

Trend and variability of major crops production: A study of Keonjhar district of Odisha

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ABSTRACT

The study attempts to examine the variability of agricultural production such as rice, wheat, pulses, oilseeds, cereals, foodgrains, spices and vegetables in the study area by considering secondary data. Agricultural sector is one of the main sectors of Odisha economy and its contribution to State GDP is comparatively very high in comparison to other state of India. The overall purpose of the study was to examine the trend pattern of agricultural production and to know the variability in the agricultural production in the study area. The findings indicate that there is high degree of variability in certain type of agricultural production. The study also reveals there is need of the government intervention in implementing of the government policy to eliminate the degree of variability in agricultural sector .

Key Words : Agriculture, Foodgrains, Trend, Variability

INTRODUCTION

The word “Agriculture” comes from Latin words ‘Ager’ meaning field and ‘cultura’ meaning to cultivate (Odisha Agriculture Statistics, 2007-08) . So, it refers to the art of raising plant from the soil. Agriculture, the world’s oldest profession is the main source of life sustenance for human population. However, though there has been substantial growth in other sectors, the Agriculture Sector still continues to be the mainstay of livelihood for human civilization. Growth of the agricultural sector is important not only for ensuing food security and reduction of poverty in rural areas, but also sustaining growth of rest of the economy. More so, growth of two non-farm sectors *viz.*, Secondary and Tertiary sectors can be sustained only when the agricultural sector continues to grow and provide adequate demand for goods and services along with market for their products.

Agriculture plays an essential role in the process of economic development of less developed countries like India. Besides providing food to nation, agriculture releases labour, provides saving, contributes to market of industrial goods and earns foreign exchange. Agricultural development is an integral part of our overall economic development. In India, agriculture was the main source of national income and occupation at the time of Independence. Agriculture and allied activities contributed nearly 50 per cent to India’s national income. Around 72 per cent of total working population was engaged in agriculture. These confirm that Indian economy was a backward and agricultural based economy at the time of Independence. After 61 year of Independence, the share

of agriculture in total national income declined from 50 per cent in 1950 to 18 per cent in 2007-08. But even today more than 60 per cent of workforce is engaged in agriculture. In spite of this, it is also an important feature of agriculture that is to be noted that growth of other sectors and overall economy depends on the performance of agriculture to a considerable extent. Because of these reasons agriculture continues to be the dominant sector in Indian Economy.

Reveiw of Literature :

In an effort to identify the possible gap from the existing research study on trend and variability of agricultural production and to focus the un-researched area, a review of some critical and more recent studies relating to major crops is attempted.

Parthasarathy (1984) has made an attempt to examine inter-district variations in Andhra Pradesh in the growth rates of agricultural production from 1955-56 to 1978-79. In this study variation in growth rates between pre and post green revolution periods in each district, inter-district variations in fluctuations in agricultural production and variations in instability indices between pre and post green revolution periods has been discussed. The analysis is restricted to two aggregative levels like food grain production and "all crops". The crops under food grains include Rice, Wheat, Jowar, Bajra, Maize, Ragi, Korra, Varagu, Red gram, Black gram, Green gram, Horse gram and other Pulses. All crops include besides Food grains Sugarcane, Onions, Chilies, Groundnut, Ginger, Castor, Tobacco, Mesta and cotton. Here the author has found that the degree of instability in agricultural production is high in all the districts.

Mitra (1990) has made an attempt to explain growth and instability in agricultural production in Maharashtra in the context of new technology. The study is an attempt at inter regional time series analysis of agricultural production in Maharashtra for the period 1956-57 through 1984-85. Here the author has made an attempt to examine the growth rates in production, area and yield of Food grains and its constituents, the variability in production of crops and the incidence of the variability in production, the trends in instability in the production of food grains and other crops, the relationship between growth and instability and the incidence of irrigation on the variability in crop production. The findings of the study reveals that the annual compound rate of growth of agricultural production in the state as well as in all the regions especially that of food grains was relatively higher in the twelve year period ending 1984-85 after a near stagnancy in the sixteen year period ending 1971-72.

