International Journal of Environment, Agriculture and Biotechnology
Vol-9, Issue-4; Jul-Aug, 2024
Peer-Reviewed International Journal
Journal Home Page Available: https://ijeab.com/
Journal DOI: 10.22161/ijeab

Dimension of Input Cost and output prices of Paddy in Odisha State of India

N. V. Shende, V. S. Shinde, U. T. Dangore, R. D. Vaidkar and V. K. Khobarkar

Department of Agricultural Economics and Statistics, Dr.Panjabrao Deshmukh Krishi Vidhyapeeth, Akola (Maharashtra), India

Received: 12 Jul 2024; Received in revised form: 11 Aug 2024; Accepted: 15 Aug 2024; Available online: 22 Aug 2024

Abstract— *Agricultural growth with stability has been a matter of concern in Odisha. As paddy is the major crop growing in the state, the present study was therefore carried out with the objectives to examine the changes in cost and Prices, growth, trend, parity between cost and Prices, gap between FHP (Farm Harvest Prices) and MSP (Minimum Support Prices), impact of MSP on area, production and productivity of Paddy in Odisha. The data of cost and Prices of Paddy were collected form the period 2000-01 to 2019-20 and analysed the temporal change, growth by using CGR (Compound Growth Rate), instability by using CV (Coefficient of Variation), trends by using linear and non-linear trend model, index number, effectiveness of the Prices policy during the harvest periods was examined by the deviations of FHP from MSP and classified into positive and negative deviations. These deviations calculated by using MAPD, MAND, AMPD and AMND formulas. To study the impact of lagged Minimum Support Prices (MSPs) on the acreage allocation, production and productivity, linear Regression equations have been fitted. The result shows that the temporal change of cost of Paddy crop increased subsequently over the period of time. This increase could due to increase in level of input use for Paddy is increases in Odisha. The growth analysis revealed that the growth in various cost of Paddy are found positively significant at 5 per cent level for overall period. For FHP and MSP of Paddy crop are found positively significant at 5 per cent level for overall period. The Coefficient of variation for various cost and Prices was found to be high in the Period-I and low in the Period-II, on the whole, it was observed that the degree of stability is increasing for over the period. There was an increase in trend in cost and Prices of Paddy during overall period and among the competitive parametric models third degree model are found best fitted based on R^2 significance The gap analysis in which deviations of FHPs from MSPs of Paddy crop results in maximum positive deviations (FHP ruled higher than MSP) in Odisha. The result shows that previous year Prices influences current years' area, production and productivity of Odisha.*

Keywords— ***Agricultural growth, paddy production, price analysis, MSP impact, Odisha agriculture.***

I. INTRODUCTION

Paddy refers to two species, all paddy varieties of Asia, Europe and America belong to Oryza sativa (2n=24), while many cultivated varieties of West Africa belong to Oryza glaberrima. Paddy is a grain belonging to the grass family other grass plants such as wheat, oats and barley which produce grain for a food are known as cereals. Paddy is rich in genetic diversity, with thousands of varieties grown throughout the world.

Paddy is a nutritional staple food which provides instant energy as its most important component is carbohydrate (starch). On the other hand, paddy is poor in nitrogenous substances with average composition of these substances being only 8 per cent and fat content or lipids only negligible, i.e.,1 per cent and due to this reason it is considered as a complete food for eating. Paddy flour is rich in starch and is used for making various food materials.

Paddy is the staple food for about half of the world population and more than two thirds of the Indian

population. India ranks first in paddy area and second in paddy production next to China. In India, paddy is grown in about 44 million ha with the production of about 116 million tons of milled paddy. Paddy cultivation engages the most of the workforce in the economy as the source of livelihood for those people.

The Slogan "Paddy is life" is most appropriate for India as this crop plays a vital role in our national food security and is means to livelihood for millions of rural households by providing direct employment in rural areas. Paddy in India's crop and is the staple food of the people of the eastern and southern parts of the country Production of the paddy was 130 million metric tons in the years 2022 - 2023. Orissa Paddy producing state with almost 3.94million hectare land under cultivation producing about 5.87 million tonnes of paddy.

Odisha is the third largest paddy producing state of the country only after Odisha and Odisha. Odisha produces about 12 million tons of paddy in about 3 million ha of area. It produces 11% paddy in 7% area of the country. Agriculture is the lifeline of state's economy as it provides employment to about two third of total workers of the state. Odisha is the pioneer state for various agricultural technologies and techniques but overall state is still lagging behind in various aspects of growth in production. The instability in area and production is quite common as per various institutes and reports in Odisha. Such fluctuations severely affect the production, and indirectly employment and income distribution are affected which there by hamper the economic growth of Odisha.

II. METHODOLOGY

The data was used for study is entire based on secondary source from Agriculture statistics at a glance. The data was collected from various government publications, and websites. Data from the previous 20 years was collected for the study and analysis from 2000-01 to 2019-20. The entire data was split up into two periods and overall i.e. period I: 2000-01 to 2010-11, period II: 2011-12 to 2019-20 and Overall: 2000-01 to 2019-20.

The study was undertaken to study the temporal changes in input use, cost and return of paddy. To estimate growth rates of input utilization and costs of paddy. To examine parity between cost and prices. To work out the impact of prices on area, production and productivity.

