Plant Archives Vol. 24, Special Issue (GABELS), 2024 pp.116-128 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.SP-GABELS.018

QUANTIFICATION OF FARM RISK AND RISK MANAGEMENT IN JABALPUR DISTRICT OF INDIA

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ABSTRACT

Agriculture risk is defined as the product of the degree of yield loss and the probability of its occurrence. These farm risks caused by climate, biological and many other factors are a serious threat to farmers as well as the stability of agriculture in various developing countries including India. To reduce this risk and stabilize farmers' income and production, a descriptive study of how farmers perceive and mitigate risks as well as is essential. A proper scoring of farmers' perceived risk and risk management methods, convert it as a quantitative variable which helpfulin achieving this goal. In this study well-structured schedule had been prepared and a survey of 296 farmers was conducted in the Jabalpur district of India by using multi stage simple random sampling to identify the major farm risk and the adopted risk mitigation strategy. For statistical analysis, Likert scale and risk matrix methods were used to find risk scores. The frequency or count and percentage adoption of each adopted risk mitigation strategy by farmers were calculated to find out the adoption score risk management category and graphically represented. Farmers had to deal with a variety of risks, in which high variability in agriculture production, frost, fog, insects, pests and disease affect crops and high prices of the input had the highest impact on farmers in the survey year. When considering occurrence frequency with impact perception high prices of the input, no proper payment of crop insurance and insect, pest, and disease effects on crop as well as effect of frost, fog and dew were the top four risks with 94.22%, 94.05%, 92.89% and 90.78% of maximum possible risk score. In the adoption of risk management increase input like fertilizer, government assistance to farmers and insurance were the top preventive, reactive risk management, and risk transfer strategies.

Keywords: Agricultural risk, farmers' risk perception, Sample survey, Risk management adoption, risk matrix, Likert scale.

Introduction

Agriculture is the leading source of livelihood in India and still, more than 50 percent of the population depends on farming for their livelihood (Ahmad *et al*., 2011). Most often, agriculture is a risky business and Indian farmers faced a variety of risks category of risks, various types of empirical research have been conducted to examine and quantify the impact of risks (Dong *et al*., 2018; Eidman, 1990; Kanwal *et al*., 2022; Karadas & Birinci, 2018; Luo *et al*., 2020; Nga *et al*., 2018; Saqib *et al*., 2021a; Stojanovski *et al*., 2015). Very few research had been carried out for the simultaneous study of all kinds of risks, a review of these kinds of agricultural risks has been presented by (Angelucci & Conforti, 2010; Komarek *et al*., 2020) in a very nice manner.

These different kinds of agricultural risks are inversely affecting agricultural production and farmer socio-economic conditions. To cope with this current downward trend of stagnating yields, various risk mitigation strategies adopted by farmers (Iqbal *et al*., 2018; Jain & Parshad, 2007; Mahdi *et al*., 2015). The process of choosing an appropriate strategy from a variety of choices used for minimizing risk is known as risk management (Harwood *et al*., 1999). It is useful to understand strategies and mechanisms adopted by farm

producers to mitigate the impact of risk and to plan better risk mitigation strategies for farmers. These risk management strategies were further generally classified into three categories viz. preventive (ex-ante, before the hazards have taken place), reactive (ex-post, after the hazards have taken place), and risk transfer (shifting of an agricultural risk from one party which is farmers to another) strategies (Jain & Parshad, 2007). These agricultural risk management strategies and techniques are needed to raise agricultural production and farmers' income sustainably.

We focused this farmers' survey and research in Jabalpur district which is situated in the central part of India. Currently, India is a developing country and here agriculture is being already hampered by urbanization, natural resource depletion, and high population expansion. According to recent studies on climate change and the IPCC report (Eckstein *et al*., 2021), India would be one of the primary nations affected by climate change disasters such as unpredictable rainfall, droughts, and floods. So it is clear that Indian agricultural development is inversely affected by these different kinds of risk, and studies of farmers' risk perception and adopted risk mitigation techniques were essential for understanding the current situation of farmers and designing suitable risk management strategies or policies accordingly.

Agricultural risk studies or sample surveys for risk perception, in India frequently concentrate on a specific crop such as maize (Choudhury *et al*., 2019), or one kind of risk, mostly on production risk caused by climatic factors such as flood, drought, frost, etc. (Mahdi *et al*., 2015; Raghuvanshi & Ansari, 2019; Rao *et al*., 2017) and biotic factors such as insect, pest, etc. (Kumar *et al*., 2021) but there are lacks of studies which investigate all kind of risk with all major sources of risks through sample survey by looking farmers' perception and adoption mitigation strategies. In this study, we widen the focus to the system level of the farm and tried to examine all kinds of perceived potential risks thought to have an impact on the livelihood of various farms and overall farm production.

This study will concentrate on two objectives (i) To assess which source of risks farmers perceive to be most significant by looking at risk scores and which kind of risk was most harmful. (ii) To analyze the number of risk mitigation strategies adopted by farmers to cope with the effect of risks. We aim to find answers to the following questions through this research study. (i) What risks do farmers believe the agricultural sector to be susceptible to? (ii) What do they perceive about the frequency and inverse impact of those hazards? (iii) How do farmers manage these risks? This type of empirical research can assist policy planners and government administrators in designing better policies or plans, identifying the gaps and inadequacies in current policies, and developing the best solutions that can assist farmers in coping with all kinds of agriculture risks.

