

ASSESSMENT OF RISK IN DRYLAND AGRICULTURE - A STUDY OF ANANTAPUR DISTRICT IN ANDHRA PRADESH

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Indian agriculture achieved an impressive growth following the green revolution but instability in production too has increased. With the advent of green revolution in our country, dryland agriculture has been conscious of increasing production and productivity by exposing the farmers to new dryland technologies. However, an intriguing feature is that dry land agriculture is subjected to high instability in production year- to- year even after the green revolution period. It was observed that drought has an invisible hand in limiting the production and the productivity. More over transition from subsistence to commercialized agriculture has resulted in market induced risk on farm. The welfare implication of risk holds that wider changes in prices and income affect the investment and rational planning of family living expenses.

The problems of dry farming areas in India were brought into sharp focus after the onset of the 'green revolution' in the mid sixties. During the last thirty-five years green revolution has undergone two phases. The phase of increased growth-from mid sixties to late seventies followed by near constant or lower growth, from the early eighties to present. The new agricultural strategy, which has concentrated mostly on areas that were endowed with irrigation and other facilities, stepped up the growth, but the growth was not even in respect to regions or crops. The result was an accentuation of disparities especially between irrigated and dry farming regions.

The present study attempts in understanding the nature and magnitude of risk in agriculture, causes underlying them and likely measures to reduce it in Anantapur district of Andhra Pradesh. For this, time series data on yield.

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prices pertaining to period 1956-57 to 1998-99 were used and the crop yield was multiplied with corresponding prices to get the gross returns per hectare at farm prices.

Methodology

For time - series data, the deviation from trend constitute the risk. The coefficient of variation was used to measure the magnitude of risk in yield, prices and gross returns per hectare of selected crops (Geeta and Pal). Therefore, yield, prices and gross-returns adjusted for trend were taken for the measurement of risk. The crop yield was multiplied with corresponding prices to get gross-returns per hectare at farm harvest prices as it was assumed that year to year changes in gross-returns represent the variability or risk as prices of inputs and inputs used are known with certainty. The coefficient of variation was used to measure the magnitude of risk in yield, prices and gross-returns per hectare for all the crops.

$$\text{Coefficient of Variation} = \frac{[\sum (xX_t - 8_t)^2 / n]^{1/2} \times 100}{8_t}$$

Where X_t is the actual value in t^{th} year, 8_t is the trend value in the t^{th} year, X_t is the period mean of X and n is the number of years in the period.

Risk Equivalent Prices

Any deviation from trends constitute the risk for the policy makers. But it is the negative deviation which is of prime importance for the farmers. Therefore, any policy option directed towards protecting farmers against risk should take negative deviations into considerations. In this study, risk equivalent prices, which can be defined as an increase in output prices needed to compensate the shortfall in the gross returns per hectare, was calculated using expected negative deviation approach.

The probability of the actual gross returns per hectare falling 5 per cent or more below their respective trend values were also estimated as

$$\Pr(8 + e_t \sigma \geq 0.95 X) = \Pr(e_t / \sigma \geq -(0.5)8 / \sigma_e)$$

Where e_t is the deviation from the trend in the t^{th} year and s_e is the standard deviation of e_t . The average probability was obtained from the statistical table for the cumulative normal distribution.

Expected annual deviations = Average absolute deviations x Probability of short in yield fall in gross returns

where, average absolute deviation = $\Sigma(X_t - 8_t)/n$

$$\text{Risk equivalent price} = \frac{\text{Expected annual negative deviation}}{\text{Average yield of recent three years}}$$

Risk equivalent prices were computed by using farm harvest prices.

Results and Discussion

The magnitude of risk in the production of principal crops is presented in the Table –1 It shows that coefficient of variation of yield was markedly high in korra (54.57 %), redgram (51.81%) and jowar (30.11%). On contrary the it was fairly low in groundnut (29.46 %), bajra (29.16 %) and ragi (16.76 %).

