Innovations in Agricultural Marketing in India: A Case Study of Supermarket in Punjab

Naresh Singla

1 Introduction

Traditionally, the marketing of fresh fruits and vegetables (FFVs) in India takes place through unregulated markets or markets regulated by Agricultural Produce Market Committee Act (APMC). The APMC Act provides for specified market yards or sub-yards, infrastructure and mode of transactions and market fee for agricultural produce (Chand 2012). However, in practice, most of the markets lack in these aspects and the produce is largely disposed of through large number of commission agents and wholesalers. Undue deductions, malpractices, delayed payments, etc., are the common traditions in these markets. The revenue generated through the market is rarely utilized for creating necessary market infrastructure (Sekhon and Rangi 2007). Considering all these, the APMC Act was modified to the Model Act 2003 to allow direct marketing and establishment of agricultural markets in the private and cooperative sectors so that farmers have the option to sell their produce directly to the agribusiness firms in the quality and form required by them (Chand 2012).

In recent years, the agri-food supply chains in most of the developing countries, including India, have been undergoing a structural change due to increasing demand for high-value food products (Reardon et al. 2009; Rao et al. 2012). These changes are largely triggered by market liberalization, rapid urbanization, rise of middle-income class, rising living standards, etc. (Rao et al. 2012). Besides, the consumers have also started demanding safe, quality and convenient fresh food (Pingali et al. 2007; Mergenthaler et al. 2009; Rao et al. 2012). Under this background, the supermarkets are emerging as alternative market channel for producers, and providers of quality, hygienic and convenient food to the consumers in India. The recent changes in foreign direct investment (FDI) norms are expected to

N. Singla (✉)
Centre for Economic Studies, Central University of Punjab,
Bathinda 151001, Punjab, India
e-mail: singla.naresh@gmail.com

Gyanendra Mani et al. (eds.), *Financing Agriculture Value Chains in India*,
India Studies in Business and Economics, DOI 10.1007/978-981-10-5957-5_6

accelerate the growth of supermarkets, and therefore the agri-food marketing structure of the future is likely to be different from the existing one.

In India, most supermarkets work with the primary producers through 'contacts' (not contracts) (Pritchard et al. 2010; Singh and Singla 2011a, b). Several studies have revealed that cost of production is higher for the farmers supplying produce to the supermarkets (Alam and Verma 2007; Joseph et al. 2008), but transaction costs are lower compared to those supplying to the traditional regulated markets (Dhananjaya and Rao 2009; Mangala and Chengappa 2008). The crop yields have been reported to be a mixed bag (Alam and Verma 2007; Mangala and Chengappa 2008). Interestingly, the price realization has been found to be higher from supermarkets compared to open market (Birthal et al. 2005; Joseph et al. 2008; Pritchard et al. 2010). In India, these chains have, so far, not made much difference in the share of producer in the consumer's rupee, other than lowering the cost of marketing (Singh and Singla 2011a, b). It is often argued that supermarkets rarely work with smallholders because of higher transaction costs of contracting with a large number of them.

The participation in supermarket-driven supply chains also influences the farmers' choice of producing high-value crops. For example, the supermarket, Aditya Birla Retail Ltd. (ABRL) in Gujarat, has introduced among farmers quality consciousness, exotic vegetables and package of practices for vegetables like cucumber and long melon (Singh and Singla 2011a). Another supermarket, Namdhari Fresh in Karnataka, adheres to strict requirements of quality, food safety and consistent supply and has introduced the use of reliable irrigation equipment, improved seeds and other modern inputs (Dhananjaya and Rao 2009; Singh and Singla 2011a, b). In some cases, the development organizations such as Himalayan Action Research Centre (HARC) in Uttarakhand have linked the smallholders to the supermarket, Mother Dairy, through technical and institutional support (Alam and Verma 2007). The participation in modern supply chains may also influence the technical efficiency positively as many of the agribusiness firms provide extension and information services also to the contract farmers (Schipmann and Qaim 2010; Rao et al. 2012). In addition, the assured markets and more stable prices for fresh produce in modern supply chains may also lead to gains in scale efficiency (Michelson et al. 2012; Rao et al. 2012).

