

Vegetable Crops: Risks and losses faced by farmers

Abstract

Farming activities take place in a highly variable biophysical and economic environment which poses numerous types of risks. Risk perception plays a key role in the production and investment behavior of farmers. But, limited attention has been paid to understand its nature in cash-crop farming such as fruits and vegetables. To get a deeper understanding of the major factors constraining production of vegetables, an analysis of the farmers' perception on various risks in vegetables was carried out. There are different types of the risks and uncertainties are involved in different vegetable crops. The present study describes some of the factors constituting uncertainties that limit farm production and productivity. The study was focused on the various risk factors involved in different vegetable crops that are most worried by the sample population and highlights the losses caused by these factors and was conducted in Haryana state. The study also highlights the loss bearing capacity of the respondents and concluded that there was a great difference between the actual average losses experienced by the farmers and loss bearing capacity of the farmers. The study also gives suggestion to make stronger the economy of the farmers, all types of risks and crops should be covered under the insurance policies formulated by the government at present or in the future. Effective measures should be taken to properly manage the risks faced by the farmers.

Key Words: *Vegetable Crops, Risk, Average Losses, Loss Bearing Capacity*

Introduction

Haryana is a major agricultural state of the country. The dominant economic activity of the state is agriculture. In the process of economic development, the state has experienced rapid structural changes such as improving infrastructures, inflated land values and crop prices, a trend which has converted agriculture into a potentially **high** profitable business. Due to globalization of the market, adoption of advanced technology and supportive government policies, changes in agriculture **have** take place. Agricultural diversification in the state is highly intensified towards vegetables production. Cultivation of vegetables crops has made rapid strides due to favorable agro-climatic conditions suitable for cultivation of a wide range of vegetables (Ali and Kapoor, 2008). The farming business is naturally risky. Disparity in weather, insect infestations and plant diseases can harm the quality of the crop and reduce production. Slight changes in aggregate supply and demand for agricultural products can lead quickly to large changes in prices and changes in regulations can alter farmers' production practices and costs. In addition to production

and price risks, farm businesses are also affected by financial risk associated with borrowing capital and farm operators and farm workers face personal health risks associated with the farm environment and working conditions (www.cdc.gov). Horticultural crop farming is associated with negative outcomes affected from imperfect expected climatic, biological and price variables. These variables include natural adversities e.g. pest and diseases, weather factors and adverse fluctuations in both input and output prices which are not within the control of farmers (Fakayode *et al.* 2012). Vegetable production in outdoor environments is affected by weather conditions whereas outdoor weather conditions have a slight impact on greenhouse environments (Jones and Harrison, 2004).

Literature Review

Agriculture provides food as well as opportunity for employment generation to the country's population. It also contribute to the industrial goods market and earn foreign exchange. In India, agriculture and allied sectors (including agriculture, livestock, forestry and fishery) contribute 16 per cent in GDP and employs over 58 per cent of the workforce in the country. In production of fruits, India got the second position in the world. India's horticulture output (fruits, vegetables and spices) reached to third position (Yadav, 2016). For many years, conservative agriculture has been increasingly subject to strict environmental and animal welfare rules. This has meant the development of new approaches and methodologies, such as integrated agriculture (Bello, 2008). Vegetables are so important for human diet that a meal without a vegetable is supposed to be incomplete in any part of the world. India is the second largest producer of vegetables in the world, next to China. A good number of vegetables in India are an introduction from foreign countries. Therefore, the developments in the field of vegetable production will not only improve the nutritional requirement for masses but also will meet the challenge of adequate food supply to the growing population in India. The limited cultivable area can be best utilized for growing vegetables which are known to give higher yields. Our country has wide range of agro-climatic conditions which make possible the production of vegetables throughout the year in one part of the country or the other and then maintaining a continuous supply of fresh vegetables. These off season vegetables are in great demand in home market as well as in the neighbouring Gulf countries (Kumar, 2012). Risk is considered as a strong behavior force that affects decision making in the production of high value commercial crops. The majority of vegetable growers experienced high variability in price than yield. It means stabilizing price,

