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Research Paper

INPUTS USE DIFFERENCES AND NATURE OF INSTABILITY IN COST AND RETURNS OF PRINCIPAL CROPS IN MADHYA PRADESH

O O Olayiwola[1]*, P K Awasthi[1] and N K Raghuwanshi[1]

Corresponding Author:* ***O O Olayiwola* ✉ *olubodun_2008@yahoo.com*

Cost and returns studies are backbone in the field of research in agricultural economics which is quite evident of the fact that all systematic research in our discipline started with cost studies not only in India but at abroad also. These studies went through various stages and were refined every time with the experience, looking to inputs use differences and the nature of instability in cost and returns of principal crops in Madhya Pradesh of India. Principal crops relative changes were worked out which gives better comparison than absolute changes. Crops to be covered for the research work are: wheat, soya bean, grams, paddy, lentil, cotton and mustard oil. Taking into consideration the importance of the cost and return studies for farm planning and policy decisions at the micro level, the present study was conducted to analyze input use differences and nature of instability in cost and returns of principal crops in Madhya Pradesh.

Keywords: Instability, Principal Crops, Inputs Use, Madhya Pradesh

INTRODUCTION

Agriculture plays a dominant role in India. Economy starting from the human civilization with the progress of agricultural practices, human are directly or indirectly depend on agriculture. The farmer society in India is not homogeneous in respect to social, economic and other developmental process. Apart from economics differentiation among the land ownership, productivity and application of improved production technologies, there are socioeconomic gradations resulting from the deep rooted farming system. Agriculture is now growing on industrial footing. The present trend of the population growth is putting heavy pressure on the agriculture land especially on the face of the fact that with the growth of industries and modern civilization everything is increasing except agriculture land. The only alternatives to boost the economy now rest with increasing productivity and improved agricultural technology through adoption of improved varieties seed, frequent irrigation, use of insecticides and pesticides which involved expenditure toward production and created

[1] Department of Agricultural Economics & Farm Management, Jawaharlal Nehru Krishi Vishwa Vidyalaya Agricultural University, Jabalpur, India.

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doubts in the mind of farmers. Taking into consideration the importance of the cost and return studies for farm planning and policy decisions at the micro level, the present study was conducted to analyze input use differences and nature of instability in cost and returns of principal crops in Madhya Pradesh.

METHODOLOGY

The study was conducted at Madhya Pradesh. The state is situated at the heart of India and lies between latitude 21°6' and 26°54' N and longitude 74° and 82°47' E. It covers a geographical area of 308, 245 sq. km which is about 9.38% of the total area of India. The State is land - locked and at no point is the sea less than 300 km away. Uttar Pradesh, Chhattisgarh, Andhra Pradesh, Maharashtra, Gujarat and Rajasthan are surrounding states. There are many important rivers which cross through Madhya Pradesh. Narmada River is the most important of all and is known as the lifeline of Madhya Pradesh. The hills give rise to the main river systems - the Narmada and the Tapti, running from east to west, and the Chambal, Sone, Betwa, Mahanadi, and the Indravati west to east. The behavior of principal crops relative changes was worked out by the method below which gives better comparison than absolute changes. Crops to be covered for the research work are: wheat, soya bean, grams, paddy, lentil, cotton and mustard oil. The following analytical method was used:

1. Absolute changes = $Y_N - Y_0$

1. Relative Change (RC %) = $\frac{Y_N - Y_O}{Y_O} \times 100$

where,

Y_n = Triennium Current year i.e. average of last three years

Y_0 = Triennium Base year i.e. average of first three years

GROWTH RATES

Compound growth rates were estimated with the following exponential model using least square techniques which are given below:

$$Y = ab_t \quad ...(2)$$

where,

Y= Trend value of dependent variable (area/ total production/yield)

a = Constant

b =Trend coefficient (slope of line)

t = Time variable (Years)

The function takes the form of a linear equation in logarithmic and become log- linear as under:

$$\text{Log } Y = \log a + \log b \quad ...(3)$$

Compound growth rate (CGR)

$$= (\text{Antilog } b-1) \times 100 \quad ...(4)$$

TEST OF SIGNIFICANCE

The results of empirical research must be put to test for their degree of acceptability. In statistics, these come under "test of significance". For testing the hypothesis, suitable statistical test are applied. These are applied to assess their significance at 1% and 5% level of significance for the period which are spelled out in the following section:

P_1, P_2 *and* P_3 Standard error (SE) ...(5)

where,

r = Coefficient of multiple determination

n= Number of observation

't 'test

To test the significance of b value of the trend equation, 't' test was used.