Further the data in the Table –1 shows that the coefficient of variation of price was the highest for redgram (97.07 %) followed by groundnut (57.66 %) Korra (46.18%) bajra (43.91 %) jowar (38.84 %) and finally the ragi (30.80 %).

Table-1: Nature and Magnitude of risk in the production of major dryland crops (1956-57 to 1998-99)

Crop	Coefficient of Variation		
	Yield	Prices	Gross-returns
Jowar	30.11	38.84	73.57
Bajra	29.16	43.91	72.76
Ragi	16.76	30.80	54.65
Korra	54.57	46.18	85.20
Redgram	51.81	97.07	119.00
Groundnut	29.46	57.66	71.56

It can be further seen from Table-1, that the average gross returns per hectare at farm harvest prices were the highest for red gram (119.00 %) on contrary ragi has exhibited less variability (54.65 %) than other six crops i.e., groundnut (71.50 %) bajra (72.76 %), jowar (73.57 %) korra (85.20 %). Thus it can be inferred that redgram remained most risky crop followed by korra, bajra, jowar, groundnut and finally ragi.

To sum up, it can be inferred that year to year changes in crop yields and product prices were substantially large. As they were interrelated, income from the crops was highly unstable in nature. But this nature of risk differs with crops. The nature of risk due to gross returns was more than the yield and prices and risk due to price variation was more than yield except for the korra, which observed a high risk due to yield. Among the selected crops ragi exhibited least yield and price risk.

The first and major reason for much high levels of risk in yield was the area under irrigation. Except ragi all other crops were cultivated under dryland conditions or some times under less irrigated area. So it is highly difficult to adopt improved package of practices especially with regard to fertilizer and plant protection. These crops were grown under most adverse and diverse situation of soil, temperature and rain fall by the most resource poor farmers. Because of this low yield and high risk factor, modern technology, which includes improved seed, fertilizer and assured water was not reaching the farmers of dry land. So this absence of improved technology, and inputs compared to those available for the cereals and finally, the flow of technology from the laboratory to the farmers were the other main causes.

Secondly, the reason for the high price variability for course grains and millets except ragi was the demand. The demand for them as a food not increased in years. The production as well as consumption remained localized with low cost technology. The only advantage of these crops was their comparative advantage i.e., their adaptability to drier and low fertile conditions with low input. It was observed that the performance of the redgram despite favourable price environment was very poor. The high price alone, or price policy per se, cannot raise the production of the crops. Improvement of technology is

equally important as has been the case with rice. Better price environment coupled with improved technology can only improve production of these crops. However, unfavorable part about this group of crops is the absence of appropriate technology, which can fit into appropriate cropping and farming system.

Risk Equivalent Price

An examination of Table -2 reveals that risk equivalent prices were high for high return crops. Among the crops, risk equivalent price for redgram (Rs 300./ Qtl) was high, followed by groundnut (Rs 151.77 / Qtl), korra (Rs 134.43/ Qtl) bajra (Rs 91.46/ Qtl) jowar (Rs 90.63/ Qtl) and lowest by ragi (Rs 32.29/ Qtl). From this it can be inferred that the farm harvest prices of the above said crops should be in accordance with the risk equivalent prices and a correction was needed to minimise the risk.

Table-2 : Risk equivalent prices of major dryland crops

Crop	Risk Equivalent Prices (Rs/Qtl)
Jowar	90.63
Bajra	91.46
Ragi	32.29
Korra	134.43
Redgram	300.00
Groundnut	151.77

Conclusions

To sum up, it was shown that the year to year changes in crop yields and product prices were substantially large. They do not have mutually offsetting behaviour and hence, the income from these crops was highly unstable in nature. It was suggested that consideration of product prices would bring risk parity among the crops. This would also stimulate the growth in the production of risk crops, which servers as a barometer to gauge the technical development of a crop over period. It was also expected that an increase

in returns would enable the farmers to build their equity over time. Hence, long term solutions of production of dry land farming lies not in higher administrative prices but in net returns per hectare.

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