Rao and Deshpande (1998) have made an analysis to examine the record of agricultural growth in West Bengal over a period of 50 years. In west Bengal the acceleration in growth occurred during and after major changes in agrarian institutions and land relations. The study shows that food grain production grew at less than 1 % annually during the 1950s: the rate of growth increased to 3.3 per cent in the 1960s but fell back to less than 1 % in the 1970s. The overall growth rate for the period 1950 to 1980 was 2.5 % a year. In the 1980s growth rate of food grain production jumped to 5.8 %. But growth rate slowed down in the first half of the 1990s but the overall annual growth.

Statement of the problem :

Agriculture sector is the mainstay of our economy, contributing about 15 per cent of National Gross Domestic product (GDP) and more importantly, about half of India's population is wholly or significantly dependent on agriculture and allied activities for their livelihood (Government of India, 2011 a). The introduction of high yielding varieties (HYV) technology (commonly known as Green

Revolution) in mid-1960s Yielded spectacular results and the production of food grains increased from about 83.4 million tonnes in 1964-65 to 104.4 million tonnes in 1971-72 (GOI, 2012). Subsequently, the country, which was threatened by hunger and high dependence on imports as late as in mid-1960s, became one of the largest producers of many agricultural commodities such as Rice, Wheat, Pulses, Fruits and Vegetables, etc., thus being self sufficient in staple foods.

So it was realized that Indian agriculture had witnessed tremendous changes during the last 4 decades following the adoption of green revolution technology during late 1960's. The Green revolution technology was initially adopted on a large scale in the regions well endowed with irrigation. As this technology possessed vast potential for increase in productivity, it led to impressive growth in agricultural output in the regions where it was adopted. Because the spread of green revolution technology was highly skewed in favour of certain states and regions, this led to a high growth in agricultural output in selected regions while the other regions suffered from stagnancy or poor growth in agricultural output. As a result of which still today large scale variations in agricultural production has remained a deep subject concern in the area of agricultural economics both for policy makers and researchers.

Agriculture is a vital sector of the economy of Odisha and a good deal has been achieved in this sector during the plan period. Farm production has increased manifold and Yields of major crops such as paddy, pulses, oilseeds and vegetables have more than trebled in the last four and half decades. The impressive long term growth in agriculture has helped in taking the state out of famines and serious food shortages into one of the food surplus states in the country and ensuring food, nutrition and livelihood security. But although the need of making available an adequate food supply of reasonable quality for the population has been accomplished, the corresponding need of sustainable and equitable agricultural growth still remains a problem in the state. In fact, agriculture in Odisha is characterized by wide diversity and considerable spatio-temporal variations in growth and productivity. Therefore, there is a need to examine the role of these factors in explaining the divergent agricultural performance among the states/regions of the country. Keeping in view all these things in the present study it is found that there is high degree of variation both in Area, Yield and Production of both Food and non-Food grains in Mayurbhanj districts of Odisha. Different inputs are having different effects on output, like some are having negative impact on total output while others are having positive impact on output.

Objectives of the study :

1. To study the trends in Area, Production and Yield of major crops *i.e.* Rice, Paddy and Wheat, in the study area.
2. To study the variability pattern of major crops *i.e.* Rice, Paddy and Wheat, in the study area.

METHODOLOGY

The present study is based on secondary data. In order to study the variability pattern and trends in Area, Production and Yield of major Foodgrains and Non-Food grains this paper has focused on the time period (2003-04 to 2013-17) *i.e.* a period of 14 years. This analysis is restricted to major Foodgrain and Non-Foodgrain crops namely Rice, Paddy, Wheat, total Cereals, total Pulses, total Foodgrains, total Oil seeds, Vegetables, total Spices and Sugarcane and covers only Keonjhar district of odisha.

