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Losses Experienced by Farmers in the Cultivation of Pulses and Oilseeds: A Case Study of Haryana

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Author's contribution

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ABSTRACT

Agriculture is nature based activity. Natural environment affect a lot to the productivity of different crops in farming. There are so many risks and uncertainties inherent in agriculture. Some of the risks are related to nature and others are related to market conditions. Most of the times, these risks adversely affect the economic condition of the farmers. The present study has been conducted in Haryana, India with the objective to trace out the different risk factors involved in the main crops of pulses and oilseeds that are grown and most worried by the sample population and also point outs the losses caused by these factors. The study highlights the loss bearing capacity of the respondents and concluded that there was a great difference between the actual experienced losses and loss bearing capacity of the farmers. The study also provides suggestion for improving the financial condition of the farmers, all kinds of risks should be covered under the insurance policies formulated by the government at present or in the future whether they are related to pre-harvesting or post-harvesting.

Keywords: Farming; risk; post-harvesting risks; financial.

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1. INTRODUCTION

Agriculture is the backbone of the economy of Haryana. Majority of the population engaged in the farming and allied activities for its livelihood. But, the agriculture sector of the state is frequently suffered from natural calamities like cyclones, droughts and flash floods which drastically affect production and productivity of agriculture. These calamities are known as risks in agriculture. Risk is potential of losing something of value. Severity of risk and unmanaged risk cause huge loss to the farmers, which results in declining area, yield and production. To evaluate the crop productivity risk, necessary efforts have been made [1]. In the agriculture environment the need of the hour is to adopt the farming risk mitigation measures that are more predictable from the point of view of the affected and more reliable from the government perspective. The risk can be better managed by spreading it across entities (public and private) that have the capacity to absorb them and to make the packaging and delivery more efficient that can reduce uncertainty in terms of the level of relief compensations. In such a scenario, crop insurance can act as a risk mitigation tool [2]. The identification, estimation, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor and control the probability and/or impact of unfortunate events is called risk management [3]. Normally, the farming sector is considered less vulnerable as compared to cities or industries in terms of economic damage. While focusing the agricultural damage, it is essential to undertake the impact of damage on crops with respect to the small land farmer [4].

After Independence, India has achieved the remarkable growth in the production and productivity of various crops such as food grains, oilseeds, fruit crops, vegetables and also in other crops. Despite this, farmers get low returns from their crop cultivation. The main reason for that are failures caused by vagaries of monsoon. Returns from crop production are essential not only for the survival of farmers but also to facilitate farmers for sowing of the next crop. If the flow of income from agriculture is not regular and insufficient, farmers will not be able to pay back their debts which would lead to increased indebtedness [5].

2. LITERATURE REVIEW

Crop diversification helps to maximize the utilization of scarce land resource, increase productivity and reduce risk in agriculture. Though, cropping diversity can reduce several limitations and risks involved in traditional methods of agriculture, it cannot remove the risk element completely. Agricultural productivity also suffers due to small farm size. Changes in cropping pattern intensify the need for stronger financial institutions. To implement and sustain the benefits of crop diversification technical and institutional supports are required [6]. Modern farming increases the loss of biodiversity, pest resistance, soil and water pollution, soil loss including soil fertility and also increases the greenhouse gas emissions. Additionally, climate change is expected to further make worse food insecurity in areas currently vulnerable to hunger and under nutrition [7]. In the northern States, particularly in Punjab and Haryana, the common rice-wheat crop rotation has washed-out soil and water resources at shocking rate. Due to an unsustainable and inefficient agricultural cycle, India is losing valuable foreign exchange at one side and importing pulses on the other side. Estimates suggest that India needs an annual growth of 4.2 per cent to ensure projected demand of 30 million tonnes by 2030. The major obstacles related to productivity of pulses are technological setbacks, managerial set-up to supervise the countryside, lack of a mechanism for the procurement and marketing of pulses and lack of drought- and disease-resistant varieties of pulse seeds. The risk of low productivity and income is too high for farmers to bear. To meet this standard, constraints to production must be analyzed and effective steps must be taken [8]. The potential of oilseeds as well as pulse production is significantly interrupted by the forecasted deviations in agro-climatic conditions especially temperature and their associated impacts on rainfall and resulting accessibility of water to crops and extreme weather circumstances [9]. Pulses are the essential part in the diet of poor as well as the rich. Pulses are grown all over the world. Among the pulses producing countries, India ranks second and contributes about 20 per cent to world production with 33 per cent of pulses area; however it ranks a poor 98th in pulses productivity. Pulses share in total food grain production has registered continuous decline from 17 per cent (1961) to below 7 per cent in 2011 [10]. Pulses are environment friendly crops that have the unique ability to fix nitrogen and thereby help improve