would be a more effective strategy to reduce income risk in the cultivation of vegetables (Mehta, 2012). The actual returns of the farmers are forced to below due to the risk factors in farming. Probability of occurrence of risks results in increased cost of production, decline in farm outputs and farm efficiency. In the processing, distribution and marketing of farm products risk is also a prominent factor (Ehirim *et al.* 2006). Government has provided a range of risk management strategies for farmers such as crop insurance, price stabilization, and emergency relief. But these strategies have been failed to effectively manage risk faced by farmers due to the poor implementation of these strategies (Miller *et al.*, 2004 & Boehije and Lins, 2010). In tropical areas, crop protection is an important element of fruit and vegetable production. To control pests and diseases, various methods have been developed both in temperate and tropical countries as like resistant cultivars, biological control, chemical control, cultural practices and integrated pest management (IPM). But instead of these existing alternative practices, the use of chemical pesticides has grown radically since the 1970s all over the world (Abate *et al.* 2000). The demand for vegetables especially for export is increasing. Vegetables can make high income for the farmers because of high market value and profitability. They also have high nutritive value compared to cereals (EARO, 2000). Vegetables are highly perishable; they start to lose their quality right after harvest and continued throughout the process until it is consumed. So, vegetables productions are risky investment activities. High risk involved in vegetable production may be attributed to several factors that are beyond the control of producers. The crops are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the marketing system (Alamerie *et al.* 2014).

Research Methodology

The present study is empirical in nature and based on primary data. To record the data, a well structured questionnaire was developed and administered on the farmers from all over in Haryana selected randomly. Data obtained through well designed questionnaire was analyzed by using simple statistical tools percentage analysis and frequency. All the calculations were done with the help of statistical software packages (SPSS). Ranking of risk factors is based on the responses of the respondents. The current paper has reported the results of a survey of total 567 farmers and reported the results of 111 respondents who have grown the vegetable crops and

conducted to investigate the risk factors involved in vegetable crops grown by the sampled population. The study also examined the average past losses experienced by the farmers and loss bearing capacity of the farmers in the main food crops. The study also highlights the difference between the loss bearing capacity and actual average losses experienced by sample population in the past.

Results and Discussion

To investigate the risk factors affecting the productivity of the vegetable crops, the data collected through sampled population is analyzed. There are different kinds of natural risks which affect the production of a crop. Every risk factor does not affect all crops uniformly. Various risk factors have an effect on the crops adversely and differently. The possible relevant risk factors includes such as variability in temperature, floods, drought, unseasonal/excess rain, hailstorms, wind storms, crust formation, etc. All these risks are away from the control of farmers. The losses made by these factors need to be managed to stablises the income of the farmers. Initially, we have discussed the crop profile of the sample respondents. The different risk factors involved in the vegetable crops, rank-wise risk factors in different crops grown, average past losses experienced by the respondents in the vegetable crops and their actual loss bearing capacity has been discussed.

Table 1: Crop wise profile of respondents

Sr.No.	Crop	Frequency	Percentage
1.	Potato	36	6.35
2.	Tomato	24	4.23
3.	Onion	22	3.88
4.	Bhindi	13	2.29
5.	Carrot	07	1.23
6.	Cauliflower	06	1.06
7.	Pea	03	0.53

The data states the crop wise profile of the respondents. It also gives details about the vegetable crops which were grown by the respondents. Among the vegetable crops, potato (6.35%) was the highest grown crop by the sampled population followed by tomato (4.23%),

onion (3.88%), and bhindi (2.29%). A proportion of 0.53% of the population grew pea. It was the least grown crop by the respondents. Carrot was grown by 1.23% respondents while, 1.06 farmers have grown cauliflower. Thus, we can say that potato, tomato and onion were the major vegetable crops grown by the sampled farmers and these crops can grown in both the seasons in Haryana.