Against this backdrop, the study presented in this chapter examines the performance of modern and traditional agricultural markets and their impact on farmers' income, efficiency and diversification focusing on the supply chain of one of the major supermarkets, namely 'Reliance Fresh' in Punjab.

2 Reliance Fresh and Its Operation Process

'Reliance Fresh' is operated by the Reliance Group of Industries and has pan-India presence. It procures its requirements of fresh fruits and vegetables directly from the farmers through its collection centres. In Punjab, Reliance Fresh has established

collection centres in Jandiala Guru in Amritsar district, Malerkotla in Sangrur district and Sirhind in Fatehgarh Sahib district. It sources about 70% of its requirement of fresh fruits and vegetables (FFVs) directly from the farmers, and the rest from the open market. The contracts with suppliers are mostly verbal, informal and non-registered. In Jandiala Guru, the domain selected for this study, Reliance Fresh has 125 farmers registered with its collection centre. The farmers bring vegetables themselves to the centre. The vegetables are pre-graded at the farm level and occasionally undergo quality check at the collection centre. For this study, a survey was conducted in 2010–2011. Sample of farmers was drawn from the list of 125 farmers supplying vegetables to Reliance Fresh. Cauliflower and cabbage being the main vegetables, a sample of 25 farmers supplying each of these vegetables was drawn from the supermarket farmers. An equal number of growers of these vegetables was drawn from those selling in the traditional unregulated/regulated market. Thus, the sample comprised 50 supermarket suppliers and 50 traditional market suppliers.

The farmers supplying vegetables to Reliance Fresh are paid in cash on a daily basis. Recently, the supermarket has also opened zero balance accounts with HDFC Bank and farmers' dues are directly credited to their accounts. The farm gate price is generally decided as open market price minus the transportation cost. The price is conveyed in advance in the morning based on the previous day *mandi* price.

Initially, the rejection rate of vegetables at the collection centre was around 10%. However, with farmers' education on quality standards, the rejection rate has come down to less than 5%. The processing and distribution of FFVs to the retail stores are carried out at the company's City Processing Centre (CPC) at Srihind. All city indents are consolidated and demands are placed by the CPC to the collection centres. The CPC undertakes grading, if needed, and does crating, packing, weighing and allocation of FFVs for distribution to its retail stores.

3 Who Supply to the Selected Supermarket and Who Do not?

Table 1 presents a comparison of the selected socio-economic characteristics of vegetable suppliers to Reliance Fresh supermarket with those selling in the traditional agricultural markets. The average landholding size of those farmers associated with this supermarket was smaller (6.2 acres) as compared to those selling in the open market (7.6 acres). The land-wise distribution of the farmers shows that 52% of the supermarket suppliers belonged to the category of small farmers (≤ 5 acres) as against 38% of those selling in the open market. The supermarket suppliers, however, were found to obtain less income from off-farm sources as well as dairying. Their average family size was slightly bigger. Tractor is one of the most common farm machineries in Punjab, and the tractor ownership was also less among those associated with this supermarket. From this comparison, we conclude

Table 1 Socio-economic profile of vegetable suppliers to Reliance Fresh and traditional market

Socio-economic variable	Supermarket suppliers (N = 50)	Traditional market suppliers (N = 50)
Average landholding (acres)	6.17	7.61
Small and marginal farmers (%)	52	38
Illiterate farmers (%)	34	26
Average off-farm income per month (Rs.)	1656	2014
Average income from dairying per month (Rs.)	2213	2958
Average family size (No.)	6.3	6.1
Tractor ownership (%)	42	56

that Reliance Fresh in order to spread procurement risk, sources its vegetable requirements not only from large farmers but also from those who have smaller landholdings and a larger endowment of family labour.

4 Do Farmers Benefit from Their Association with Supermarket?

The direct purchase of produce by supermarkets from the farmers is expected to benefit both the parties. While the supermarkets have an assured procurement of the produce of the desired quality, farmers benefit from assured market, reduction in cost on marketing and transaction, and better access to new technologies, inputs, extension services, credit, etc. In this section, we analyse whether farmers benefited from their association with Reliance Fresh.

