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Temporal Changes in Cost Structure and Profitability of Wheat and Paddy Crops in India

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Abstract

The paper evaluates the trend of cost structure and profitability in wheat and paddy in major producing states in India using secondary data for the period 1994-95 to 2015-16.The study revealed that cost of cultivation increased over years and human labour has largest share in operational cost and continuously increased during the study period whereas the animal labour substituted by machine labour. The high productivity states in paddy crop like Andhra Pradesh, Punjab and Madhya Pradesh have maintained profits over years, whereas the low productivity states like Bihar, Odisha and West Bengal have shown negative profits. The return per rupee was found to be highest in Punjab and lowest in Odisha. The percentage margin of MSP over cost A_2+ FL in wheat crop was highest in Punjab(169.6%) and lowest in Uttar Pradesh (67.8%). The Margin of MSP over cost A_2+ factor cost+50% will be beneficial for some states whereas it will not provide any additional benefits to farming sector of other states as it is more than 100% in Punjab, Haryana and Madhya Pradesh in 2015-16 whereas this margin was just 70 percent in Bihar and Uttar Pradesh. Therefore, the government must rebuild the procurement operations in the country and also focus on the agriculture research and extension programmes, cost reduction, productivity growth and creating marketing infrastructure. This will help in boosting the farmer's income and reduce rural poverty.

Keywords: Cost, India, MSP, paddy, profitability, wheat

JEL Classification: Q12,Q16

Introduction

India being an agrarian country has reached a long-distance in development of its primary sector after the implementation of "Green Revolution" during mid-sixties. Green revolution resulted in introduction of high yielding varieties, fertilizers and technological changes in agricultural structure of the country but this transformation was witnessed in certain crops and regions only (Nelson et al 2019). It led to emergence of wheat-paddy cycle in Punjab, Haryana and Western Uttar Pradesh (Gurjar and Varghese, 2005). It has resulted in surpassing increase in production of cereal crops, which also turned the tables for hunger crisis in India. With the implementation of minimum support price policy, cost structure and income generation of farmer improved and enhanced, respectively during this period.The assured MSP led to increased trend of profitability till mid-eighties but increased cost of cultivation during late nineties led to squeezed profits. Aspect like MSP played a major role in increasing income of farmers but some studies have showed that only 23.72 and 20.04 per cent of agricultural farmers are aware of its implementation (Aditya K S et al 2017). It was observed that application of MSP was only in certain states backed by procurement policy (Ali et al. 2012; Tripathi 2013).

But with time increasing cost of cultivation has led to squeezing of returns and hence profitability. This transformation in agricultural structure has led to chronological changes in farm income and crop profitability for farmers. Most of the farmers from India are bearing acute stress levels because of poor return from crop cultivation. Under certain circumstances,

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it is really hard to raise the agricultural growth by 4 percent as illustrated by the policy makers in recent years. Without adequate profits, farmers may show less interest to get recommended inputs regarding enhancement of crop's productivity at the appropriate time (Naravanmoorthy, 2013).

Indian agriculture is facing several challenges. Despite national food surpluses, wide spread poverty and hunger remains has not declined proportionality. Moreover, with the increase in per capita income and growing pressure of increasing urbanization and population, total cereal demand is expected to grow by nearly 85 million metric tonnes. However, it has been observed that relatively higher growth in production of all major crops during and after the green revolution has shown remarkable increase in returns. But in the recent years, there has been considerable concern regarding productivity growth and sustainability of these agriculture systems, as the growth rates of cereals are either stagnating or declining (Paroda *et al* 1994). The use of modern inputs was overused in some parts of country, especially in agricultural surplus states and further intensification of inputs was providing low returns (Byerlee, 1992). The productivity of cereals in major producing states has reaches peak and now further increase in productivity is a major concern for the policy planners. So there is a need to explore issues related to the trends in agricultural productivity, particularly with reference to cereal crops in recent years.

Rice and Wheat are the most efficient crops in Indian agriculture and myriads of farmers are dependent on income of these crops. Both crops are cultivated in about 40 per cent of the gross sown area, and cost and returns structure of those can help out in deciding future price policies. (Dev and Rao, 2010). The production and productivity of both the crops are critical in the current scenario of population growth and food security with sustainable resource use (Monga and Sidana, 2019)

In this paper an attempt has been made to study the issue of profitability in wheat and paddy crops in an in-depth manner using temporal data. The trends in profitability, structural changes in share of inputs in operational cost, prices realised, margin of MSP over cost C_2 and cost A_2+ FL has also been structured.

