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FARMERS PERCEPTION TOWARDS NATURAL DISASTERS AND CROP INSURANCE : A CASE STUDY OF BHARUCH GUJARAT, INDIA

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ABSTRACT

Farmers incur huge crop and financial loss due to natural disasters. Insurance safeguards farmers from crop loss. However, information on perception of farmers towards natural disasters and crop insurance schemes is limited. Understanding perception of farmers towards crop insurance schemes during the natural calamities helps to plan policies for effective implementation crop insurance schemes and to management climatic risk by farmers. The present study was conducted in Bharuch district of Gujarat, India. Total 62 agriculture respondents from 12 villages were selected to identify the farmer's perception towards crop insurance and natural disasters by employing ex-post-facto research design. Significant positive correlation was observed between source of information (0.41), mass media exposure (0.38) and farming experience (0.35) with respect to perception farmers towards crop insurance schemes. Exogenous variable source of information has exhibited highest total direct positive effect followed by farming experience and mass media exposure. Increased perception towards crop insurance will encourage farmers to register their crops under the crop insurance scheme which will help to cover the financial losses due to natural disasters and subsequently help them plan for the next cropping season. The perception regarding crop insurance schemes helps the policy makers to design the programs that offers determined benefits to the farmers. The increased perception regarding crop insurance schemes helps to mitigate the natural disasters by the farmers to some extent. This study addresses a significant research gap in perception of farmers towards a new crop insurance scheme introduced in the study area.

Key words : Perception, Farmers, Crop insurance, Natural disasters, Agriculture, Climate change.

Introduction

Agriculture is entirely weather based activity. Due to climate change, behavior of weather is erratic and uncertain (Das *et al.*, 2007). Over the past 20 decades, natural disasters have caused massive damages and immense economic losses across the globe. Numerous reports have witnessed for the loss of natural disasters (FAO, 2015). Farming is sensitive to weather and climate risks and it is one of the most economically affected sector through natural disasters. The relationships between produc-tion, weather and climate risk are well documented (George *et al*., 2005). Maximum total annual agricultural crop loss in the world due to direct weather and climatic effects such as hails storms, hurricanes, droughts, typhoons, untimely rains, frost, severe floods and seasonal epidemics. Agriculture is a complex system, within which changes are driven by the joint effects of environmen-tal, social, climatic, economic and political forces (Bryant and Johnston, 1992). Natural disasters often threaten agricultural production and negative effects across national economy. In developing countries like India, 22 percent of the total damage and losses caused by natural disasters were absorbed by agriculture sector (FAO, 2015).

According to Centre for Research on the Epidemiology of Disasters (CRED) since 1900 to 2020, worldwide 22,000 mass disasters were recorded. Indian history accounted 34 different types of droughts in the

time span of 1870 to 2018 (Vimal, 2019). The increased frequency of droughts increases overall temperature and rainfall has been decreased. In India, 80 percent of crop damage in agriculture has been by drought. The 2002 drought, one of the severest in the 130 years of Indian history affected 56 per cent of the geographical area (Samra, 2004). Earlier the average of drought was one in every 15 years, but the last one decade, has itself witnessed three droughts (FAO, 2015). During drought years, average total food grain production decreased by 24 per cent in 9 out of 11 events. Almost 37 per cent of drought evens have depicted decrease in food grain production (Parmeshwar *et al.*, 2014).