Table 2 presents a comparison of yields and costs on production and marketing of cauliflower and cabbage of farmers associated with Reliance Fresh with those selling in the open market. The average yield of cauliflower as well as cabbage was found higher for the supermarket farmers. Reliance Fresh procures only 25% of their production of cauliflower as well as cabbage. The cost of cultivation of both the crops was about 10% higher for Reliance farmers mainly on account of higher use of labour and agro-chemicals. Together these account for about half of the total cost on both the categories of suppliers (Table 10).

The farmers associated with supermarkets incur lower marketing and transaction costs. The transportation cost for suppliers to traditional market is higher than that incurred by the supermarket suppliers. The wastage is also less in the supermarket supply channel. Both the supermarket and non-supermarket farmers pay unloading charges (Re. 0.02/kg) in the mandi. The marketing cost was lower for supermarket suppliers (Re. 0.19/kg) as compared to sellers in open market (Re. 0.36/kg) (Table 11). The average price realized was higher for the supermarket farmers. On

Table 2 Economics of cauliflower and cabbage production for supermarket farmers and traditional market farmers

Particulars	Cauliflower farmers				Cabbage farmers			
	Supermarket			Traditional market	Supermarket			Traditional market
	A grade	B grade	Remaining produce	All in *mandi*	A grade	B grade	Remaining produce	All in *mandi*
Yield (quintal/acre)	92.0			86.8	94.5			90.0
Sold (%)	15	10	75	100	15	10	75	100
Quantity sold (quintal)	13.8	9.2	69.0	86.8	14.2	9.5	70.9	90.0
Price (Rs./kg)	8.00	7.00	7.40	7.2	7.25	6.50	6.35	6.00
Gross returns (Rs.)	11,040	6440	51,060	62,460	10,276	6142	45,005	54,000
Production cost (Rs.)	34,444			30,947	32,418			29,376
Marketing cost (Rs.)	262	174	2484	2602	269	179	2551	2700
Net returns (Rs.)	5611	2820	22,743	28,910	5144	2721	18,140	21,924
	31,175				26,006			21,924
Net returns (Rs./kg)	3.39			3.33	2.80			2.40

the whole, the farmers associated with supermarket realized 10–15% more net income (Table 2).

5 Dynamics in Prices of Cauliflower and Cabbage

The prices of cauliflower and cabbage during peak arrival months, viz. October, November, December and January during 2010–2011, realized by the farmers on supplying to Reliance Fresh and selling in traditional local markets are compared in Table 3. The average price for both cauliflower and cabbage was 7–15% higher in Reliance Fresh than in local wholesale market. In general, the coefficient of variation was higher in local market price than in supermarket price, indicating that prices in local wholesale market are more volatile.

6 Technical Advice

About 76% supermarket farmers responded to the question on their sources of technical advice. Of these, about 32% did not seek advice from any source; for 26%, fellow farmers were the main source of information; 18% sought advice from input dealers; and 8% got advice from state department of agriculture and mass media. The commission agents/wholesalers were the main source of information for 5% farmers. Only 3% supermarket farmers reported to have received technical guidance from Reliance Fresh (Table 4).

7 Technical Efficiency and Scale Efficiency

The technical efficiency (TE) measures the success of producing maximum output at given levels of different inputs. We computed TE scores for cauliflower and cabbage using Data Envelopment Analysis (DEA) programme developed by Coelli (1996) for suppliers to supermarket and traditional market. The mean technical efficiency (OTE) for both cauliflower and cabbage was higher for supermarket suppliers. Twelve percent cauliflower as well as cabbage farmers associated with Reliance Fresh appeared to be fully efficient, as compared to 8 and 4% of their counterparts in the traditional market. The technical efficiency was further decomposed into pure technical efficiency (PTE) and scale efficiency (SE). The PTE that reflects the managerial performance to organize inputs in the production process revealed that supermarket farmers were more efficient in the production of both cauliflower and cabbage. The coefficient of variation in TE was relatively less in the case of supermarket farmers. However, SE scores of the traditional market farmers were relatively more consistent (Table 5).