soil health. Even though, they have low genetic potential in terms of realizing productivity as compared to cereals, they contribute to the environment protection. But, the main risks involved in pulses are Climatic factors, Soil related constraints, Input quality and availability related constraints, Pests and diseases, technological constraints etc. [11]. [12] suggested that to improve the productivity of pulses there is a need to encourage the accelerated adoption of present technology for bridging the yield gap, institutional support to boost seed replacement rate and quality production as well as to strengthen the life-saving irrigation in pulse growing pockets and to provide guaranteed availability of critical inputs viz., seed fertilizer, pesticides. Regular mechanization for pulse production and also the policy support for value chain for pulses.

3. RESEARCH PROBLEM

All the past studies pointed out the importance and need of pulses and oilseeds but not state the problems and risk faces by the farmers due to market and weather conditions, which grow the pulses and oilseeds. There is an urgent need to mitigate and manage these risks properly and timely. The present study is totally focused on the risks and losses experienced by the pulses and oilseeds growers due to different risk factors.

4. RESEARCH METHODOLOGY

Haryana is the leading state of India in the field of agriculture. Most of the population of the state depend on the farming and allied activities for their livelihood. The present study is based on primary data which has been conducted in Haryana state of India. To record the data, a well structured questionnaire was developed and administered on the farmers with help of interview schedules with the farmers. The sample was selected randomly from all over in Haryana. Data obtained through the structured questionnaire was analyzed using simple statistical tools frequency calculation and percentage analysis. These 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 study was conducted on the total 567 respondents and reported the results of only those respondents who were growing the major crops of pulses and oilseeds to investigate the risk factors involved in pulses and oilseeds.

5. RESULTS AND DISCUSSION

To investigate the risk factors affecting the productivity of pulses and oilseeds, the sampled data was analyzed. There were various risks factors involved in cultivation of pulses and oilseeds grown in the sampled area. The major risks were price, unseasonal/excess rain, hailstorms, wind storms, floods, drought, crust formation, variability in temperature, pests and diseases, etc. Most of these risks are away from the control of respondents and affect adversely and differently to each crop. To stabilize the earnings of the farmers, the management of the losses made by these factors is required. Initially, we have discussed the crop profile of the sample respondents. In the coming sections, we have described the different risk factors concerned to the pulses and oilseeds, rank-wise risk factors in various pulses and oilseeds grown, average past losses experienced by the respondents in the these crops and their actual loss bearing capacity has been discussed.

Table 1 states the crop wise profile of the respondents. It also gives details about the crops which were grown by the respondents. A variety of crops were grown by the respondents including commercial crops, annual crops, vegetable and horticultural crops and also some agro-forestry crops. Wheat (90.65%) was the highest grown crop by the farmers followed by rice (54.14%), cotton (40.21%), mustard (30.34%) and cluster bean (25.57%). The farmers (7.41%) grow sugarcane and 6.35% were involved in growing potato and barley. Only 0.53% farmers grew pea followed by arhar (0.35%). The least grown crops were safeda, castor and fruit trees (0.18%). Thus, we can say that the major crops grown by the respondents were wheat, rice, cotton, mustard, cluster bean, pearl millet, sugarcane, barley, potato, jawar tomato, onion, etc.

5.1 Risks Involved in Pulses and Oilseeds

Various types of risks and uncertainties are related to the agricultural activities. Risk may be defined as imperfect knowledge where the probabilities of the possible outcomes are known, and uncertainty exists when these probabilities are not known. Because farm production is often carried out in the open air, so the probability of risk in agriculture becomes more. Production risks come from the unpredictable nature of the weather and uncertainty about the performance of crops such as through the incidence of pests

and diseases, or from many other unpredictable factors. In addition, prices of farm produce are rarely known for certain at the time that a farmer must make decisions about how much of which inputs to use or what and how much of various products to produce, so that price or market risks are often significant [13].