Data Sources and Methodology

Secondary data regarding cost of cultivation and input use for wheat and paddy were collected from published reports as well as soft copies of cost estimates provided by Directorate of Economics & Statistics, Ministry of Agriculture and Farmer Welfare, GOI. The time series data were collected for 22 years starting from 1994-95 to 2015-16 . For trend analysis, three years' average (i.e. triennium ending [TE] of different variables) were calculated to find out the inter-year fluctuations.

Various cost concepts and profitability measures were used for the analysis. Different cost concepts and items of cost of cultivation (per ha) of farm management are taken in the present study are as follows:

Cost A_1 = All paid-out costs.

These includes (i) Value of seed (ii) Value of insecticides and pesticides (iii) Value of fertilizers(iv) Value of manure(v) Irrigation charges (vi) Value of hired bullock labour (vii) Value of owned bullock labour (viii) Value of hired human labour (ix) Value of owned machine labour (x) Value of hired machine labour (xi) Depreciation on implements and machinery (xii) Land revenue (xiii) Interest on working capital (xiv) Miscellaneous expenses

Cost A_2 = Rent paid for leased-in land + Cost A_1

Cost A_2+FL= Imputed value of family labour +Cost A_2

Cost B_1 = Interest on values of owned fixed capital assets (excluding rent) + Cost A_1

Cost B_2 = Rental value of owned land + Rent paid for leased-in land +Cost B_1

Cost C_1= Imputed value of family labour+ Cost B_1

Cost C_2 = Imputed value of family labour +Cost B_2

The study used the following profitability measures:

Farm Business Income (FBI) = Gross value of output –Cost A_2

Return over A_2+FL cost= Gross value of output –Cost A_2+FL

Net return (NR) = Gross value of output – Cost C_2

Farmers Realised Price (Implicit price) = Value of main product/yield (Rs per quintal)

Returns per rupee (RPR) = Gross income/ Cost C_2

Results and Discussion

Structural change in cost of cultivation

Wheat

Wheat is not only one of the important foodgrains of the country but is also most productive and economically

profitable crop in the Indian farming system. The share of input in operational cost of wheat has been presented in Table 1. It was observed from the table that human labour had the largest share in the operational cost in all the states during study period. Except Punjab, all states showed increasing trend in share of human labour in operational cost. Haryana showed the highest human labour share i.e. 37.9 per cent closely followed by Bihar (35%) in the operational cost during the period TE 2015-16. The share of animal labour continuously declined in all states due to gradual shift towards mechanisation in wheat cultivation. On the other hand, machine labour used in wheat cultivation witnessed steady rise in all the states from the period 1996-97 to 2015-16. The share of fertilizer and manure was also comparatively high in operational cost but it showed declining trend in all the states during the study period.

The share of seed in operational cost remained stagnant during the study period although in absolute terms the cost has increased due to increase in price of fertilizers. The share of plant protection chemicals increased at a fast pace only in Punjab i.e. 4.4 to 7.0 per cent in operational cost. This increase may be mainly on account of the shift from diversified cropping pattern toward mainly two crops i.e. paddy in kharif and wheat in rabi season which led to higher insect and disease infestation in the crop resulting in higher use of plant protection chemicals. In Punjab, the share of human labour in operational cost witnessed a fluctuating trend during the successive periods and decline to 23.2 per cent in TE 2015-16 as compared to 33.9 per cent in the year TE 1996-97 whereas share of machine labour experienced an increase of 18 per cent to 34 per cent during the same period. The machine labour was followed by human labour, fertilizer& manure, seed, insecticide and irrigation charges with their respective shares of 23.2 per cent, 21.9 per cent, 8.5 per cent, 7.0 per cent and 1.9 per cent during TE 2015-16. The share of irrigation in operational cost of wheat cultivation was found accelerating in major wheat growing states but in Punjab this share was not only very low about 4 per cent as compared to other states, but also has reduced during study period. The amount of expenditure on irrigation for the TE 2015-16 was near about Rs 4000 per hectare for all the states, except Punjab wherein this amount was just Rs 464 per hectare. This is due to the fact that electricity for irrigation in Punjab is heavily subsidised which is not prevalent in other states.

