Management of risk in agriculture

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Abstract   The nature of risk and farmers adoption to risk arises on account of risk of loss of production and depressed price. In present study, to measure the risk and to develop risk minimizing crop production strategy for Akola district. The study is based on primary as well as secondary data. for the period 1980-81 to 2010-11. The study reveals that the growth rates of area, production and productivity of cereals decreased while, increased in total pulses and total oilseed. In all, highest annual negative deviation with probability of shortfall is observed in Soybean followed by Kh. Jowar. While minimum expected negative deviation is observed in cotton. Analysis of break-even yield suggests that with the present productivity and prices of Kh. Jowar, it is not economical The high growth rate and less variability in productivity is observed in Gram. The farmers should diversify their cropping pattern shift from existing mono-cropping to the inter-cropping system to reduce the yield risk.
Key words: Risk management, cropping pattern

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INTRODUCTION

Risk in agriculture, are associated with the process of production as well as the product of agriculture and its transfer to ultimate consumer. Naturally, the risks are faced by farmers as producer and all other stake holders who perform the functions of input production and supply and product-marketing and processing. Among all the Stake holders, the most vulnerable to these risk are farmers in general. Globalization and opening up of the agricultural economics by developing and least developed. The risk management in agriculture is a researchable domain. Indeed, to the best of our knowledge this is the first study of its kind in Vidarbha. The objectives of the study are To examine the growth and variability in different crops, to measure the risk in yield of different crops and to work out the Break even yield indifferent crops.

METHODOLOGY

The study is conducted in Akola district and based on primary as well as secondary data. A time-series data on area, production and yield pertaining to the period 1990-91 to 2010-11 has been used.
Analytical Techniques
The Growth and variability in different crops is measured by using exponential growth model and coefficient of variation.
Measurement of Risk in Yield

The study is restricted to measurement of yield risk, coefficient of variation is commonly used to quantify the risk. Different types of trend curves were fitted and one giving highest R2 is used for obtaining data adjusted trend and computation of risk. Different types of trend curves have been used to identify appropriate trend. Finally, sinusoidal curve is used to obtain the results. Besides coefficient of variation the risk in terms of probability of obtaining yields below 95 per cent of the trend value have been computed with the help of one of probability distribution i.e. Normal Distribution and Probability Distribution Function :

Break Even Point

To estimate the break even yield the following formula is used -
Break Even Point

$$(BEP) = \frac{F}{P - V}$$

Where F=Fixed cost in Rs/hect.,
P =Price per quantity
V =Variable Cost per quintle
The break even analysis will facilitate in computation of measures like margin of safety and percentage of margin of safety which helps in the decision making.

RESULTS AND DISCUSSION
Growth Rate and Coefficient of Variation in Area, Production and Productivity
The performance of different crops in Akola district is ascertained by studying the growth rates and coefficient of variation of area, and productivity for the period **1990-91 to 2010-11 is presented in table-2.**

Table 2: Growth Rate and Coefficient of Variation of Area and Productivity of Different Crops in Akola District

Sr. No.	Crop	Cofficient of Variation		Compound growth rate	
		Area	Productivity	Area	Productivity
1	Rice	50.17	39.19	- 8.26**	- 1.75
2	Wheat	32.50	24.19	- 3.29	1.99**
3	Kh. Jowar	21.20	29.69	- 3.01**	2.59**
4	Tur	26.89	25.12	3.78**	1.12
5	Gram	52.65	38.48	7.55**	3.22**
6	Groundnut	101.44	39.21	- 17.92**	3.48**
7	Safflower	57.58	44.27	- 2.12	- 1.17
8	Soybean	151.98	243.97	52.18**	39.54**
9	Cotton	7.74	46.21	- 0.49*	4.62**

Table-2 reveals that the growth rate of area under Rice, Wheat and Kh. Jowar are negative but significant by 8.26, 3.49 and 3.01 per cent respectively indicates that the area under these crops are decreasing over the years. The area under Tur and Gram shows positive and significant growth rate of 3.78 per cent and 7.55 per cent respectively. The growth rates of area under Soybean which has great importance in the present scenario showing highest growth rate of 52.18 per cent over the years. While the area under Groundnut decreased to tune of 17.92 per cent per annum. Cotton being the important cash crop of the district shows decreasing trend in area. The growth rates of area under Cotton is 0.49 per cent which is negative and significant. The highest C.V. is observed in Rice (50.17per cent) followed by Wheat (32.50 per cent) and Kh. Jawar (21.20 per cent). As regards to pulses, the highest C.V. is observed in case of Gram (52.65 per cent). While highest variation in area under Groundnut, Soybean and Sugarcane is observed in Akola district with a value of 101.44 and 151.98 per cent respectively. This indicates the inconsistence in the area allocation of these crops in cropping pattern.

Growth rates of Productivity
As seen from table-2 that rice and wheat productivity registered growth of 1.75 per cent and 1.99 per cent respectively.
The growth rate of productivity for Gram 3.22 per cent which are significant indicates that the productivity of Gram is increasing over the years. The growth rate of productivity of oilseed over the year is positive and significant. A coefficient of variation greater than 40 per cent is considered as high. The results of the C.V. of productivity in Akola

district shows that crop like Rice, Gram, Groundnut, Safflower, Soybean, Cotton and Sugarcane have crossed the limit and hence inconsistent in productivity

Growth Verses Instability in Yield

The annual growth rate of yield greater than 3 per cent and statistically significant is considered as high because the average growth of population of the country during 1991-2001 was more than 2 per cent per annum. A coefficient of variation less than 40 per cent is considered as consistent for agricultural data normally. So a C.V. greater than 40 per cent is considered as high. Considering growth rate and instability in yield, two way classifications of crops is done and presented in table-4.