Table 3 Price realized from sale to supermarket and traditional market during peak arrival period of cauliflower and cabbage

	October, 2010		November, 2010		December, 2010		January, 2011		All (October, 2010–January, 2011)	
	Super market	Traditional market	Super market	Traditional market	Super market	Traditional market	Super market	Traditional market	Super market	Traditional market
Cauliflower										
Price (Rs./kg)	17.32	16.22	12.92	11.91	7.71	6.72	7.19	6.23	11.40	10.38
% difference in price	6.78		8.48		14.72		15.45		9.79	
Standard deviation	2.97	3.12	2.60	2.79	1.98	1.94	1.79	1.69	4.80	4.78
Coefficient of variation (%)	17.14	19.24	20.13	23.46	25.63	28.90	24.94	27.15	42.14	46.04
Cabbage										
Price (Rs./kg)	11.04	9.90	8.34	7.59	5.38	4.66	4.84	4.22	7.35	6.55
% difference in price	11.42		9.88		15.38		14.69		12.18	
Standard deviation	0.81	0.89	2.22	2.21	0.78	0.77	1.26	1.27	2.82	2.67
Coefficient of variation (%)	7.35	8.98	26.67	29.13	14.58	16.47	26.06	30.08	38.30	40.75

Source Author's compilation and www.agmarknet.nic.in

Table 4 Distribution of supermarket farmers by source of advice for production of vegetables

Source of technical advice	No. (%) of farmers reported
Own decisions	12 (31.6)
Fellow farmers	10 (26.3)
Agri-input dealers	7 (18.4)
Agriculture department officials	3 (7.9)
Media (Newspaper, TV, radio, etc.)	3 (7.9)
Supermarket retail chains	1 (2.6)
Commission agents/wholesalers	2 (5.3)

The scale efficiency (SE) provides information about the ability of farmers to choose the optimum scale of production to attain the expected level of production. The proportion of farmers having suboptimal returns to scale was higher in the case of traditional market farmers (76% in cauliflower and 88% in cabbage) vis-à-vis supermarket farmers (60% in cauliflower and 64% in cabbage). This indicates that those farmers who experience increasing returns to scale (also known as economies of scale) allocate a smaller area to cauliflower and cabbage. Thus, inefficiency among traditional market suppliers existed due to less area. Further, 24% of cauliflower and 12% of cabbage supermarket farmers realized supra-optimal returns to scale. Only 16% of cauliflower farmers supplying to the local market realized supra-optimal results. None of the cabbage farmers supplying to the traditional market experienced supra-optimal returns to scale. Also, 16% of cauliflower farmers and 24% of cabbage farmers associated with supermarkets were fully scale efficient compared to 8% of cauliflower farmers and 12% of cabbage farmers supplying to traditional market (Table 6).

8 Farmers' Opinion on the Role of Supermarket in Vegetable Marketing

Eighty percent of the supermarket farmers gave their opinions on the role of supermarkets in making farmer–firm linkage more effective. Of these, about 62% indicated that supermarkets should procure all the produce so that farmers use only one marketing channel rather than selling the un-procured produce in the open market. Opening of more retail outlets was reported by 47% of the farmers, who opined that more organized retail outlets would enhance competition in the market, which would benefit them in obtaining better price terms. Forty percent of the supermarket farmers suggested that supermarket should provide packaging material so as to reduce wastages of produce. Nearly 35% of the supermarket farmers opined that the supermarket should give higher prices for superior grade produce. Need for supplying agri-inputs and for training in vegetable cultivation was indicated by 32 and 25% farmers, respectively. Further, 20% farmers suggested a premium for quality produce (Table 7).