Table 1. Crop wise profile of respondents

Crop	Frequency	Percentage
Wheat	514	90.65
Rice	307	54.14
Cotton	228	40.21
Mustard	172	30.34
Cluster bean	145	25.57
Pearl millet	56	9.88
Sugarcane	42	7.41
Barley	36	6.35
Potato	36	6.35
Jawar	26	4.59
Tomato	24	4.23
Onion	22	3.88
Green gram	18	3.17
Berseem	18	3.17
Bhindi	13	2.29
Sunflower	09	1.59
Poplar	08	1.41
Chickpea	07	1.23
Maize	07	1.23
Carrot	07	1.23
Cauliflower	06	1.06
Marigold	04	0.71
Pea	03	0.53
Arhar	02	0.35
Castor	01	0.18
Safeda	01	0.18
Fruit trees	01	0.18

Table 2 states different kinds of risks which affect their crops. The figures given in the table also indicate that which risk factor was more or less serious for a particular crop. In this table, the percentage is used to know the weightage assigned to risks and their ranking. Pests and diseases (85.7%) attacked highly the chickpea crop followed by losses made by the animals (42.9%) and after that unseasonal/excess rain (42.8%) also affected. Mustard is also the main crop of rabi season. In mustard, 74.9% farmers thought that wind storm was high risk factor followed by the price (71.3%) and unseasonal/excess rain (69.8%). Green gram was highly affected by pest and disease (100%). The next worried risk factor was price (61.1%) in green gram. With regard to crops like castor and sunflower almost all the farmers bothered about price. 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. 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. Arhar was the crop in which the highest risk factors were pest and disease and animal losses (100%). So, the farmers should be protected from these risks with the help of insurance of their crops and all the risk factors about which they are worried should be covered in that insurance.

Table-3 states different kinds of risks which affect the production of a crop. Pests and diseases attacked highly the chickpea crop followed by losses made by the animals and after that unseasonal/excess rain also affected. Mustard is also the main crop of rabi season. For mustard, farmers perceive that wind storms were high risk factor followed by the price and unseasonal/excess rain. Farmers never got those prices for these crops as they wanted. In case of green gram, pests and disease was the highly worried risk factor. After that animal loss was risk factor in green gram. With regard to crops like castor and sunflower, price was that risk factor about which farmers were highly worried and concerned. Thus, we can say that a price for their crops is the main problem for the farmers. They did not get right prices for their produce. Post-harvest losses like rain, theft and fire in crops after harvesting but before selling were also an important risk factor. They wanted high prices for their crops but they did not get. So, the farmers wanted to cover this risk in their crop insurance policy. Pests and diseases were the main hurdle in high productivity of this crop. 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 like flood, temperature variability, unseasonal/excess rain, hail storms, etc. So, the farmers should be protected from these risks with the help of insurance of their crops and all the risk factors about which they are worried should be covered in that insurance.

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

Risk	Rank	Castor	Arhar	Chickpea	Sunflower	Green gram	Mustard
Flood	HW	-	-	-	11.1	-	1.8
	MW	-		-	-	-	7.0
	LW	100.0	100.0	100.0	88.9	100.0	91.2
Drought	HW	100.0	50.0	28.5	-	33.3	22.1
	MW	-	50.0	42.9	-	22.2	19.2
	LW	-	-	28.6	100.0	44.5	58.7
Crust formation	HW	-	50.0	14.2	11.1	16.6	2.9
	MW	-	50.0	42.9	22.2	27.8	5.2
	LW	100.0	-	42.9	66.7	55.6	91.9
Fire	HW	-	-	14.3	-	5.6	25.0
	MW	-	-	-	-	-	7.6
	LW	100.0	-	85.7	100.0	94.4	67.4
Wind storms	HW	100.0	50.0	28.6	88.9	27.8	74.9
	MW	-		14.3	11.1	16.7	11.6
	LW	-	50.0	57.1	-	55.5	13.5
Frost	HW	100.0	-	40.0	-	-	64.1
	MW	-	-	40.0	-	-	28.8
	LW	-	-	20.0	100.0	-	7.1
Pest & Diseases	HW	100.0	100.0	85.7	88.9	100.0	66.8
	MW	-	-	-	11.1	-	19.2
	LW	-	-	14.3	-	-	14.0
Temperature variability	HW	100.0	50.0	14.2	60.0	11.1	25.2
	MW	-	-	42.9	40.0	22.2	18.0
	LW	-	50.0	42.9	-	66.7	57.8
Unseasonal/excess rain	HW	-	50.0	42.8	100.0	55.6	69.8
	MW	100.0	50.0	14.3	-	22.2	19.2
	LW	-	-	42.9	-	22.2	11.0
Hailstorm	HW	100.0	-	28.6	77.8	27.8	60.2
	MW	-	50.0	14.3	11.1	22.2	15.8
	LW	-	50.0	57.1	11.1	50.0	24.0
Post harvest losses	HW	-		14.3	25.0	22.2	25.6
	MW	-	50.0	14.3	25.0	27.8	24.4
	LW	100.0	50.0	71.4	50.0	50.0	50.0
Price	HW	100.0	50.0	28.6	100.0	61.1	71.3
	MW	-	50.0	57.1	-	33.3	20.5
	LW	-	-	14.3	-	5.6	8.2
Animal losses	HW	-	100.0	42.9	77.8	88.9	12.8
	MW	-	-	42.9	22.2	11.1	26.7
	LW	100.0	-	14.2		-	60.5
Weed	HW	-	-	14.3	-	44.5	22.2
	MW	-	50.0	28.6	33.3	11.1	27.5
	LW	100.0	50.0	57.1	66.7	44.4	50.3

