Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.7748

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2019) *7*(6), 71-76

Research Article

Scenario of Changing Cropping Pattern and Key Indicators of Agriculture in Odisha- An Economic Analysis

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Received: 17.09.2019 | Revised: 24.10.2019 | Accepted: 1.11.2019

ABSTRACT

The study was conducted to analyze the changing cropping pattern in Odisha along with growth rates in key indicators of development in the state. The secondary data were collected from Directorate of Economics and Statistics, Directorate of Agriculture and Food Production, Odisha, Government of Odisha and other reliable secondary sources and were subjected to growth rate analysis and descriptive analysis. Over a period of 45 years, area under paddy in the state has reduced by 7 per cent, while area under wheat and ragi remained stagnant and area under jowar crop has reduced to half over the period. Area under maize has shown significant growth 1970-71 to 2015-16. Overall the area under cereals in the state has reduced from 4906 thousand hectares to 4668.2 thousand hectares registering a decline of 4.9 per cent. Paddy and ragi remain the main cereal crops of the state. Among the key indicators of Odisha agriculture, kharif crop area, net sown area and power consumption in agriculture have declined over 2000-01 to 2017-18 at the rate of 7.86 per cent, 8.11 per cent and 69.23 per cent, respectively. Although the gross cropped area (GCA) of the state has a positive rate of growth over eighteen years, it is still insignificant. Net irrigated area and fertilizer consumption have increased significantly from 2000-01 to 2017-18. The cropping pattern reveals that the major crops of the state are paddy, maize, black gram, green gram and groundnut. The increase in cropping intensity of the state to the tune of 24.44 per cent during 2000-01 to 2017-18 indicates the growth of intensive agriculture in the state.

Keywords: *Odisha, Agriculture, Key indicators, Cropping pattern, CAGR*

INTRODUCTION

Odisha is predominantly an agrarian state situated in eastern India. Agriculture sector contributes 20 per cent to Net State Domestic Product and employs 50 per cent of the total working population (Odisha Economic Survey, 2017-18). Percentage of small farmers (with less than 2 ha of land) is about 57 per cent and landless laborers are about 36 per cent of total households in rural Odisha (Mishra, 2009). The state agrarian economy is dominated by small and marginal farmers.

Cite this article: Mohapatra, U., & Mishra, R. K. (2019). Scenario of Changing Cropping Pattern and Key Indicators of Agriculture in Odisha- An Economic Analysis, *Ind. J. Pure App. Biosci. 7*(6), 71-76. doi: http://dx.doi.org/10.18782/2582-2845.7748

Like in other states, the seed-fertilizer-irrigation based technology was introduced in the state during early seventies. Besides, numerous programmes have been launched to increase crop production in the state. But productivity of major crops is still below national average. Low agricultural production is one of the important factors of rural poverty.

Commensurate with these changes, the net sown area (NSA) in Odisha has declined from 5691 th ha in 2005-06 to 5424 th ha in 2013-14. In contrast, area sown more than once (ASMO) has increased continuously from 2003-04 to 2013-14, except in the year 2010-11. These facts clearly signify that there is perceptible structural change in Odisha agriculture. The Green Revolution was started in our country in around 1965-66 onwards. The development of new high yielding varieties of food grains *viz*., wheat, rice, maize, jowar and bajra was the spectacular achievement of agricultural research. The new strategy concentrated not only on high yields per unit of land but also on higher intensity of cropping. The conditions did not remain the same and since 1966-67 with the onset of the process of agricultural development involving technological changes with the introduction of high yielding varieties of seeds during mid sixties and increase in availability of chemical fertilizers and irrigation facilities, Indian agriculture no longer continued to be traditional one as it was during the fifties.

