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VARIABILITY OF YIELDS, PRICES AND INCOME FOR SELECTED CROPS IN VARANASI DISTRICT (UTTAR PRADESH)

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Annual variations in crop yields, prices and income caused by the fluctuations in weather conditions bring about uncertainties in the expectations of the farmers. A part of this variation which can be measured in a quantitative manner through probability estimates may be termed as 'Risk', while that part for which parameters of probability distribution cannot be established in an empirical manner, may be termed as 'Uncertainty'.² Risk generally arises due to factors like technological advances, inflation and price cycle, etc., which are generally recognised by the farmers, while uncertainty is caused by unpredictable weather conditions.

Indian agriculture which may be rightly described as a gamble in the monsoon is almost at the mercy of the hazards of nature and as such problems of fluctuations in the agricultural yields, prices and income affect adversely the prosperity of the enterprise. The long time lag between the inputs and outputs which is a special feature of agricultural industry aggravates the problem further. The same is true of agriculture in the Varanasi district.

Since a wide variety of crops are grown in the Varanasi district, the farmers are required to make a choice out of the available alternatives. But the two eventualities mentioned above namely, risk and uncertainty prevent the farmers from making efficient managerial decisions. In the selection of the crops to be grown, the attitude of the individual farmer toward risk or uncertainty associated with different crops plays an important role. Their attitude, in turn, is generally based on the past experience which itself may be founded on a biased sample of uncommon years. Such an unusual experience may obscure the events which are likely to take place during the more common years and which may prove to be equally important for wise planning. As such the farmers need some objective measures of these year to year variations based on past records which may serve as a guide in decision making. With this end in view an attempt has been made in this paper to measure the variability of yields, prices and income for 14 selected crops in the Varanasi district.

The study is based on the data obtained for a period of 12 years (1950-51 to 1961-62) for 14 selected crops in the Varanasi district. The utility of the study may be justified by the assumption, pointed out by Carter and his associates

1. The author appreciates the help rendered by Shri M. M. Bhalerao and Shri P. P. Singh, Lecturer and Research Scholar, respectively, in Agricultural Economics, in the preparation of this manuscript.

2. E. O. Heady : *Economics of Agricultural Production and Resource Use*, Prentice Hall, 1961, pp. 440-443.

3. H. O. Carter, G. W. Dean and A. D. Reed : *Risk and Diversification for California Crops*, California Experiment Station, Extension Service Circular No. 503.

that certain measures of variability of crop yields, prices and income can be established and that future variability of a particular crop is closely related to past variability. And as such the objective measure so computed can serve as a guide in making better or more profitable choice from among the alternative crops grown.

Sources of Data

The data obtained for the study is mostly from the secondary sources, as no such primary data is available over a period of time. The yield data has been obtained from the office of the Chief Statistician, Department of Agriculture, U.P. The price data obtained from the Monthly Bulletin of Statistics, U.P., has been supplemented by the data obtained from the office of the Senior Marketing Inspector, Varanasi and from the records of the Banaras Hindu University Agriculture Farm. The gross income figures, for the various years, are the product of average yields per acre and average prices per maund of the respective crops.

Limitations of the Study

The first limitation of the study is that the twelve-year period is not long enough to make estimates with high reliability. Secondly, the use of district average yields tend to under-estimate the variation for any particular farm or field within the district. It would have been more desirable to use the data for individual farms over a long period in order to have better estimates of the yield fluctuations. But such data for individual farms are not available, except for a few commercial farms where irrigation is secured and technological developments are taking place at a faster rate. Hence, the data available from them cannot be accepted as representative of the small holdings generally found in the district. Another limitation of the study is that the price data for the entire period for all the crops could not be obtained from one and the same source. This may bring about some inconsistency in the results. The whole study, therefore, is to be viewed with these limitations in sight.

Measurement of Variability

The variability index has been used as a measure of variation in the study. It refers to year to year variations in crop yields, prices and income as per cent of the current level (average for the last 5 years) of these items. The figures obtained in fraction have been rounded off to represent the whole number.

Yield Variability

The available yield data for the last 12 years does not reveal any definite trends. This fact indicates that no significant technological change has taken place in the agriculture of Varanasi since 1950-51. Therefore, it has been assumed in the study that year to year variations in the available yield data are of random order and can be attributed to fluctuating weather conditions.

The average yield per acre and variability index for the 14 selected crops in Varanasi are given in Table I. The crops have been ranked on the basis of variability indices.

TABLE I—YIELD VARIABILITY INDICES FOR 14 SELECTED CROPS IN VARANASI DISTRICT

S. No.	Crop	Average yield in maunds per acre from 1950-51 to 1961-62	Variability index
1.	Sugarcane (<i>Gur</i>)	28.71	9
2.	Wheat	7.96	13
3.	Gram	6.87	13
4.	<i>Moong</i>	3.78	13
5.	Barley	9.87	14
6.	<i>Arhar</i>	10.66	17
7.	Peas	9.62	21
8.	Paddy	6.64	25
9.	Potato	70.86	27
10.	Bajra	9.97	28
11.	Linseed	3.42	37
12.	Jowar	6.37	40
13.	Mustard	4.89	43
14.	Maize	8.17	48

The above table reveals that the yield variability varies considerably from crop to crop. In general the variability of *rabi* crops is lower than that of *kharif* crops. This conforms closely with established fact that the *kharif* crops are more open to hazards of weather conditions, as compared to *rabi* crops.

