

Original Research Article

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Risk Analysis in Sugarcane Production: Evidences from Uttar Pradesh and Maharashtra States of India

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ABSTRACT

Agriculture is an intrinsically risk industry. Sugarcane crop is grown as a important cash crop in all over the world and facing several risks in production and marketing. Present study focuses on the measurement of farm risk i.e. area, production, productivity and price for sugarcane production in Uttar Pradesh and Maharashtra. Coefficients of variation (CV) are used to analyze the production risk for both states. Result revealed that coefficients of variation by standard deviation (SD) of area in Uttar Pradesh were 4.92 per cent and in Maharashtra 32.82 per cent. Production risk was lower in Uttar Pradesh (7.85 %) as compared to Maharashtra (36.89 %). Productivity risk in Uttar Pradesh and Maharashtra were 4.49 and 10.04 per cent respectively. Price risk showed high in both state Uttar Pradesh and Maharashtra with 45.59 and 49.55 per cent respectively. Therefore, it can be concluded that risk associated with area, production, productivity and price risk in Uttar Pradesh was lower as compared to Maharashtra.

Keywords

Area, Production,
Yield, Sugarcane,
Price risk.

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Introduction

Sugarcane crop is important cash crop of India and it's grown on area of more than one million hectares. The sugarcane crop is beset with many problems one abysmally low productivity leading to yearly fluctuation in production, and secondly monopolistic exploitation of sugarcane growers by the powerful sugar syndicate. Variability of crop revenues is a primary source of business risk for a farm, comprised of fluctuating components, the most important of which are area, production, productivity and prices. The risks in these components arise from different sources: productivity is dependent on weather

and other external factors, and market prices are affected by supply and demand in world markets. Productivity risk varies regionally and depends on soil type, climate, the use of irrigation, etc. In contrast, price risk for a given crop depends on such factors as stock levels, supply and export demand. Risk and uncertainty are inescapable factors in agriculture. The uncertainties of weather, yields, prices, government policies, global markets, and other factors can cause wide swings in agricultural income. Price or market risk refers to uncertainty about the prices producers will receive for commodities or the

prices they must pay for inputs. The nature of price risk varies significantly from commodity to commodity.

The market risks result from fluctuations in the prices of inputs and outputs, outside competition, changing supply and demand, market imperfections, changing consumer preferences, etc. Sale of farm produce under distress may take place due to lack of post-harvest processing and lack of infrastructure storage facilities.

Weather is an important production factor in agriculture that can hardly be controlled; for example, drought or excess rain can cause poor harvests. Hence, weather risks are a major source of uncertainty in agriculture, exerting the most obvious impact on crop yields. The problem of farm income instability, affected by different sources of risks, has been raised in different contexts, such as in policy documents, scientific and applied studies. Productivity and commodity prices are important factors that determine farmers' income.

Productivity depends on natural conditions, such as climate, rainfall, soils, etc., which vary regionally. Prices are (often assumed to be) the same for all farms, however prices vary both within a single year, and across the years. This paper is mainly confined to analyze production risks viz. area, production, productivity and price risk for sugarcane production in Uttar Pradesh and Maharashtra.

Materials and Methods

The present study focuses on the measurement of farm (area, production, productivity and price) risks in sugarcane production in Uttar Pradesh and Maharashtra. For the analysis, time series (yearly) data on area, production, productivity and prices pertaining to period 2000-01 to 2014-15. The data was obtained from the database of

Department of Agricultural Cooperation and Farmers Welfare, Government of India, Directorate of Economics and Statistics in Uttar Pradesh, Sugar commissionerate, Maharashtra state, Pune. In order to analyze the farm risks descriptive statistics and coefficients of variation (CV) by range, standard deviation and mean deviation was calculated by following formula:

$$\text{Range} = X_1 - X_2$$

Where,

X_1 = minimum value

X_2 = maximum value

$$\text{Standard deviation (SD)} = \sqrt{\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2}$$

$$\text{Mean deviation (MD)} = \frac{1}{n} \sum_{i=1}^n |X_i - \bar{X}|$$

Where, X_i is the value of i^{th} individual \bar{X} is the mean value, $i = 1, 2, 3, \dots, n$ (n is the number of observation)

$$\text{Coefficient of variation by range} = \frac{\text{range}}{\bar{X}} \times 100$$

$$\text{Coefficient of variation by range SD} = \frac{SD}{\bar{X}} \times 100$$

$$\text{Coefficient of variation by range MD} = \frac{MD}{\bar{X}} \times 100$$

Results and Discussion

The main threats' facing the farmer was area, production, yield and price risks (Kimura *et al.*, 2010). Sugarcane cultivation area in Uttar Pradesh is higher than Maharashtra as depicted in table 1. Average cultivation area of sugarcane in Uttar Pradesh and

Maharashtra were 2113.63 and 772.33 thousand hectare respectively for the period 2000-01 to 2014-15. Area in Uttar Pradesh had lower deviation as compared to area in Maharashtra.

Similarly all the deviation of area in Uttar Pradesh was lower than Maharashtra. Result revealed that Coefficient of variation by SD of area in Uttar Pradesh was 4.92 per cent and in Maharashtra was 32.82 per cent. From the result it can be say that risk associated with area of sugarcane in Uttar Pradesh is significantly lower than Maharashtra.