1.The growth rates were used to measure the past performance of the economic variable. The growth rates are used to examine cost and prices change over a period of time.

Growth rate was worked from using the following exponential function.

$$\mathbf{Y = a\, b^t}$$

Where, Y= Cost/ Prices**,** T= time in years**,** b = regression coefficient**,** a = intercept

The compound growth rates 'r' was calculated by using the following formula

$$\mathbf{CGR(r) = [Antilog\ (log\ b)\text{-}1]\times 100}$$

Where, r = compound growth rates

2.To measure the instability in cost of cultivation and input utilization, an index of instability was used as measure of variability. The coefficient of variation (CV) will be calculated by the formula.

$$\text{C.V. (\%)} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

3.The factors affecting the cost of cultivation of paddy crops from the last 20 years was determined the differentials in costs of cultivation and Input use of crops. The significance level of changes in cost will be tested by 't' test.

The effect of cost of cultivation were explained to a certain degree by multiple regression analysis**.**

4.The behaviour of cost and prices of paddy for major states was studied by analysing the trend in the cost and prices of paddy for major states was worked out by fitting linear, quadratic, 3rd degree polynomial equation.

Table: Linear and Non Linear Trend Model.

Model no.	Model	Name of model
1.	$Y_t=b_0+b_1t$	Linear equation
2.	$Y_t=b_0+b_1t+b_2t^2$	Second degree polynomial
3.	$Y_t=b_0+b_1t+b_2t^2+b_3t^3$	Third degree polynomial

5.An index number is a statistical measure design to show the changes in variables or group of related variables or group of related variables with respect to time.

The index number was calculated by choosing the 1^{st} triennium average as a base year.

$$\text{Index Number} = \frac{\text{Current Year Value}}{\text{Base Year Value}} \times 100$$

6.Factors affecting cost of cultivation was analysed by using multiple linear regression analysis. Multiple linear

regression analysis is a statistical technique used to understand the relationship between multiple independent variables and a dependent variable. In the context of calculating the cost of cultivation, it can be employed to predict the costs based on various factors that influence cultivation expenses. The equation for multiple linear regressions can be represented as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$$

Where:

Y = the dependent variable (cost of cultivation).

β_0 = intercept or constant term.

$\beta_1, \beta_2, \ldots, \beta_5$ = coefficients associated with independent variables

$X_1, X_2 \ldots X_5$.

X_1 = Seed, X_2 = Fertilizer and Manure, X_3 = Human labour, X_4 = Animal labour

X_5 = Machin labour, X_6 = Plant protection, ϵ = error term, representing the unexplained variability in the model.

7.The study was based on the farm harvest Prices and minimum support Prices is of major crops in India. To study the parity between the cost and Prices, the tabular analysis was used. To study the effectiveness of the Prices policy during the harvest period of deviation of farm harvest Prices from the MSP was worked out and classified into the negative and positive deviation to examine whether the market Prices ruled higher or lower over the MSP. Hence the absolute positive deviation (APD) or absolute negative deviation (AND) and mean absolute positive derivation (MAPD) or mean absolute negative deviation MAND) calculated. Also adjusted mean positive deviation (AMPD) and adjusted mean negative deviation (AMND) was worked out.

$$\text{MAPD or MAND} = 1/n \sum | FHP_i - MSP_i |$$

If, FHP > MSP = Positive deviation (PD)

FHP < MSP Negative deviation (ND)

Where,

MAPD = Mean absolute positive deviation,

MAND= Mean absolute negative deviation,

FHP = Farm harvest prices,

MSP = Minimum support prices, and

n = Frequency of positive or negative deviations.

These deviations were adjusted with MSP in order to examine the degree of their deviation from the MSP. The formulae used for the adjusted mean negative/positive deviation was as follows:

$$\text{AMPD or AMND} = 1/n \sum (FHP_i\text{-}MSP_i|/MSP_i) *100$$

Where,

AMPD = Adjusted mean positive deviation, and

AMND = Adjusted mean negative deviation

The significance of gap between FHP and MSP of paddy for major states was tested by two sample t-test.

$$t = \frac{(x - y)-(u_x - u_y)}{\sqrt{\frac{1}{n_x} + \frac{1}{n_y}}}$$

Where, x= mean of FHP of size n_x, y= mean of MSP of size n_y, Sp^2 = pooled variance

$$Sp^2 = \frac{(n_x - 1)s_x^2}{(n_x - 1)+(n_y - 1)}$$

To study the impact of lagged minimum support Prices on the area, production and productivity of the paddy. Linear form of equation was used. The previous year MSP generally influence the producer farmer decision on a carrier location for the current year the linear.

1. Linear regression equation:

a. A_t = a + b Pr_{t-1}

b. P_t = a + b Pr_{t-1}

c. Y_t = a + b Pr_{t-1}

2. Logarithmic regression equation:

a. Log. A_t = log a + b Pr_{t-1}

b. Log. P_t = log a + b Pr_{t-1}

c. Log. Y_t = log a + b Pr_{t-1}

Where,

A_t = Area of paddy crop at (t^{th}) period,

P_t = Production of paddy crop at (t^{th}) period,

Y_t = Productivity of paddy crop at (t^{th}) period,

Pr_{t-1} = Minimum Support Prices of major crops taken in per quintal at

($t - 1^{th}$) period.

