

A Study of Risk Factors Associated with Crop Shift in District Hamirpur of Uttar Pradesh

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Abstract

Bundelkhand region of Uttar Pradesh characterized as semi arid climate, undulating topography, residual and low depth of soil with annual rainfall of 800 mm and well suited for *rabi* pulses while farmers of this region prefer to grow wheat crops from last few years. The increasing preference regarding growing area of wheat reduces the area and production of pulses. Several factors are working behind this changing scenario. On this background a study related to risk factors associated to area shift from pulses to wheat in Hamirpur district was plan. The samples were collected from four blocks and 200 respondents were randomly identified for the same. The findings of study show that the risk involved in pulse production too much as compare to wheat in this district. Several biotic and abiotic stresses as perceived by farmers showed that *rabi* crops may be damage up to 71 percent from biotic stress as compare to 96% from abiotic stress. Among all main *rabi* crops grown in the district Hamirpur wheat was less affected form biotic and abiotic stresses and this was the main cause of area shift from *rabi* pulses to wheat.

Keywords: Risk Factors, Crop Shift, Pulses, Biotic & Abiotic Stress

Agriculture is the lifeline of rural population and about 62% population depend upon agriculture. Agriculture under rainfed conditions is characterized by uncertainty and risk. Farmers are always uncertain about the conditions of the ensuring crop season and cannot make any assessment of the crop output owing to uncertainties on account of a large number of factors beyond their control. Among food crops, pulses are exposed to high risk due to large area under rainfed cultivation, frequent crop damage due to biotic and abiotic stresses. (Gandhi Prasad and Tingre 2006, Reddy 2009). The risk in crop failure and uncertainty of the desired output at the end of crop season discourages farmers to adopt recommended practices (Naphade, SA, *et al.* 2011). Due to risk and uncertainty farmers are always

shifted from one crop to another crop/crops and sometimes they changes their crop rotation.

Bundelkhand region of Uttar Pradesh consists of seven districts including district Hamirpur has broad group of soils namely *kabar*, *mar*, *parwa* and *rakar*. The district is basically comes under rainfed condition where pulse crops was predominantly grown especially during *rabi* crop season. But after the year of 2000 the farmers interest increasing in the cultivation of wheat due to uncertainty and risk with *rabi* pulses. From 2010 onwards the area expansion of wheat is more rapiditaly due to shortage of labour and more frequent risk appearance in *rabi* pulses. A survey report of Bundelkhand region of Uttar Pradesh showed that wheat becomes a main *rabi* crop and most of the irrigated belts including

availability of two – three irrigation during rabi season shifted from rabi pulses to wheat growing areas (Sarju Narain, 2013). Hence, it was thought worthwhile to ascertain the risk factors which are associated to area shift from rabi pulses to wheat in Hamirpur district. The objectives of the study were the following.

1. To study the risk factors associated to area shift from pulses to wheat
2. To know the perception of farmers regarding extent of crop losses by risk factors

Materials and Methods

The study was purposively conducted in Hamirpur district of Bundelkhand region of Uttar Pradesh. The district consists of 7 blocks from which 4 blocks namely Gohand, Kurara, Sarila and Muskara were selected randomly through lottery method. From each block two randomly selected villages & their 25 farmers were interviewed in well structured schedule about risk factors associated to area shift from pulses to wheat production. Thus, data were recorded from 200 farmers as respondents for tabulation and analysis of risk factors. Percentage average and mean value were used to analysis of the data. The study was conducted during Feb to April, 2015.

Results and Discussion

Factors Associated to area shift from rabi pulses to wheat

Factors associated with area shift from rabi pulses to wheat were identified and classified into two main heads viz. risk factors associated to biotic stress and abiotic stress. On both stress, farmers' perception regarding severity of crop losses were recorded and data were presented in Table 1 and 2.