The study has used the published secondary data collected from various publications of the Govt. of Odisha *viz.*, various publications of Odisha Agriculture Statistics (Directorate of Agriculture and Food Production Odisha, Bhubaneswar), various issues of Statistical Abstract of Govt. of Odisha, Odisha Economic survey (Planning and Coordination Department, Directorate of Economics and Statistics Govt. of Odisha), District Statistical Hand Book for Keonjhar District (Govt. of Odisha), Agriculture Census of Odisha and districts at a glance (Keonjhar district). SPSS version 20.0 has been used to calculate mean, standard deviation for measuring variability of crops and linear trend model of regression is adopted to know the trend of major crops in the study area.

Table 1: Area, Production and Yield of total Rice, Paddy and Wheat in Keonjhar district during the year (2003-04 to 2016-17)

Year	Area	Paddy		Rice		Wheat		
		P	Y	P	Y	Area	P	Y
2003-04	235.46	557.098	2366	367.63	1561	0.58	0.65	1126
2004-05	240.35	550.72	2222	423.99	1764	0.51	0.55	1072
2005-06	246.79	567.37	2299	380.17	1540	0.45	0.56	1250
2006-07	251.28	543.52	2163	364.15	1449	0.59	0.76	1295
2007-08	241.13	589.57	2445	395.00	1638	0.74	0.96	1300
2008-09	245.54	524.72	2137	351.58	1432	0.80	1.08	1350
2009-10	240.86	577.83	2399	387.08	1607	0.71	0.58	812
2010-11	239.61	622.23	2764	443.75	1852	0.38	0.39	1018
2011-12	235.50	755.25	3207	506.03	2149	0.39	0.47	1159
2012-13	206.64	552.61	2674	364.72	1765	0.36	0.69	1910
2013-14	226.29	427.88	1891	282.41	1248	0.37	0.70	1880
2014-15	225.23	411.34	1876	281.23	1237	0.37	0.65	1787
2015-16	225.12	410.89	1834	279.00	1210	0.38	0.67	1720
2016-17	219.45	421.78	18.89	290.60	1340	0.40	0.60	1890

A=Area in '000 ha

Y=Yield in kg./ha

P=Production on '000 MTs

Source: Odisha Agriculture Statistics (Year 2003-04 to 2013-14), Directorate of Agriculture and Food Production Govt. of Odisha, Bhubaneswar.

From Table 1 it can be seen that the area, production and yield of Rice and Paddy are showing a steady growth with a slightly fluctuating trend. In case of Wheat area has also indicated a fluctuating trend with slightly increase in both production and yield. Production of Paddy was highest in 2011-12 (*i.e.* 755.25) thousand metric tons and also yield of Paddy was highest in 2011-12 (*i.e.* 3207 kg/ha). Also production (*i.e.* 506.03 thousand metric tons) and yield (2149 kg/ha) of Rice was highest in 2011-12. Wheat production was highest in 2008-09 *i.e.* 1.08 thousand metric tons and Yield was highest in 2013-14 *i.e.* 1880 kg/ha.

Table 2 explains the Area, Production and Yield rate of Total Cereals in Mayurbhanj District during 2003- 2014. In 2003-04, the Area under Total Cereal cultivation was 236.49 thousand hectares, Production was 368.70 thousand metric tons and Yield rate was 1599 kg/ha. In 2013-14, the Area under total Cereal cultivation was 227.11 thousand hectares, Production was 284.14 thousand metric tons and Yield rate was 1251 kg/ha. This table shows that the cultivated area under total Cereals was highest in 2006-07 (*i.e.* 252.24 thousand hectares) and lowest in 2012-13 (*i.e.* 207.49 thousand hectares). The total Cereal production was highest in 2011-12 (*i.e.* 509.52 thousand metric tons) and lowest in 2013-14 (*i.e.* 284.14 thousand metric tons). Similarly Yield was highest in 2011-12 (*i.e.* 2148 kg/ha) and lowest in 2013-14 (*i.e.* 1251 kg/ha).