$$t = \frac{\text{anti}\log b}{\text{SE}} \sim (n - 2)\text{ d.f}$$

where,

b = Independent variable

SE = Standard error.

df = Degree of freedom

Source: (Corelli *et al.*, 2005)

RESULTS AND DISCUSSION

Table 1 represented the detail analysis of economic production and the variation according to the rupees in cued during the cultivation of wheat and paddy crops. The Gross Income from cultivation of wheat was found to be Rs.15631.9

Table 1: Pattern of Input Use and Income of Cereal Crops in Madhya Pradesh

Cereals Crops		Indicators				
		AC (RC %)	CV	SGR	CGR	R2
Wheat	Seed	48.1(71.3)	18.16	2.45	2.65	0.84
	Fertilizer	44.8(118.3)	27.68	3.64	5.15	0.79
	Manure	2.59 (64.7)	85.02	12.18	23.30	0.94
	H.L	211.0 (128.7)	26.88	3.46	3.45	0.76
	A.L	42.5(230.8)	32.16	4.60	5.35	0.94
	R.V	-	-	-	-	-
Cost of Cultivation(Rs/ha)	A2	5289.2 (98.3)	33.22	4.06	4.48	0.69
	C3	8811.05 (88.11)	29.30	3.56	4.03	0.68
Cost of Production (Rs/qty)	A2	150 (73.18)	18.33	2.57	2.72	0.90
	C3	281.0(82.13)	24.41	3.10	3.47	0.74
Yield(qty/ha)		32.19(24.31)	53.26	6.25	7.08	0.96
Gross Income(Rs/ha.)		15631.9(185.4)	49.62	6.23	7.04	0.84
Paddy	Seed	62.3(79.6)	19.27	2.66	2.68	0.88
	Fertilizer	21.7(40.3)	14.74	1.10	1.05	0.26
	Manure	15.7(18.36)	56.74	8.05	10.51	0.92
	H.L	359.5(173.5)	30.99	4.02	4.91	0.77
	A.L	211.0(128.4)	26.88	3.46	3.45	0.76
	R. V	-	-	-		-
Cost of Cultivation(Rs/ha)	A2	1051.16(21.95)	21.95	9.94	11.05	0.41
	C3	1354.55(12.95)	6.93	0.60	0.62	0.34
Cost of Production (Rs/qty)	A2	338.53(82.13)	37.17	5.00	6.40	0.83
	C3	317.54(92.21)	21.44	2.64	3.04	0.70
Yield(qty/ha)		11.95(55.38)	23.81	0.30	0.49	0.71
Gross Income(Rs/ha.)		16802.78(176.84)	49.62	14.96	13.62	0.83

while the Gross Income for paddy crop was Rs.16802.78, respectively. There was slight difference in wheat and paddy crops despite the fact that they belongs to the same family kingdom (cereals crops). The variation in income during wheat and paddy crops cultivation was as a result of disparity in the distribution of inputs used during the cultivation in Madhya Pradesh of India. The result was similar to Suhag *et al.* (2012) findings when conducted research that focused on technical efficiency of wheat farm in Northern India. The value of inputs used for paddy and wheat crops for different years was collected from cost of cultivation scheme report data and it was converted for the aggregate level by multiplying respective crop acreage for different years. The data shows that the value of seed used for wheat crops increased by 71.3% and increased by 79.6% for paddy crops. The data revealed that among the inputs considered for the study, the contribution of animal labor and manure was higher during the period (1990-91 to 2011-12). During the study period, the contribution of seeds was also notable and the value of the coefficient of multiple determinations (R^2) was higher but no available information on rent value for wheat and paddy crops in Table 1. The structural changes occurred in the absolute and relative changes for wheat and paddy crops during the cultivation have caused dramatically fluctuation in yield and gross income. Table 2 also described the pattern of inputs use and income fluctuation or variation between grams and lentil crops in Madhya Pradesh of India. The gross income of grams was found to be Rs. 9638.23 while lentil gross income was Rs. 13354.7. The contribution of all inputs are higher in grams and lentil crops except fertilizer input (0.38) used during grams cultivation and rent value input (0.43) used in lentil crops that was not impressive to contribute the huge per cents to the total factor productivity growth in the state. Table 3 explained the contribution of different inputs used during the cultivation of soya bean, mustards oil and cotton crops. The soya bean gross income was found to be Rs.13645.22, followed by cotton (Rs. 10766.20) and mustard oil (Rs. 11761) respectively. The rent value input contribution was higher in mustard oil and cotton (72 and 162%) The reason may be as result of adoption of Bt cotton production technology in Madhya Pradesh. Cotton crops have the highest values in growth rate, followed by mustard oil, and soya bean in respect to simple and compound growth rate. The result is in line with Isakson findings (2004) that research on world productivity database with special reference to India and China Agricultural system database. In addition, when compared the three tables with reference to inputs use pattern and income distribution of all the selected principal crops for the study. The contributions of all inputs are higher in all the selected principal crops except fertilizer input that was not impressive to contribute the huge percents to the productivity growth in the Madhya Pradesh. It was as a result of unclear market linkage for the distribution of fertilizer across the state. The problem has made the farmers to diversify from use of fertilizer to manure. The finding is in line with Niranjan *et al.* (2011) who studied cost analysis and profitability of major Rabi and Kharif crops in Madhya Pradesh of India. The data shows that the value of seed used for wheat crops increased by 71.3%, followed by 79.6% for paddy crops, 44.63% for lentil crops, 54.46% for mustard oil, 65.04% for cotton crops and highest values of seeds was recorded in grams crops (143.1%) and the lowest increased value of seed showed in soya bean (20.89%). The data revealed that among the inputs considered for the study, the contribution of animal labor and manure was higher during the period (1990-91 to 2011-12) except in mustard oil that is bite low as compare with other selected principal crops. During the study period, the contribution of seeds was also notable and the value of the coefficient of multiple determinations (R^2) was higher in all the selected principal crops except lentil crop. The rent value input contribution