The increased agricultural production enabled India to become self sufficient in food grains. The production of other crops such as cotton, sugarcane, oilseeds, fruits and vegetables as well increased during the seventies and eighties. In recent past, Government of India has been focusing on agricultural development by giving special efforts on policies, strategies and framework such as General Agreement on Tariffs and Trade (1994), National Agriculture Policy (2000), National Seeds Policy (2002), Cooperative Policy, Agriculture Price Policy, Agricultural Extension Framework (2001), Mahatma Gandhi National Rural Employment Guarantee Scheme (2005), National Horticultural Mission (2005-06), National Food Security Mission (2007) and Rashtriya Krishi Vikas Yojana (2007-08). Overall, the total food grain production in the country has increased from 123.7 million tonnes in 1980-81 to 255.36 million tonnes in 2012-13. The country has already reached a stage of self-sufficiency in food grain production. The total irrigated area in 1980-81 was 49.78 million hectares, which rose to 91.53 million hectares in 2012-13 i.e. by 83.87 percent. The fertilizer consumption was 55.16 lakh tonnes in 1980-81, which rose to 255.36 lakh tonnes in 2012-13. It is thus clear that the agriculture in the country is marching on the path of development aimed at socio-economic prosperity of the people. Cropping intensity of India in 1980-81 was 123.3 percent, which rose to 133.14 percent in year 2012-13 and 137 per cent in 2016-17.

During Green Revolution period, there was a continuous surge for diversifying agriculture in terms of crops, primarily on economic considerations (Joshi et al., 2006, Paltasingh & Goyari, 2013). The cropping pattern changes, however, are the outcome of the interactive effect of many factors such as: resource-related factors (Paltasingh et al., 2012) (irrigation, rainfall and soil fertility); technology related factors (seed, fertilizer, and storage and processing); and institutional and infrastructure-related factors (farm size, extension, marketing systems, investment, output and input prices, government regulatory policies, and research). Given this backdrop, the broad objective of this study is to analyze the changing cropping pattern in Odisha along with growth rates in key indicators of development in the state.

MATERIALS AND METHODS

The secondary data were collected from Directorate of Economics and Statistics, Directorate of Agriculture and Food Production, Odisha, Government of Odisha and other reliable secondary sources and were subjected to analysis.

Analytical tools used: The tools used for the study are growth rate analysis and descriptive analysis.

i) Compound Annual Growth Rate Analysis (CAGR):

For estimating the compound growth rates, growth model of the following type was used.

ln Y= 1n a + t 1n b + u …….. (1)

where, Y= area /yield/ production

t =time variable

u= disturbance terma and b are the parameters to be estimated from the sample observations.

Compound growth rate (per cent per annum) = (b - 1) x 100

ii) Descriptive Analysis:

Data collected were presented in tabular form to facilitate easy comparison. The presentation was adopted to compile characteristics of the sample farmer's data. Statistical tools like averages and percentages were used to compare, contrast and interpret the results.

RESULTS AND DISCUSSION

Change in cropping pattern of Odisha state:

The cropping pattern of Odisha in the years 1971, 1991, 2011 and 2015-16 has been presented in Table 1. Over a period of 45 years, area under paddy in the state has reduced by 7 per cent, while area under wheat and ragi remained stagnant and area under jowar crop has reduced to half over the period. Area under maize has shown significant growth 1970-71 to 2015-16. Overall the area under cereals in the state has reduced from 4906 thousand hectares to 4668.2 thousand hectares registering a decline of 4.9 per cent. Paddy and ragi remain the main cereal crops of the state.

Some significant changes have taken place in the cropping pattern of Odisha in the post-liberalization period. Area under paddy was 71.1 per cent of the gross cropped area during 1970-71, which declined to 58.11 per cent in 1990-91. Currently, the share of cereals in cropping pattern of Odisha is 51.69 per cent (a decline of about 3 lakh hectares since 1970-71). The state witnessed sustainable increase in area under pulses in general and black gram, green gram and arhar in particular during the period 1970-71 to 2015-16. Area under green gram and total pulses has increased threefold during the period of study. This is one of the reasons why area under paddy has declined in the state. There has not been much change in area under horse gram in the state during the study period. Among cereals, paddy has lost its GCA from 64.80 per cent to 46.29 per cent during 1970-71 to 2015-16 while, maize has nearly tripled its GCA in this period; the reason being maize used as feed. Relatively moderate growth rate of cereals and pulses has been achieved mainly through yield effect. This pattern of growth is unlikely to continue without improved strategies on increasing land productivity. Although contribution of technology inputs towards sustainable output growth has been recognized, the growth in yield rate in Odisha agriculture is rather slow and yield barriers are to be overcome with modern technologies.