Table 2 : Area, Production and Yield of total Cereals in Keonjhar district during the year (2003-04 to 2016-17)

Year	A	P	Y
2003-04	236.49	368.70	1599
2004-05	241.25	424.92	1761
2005-06	247.61	400.00	1500
2006-07	252.24	365.32	1448
2007-08	242.25	396.40	1636
2008-09	246.74	353.13	1431
2009-10	241.98	388.16	1604
2010-11	240.71	445.06	1849
2011-12	237.23	509.52	2148
2012-13	207.49	366.51	1766
2013-14	227.11	284.14	1251
2014-15	228.12	284.10	1327
2015-16	227.10	280.00	1230
2016-17	226.70	278.89	1235

A=Area in '000 hect

Y=Yield in kg. /ha

P=Production in '000 MTs

Source: Odisha Agriculture Statistics (Year 2003-04 to 2013-14), Directorate of Agriculture and Food Production Govt. of Odisha, Bhubaneswar

(NOTE: Total cereals include Rice, Paddy, Wheat, Bajra, Maize, Ragi, Jowar and Small Millets)

RESULTS AND DISCUSSION

In order to know the trend in production of major crops such as Rice, Paddy and Wheat, a trend linear regression model is estimated. In this model Rice, Paddy and Wheat are taken as dependent variable and time is taken as independent variable *i.e.* time variable. There are six trend linear regression model have been taken into consideration and to calculate the variability of agricultural production of different crops the different statistical tools were used such as mean, median, standard deviation etc.

$$Y_t = \beta_1 + \beta_2 t + u_t \dots \dots \dots (i)$$

 β_1 = Constant β_2 t = Rice, Paddy, Wheat, Area, Production and Yield u_t = Error term

$$Y_t = 618.3845 + (-10.9007) (\text{time}) \dots \dots \dots \text{eq i.i (Paddy)}$$

$$Y_t = 426.3534 + (-8.110549) (\text{time}) \dots \dots \dots \text{eq i.ii (Rice)}$$

$$Y_t = 0.7030 + (-0.005677) (\text{time}) \dots \dots \dots \text{eq i.iii (Wheat)}$$

$$Y_t = 249.8659 + (-2.084505) (\text{time}) \dots \dots \dots \text{eq i.iv (Area)}$$

$$Y_t = 433.3638 + (-8.783275) (\text{time}) \dots \dots \dots \text{eq i.v (Production)}$$

$$Y_t = 1728.538 + (-22.99560) (\text{time}) \dots \dots \dots \text{eq i.vi (Yield)}$$

It is interesting to know that from equation no (i.i) that the beta co-efficient for time variable is -10.9007 which is negative and it indicates that there is a downward trend in paddy production which means over the period of 2004 to 2017, on an average paddy production decreased at the absolute rate of about 10 thousand metric tons per year. The equation no (i.ii) indicates that the beta coefficient for time variable is -8.110549 which is negative and it indicates that there is a downward trend in rice production. It means over the period 2004 to 2017, on an average rice production decreased at the absolute rate of about 08 thousand metric tons per year. The equation no (i.iii)

indicates that the beta coefficient for the time variable is -0.005677 which is negative and it indicates that there is a down upward trend in total Wheat production. In other words over the period 2004 to 2017 on an average the total Wheat production decreased at the absolute rate of 0.005 thousand metric tons per year. The equation no (i.iv) indicates that the beta coefficient for time variable is -2.084505 which is negative and it indicates that there is a downward trend in area under cultivation which means over the period 2004 to 2017, on average area of cultivation decreased at the absolute rate of 2 hector per year. The equation no (i.v) indicates that the beta coefficient for time variable is 8.783275 which is negative and it indicates that there is a downward trend total agricultural production which means over the period 2004 to 2017, on an average total agricultural production decreased at the absolute rate of about 8 thousand metric tons per year. The equation no (i.vi) indicates that the beta coefficient for time variable is 22.99560, which is negative and it indicates that there is a downward trend in total yield of foodgrain. It indicates that over the period of 2004 to 2017, on an average Food grain production decreased at the absolute rate of about 22 thousand metric tons per year in Keonjhar district.

