Risk management behaviour of dry farming households in Kurnool, Nandyal and Anantapur District of Andhra Pradesh

Abstract:

Dryland agriculture is vulnerable to a variety of threats, including climate change, shifting market prices, pest and disease infestations, and insufficient institutional support. The current study, "Economic Analysis of Risk and Resilience Among Dry Farming Households in Andhra Pradesh," looks into how farmers involved in dryland farming handle risks and build resilience. The investigation used the Risk Aversion Index to assess the extent of risk aversion among farmers of various farm sizes and socioeconomic categories. The results of this study show that most farmers have moderate to high levels of risk aversion, generally relying on traditional coping techniques and market information to mitigate vulnerabilities. Small and marginal farmers experience greater income gaps than their medium and large counterparts. The study underscores the need to strengthen farmers' adaptive capacities by enhancing their access to climate information, financial services, and market opportunities. These insights offer a strong foundation for policymakers and development agencies to implement targeted strategies that promote resilience and sustainable livelihoods in dryland farming systems.

Keywords:

Dry farming, Risk aversion, Risk management behaviour, Socio-economic factors, non-farm assets, Farm size, Climatic uncertainty, Income vulnerability, Regression analysis, Farmer resilience.

Introduction:

Risk is defined as a solution when all possible outcomes for a given management action are known, as well as the likelihood of each outcome. Risk is quantified using the probability

concept. All marketing interactions involve risk, which is the uncertainty of cost, loss, or harm. There is a risk of the produce being destroyed by fire, rats, or other elements, quality deterioration, market price drops, changes in tastes, habits, or fashion, and the commodity being placed in the incorrect location. Farm product production and consumption are separated by a significant time lag. **Resilience** addressing the underlying causes of crises while bolstering a system's capacity and assets to withstand risk, strains, and shocks is the essence of resilience. The capacity of families, communities, and countries to withstand shocks, bounce back, and modify their structures and ways of life in the face of long-term stressors, changes, and uncertainty. By assisting societies in managing risks and shocks more effectively, we can prevent crises from undermining or destroying our development efforts. Given the complexity and interdependence of many risks (such as conflict and violence, natural disasters, economic shocks, etc.) and stressors (such as urbanization and population aging), humanitarian organizations and governments must collaborate to address vulnerability. Examples include conservation farming, small-scale fertilizers and herbicides, integrated pest control, and different types of mixed cropping that facilitate more effective use and cycling of soil resources. These are conventional methods that utilize ecological concepts.

Methodology:

As risk aversion is majorly considered as predominant in deterring the farmers to seek higher income, the relationship of selected socio- economic characters were studied through multiple regression analysis. A linear regression coefficient model was fitted with risk aversion coefficient of the farmers as dependent variable, and number of dependents, size of the farm in hectares, value of non-farm assets, years of education and extension agency and mass media exposure were taken as independent variables.

The model specified is as follow:

$$\mathbf{RA = b_0 + b_1\ depnts + b_2\ f\ size + b_3\ nf\ asset + b_4\ edn + b_5\ expn + b_6\ extn\ media}$$

Where:

RA = Risk Aversion

Depnts = Number of dependents

f size = Size of the farm in hectares

nf assets = Value of non-farm assets in 000’ Rs

edn = Years of Education

expn= Experience

extn media = Contact with extension agency and Mass media exposure

Risk Aversion Index (RAI):

The Risk Aversion Index (RAI) is a tool often used in agricultural research to determine farmers' willingness to take or avoid risk. The Risk Aversion Index (RAI) was computed by averaging the proportionate scores for all statements concerning risk behaviour.

$$\mathbf{RAI} = \frac{\sum \textbf{Sum of Scores of respondents statement}}{\textbf{Number of statements}}$$

Where:

RAI = Risk Aversion Index

$\sum$ = Sum of scores of all respondents for all statements

n = Number of items/statements.

Categorization of Farmers Based on RAI

RAI values, farmers were categorized into three groups:

Low risk aversion: RAI < 0.33

Moderate risk aversion: 0.34 ≤ RAI ≤ 0.66

High risk aversion: RAI > 0.66

Results and Discussion:

Kurnool district:

The risk management behaviour of the farmers practicing dry farming was assessed based on the Risk aversion index developed by Uma Devi (2023). The major findings of the

study regarding risk aversion index in Tables. and socio-economic factors influencing risk aversion behaviour of farmers in Table 4.