III. RESULT AND DISCUSSION

3.1 Temporal changes in input use, cost and returns of paddy.

The Temporal changes in cost and Prices crop have been examined as a whole for Paddy. The

temporal changes in cost and Prices were estimated form the period 2000-01 to 2019-20.

The result shown in Table 1.1 shows the changes in the cost cultivation of paddy in Odisha. The total cost of paddy has gone up from Rs. 22822.44 per hectare in 2000-01, Rs. 45239.04 per hectare in 2010-11 to Rs. 101525.6 per hectare in 2019-20 depicting an increase 198.22 per cent and 444.85 per cent during a period of study. The increase has occurred in paddy of cost like hired human labour, family labour, bullock labour, machine labour, seed, fertilizer, farm yard manure, insecticide, rental value of owned land and interest on working capital, costs of interest on fixed capital and depreciation cost.

The cost of human labour, family labour, machine labour, seeds, fertilizer, and insecticide has increased at a faster rate. Among total hired human labour (234.45 per cent) in 2010-11 and (515.59 per cent) in 2019-20 recorded the maximum share followed total family labour (195.71 per cent) in 2010-11 and (543.32 per cent) in 2019-20 followed by machine labour (377.33 per cent) in 2010-11 and (3064.74 per cent) in 2019-20 in the increase in cost of cultivation over time. Out of the total increase of 198.22 per cent and 444.85 per cent in the total cost of cultivation in 2010-11 and 2019-20. The items contributed about 70 per cent and 33 per cent and the remaining 205.87 per cent and 498.70 per cent by fixed cost items in 2010-11 and 2019-20 respectively.

Table 1.1 Temporal changes in cost of Paddy in Odisha

Particulars	**Rs/ha**			**Percent charges over Base period i.e. 2000-01**	
	2000-01	**2010-11**	**2019-20**	**2010-11**	**2019-20**
Hired human labour	5801.91	13602.35	29913.95	234.45	515.59
Total family labour	3065	5998.43	16652.8	195.71	543.32
Bollock labour	1684.05	2980.08	2854.93	176.96	169.53
Machine labour	225.15	849.56	6900.26	377.33	3064.74
Seed	586.1	889.69	1478.27	151.80	252.22
Fertilizer	1001.51	1362.58	4059.39	136.05	405.33
Manures	528.81	950.35	2277.63	179.71	430.71
Irrigation charges	82.57	100.83	827.99	122.11	1002.77
Insecticides	68.98	100.72	166.05	146.01	240.72
Interest on working capital	216.06	463.68	997.03	214.61	461.46
Cost A	13260.14	27298.27	66128.3	205.87	498.70
Fixed costs	4898.43	9018.56	17931.5	184.11	366.07
Rental value	3583.29	7230.77	15526.61	201.79	433.31
Interest on fixed capital	730.54	1192.65	1268.02	163.26	173.57
Depreciation	332.79	478.15	651.59	143.68	195.80
Land revenue	17.25	20.64	19.55	119.65	113.33
Cost B	9562.3	17940.77	35397.27	187.62	370.18
Cost C	22822.44	45239.04	101525.6	198.22	444.85

The increase in insecticide and fertilizer charges has been to the tune of 122.11 per cent, 1002.77 per cent and 136.05 per cent, 405.33 per cent in 2010-11 and 2019-20 respectively, of the total increase in cost of cultivation. The per cent changes over inputs in the cost of cultivation of Paddy at two points of time are also given in Table 1.1 the per cent changeover has remained around per cent in 2010-11, which was lower than that in 2019-20. Within the operational cost, the per cent changeover of machine labour in the total cost increased from 377.33 per cent in 2010-11 to 3064.74 per cent in 2019-20 and the per cent changeover of bullock labour in the total cost decreased from 176.96 per cent in 2010-11 to 159.63 per cent in 2019-20. The decrease in the per cent changeover

of bullock labour is on account of substitution by machine labour. The per cent changeover of fertilizer in the total cost increase from 136.05 per cent in 2010-11 to 405.33 per cent in 2019-20, for Paddy.

The extent of change in physical inputs and their prices along with changes in physical output and their prices and gross return for paddy over time is given in Table 1.2. It is remarkable to note that the physical quantity of bullock labour, seed and manure has come down for Paddy due to increase in the wage rate of bullock labour and prices of manure, seed. Only physical quantity of fertilizer is increase and decrease in human labour due to increase in ppaddyof fertilizer and demand for human labour. The gross return for paddy has recorded a 419.92 per cent in 2010-11 and 217.01 per cent in 2019-20 during the period study.