Table 5 Technical efficiency scores for cauliflower and cabbage across reliance fresh and traditional market farmers

Efficiency score	Reliance fresh						Traditional market					
	Overall Technical Efficiency (OTE)		Pure Technical Efficiency (PTE)		Scale Efficiency (SE)		Overall Technical Efficiency (OTE)		Pure Technical Efficiency (PTE)		Scale Efficiency (SE)	
	Cauliflower	Cabbage	Cauliflower	Cabbage	Cauliflower	Cabbage	Cauliflower	Cabbage	Cauliflower	Cabbage	Cauliflower	Cabbage
1.0	3 (12)	3 (12)	5 (20)	8 (32)	6 (24)	6 (24)	2 (8)	1 (4)	3 (12)	3 (12)	4 (16)	3 (12)
0.9–1.0	1 (4)	3 (12)	7 (28)	6 (24)	5 (20)	3 (12)	1 (4)	2 (8)	4 (16)	8 (32)	4 (16)	4 (16)
0.8–0.9	6 (24)	9 (36)	10 (40)	8 (32)	4 (16)	13 (52)	4 (16)	3 (12)	9 (36)	9 (36)	12 (48)	8 (32)
0.7–0.8	8 (32)	6 (24)	2 (8)	3 (9)	6 (24)	3 (12)	6 (24)	11 (44)	5 (20)	2 (8)	2 (8)	5 (20)
0.6–0.7	5 (20)	4 (16)	1 (4)	–	4 (16)	–	7 (28)	5 (20)	3 (12)	3 (12)	3 (12)	4 (16)
0.5–0.6	2 (8)	–	–	–	–	–	3 (12)	3 (12)	1 (4)	–	–	1 (4)
0.4–0.5	–	–	–	–	–	–	2 (8)	–	–	–	–	–
Mean	0.77	0.82	0.91	0.92	0.86	0.89	0.72	0.75	0.84	0.88	0.86	0.85
Maximum	1	1	1	1	1	1	1	1	1	1	1	1
Minimum	0.55	0.62	0.65	0.75	0.63	0.74	0.41	0.55	0.58	0.67	0.63	0.70
Standard deviation	0.13	0.12	0.09	0.08	0.13	0.08	0.16	0.12	0.13	0.11	0.10	0.09
Coefficient of variation (%)	16.63	14.21	9.83	8.35	14.72	8.73	21.58	16.07	14.98	12.07	11.62	10.54

Note Figures within the parentheses indicate percentage of farmers with T.E. scores

Table 6 Scale efficiency of farmers supplying vegetables to supermarket and traditional market

Returns to scale	Cauliflower (%)		Cabbage (%)	
	Supermarket farmers	Traditional market farmers	Supermarket farmers	Traditional market farmers
Increasing	60	76	64	88
Constant	16	8	24	12
Decreasing	24	16	12	–

Table 7 Opinion of farmers on the role of the supermarkets

Particulars	No. of farmers (%)
Procure all the produce and grades	25 (62.5)
Open more retail outlets	19 (47.5)
Provide crates to pack vegetables	16 (40.0)
Give higher prices for A and B grades produce	14 (35.0)
Provide agri-inputs	13 (32.5)
Provide training on quality vegetable cultivation	10 (25.0)
Give incentives for good quality produce	8 (20.0)
Crop insurance in event of crop failure	5 (12.5)

Note Figures within the parentheses indicate the percentage of total number of responses

9 Supermarkets and Crop Diversification

Diversification is one of the several pathways to enhance farm incomes. The growing demand for high-value food commodities in the domestic as well as global markets is an opportunity for small farmers to enhance their incomes through diversification of their production portfolio towards these commodities (Birthal et al. 2006). This issue assumes more importance in a state like Punjab where agriculture is dominated by monoculturing of rice and wheat, causing damage to soil health and water resources. Moreover, land productivity has reached a plateau. Given this situation, an attempt has been made to examine the role of supermarkets in motivating farmers to cultivate high-value crops.

Table 8 shows the area share of different crops across supermarket farmers and traditional market farmers. The proportion of gross cropped area (GCA) under vegetables was higher for supermarket farmers than traditional market farmers. The traditional market farmers grow more of traditional crops such as wheat, paddy and fodder, while supermarket farmers grow more of vegetables. The cropping intensity has also been found higher for the supermarket farmers.