Table 2: Pattern of Input Use and Income of Legume Crops in Madhya Pradesh

Oil Crops and Cotton		Indicators				
		AC (RC %)	CV	SGR	CGR	R2
Soya bean	Seed	16.3(20.93)	6.85	0.49	0.54	0.84
	Fertilizer	27.29(57.2)	17.12	1.39	1.45	0.31
	Manure	15.57(50.6)	57.11	8.14	10.58	0.93
	H.L	203.6(127)	26.41	3.44	3.46	0.78
	A.L	42.07(21.8)	32.28	4.63	5.30	0.95
	R.V	-	-	-	-	-
Cost of Cultivation (Rs/ha)	A2	1599(33.3)	12.90	1.71	1.75	0.81
	C3	3327(35.5)	14.70	1.92	1.95	0.78
Cost of Production (Rs/qty)	A2	395(127.4)	26.60	3.85	4.20	0.96
	C3	336(51.3)	14.07	1.92	2.05	0.86
Yield (qty/ha)		4.23(55.5)	13.98	2.06	3.02	0.90
Gross Income (Rs/ha)		13645.22(139.52)	26.06	11.61	16.54	0.82
Mustard Oil	Seed	15.75(54.4)	1.10	7.53	8.64	0.89
	Fertilizer	43.32(59.8)	25.82	2.85	3.50	0.56
	Manure	-2.58(-46.5)	40.92	-4.87	-4.54	0.65
	H.L	295(116.2)	23.62	2.87	3.35	0.68
	A.L	220(141.2)	27.77	3.78	3.78	0.85
	R.V	147.9(72.5)	19.15	2.67	2.83	0.79
Cost of Cultivation (Rs/ha)	A2	2563(74.1)	46.26	3.46	3.69	0.66
	C3	9305(109.1)	30.76	3.99	4.57	0.78
Cost of Production (Rs/qty)	A2	330(94.12)	27.45	3.46	3.81	0.73
	C3	514(76.5)	17.17	2.02	2.32	0.63
Yield (qty/ha)		4.01(127.7)	24.48	3.30	3.80	0.83
Gross Income (Rs/ha)		11761(164.6)	84.60	10.91	19.41	0.77
Cotton	Seed	37.3(65.04)	16.53	2.11	2.35	0.75
	Fertilizer	29.0(62.1)	16.57	1.52	1.52	0.39
	Manure	16.32(18.8)	65.81	9.29	12.33	0.92
	H.L	318(102.4)	21.21	2.76	3.13	0.78
	A.L	46.4(84.5)	30.48	4.32	4.84	0.92

Table 2 (Cont.)

Oil Crops and Cotton		**Indicators**				
		AC (RC %)	**CV**	**SGR**	**CGR**	**R2**
	R. V	249(162.7)	35.56	4.78	4.68	0.83
Cost of Cultivation	A2	5289(98.3)	33.22	4.06	4.48	0.69
(Rs/ha)	C3	8811(88.11)	29.30	3.56	4.03	0.68
Cost of Production	A2	728(96.6)	25.93	3.31	3.76	0.75
(Rs/qty)	C3	998.5(33.9)	38.32	8.09	12.90	0.80
Yield (qty/ha)		9.49(42.2)	21.17	10.24	10.05	0.81
Gross Income (Rs/ha)		10766.20(304.26)	68.27	18.76	20.27	0.76