Materials and Methods

Concept of agricultural risk

In the available scientific literature, agricultural risk has been already defined in various ways Risk is defined as an undesirable part of a collection of uncertain results (Harwood *et al*., 1999). The combination of probability and magnitudes of a hazardous event is defined as risk (FAO and MOAC, 2010). According to (IPCC, 2014) risk is sometimes expressed as the chances that dangerous events or trends will occur multiplied by their impact when the event happened. So Agriculture risk is defined as the product of the degree of yield loss and probability of its occurrence (Fig. 1). In this study, by expanding the approach of (Musser and Patrick, 2002) agricultural risk is classified into five categories viz., (i) Economic risk (ii) Production risk, (iii) Technological risk, (iv) Institutional risk, and (v) Personal risk. Where these risks are defined as follows

(i) **Economic risk** - Risks originate from fluctuations in the price of farm input and output as well as agricultural markets are defined as economic risk.

(ii) **Production risk -** All biotic factors like insects, pests, disease-causing pathogens, etc., and abiotic factors like climate or weather change, etc. will reduce crop production and it is defined as production risk.

(iii) **Technological risk -** Lack of access to modern farm technology will inversely affect agriculture and these are known as technological risks.

(iv) **Institutional risk -** Unexpected changes in rules by the government, credit seized and malfunctioning, corruption in agencies like agricultural cooperative societies, and agricultural markets can influence farmers badly, and these are defined as Institutional risk

(v) **Personal risk -** Due to some unwanted events like an incident or misshaping faced by the farmer's household or his permanent work force, or potential loss (damage) to equipment or other farm assets, the farm plan may be inversely affected or may be delayed and this all comes under personal risk.

The analysis of agricultural risk specifically production and economic risk were based on the definition given by world bank "Agricultural risk is a combination of the likelihood of a hazardous event or exposure(s) and the severity of the losses that can be caused by the event or exposure(s)" (World Bank 2016). Where perceptions about the frequency of occurrence and impact were recorded for production and economic risk andthe analysis of rest kinds of risks was based only on the impact perception of risk sources.

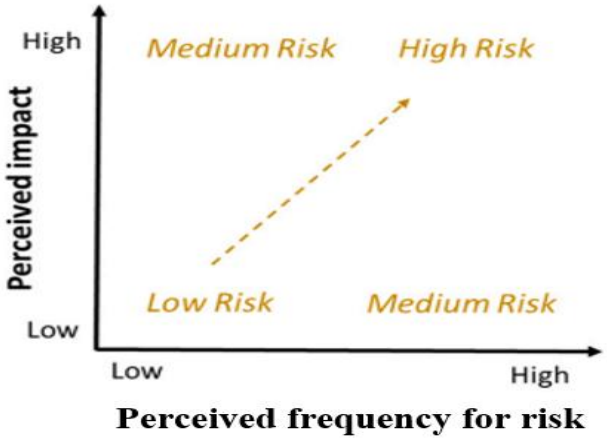

Fig. 1 : Graphical representation for economic and production risk.(Huet *et al*., 2020)

Study area

The study was confined to the Jabalpur district of India. This district was selected due to its accessibility and acquaintance with local farmers of the area. The Jabalpur district is divided into seven administrative blocks (Figure 2)

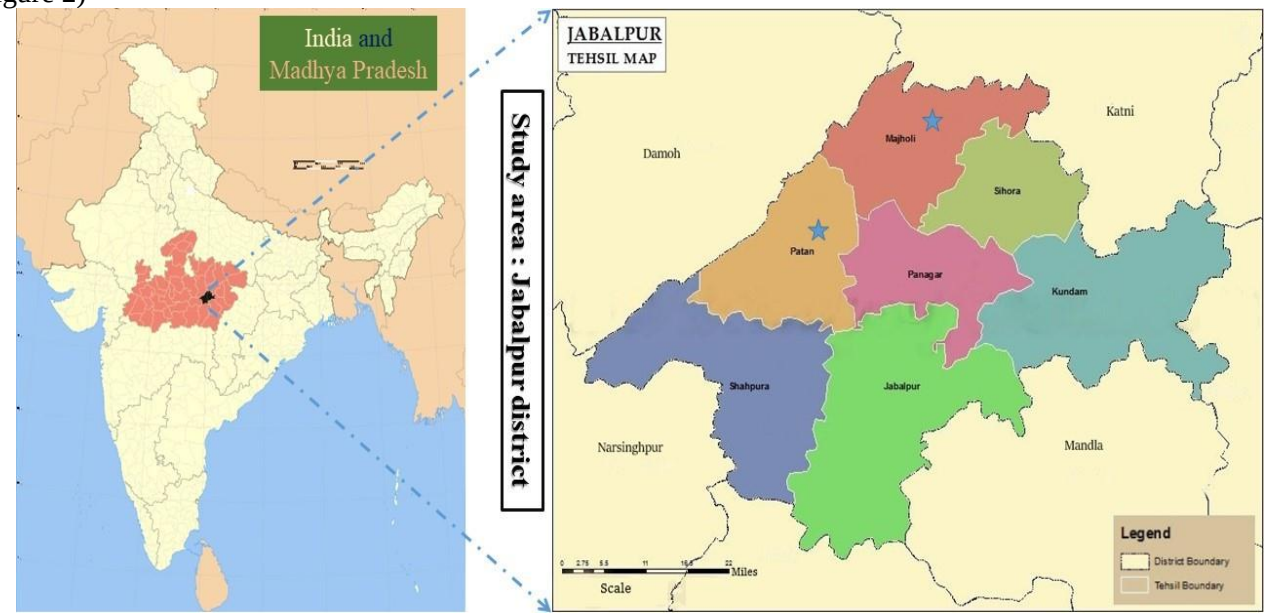

Fig. 2 : Study area (Jabalpur district) map, selected blocks in survey is indicated by blue stars