Paddy

Human labour took the first place whereas fertilizer and manure took the second place among all the major cost components of paddy during study period (Table 2). Odisha state showed the highest human labour share i.e. 66.5 per cent intimately followed by West Bengal (64.4%) in the operational cost during the period. The machine labour used in paddy cultivation continuously increased in all the states from period 1996-97 to 2015-16 signifying increased use of technology or mechanization. The share of fertilizer & manure in operational cost hovered around 11 to 16 per cent during TE 2015-16, though in absolute terms, at current prices, the amount of expenditure spends on fertilizer & manure has increased. All the selected states, except Punjab and Uttar Pradesh depicted a decline in the share of seed in operational cost during study period. The quantity as well as price of fertilizer & manure and seed have not changed much relative to other components of operational cost, so the share of seed showed declining trend in total operational cost. Fast growth in cost of plant protection chemicals, cost of machine power used, cost of seed and human labour was observed in cultivation of paddy in major producing states implying thereby that crop cultivation now requires more capital.

Trend in costs and returns

Wheat

The data on cost and returns from wheat crop in major producing states at different points of time have been presented in Table 3. It was interesting to note that per hectare cost A_2 of major wheat producing states in TE 2015-16 ranged between Rs 19519 to Rs 26406 clearly depicting more than fourfold increase than TE 1996-97.

The cost A_2 of Punjab, Haryana and Uttar Pradesh for wheat crop came out to be approximately Rs 26000 per hectare, as the rent paid for leased in the land is highest in these states. The gross value of output increased almost four fold during the study period in all states. Highest gross value of output has been recorded in Haryana i.e. Rs 78171 nearly followed by Punjab (Rs 76785). This record increase is due to increase in productivity as well as in price. On the other hand, Bihar and Uttar Pradesh showed less profitability in wheat during study period. This was due to low productivity ranging from 27 to 32 quintals per hectare in wheat

Table 1. Structural change in share of inputs in operational cost of wheat cultivation in major wheat producing states of India, 1994-95 to 2015-16 **(Rs/ha)**

Year	Human Labour	Animal Labour	Machine Labour	Seed	Fertilizer & Manure	Insecticide	Irrigation charges	Other charges*	Operational Cost
Bihar									
TE 1996-97	1914.1 (30.5)	921.4 (14.7)	601.5 (9.6)	690.4 (11.0)	1308.6 (20.9)	0.3 (0.0)	752.5 (12.0)	154.9 (2.5)	6273.6 (100.0)
TE 2006-07	2663.7 (25.6)	549.4 (5.3)	2334.4 (22.4)	1254.1 (12.0)	1708.0 (16.4)	0.0 (0.0)	1630.4 (15.7)	271.8 (2.6)	10411.8 (100.0)
TE 2015-16	9138.3 (35.0)	171.9 (0.7)	5495.7 (21.0)	2924.8 (11.2)	4224.7 (16.2)	32.9 (0.1)	3487.3 (13.4)	639.0 (2.4)	26114.7 (100.0)
Haryana									
TE 1996-97	2564.0 (32.5)	238.1 (3.0)	1542.5 (19.5)	656.1 (8.3)	1751.2 (22.2)	60.9 (0.8)	892.4 (11.3)	189.9 (2.4)	7894.9 (100.0)
TE 2006-07	4343.9 (28.2)	367.6 (2.4)	4077.0 (26.4)	1146.4 (7.4)	2516.0 (16.3)	674.4 (4.4)	1913.6 (12.4)	378.7 (2.5)	15417.7 (100.0)
TE 2015-16	12796.9 (37.9)	101.3 (0.3)	8457.6 (25.0)	2380.3 (7.0)	4391.1 (13.0)	885.1 (2.6)	4018.9 (11.9)	774.1 (2.3)	33805.3 (100.0)
Madhya Pradesh									
TE 1996-97	1619.3 (30.0)	536.2 (9.9)	762.7 (14.1)	714.1 (13.2)	898.8 (16.7)	0.6 (0.0)	727.6 (13.5)	132.6 (2.5)	5391.6 (100.0)
TE 2006-07	2635.2 (27.0)	689.8 (7.1)	1876.0 (19.2)	1245.9 (12.7)	1247.0 (12.8)	4.4 (0.0)	1830.8 (18.7)	247.5 (2.5)	9776.6 (100.0)
TE 2015-16	7992.3 (32.7)	615.3 (2.5)	6260.3 (25.6)	2704.9 (11.1)	2822.8 (11.5)	34.0 (0.1)	3403.0 (13.9)	638.1 (2.6)	24470.6 (100.0)
Punjab									
TE 1996-97	2576.0 (33.9)	44.4 (0.6)	1384.4 (18.2)	537.3 (7.1)	2143.6 (28.2)	332.3 (4.4)	339.8 (4.5)	231.7 (3.1)	7589.6 (100.0)
TE 2006-07	2725.5 (21.3)	74.0 (0.6)	4152.0 (32.4)	958.3 (7.5)	2878.0 (22.5)	1076.5 (8.4)	508.6 (4.0)	433.5 (3.4)	12806.3 (100.0)
TE 2015-16	5615.0 (23.2)	54.9 (0.2)	8283.1 (34.3)	2061.8 (8.5)	5285.4 (21.9)	1684.7 (7.0)	464.8 (1.9)	702.3 (2.9)	24151.9 (100.0)
Uttar Pradesh									
TE 1996-97	2316.0 (30.9)	647.6 (8.7)	1188.6 (15.9)	745.0 (10.0)	1535.9 (20.5)	15.0 (0.2)	857.7 (11.5)	181.0 (2.4)	7486.7 (100.0)
TE 2006-07	3768.4 (26.2)	685.0 (4.8)	3276.2 (22.8)	1461.6 (10.2)	2157.2 (15.0)	27.9 (0.2)	2657.8 (18.5)	365.2 (2.5)	14399.3 (100.0)
TE 2015-16	10620.1 (34.7)	588.5 (1.9)	6523.5 (21.3)	3098.8 (10.1)	4651.8 (15.2)	66.8 (0.2)	4336.7 (14.2)	716.8 (2.3)	30602.8 (100.0)