At the time of survey, the Reliance Fresh supermarket has been procuring vegetables for the past 3 years; therefore, we looked into the trend in area under vegetables. The area under vegetables across all farm categories of both supermarket and traditional market suppliers has increased during the past 3 years. The percentage increase was higher across supermarket farmers (13%) than traditional

Table 8 Cropping pattern across supermarket farmers and traditional farmers

Particulars	Supermarket farmers		Traditional market farmers	
	Area (acres)	% of GCA	Area (acres)	% of GCA
Cauliflower	2.09	16.7	1.05	7.7
Cabbage	1.58	12.6	0.97	7.1
Potato	1.45	11.6	2.74	20.0
Cucumber	1.15	9.2	0.39	2.8
Radish	0.90	7.2	0.47	3.4
Carrot	0.75	6.0	0.46	3.3
Other vegetables	0.66	5.3	0.53	3.9
All vegetables	8.58	68.7	6.60	48.4
Wheat	1.73	13.9	3.30	24.2
Paddy	1.40	11.2	2.74	20.0
Fodder	0.78	6.2	1.01	7.4
All traditional crops	3.91	31.3	7.05	51.6
GCA	12.49	100	13.65	100
Net area	6.17		7.61	
Cropping intensity (%)	202.4		179.3	

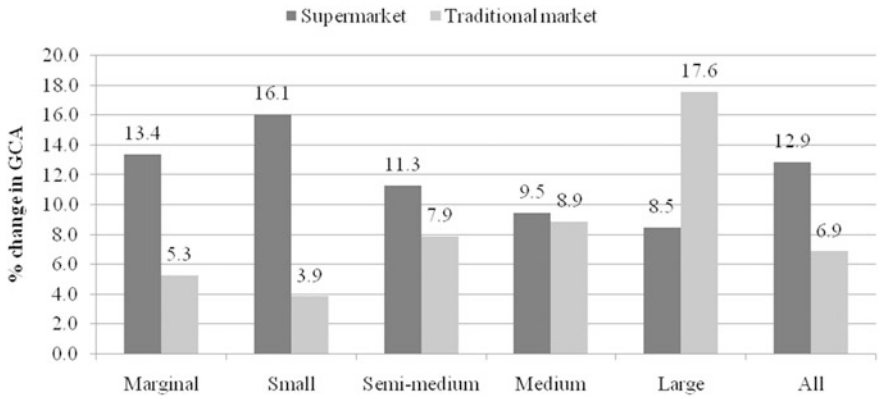

Fig. 1 Farm category-wise % change in GCA under vegetables in past 3 years across upper market farmers and traditional farmers

market farmers (7%). Further, the proportionate increase in area under vegetables was found to be higher for marginal and small supermarket farmers as compared to their counterparts, traditional market suppliers. Increase in area under vegetable cultivation starts declining with increase in landholding size (Fig. 1). Of the 72% supermarket farmers who responded to the reasons for allocating more area to vegetables in the past 3 years, 58% did it for higher income from vegetables. About 44% had shifted due to increase in demand for vegetables. Lack of hired labour was another major reason to shift to vegetable cultivation for 36% of the growers.

Table 9 Distribution of supermarket farmers by reasons for increasing area under vegetables during past three years ($N = 50$)

Reasons for increasing area under vegetables	No. (%) of farmers
Higher income	21 (58.3)
Increase in demand for vegetables	16 (44.4)
Lack of hired labour	13 (36.1)
Regular flow income from vegetables	9 (25.0)
Land more suitable for vegetables	8 (22.2)
Reduction in operational holding size resulting in diseconomies of scale from crops like wheat and paddy	8 (22.2)
Emergence of organized supermarkets	3 (11.1)

Regular flow of income from vegetable cultivation, suitability of land for vegetable cultivation, and reduction in operational landholdings resulting in diseconomies of scale from the traditional crops were some of the other reasons reported by the supermarket farmers for the adoption of vegetable cultivation. Surprisingly, 11% of the farmers attributed their shift to the presence of organized supermarket that provides assured market and pays a higher price (Table 9).

