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SPATIAL AND TEMPORAL VARIATIONS IN AGRICULTURAL PRODUCTIVITY IN MYSORE STATE

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Agricultural productivity varies from region to region. Reasons for such a variation may be numerous. The determination of variations in agricultural productivity and their probable causes will make it possible to demarcate the areas of high and low agricultural productivity and intensify our efforts to increase it in areas of low productivity.

AGRICULTURAL PRODUCTIVITY

The definition of the term "agricultural productivity" engaged the attention of many an economist at the 23rd Annual Conference of the Indian Society of Agricultural Economics. Some suggested that the yields per acre should be considered to indicate agricultural productivity. This definition was found to be defective as it considered only land which is just one factor of production while other factors are also responsible for the same. Another suggestion was to consider the returns per unit of the scarce resource to represent agricultural productivity. It was further argued that the average returns per unit of the scarce resource does not depict the true picture and instead, the marginal returns per unit of the scarce resource should be considered. This definition, though more meaningful than others, gives rise to lot of practical difficulties. After a thorough discussion it was generally agreed that yields per acre may be considered to represent the agricultural productivity in a particular region and that the other factors of production be considered as possible causes for their variations in different regions.¹ Hence, for the purpose of this paper, yields per acre are taken to represent the agricultural productivity.

For spatial and temporal comparisons in agricultural productivity, measures to determine the agricultural productivity of each region or for each year have to be developed. Experience indicates that the yields per acre in a region may be high for some crops and low for others compared to those in other regions. Also, even in the same region, some crops may be more important than others. Hence, a composite index taking into consideration the yields per acre of different crops and their relative importance in the region under study has to be developed. Crop yield index is one such measure which can be used for determining agricultural productivity and making spatial and temporal comparisons.

Objectives

The objectives of this paper are three-fold : (1) To work out crop yield indices in a given year for all the districts in Mysore State and make spatial comparisons; (2) to work out the crop yield indices for Mysore State for some years and make temporal comparisons; (3) to measure overall changes in productivity over time.

1. For a thorough discussion on this issue, refer the Summary of Group Discussion on the topic "Regional Variations in Agricultural Development and Productivity," *Indian Journal of Agricultural Economics*, Vol. XIX, No. 1, January-March, 1964, pp. 263-266.

Collection of Data

The data are collected from secondary sources. The data for each district regarding the area under different crops and their production are obtained from the "Mysore State in Maps."² Yield per acre for different crops are worked out by dividing the total production of a particular crop by the area under it. The following crops have been considered for working out the crop yield indices for making spatial comparisons. All the figures pertain to the year 1956-57.

- | | |
|-----------------|-----------------|
| (1) Jowar | (6) Bengal gram |
| (2) Rice | (7) Sugarcane |
| (3) <i>Ragi</i> | (8) Groundnut |
| (4) Bajra | (9) Castor |
| (5) <i>Tur</i> | (10) Cotton |

For measuring the temporal variations, the area under each crop and its production in different years in Mysore State from 1955-56 up to 1960-61 are obtained from the "Statistical Outline of Mysore."³ The per acre yields are calculated by dividing the total production of the crop in the State by the respective area under it during the year. The area under each crop in a particular year is considered as its weight which represents its importance. The following crops are included in computing the crop yield indices for making temporal comparisons.

- | | |
|-----------------|---------------|
| (1) Rice | (5) Gram |
| (2) <i>Ragi</i> | (6) Groundnut |
| (3) Jowar | (7) Sugarcane |
| (4) Wheat | (8) Cotton |

CROP YIELD INDICES

"A crop yield index number expresses the average of the yields of various crops on a farm or in a locality relative to the yields of the same crops on another farm or in a second locality."⁴ They are also used to make year to year comparisons by relating the yields in a given year to the yields of the same crops in the base year. These indices indicate how the yields of several crops vary on the average between farms, geographical areas or years.

Two things are important in calculating the crop yield indices. The first is the yield per acre of different crops. The second is the weight assigned to each crop which represents its importance. In calculating crop yield indices for different areas, the area under each crop or its percentage to the total cropped area of that locality may be considered as a weight, which represents its importance in that area.

