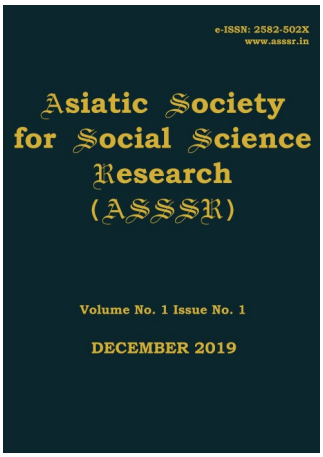

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Analysis of Agricultural Development in Odisha: A Statistical Study

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ABSTRACT:

Odisha is agriculture-based state, where most of the people depend on agriculture for their living and source of income. So the status of agricultural development of different districts of the state Odisha has been estimated with the help of composite index based on optimum combination of twenty one developmental indicators. Out of those twenty-one indicators, eighteen are crops and remaining three like Gross Cropped Area, fertilizer consumption and irrigated area are taken on the basis of their impact on the agriculture in the districts of Odisha. The secondary data regarding the yield of important crops, gross cropped area, fertilizer and irrigated area are used as indicator variables All the thirty districts have been included in the study. Bargarh district is found to be the best developed district in the farm sector whereas Boudh is on the last position. On the basis of result obtained from the correlation coefficient of the yield rate it is concluded that the yield rate of cereals has positive correlation with the production of oilseeds. Agricultural development is found to be highly associated with the productivity levels of cereals and pulses. Wide disparities have been observed in the level of development of different districts. Four districts namely Gajapati, Kandhamal, Sonepur and Boudh are found to be much below to the level of average performance of Odisha state in almost all the developmental indicators. General suggestions for improving the level of agricultural development of low developed districts have been given.

KEY WORDS: Agricultural Development, Developmental Indicators, Correlation Coefficient

Introduction

Role of agriculture in economy of the state is important for its contribution to the state income around 15% to our Gross Domestic Product (GDP) (rephrase). Agriculture not only provides food to its

population but also provides employment opportunities to about 60% of the total workforce of the State. About 70% of our population is directly or indirectly engaged in agriculture. The state has a total geographical area of 155.71 lakh hectares of which total cultivated land is about 61.80 lakh hectares. The net area sown is about 53.31 lakh hectares which is 34% of the state geographical area. (Provide reference from which the author has adopted these statistics)

Development being a multi dimensional process, its impact cantnot be analyzed fully by any single indicator. More over individual analysis of a number of indicators cannot provide an integrated and easily understandable of picture of reality. Thus there is need for construction of composite index of development based on optimum combination of various indicator indicators. Not connected to previous paragraph. Rice, the most important crop of Odisha and other important crops such as maize, wheat, ragi, greengram, blackgram, cowpea, redgram, pulses and oilseeds, groundnut, mustard, sunflower, sesamum, and castor (non edible), with vegetable and sugarcane are taken into consideration for indicator variables of agricultural development in the state. Gross cropped area, fertilizer consumption and irrigated area also affect the agricultural development of the state. So these factors are also considered as important indicators for the agriculture development of odisha.(Rephrase) Since the socio economy, physiographic, topographic and climatic conditions of the district of Odisha differ, the developmental indices are studied district wise. Thus objectives of the study is the objective of the study is to find the Composite Indices of agricultural development of all districts of Odisha and ranking of the districts on the basis of Composite Indices of agricultural development.

Review of Literature

Narain et al. (2005) studied the level of development of different districts of Kerala with the help of composite index based on optimum combination of thirty nine socio-economic indicators.

Narain et al. (2007) have developed composite index for development based on various socio economic indicators for 17 major states and 10 smaller states of the country using data pertaining to year 2001 -02. They have used 33 indicators representing agriculture, industry, infrastructure and overall socio economic sector. Authors have found wide disparities in the level of development among different states. The state of Punjab was ranked first and Bihar was ranked last in the overall socio economic development.

Materials and Methods

The indicator variables used in the studied are cereals like rice, maize, ragi and wheat, pulses like green gram, black gram, cowpea and red gram, oilseeds like groundnut, mustard, sunflower, sesame, castor (non edible) with vegetables and sugarcane. The study period consists from the year 2005-06 to 2016-17. The secondary data regarding the yield of important crops, gross cropped area, fertilizer and irrigated area which are used as indicator variables are collected for the year from 2005-06 to 2016-17 from various volumes of Odisha Agricultural Statistics published by Directorate of Economics and Statistics, Government of Odisha.

Research Hypotheses

There is no difference in the performance of districts of Odisha with respect to the agricultural development. There is no significant correlation between the important indicators variables related to

agricultural performance.