Sampling framework and design

At the starting point of this research, we conducted two focus group discussions in two chosen blocks i.e. Patan and Majholi, to identify major sources of risk. Then we conducted a pilot survey that included 30 farmers to test the validity of the prepared survey schedule. Finally, using the revised survey schedule, the investigator collected data from 296 farmers through a physical survey after excluding four farmers' data which had insufficient or incomplete data, from the Jabalpur district. For the sampling purpose, multistage sampling is adopted and it has three stages, each stage's details and sampling plan are explained below in figure 3.

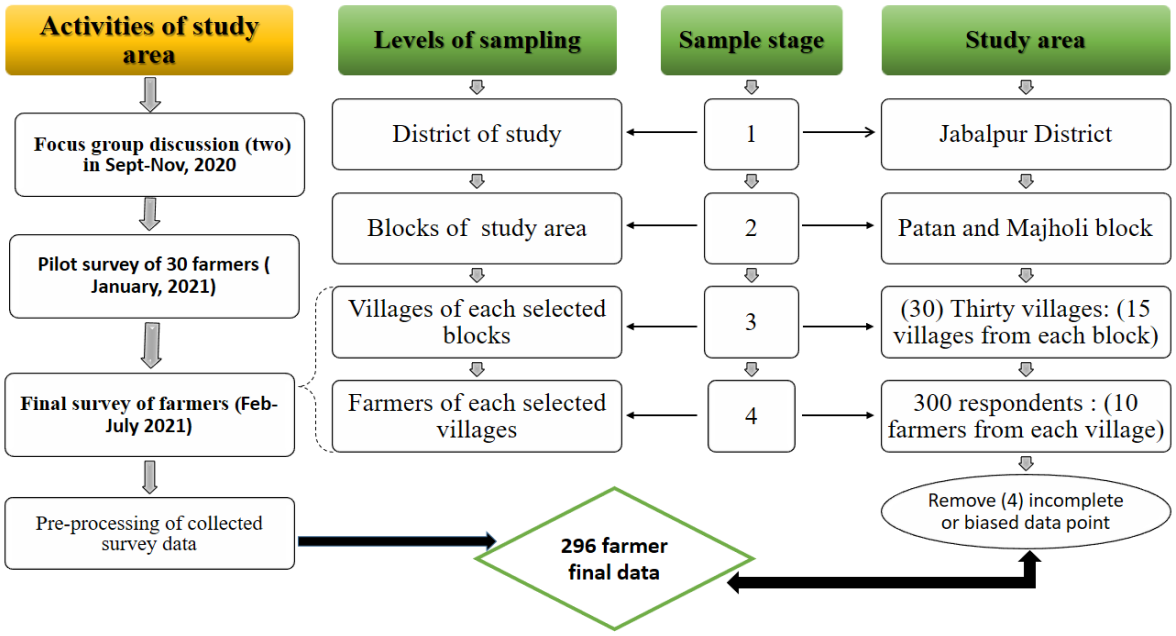

Fig. 3 : Design of sampling framework

Focus group discussions, piolet survey, and survey schedule

Two rounds of focus group discussion (FGD) were organized at end of the rainy seasons (in September-November) of the year 2020 in the Patan and Majholi blocks separately. Both sessions of FGD were includes 10 to 20 participants, and incidents that pose the majority of risks in farming were explained by participants based on their past experiences in this FGD. The goal of these FGDs is to identify major sources of risk in agriculture and to compile a list of major agricultural risks faced by them, this gives an idea to design a draft questionnaire for agricultural risk assessment. After that, a discussion with experts was made to finalize the schedule using this prepared draft of FGD, and a pilot survey of 30 farmers was conducted to test the validity of the prepared survey schedule in January 2021. Deficiencies in the schedule identified during the pilot survey were removed and finally, an improved revised survey schedule was finalized to survey farmers.

This survey was conducted from February to July 2021 in the study area. This prepared schedule will contain information majorly on risk perception for all five kinds of risks and adopted risk management. Each respondent is asked to choose a level of agreement about the bad impact of different risky events or sources of risk for all five kinds of risk and assignsa score (0 = Strongly Disagree; 1 = Disagree, 3 = undecided; 4 = Agree and 5 = Strongly Agree) accordingly based on a 1–5 Likert scale (Likert, 1932). Along with these for production and economic risk additionally, each participant is asked to choose the incidence nature of these hazardous events as follows: Never occurring (not experienced by farmers in their life), occasional (ten years or more), probable (2 to 10 years), and every year (once in a year or numerous time within a year) based on the methodology of world bank (World Bank, 2016) with some modification and score assigned accordingly1 to 4 as per defined occurrence frequency.

