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

Abstract:

Dryland agriculture is highly exposed to a range of risks, including climate variability, fluctuating market prices, pest and disease infestations, and inadequate institutional support. The present study, *"Economic Analysis of Risk and Resilience Among Dry Farming Households in Andhra Pradesh,"* investigates how farmers engaged in dryland cultivation manage risks and build resilience. The analysis utilizes the Risk Aversion Index to evaluate the extent of risk aversion among farmers of different farm sizes and socio-economic categories. Additionally, Gini ratio and Lorenz curve methods are applied to assess income inequality within the farming community. Results indicate that most farmers display moderate to high levels of risk aversion, often depending on traditional coping mechanisms and market information to reduce vulnerabilities. Income disparities are more significant among small and marginal farmers compared to 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:

Resilience for what (functions), resilience to what (difficulties), resilience of what (farms and farming systems), and resilience-enhancing factors (resilience attributes). Two classes of farmers with significantly high and weak resilience profiles will be defined based on three indicators for each farmer that indicate the perceived robustness, adaptability, and transformability of their farms. For the analysis, descriptive statistical methods will be employed. **1. Physical Risk:** This involves a reduction in the product's quantity and quality throughout the marketing phase. Yield variability can be caused by a variety of unpredictable circumstances, such as fire, floods, earthquakes, pests, illnesses, irresponsible handling, unscientific storage, and incorrect packaging. **2. Price or marketing risk:** Another source of risk is the fluctuation of output prices. Commodity prices fluctuate annually and can exhibit significant seasonal fluctuations within a single year. **3. Institutional risk:** Changes in government regulations, export and import policies, and budgetary policies that impact

agricultural standards result in institutional risk. **4. Financial risk:** Borrowing money to fund the operation of a farm business entails financial risk. If debt is not paid back within the allotted time, changes may occur in interest rates, the size of the financing, and the company's capacity to make money. **5. Technological risk:** The introduction of new technology is another cause of production risk. A few questions must be addressed before implementing new technologies. They are as follows: (a) Will the new technology function as anticipated? (b) Will it genuinely raise yields and lower costs?

Results and Discussion:

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 influence of socio-economic factors towards risk aversion behaviour of farmers in Table 1.

Table.1. Risk Aversion Index for Kurnool district

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

Regarding the risk aversion index of farmers practicing dry farming, it could be observed 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 Score range between 0.519 and 0.667, indicating moderate 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 is 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.

Table 2. Risk Aversion Index for Nandyal district

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

Regarding the risk aversion index of farmers practicing dry farming, it could be observed 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 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 Nandyal District farmers.

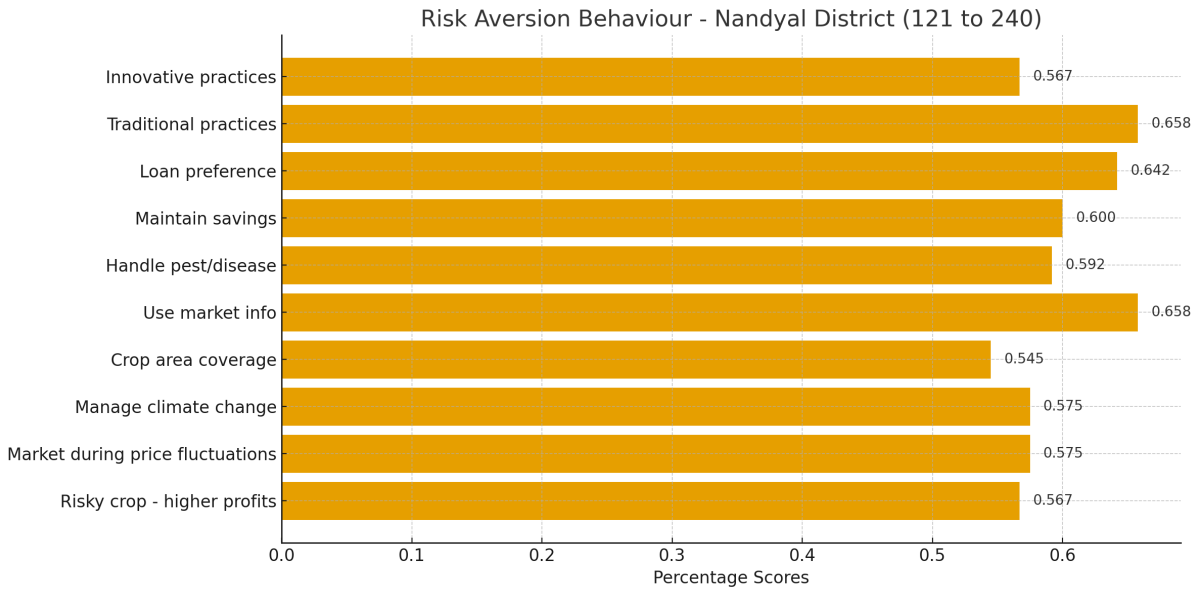

Fig. 2. Risk Aversion Index for Nandyal District

Fig:2 Depicts that Score range between 0.545 and 0.658, indicating moderate 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.