Nearly 40 m ha area in India is flood-prone and every year nearly eight million hectares of land are affected by floods (Kamaljit *et al.*, 2019). The most severe flood examples in Indian history were during 2017 July in Gujarat, August 2018 and 2019 in Kerala, May 2020 in Assam floods, (Sushmita, 2019). According to Omvir and Manish in 2013 revealed that long-term analysis, 2,443 flood events claimed 0.35 million hectares of standing crop was affected. Just a month away from harvesting, 5.5 million ha crops was affected in 2014. In 2015 hit with unexpected rain fall and 18.23 million ha of crops were damaged. It accounts 182.38 lakh ha of standing crops, 18 per cent of food grain production and 70 per cent of geographical area (Chandra *et al.*, 2015). Such continuous floods and droughts create critical situations to farmers, drastic drop in farmers' income and significant threat to India's agrarian economy. Additional burden for farmers, were regular pest and insect's attacks. Losses by pest and insects attack in major food and cash crops estimated on an average of 15 to 20% (Mandeep and Pradeep, 2018). Jamkhandi (2018) reported 2.5 -2.6-billion-dollar maize crop was damaged by fall army worm in Karnataka. *Maruca vitrata* has emerged as a predominant pest causing up to 42% damage in cowpea at Andhra Pradesh (Halder, 2012). In Thane, Maharashtra due to an invasive pest, the coconut eriopyhid mite damaged 64.2-89.4% coconut (Bagde and Pashte, 2014). Locust attacks in the country damaged at least 200,000 ha of crops in the last two years (2019 & 2020), Rajasthan and Gujarat reported the highest crop losses of 179,750 ha and 21,500 ha, respectively in 2020 and 2021 (Shagun, 2021).

Natural disasters are unpredictable, India is agrarian country with two third of its population entirely depending on agriculture and allied activities. Indian agriculture is directly depending on weather and climate. In India around 60% of total cultivated area is still under normal precipitation and hence change in climate (rainfall patterns) is a major threat to India's rural economy. The direct influence of natural disasters on Indian farming is reduction in crop (cereals pulses and oilseeds), fruit and vegetable production. This makes radical decrease in the income and increased financial stress across farming community, moreover, spatial and temporal uncertainties of weather and climate peasants are always under risk. Repetitive uncertainties lead finally farmers to fall into poverty trap by selling livestock and other durable assets in the mode of overcoming risk (Barnett et al. 2008). There is need to adopt a strategy to combat these risks that provide inclusive solutions to agrarian population and to safeguard agricultural productivity. The concept of crop insurance was introduced to minimize financial risk, agrarian poverty and hence peace of mind to farming community. Taken together natural disasters, the overall cost of agriculture production increases, productivity declines, indirectly affects food security and economy of nation. According to Sebastian *et al*. (2012) crop insurance provides the solutions to farmer's problems raised by uncertainties by stabilizing the farm income and increased production to the farmer. The formalized risk management in farming is insurance, being one obvious mechanism which can be harnessed for this task.

In India crop insurance concept was first introduced in 1920's by the end of 2021 around 12 different types of crop insurance schemes were introduced with contemporary reforms to provide the maximum benefit to farming community (Netravathi and Aneri, 2019). To safeguard farming, Indian Government implemented a unique insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY) on 1st April 2016 with the slogan of minimum premium and maximum insurance for farmers (PMFBY, 2020). The major objective of this program is to support sustainable production, continues farming, promote agriculture mechanization, protect farmers towards unforeseen events and increase the food security. It ensures financial support for the agrarian community by continues flow of credit and to ensure stabilizing the income of the farmer. Few studies were reported regarding importance of insurance in agriculture crops but limited studies on perception of farmers regarding crop insurance. Perception means understood information of the farmers regarding crop incurrence scheme with respect to natural calamities. The study identifies perceived advantages and difficulties faced by the farmers while insuring their crops. This perception is important to ascertain the complications faced by the farmers to insure their crops. The study helps to policy makers to designed the crop insurance schemes in more effective and convenient way to farmers, to insure their crops and