Data Analysis and visualizations

Risk perception score

Respondents' perceptions about the agreement of bad impact and the frequency of occurrence of various hazardous events (like agreement of bad impact and incidence of excessive rainfall or flood risk)for economic and production risks were recorded. The risk perception score for these risks was calculated by using the risk matrix (Cooper *et al*., 2019) presented in Figure 4 (Cooper, 2005). After applying the score as per the Likert scale for impact and incidence both, obtained total score differs from 1 to 9 and the final score was obtained by taking the mean of all individual scores, in which a final risk score of 6 and above denotes a high risk, while a final risk score of less than 6 denotes a low risk. In the field of agriculture this risk matrix is used by (Posthumus *et al*., 2008); (Rizwan *et al*., 2020); (Ahmad *et al*., 2019); and (Akhtar *et al*., 2019) for risk perception and classification of risk.

For the rest three kinds of risks, only perception about the agreement of bad impact of risk sources were considered on the five-point, this Likert-type scores for the respondents' concern about the impact of risk were analyzed as ordinal data to obtain risk perception associated with each hazard or source of risk (Jamieson 2004). This Likert score can vary from 1 to 5, for any statement, and the final total score or mean score for each statement can be obtained by taking the sum (Ndamani & Watanabe, 2017) or average (Devegowda *et al*., 2021) of scores given by all respondents. In this study, we used this mean score as a risk perception score for Institutional, technological and personal risk, if this score is 3 or above then we can consider this risk source as significant or high risk, if not then non-significant or low risk (Devegowda *et al*., 2021). For the visualization of perception about impact, plots are created by using the (Likert package) R software. Two different methods simple Likert method and a risk matrix with different scales were used for the calculation of the risk score, so for normalization and ease of comparison, percentages out of the maximum possible score were calculated for each calculated risk score.

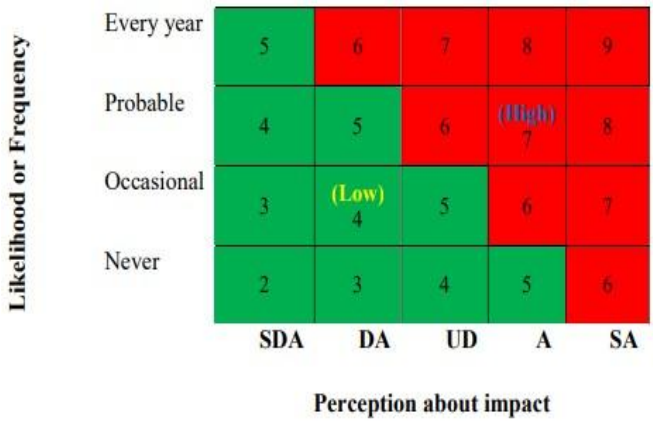

Fig. 4 : Risk Matrix applied for production and economic risk

Risk management adoption

Risk management was further classified into three categories and numerous strategies consider under each of these categories viz. nine strategies were considered preventive, five strategies were considered reactive, and two strategies with four combinations were considered the risk transfer strategy category. The number of strategies adopted under a specific category by any farmer is denoted as the risk management adoption score (RMA score) for this specific risk management category and total risk management adoption (RMA) score was calculated by summing the adoption score of all three risk management categories. This adoption score for all three risk management categories as well as the frequency or count and percentage adoption of each adopted risk mitigation strategy by farmers were calculated and graphically represented.

Results and Discussion

Risk perception score

The two FGDs returned a total of 24 risks related to farming considered important by farmers. Out of these 24 hazards, 4 came under economic risk, 7 belong to Production risk, 4 belong to Technological risk, 5 belong to Institutional risk, and 4 belong to Personal risk (Figure 5). The criteria percentage out of the maximum possible score was adopted here to rank all 24 risks. The high price of inputs like seeds, fertilizers, pesticides and farm equipment, etc. was considered a top hazard or risk with a score of 94.22%, this hazard can increase the cost of cultivation and farmers need more investment for farming activities and finally cause a reduction of their income. As per (Ndamani & Watanabe, 2017) high cost of inputs was one of the vital risks in agriculture production. Farmers also faced a high issue with insurance claim settlement after losing their crop due to any natural calamities, in the current era insurance is recommended risk management strategy but not properly implemented due lack of supporting policies and expertise (Islam *et al*., 2021). No proper payment of crop insurance amount to farmers was perceived as the second top-ranked risk with 94.05% of the maximum score. Most crop insurance generally covered a single risk like hail storms but in the current era rising production risk due to natural calamities and volatile prices as well as policy reforms amplified the requirement of novel insurance schemes that cover more than single risks in agriculture (Bielza Diaz-Caneja *et al*., 2009). In India, food crop production suffers from numerous newly developing and invading biotic stresses like insect pests, diseases, and weeds (Kumar *et al*., 2021) and these insect pests infestation lead to significant production risk and 92.89% of the maximum score given by farmers. (Ahmad *et al*., 2019) also reported according to farmers' perceptions about the insect, pest, and crop diseases as prime risk sources for wheat. In the winter season when the temperature goes down, then the probability of events like frost, fog, and dew increases, and these weather events can cause considerable losses to agricultural production (Gobin, 2018; Mahdi *et al*., 2015). So the majority of farmers were worried about the incidence of frost, fog, and dew and they highly perceived the bad impact of these events with 90.78% of the maximum score, (Choudhury *et al*., 2019), also reported frost frequently damages maize crops, leading to reduced yields in the highlands of northeast India (Fig. 5).