Table 3. Risk Aversion Index for Anantapur district

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.

Regarding the risk aversion index of farmers practicing dry farming, it could be observed that, was the first and foremost risk aversion behaviour followed by farmers perceived that traditional farming practices influences the way to management of Agri field during climate change (0.790), marketing the 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 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. The following figure represents risk aversion index for Anantapur District farmers.

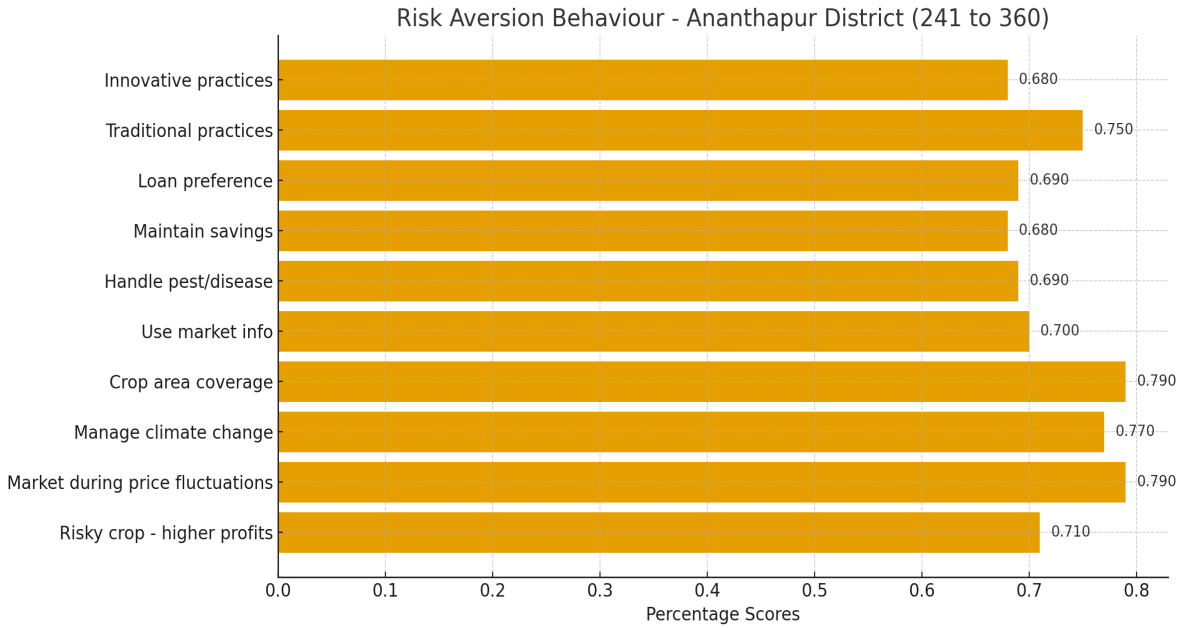

Fig 3. Risk Aversion Index for Anantapur District

Fig:3 Depicts that Score range between 0.680 and 0.790, indicating moderate risk aversion. The highest score for the way to management of Agri field during climate change (0.790), indicates that farmers rely heavily on weather conditions. The lowest value is for maintaining savings earlier 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.

Table 4. Influence of socio-economic factors on 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)**

The findings in Table 4 revealed that the variable value of non-farm assets had positive and significant influence towards the risk aversion behaviour of farmers at 5 percent level of significance. Similarly, size of farm had negative but significant influence over the risk aversion behaviour of the farmers at 5 percent level of significance. Whereas, the other variables such as no. of dependents in the family, years of education, farming experience, extension agency and mass media exposure had non-significant influence over the risk aversion behaviour of the farmers practicing dry farming. This 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 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.

Conclusion:

Dryland farming in Andhra Pradesh is exposed to a combination of risks such as climate variability, pest and disease infestations, volatile market prices, and institutional constraints. Risk Aversion Index, shows that farmers exhibit moderate to high levels of risk aversion, relying predominantly on traditional farming practices and market information to manage uncertainties. This dependence on conventional methods reflects a preference for familiar, low-risk strategies rather than adoption of high-risk innovations. The regression results indicate that non-farm assets have a positive and significant impact on risk aversion, implying that farmers with more assets tend to be more cautious in their decision-making. Conversely, farm size shows a negative and significant effect, suggesting that larger farms are better equipped to handle risks due to greater resource availability. Other variables, including education, number of dependents, farming experience, and media exposure, were not statistically significant. These results highlight that small and marginal farmers are particularly vulnerable to climatic and economic shocks, emphasizing the importance of well-designed policy support. Strengthening farmers' adaptive capacity through improved climate information services, access to formal credit, insurance coverage, and market linkages can play a critical role in enhancing resilience. Encouraging the adoption of climate-smart technologies and capacity-building programs can further reduce overdependence on traditional practices and build greater risk tolerance. In essence, building a robust dryland farming system demands a holistic strategy that integrates financial empowerment, technological advancement, and institutional support, paving the way for sustainable and resilient livelihoods in vulnerable agricultural regions.

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