Table 1.2 The extent of changes in physical inputs, input Prices, physical output, output Prices and gross return for paddy in Odisha

S.N.	**Particular**	**2000-01**	**2010-11**	**2019-20**	**Percent charges over Base period i.e. 2000-01**	
					2010-11	**2019-20**
A	**Quantity of input**					
1	Seed (Kg/Ha)	90.47	89.75	58.99	65.20	65.73
2	Fertilizer (Kg/Ha)	81.18	90.82	125.68	154.82	138.38
3	Manure (Qtl/Ha)	23.98	23.76	14.59	60.84	61.41
4	Human labour (hrs/ha)	1089.03	1041.75	837.84	76.93	80.43
5	Bullock labour (hrs/ha)	200.27	188.95	87.07	43.48	46.08
B	**Prices of input**					
1	Seed (Rs/Ha)	6.48	9.91	25.06	386.73	252.88
2	Fertilizer (Rs/Ha)	12.34	15.00	32.30	261.75	215.33
3	Manure (Rs/Ha)	22.05	40.00	156.12	708.03	390.30
4	Human labour (Rs/ha)	5.33	13.06	35.70	669.79	273.35
5	Bullock labour (Rs/ha)	8.41	15.77	32.79	389.89	207.93
C	**Yield (Qtl/Ha)**					
1	Main Product	26.10	28.30	41.87	160.42	147.95
2	By- product	5.54	3.42	2.92	52.66	85.24
D	**Prices of output (Rs/Qtl)**					
1	Main Product	476.46	919.57	1413.48	296.66	153.71
2	By- product	101.16	111.24	98.51	97.38	88.56
E	**Value of output (Rs/Ha)**					
1	Main Product	12435.69	26023.86	59182.37	475.91	227.42
2	By- product	2640.31	3148.09	4124.65	156.22	131.02
3	Gross Return	15076.00	29171.95	63307.02	419.92	217.01
F	**Cost of production (Rs/Qtl)**	477.04	955.59	1505.22	200.32	315.53

3.2 Temporal changes in Farm Harvest Prices of paddy

The results shown in Table 1.3 shows the changes in farm harvest Prices of paddy in Odisha. The increase has occurred form the year 2000-01 to 2019-20. Odisha and MSP shows 409.38 per cent ,190.74 per cent change during 2019-20 over 2000-01 respectively. Odisha shows the positive increase in farm harvest Prices of paddy.

Table 1.3 Changes in Farm Harvest Prices of paddy in Odisha

S.N.	STATES	2000-01	2019-20	% change during 2019-20 over 2000-01
1	Odisha	405	1658	409.38
2	Minimum Support Prices	540	1030	190.74

1.3.2 Growth rates of cost and Prices of paddy in Odisha

The rate of change in terms of various Costs of paddy in Odisha expressed in terms of compound growth rates estimated through exponential function were presented in Table 1.4

Table 1.4 Compound growth rate of cost of paddy in Odisha

S.N.	Particular	Period I	Period II	Overall
		2000-01 to 2010-11	2011-12 to 2019-20	2000-01 to 2019-20
1	Cost -A	6.15*	8.30*	8.91*
2	Cost -B	8.46	8.16*	10.71*
3	Cost -C	6.44*	8.63*	9.44*
4	Cost of production	5.67*	3.95*	8.01*

Note: *= Significance at 5 per cent level

During the first period 2000-01 to 2010-11 (Period-I) the estimated compound growth rates were found to be significant for all the Cost of paddy is found to be satisfactory, except Cost-B it is found to be non-satisfactory. Cost of production shows the positive and significant growth rate at 5 per cent level.

During the 2011-12 to 2019-20 (Period-II) all the Costs of paddy showed positive and significant growth rates at 5 per cent level. Cost of production shows the positive and significant growth rate at 5 per cent level.

In the overall period, all the Costs of paddy showed positive and significant growth rates at 5 per cent level. In general, it can be concluded that there was positive and significant growth rate during the period of study.

3.3 Instability of cost of paddy in Odisha

As seen from Table 1.5, that coefficient of variation of Cost-C for paddy in Odisha was highest during overall period by 50.82 per cent. For period-l the coefficient of variation is highest for Cost-B i.e. 40.09 per cent. And for period-ll it is highest for Cost-C i.e. 23.94 per cent.

Table 1.5 Instability for cost of paddy in Odisha

S.N	Particular	Coefficient of variation (CV)(%)		
		Period-I	Period-II	Overall
1	Cost -A	20.08	23.19	50.08
2	Cost-B	40.09	22.93	50.68
3	Cost-C	21.31	23.94	50.82
4	Cost of production	20.06	12.97	43.26

3.4 Trends in cost and Prices of paddy in India

The trend equations were fitted to assess the cost and Prices of paddy crops in India. Depending upon its better fit, was analysed by the production model viz, linear, second degree and third degree polynomial equation trends results are assessed and presented under cost and Prices of selected crops.

Table 1.6 Trend in cost of paddy in Odisha

S.N.	Particulars	Model		Coefficients			
			R^2	b_0	b_1	b_2	b_3
1	Cost A	Third Degree Polynomial	0.99	9831.27	-5.19	223.70	-1221.67
2	Cost B	Third Degree Polynomial	0.96	15321.82	-11.37	443.44	-2603.79
3	Cost C	Third Degree Polynomial	0.99	21582.94	-16.45	639.21	-3897.35
4	Cost of production	Third Degree Polynomial	0.97	633.60	-0.66	21.29	-123.23

For trend analysis of Cost-A of paddy (Table 1.6), maximum value of R^2 is 0.99 third degree polynomial trend is best fitted. In trend analysis of Cost-B, maximum value of R^2 i.e. 0.95 is best fitted for third degree polynomial trend. In trend analysis of Cost-C, maximum value of R^2 i.e. 0.98 is best suited for third degree polynomial trend. For trend analysis of cost of production, maximum value of R^2 i.e. 0.97 is for third degree polynomial trend which is best suited.