Composite Agricultural Development Indices

Variables in respect of different indicators are taken from various population distributions and these are recorded in different levels of measurement. Number of indicators utilized for estimation of level of development remains same for each district as all the important indicators used in the study remains same for each district. The values of the variables are not quite suitable for simple addition in combined analysis. The values of indicators are transformed as follows:

Let Xij be the value of jth indicator of ith district. (i = 1, 2……n and j = 1, 2…….k)

Transform Xij to Zij as

(1) $Z_{ij} = \frac{X_{ij} - \bar{X}_j}{s_j}$ Where

From [Zij], identify best value of each indicator. The best value of the transformed variable for each indicator (with maximum/minimum value depending upon the direction of the impact of indicator on development) is obtained.

Let the best value for the jth indicator be Zoj.

For obtaining the pattern of Development, calculate Pij as follows. Pij = (Zij – Zoj)2

Pattern of development is further standardized and a new parameter Ci and is given as

Ci =

Where (C.V.)j is the coefficient of variation of the jth indicator in Xij .

Composite Development Index Di is given by

(4) Di = Ci / C for i=1,2,…n

Where C = $\bar{C}$ + 3

r is the observed correlation in a sample of n pairs of observations.

ñ is the population correlation coefficient. We want to test whether ñ differs significantly from 0 or not.

Null hypothesis H0: ñ = 0 Alternate hypothesis H1: ñ ≠ 0 Level of significance,

If |calculated t | ≥ tab

Results and Discussion

The composite index of agricultural development has been calculated for different districts. The districts have been ranked on the basis of value of composite indices. The composite index of agricultural development along with the rank is presented in table 1 for different districts.

The composite indices varied from 0.54 to 0.99. Bargarh is found to be the best agricultural developed district in Odisha whereas Boudh is in the last place. Bargarh, Nuapada, Khurda, Cuttack, Bolangir, Puri are observed to be the best six developed districts and Boudh, Kandhamal, Sonepur, Gajapati, Deogarh, Keonjhar are the last six developed districts in the Odisha. Wide disparities in composite indices of agriculture development have been observed among different districts.

Different Stages of Development:

Districts having the composite indices less than or equal to 0.621184 are highly developed and put in stage I of development and districts having composite indices greater than 0.810592 are low developed and these are classified in stage IV of development. Districts having composite indices between 0.621185 to 0.715888 are high middle level developed and these are classified in stage II of development and districts with composite indices between 0.715889 to 0.810591 are low middle level developed and these are classified in stage III

of development. The following table presents the names of districts and percentage population lying in different stage of developments.

It may be seen from the Table 2 that out of 30 districts included in the analysis, three districts are found to be highly developed in agriculture. These districts are thinly populated and they cover about 11 percent of population of Odisha. Sixteen districts are found to be in high middle level developed group and about 63 percent population of the Odisha come from these districts. Eight districts are found to be low middle level developed and these districts cover about 21 percent population. Four districts are poorly developed and these are in low stage of development. These districts cover about 5 percent population of the state. Special steps are needed for enhancement of agricultural development in these districts.

Inter-relationship between Different Indicators used to measure agricultural development:

For proper and effective agricultural development, it is desirable that the crop productions activities should adopt new technology in the districts. The correlation coefficients between different important indicators are given below.

From the table 3 it is found that the correlation coefficient between yield rates of cereals and pulses is highly significant which indicates that the productivity levels of these two crops are positively associated. The productivity of cereals is also found to be highly positively associated with productivity of oilseeds crops. Again the productivity level of cereals is very highly positively associated with the productivity levels of vegetables. The productivity levels of cereals is observed to be less associated with sugarcane and with the average gross cropped area (GCA), fertilizer consumption and irrigated area of the districts.

Table 3 shows that the yield rates of pulses is found to be very highly positively associated with the yield rates of oilseeds, which is highest positive coefficient among all the calculated coefficients of the indicators of the districts. Productivity level of pulses is also highly associated with the productivity rates of the vegetables. Yield rates of pulse are moderately associated with the yield rates of sugarcane crop. But yield rates of pulses are less associated with the average GCA and fertilizer consumption. Yield rate of pulses is not found to be associated with the average irrigated area.

From the table 3 it is found that the correlation coefficient between the yield rate of oilseeds and vegetables is significantly positive. Productivity levels oilseeds are also highly positively associated with the productivity levels of Sugarcane. The yield rate of oilseeds is moderately associated with the average GCA and fertilizer consumption. The yield rate of oilseeds and average irrigated area are found to be negative. Since higher level of irrigation lower the yield of oilseed crops.

From the above table 3 it is seen that higher levels of irrigation decrease the productivity of vegetables so it is also negatively correlated. The productivity of vegetables and sugarcane are also moderately associated in the positive direction. The productivity levels of vegetable are less positively associated with the average GCA and fertilizer consumption. The yield rates of sugarcane are also less associated with the average GCA, fertilizer consumptions and irrigated area.