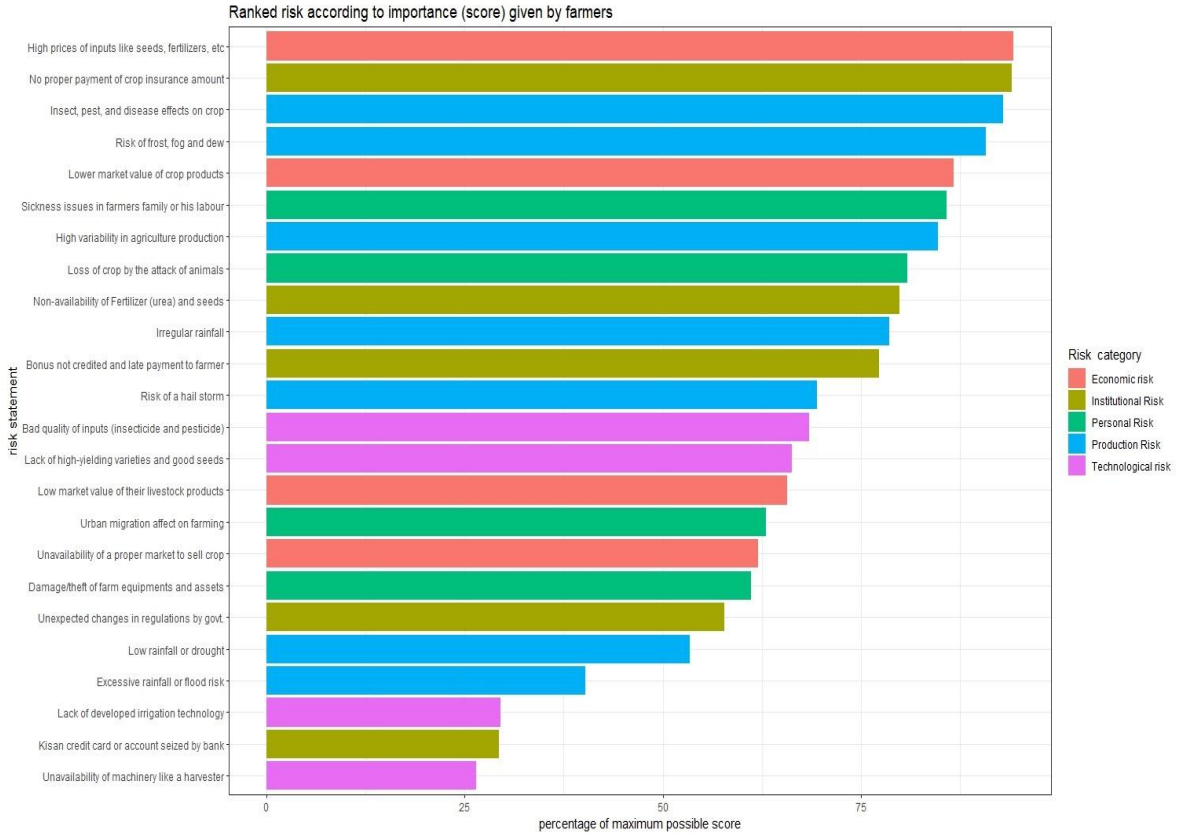

Fig. 5 : The 24 risks ranked according to percentage score (expressed as the percentage of actual score out of the maximum score). The colouring denotes the risk category.

Prices of agricultural products are the key factors that directly affect farmers' annual income as well as economic status, lower market value of products can cause a fall in their income. Lower market value or price of crop products was always a cause of worry for farmers and scored 85.33% as per farmers' perception. Farmers perceive a high crop price volatility in recent years, which become a cause of risk to farmers (Haile *et al*., 2017).The health of family members or his permanent workforce was always a concern for farmers so health and misshaping issues were perceived at 85.81% of the maximum score by farmers, (Huet *et al*., 2020) also reported sickness problems in the farmer's household or his permanent labor as top risk based on farmers' perception. Due to this, the farm plan may be inversely affected or may be delayed and health risks were also the chief cause of income instability and become a major concern for farmers (Dercon *et al*., 2005). It was noticed there is high variability in crop production data over the years and a reduction in agriculture production was also observed in some years (Joy Harwood *et al*., 1999). So year-to-year variability and reduction in agricultural production caused risk to farmers and this risk was perceived at 84.72% of the maximum possible score, (Gupta *et al*. 2017) also observed that significant reduction in wheat yield in India. Almost all respondents (99.66%) strongly agreed or agreed that they observed high variability in agricultural production (Figure 6). Animals like bulls/cows and the wild pig will also damage the field crop, this was accepted by Approx. 77.37% of respondents with 80.81% of the maximum score, (Huet *et al*., 2020) also listed crop damages due to animals as medium risk. It was noticed villages near frost or hill areas mostly in Majholi block faced more issues related to the animal compared to Patan block. Irregular rainfall distribution over time was observed by looking at time series data of Jabalpur district rainfall, the majority of respondents (96.28%) at least agreed that they received irregular rainfall. Irregular rainfall perceive a 78.56% score and becomes an impactful risk for agriculture, irregular rainfall caused a decrease in fruit yield and size, a change in flavor and color, as well as a corresponding decline in pineapple production and revenue(Portia *et al*., 2018).

Institutional risk (like non-availability of input and payment on time) was ranked as low risk, Approx.