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

The data given in table depict characterize that the highest amount of losses (50.83%) was incurred by the sampled population in the crop of green gram followed by chickpea (50.56%). In all these crops, the highest risk factor was connected with pests and diseases. The next ranked risk factor after these two was damage by animals in green gram and chickpea crops. Price was also insured by the government but not up to the expectation of the farmers. In some cases, farmers tried to want for increase in the prices and stored their produce for a long time. In this way cost of storage also increased their total cost of production in different crops. Thus, it may be argued that risks were more in farming of pulses such as green gram, chickpea, arhar, etc. This was the reason that a small percentage of farmers grew pulses. 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 castor and sunflower 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 3. Ranking of risk factors involved in different crops

Crop	Risks involved		
	R_1	R_2	R_3
Castor	Price/Drought/Hail storm/ Wind storms/Frost/ Pests & diseases/ Temperature variability	Unseasonal/excess rain	Flood/Crust formation/ Fire/ Post- harvest losses /Animal losses / Weed
Arhar	Animal losses/ Pests & diseases	Drought/ Crust formation/Wind storms /Temperature variability /Unseasonal/excess rain/Price	Weed/ Hail storms/ Post- harvest losses
Chickpea	Pest & diseases	Animal losses	Unseasonal/excess rain
Sunflower	Price/ Unseasonal/excess rain	Pest & diseases/ Wind storms	Animal losses/ Hail storm
Green gram	Pest & diseases	Animal losses	Price
Mustard	Wind storms	Price	Unseasonal/excess rain

Table 4. Average loss experienced by farmers in the past

Crop	Average loss (%)	Risks involved		
		R_1	R_2	R_3
Green gram	50.83	Pest & diseases	Animal losses	Price
Chickpea	50.56	Pest & diseases	Animal losses	Unseasonal/excess rain
Castor	40.00	Price/Drought/Hail storm/ Wind storms/Frost/ Pest & diseases/ Temperature variability	Unseasonal/ excess rain	Flood/Crust formation/ Fire/ Post-harvest losses /Animal losses / Weed
Arhar	38.33	Animal losses/ Pest & diseases	Drought/ Crust formation/Wind storms/Temperature variability /Unseasonal/ excess rain/Price	Weed/ Hail storms/ Post- harvest losses
Mustard	34.02	Wind storms	Price	Unseasonal/excess rain
Sunflower	30.00	Price/ Unseasonal/excess rain	Pest & diseases/ Wind storms	Animal losses/ Hail storm

Table 5. Loss bearing capacity of farmers in different crops

Extent of loss	Percentage of respondents					
	Castor	Arhar	Chickpea	Sunflower	Green Gram	Mustard
Up to 10%	-	33.33	-	-	-	5.03
Up to 9%	-	-	-	-	-	5.53
Up to 8%	-	-	-	-	-	9.55
Up to 7%	-	-	5.88	-	1.39	10.05
Up to 6%	-	66.67	11.76	-	6.94	16.58
Up to 5%	100.00	100.00	76.47	36.36	44.44	46.73
Up to 4%	-	-	-	-	48.61	55.78
Up to 3%	-	-	88.24	54.55	70.83	76.38
Up to 2%	-	-	100.00	-	86.11	89.45
Up to 1%	-	-	-	100.00	100.00	100.00

