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Risk Attitude of Farmers in the Climate Extreme Region of Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The objective of the current study was to assess the risk attitude of both insured and non-insured farmers and identify the factors influencing the risk attitude of insured and non-insured farmers.

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Study Area and Design: An ex-post-facto study was conducted, and the stratified random sampling method was used to collect the data at selected villages in Prakasam district, Andhra Pradesh.
Methodology: A sample of 150 farmers of chilli and cotton was collected (90 insured and 60 non-insured). Data regarding the agriculture year 2021-22 was analysed using Moscardi and de Janvry approach. The socioeconomic, institutional and farm characteristics were analysed by using discriminant analysis to identify the factors influencing farmers' risk attitudes.
Results: The present study results showed that the majority of the farmers are risk neutral. In the case of risk preferers insured farmers are more compared to non-insured farmers. Insured chilli farmers more than non-insured chilli farmers in case of risk-averse but, it is the reverse in the case of cotton farmers. Occupation, constraints in getting credit facility, membership of the association, the proportion of crop income to the total farm income and family size of insured chilli farmers and family size, education level membership of the association, constraints in getting credit facility, the proportion of crop income to total farm income of non-insured chilli farmers are significant. Variables like age, occupation, farming experience, constraints in getting credit facility and age, occupation, education level, and farming experience of insured and non-insured cotton farmers were found to be significant.
Conclusion: The majority of the farmers (both insured and non-insured) are risk neutral.

Keywords: Risk attitude; crop insurance; cotton; chilli.

1. INTRODUCTION

Agriculture in India faces a lot of uncertainties. Still, more than 70 per cent of people in India are engaged in this sector. In India agriculture and allied activities contributes 18.3 per cent of GVP. It also provides employment opportunities to nearly two-thirds of the working force. Farmers face a lot of risks and uncertainties including pest outbreaks, Market fluctuations and variations in weather conditions like drought, flood etc. Due to these farmers face losses in their crop yield and financial stability if these risks were not managed properly [1]. There is an immense diversity of agricultural practices because of the climate and other environmental factors, farm characteristics, institutional, and socio-economic factors, and their interactions [2]. Most of the agriculture production activities in India are highly susceptible to uncontrollable weather events that can severely impact both the quality and quantity of a yield [3]. In crops requiring higher initial investment, the weather risks may prevent the farmers to opt for high-value crops [4]. Farmers need to make decisions about steps to take to reduce the potential impact of risk [5]. Understanding farmers' attitudes and perceptions towards risk is crucial for planners and research organizations in delivering accurate information, framing various risk management strategies, and supplying farming credit and extension facilities [6]. Given the close relationship between economic and agricultural growth, risk management in agriculture may present significant challenges for decision-makers and researchers [7] Generally, Indian farmers exhibit a higher risk aversion behaviour in the decision-making process [8]. The risks, which farmers are facing, may result from extreme climate and weather conditions, insect pests and diseases, market vacillation and indiscretion of product prices [9]. Crops insurance helps the farmers in stabilizing their income and production. It is considered an essential part of agricultural programs designed to protect farmers against the physical failure of crops due to weather and other natural hazards. Compared to other risk-reducing strategies, such as intercropping, crop diversification, mixed farming, etc., available to farmers crop insurance is more efficient [10] it is necessary to protect the farmers from natural calamities and ensure their credit eligibility for the next season [11]. The insurance mechanism is unique in that it considers the possibility that a person who had a loss may make more money than if they had hurt another farmer [12]. The government introduced many crop insurance schemes and presently two most important schemes are functional i.e., Pradhan Mantri Fasal Bhima Yojana (PMFBY) and Weather Based Crop Insurance Scheme (WBCIS) are in operation [13]. A weather-based crop insurance scheme is a type of insurance program that provides financial protection to farmers against losses due to adverse weather conditions such as drought, excessive rainfall, hailstorms, and other natural calamities. As agricultural output is the main source of income for agricultural households, therefore the farmers must acknowledge and manage production risks [14]

to manage the risks at the farm level. The framer's risk attitude plays an important role in farmers' management and adaptation decisions against exposed risks at the farm level. Accurate and timely perception of risks may also assist farmers to assess the probability and consequences of exposed risks [15]. If farmers were given assurance financially, they will allocate resources optimally. Risk-averse farmers apply fewer fertilizers than other farmers [16]. However, some other studies have shown that farmers consistently over-apply fertilizers [17]. Insurance will induce the use of the risk-increasing factor and reduce the use of the risk-decreasing factors thereby increasing production risk and indicating moral hazard [18]. To analyze the farmer's decision in risky and uncertain conditions it is necessary to observe how they perceive risk and behave against various kinds of risks [19].