Note: H. L = Human Labour, R.V = Rent Value, A.L = Animal Labour

Table 3: Pattern of Input Use and Income of Oil and Cotton Crops in Madhya Pradesh

Oil Crops and Cotton		**Indicators**				
		AC (RC %)	**CV**	**SGR**	**CGR**	**R2**
Soya bean	Seed	16.3(20.93)	6.85	0.49	0.54	0.84
	Fertilizer	27.29(57.2)	17.12	1.39	1.45	0.31
	Manure	15.57(50.6)	57.11	8.14	10.58	0.93
	H.L	203.6(127)	26.41	3.44	3.46	0.78
	A.L	42.07(21.8)	32.28	4.63	5.30	0.95
	R.V	-	-	-	-	-
Cost of Cultivation	A2	1599(33.3)	12.90	1.71	1.75	0.81
(Rs/ha)	C3	3327(35.5)	14.70	1.92	1.95	0.78
Cost of Production	A2	395(127.4)	26.60	3.85	4.20	0.96
(Rs/qty)	C3	336(51.3)	14.07	1.92	2.05	0.86
Yield (qty/ha)		4.23(55.5)	13.98	2.06	3.02	0.90
Gross Income (Rs/ha)		13645.22(139.52)	26.06	11.61	16.54	0.82
Mustard Oil	Seed	15.75(54.4)	1.10	7.53	8.64	0.89
	Fertilizer	43.32(59.8)	25.82	2.85	3.50	0.56
	Manure	-2.58(-46.5)	40.92	-4.87	-4.54	0.65
	H.L	295(116.2)	23.62	2.87	3.35	0.68
	A.L	220(141.2)	27.77	3.78	3.78	0.85
	R.V	147.9(72.5)	19.15	2.67	2.83	0.79

Table 3 (Cont.)

Oil Crops and Cotton		**Indicators**				
		AC (RC %)	**CV**	**SGR**	**CGR**	**R2**
Cost of Cultivation	A2	2563(74.1)	46.26	3.46	3.69	0.66
(Rs/ha)	C3	9305(109.1)	30.76	3.99	4.57	0.78
Cost of Production	A2	330(94.12)	27.45	3.46	3.81	0.73
(Rs/qty)	C3	514(76.5)	17.17	2.02	2.32	0.63
Yield (qty/ha)		4.01(127.7)	24.48	3.30	3.80	0.83
Gross Income (Rs/ha)		11761(164.6)	84.60	10.91	19.41	0.77
Cotton	Seed	37.3(65.04)	16.53	2.11	2.35	0.75
	Fertilizer	29.0(62.1)	16.57	1.52	1.52	0.39
	Manure	16.32(18.8)	65.81	9.29	12.33	0.92
	H.L	318(102.4)	21.21	2.76	3.13	0.78
	A.L	46.4(84.5)	30.48	4.32	4.84	0.92
	R. V	249(162.7)	35.56	4.78	4.68	0.83
Cost of Cultivation	A2	5289(98.3)	33.22	4.06	4.48	0.69
(Rs/ha)	C3	8811(88.11)	29.30	3.56	4.03	0.68
Cost of Production	A2	728(96.6)	25.93	3.31	3.76	0.75
(Rs/qty)	C3	998.5(33.9)	38.32	8.09	12.90	0.80
Yield (qty/ha)		9.49(42.2)	21.17	10.24	10.05	0.81
Gross Income (Rs/ha)		10766.20(304.26)	68.27	18.76	20.27	0.76
Note: H. L = Human Labour, R.V = Rent Value, A.L = Animal Labour						

was higher in mustard oil and cotton (79 and 83%) but no available information on rent value for the rest of the principal crops. The reason may be as result of adoption of Bt cotton production technology in Madhya Pradesh. The contributions of all inputs are higher in all the selected principal crops except fertilizer input that was not impressive to contribute the huge per cents to the productivity growth in the state.

SUGGESTIONS

The following suggestions emerged from the study and they are:

- There is a need for clear cut market supply for fertilizer distribution in Madhya Pradesh of India.
- There are needs for government to subsidies price of seeds and to encourage more hybrid seeds that enhanced more outputs.
- Adequate farm inputs must be made available at cheap price to the farmers and government must follow a clear channel supply systems of inputs.
- Frequency of extension visits should be increased to encourage wider spread and adoption of improved farm technology.

- Strengthening support and Public-Private Partnership so as to boost production and win niche markets with a challenge of making better markets for farmers, while at the same time ensuring that production technologies adopted is more environmentally sustainable.

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Hyderabad, INDIA. Ph: +91-09441351700, 09059645577

E-mail: editoriajavs@gmail.com or editor@iajavs.com

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