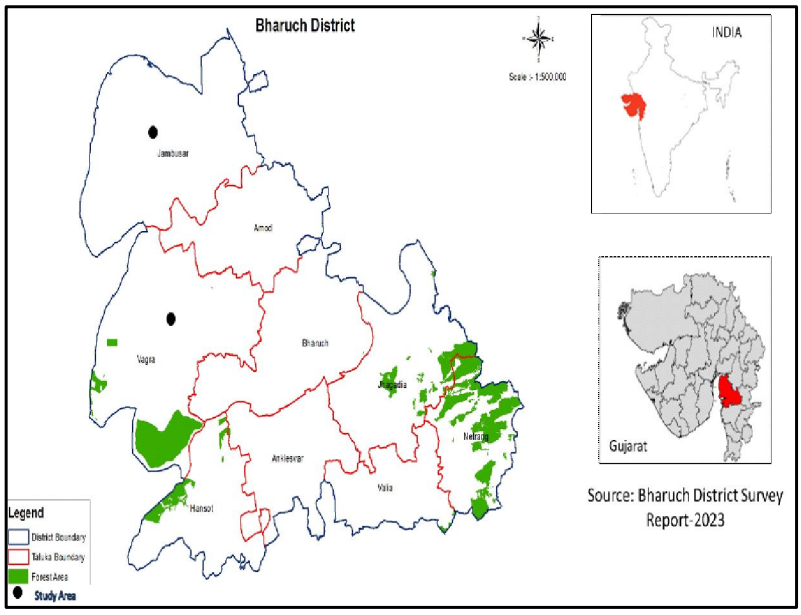

Fig. 1 : Map of Bharuch district, Gujarat, India showing study area.

to manage agriculture production risk.

Materials and Methods

The study was conducted purposively under the Narmada catchment area of Bharuch district (21.65^{0}N, 73.18^{0}E) in Gujarat state which wherein agriculture is the major livelihood to people. The district is characterized by 66 % of population entirely depending on agriculture and allied activities, an average annual rainfall is 1000 mm with 12°C (minimum) and 44°C (maximum) temperature. Bharuch District is sharing its eastern border to the Narmada District, South to the Surat District, North to the Baroda District Gulf of Khambhat to the west (Gulf of Cambay). The district is categorized by short and irregular rainfall and increased temperature, with low to average productivity in agriculture (Table S1).

Insured farmers list of PMFBY was collected from for District Agriculture Development Office, Bharuch, Gujarat. In the year 2022, 305 farmers insured their crop under PMFBY in Bharuch district with Jambusar (248) and Vagra (30) blocks having maximum insured farmers in Fig. 1. From Jambusar (11) and Vagra (1) blocks villages were selected by proportionate sampling method because maximum farmers insured their crop in Jambusar Taluk. Sixty-two insured farmers were selected based on random sampling method in selected twelve villages of the blocks (Jambusar and Vagra).

Data collection

Data was collected in the month of September and October 2022 using pretested questionnaire through face-to-face contact method to elicit both qualitative and quantitative data on perception of farmers towards crop insurance scheme. To avoid the biasness in the questionnaire simple, familiar and unambiguous words were used to targeted respondents. Questions on the same topic were grouped together and transitional statements were used to switch between different topics. Individual insured farmer was considered as a primary sampling unit. Farmers were particularly interviewed on social, personal, psychological, economic, situational and perceptional factors. The primary objective of the study was to analyze, how these factors were affecting perception. For better understanding the study was conducted in local language. The questionnaire was pre-tested, prior to the survey to check the relevance, redundancy, missing information, as well as validity of the questions with sub-sets of the target population. Based on the pre-tested results the questionnaire was modified. The respondents included in pre-test were omitted from the sample considered in this study.

Data analysis

Primary data collected from the respondents was processed and statically analyzed in excel 2010 and R 4.0.2 (R core team 2021). Keeping in view of the objective of the study, descriptive and inferential statistics have been used to assess farmer's perception. The analytical tools used for the study were briefed below.

Frequency distributions : Frequency distributions were used to specify the percentage of observations in each group of data points and it was particularly useful when making comparisons in handy for studying an initial value.

Mean : The mean is the mathematical average of a set of numbers and used to measure of central tendency.