Y.S.R Free Crop Insurance Scheme is launched by the Government of Andhra Pradesh on 15th December 2020 to provide financial assistance to the farmers. All farmers cultivators, sharecroppers and tenant farmers are eligible under YSR Free Crop Insurance Scheme. Earlier farmers used to pay a high premium on crop insurance but now with the introduction of this scheme, farmers would pay a charge of one rupee only. But now this insurance scheme is completely free of premium. The YSR free crop insurance is divided into yield-based crop insurance and weather-based crop insurance. In Yield based Crop Insurance farmers will be provided financial assistance based on post-harvest losses. In Weather Based Crop Insurance financial assistance will be given based on crop losses due to adverse weather conditions. There are around 22 notified crops that are covered under this scheme. Chilli and cotton crops are among them [20]. The objective of the current study was to assess the risk attitude of both insured and non-insured farmers and identify the factors influencing the risk attitude of insured and non-insured farmers.

2. METHODOLOGY

2.1 Study Area

The study was purposively conducted in the western region of Prakasam district Andhra Pradesh which is one of the climate-extreme regions of Andhra Pradesh. This district has a moderate climate in the coastal areas and a hot climate in the non-coastal areas. The normal maximum and minimum temperatures recorded in the district are 40.20 C and 20.30 C respectively and mean annual rainfall was maximum during 2 seasons i.e., post-monsoon, and monsoon periods with 419.65 mm, and 404.14 mm respectively [21] Stratified random sampling method was used to collect the data. The survey was conducted in the Yerragondapalem and Dornala mandals of the Prakasam district. A total of 150 samples were collected consisting of ninety insured farmers and sixty non-insured farmers of both chilli and cotton.

2.2 Method

2.2.1 Cobb-Douglas production function

Before going to estimate the risk attitude of the farmers first we have to determine the variable which is determining the yield. For that, we used cobb-Douglas production method was used.

Using the data collected, the cobb-Douglas (double log) production function was formed. We ran the data to ordinary least square (OLS) was used to obtain the regression coefficient and coefficient of determinants. The function is expressed as

$$Y=f(X_1, X_2, X_3, X_4, X_5, X_6, U)$$
$$Y= \alpha X^{\beta}$$

$$\ln Y= \alpha+\beta_1 \ln X_1+ \beta_2 \ln X_2+ \beta_3 \ln X_3+ \beta_4 \ln X_4+ \beta_5 \ln X_5+ \beta_6 \ln X_6+U \quad \ldots\ldots\ldots (1)$$

Where Y is output, X_1 is the Quantity of seed (kg/acre) used X_2 is the Quantity of Nitrogen (kg/acre) used, X_3 is the Quantity of Phosphorus (kg/acre) used, X_4 is the Quantity of Potassium (kg/acre) used, X_5 is Number of times irrigated for crop, X_6 is Labour utilization in labour day/ha U is Error term [22].

2.2.2 Moscardi and de Janvry approach

The estimated model is Moscardi and de Janvry model which was first introduced by Moscardi and de Janvry [23].

Assume that the random net income that a farmer obtained from yield uncertainty and also from the relationship between input (X) and yield (Y) is represented by production function, the coefficients of variation (cv) of yield is

$$\theta = \frac{\delta_y}{\mu_y} \quad \text{----------(2)}$$

where θ is the coefficient of variation yield; δ_y is the standard deviation of yield; μ_y mean yield and given factor cost (P_i) and a given product price (P_y), the preferences order can be maximized concerning input levels. The resulting first-order condition is

$$P_y f_i \frac{\mu_y}{X_i} = \frac{P_i}{1-\theta K_s} \quad \text{----------(3)}$$

Where p_i is the input cost; X_i is the input vector (most significant input); P_y is the output price; f_i is the elasticity of production of the i^{th} input; K_s is the risk attitude parameter, while θ and μ are as defined in equation (2)

The value of the risk attitude parameter was deduced from observed levels of products and inputs by solving equation (2) as follows

$$K(S) = \frac{1}{\theta}(1-P_iX_i / P_yf_i\mu_y) \quad \text{……. (4)}$$

Equation (4) provides a measure of risk attitude K_s that were derived from each farmer's knowledge of production function, the coefficient of variation of yield, product price and input cost and observed levels of inputs used.

Following Moscardi and de Janvry's approach, the risk attitude parameter K_s was equally distributed among the groups: i) risk-prefer ii) risk-neutral and iii) risk-averse [23].

2.2.3 Discriminant analysis

Discriminant analysis is done using SPSS software to find out the factors influencing the risk attitude of the farmers. Socio-economic, institutional and farm characteristics like age, occupation, education levels, family size, proportion of crop cultivated area to the total farm area, proportion of crop income to total farm income, farming experience, constraints in getting institutional credit facilities and membership of association were used as the factors. It is estimated that discriminant function estimates would assign the farmers to the same group as would have done the classification variables (parameter K_s).

3. RESULTS AND DISCUSSION

3.1 Risk Attitude

The results of the analysis done within the framework of specified methodology and also concerning each of the objectives set forth for the study are presented. The significant determinants of crop yield have been found to determine the risk attitude of the farmers based on Moscardi and Janvry's econometric approach. Based on this approach, the risk attitude parameter K_s for each farmer was estimated and classified farmers into three distinct risk attitude groups. The results of the analysis are presented and discussed in this section.