79% accepted that there was non-availability of fertilizer (like urea) and seed in appropriate quantity and at the appropriate time in cooperative society with a 79.80% score. statement bonus not credited by the central govt. and late payment of the purchased food grains on MSP by the state government was strongly agreed by 18.24% and agreed by 63.18% of farmers with (77.23%) score (Fig 5 and 6). The hail storm is a destructive weather event that can cause huge losses to agricultural production and the economy as well as harm to other human activities (Ahmad *et al*., 2019; Nicolaides *et al*., 2008). 90.54 % of respondents agreed, that they received a hail storm and 81.76% of farmers experience hail occurs occasionally, so the risk of hail produced a comparatively low score of 69.41% but still it is a risky event, (Ahmad *et al*., 2019) also ranked hail storms as the top four disastrous risk sources for wheat according to farmers' perceptions.

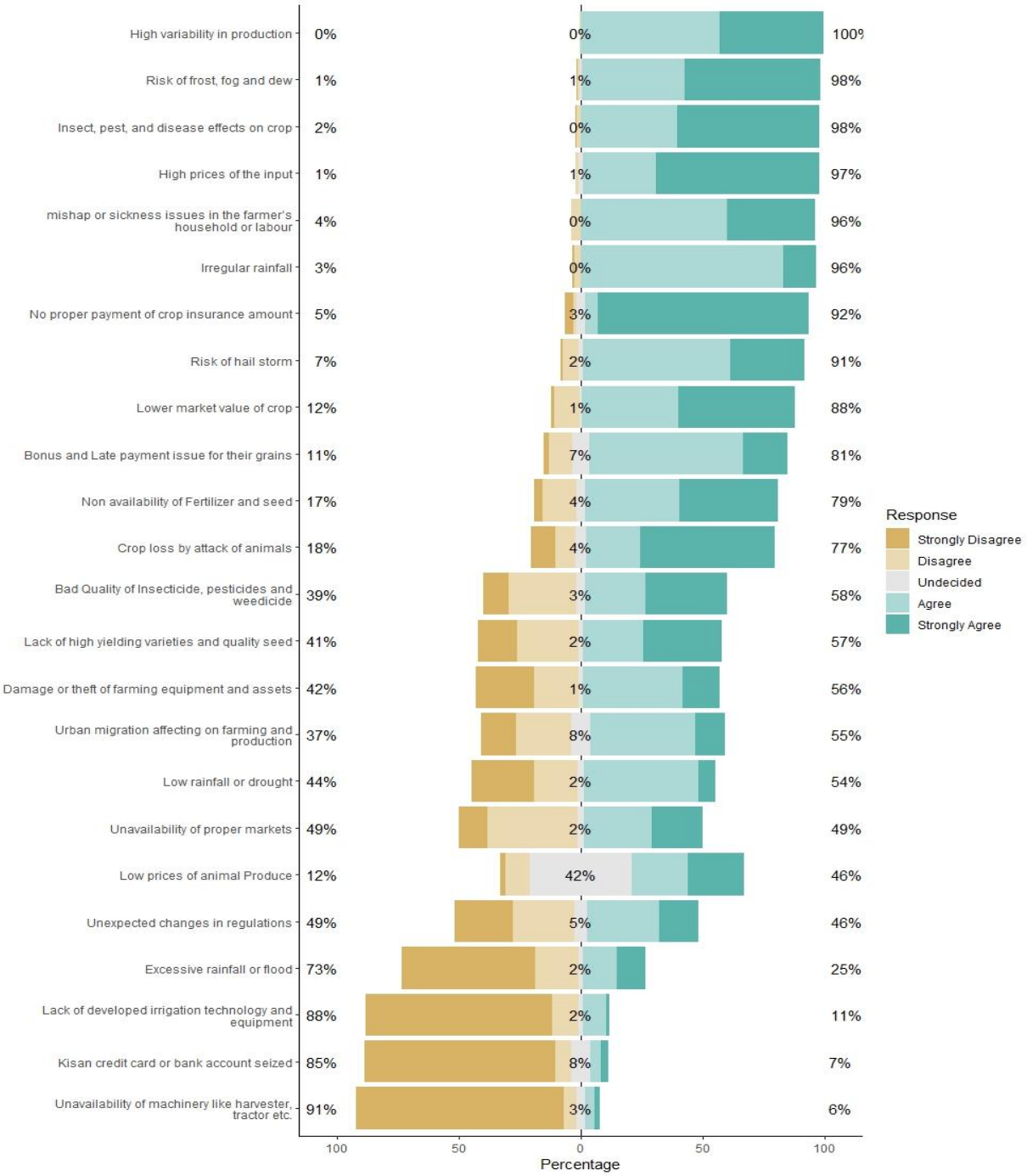

Fig. 6: Likert scale plot for all risk perception: The proportion of respondents answering "strongly agree", "agree", "undecided", "disagree" or "strongly disagree" to the question "Are you perceived bad impact of the risk

on farming?". The percentage on the left side is the combined % for "strongly disagree" and "disagree", mid for "undecided" and the one on the right side for "strongly agree" and "agree".