Price Variability

Another important factor that may influence the selection of crops is price. However, the influence of prices may not be so dominant under existing Indian conditions where marketable surplus, except for cash crops, forms a very small proportion of the total produce. But with the increasing commercialised nature of Indian agriculture the producers would be seriously handicapped in the absence of such an information. To provide such an estimate the average price in rupees per maund and variability index for 14 selected crops in the district are given in Table II.

TABLE II—PRICES VARIABILITY INDEX FOR 14 SELECTED CROPS IN VARANASI DISTRICT

S. No.	Crop	Average price in Rs. per maund from 1950-51 to 1961-62	Variability index
1.	Peas	11.72	8
2.	Wheat	15.79	8
3.	Maize	11.80	9
4.	Gram	14.34	10
5.	Barley	10.99	13
6.	<i>Moong</i>	15.50	14
7.	Bajra	11.92	14
8.	Linseed	21.87	14
9.	Jowar	11.00	14
10.	Mustard	23.53	15
11.	<i>Arhar</i>	13.64	15
12.	Paddy	9.90	16
13.	Potato	6.15	18
14.	Sugarcane (<i>Gur</i>)	14.21	18

It is evident from Table II that the price variability, in general, is comparatively lower than yield variability.

Gross Income Variability

Gross income refers to the total returns and has been computed as the product of average yield per acre \times average price per maund over the period of study. It would have been more appropriate to compute the variability of net income (gross income *minus* cost) from the farmers' viewpoint. But this could not be done due to the non-availability of data on costs for the period of study. However, as the variation in net income is closely related to variation in gross income due to slow and gradual change in the cost, this should not prove to be a serious limitation of the study.

The income variability index exerts an almost direct influence on the farmer's decision and as unstable income is the major headache of Indian rural economy, diversified farming is very often recommended to reduce the variability of incomes. But the choice and combination of crops in the crop diversification plan would be best obtained only when the farmers have knowledge of income variability figures for different competing crops.

Table III gives the average gross income per acre and gross income variability index for 14 selected crops in the district.

TABLE III—GROSS INCOME VARIABILITY INDICES FOR 14 SELECTED CROPS IN VARANASI DISTRICT

S. No.	Crop	Average gross income in Rs. per acre from 1950-51 to 1961-62	Variability index
1.	Sugarcane (<i>Gur</i>)	405.80	11
2.	Peas	113.03	15
3.	Wheat	125.94	18
4.	Bajra	118.74	18
5.	Gram	99.33	19
6.	<i>Moong</i>	58.05	19
7.	Barley	109.00	23
8.	Potato	428.47	23
9.	<i>Arhar</i>	141.45	23
10.	Paddy	67.13	30
11.	Jowar	71.66	35
12.	Maize	93.81	36
13.	Linseed	71.69	40
14.	Mustard	112.52	52

It is observed from Table III that the gross income variability, like yield variability, for *rabi* crops, in general, is lower than that of *kharif* crops. This indicates that the gross income variability is closely related to yield variability and the price variability exerts little influence on the expectations of the farmers in the Varanasi district.

Based on these variability indices for yields, prices and income, the farmers may choose the crops keeping in view their individual goals and the capacity to bear risk.

EFFECTS OF WEATHER UNCERTAINTY ON THE YIELD OF PADDY AND MANAGEMENT DECISIONS

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Variations in crop yields result mainly from two factors, *viz.*, those which are considered as controllable and those which are considered as uncontrollable. Among controllable factors can be included such things as seeds, fertilizer, and labour. Chief among uncontrollable factors is weather. Weather is a limiting factor in determining crop yield, particularly in India where nearly four-fifth of the cropped area depends on monsoon. Weather factor is important even in other countries where weather proofing devices have been evolved through the development of technology and extensive irrigation systems.

The term weather includes rainfall, temperature, humidity and other factors. The amount and distribution of rainfall, temperature and extent of humidity are highly variable. Under a given situation of soil, crop and climate complexes, rainfall is an important factor which affects the yield of a crop. The effects of rainfall may be direct or indirect. The direct effect is through precipitation and the indirect effect is through supplementing it by artificial irrigation. In this paper attempts have been made to assess both direct and indirect effects of rainfall on the yield of paddy grown under tank command in the Bangalore district.

Brief Description of the Area and Method of Paddy Cultivation

Bangalore district lies in the dry zone of Mysore State where water is the main limiting factor in the production of crops. Though the district receives the benefits of Ante-monsoon, South-east and North-west, monsoon rains and the annual precipitation is about 30", the rainfall is typically characterised as uneven, uncertain and inadequate and the district more often has to face the weather hazards.