Table 3 : Instability in Area, Production and Yield of major Food and Non-Foodgrains in Keonjhar District (2003-04 to 2016-17)

Keonjhar district			
Crops	Area	Production	Yield
Rice	5.23 %	13.69 %	15.79 %
Paddy	5.220 %	17.766 %	17.060 %
Wheat	28.08 %	31.31 %	25.09 %
Total Cereals	5.09 %	35.89 %	35.77 %
Pulses	11.11 %	19.27 %	12.71 %
Total Food grains	4.81 %	14.47 %	21.56 %
Oil seeds	27.39 %	39.88 %	15.97 %
Vegetables	5.83 %	10.29 %	13.63 %
Spices	5.03 %	13.44 %	17.41 %
Sugarcane	32.81 %	32.14 %	12.86 %

Note –Instability of Area, Production and Yield is calculated from secondary data

In this paper an attempt has been made to know the variability in major crops like paddy, rice wheat, area under cultivation, total yield of crops and total agricultural production in Keonjhar District. The above table shows that during the years 2003-04 to 2013-17, the variability in the cultivated Area for Rice is (5.23%) fluctuated. Likewise the Production is (13.69%) and Yield is (15.79%) which indicates a greater degree of instability. It indicates that there is high fluctuation in Area, Production and Yield of rice. In case of Paddy the variability of Area is (5.220 %), Production is (17.76%) and Yield (17.060%) which indicates the instability is more in production, yield and the cultivated area of paddy during the mention year.

In case of wheat, total cereals oilseed and sugarcane there is high gegree of variability in area, production and yield. But in incase of vegetables and spices the variability with regard to area, production and yield are low. More over the result indicates that the variability of total foodgrains with regard to are, production and yield are also high in the study area.

Major findings :

1. The result shows that there is a downword trend in paddy production from the year 2003 to

2017.

2. In the case of wheat production the result indicates the downward trend of wheat crops from the year 2003 to 2017.

3. Moreover the result shows the decreasing trend of area under cultivation, total production and yield of major production.

4. The Table 3 shows that there has been high degree of variability in area, production and yield of major crops like paddy, wheat, total foodgrains, total cereals and sugarcane.

5. The result also indicates of low degree of variability in area, production and yield in case of pulses and spices.

Suggestions :

1. From the study it is found that the degree of variability in the production of crops was because of low precipitation during the *Kharif* season, therefore to overcome this problem government should provide the initiative of irrigation facility to the farmer so that they are able to increase the production in increasing trend.

2. The study found that access of agricultural credit also very low in comparison other district of Odisha, so government should provide adequate amount of credit facility to the farmer in the study area.

3. With respect to increasing trend and decrease in variability in major crops government should give emphasis to the adoption of HYVs seed from the farmer's point of view as a result the farmer could be able to use the HYVs seed and other requisite components of green revolution packages.

Conclusion:

There are various factors which are responsible for instability in agricultural production like irrigation, rainfall and variation in land productivity. Another interesting feature of land productivity is that it very closely follows variation in per hectare fertilizer-use. Cropping intensity which is an important factor to measure agricultural performance is associated with increase in production and area under different food and non-food grain items. The information on cropping intensity matters for productivity but itself is affected by rainfall and irrigation. Diversifications towards high-value crops have also been observed to have a significant effect on variations in productivity in agriculture. Increase in instability in area and production of rice is mainly due to erratic, irregular and insufficient power supply for irrigation purpose and highly erratic rainfall distribution during a harvesting period.

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