It is evident from table 2 that the sugarcane production in Uttar Pradesh is higher than Maharashtra. Average production of sugarcane in Uttar Pradesh and Maharashtra were 122780.1 and 60747.05 thousand tonnes respectively for the period 2000-01 to 2014-15. Similar result showed in case of production also with lower deviation in Uttar Pradesh has compared to Maharashtra. There was highly difference in all coefficient of

variation between Uttar Pradesh and Maharashtra. From the table production coefficient of variation by SD in Uttar Pradesh and Maharashtra are 7.85 and 36.89 per cent respectively. From the result it can be calculated that there is high risk in sugarcane production in Maharashtra.

Table 3 indicates that the sugarcane productivity in Maharashtra is higher than Uttar Pradesh. Average yield of sugarcane in Maharashtra and Uttar Pradesh are 772.48 and 580.43 quintal per hector respectively from 2000-01 to 2014-15. In case of productivity similar result were obtained as area and production. In Uttar Pradesh there was less productivity deviation as compared to Maharashtra. Result revealed that productivity coefficient of Variation in Uttar Pradesh was slightly lower than Maharashtra. Productivity coefficient of variation by SD in Uttar Pradesh and Maharashtra were 4.49 and 10.04 per cent respectively. From the result inference can be drawn that risk associated with productivity is low for both the states.

Table.1 Area variation of sugarcane in Uttar Pradesh and Maharashtra from 2000-01 to 2014- 15

Particulars	Area in Uttar Pradesh (000 ha)	Area in Maharashtra (000 ha)
Maximum	2246.5	1093
Minimum	1938.4	324
Mean	2113.63	772.33
Range	308.1	769
Standard deviation (SD)	104.17	253.55
Mean deviation (MD)	88.34	218.75
Number of observations	15	15
Coefficient of Variation by range (%)	14.57	99.56
Coefficient of Variation by SD (%)	4.92	32.82
Coefficient of Variation by MD (%)	4.17	28.32

Table.2 Production variation of sugarcane in Uttar Pradesh and Maharashtra from 2000-01 to 2014-15

Particulars	Production in Uttar Pradesh (000 Tonnes)	Production in Maharashtra (000 Tonnes)
Maximum	138481	88437
Minimum	106067.5	20475
Mean	122780.1	60747.05
Range	32413.5	67962
Standard deviation (SD)	9641.93	22413.79
Mean deviation (MD)	7872.08	18964.74
Number of observations	15	15
Coefficient of Variation by range (%)	26.39	111.87
Coefficient of Variation by SD (%)	7.85	36.89
Coefficient of Variation by MD (%)	6.41	31.21

Table.3 Yield variation of sugarcane in Uttar Pradesh and Maharashtra from 2000-01 to 2014-15

Particulars	Productivity in Uttar Pradesh (Q/Ha)	Productivity in Maharashtra (Q/Ha)
Maximum	621.55	848.66
Minimum	523.26	579.41
Mean	580.43	772.48
Range	98.29	269.25
Standard deviation (SD)	26.07	77.61
Mean deviation (MD)	20.69	54.92
Number of observations	15	15
Coefficient of Variation range (%)	16.93	34.85
Coefficient of Variation by SD (%)	4.49	10.04
Coefficient of Variation by MD (%)	3.56	7.10

Table.4 Price variation of sugarcane in Uttar Pradesh and Maharashtra from 2000-01 to 2014-15

Particulars	Sugarcane Price in Uttar Pradesh (Rs./Q)	Sugarcane Price in Maharashtra (Rs./Q)
Maximum	280	232
Minimum	90	59.5
Mean	162.46	112
Range	190	172.5
Standard deviation (SD)	74.07	55.71
Mean deviation (MD)	63.36	46.84
Number of observations	15	15
Coefficient of Variation by range (%)	116.94	153.41
Coefficient of Variation by SD (%)	45.59	49.55
Coefficient of Variation by MD (%)	38.99	41.66

Over the year average price of sugarcane in Uttar Pradesh is higher than Maharashtra as depicted in table 4. Average price of sugarcane for the period 2000-01 to 2014-15 in Uttar Pradesh and Maharashtra were 162.46 and 112 Rs/Q respectively. There was little deviation in price for both the states. Similarly, coefficient of variation in Uttar Pradesh was slightly lower than Maharashtra. Price coefficient of variation by SD is recorded high for both Uttar Pradesh and Maharashtra with 45.59 and 49.55 percent respectively.

Therefore, it can be calculated that risk associated with price is high for both states. Price risk is the risk of price decrease or increase after a production modification has been made.

Sugarcane is an important cash crop in India and grown in all season at different region of the country. Sugarcane production is affected by internal and external factors. Risks associated with sugarcane production are mainly area, production, productivity and price risk. Risk associated with area of sugarcane production in Uttar Pradesh (4.92 %) was lower than Maharashtra (32.82%). In case of production Uttar Pradesh (7.85 %) state showed lower risk as compared to Maharashtra (36.89 %).

Similarly, Productivity risk was found lower in Uttar Pradesh (4.94 %) than Maharashtra (10.04 %). Price risk was more in both states Uttar Pradesh and Maharashtra with 45.59 and 49.55 per cent respectively.

Therefore, It is suggested that farmer of Uttar Pradesh may be benefited by mitigating price risk. It is recommended that State Govt. should take necessary measures to mitigate price risk in both states, which will ultimately take care of area and production stability, because productivity risk is on minimum side.

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