10 Conclusions and Policy Implications

The major findings of this study are summarized below

- The supermarkets, in order to reduce the procurement risks, are associated more with large farmers, and work with a sizable number of small farmers though they have small surpluses for the market. Another reason for contracts with small farmers is their family labour resource, which has advantage in cultivation of labour-intensive crops such as vegetables and in post-harvest activities related to grading, sorting and packaging.
- Farmers benefit from linkages with supermarkets, though they are informal. The supermarket farmers are technically more efficient, reap better harvest and realize better and stable prices from the institutional buyers. The main benefit, however, accrues from reduction in cost on marketing and transportation. They, however, incur more of production costs. Nonetheless, they realize 10% or more net returns from their association with supermarket supply chain. Farmers also benefit from the technical advice on grades and standards. Interestingly, the presence of an assured market motivates the farmers to scale up their production activity, which is important to persuade the farmers away from cultivation of cereals, which has been damaging both land and water resources.

- There are certain suggestions that need attention of the agribusiness firms to strengthen the linkages. One, many firms such as Reliance Fresh link with farmers through contacts and not contracts, probably to avoid transaction costs of enforcement and legal problems associated with disputes if any, which is contrary to the spirit of Modal Act 2003. A formal contract would benefit both the firms and producers in case of violation of the terms and conditions of the contract. Two, farmers need to be educated in crop planning, production and post-harvest management through provision of support services so as to avoid excess production. Note that the majority of farmers have indicated that the firm should procure all that they produce while it procures only a part of it. Three, vegetable production is also cost-intensive; the firm should consider providing credit support to their farmers, which of course is possible if the contract is formal. Four, the government should encourage or facilitate institutional arrangements such as contract farming that motivate the farmers to diversify away from monoculturing of crops like rice and wheat.

Appendix

See Tables 10 and 11.

Table 10 Production costs among supermarket and traditional market supplying farmers

Cost component (Rs./acre)		Cauliflower		Cabbage	
		Supermarket farmers	Traditional market farmers	Supermarket farmers	Traditional market farmers
Land rent		6500 (18.9)	6500 (21.0)	6200 (19.1)	6250 (21.3)
Land preparation		1675 (4.9)	920 (3.0)	1520 (4.7)	876 (3)
Seed		3942 (11.4)	3678 (11.9)	3537 (10.9)	3425 (11.7)
FYM		1120 (3.3)	800 (2.6)	1043 (3.2)	750 (2.6)
Fertilizer		5687 (16.5)	5135 (16.6)	5448 (16.8)	5021 (17.1)
Pesticide		4655 (13.5)	4215 (13.6)	4335 (13.4)	3956 (13.5)
Weedicide		825 (2.4)	770 (2.5)	790 (2.4)	750 (2.6)
Irrigation		956 (2.8)	754 (2.4)	1050 (3.2)	850 (2.9)
Labour	Hired	3048 (8.8)	2884 (9.3)	2755 (8.5)	2442 (8.3)
	Family	6036 (17.5)	5291 (17.1)	5740 (17.7)	5056 (17.2)
Cost of production		34,444 (100)	30,947 (100)	32,418 (100)	29,376 (100)

Note The overall average irrigation cost figures are based only on diesel engine and water hired expense since electricity for tubewells is free in Punjab

Table 11 Marketing costs across supermarket and traditional market supplying farmers

Cost	Cauliflower			Cabbage		
	Supermarket farmers		Traditional market farmers	Supermarket farmers		Traditional market farmers
	A and B grades	Rest in *mandi*	All	A and B grades	Rest in *mandi*	All
Transportation cost	414 (0.18)	2070 (0.30)	2168.8 (0.25)	425.3(0.18)	2126.2 (0.30)	2250.0 (0.25)
Spoilage	23 (0.01)	276 (0.04)	260.3 (0.03)	23.6 (0.01)	283.5 (0.04)	270.0 (0.03)
Unloading charges	–	138 (0.02)	173.5 (0.02)	–	141.8 (0.02)	180.0 (0.02)
Marketing cost	437 (0.19)	2484 (0.36)	2602.5 (0.30)	448.9 (0.19)	2551.5 (0.36)	2700.0 (0.30)

Note Figures within the parentheses indicate the marketing costs in Rs./kg

References

Alam, G., and D. Verma. 2007. *Connecting Small-Scale Farmers with Dynamic Markets: A Case Study of a Successful Supply Chain in Uttarakhand*. Dehradun: Centre for Sustainable Development.