3.5 Index number

An index number is a statistical measure design to show the changes in variable or group of related variables with respect to time. The index numbers were worked out for the cost and Prices of paddy crop. The basic object of estimating index numbers was to make the trends in cost and Prices of selected crops. For this analysis the data pertaining to the year 2000-01 to 2019-20 i.e. last 20-year data were used. The results are presented in following tables.

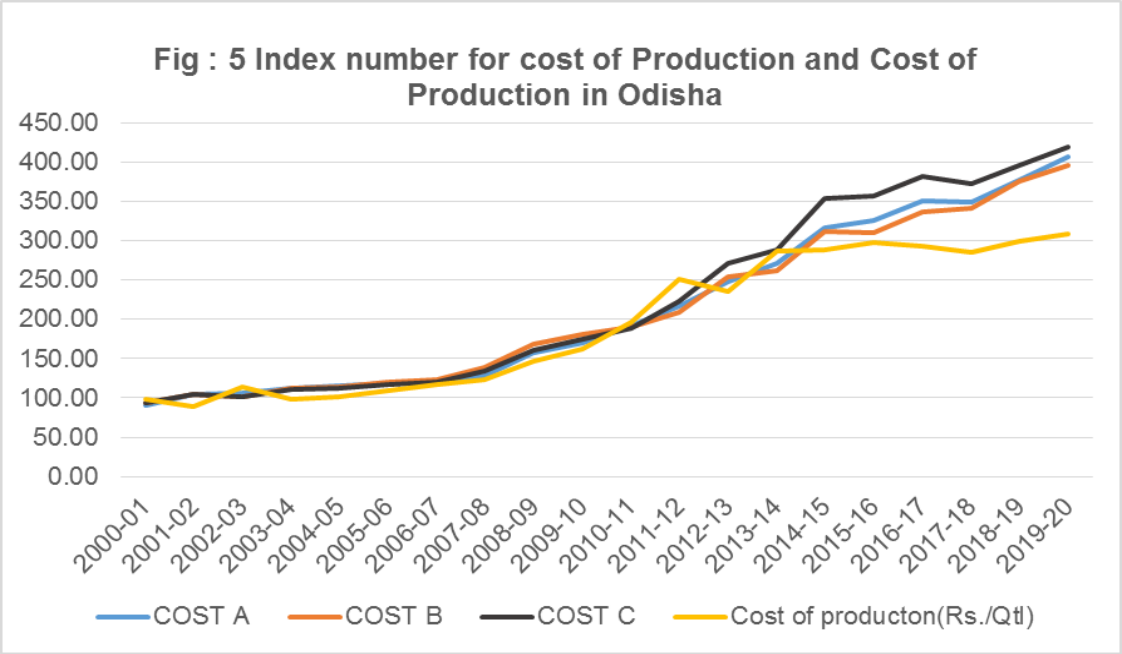
Table 1.7 indicate that the highest increase in index number of Cost-A was (394.13) in the year 2019-20 and with lowest (84.65) in the year 2000-01. Index number for Cost-B was recorded highest (375.87) among all the cost from 2019-20 and with lowest (8711) in year 2000-01. For Cost-C index number was (390.00) the highest value in 2019-20 and with lowest (88.48) in the year 2000-01. Cost of production has the highest index number of in 2019-20 (351.85) and lowest (96.46) in year 2000-01.

Table 1.7 Index number for cost of paddy in Odisha

(First triennium average as a base year)

YEAR	COST A	COST B	COST C	Cost of production
2000-01	90.58	93.74	93.66	97.83
2001-02	104.02	104.64	104.27	88.81
2002-03	105.40	101.62	102.06	113.36
2003-04	112.52	112.17	110.79	98.00
2004-05	114.78	114.44	112.90	101.25
2005-06	118.68	119.97	116.55	108.47
2006-07	121.72	122.78	119.89	116.97
2007-08	127.16	138.71	134.74	122.98
2008-09	158.20	168.35	160.78	146.64
2009-10	170.59	180.56	174.65	162.76
2010-11	191.33	189.53	188.14	195.97
2011-12	216.78	208.99	223.23	250.49

2012-13	248.26	253.99	270.94	235.46
2013-14	271.43	261.61	288.79	286.93
2014-15	316.31	311.90	353.18	288.23
2015-16	325.96	310.23	356.47	297.43
2016-17	349.95	336.07	381.67	292.62
2017-18	348.69	341.10	372.97	285.88
2018-19	377.75	375.04	396.44	299.30
2019-20	406.55	396.15	418.79	308.69



3.6 Factors affecting cost of cultivation of paddy in Odisha

The multiple linear regressions were carried out between the independent variables and dependent variable. The independent variables that represent seeds, fertilizer and manure, human labour and bullock labour, machine labour and plant protection while dependent variable represent cost of cultivation of paddy in Odisha for overall period (2000-01 to 2019-20).