Factors related to biotic stress

Among the factors related to biotic stress crop wise perception of respondents about risk were shown in table 1. In mustard crop severe risk factors was found

aphid attack during flowering stage supported by 45 percent respondents, followed by 42 percent for lentil crop. In case of wilt attack in gram & lentil both were severely affected as viewed 25 percent respondents. About 60 percent respondents also feel that gram crops was more severely affected from gram pod borer & than other crops. In diseases of powdery or downey mildew/rust, etc discusses lentil more affected as compare to other crops as viewed by 37% respondents. While wheat crop was not affected by any type of biotic stress as feel by all respondents.

Factors related to abiotic stress

Respondents perception about abiotic risk were indicate that adhesive nature of *kabar* soil' with lentil crop plants during rainfall cause losses due to soft and small plant type and it was supported by 45 percent farmers. It means more losses occurs in lentil as compare to other pulse crops. Respondents also viewed that rainfall during flowering cause more losses in lentil, gram and pea as compare to other pulses and about 47, 42 and 37 percent respondents supported to this stress factor. Respondents were also in faovur that fluctuation in temperature during crop season more losses to gram crop (29% farmers viewed) as compare to 24 percent in lentil, 20 percent in pea (grain) and 18 percent in wheat. Duration of froast are also affected to all crops was more or less same in terms of severity. Respondents views indicate that winter rainfall increases more vegetative growth in gram crop (49 percent viewer) as compare to other rabi pulses. Hail more affected to lentil crop (65 percent), mustard (60 percent) pea (grain) (43 percent) and gram (32 percent) as respond by farmers. About 40 percent respondents also infavour that wheat crop was more damage by storm followed by mustard (33.5%) and pulses. High temperature during rabi crop season more affected to wheat (38.50%) followed by lentil (21%) and others as perceived by respondents. Rajput, HD *et al.* 2011 also reported that 50.82% respondents agree that high temperature as a major reason responsible to declining chilli area in Nagpur district of Maharashtra.

Table 1. Risk factors associated to area shift from rabi pulses to wheat (N = 200)

| S. No. | Major risk factors | Crop-wise perception of respondent about risk | | | | |
|--------|---|---|---------------|---------------|--------------|---------------|
| | | Lentil | Gram | Pea (grain) | Mustard | Wheat |
| I | Factors related to biotic stress | N (%) | N (%) | N (%) | N (%) | N (%) |
| 1. | Aphid attack on crop especially flowering stage | 84 (42.00) | 37 (18.50) | 36 (18.00) | 90 (45.00) | 00.00 |
| 2. | Wilt attack | 50 (25.00) | 50 (25.00) | 44 (22.00) | - | 0.00 |
| 3 | Pod borer attack | 24 (12.00) | 121 (60.50) | 42 (21.00) | - | 0.00 |
| 4 | Powdery / downey mildew, rust, etc. | 74 (37.00) | 54 (27.00) | 64 (32.00) | 34 (17.00) | 0.00 |
| II | Average risk from biotic stress | 58 (29.00) | 65.50 (32.75) | 46.50 (23.25) | 31 (15.50) | 0.00 |
| | Factors related to abiotic stress | | | | | |
| 5 | Adhesive nature of kabar soil with crop plants during rainfall cause losses | 91 (45.50) | 11 (5.50) | 61 (30.50) | - | - |
| 6 | Rainfall during flowering | 95 (47.50) | 85 (42.50) | 75 (37.50) | 59 (29.50) | 24 (12.00) |
| 7 | Fluctuation in temperature during crop | 48 (24.00) | 58 (29.00) | 41 (20.50) | 25 (12.50) | 36 (18.00) |
| 8 | Frost duration promote losses | 55 (27.50) | 46 (23.00) | 44 (22.00) | 47 (23.50) | 24 (12.00) |
| 9 | Winter rainfall increases vegetative growth of crops cause yield loss | 21 (10.50) | 98 (49.00) | 42 (21.00) | 10 (5.00) | - |
| 10 | Hail | 130 (65.00) | 64 (32.00) | 87 (43.50) | 120 (60.00) | 50 (25.00) |
| 11 | Storm | 20 (10.00) | 34 (17.00) | 19 (9.50) | 67 (33.50) | 81 (40.50) |
| 12 | High temperature during crop season | 42 (21.00) | 32 (16.00) | 36 (18.00) | 32 (16.00) | 77 (38.50) |
| | Average risk from abiotic stress | 62.74 (31.37) | 58.50 (29.25) | 50.62 (25.51) | 45.0 (22.50) | 36.50 (18.25) |
| | Average risk from biotic & abiotic (%) | 30.18 | 31.00 | 24.28 | 19.00 | 1.52 |
| | Total risk (biotic + abiotic) for crops (%) | 60.37 | 62.00 | 48.56 | 38.00 | 18.25 |