Table S1 : Profile of the Bharuch district of Gujarat, India.

Profile	Estimate
Total geographical area	6,527sq. m
Total population	1,550,822
Population density	238/ Km^2
Sex ratio (per 1000)	924
Literacy rate	87.66%
Net sown area (000 ha)	327.2
Soil types	Sandy, Saline and Alkali soils
Cropping intensity %	117.0
Rain fed area (000 ha)	255.8

Source: Bharuch district report 2024, Government of Gujarat, India.

It was used to classify the farmer's groups around central value. Further, averages were employed to associate the importance and usefulness of crop insurance in these changed climatic conditions.

Perception : In the study, perception of the farmers towards PMFBY was measured using scientific statements developed through review of literature. Nineteen different statements related to perception towards scheme were made and asked the respondents to give their opinion against each statement in form of five-point continuum (strongly agree, agree, undecided, disagree and strongly disagree). To analyses the ranks Garrett ranking technique was used. These ranks were then converted in to scores values using formula proposed by Garrett (1997).

Correlation : The relationship between dependent and independent variables was defined by computing Pearson product moment correlation. In the study farmer's perception was studied in relationship with the personal and socioeconomic characteristics of respondents.

Path analysis : It is a technique used to assess the direct causal contribution of one variable to another in a non-experimental situation. Path analysis identified contribution of every independent variable on perception of crop insurance schemes by the farmer weather directly or indirectly.

Results and Discussion

Socioeconomic and personal profile of the farmers

The profile of respondents from the study area comprised and presented in Table S2. The different socioeconomic and personal characteristics indicated that 60% of the farmers were middle aged (26 to 40 years) followed by old (25%) with more or equal to 41 years and young (15%) with less or equal to 25 years. Majority of the respondents belonged to higher-secondary education category (56.45%) followed by degree and above (22.58%) secondary education (14.52%) and primary education (6.45%) level. Regarding family size, 48.39% of respondents belongs to small family with 2 to 4 members followed by medium (32.26%) with 5 to 8 members and large (19.35%) with more or equal to 9 members in a family. Nearly 60% of the respondents belongs to medium size of land with 2.5 to 5 ha followed by big (24%) with more than 5 ha and marginal and small farmers (16%) with 2.5 ha or lesser land holdings. About 61% of respondents belongs to medium category of farming experience with 7 to 9 years, followed by high (21%) with 10 or more years and low (18%) with 6 or lesser years. Nearly 34% of the insured farmers belongs to 200,001-300,000 annual incomes, followed by 26% (` 300,001-400,000), 13% (` 100,001-200,000) 11% (` 400,001-500,000) and an equal percent (8%) belongs to ` ≤ 100,001 and ` ≥ 500,001, respectively. More than 53% of the farmers have medium level of social participation followed by 26% (high) and 21% (low). About 58% of the respondent's access scientific information occasionally followed by regularly (24%) and rarely (18%). Regarding mass media exposure, 69% of farmers belongs to moderate followed by higher (18%) and lower (13%) level. Around 61% of respondents have to moderate level of extension contact followed by higher (23%) and lower (16%) level. About, 61 per cent of farmers have moderate level of risk orientation followed by higher (23%) and lower (16%) level. Almost seventy percent (68 %) of the respondents have moderate level of economic motivation followed by higher (19%) and lower (13%) level.

The respondents belong to middle aged to old aged with small to medium sized family, having middle to higher level of farming experience insure their crops indicated that aged with experienced farmers having education recognized the crop losses due to natural disasters and importance of the crop insurance to overcome the problems. In a small to medium sized family, family members entirely depending on single person's income, it creates an unavoidable situation on head of the family to safeguard the family during extreme situations, in this situation crop insurance is one of the alternative options. Farmers having medium to large sized land holding with higher-secondary to degree and above level of education with medium level of annual income recognized the importance of crop insurance in this changed climatic situation. These respondents insure their crop to stabilize the family income and to avoid the further complications due to crop loss. It was found that maximum insured farmers have medium to high level of social participation, risk orientation, extension contact, mass media exposure and also access to scientific information regularly to collect information, facts and technical knowledge regarding climate variations and crop insurance scheme. The pulled information by the respondents play significant role on their perception levels.