Table 4: Two Way Classification of Growth Rates and Instability in Yield of Different Crops in Akola District

		Instability in Yield	
		Low	High
Significant Growth Rate of productivity.	Low	Rice, Wheat, Kh. Jowar, Gram	Soybean
	High		Groundnut, , Cotton,

Note: Cut off point

Growth rate > 3 % - High

Instability > 40% - High

Both Growth rate and instability in the yield are equally important in choosing the most suitable crop for any area. Table-4 shows the two way classification of growth rate and instability in yield. The ideal condition is one with high growth rate coupled with low level of instability in yield. This condition is observed in Gram only. There exist a number of situations where yield instability is relatively low and growth in yield is also low. Rice, Wheat, Kh. Jowar fall under this category. All these cases indicated the need for strategic approach to enhance the yield level without increasing the inter year yield instability. The other category of high growth rate and high inter year yield instability is found in Groundnut, and Cotton. The technological thrust for this category must aim to reduce the inter year fluctuation without hampering the high yield growth potential of these crops. The last category of crop is low growth rate and high inter year instability. Soybean falls under this category. These crops need an approach to enhance their yield levels and decrease the instability simultaneously. A mixed crop strategy for increasing the yield and reducing inter year yield instability must find adequate attention while devising crop production strategies in this ecologically vulnerable area of the Vidarbha.

Break-even Yield of Different Crops in Akola District

Break-even yield is defined as that yield which offsets cost of cultivation of a crop in a unit area. The details of break-even yield for different crops are given in table-5

Table 5: Breakeven Yield of Different Crop in Akola District

Sr. No.	Crop	Total fixed cost (Rs./ha)	Price per Unit	Average variable cost (Rs./ha)	Break-even yield (qnt.)	Actual Yield (qtl.)
1.	Kh. Jowar	1890	449	378	24.29	19.27
2.	Tur	3469	1423	867	5.36	11.59
3.	Gram	1826	1536	887	3.12	4.69
4.	Soybean	2389	1101	816	6.99	11.23
5	Cotton	3196	2223	1296	3.29	7.39

Table-5 reveals that the break-even yield varied from 5.36 q/ha to 24.29 q/ha in different crops grown in the district. In most of the crops actual yield is found to be higher than the corresponding break-even yield except Kh. Jowar. In Kharif Jowar actual yield is 19.27 qtls less than break even yield. As such with the present productivity and prices of Kh. Jowar it is not economical to include Kh. Jowar in cropping pattern.

Measurement of Risk in Yield

The estimated probabilities of shortfall in realised yields and resulting expected negative deviations are presented in table-6.

Table 6: Probabilities of Shortfall and Expected Negative Deviations in Different Crops

Sr. No.	Crops	Av. Yield (Kg/ha)	Probability of Shortfall	Expected Negative Deviations (Kg/ha)
1.	Kh. Jowar	1407	0.69	117.68
2.	Tur	899	0.43	63.69
3.	Gram	519	0.68	89.16
4.	Soybean	1496	0.78	164.21
5.	Cotton (Lint)	135	0.72	19.77

The probability of shortfall is found to be highest in Soybean to the extent of 0.78 and in remaining crops it varied between 0.43 to 0.72 . In all, highest annual negative deviation to the extent of 164.21 kg/ha with probability of shortfall is observed in soybean followed by Kh. Jowar (117.68kg/ha). While minimum expected negative deviation is observed in cotton production (19.77kg/ha).

Risk Associated with Different Crops

Net return for various crops grown in is presented in table-7. The average net return is found to be highest for Tur (Rs.8865.50) followed by sunflower (Rs.8050.63). While the average net return per hectare for Safflower and Cotton are Rs.6348.48 and Rs.5157.92, respectively. The crops which producing net returns below cut-off points are Kh.Jowar, Mung, Udid, Groundnut, Wheat and Gram, respectively. The low C.V. (less than cut-off point) is observed in crops like Cotton (Deshi) and Kh. Jowar. (Beal, 1996)

Table 7a: Average Net Return and Coefficient of Variation of Net Return of Different Crops (1995-96 to 2010-11)

Sr. No.	Particulars	Crop					
		Cotton (Hy.)	Cotton (local)	Kh. Jowar	Tur	Mung	Udid
1	Average Net Return (Rs.)	5245.39	4728.52	3973.73	8865.50	2064.37	2927.92
2	Coefficient of Variation (%)	53.39	31.49	30.34	40.89	65.51	57.66

Cut-off Point

Net return > Rs.4000/ ha. – high

Risk (C.V.) > 40% - high

CONCLUSIONS

- The growth rate of area, and productivity of total pulses and total oilseeds increased substantially over the entire study period.
- In all, highest annual negative deviation with probability of shortfall is observed in Soybean followed by Kh. Jowar. While minimum expected negative deviation is observed in Cotton.
- Analysis of break-even yield suggest that with the present productivity and prices of Kh. Jowar, it is not economical to include Jowar in the cropping pattern.
- The study concludes that the farmers should diversify their cropping pattern/shift from existing mono-cropping to the inter-cropping system to reduce the yield /income risk.

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