Wheat is another important crop which shows very discouraging results as its production is declining along with a highly erratic yield rate. During 1970-74 the average wheat product were 59.5 thousand metric tons which increased to 116.1 thousand metric tons during 1980-84 but there after it continuously decreased and during 2010- 2015 it became 25.9 thousand metric tons only. This shows a very erratic behaviour of yield rate which is a matter of concern. The erratic yield rate and decline in average wheat production may be attributed to different factors including climatic factors and this requires a special investigation.

In case of oil seeds such as groundnut, sesamum and mustard, area has expanded significantly. Area under niger has declined in the post globalization period in Odisha due to lack of competitiveness over other oilseed crops. In post-liberalization period, groundnut is facing stagnation though its yield performance (1808 kg ha^{-1}) is better than the national average i.e., 1690 kg ha^{-1}.

Substantial shift in area under cotton has been witnessed during the post reforms period. The share of cotton has doubled in the last two decades (1999-2017) in the state. Area

under coarse cereals and jute has been substituted by cotton after 2000-01. Though the total area under fibres has doubled in the last four decades, the contribution of fibres to the gross cropped area is merely 1.68 per cent. High value crops such as spices, fruits, vegetables and medicinal crops occupy about one sixth of the gross cropped area of the state during 2015-16. The area under total spices has almost tripled during the period of study. In case of fibres and vegetables the agricultural growth during the period 2000-01 to 2017-18 has been mostly due to the area effect and this result is in line with the findings of Malik et al. (2004) and Nayak (2016). The yield effect has not been substantial.

Area under sugarcane has more or less remained stagnant but area under tobacco has almost been wiped out in the state over the period of study. The gross cropped area (GCA) has increased by 30.86 per cent from 6.90 mha to 9.04 mha clearly stating a significant increase in cropping intensity of the state.

Growth in key indicators of Odisha agriculture

The key indicators of Odisha agriculture include kharif cropped area, rabi cropped area, gross cropped area, net sown area, cropping intensity, net irrigated area, fertilizer consumption and power consumption in agriculture. Among these indicators, kharif crop area, net sown area and power consumption in agriculture have declined over 2000-01 to 2017-18 at the rate of 7.86 per cent, 8.11 per cent and 69.23 per cent, respectively.

Table 1: Area under different crops in Odisha in absolute terms ('000 ha) and percentage breakup

Crops	1971	% to GCA	1991	% to GCA	2011	% to GCA	2015-16	% to GCA	Overtime change (%)
Paddy	4471	64.80	4404	52.69	4225.69	46.54	4180.22	46.29	-6.50
Wheat	13	0.19	34	0.41	17.55	0.19	12.76	0.14	-1.85
Jowar	17	0.25	27	0.32	8.9	0.10	7.46	0.08	-56.12
Maize	69	1.00	160	1.91	212.65	2.34	219.6	2.43	218.26
Ragi	156	2.26	248	2.97	179.48	1.98	165.8	1.84	6.28
Total Cereals	**4906**	**71.10**	**4857**	**58.11**	**4703.36**	**51.80**	**4668.2**	**51.69**	**-4.85**
Arhar	72	1.04	211	2.52	177.3	1.95	138.88	1.54	92.89
Green Gram	323	4.68	735	8.79	836.04	9.21	857.07	9.49	165.35
Black Gram	202	2.93	573	6.86	617.19	6.80	598.14	6.62	196.11
Horsegram	175	2.54	410	4.91	244.01	2.69	231.16	2.56	32.09
Total Pulses	**845**	**12.25**	**1931**	**23.10**	**2079.68**	**22.90**	**2088.3**	**23.13**	**147.14**
Groundnut	71	1.03	396	4.74	247.69	2.73	267.68	2.96	277.01
Sesamum	90	1.30	345	4.13	260.62	2.87	212.85	2.36	136.50
Niger	78	1.13	182	2.18	93.35	1.03	64.84	0.72	-16.87
Mustard	55	0.80	162	1.94	112.45	1.24	145.36	1.61	164.29
Total Oilseeds	**330**	**4.78**	**1057**	**12.65**	**770.68**	**8.49**	**752.4**	**8.33**	**128.00**
Jute	44	0.64	36	0.43	9.46	0.10	8.88	0.10	-79.82
Mesta	28	0.41	34	0.41	16.04	0.18	12.73	0.14	-54.54
Cotton	0.32	0.00	6.5	0.08	74.37	0.82	123.99	1.37	38646.88
Total Fibres	**78**	**1.13**	**90**	**1.08**	**107.85**	**1.19**	**151.87**	**1.68**	**94.71**
Total Spices	**58**	**0.84**	**163**	**1.95**	**154.46**	**1.70**	**155.3**	**1.72**	**167.76**
Sugarcane	30	0.43	49	0.59	40.84	0.45	35.34	0.39	17.80
Tobacco	14	0.20	15	0.18	2.16	0.02	1.69	0.02	-87.93
Other Crops	639	9.26	196	2.35	1220.69	13.44	1177.33	13.04	84.25
Gross Cropped Area	**6900**	**100.00**	**8358**	**100.00**	**9079.72**	**100.00**	**9030.43**	**100.00**	**30.88**