Table 2: Ranking of different risk factors with regard to different crops

Risk	Rank	Potato	Tomato	Onion	Bhindi	Carrot	Cauliflower	Pea
Flood	HW	-	-	18.2	-	-	-	-
	MW	2.9	-	-	-	-	-	-
	LW	97.1	100.0	81.8	100.0	100.0	100.0	100.0
Drought	HW	-	-	-	-	-	-	-
	MW	5.6	4.2	22.7	7.7	-	-	-
	LW	94.4	95.8	77.3	92.3	100.0	100.0	100.0
Crust formation	HW	-	-	-	-	-	-	-
	MW	-	-	-	50.0	-	-	33.3
	LW	100.0	-	100.0	50.0	100.0	-	66.7
Fire	HW	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
	LW	-	-	-	-	-	-	-
Wind storms	HW	20.0	66.7	13.6	66.7	28.6	-	-
	MW	8.6	25.0	9.1	16.7	14.3	-	33.3
	LW	71.4	8.3	77.3	16.6	57.1	100.0	66.7
Frost	HW	43.3	36.4	47.1	-	28.6	16.7	33.3
	MW	43.3	63.6	11.8	-	71.4	66.7	66.7
	LW	13.4	-	41.1	-	-	16.6	-
Pest & Diseases	HW	88.9	87.5	94.4	92.3	57.1	83.3	100.0
	MW	11.1	12.5	5.6	-	28.6	16.7	-
	LW	-	-	-	7.7	14.3	-	-
Temperature variability	HW	22.2	29.2	40.9	15.4	28.6	50.0	-
	MW	55.6	41.7	50.0	61.5	71.4	50.0	100.0
	LW	22.2	29.1	9.1	23.1	-	-	-
Unseasonal/ excess rain	HW	75.0	54.2	50.0	30.8	28.6	50.0	66.7
	MW	22.2	33.3	22.7	46.1	57.1	50.0	33.3
	LW	2.8	12.5	27.3	23.1	14.3	-	-
Hailstorm	HW	8.3	29.2	22.7	-	28.6	16.7	-
	MW	16.7	16.7	13.6	46.2	14.3	66.7	33.3
	LW	75.0	54.1	63.7	53.8	57.1	16.6	66.7
Post harvest losses	HW	61.1	62.5	54.5	46.2	57.1	50.0	66.7
	MW	22.2	12.5	27.3	38.5	42.9	33.3	33.3

	LW	16.7	25.0	18.2	15.4	-	16.7	
Price	HW	83.3	79.2	86.4	84.6	57.1	100.0	100.0
	MW	16.7	20.8	13.6	15.4	28.6	-	-
	LW	-	-	-	-	14.3	-	-
Animal losses	HW	11.1	29.2	27.3	76.9	14.3	66.7	66.7
	MW	44.4	58.3	27.3	15.4	57.1	16.7	33.3
	LW	44.5	12.5	45.4	7.7	28.6	16.6	-
Weed	HW	-	8.3	4.5	23.1	-	-	-
	MW	16.7	12.5	36.4	7.7	-	16.7	33.3
	LW	83.3	79.2	59.1	69.2	100.0	83.3	66.7

HW- Highly Worried MW- Moderately Worried LW- Least Worried

With regard to onion crop price was that risk factor about which farmers were highly worried and concerned. Almost all the farmers bothered about it. Thus, we can say that the price for their crops is the major problem for the farmers. The farmers did not get right prices for their produce. Pests and diseases affected a lot the productivity potato (88.9%). In case of potato, the second bothered risk factor was price. The production of potato was also affected by the unseasonal/excess rain (75.0%) during the crop season. The figures explain that the respondents were highly worried about pests and diseases in the crop of tomato (87.5%). The second concerned risk factor was price in tomato. Post-harvest losses like rain, theft and fire in crops after harvesting but before selling were also an important risk factor in case of tomato. If we give a look to the crop carrot, farmers were highly anxious for the prices of carrot. They wanted high prices for their crop but they did not get. Bhindi is a vegetable crop and it was grown by very small number of farmers. Pests and diseases were the main hurdle in high productivity of this crop. If a farmer produces bhindi in good quantity, then the second concern is for its price. Bhindi was also affected by the losses due to animals in the crop. The data also describe the risks involved in cauliflower and pea. It was clearly observed from the data that highly risky factor in cauliflower and pea was the price of the crops that a farmer got. All the farmers (100.0%) were highly worried about it. The next risk factor concerned was pest and diseases. There are some risks that can be controlled by treatment in crops on time after observation of these risks like pests and diseases, irrigation in case of drought, but some risks are there which can't be controlled.

Table 3: Ranking of risk factors involved in different crops

Sr.No.	Crop	Risks involved		
		R ₁	R ₂	R ₃

1.	Potato	Pest & diseases	Price	Unseasonal/excess rain
2.	Tomato	Pest & diseases	Price	Wind storms
3.	Onion	Pest & diseases	Price	Post- harvest losses
4.	Bhindi	Pest & diseases	Price	Animal losses
5.	Carrot	Price/Post- harvest losses /Pest & diseases	Wind storms/Frost/ Temperature variability/ Unseasonal/excess rain/Hail storms	Animal losses
6.	Cauliflower	Price	Pest & diseases	Animal losses
7.	Pea	Price/Pest & diseases	Unseasonal/excess rain/Post- harvest losses/Animal losses	Frost