2. *Mysore State in Maps*, Department of Statistics, Government of Mysore, Bangalore, 1958, pp. 17-25.

3. *Statistical Outline of Mysore*, Department of Statistics, Government of Mysore, Bangalore, 1963, pp. 68-71. The figures for the years 1958-59 to 1960-61 are subject to revision.

4. H. G. Hirsch, "Crop Yield Index," *Journal of Farm Economics*, Vol. XXV, No. 3, August, 1943, p. 583.

The crop yield indices can be calculated by the following formula:⁵

$$\text{Crop Yield Index} = \frac{\sum_{i=1}^n \frac{Y_i}{Y_{i0}} \cdot A_i}{\sum_{i=1}^n A_i}$$

Where

$i = 1, 2, \dots, n$ are the crop on a given farm area or year.

Y_i is the yield per acre of crop i , on the given farm area or year.

A_i is the weight of a crop i , denoted by the area under the crop or the area under the crop as a percentage of total cropped area.

Y_{i0} is the average yield per acre of crop i of the group of farms, region or the base year.

The crop yield indices so computed assume that all crops considered are of equal value. Thus a crop yield index computed by considering jowar, groundnut and cotton presumes that a unit of all these crops are of equal value. Experience reveals that they differ considerably in their value. In such cases, it may be advisable to include the value of the crops. To do so, the total production has to be multiplied by the price of respective products (P_i). This type of crop yield index can be calculated by the following formula :

$$\text{Crop Yield Index} = \frac{\sum_{i=1}^n Y_i P_i A_i}{\sum_{i=1}^n Y_{i0} P_i A_i}$$

SPATIAL COMPARISONS

For computing the crop yield index for each district, the average yield per acre of each crop and its area in the district as a percentage of the total area under that crop in Mysore State is considered. These percentages form the weights which represent the importance of the crop in the district with reference to the entire State.

The crop yield indices obtained for different districts in Mysore State are given in Table I.

Experience shows that Raichur, Gulbarga and Bijapur districts are scarcity areas. This is reflected in the low crop yield indices obtained for these districts which are 66.86, 81.21 and 89.25 respectively. Mandya, Coorg, South Kanara and Belgaum districts are more progressive from the standpoint of agricultural production which is confirmed by the high crop yield indices obtained for these

5. *Ibid.*, p. 583.

TABLE I—CROP YIELD INDICES FOR DIFFERENT DISTRICTS IN MYSORE STATE :
1956-57

Districts	Crop Yield Indices
Bangalore	84.83
Kolar	113.00
Tumkur	105.82
Mysore	90.91
Mandya	121.86
Hassan	114.53
Shimoga	88.50
Chikmagalur	97.03
Chitaldurg	85.78
Bellary	147.51
Dharwar	97.87
Belgaum	128.11
Bijapur	89.25
Bidar	114.02
Raichur	66.86
Gulbarga	81.21
South Kanara	148.58
North Kanara	94.57
Coorg	127.81

districts, viz., 121.86, 127.81, 148.58 and 128.11 respectively.⁶ Thus, these indices are found to represent the agricultural productivity in different regions, which is confirmed by common experience.

As the data considered is for a single year, doubts may be expressed that the particular year may be favourable for production of crops under consideration in some areas and may be unfavourable for the same crops in other areas. In such cases, to eliminate the effect of seasonal or climatic variations, data over a number of years may be obtained and the average considered for analysis.

TEMPORAL COMPARISONS

Crop yield indices, for the State as a whole, have been computed for the years from 1955-56 to 1960-61. For calculating the crop yield index in a given year,

6. The high crop yield index obtained in respect of Bellary district seems contrary to common experience. A thorough examination reveals that the per acre yields of many crops considered are very high in that year which is not borne out by experience.

The year 1955-56 is taken as the base year. The index has fallen considerably during the year 1956-57. It has reached a high of 106.95 in the year 1957-58. Since then, it has consistently declined.

The area under the crops considered for analysis has shown an increase over the years from 1955-56 to 1960-61 (Table IV).