Perception of insured farmers towards natural disasters and crop insurance schemes

The information on perception of farmers with respect to crop insurance scheme revealed in Table 1 that major encouraging factors perceived by the farmers were, farmer can sustain safely during calamities ranks 1st with

Table S2 : Personal and socioeconomic characteristics of farmers.

Variables	Category	Insured farmers	
		Frequency	Percent
Age	Young d” 25 (years)	09	15.00
	Middle 26-40 (years)	37	60.00
	Old e” 41(years)	16	25.00
Education	Primary education (1-8 classes)	4	6.45
	Secondary education (9-10 classes)	9	14.52
	Higher-secondary education (11-12 classes)	35	56.45
	Degree and above	14	22.58
Family Size	Small 2 - 4 members	30	48.39
	Medium 5-8 members	20	32.26
	Large e” 9 members	12	19.35
Land Holdings	Marginal and small farmers (< 2.5 ha)	10	16.00
	Medium farmers (2.5-5.0 ha)	37	60.00
	Big farmers (> 5.0 ha)	15	24.00
Farming experience	Low (d” 6 years)	11	18.00
	Medium (7-9 years)	38	61.00
	High (e” 10 years)	13	21.00
Annual income	d” ¹ 100,000	5	08.00
	¹ 100,001-¹ 200,000	8	13.00
	¹ 200,001-¹ 300,000	21	34.00
	¹ 300,001-¹ 400,000	16	26.00
	¹ 400,001-¹ 500,000	7	11.00
	e”¹ 500,001	5	08.00
Social Participation[a]	Low	13	21.00
	Medium	33	53.00
	High	16	26.00
Access to scientific information	Rarely	11	18.00
	Occasionally	36	58.00
	Regularly	15	24.00
Mass media exposure[a]	Lower	08	13.00
	Moderate	43	69.00
	Higher	11	18.00
Extension contact[a]	Lower	10	16.00
	Moderate	38	61.00
	Higher	14	23.00
Risk orientation[a]	Lower	10	16.00
	Moderate	38	61.00
	Higher	14	23.00
Economic motivation[a]	Lower	08	13.00
	Moderate	42	68.00
	Higher	12	19.00

Note: a = mean & standard deviation.

Table S3 : Constraints of farmers while insuring crops under crop insurance schemes.

Constraints	Frequency	Percentage	Rank
Delay in payment of insurance claims	58	93.55	I
Compensation provided only when entire crop was damaged	56	90.32	II
Less compensation offered in crop insurance scheme	55	88.71	III
Premium rates should high	53	85.48	IV
Unavailability of reporting authority at the time of loss	50	80.65	V
Lack of information regarding scheme	48	77.42	VI
It is compulsory for loanee farmers	45	72.58	VII
Negative attitude of the staff towards beneficiaries	42	67.74	VIII

Table 1 : Perception of insured farmers towards natural disasters and crop insurance schemes.

Statements	Score	Rank
Under the crop insurance scheme farmer can sustain safely during calamities.	4.68	I
The claim amount is good enough for farmers	4.66	II
It is for minimum premium and maximum insurance	4.40	III
The claim amount is based on MSP	4.29	IV
Transparent financial process as compare to other crop insurance schemes	4.27	V
Faster assessment of crop damages	4.21	VI
Use of modern technology for assignment of damage	4.16	VII
It fulfills the requirements of large farmers only.	4.15	VIII
Premium for small and marginal farmers is high.	3.70	IX
It should make mandatory for all farmers to get crop insurance with minimum premium	3.82	X
All crops must be notified under this scheme	3.44	XI
It involves lengthy application procedures	3.31	XII
Capping system works upright	3.27	XIII
Assessment of damage must be on the basis on area approach	3.26	IXV
It includes risk coverage of entire crop cycle	3.15	XV
It covers market risk.	3.03	XVI
Educating the farmers regarding importance of protecting crops from natural calamities	2.58	XVII
Poor awareness about the scheme and its provisions	2.45	XVIII
Quick settlement of compensation amount for the damaged crop (within 30 days)	1.68	IXX