Table.1. Risk Aversion Index for Kurnool district: (1 to 120)

S. No	Particulars	Percentage Scores
1	Will you choose a risky crop if the potential profits are higher	0.575
2	Will you market the produce during price fluctuations	0.583
3	How will you manage when climate change occurs	0.592
4	What percentage of the area will be covered under the crop	0.519
5	Will you use market information for the upcoming season	0.667
6	How will you handle any pest or disease outbreaks that occur	0.592
7	Will you maintain savings earlier to protect from unexpected financial hardships	0.642
8	Do you prefer loans from credit institutions or non-institutional sources	0.658
9	Will traditional farming practices influence the way you manage risk in dry farming	0.633
10	Are you ready to utilize innovative methods or modern farming practices to reduce risk	0.608
	Total	**6.07**

Risk Aversion Index: 6.07 /10 = 0.607. The Risk Aversion Index of 0.607 indicates a moderately high level of risk aversion among farmers in Kurnool district.

Regarding the risk aversion index of farmers practicing dry farming in Kurnool district is presented in Table 1. It could be observed from Table 1, that, was the first and foremost risk aversion behaviour followed by use of market information for the upcoming season (0.667), preferences of loans from credit institutions or non-institutional sources (0.658), maintaining savings earlier to protect from unexpected financial hardships (0.642), farmers perceived that traditional farming practices influences the way you manage risk in dry farming (0.633), utilizing innovative methods or modern farming practices to reduce risk (0.608), management of Agri field during climate change (0.592), handling pest or disease outbreak (0.592), marketing the produce during price fluctuations (0.583), selecting a risky crop if the potential profits are higher (0.575), and percentage of the area will be covered under the crop (0.519), were the other risk aversion behaviour practiced by farmers involved in dry farming.

Farmers exhibit risk-averse behavior to cope with agriculture's inherent uncertainties, such as extreme weather, pest outbreaks, and market price fluctuations, which threaten their livelihoods

and food security. Furthermore, adoption of traditional farming practices in the present situation increases its exposure towards insects that are resistant to pesticides, selling of produce during market price fluctuations in order to pay their debt, using previous market information to cultivate crops at present will lead to greater production and selling of produce at very low price than usual. In addition, uncertainties such as unpredictable weather, drought, floods, pest and disease outbreak, middlemen exploitation, lack of access to credit and resources and insufficient post-harvest infrastructure. The following figure represents risk aversion index for Kurnool District farmers.

Fig 1. Risk Aversion Index for Kurnool District

Fig:1 Depicts that the score ranging between 0.519 and 0.667, indicating moderate high-risk aversion. The highest score for use of market information for the upcoming season (0.667), indicates that farmers rely heavily on traditional knowledge. The lowest value was observed for area covered by crop (0.519), indicating caution in expanding cultivation. This visual clearly demonstrates areas where farmers are more or less risk-averse.

Nandyal district:

Regarding the risk aversion index of farmers practicing dry farming in Nandyal district is presented in Table 2. It could be observed from Table 2, that was the first and foremost risk aversion behaviour followed by farmers perceived that traditional farming practices influences

the way you manage risk in dry farming (0.658), use of market information for the upcoming season (0.650), preferences of loans from credit institutions or non-institutional sources (0.642), maintaining savings earlier to protect from unexpected financial hardships (0.600), handling pest or disease outbreak (0.592), management of Agri field during climate change (0.575), percentage of the area will be covered under the crop (0.575), utilizing innovative methods or modern farming practices to reduce risk (0.567), selecting a risky crop if the potential profits are higher (0.566), and marketing the produce during price fluctuations (0.545),were the other risk aversion behaviour practiced by farmers involved in dry farming.

Farmers exhibit risk-averse behavior to cope with agriculture's inherent uncertainties, such as extreme weather, pest outbreaks, and market price fluctuations, which threaten their livelihoods and food security. Furthermore, adoption of traditional farming practices in the present situation increases its exposure towards insects that are resistant to pesticides, selling of farm produce during market price fluctuations in order to pay their debt, using previous season market information to cultivate crops at present will leads to higher production at the same time selling of produce at lower price than usual. In addition, uncertainties such as unpredictable weather, drought, floods, pest and disease outbreak, middlemen exploitation, lack of access to credit and resources and insufficient post-harvest infrastructure. Table 2 represents risk aversion index for Nandyal District farmers.