Birthal, P.S., A.K. Jha, P.K. Joshi, and D.K. Singh. 2006. Agricultural diversification in North Eastern Region of India: Implications for growth and equity. *Indian Journal of Agricultural Economics* 61 (3): 328–340.

Birthal, P.S., Joshi, P.K. and Gulati, A. 2005. *Vertical Co-ordination in High-Value Food Commodities: Implications for Smallholders*, MTID Discussion Paper No. 85. Washington, DC: International Food Policy Research Institute.

Chand, R. 2012. Development policies and agricultural markets. *Economic and Political Weekly, XLVII* 52: 53–63.

Coelli, T.J. 1996. *A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program*. CEPA Working Paper 96/08. Armidale: Department of Econometrics, University of New England.

Dhananjaya, B.N. and Rao, A.U. 2009. Namdhari Fresh Limited. In: *Inclusive Value Chains in India—Linking the Smallest Producers to Modern Markets*, ed. M. Harper, 26–41. Singapore: World Scientific.

Joseph, M., Soundrarajan, N., Gupta, M. and Sahu, S. 2008. *Impact of Organised Retailing on the Unorganised Sector.* New Delhi: Indian Council for Research on International Economic Relations (ICRIER).

Mangala, K.P. and Chengappa, P.G. 2008. A novel agribusiness model for backward linkages with farmers: A case of food retail chain. *Agricultural Economics Research Review* 21(Conference Number):363–370.

Mergenthaler, M., K. Weinberger, and M. Qaim. 2009. The food system transformation in developing countries: A disaggregate demand analysis for fruits and vegetables in Vietnam. *Food Policy* 34 (5): 426–436.

Michelson, H., T. Reardon, and F. Perez. 2012. Small farmers and big retail: Trade-offs of supplying supermarkets in Nicaragua. *World Development* 40 (2): 342–354.

Pingali, P., Khwaja, Y. and Meijer, M. 2007. The role of the public and private sectors in commercializing small farms and reducing transaction costs. In: *Global supply chains, standards and the poor*, ed. J.F.M. Swinnen, 267–280. Cambridge: CAB International.

Pritchard, B., C.P. Gracy, and M. Godwin. 2010. The Impacts of supermarket procurement on farming communities in India: Evidence from rural Karnataka. *Development Policy Review* 28 (4): 435–456.

Rao, E.J.O., B. Brümmer, and M. Qaim. 2012. Farmer participation in supermarket channels, production technology, and efficiency: The case of vegetables in Kenya. *American Journal of Agricultural Economics* 94 (4): 891–912.

Reardon, T., C.B. Barrett, J.A. Berdegué, and J.F.M. Swinnen. 2009. Agrifood industry transformation and small farmers in developing countries. *World Development* 37 (11): 1717–1727.

Schipmann, C., and M. Qaim. 2010. Spillovers from modern supply chains to traditional markets: Product innovation and adoption by smallholders. *Agricultural Economics* 41 (3–4): 361–371.

Sekhon, M.K., and P.S. Rangi. 2007. Marketing infrastructure for sustainable development-role of Punjab Mandi Board. *Indian Journal of Agricultural Marketing* 21 (1): 110–121.

Singh, S., and N. Singla. 2011a. *Fresh Food Retail Chains in India: Organisation and Impacts*. New Delhi: Allied Publisher.

Singh, S., and N. Singla. 2011b. Fresh food supermarkets in India: An analysis of their inclusiveness and impact on primary producers. *Millennial Asia* 2 (1): 65–91.