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

Crops	Loss bearing capacity										
	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%	Average past losses (%)
Green gram	-	-	-	1.39	6.94	44.44	48.61	70.83	86.11	100.00	50.83
Chickpea	-	-	-	5.88	11.76	76.47	-	88.24	100.00	-	50.56
Castor	-	-	-	-	-	100.00	-	-	-	-	40.00
Arhar	33.33	-	-	-	66.67	-	100.00	-	-	-	38.33
Mustard	5.03	5.33	9.55	10.05	16.58	46.73	55.78	76.38	89.45	100.00	34.02
Sunflower	-	-	-	-	-	36.36	-	54.55	-	100.00	30.00

The data explains that how much the farmers can afford the risk in a particular crop. If we talk about the chickpea crop, the maximum limit of loss bearing among the respondents was up to 7% and all the respondents could bear the losses up to 2%. In mustard, 89.45% farmers could bear the loss up to 2%. About 5% of the total population could bear the losses up to the limit of 10 and 9%. 76.38% farmers could manage the losses up to 3%. In case of castor and sunflower, all the farmers could manage the amount of losses up to 5%. This was maximum limit of bearing the loss. In green gram, there were only 1.39% farmers who could afford the losses of up to 7%. There are 36.36% respondents could tolerate the loss of up to 5% in sunflower. All the farmers could afford the loss up to 5% in arhar. The percentage of farmers in loss bearing capacity (up to 10%) was more in case of arhar (33.33%).

The data given in 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. In green gram, only 1.39% farmers could afford the losses up to 7%. If we take out the case of chickpea crop, the maximum limit of loss bearing among the respondents was up to 7% and average amount of past loss was 50.56%. It shows a significant difference between the actual losses and bearing capacity of the farmers. All the farmers could afford the loss up to 5% in castor. The maximum number of farmers (33.33%) could bear the losses up to 10% in case of arhar. In mustard, 89.45% farmers could afford the loss up to 2%. About 5% of the total population could bear the losses up to the limit of 10 and 9%. 76.38% farmers could manage the losses up to 3%. Thus, almost in all the crops maximum average past losses experienced by the sampled farmers were too much than the present bearing capacity.

6. CONCLUSION

Mustard was highly (30.34%) grown crop by farmers and castor was the lowest (0.18%) grown crop in the sampled population. Mustard is also the main crop of rabi season. In mustard, farmers thought that wind storm was high risk factor followed by the price and pest and diseases. With regard to crops like castor and sunflower price was that risk factor about which farmers were highly worried and concerned. Price for their crops was the main problem for the farmers. Pest and diseases attacked highly the chickpea crop followed by losses made by the animals and unseasonal/excess rain. In case of green gram, pest and disease was the highly worried risk factor. After that, animal loss and price were the main problems before the farmers in green gram. The highest amount of losses (50.83%) had been experienced by the sampled population in the crop of green gram followed by chickpea (50.56%). There was a great difference between the actual losses and loss bearing capacity of the farmers. In green gram only 1.39% farmers could afford the losses up to 7%. But the average losses in the past by farmers experienced were 50.83% in the green gram crop. In the chickpea crop, the maximum limit of loss bearing among the respondents was up to 7% and average amount of past loss was 50.56%. Thus, almost in all the crops, maximum average past losses experienced by the sampled farmers were too much than the present bearing capacity. There are some risks that can be controlled by treatment in crops on time after observation of these risks like pests and disease, irrigation in case of drought but some risks are there which can't be controlled. So, the farmers should be protected from these risks with the help of insurance of their crops and all the risk factors about which they are worried should be covered in that insurance.

7. SIGNIFICANCE OF THE STUDY

This kind of research motivates the governments to take initiatives in the field of pulses production which may result in the increase in production and positive impact on the consumption level also. For wider afford of pulses production improvement in the state at the faster rate, there is a need to mitigate the risks faced by the farmers through the effective risk reduction measures.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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