TABLE IV—AREA UNDER SELECTED CROPS IN MYSORE STATE :
1955-56 to 1960-61

Year	Area under Selected Crops in '00 hectares	Index with the Area under the Crops in 1955-56 as the Base
1955-56	669,8	100.00
1956-57	665,6	99.37
1957-58	695,4	103.82
1958-59	698,6	104.30
1959-60	690,1	103.03
1960-61	699,6	104.45

Crop yield indices with fixed weights as well as variable weights have shown a tendency to decline from 1957-58 onwards. The area index has shown an increasing tendency over the years 1955-56 to 1960-61.

Thus it can be inferred that the decline in the agricultural productivity is responsible to a large extent in decreasing the crop yield index.

This leads us to the further investigation as to the crops in which the yield per acre has increased and the crops in which it has decreased over time.

TABLE V—INDEX NUMBERS OF YIELDS PER ACRE OF DIFFERENT CROPS IN MYSORE STATE WITH 1955-56 AS THE BASE YEAR

Crops	Index Numbers of Yields per Acre for the year					
	1956-57	1957-58	1958-59	1959-60	1960-61	Average
Rice	81.20	84.96	103.01	102.26	129.32	100.15
Ragi	79.59	78.57	80.61	73.47	71.43	76.73
Jowar	83.78	113.51	105.41	108.11	105.41	103.24
Wheat	109.09	109.09	100.00	95.45	118.18	106.36
Gram	100.00	106.45	93.55	77.42	100.00	95.48
Groundnut	117.26	125.86	115.52	110.34	87.93	111.58
Sugarcane	101.27	96.97	111.65	105.25	100.48	103.02
Cotton	105.26	115.79	113.16	121.05	71.05	105.26

Yields of *ragi* and gram have on an average decreased whereas the yields of other crops have increased during the years 1956-57 to 1960-61 compared to those in the base year 1955-56.

It has been already observed that the area under the crops considered for analysis has shown an increasing tendency. It would be interesting to know the crops in which it has increased and those in which it has decreased.

TABLE VI—INDEX NUMBERS OF AREA UNDER DIFFERENT CROPS IN MYSORE STATE WITH 1955-56 AS THE BASE YEAR

Crops	Index Numbers of Area under the Crops for the year					
	1956-57	1957-58	1958-59	1959-60	1960-61	Average
Rice	111.22	115.96	119.20	120.20	123.69	118.05
<i>Ragi</i>	104.40	103.59	131.32	122.71	105.91	111.51
Jowar	84.76	97.52	95.87	91.12	98.90	93.63
Wheat	102.41	104.48	103.10	103.10	104.83	103.58
Gram	95.86	97.04	91.72	92.31	92.90	93.97
Groundnut	109.10	104.73	99.64	104.61	102.79	104.17
Sugarcane	106.38	117.02	121.28	125.53	129.79	120.00
Cotton	117.15	111.15	106.10	104.13	104.75	108.66

The area under jowar and gram has on an average decreased whereas the area under other crops has increased during the years 1956-57 to 1960-61 compared to those in the base year 1955-56. Maximum increase in the area is noticed in sugarcane, followed by rice.

LIMITATIONS

Like many other measures, crop yield index has its own limitations. It concerns only with outputs and not inputs. Since the cost of production is not considered, it does not indicate the efficiency of production in terms of inputs and outputs. Secondly, as production is considered in physical units, crops are not weighted according to their value. However, this can be overcome by including the price of each commodity.

CONCLUSIONS

A study of the spatial variations in agricultural productivity reveals that the districts like Mandya, Coorg, South Kanara and Belgaum are agriculturally progressive and have higher crop yield indices whereas districts like Raichur, Gulbarga and Bijapur are agriculturally backward and have low crop yield indices.

Crop yield indices for Mysore State during different years indicate a decline from the year 1957-58 onwards. On further examination it is found that the total area under the crops considered for analysis has been steadily increasing over the years from 1956-57 to 1960-61, whereas the crop yield indices have declined from 1957-58 onwards. This calls for further research to delineate the factors responsible for a continuous decline in the agricultural productivity and find out suitable measures to overcome them.