score of 4.68 followed by claim amount is good enough to farmers, minimum premium and maximum insurance and claim amount based on minimum support price (MSP) ranks 2nd, 3rd and 4th with score of 4.66, 4.40 and 4.29, respectively. Transparency in financial process, faster assessment of crop damages, modern technology for assignment of damaged crop, the scheme fulfills the requirements of large farmers only, premium is high for the small and the large farmers ranks 5th, 6th, 7th, 8th and 9th respectively with score of 4.27, 4.21, 4.16, 4.15 and 3.70. The financial factors play a significant role in the perception farmers regarding crop insurance. Conformed financial assistance increases farmer's perception with minimum premium amount. Some of the difficulties experienced by the insured farmers under this scheme were, make it mandatory for all farmers to get crop insurance, all crops must be notified under this scheme, lengthy application process, cropping system works upright and damage assignment is mainly based on area approach ranks 10th, 11th, 12th, 13th and 14th with score of 3.82, 3.44, 3.31, 3.27 and 3.26, respectively. Followed by risk coverage by entire crop cycle, should cover market risk, educating the farmers regarding importance of protecting crops from natural calamities, poor awareness about the scheme and compensation amount for the damaged crop reaches the farmers within 30 days ranks 15th, 16th, 17th, 18th, and 19th with a score of 3.15, 3.03, 2.58, 2.45 and 1.68, respectively. Major difficulties experienced by the farmers were more compensation time required, lack of awareness towards natural calamities and the importance of crop insurance. Market and the post-harvest crop loss must include in crop insurance schemes because agricultural markets where more fluctuating creates unexpected glute of agricultural

Table 2 : Association (r) between personal profile and perception of farmers towards natural disasters and crop insurance schemes.

Variables	Correlation with perception (r value)
Age	0.37*
Education	0.33*
Family size	-0.03^{NS}
Land holding	0.27*
Farming experience	0.35*
Annual income	-0.06^{NS}
Social participation	0.13^{NS}
Source of information	0.41*
Mass media exposure	0.38*
Extension contacts	0.27*
Risk orientation	0.18^{NS}
Economic motivation	0.23*

*Significant at 0.05 level; NS non-significant

products leads to price crash.

Association (r) between personal profile and perception of farmers towards natural disasters and crop insurance schemes

Pearson's product moment correlation (r) was used to find the determinants of farmer's perception towards crop insurance. Table 2 shows, source of information (0.41) mass media exposure (0.38), farming experience (0.35), age (0.37), education (0.33), extension contact (0.27) land holdings (0.27) and economic motivation (0.23) have significantly and positively correlated with farmers perception. Reasonably higher education, farming experience, availability of scientific and technical information through different sources like mass media, scientists and extension workers, enable farmers understand the risks involved in agriculture under changed climatic conditions. Crop insurance is the income source and input source for the farmers when the crop damaged by unexpected natural calamities. The experienced and educated farmers opt crop insurance to minimize crop loss risk, it serves as their livelihood and source of investment for the next cropping season. Risk orientation (0.18) and social participation (0.13) have non significantly and positively correlated and family size (-0.03) and annual income (-0.06) have non significantly and negatively correlated with perception of farmers. Complicated procedure to insure crop and increased premium cost created negative perception towards crop insurance. Maximum insurance schemes cover crop loss only for natural calamities, human intervention like market fluctuations were not included under the crop insurance schemes. Large farmers have multiple income sources with diversified cropping patterns and no dependency on crop insurance for their income. But small to medium farmers every season and crop play an important role in their family income.