Table 2. Risk Aversion Index for Nandyal district (121 - 240)

S. No.	Particulars	Percentage Scores
1	Will you choose a risky crop if the potential profits are higher	0.566
2	Will you market the produce during price fluctuations	0.545
3	How will you manage when climate change occurs	0.575
4	What percentage of the area will be covered under the crop	0.575
5	Will you use market information for the upcoming season	0.650
6	How will you handle any pest or disease outbreaks that occur	0.592
7	Will you maintain savings earlier to protect from unexpected financial hardships	0.600
8	Do you prefer loans from credit institutions or non-institutional sources	0.642
9	Will traditional farming practices influence the way you manage risk in dry farming	0.658
10	Are you ready to utilize innovative methods or modern farming practices to reduce risk	0.567
	Total	**5.970**

Risk Aversion Index: 5.97 /10 = 0.597. The Risk Aversion Index of 0.597 indicates a moderate level of risk aversion among farmers in Nandyal district.

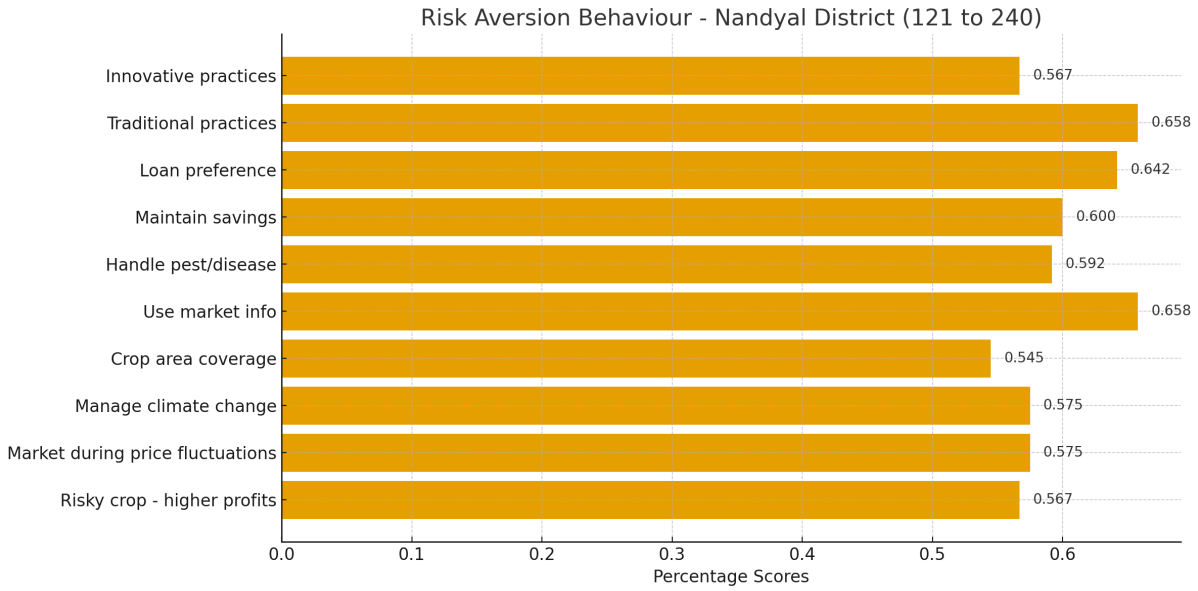

Fig. 2. Risk Aversion Index for Nandyal District

Fig:2 Depicts that the score ranging between 0.545 and 0.658, indicating moderate level of risk aversion. The highest score for traditional farming practices influences the way you manage risk in dry farming (0.658), indicates that farmers rely heavily on traditional knowledge. The lowest value is for marketing the produce during price fluctuations (0.545), indicating caution to maintain proper imbalances in price of produce. This visual clearly demonstrates areas where farmers are more or less risk-averse.

Anantapur district:

Regarding the risk aversion index of farmers practicing dry farming in Anantapur district is presented in Table 3. It could be observed from Table 3, that was the first and foremost risk aversion behaviour followed by farmers perceived that traditional farming practices influences the way to management of Agricultural field during climate change (0.790), marketing the farm

produce during price fluctuations (0.770), percentage of the area will be covered under the crop (0.770), manage risk in dry farming (0.750), selecting a risky crop if the potential profits are higher (0.710), use of market information for the upcoming season (0.700), handling pest or disease outbreak (0.690), preferences of loans from credit institutions or non-institutional sources (0.690), maintaining savings earlier to protect from unexpected financial hardships (0.680), utilizing innovative methods or modern/improved farming practices to reduce risk (0.680), and were the other risk aversion behaviour practiced by farmers involved in dry farming.