The above table 3 shows that Gross Cropped Area (GCA) is highly positively correlated with irrigated area, because when the no. of irrigated area increases, the land under cultivation also increases. GCA is also significantly positively correlated with average fertilizer consumption. Fertilizer consumption is also correlated with the no. of

irrigated area, as availability of water increases the efficient use fertilizers. Because when there is less amount of moisture present the soil, the effectiveness of fertilizers use also decreases.

Summary and Conclusion

The study of the ranking table of composite indices of yield rate of 21 indicator variables reveals that Bargarh, Nuapada and Khurda district occupies the 1st, 2nd and 3rd position respectively. In the same way the districts which occupy the last three positions i.e., 28th, 29th and 30th position in the ranking table of composite indices are Sonepur, Kandhamal and Boudh respectively.

The correlation table between the important crop groups and gross cropped area, fertilizer consumption and irrigated area reveals that only the correlation between irrigated area and yield of cereals, between yield of oilseeds and irrigated area and between yield of vegetables and irrigated area are negative, and all other correlations are positive. The districts which have very poor rank in composite indices table are briefly described below with the general suggestions to improve the agriculture status.

Four districts namely Gajapati, Kandhamal, Sonepur and Boudh are found to be low developed in agriculture. These districts are situated in different parts of the state Odisha having different climatic conditions. The present achievements of these four districts are extremely low. These are found to be much below to the level of average performance of Odisha state in almost all the developmental indicators. Special studies for estimating the level of development at micro level (block or sub-division level) are required to be conducted in these districts for providing specific location-wise suggestions of improving the status of development.

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Figures

Table 1: Ranking of the districts according to composite index

Sl. No.	Districts	Composite Index of Agricultural Development	Rank
1	Angul	0.642364	7
2	Balasore	0.649315	9
3	Bolangir	0.638073	5
4	Bhadrak	0.690522	13
5	Bargarh	0.54281	1
6	Boudh	0.993494	30
7	Cuttack	0.630989	4
8	Deogarh	0.80832	26
9	Dhenkanal	0.689552	12
10	Gajapati	0.829209	27
11	Ganjam	0.703604	16
12	Jagatsinghpur	0.679286	11
13	Jajpur	0.771675	23
14	Jharsuguda	0.774159	24
15	Kalahandi	0.755395	22
16	Kandhamal	0.873975	29
17	Kendrapada	0.743234	21
18	Keonjhar	0.797165	25
19	Khurda	0.595816	3
20	Koraput	0.737287	20
21	Malkangiri	0.698104	14
22	Mayurbhanj	0.674867	10
23	Nabarangpur	0.709224	19
24	Nayagarh	0.70161	15
25	Nuapada	0.584292	2
26	Puri	0.641102	6
27	Rayagada	0.705115	17
28	Sambalpur	0.707095	18
29	Sonepur	0.859729	28
30	Sundargarh	0.648669	8

Table 2: Names of districts and Percentage Population under Different Stages of Development

Developmental stage	Name of the district	Percentage population
High	Bargarh, Nuapada, Khurda	11%
High middle	Cuttack, Bolangir, Puri, Anugul,Sundargarh, Balasore,Mayurbhanj, Jagatsingpur, Dhenkanal, Bhadrak, Malkangiri, Nayagarh, Ganjam, Rayagada, Sambalpur, Nabarangpur	63%
Low middle	Koraput, Kendrapada, Kalahandi, Jajpur, Jharsuguda, Keonjhar, Deoghar	21%
Low	Gajapati, Sonepur, Kandhamal, Boudh	5%

Table 3: Correlation coefficients between the major indicator variables

	Cereals	Pulses	Oilseeds	Vegetables	Sugarcane	GCA	Fertilizer consumption	Irrigated area
Cereals	1	0.716** (0.22)	0.726** (0.21)	0.734** (0.21)	0.161 (0.31)	0.113 (0.405)	0.035 (0.407)	-0.01 (0.408)
Pulse		1	0.956** (0.09)	0.738** (0.21)	0.572* (0.25)	0.537 (0.344)	0.341 (0.383)	0.023 (0.396)
Oilseeds			1	0.858** (0.16)	0.554* (0.26)	0.325 (0.386)	0.478 (0.358)	-0.009 0.408)
Vegetables				1	0.451 (0.28)	0.204 (0.399)	0.391 (0.375)	-0.13 (0.404)
Sugarcane					1	0.129 (0.404)	0.415 (0.371)	0.186 (0.401)
GCA						1	0.636* (0.314)	0.872** (0.199)
Fertilizer Consumption							1	0.608* (0.323)
Irrigated area								1

* Significant at 0.05 probability level **Significant at 0.01 probability level