Direct and the indirect effect of socioeconomic characters on perception of farmers towards natural disasters and crop insurance schemes

Path analysis results of perception versus 12 exogenous variables are presented in Table 3. It was found that exogenous variables source of information (0.3063) has exerted highest total direct positive effect followed by forming experience (0.2545), mass media exposure (0.2201), land holdings (0.8132), economic motivation (0.1326), and social participation (0.1048). Whereas the other exogenous variable education has exerted highest total negative direct effect followed by annual income risk orientation and family size. The exogenous variables risk orientation (0.2264) has exerted highest total indirect direct effect followed by) mass media exposure (0.1634), source of information (0.1023), economic motivation (0.0977) farming experience (0.0918) and land holdings (0.0908). Mass media is one of the most powerful information sources to know, understand and learn the things. Directly or indirectly, digital media played a vital role in changing the perception of respondents by providing required information. In this digital era, mass media channels act as authenticated information sources for the farmers to access required information to insure their crops. Besides conventional extension mechanisms such as radio, television and newspapers, information communication technology applications such as mobile applications, kisan call centers, YouTube, Facebook, Twitter videos and voice blasts increases crop insurance literacy across the farming community (Amutha *et al*., 2021).

Difficulties of farmers while insuring crops under crop insurance schemes

It could be observed from Table S3 the difficulty felt by the respondents during crop insurance, the majority of the respondents in the study expressed that delay in payment of insurance claims ranks first with score of (93.55). Under PMFBY compensation provided only for entire crop damage with score of (90.32) (Rank II). From the study it's identified that payment for insurance claims an average takes more than a year. Small and marginal farmers dominate Indian agriculture with scattered land holdings minor crop loss due to natural calamities accounts higher financial loss to them. Less compensation offered in crop insurance scheme ranks third (88.71) and premium

Table S4 : Solutions offered by farmers to overcome the constrains while insuring the crops.

Solutions	Frequency	Per cent	Rank
Compensation should be provided for partial damage	58	93.55	I
Immediate payment of insurance claims	55	88.71	II
More compensation offered in crop insurance scheme	52	83.87	III
Premium amount should be decreased	51	82.26	VI
Should not be compulsory for loanee farmers specified crops	45	72.58	V
At village level one financial institution to guide and assist regarding scheme	38	61.29	VII

Table 3 : Direct and indirect effect of independent variables on farmer's perception towards crop insurance schemes.

Variables	Direct effect	Indirect effect	Total effect	Correlation with perception (r value)
Age	0.0022	0.0346	0.0368	0.0368
Education	-0.0949	0.0678	-0.0272	-0.0272
Family size	-0.0421	0.0108	-0.0313	-0.0313
Land holding	0.1832	0.0908	0.274	0.274
Farming experience	0.2548	0.0918	0.3466	0.3466
Annual income	-0.0811	0.0255	-0.0556	-0.0556
Social participation	0.1048	0.0267	0.1316	0.1316
Source of information	0.3063	0.1023	0.4086	0.4086
Mass media exposure	0.2201	0.1634	0.3835	0.3835
Extension contact	0.0988	0.1759	0.2747	0.2747
Risk orientation	-0.0423	0.2264	0.1841	0.1841
Economic motivation	0.1326	0.0977	0.2304	0.2304

rate should high ranks fourth (85.58). Majority of the small and marginal farmers feel that high rate of premium and small quantity of compensation offered for the insured crops. The premium amount was not adequate for further crop production. Unavailability of reporting authority at the time of crop loss ranks fifth (80.65) and lack of information regarding scheme ranks sixth (77.42). digitalized insurance programs were still not comfortable by the respondent's; they depend on the authorities to access the information. Compulsory for loanee farmers ranks seventh (77.42) and negative attitude of the staff towards beneficiaries ranks eighth (67.74). Despite the adoption of modern digital technologies, the diverse agro-ecological regions of the country limit the implementation of this program and the different states, researchers and insurance players have diverse views on this crop insurance scheme.