Table 1.8 Factors affecting cost of cultivation of paddy in Odisha

S.r. no	Variables	Coefficients	Standard Error	t Stat
1	Intercept	210.76	1314.86	0.16
2	X_1 (Seed)	16.07**	3.96	4.05
3	X_2 (Fertilizer & Manure)	1.99	0.65	3.07
4	X_3 (Human Labour)	0.92**	0.18	5.06
5	X_4 (Bullock Labour)	-0.61	0.81	-0.76
6	X_5 (Machin Labour)	1.59	0.87	1.83
7	X_6 (Plant protection)	-6.45	6.73	-0.96
8	R^2	1.00		
9	F	1799.75		

Note: **Significant at 5% level

Table 1.8 shows that the coefficient of determination (R^2) is used to measure how much the ability of the independent variable in explaining the bound variation. The coefficient of determination (R^2) obtained was 1.00. This means that 100 per cent variation explained by the studied independent variable. Seed and human labour were found to be statistically significant at 5 per cent level.

3.7 Parity between cost and Prices

In this objective the gap between Minimum Support Prices (MSP) and cost of production of major crops and gap between the Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) of paddy crop from 2000-01 to 2019-20 was studied.

3.7.1 Gap between Minimum Support Prices and Cost of cultivation of paddy in Odisha

The gap between Minimum Support Prices and cost of cultivation of paddy in Odisha is presented in the Table 1.9. The gap is calculated for the study period i.e. 2000-01 to 2019-20. The results revealed that the gap between MSP and Cost of cultivation in Orissa recorded which ranged from -111.44 Rs/Qlt to 329.78 Rs/Qlt

Table 1.9 Gap between Minimum Support Prices and cost of production of Paddy in Odisha

YEAR	MSP	Cost of production	Gap
2000-01	540	477.04	62.96
2001-02	560	433.05	126.95
2002-03	560	552.75	7.25
2003-04	580	477.86	102.14
2004-05	590	493.69	96.31
2005-06	590	528.9	61.1
2006-07	610	570.35	39.65
2007-08	675	599.68	75.32
2008-09	880	715.04	164.96
2009-10	1030	793.65	236.35
2010-11	1030	955.59	74.41
2011-12	1110	1221.44	-111.44
2012-13	1280	1148.11	131.89
2013-14	1345	1399.1	-54.1
2014-15	1400	1405.45	-5.45
2015-16	1450	1450.32	-0.32
2016-17	1510	1426.87	83.13
2017-18	1590	1394.01	195.99
2018-19	1770	1459.43	310.57
2019-20	1835	1505.22	329.78

3.7.2 Gap between Farm Harvest Prices and Minimum Support Prices of paddy in India

The gap between Farm Harvest Prices and Minimum Support Prices of paddy in Odisha markets of are presented in the Table 1.10 results revealed that the average gap between FHP and MSP of paddy in Odisha recorded was 130.85 Rs. /Qlt.

Table 1.10 Gap between Farm Harvest Prices and Minimum Support Prices of Paddy in Odisha

S.N.	STATES	FHP	MSP	Gap (MSP-FHP)
1	Odisha	915.90	1046.75	130.85

1.3.7.3 Deviations of FHPs from MSPs of paddy in Odisha

To examine the effectiveness of MSP policy for paddy in Odisha, difference between its FHP and MSP was calculated in different years and is given in Table 1.11 Odisha experienced positive deviations 2, times in 20 years during 2000-01 to 2019-20. This means that the average FHP was ruled higher than MSP in 2 times out of 20 years. The adjusted difference (positive) between MSP and FHP was low as 10 per cent of MSP and the negative difference was 90 per cent.

Table 1.11 Deviations of FHPs from MSPs of paddy in Odisha

		POSITIVE DEVIATION				
S.N.	STATE	Frequency	MAPD	Range	AMPD	Per cent
1	Odisha	2	173	3-173	14.4	10
		NEGATIVE DEVIATION				
		Frequency	MAND	Range	AMND	Per cent
1	Odisha	18	-146.84	(-2)-(-356)	-16.2	90

3.8 Impact of MSP on Area, production and productivity of Paddy on Odisha

The numerical values of the linear lag function for paddy indicates that R^2 is significant at 1 per cent level and supports the results that variation in Area of paddy is explained by the explanatory variable, i.e. previous year's minimum support Prices of the Paddy. Table no 1.12 revealed that 66 per cent variation in area, 43 per cent variation in production, 25 per cent variation in productivity of Odisha is explained by independent variable i.e. lagged MSP.

The elasticity for these variables is significant at 1 per cent level in case of area, production and productivity found as -0.33 per cent, 1.90 per cent, 0.72 per cent respectively indicating thereby that previous year Prices influences current year's area production and productivity of major growing State Odisha.