Technological risks like the quality of inputs (insecticides, pesticides, and seeds, etc.) were not a matter of high concern for all farmers only 55% accept they faced an issue regarding the quality of inputs (Figure 6). Bad quality of insecticide, pesticides, and weedicide perceive 68.45% and Lack of high yielding varieties, the seed was perceived 66.28% of the maximum score, (Huet *et al*., 2020) also found as per farmers perception bad quality of pesticides and seeds as relatively less important risk. The low market value of their livestock products, urban migration, unavailability of the proper market (Mandi), damage or theft of farming equipment, and unexpected changes in regulations were perceived as relatively less risky with65.66, 63.04, 62.04, 61.15, and 57.77 percent of the maximum score, these risks were less perceived in majorly all reviewed studies except few like (Iqbal *et al*., 2020), in which farmers of Pakistan perceived change in agricultural policies as the greatest source of risk with score 3.96. Worldwide the occurrence of droughts and floods is becoming more frequent, which is threatening sustainable agricultural development. In developing nations like India, where agriculture is the main source of income and is primarily rainfed, the flood risk is more serious(Kanwal *et al*., 2022). Butas per past metrological data chance of severe flood and drought are very low in the study area and most farmers have good irrigation management so farmers perceive crops were very less likely to be affected by these risk with a score of 53.41% and 40.24% of the maximum score. Risks derived by the problem like lack of irrigation and Kisan credit card or bank issues scored low (less than 30%) and which makes these risks non-significant. The unavailability of machinery like harvesters was perceived as least important with 26.42% of the maximum score because at the time of harvesting a large number of harvesters reached villages from developed agriculture states like Panjab and Haryana etc. and they were easily available on a rent basis for harvesting purpose. Overall, the Production and economic risk were perceived as more important compared to Personal, Institutional, and technological risks. The technological risk was found to be the least important for the farmer in all five kinds of risk as we can see not a single technological risk appears in the top half of risks.

Risk management adoption

Risk management (RM) methods in farming are a state-of-the-art approach used to mitigate agricultural risks in the farmer's field. In this study risk management strategies were further classified into three categories viz. preventive (ex-ante), reactive (ex-post), and risk transfer strategies. The ex-ante strategies were highly adopted by farmers and almost all the farmers adopted strategies like increasing fertilizer dosage, borrowing oxen/equipment, seed, and grain in the village or getting credit, irrigation and developing flood control infrastructure, and viewing weather forecast using the internet and TV as preventive risk management strategies with frequency 292, 290, 289, 283 and 98.65%, 97.97%, 97.64% and 95.61% of all 296 farmers. Farmers of North Yorkshire adopted temporary storage(pond) of runoff water on farm land as flood control infrastructure and found it had the potential to reduce flooding (Posthumus *et al*., 2008). Adoption of weather forecasts is an additional skill, which helps farmers to face climatic uncertainty or risk (Crane *et al*., 2010; Kgakatsi & Rautenbach, 2014). Diversification and agricultural credit were jointly adopted by most of the farmers as risk management tools (Ahmad & Afzal, 2022; Akhtar *et al*., 2019; Saqib *et al*., 2016; Saqib *et al*., 2021a). While risk management strategies like changing cropping patterns, the use of short-term and disease-resistant varieties, and crop-livestock diversification were highly adopted by 272, 261, and 214 farmers with 91.89, 88.18, and 72.30 percent share in all 296 respondents. Few farmers adopted strategies like reducing crop area and increasing the use and production of organic manure with frequencies 91 and 33 and 30.74% and 11.15% of all farmers, this low adoption of organic manure was a matter of attention government needed to motivate farmers to adopt organic manure (Figure-7). Reduction of pineapple farmland and expansion of livestock predominantly under diversification of livelihoods were prime risk migration measures adopted by Ghana's pineapple farmers to mitigate climate risk (Portia *et al*., 2018). Diversification of enterprises and crops, altering agronomic practices, etc. were adopted by most of the farmers as risk preventive risk mitigation strategies (Ashfaq *et al*., 2008; Kanwal *et al*., 2022). After calculation of the number of strategies adopted under this category by each farmer the minimum, maximum, and mean adoption scores were found as 3, 9, and 6.84 out of 9 for ex-ante risk management.

Afterward facing risk in agriculture to overcome the effect of risk, the majority of farmers adopted ex-post or reactive strategies viz. government assistance to farmers, use of capital deposits, and use of strategic reserves as reactive or ex-post management strategies with frequencies 295, 294, and 290 with percentage share 99.66 %, 99.32%, and 97.97% for all 296

respondents. While rest risk management strategies like liquidity and use of buffer funds were highly adopted by 254 and 223 farmers with 85.81 and 75.34 percent share in all 296 respondents of the study area (Figure7).Farmers mostly adopted assets depletion and liquidity as an ex-post or reactive risk management tool (Saqib *et al*., 2021a). After counting the number of strategies adopted under this category by each farmer, minimum, maximum, and mean adoption scores were calculated as 1, 5, and 4.58 out of 5 for ex-post risk management.