Recommendations offered by farmers to overcome the constrains while insuring the crops

The recommendations to improve farmer's perception towards crop insurance scheme, as reported by the respondents were analyzed and presented in Table S4. Results show that out of six suggestions given by the respondents, compensation should be provided for partial damage ranked first. It motivates small and marginal farmers to insure every crop they grow in their fields as they get compensation with minimum crop damage and feel secure to invest in agriculture for future. Immediate payment for insurance claims ranks second as it provides instant benefit for the next cropping season. The respondents ranked more compensation offered in crop insurance scheme as the third suggestion as the increased cost for cultivation of agricultural crops compared to insurance claim amount and avoids farmer's dependency on moneylenders for deficit amount at the time of next season. The fourth rank was given to premium amount should be decreased, as the agriculture depends on climate and market both were not under the control, due to these unavoidable factors farmers were under crises. Moderate premium amount encourages average farmers to insure their crops. The fifth rank was given to crop insurance, not compulsory for loanee farmers, loanee farmers were already in deficit situations. They feel difficult to payment premium amount to insure their crop. Financial institution in each village which guide and assist regarding scheme ranks sixth, it makes the process easier to the farmers.

Conclusion

Agriculture is one among the important component

of Indian Economy as more than 45 to 46% of the workforce depends on agriculture for their livelihood. But the sector is under continuous risks, which are intensified by a various factor, from frequent natural disasters, climate variability, imperfect markets, weak rural infrastructure and appropriative financial services (NITI Aayog Report, 2012). These factors have a multiplier impact on livelihood and income and create repeated losses especially for small and marginal farmers who comprise over 85 percent of total farmers in India. Hence, there is a need to protect Indian farmers from environmental risks and encourage them to reduce, mitigate and manage it. Despite impressive implementation of disaster risk management and mitigation strategies a large part of Indian agriculture still remains exposed to climatic risks. Crop insurance provides a protection for farmers to minimize losses arising from natural disasters. It encourages them to continue to invest in inputs and technology to increase yields and household income. To address these challenges and to find a single solution to all the natural disasters in agriculture, Indian government introduced Pradhan Mantri Fasal Bima Yojana (PMFBY) by scraping down the earlier insurance schemes. This scheme provides financial support and insurance coverage to farmers in case of failure of any of the notified crops as a result of natural calamities, pests and diseases. Despite the Indian government strongly pushing the scheme, an average 26 to 28 percent of cropped area was insured every season (PMFBY report, 2023). There are several reasons for low to moderate perception primary reasons being, lack of awareness about importance of insurance for their crops even though they were experiencing crop loss in every season. Creating awareness among farming community using primary contact methods will be effective to increases the perception towards the scheme. During upright seasons, there is no need for a claim and during a depraved season, the claim is not settled, because state government delays release of premium share beyond a prescribed time limit to insurance companies would not be allowed to implement the scheme in subsequent seasons. Both the state and the central governments have to work together to resolve the financial settlements with insurance companies in the stipulated time period. The scheme structured, funded and implemented based on cropping system approach, non-listed crop claims were rejected because they fall outside the coverage of the scheme. Cropping system under this scheme should be restructured depending on local situations. Additionally, glut in the market is the major problem for agriculture products leads to price instability. The remedy to the crises has to create processing and cold storage facilities for agriculture products at local level and direct marketing linkages should be strengthened. As an effort toward this direction, the government should expand its investment and expenditure in the farm sector. The solution to the problem is not in a crop insurance package in addition to this awareness and understood information of the farmers has to change regarding crop insurance, processing and export-oriented market to reduce the effects of natural disasters in agriculture sector.

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