Source: Author's Calculation from area data obtained from published sources of Directorate of Agriculture and Food Production, Government of Odisha

Rest of the indicators have shown a positive trend supported by positive growth rates in the first period *i.e.,* from 2000-01 to 2005-06. The rabi cropped area has increased by 42.04 per cent in the period of eighteen years *i.e.,* from 2000-01 to 2017-18. The cropping intensity of the state, net irrigated area, gross cropped area and fertilizer consumption increased by 24.44 per cent, 36.90 per cent, 3.22 per cent and 75.60 per cent, respectively in the same period.

Table 2: Growth in key indicators of Odisha agriculture from 2000-01 to 2017-18 (in %)

Sl No	Particular	Period I (2000-01 to 2005-06)	Period II (2006-07 to 2011-12)	Period III (2012-13 to 2017-18)	Pooled	Percentage Change from 2000-01 to 2017-18
1	**Kharif Cropped Area**	5.2	-1.5	-1.2	-0.5	-7.86
2	**Rabi Cropped Area**	0.8	-1.7	1.3	1.2	42.04
3	**Gross Cropped Area (GCA)**	1.9^{NS}	-1.6^{NS}	-1.7	0.001^{NS}	3.22
4	**Net Sown Area (NSA)**	-0.4	-1.3	0.5	-0.4	-8.11
5	**Cropping Intensity (CI)**	2.46	1.09	0.10	1.03	24.44
6	**Net Irrigated Area (NIA)**	4.14	0.73	0.77	2.10	36.90
7	**Fertilizer consumption (Kg/ha)**	2.07	6.06	2.17	4.38	75.60
8	**Power consumption in agriculture**	-14.50	-3.10	-1.30	-6.01	-69.23

Although the gross cropped area (GCA) of the state has a positive rate of growth over eighteen years, it is still insignificant. Net irrigated area and fertilizer consumption have increased significantly from 2000-01 to 2017-18.

The slow growth of two agricultural output growth enhancing inputs, viz. irrigation and fertilizer, are considered to be the most immediate and important determining factors responsible for sluggish agricultural production in Odisha. Though fertilizer consumption has increased by 75.60 per cent, the absolute amount of consumption per hectare is much lower than at the national level. Although net irrigated area has increased by 36.90 per cent, a large part of the cultivated land still depends on monsoon. Irrigation facility is the paramount factor that determines the performance of agriculture, but the expansion of publicly supported programmes of surface irrigation has been poor since the early 2000s because of inadequate allocation of funds required for completing the on-going projects or poor use of funds of irrigation projects by State agencies. This poor growth in surface irrigation has compelled the farmers to heavily rely on groundwater irrigation and rainfall for crop cultivation, which also increased the cost of cultivation (Narayanamoorthy, 2013).

The low level of consumption of power which is critical for mechanization of agriculture indicates the lack of modernization of the agriculture sector in the state. The percentage of power consumption for agricultural purposes has declined over the period of time by 69.23 per cent. As multiple demands for land increase, less land is devoted to the agricultural sector. Therefore, intensive cultivation of available land seems to be a viable strategy for increasing the gross cropped area along with mechanization and modernization of agriculture for augmenting agricultural production in the state.

CONCLUSION

The cropping pattern reveals that the major crops of the state are paddy, maize, black gram, green gram and groundnut. The increase in cropping intensity of the state to the tune of

24.44 per cent during 2000-01 to 2017-18 indicates the growth of intensive agriculture in the state. As multiple demands for land increase, less land is devoted to the agriculture sector. Therefore, intensive cultivation of available land seems to be a viable strategy to increase the GCA.

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