Table 2. Farmers perception about extent of crop losses by biotic stress (N = 200)

| S. No. | Rabi crops | Farmers' perception about crop losses | | | | | | |
|--------|----------------------------|---------------------------------------|--|-------|--------|--------|------|-------|
| | | Average grain yield (q/ha) | Extent of crop yield losses (%) by biotic stress | | | | | Total |
| | | | Less than 5% | 5-25% | 25-50% | 50-75% | >75% | |
| 1 | Wheat | 35 | 95.50 | 4.50 | - | - | - | 100 |
| 2 | Mustard | 14 | 23.50 | 55.00 | 21.50 | - | - | 100 |
| 3 | Lentil | 10 | 4.00 | 28.00 | 42.50 | 25.50 | - | 100 |
| 4 | Gram | 12 | 7.50 | 49.00 | 33.50 | 10.00 | - | 100 |
| 5 | Grain pea | 15 | 10.00 | 54.50 | 29.50 | 6.00 | - | 100 |
| 6 | Khesari | 16 | 29.00 | 52.50 | 18.50 | - | - | 100 |
| 7 | Average loss of rabi crops | - | 28.25 | 40.58 | 24.25 | 6.92 | - | 100 |
| | | | | | 71.75 | | | |

* Data collected only for knowing information, no relation to cultivation

The average risk from biotic stress more in gram (32.75 percent) followed by in lentil (29 percent) pea grain (23.25 percent) and mustard (15.50 percent) as perceived by farmers but wheat crop is not affected. Farmers were also perceived that risk of abiotic stress highest in lentil (31 percent) followed by gram (29 percent) pea (25 percent), mustard (22 percent) and wheat (18 percent). The average risk from biotic and abiotic stress were also indicate that gram (31 percent), lentil (30 percent), pea grain (24 percent) and mustard (19 percent) were more affected in the views of respondents. The total risk of rabi crops from biotic and abiotic stresses as perceived by respondents were gram crop was highest (62 percent) affected followed by lentil (60 percent), pea grain (48 percent), mustard (38 percent) and wheat (18 percent). Thus, wheat crop was more safe from biotic and biotic stresses as compare to other rabi crops.

Extent of crop losses by risk factors as perceived by farmers

To knowing extent of crop losses, respondents perception were categorized on the basis of severity of losses and grouped into biotic and abiotic group.

Farmers' perception about extent of crop losses by biotic stress

The Table 2 indicates that respondents perception about wheat crop was comes under category of 'less than 5 percent crop losses by biotic stress and supported by 95 percent respondents. In case of mustard 55 percent, followed by grain pea, 54 percent, Khesari 52 percent, gram 49, lentil 28 percent and wheat 4.5 percent respondents perceived by severity of crop losses ranges comes under 5 – 25 percent. The crop yield losses by biotic factor were more severe in case of lentil followed by gram, grain pea, mustard and in khesari and perceived by 42,

33, 29, 21 and 18 per cent respondents. Lentil, Gram and grain pea (pulses) losses much more by biotic factors as compare to other and comes under the severity range of 50-75 percent with respondents views 25 percent for lentil, 10 percent for gram and 5 percent for grain pea with no any loss in case of wheat. On an average basis all rabi crops severity of crop losses were under the range of 5-25 percent and they damage upto 40.58 percent. On the basis of total losses (range 5 to 75 percent) upto 72 percent crop losses chances was found due to biotic stress. Table data also indicate that wheat is the only one rabi crop which very less affected from biotic stress and produces 35 q/ha yield as compare to rabi pulses & other crops.