The majority of the sample farmers 46 per cent, 61.5 per cent of insured and non-insured chilli farmers and 47.5 per cent and 32.3 per cent of insured and non-insured cotton farmers are risk neutral. Risk preferers and Risk averse are more in insured chilli farmers compared to non-insured chilli farmers but, risk-averse are more in non-insured cotton farmers than insured cotton farmers.

3.2 Factors Influencing the Risk Attitude of the Farmers

Five out of nine variables are statistically significant. Major occupation, constraints in getting credit facilities membership of association are statistically significant at 5 per cent level and family size, proportion of crop income to the total farm income are statistically significant at 10 per cent level for insured chilli farmers. In the case of non-insured chilli farmers. Family size is statistically significant at a 1 per cent level. Constraints in getting credit facility, membership of association are statistically significant at 5 per cent level and educational level, the proportion of crop income to the total farm income is statistically significant at 10 per cent level.

Table 1. Risk attitude of the sample farmers

Risk Type	Chilli		Cotton	
	Insured	Non-insured	Insured	Non-insured
Risk Preferer	5 (10)	2 (7.6)	15 (37.5)	10 (29.4)
Risk Neutral	23 (46)	16 (61.5)	19 (47.5)	11 (32.3)
Risk Averse	22 (44)	8 (30.76)	6 (15)	13 (38.3)
Total	50 (100)	26 (100)	40 (100)	34 (100)

(Note: numbers in parentheses indicate per cent of the total)

Table 2. Factors Influencing the risk attitude of the chilli sample farmers

	Variable	Insured chilli Farmers		Non-insured chilli farmers	
		Wilks Lambda	Significance	Wilks Lambda	Significance
1	Age (years)	0.938	0.222	0.840	0.135
2	Occupation (Farming=1, others=0)	0.846**	0.020	0.867	0.193
3	Education level (illiterate=0, primary=1, secondary=2, higher=3)	0.995	0.149	0.805*	0.083
4	Family size (No.)	0.888*	0.062	0.572***	0.002
5	The proportion of crop cultivated area to total farm area	0.930	0.183	0.890	0.263
6	Proportion of crop income to total farm income	0.902*	0.090	0.804*	0.081
7	Farming experience	0.943	0.253	0.851	0.156
8	Constraints in getting credit facility (yes=1, No=0)	0.883**	0.018	0.745**	0.034
9	Membership of association (Yes=1, No=0)	0.870**	0.049	0.722**	0.024

*(Note:- *** indicates one per cent significance; ** indicates five per cent significance; * indicates ten per cent significant)*

Table 3. Factors influencing the risk attitude of the cotton farmers

	Variable	Insured Cotton Farmers		Non-insured Cotton farmers	
		Wilks Lambda	Significance	Wilks Lambda	Significance
1	Age	0.875*	0.084	0.727***	0.008
2	Occupation (Farming=1, others=0)	0.849**	0.048	0.816**	0.047
3	Education level (illiterate=0, primary=1, secondary=2, higher=3)	0.945	0.352	0.797**	0.033
4	Family size (No.)	0.914	0.188	0.918	0.278
5	The proportion of crop cultivated area to total farm area	0.929	0.256	0.895	0.190
6	Proportion of crop income to total farm income	0.946	0.355	0.840	0.73
7	Farming experience	0.833**	0.034	0.842*	0.076
8	Constraints in getting credit facility (yes=1, No=0)	0.085*	0.052	0.894	0.186
9	Membership of association (Yes=1, No=0)	0.916	0.196	0.877	0.140

*(Note:- *** indicates one per cent significance; ** indicates five per cent significance; * indicates ten per cent significant)*

Four variables were found to be statistically significant at ten per cent, five per cent and one per cent level of probability, they were age, occupation, education, farming experience and proportionate of crop income to the farm income of insured cotton farmers. In the case of non-insured cotton farmers age, major occupation and education level and farming experience were statistically significant at 1 per cent, 5 per cent level and 10 per cent level.

4. CONCLUSION

Farmers' attitude towards risk is the most important aspect of farming for production, investment and adoption of different technologies and strategies of risk management. In agriculture, most of the farmers show a tendency towards risk aversion even though there is a chance of high profits. Farmers observe the risk of natural calamities, pests and diseases as probable risks which alter the farm income. Quantity of seeds, nitrogen, phosphorus, potassium, labour utilization and number of times irrigated for crops are factors taken into consideration for the estimation of the risk attitude of the insured and non-insured farmers of chilli and cotton.

The present study results showed that the majority of the farmers are risk neutral and insured farmers are mostly risk preferers compared to non-insured farmers (in comparison to risk preferers) in both chilli and cotton crops and non-insured farmers are mostly risk averse farmers. The discriminant analysis result indicated that occupation, constraints in getting credit facility, membership of the association, the proportion of crop income to the total farm income and family size of insured chilli farmers and family size, education level membership of the association, constraints in getting credit facility, the proportion of crop income to total farm income of non-insured chilli farmers are significant. Variables like age, occupation, farming experience, constraints in getting credit facility and age, occupation, education level, and farming experience of insured and non-insured cotton farmers were found to be significant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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