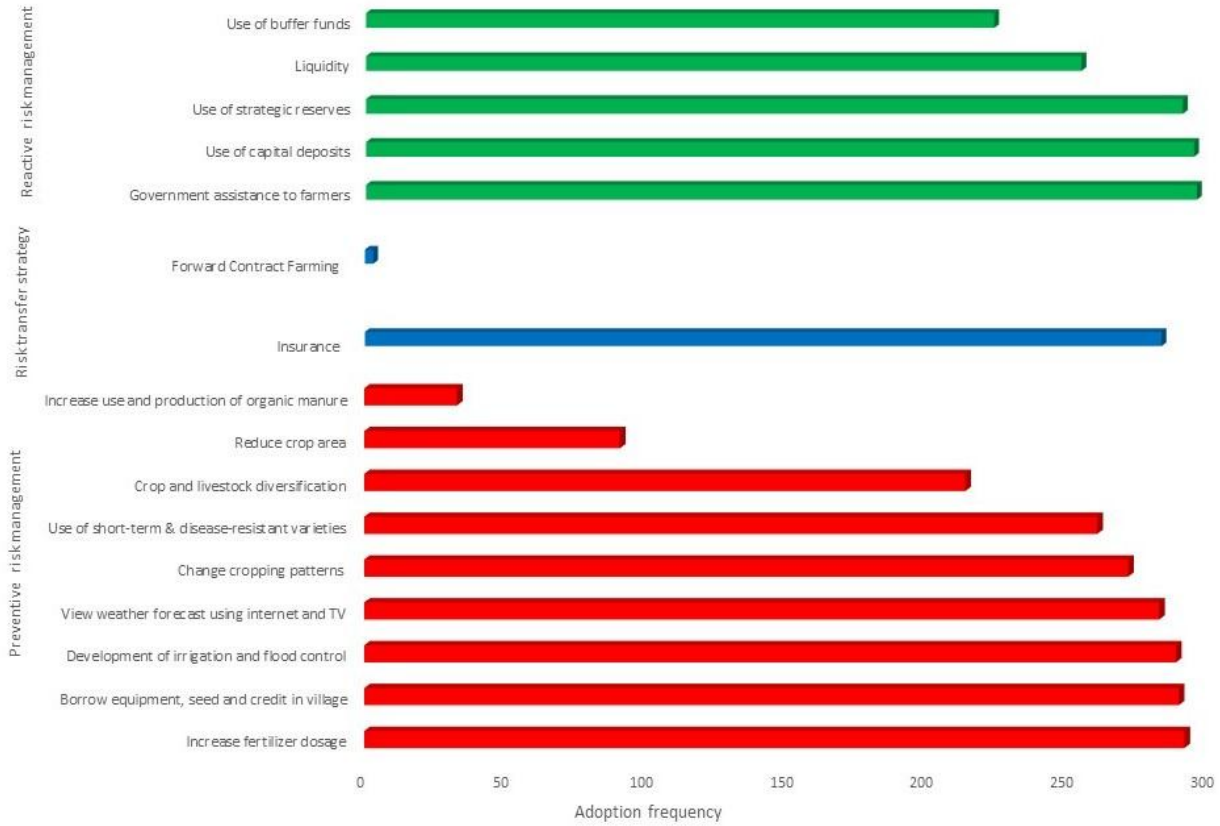

Fig. 7 : Adoption frequency of reactive, preventive, and risk transfer strategies

In the current era farmers were adopting risk transfer strategies as a modern solution for agriculture risk, Figure-7 indicates most of the farmers 283 (95.61%) had adopted crop insurance alone as a risk transfer strategy, (Jain & Parshad, 2007) suggested crop insurance as effective risk mitigation measure in India. In the available review of literature, the adoption of crop insurance and the willingness to pay for crop insurance by farmers was studied by many researchers (Abebe & Bogale, 2014; Islam *et al*., 2021; Meuwissen *et al*., 2001; Wang *et al*., 2016). Only a single farmer (0.34%) adopted forward contract farming alone and two (0.68%) adopted both insurance and contract farming as risk transfer strategies. Maize farmers inBangladesh adopted diversification, contract farming, and agricultural credit as risk mitigation strategies (Adnan *et al*., 2021). It is also recorded that 10 (3.38%) farmers were not using any risk transfer strategies. Overall we can conclude in the current era risk management adoption was most needed and all the farmers adopted one or more management strategies as safeguards against agriculture risk. Agriculture could be grown successfully if the risks are managed correctly using suitable risk mitigation techniques, and in the absence of proper risk mitigation techniques, then food security and agricultural development will be in danger (Dong, 1999). After counting the number of strategies adopted under this category by each farmer, minimum, maximum, and mean adoption scores were calculated as 0, 2, and 0.97 out of 2 for the risk transfer category. Finally, after summing the number of strategies adopted under all three categories by each farmer, minimum, maximum, and mean adoption scores were calculated as 7, 15, and 12.40 out of16 for total risk management.

Conclusion

Farmers deal with a variety of risks, with that production and economic risks precedence over technological, institutional, and personal risks. All

most all farmers accepted that they were affected by high variability in agriculture production, frost, fog, insects, pests, crop diseases, and high prices of the input. When considering occurrence frequency with impact perception high prices of the input, no proper payment of crop insurance, and insect, pest, and disease effects on the crop as well as the effect of frost, fog and dew were the top four risks. The technological risk was found to be the least risky for the farmer, as we can see not a single technological risk appears in the top half of risks. Farmers responded to these risks in various ways, each farmer adopted one or more strategies to mitigate the effect of these risks. In general, farmers adopted preventive strategies more in comparisonto reactive strategies. As per the adoption score of risk management tools increase input like fertilizer dosage, govt. assistance to farmers and insurance were the top ex-ante, ex-post risk management, and risk transfer strategies.

Agricultural risks are complex phenomena and these all risk interrelated to each other, this empirical research can assist policy planners and government administrators in designing better policies or plans, identifying the gaps and inadequacies in current policies, and developing the best solutions that can assist farmers in better coping with all kinds of agriculture risks.

Acknowledgements

We would like to thank the farmers that participated in the survey and focus group discussion.

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