Farmers exhibit risk-averse behavior to cope with agriculture's inherent uncertainties, such as extreme weather, pest outbreaks, and market price fluctuations, which threaten their livelihoods and food security. Furthermore, adoption of traditional farming practices in the present situation increases its exposure towards insects that are resistant to pesticides, selling of produce during market price fluctuations in order to pay their debt, using previous market information to cultivate crops at present will lead to greater production and selling of produce at very low price than usual. In addition, uncertainties such as unpredictable weather, drought, floods, pest and disease outbreak, middlemen exploitation, lack of access to credit and resources and insufficient post-harvest infrastructure. Table 3 represents risk aversion index for Anantapur District farmers.

Table 3. Risk Aversion Index for Anantapur district (241-360)

S. No.	Particulars	Percentage Scores
1	Will you choose a risky crop if the potential profits are higher	0.710
2	Will you market the produce during price fluctuations	0.770
3	How will you manage when climate change occurs	0.790
4	What percentage of the area will be covered under the crop	0.770
5	Will you use market information for the upcoming season	0.700
6	How will you handle any pest or disease outbreaks that occur	0.690
7	Will you maintain savings earlier to protect from unexpected financial hardships	0.680
8	Do you prefer loans from credit institutions or non-institutional sources	0.690
9	Will traditional farming practices influence the way you manage risk in dry farming	0.750
10	Are you ready to utilize innovative methods or modern farming practices to reduce risk	0.680
	Total	**7.250**

Risk Aversion Index: 7.250 /10 = 0.725. The Risk Aversion Index of 0.725 indicates a high level of risk aversion among farmers in Anantapur district.