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150 The figures state different kinds of risks which affect the production of a crop. Pests and
151 diseases affected a lot the productivity of all the vegetable crops. In case of potato, tomato, onion
152 and bhindi the second bothered risk factor was price. The production of potato was also
153 exaggerated by the unseasonal and excess rain during the crop season. The main risk factor was
154 pests and diseases in the crop of tomato followed by price. A post-harvest loss like rain, theft and
155 fire in crops after harvesting but before selling was also an important risk factor. If we give a
156 look to carrot, farmers were highly anxious for the prices of this crop. They wanted high prices
157 for their crops but they did not get. So, the farmers wanted to cover this risk in their crop
158 insurance policy. Bhindi is a vegetable crop and it is grown by very small number of farmers.
159 Pests and diseases were the main hurdle in high productivity of this crop. If a farmer produces
160 bhindi in good quantity, then the second concern was for its price. Carrot, bhindi and cauliflower
161 were also affected by the losses due to animals in the crop. It was clearly observed from the data
162 that highly risky factor in carrot, cauliflower and pea was the price of the crop that a farmer got.

163 **Table 4: Average loss experienced by farmers in the past**

Sr.No.	Crop	Average Loss (%)	Risks involved		
			R ₁	R ₂	R ₃
1.	Potato	37.26	Pest & diseases	Price	Unseasonal/excess rain
2.	Bhindi	37.00	Pest & diseases	Price	Animal losses
3.	Tomato	34.55	Pest & diseases	Price	Wind storms
4.	Cauliflower	30.00	Price	Pests& diseases	Animal losses
5.	Onion	30.05	Pest & diseases	Price	Post- harvest losses
6.	Carrot	28.13	Price/Post harvest losses/Pest & diseases	Wind storms/Frost/ Temperature variability/	Animal losses

				Unseasonal/ excess rain/Hail storms	
7.	Pea	20.00	Price/Pest & diseases	Unseasonal/ excess rain/Post- harvest losses/Animal losses	Frost

The data given in table depict that the vegetable crops such as potato, bhindi and tomato, losses in potato (37.26%) were more than the bhindi (37.00%) and tomato (34.55%). The largest risk factor was pests and diseases in potato, bhindi, tomato, onion, carrot and pea. The farmers used pesticides and chemicals to protect their crops from different pests and diseases which increased their cost on one side along with ill side effects on the quality of product and soil. So, in this way, the farmer suffered double loss on the same time. In case of pea, cauliflower and carrot price assigned the main risk factor. However, in India, to cover the risk of price in agriculture there is a provision of MSP (Minimum Support Price) but it does not cover all the crops and in some cases it also in synchronized with the farmers. Further, the risk in agriculture is vulnerable to non price such as wind storms, crust formation, post-harvest losses, frost, fire, etc. involved in different crops at different times which were beyond the control of the farmers.

Table 5: Loss bearing capacity of farmers in different crops

Extent of Loss	Percentage of Respondents						
	Potato	Tomato	Onion	Bhindi	Carrot	Cauliflower	Pea
Up to 10%	5.66	21.21	-	-	-	-	-
Up to 9%	15.09	30.30	2.17	10.00	-	-	-
Up to 8%	35.85	42.42	8.70	20.00	-	-	25.00
Up to 7%	39.62	48.48	15.22	30.00	25.00	-	50.00
Up to 6%	75.47	63.64	26.09	40.00	75.00	-	-
Up to 5%	77.36	90.91	60.87	80.00	100.00	50.00	100.00
Up to 4%	84.91	93.94	65.22	-	-	-	-
Up to 3%	90.57	96.97	84.78	90.00	-	100.00	-
Up to 2%	96.23	100.00	100.00	-	-	-	-
Up to 1%	100.00	-	-	100.00	-	-	-

The data given the table compares the maximum limit of average losses experienced by the farmers in the past and the loss bearing capacity of farmers with regard to different crops. There are 5.66% farmers were there in the sampled population who could afford the losses of up to 10% in potato which is the main vegetable crop. All the farmers could afford the loss up to 5% in carrot. In bhindi, 90.00% farmers could afford the losses up to 3% in relation to 10.00%

farmers could bear up to 9% losses. In carrot, the loss limit was up to 7% (25.00%) and in cauliflower it was just 5% (50.00%). Onion which is the major vegetable crop, the highest limit of bearing losses by respondents was up to 9% and only 2.17% of sampled population could manage this limit, 8.7% could bear up to 8%, 15.22% could up to 7%. All the farmers could bear the losses up to 2% in onion. The percentage of farmers in loss bearing capacity up to 10% in tomato was 21.21%.