Table 1.12 Impact of MSP on Area, production and productivity of Paddy on Odisha

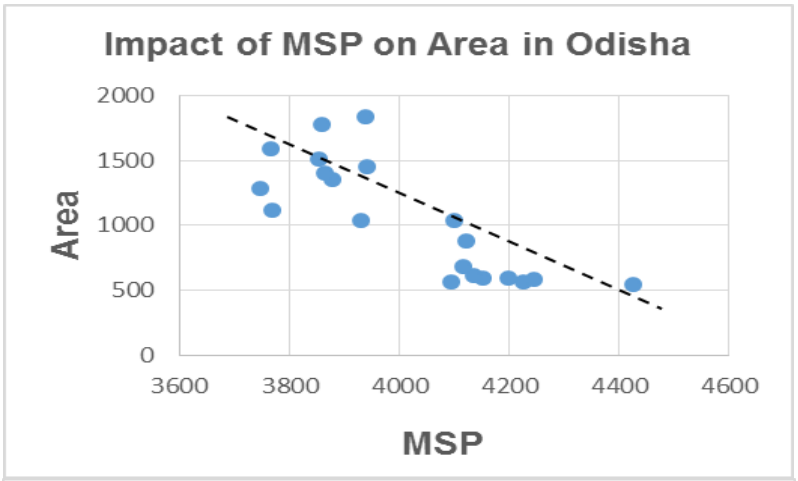
S.N.	**Variables**	**R^2**	**S.E. of R**	**Linear regression equation**
1	Area	0.66	103.08	A_t= 4332.03+(-0.33)Pr_{t-1}
2	Production	0.43	958.05	P_t=4447.35+(1.90) Pr_{t-1}
3	Productivity	0.25	543.55	Y_t=1198.65+(0.72)Pr_{t-1}

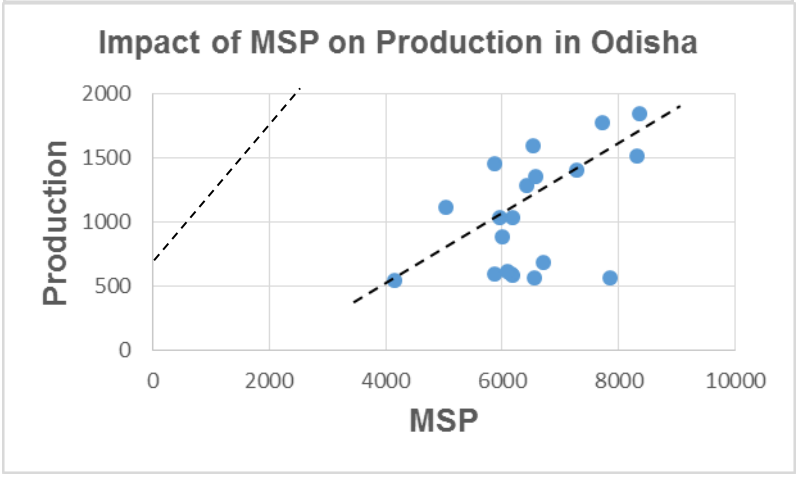
A_t= Area of paddy crop at (t^{th}) period,

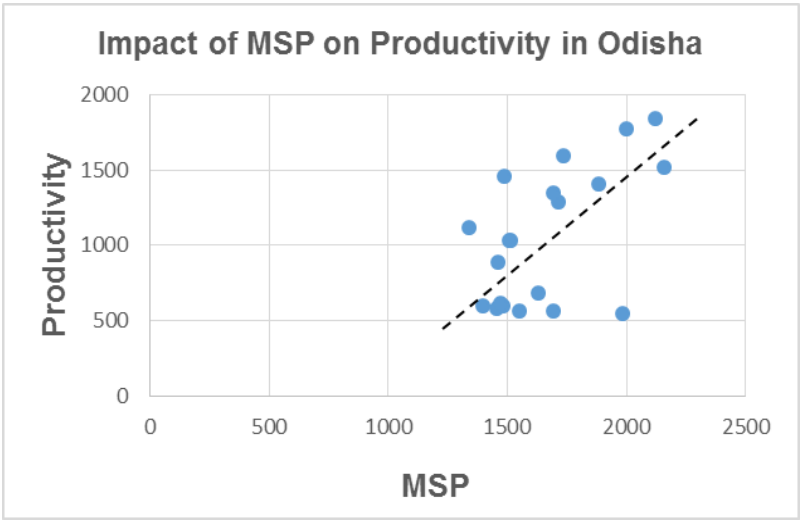
P_t = Production of paddy crop at (t^{th}) period,

Y_t= Area of paddy crop at (t^{th}) period,

Pr_{t-1} = MSP of paddy taken in Per quantal at ($t-1^{th}$) period







IV. CONCLUSIONS

The study of temporal changes, growth rate and trend enable one to indicate the general direction of change in Prices in different markets. To study the effectiveness of the Prices policy during the harvest periods, the deviations of farm harvest Prices (FHP) from the Minimum Support Prices (MSP) were worked out and divided into positive and negative deviations to examine whether market Prices ruled higher or lower than the minimum support Prices. The negative deviations reflected ineffectiveness of MSP policy for producers. These deviations were adjusted with MSP in order to examine the degree of their departure from the minimum support Prices. By using linear and logarithmic regression equations we examined the impact of previous year Minimum Support on farmer decision on acreage allocation, production, productivity for the current year.

The total cost of Paddy in Odisha has gone up from 22822.44 per hectare in 2000-01 to 45239.04 per hectare in 2010-11 and 101525.6 per hectare in 2019-20 depicting an increase during a period of study. The increase has occurred in all major items the cost of machine labour 377.33 per cent and 3064.74 per cent recorded the maximum share during percent change over in 2010-11 to 2019-20 respectively. The gross return for Paddy has recorded 419.92 per cent and 217.01 per cent form 2010-11 to 2019-20 respectively during the period study.