Farmers' perception about extent of crop losses by abiotic stress

Distribution of respondents views according to extent of crop losses by abiotic stress were presented in Table 3. Table showed that most of the respondents perceived that generally all rabi crops comes under the losses range of 25-50 percent including grain pea (58 percent), mustard (54 percent), gram (45 percent), lentil (43 percent), wheat (42 percent) and khesari (33 percent). But some times losses by abiotic stress occurs in the range of 50-75 percent and then gram (30 percent). Lentil (29 percent) and wheat (22 percent) losses occurs in extream way but it depends upon intensity and severity of abiotic stress. About 10 percent respondents were viewed that gram and grain pea some times comes under the extent losses of more than 75 percent. On an average basis abiotic stress data indicate that 46 percent respondents perceived about the extent losses in the range of 25-50 percent followed by 22 percent, 19 percent, 8 percent and 4 percent in the extent range of 5-25 percent, 50-75 percent, more than 75 percent and less than 5 percent respectively.

Table 3. Farmers' perception about extent of crop losses by abiotic stress (N = 200)

| S. No. | Rabi crops | Farmers' perception about crop losses | | | | | | |
|--------|----------------------------|---------------------------------------|--|-------|--------|--------|-------|-------|
| | | Average grain yield (q/ha) | Extent of crop yield losses (%) by abiotic factors | | | | | Total |
| | | | Less than 5% | 5-25% | 25-50% | 50-75% | <75% | |
| 1 | Wheat | 35 | 0.9 | 17.50 | 42.0 | 22.50 | 09 | 100 |
| 2 | Mustard | 14 | - | 28.00 | 54.00 | 11.00 | 07 | 100 |
| 3 | Lentil | 10 | - | 17.00 | 43.00 | 29.00 | 11 | 100 |
| 4 | Gram | 12 | - | 14.00 | 45.50 | 30.00 | 10.50 | 100 |
| 5 | Grain pea | 15 | - | 15.00 | 58.50 | 16.50 | 10.00 | 100 |
| 6 | Khesari | 16 | 16.50 | 40.50 | 33.00 | 08.00 | 2.00 | 100 |
| 7 | Average loss of rabi crops | - | 4.25 | 22.00 | 46.00 | 19.50 | 8.25 | 100 |
| | | | | | 87.50 | | | |

* Data collected for knowing information, no relation to cultivation

Conclusion

The study reveals that rabi pulse crops were more risk sensitive than non pulse especially wheat. Among rabi pulses lentil and gram were more affected by biotic and abiotic stresses. Another feature of Hamirpur's kabar soil is that lentil crop plants were more damage by stickyness nature of soil during rain. Among abiotic stress hail more affected to lentil, mustard and grain pea as compare to other abiotic stress as perceived by farmers. Wheat was the only crop which was not affected to biotic stress while 18 percent farmers perceived that it affected from abiotic stress. The extent of rabi crops damage were more under the range of 5-25 percent in case of biotic stress which cause about 40 percent crop losses. Extent of losses from 5 to 75 percent indicate that about 71 percent crop losses may be occurs but in case of wheat 95 percent farmers viewed that losses occurs in the extent range of less than 5 percent. Farmers' perception about abiotic stress

shows wheat damage chances was less as compare to other rabi crops especially pulses but 46 percent farmers perception indicate 25-50 percent crop losses extent.

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