of the art protected and open field cultivation for value added vegetables. At ACE, the advanced technologies and agricultural best practices are showcased to partner farmers in order to help them in enhancing their agricultural productivity and farm income in an environmentally sustainable manner. FieldFresh Foods also has a new product development farm in Karad, Maharashtra. FieldFresh Foods is engaged with over 4000 partner farmers across 5000 acres in Punjab & Maharashtra, who are Global GAP compliant and grow vegetables for export to Europe. This has enabled

FieldFresh Foods to become the largest Indian exporter of fresh baby corn with a 15% share of the UK retail market. In addition, FieldFresh Foods is also growing and exporting fresh sweet corn, chillies, herbs, sugar snaps & snow peas.

3. The way forward

Increasing area and productivity of fruits and vegetables is not the answer to Punjab's diversification and thereby value chain issues. Unless all farmers are a part of a modern value chain structure, there will always be a disconnect between the various stake-holders involved in the movement of produce from the farm gate to the consumer. Farmers must have proper conditions for farming. For that they must have incentives to move away from the rice-wheat cropping pattern in the form of price support, proper inputs like adequate labour at the right time, good quality seeds, fertilisers and pesticides, credit for mechanisation if need be etc. If middle men are present in the chain, they should act as facilitators to add value to the produce by way of consolidation, wholesale activities, processing, storage, packaging and transportation. They should add value as opposed to pocketing majority of the margin without providing any services. Focusing primarily on production, with less emphasis on the role of traders, processors, and retailers, restricts opportunities for value-adding activities and development of a value chain.

As many marginal groups are directly involved in farming, support for improving the participation of small producers in value chains by providing access to inputs, information, and technology would be useful. Additional skills and expertise required for high-value markets need to be developed. Small and marginal farmers are generally capital starved and cannot make major investment in land improvement and modern inputs. Contract farming can fill up this gap by providing the farmers with quality inputs, technical guidance and management skills. Although the company deals only with the contract crop, the farmer's overall management skills may improve, thereby helping him to raise the yields of both contract and non-

contract crops. From the standpoint of corporate bodies, contracting reduces the supply risk, while the farmers enter into contractual arrangements with companies in order to minimize price risks.

Infrastructure forms the skeletal framework of the body of a value chain. Access to credit is a key requirement for all participants in a value chain. Road and market infrastructure are important, as they provide critical linkages for connections and transactions between value chain participants apart from the other rural functions they perform that indirectly support value chain development. Government and private agencies should provide lab testing and grading facilities. These two activities add tremendous value to products. Extension services empower farmers by providing them with knowledge about the latest technologies and inputs. Also, finance and insurance are very important for the smooth functioning of a value chain.

Access to timely market information, such as prices, is essential for a functioning value chain. This helps participants in the chain, such as producers, to respond to changes in market prices and improves their negotiating power with traders and processors. An understanding of market demands and requirements is necessary to take advantage of market opportunities. Value chains require constant innovation and technology inputs to become and remain competitive. Therefore research and development is an area that needs immediate attention.

Transparency between farmers and contracting agencies is very important so that a steady supply is maintained in the market. Investing on different farmers every cropping season is wasteful for the contracting agency and hence a good rapport between the two is important. To facilitate increased private sector engagement, greater clarity is needed between the evolving and expected roles of the public and private sectors.

This study is a work in progress and subsequently results, conclusions and policy implications will be added.

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About the Authors

Shayeqa Zeenat Ali is Research Associate, Centers for International Projects Trust, New Delhi, email: shayequa@cipt.in

Dharvinder Singh is Project Coordinator, Centers for International Projects Trust, New Delhi, email: dharvinder@cipt.in

Sandeep Dixit is Program Manager, Centers for International Projects Trust, New Delhi, email: sandeep@cipt.in

R. S. Sidhu is Director, Extension Education, PAU, Ludhiana, e-mail: sidhurajinder@gmail.com

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Contact Us

Centers for International Projects Trust
910-911, Pragati Towers, Rajendra Place
New Delhi - 110008
T: +91-11-4056 5989
W: www.cipt.in