In Odisha the compound growth rates of various cost revealed that, during overall period growth rates of cost were increasing significantly at 5 per cent level of significance. Among the cost the growth rate for Cost-B found highest increased significantly 10.71 per cent during the study period followed by Cost-C, Cost-A and Cost of production has found increased significantly by 9.44 per cent, 8.91 per cent and 8.01 per cent resp. during the study period.

Trend analysis of cost of paddy and Prices i.e. MSP and FHP for the overall period showed that, a wide range of models has been explored, among the competitive models the best fitted models are selected based on the R^2 significance. Among the competitive parametric models, almost all cases Third Degree Polynomial models are found best fitted; thereby indicating that the movement of all the series was uniform throughout the India. The gap between MSP and cost of production of Paddy in Odisha recorded which ranged from -111.44 to 329.78 Rs/Qlt. The highest gap was registered in year 2018-19 (329.78 Rs/Qlt).

Average gap between FHP and MSP of paddy gap was registered in (-136.30 Rs/Qlt). The impact of MSP shown by linear regression equation analysis. The State wise impact of MSP on the areas, production and productivity of paddy is explained by the explanatory variable, i.e., previous year's Minimum Support Prices of the paddy. The result revealed that 86 per cent, 71 per cent and 32 per cent respectively, variation in Odisha state, Value of elasticity has found as 0.38, 2.38 and 0.47 respectively for area, production and productivity. The gap analysis in which deviations of FHPs from MSPs of Paddy crop results in maximum positive deviations (FHP ruled higher than MSP) in Odisha.

REFERENCES

[1] Barmon, B. K., & Chaudhury, M. (2012). Impact of Prices and Prices variability on acreage allocation in paddy and wheat production in Bangladesh. *The Agriculturists*, *10*(1), 23-30.

[2] Gandhimathy, B. 2020. Growth and Instability of Paddy Production in India,Social vision, 7(2):119-126.

[3] Jambhulkar N. N.,Jena S. S., Mondal B. and Samal P.(2020), Estimation of Growth Rate and Instability Analysis of Area, Production and Yield of Paddy in Odisha State of India. International Journal of Current Microbiology and Applied Sciences, Volume 9 (7).

[4] Korem Sunitha, Gowda DM & Rajashekar K. 2018. Analysis of growth rates in area, production and productivity of paddy crop in Telangana State, International Journal of Chemical Studies 2018, 6(3): 283-286

[5] Monga S. and Sidana B.K. (2021), Temporal Changes in Cost Structure and Profitability of Wheat and Paddy Crops in India. Journal of Agricultural Development and Policy, 2020 Volume 30(2), 184-194.

[6] Nitiprasad, N.J., Sushree. S.J., Biswajit Mondal and Parshuram Samal, 2020. Estimation of Growth Rate and Instability Analysis of Area, Production and Yield of Paddy in Odisha State of India, International Journal of Current Microbiology and Applied Sciences, 9(7):3107-3115.

[7] Prabhakaran.K, Sivapragasam C. 2013. Analysis of growth rates of paddy and sorghum in Odisha, International Journal of Farm Sciences, 3(1): 1-9.

[8] Punit K.A.,Yadav P., Mondal S. (2018) Economic Analysis of Cost and Return Structure of Paddy Cultivation Under Traditional and Sri Method: A Comparative Study. International Journal of Agriculture Sciences, Volume 10, Issue 8, pp.-5890-5893.

[9] Sawarkar P. S., Shende N. V., Bhopale A. A. and Koshti N. R. (2022). Impact of Agricultural Prices Policy on Soybean in Vidarbha region of Maharashtra. PKV Res. J. Vol. 46(2).

[10] Shayequa Z. Alia, Sidhub R.S. and Kamal Vattac(2012), Effectiveness of Minimum Support Prices Policy for Paddy in India with a Case Study of Odisha. Agricultural Economics Research Review Vol. 25(No.2) July-December 2012 pp 231-242.

[11] Shende, N. V., I. U. Valvi, and P. V. Shende, 2017. Growth Dynamics and Acreage Response of Paddy in Eastern Vidarbha Zone of Maharashtra. International Research Journal of Agricultural Economics and Statistics. 8 (1): 121-129.

[12] Shende, N.V., 2020. Impact of Prices on Paddy Performance in Eastern Vidarbha Zone. International Journal Current Microbiology Applied Science. 9(08): 2993-2999.

[13] Thakare, S.S and Shende N.V. (2012) Temporal variation in input-output Prices and cost of cultivation of soybean in vidharbha, Journal of food legumes. Vol 25(3): pp-222-226.

[14] Thakare, S.S and Shende N.V. (2023) Prices Deviation and its Impact on Major Kharif Crops in Maharashtra, Agricultural Situation in India. 16-35.

[15] Thorat, V.A; Dhekale; R.M. Joshi;Bhosale, J.M. Talathi (2017). The temporal and structural changes in cost of cultivation of paddy in konkan region, AGROSCO report, Dept. of Agricultural Economics.

[16] Tingare, A. S; A.A.Bhopale; R.G. Deshmukh(2015).The temporal variation in input cost and output Prices of major crops in Vidharbha, Maharastra journal of Agricultural Economics, Vol.18(1).