Table 6: Average past losses experienced and loss bearing capacity of farmers

Crops	Loss bearing capacity										Average past losses (%)
	Up to 10%	Up to 9%	Up to 8%	Up to 7%	Up to 6%	Up to 5%	Up to 4%	Up to 3%	Up to 2%	Up to 1%	
Potato	5.66	15.09	35.85	39.62	75.47	77.36	84.91	90.57	96.23	100.00	37.26
Bhindi	-	10.00	20.00	30.00	40.00	80.00	-	90.00	-	100.00	37.00
Tomato	21.21	30.30	42.42	48.48	63.64	90.91	93.94	96.97	100.00	-	34.55
Onion	-	2.17	8.70	15.22	26.09	60.87	65.22	84.78	100.00	-	30.05
Cauliflower	-	-	-	-	-	50.00	-	100.00	-	-	30.00
Carrot	-	-	-	25.00	75.00	100.00	-	-	-	-	28.13
Pea	-	-	25.00	50.00	-	100.00	-	-	-	-	20.00

Table-6 compares the maximum limit of average losses experienced by the farmers in the past and the loss bearing capacity of farmers with regard to vegetable crops. There are 5.66% farmers were there in the sampled population who could afford the losses of up to 10% in potato which is the main vegetable crop. The past experienced loss for potato was 37.26%. All the farmers could afford the loss up to 5% in pea and carrot. In bhindi, 90.00% farmers could afford the losses up to 3% and only 10.00% farmers could bear up to 9% losses. In carrot, the loss limit was up to 7% (25.00%) and in cauliflower it was just 5% (50.00%). The average loss in the past was 28.13% in carrot and 30.00% in cauliflower. Onion which is the major vegetable crop, the highest limit of bearing losses by respondents was up to 9% and only 2.17% of sampled population could manage this limit, 8.7% could bear up to 8%, 15.22% could up to 7%. All the farmers could bear the losses up to 2% in onion but the average losses experienced by the

farmers in the past in onion crop were 30.05%. Thus, almost in all the crops maximum average past losses experienced by the sampled farmers were too much than the present bearing capacity.

Conclusions

A proportion of 6.35% of respondents were involved in growing potato. Pests and diseases affect a lot to the productivity of potato (88.9%). In case of potato and onion, the second bothered risk factor was price after the pests and diseases attacks. The production of potato was also exaggerated by the unseasonal and excess rain during the crop season. The main risk factor was pests and diseases in the crop of tomato. The second concerned risk was price in tomato. Bhindi is a vegetable crop and it was grown by very small number of farmers. Pests and diseases were the main hurdle in high productivity of this crop. If a farmer produces bhindi in good quantity, then the second concern was for its price. Carrot and bhindi were also affected by the losses due to animals in the crop. The highly risky factor in cauliflower and pea was the price of the crop that farmers got. But cost of cultivation was also high. Market risks were also there in the vegetable crops. Average past losses in potato (37.26%) were more than the bhindi (37.00%) and tomato (34.55%). The largest risk factor was pests and diseases followed by price. Only 5.66% farmers were there in the sampled population who could afford the losses up to 10% in potato which is the main vegetable crop. The past experienced loss was 37.26%. In carrot the loss limit was up to 7% (25.00%) and in cauliflower it was just 5% (50.00%). The average loss in the past was 28.13% in carrot and 30.00% in cauliflower. In onion, which is the major vegetable crop, the highest limit of bearing losses by respondents was up to 9% and only 2.17% of the sampled population could manage this limit, 8.7% could bear up to 8%, 15.22% up to 7% but the average losses experienced by the farmers in the past in the onion crop were 30.05%. The study suggests that the proper measures have to be taken by the government to strengthen the economy and wealth of the farmers and their crop losses should be managed effectively, so that they could be able and prepare for the next cropping season on crop failure.

Future Scope of the Study

This kind of research motivates the governments to take initiatives in the field of vegetable crops production which may result in the increase in production and positive impact on the consumption level also. For wider afford of vegetables production improvement in the state as well as in the country at the faster rate, there is a need to mitigate the risks faced by the farmers

through the effective risk reduction measures. Such kind of studies is the need of the hour to strengthen the economic position of the farmers of the country which may also motivate the farming community to adopt diversified farming.

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