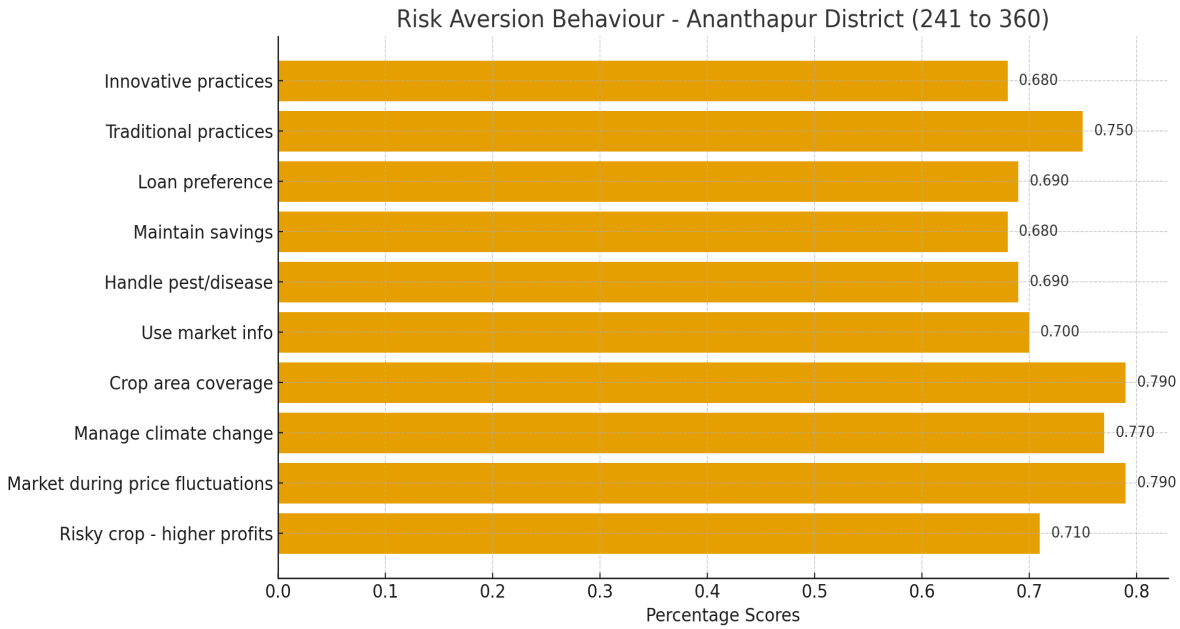

Fig 3. Risk Aversion Index for Anantapur District

Fig:3 Depicts that the score ranging between 0.680 and 0.790, indicating high level of risk aversion. The highest score for the way to management of Agricultural field during climate change (0.790), indicates that farmers rely heavily on weather conditions. The lowest value was observed for maintaining earlier savings to protect from unexpected financial hardships (0.680), utilizing innovative methods or modern farming practices to reduce risk (0.680), indicating caution in Government should provide best financial support to the formers and adopting new technologies for best forming practices. This visual clearly demonstrates areas where farmers are more or less risk-averse.

Socio-economic factors for Risk Aversion:

Table 4 represents the socio-economic factors that influence the farmer's risk aversion in dry land farming. The variable value of non-farm assets had positive and significant influence towards the risk aversion behaviour of farmers and it was significant at 5 percent level of significance. Similarly, size of farm had negative but significant influencing factors

over the risk aversion behaviour of the farmers at 5 percent level of significance. Whereas, the other variables such as number of dependents in the family, years of education, farming experience, extension agency and mass media exposure had non-significant influencing factors over the risk aversion behaviour of the farmers that practicing dry farming. These finding implies that, the coefficient of farm size reduced the risk aversion behaviour of farmers by 0.294 percent. While, the coefficient of value of non-farm assets increased the risk aversion behaviour of farmers by 0.331 percent. Eventually, it was observed that the coefficient of multiple determination (R^2) was 0.5644 implying the goodness of fit indicating that 56.44 percent of variation in farmers risk aversion behaviour occurs as a result of identified variables.

Farming is a risky enterprise due to unpredictable climatic conditions, the threat of pests and diseases, and volatile market prices, all of which can lead to significant financial losses. Small and marginal farmers often operate with limited resources, making them more vulnerable to shocks and less able to absorb potential losses. Availability of informal credit, agricultural insurance, and participation in farmer groups can affect how much risk a farmer is willing to take. Risk aversion can influence a farmer's willingness to adopt new technologies, potentially leading to reduced adoption of innovations that promise higher returns but also carry higher risks.

Table 4: Socio-economic factors influencing risk aversion behaviour of farmers practicing dry farming.

S. No.	Variables	Regression co-efficient	t-value	Probability
1	Intercept	12.720	17.72	0.104
2	No. of dependents in the family	0.042 ^{NS}	0.356	0.722
3	Size of farm (ha)	-0.294**	-2.011	0.045
4	Value of non-farm assets (‘000 rupees)	0.331**	2.266	0.024
5	Years of education	-0.036 ^{NS}	-0.565	0.572
6	Farming experience	0.125 ^{NS}	1.023	0.307

7	Extension agency and mass media exposure	-0.063 ^{NS}	-0.849	0.340
R square		0.5644		
Adjusted R square		0.6267		
No. of observations		360		

(- Significant at 5 percent level, ^{NS}- Not Significant)**

Conclusion:

Dryland farming in Andhra Pradesh is exposed to a combination of risks such as climate variability, pest and disease infestations, variable market pricing, and institutional constraints. The Risk Aversion Index reveals that farmers have moderate to high levels of risk aversion, relying primarily on traditional farming practices and market knowledge to handle uncertainty. The reliance on conventional approaches demonstrates a preference for familiar, low-risk strategies over the implementation of high-risk innovations. The socioeconomic factors show that non-farm assets have a positive and significant impact on risk aversion, meaning that farmers with greater assets are more cautious in their decision-making. On the contrary, farm size has a negative and substantial effect, implying that larger farms are better able to handle hazards due to increased resource availability. Other characteristics such as education, dependents, farming experience, and media exposure were not statistically significant. These findings show that small and marginal farmers are especially sensitive to climatic and economic shocks, highlighting the necessity of well-designed governmental support. Improving farmers' adaptive capacity through improved climate information services, access to formal credit, insurance coverage, and market linkages can be essential in increasing resilience. Encouraging the adoption of climate-smart technologies and capacity-building programmes can further reduce overreliance on traditional practices and promote better risk tolerance. In essence, developing a strong dryland farming system necessitates a comprehensive plan that includes financial empowerment, technological improvement, and institutional assistance, paving the way for long-term and resilient livelihoods in vulnerable agricultural regions.

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