crop accompanied by prices ranging from Rs 1440 to Rs 1443 per quintal whereas productivity in Haryana and Punjab was ranging from 43 and 47 quintals per hectare with a price of Rs 1525 per quintal. The per hectare net return which is difference between gross value of output and cost C_2 came out to be the highest in Punjab (Rs 21978) followed by Haryana (Rs 15485), Madhya Pradesh, (Rs 12911) Bihar (Rs 8923) and Uttar Pradesh (Rs 4103). Punjab has been marked as highest profitable state with return per rupee of 1.40 and Uttar Pradesh marked as lowest profitable state with RPR of 1.08 in TE 2015-16.

Table 2. Structural change in share of inputs in operational cost of paddy cultivation in major paddy producing states of India, 1994-95 to 2015-16 (Rs/ha)

Year	Human Labour	Animal Labour	Machine Labour	Seed	Fertilizer & Manure	Insecticide	Irrigation charges	Other charges*	Operational Cost
					Andhra Pradesh				
TE 1996-97	6376.1	589.4	957.5	566.8	2334.8	404.5	586.3	315.9	12131.2
	(52.6)	(4.9)	(7.9)	(4.7)	(19.2)	(3.3)	(4.8)	(2.6)	(100.0)
TE 2006-07	9160.0	759.2	2276.2	861.5	2993.0	990.2	737.7	511.3	18289.1
	(50.1)	(4.2)	(12.4)	(4.7)	(16.4)	(5.4)	(4.0)	(2.8)	(100.0)
TE 2015-16	25506.7	573.4	9052.4	2006.1	7949.6	2626.2	1236.4	1321.4	50272.3
	(50.7)	(1.1)	(18.0)	(4.0)	(15.8)	(5.2)	(2.5)	(2.6)	(100.0)
					Bihar				
TE 1996-97	2860.9	837.1	238.0	598.5	715.5	0.0	14.6	123.0	5387.6
	(53.1)	(15.5)	(4.4)	(11.1)	(13.3)	(0.0)	(0.3)	(2.3)	(100.0)
TE 2006-07	5494.9	707.9	1292.1	795.8	1168.0	8.1	594.1	254.5	10315.4
	(53.3)	(6.9)	(12.5)	(7.7)	(11.3)	(0.1)	(5.8)	(2.5)	(100.0)
TE 2015-16	15229.0	335.4	3504.5	1644.1	2962.7	19.0	2603.3	618.4	26916.5
	(56.6)	(1.2)	(13.0)	(6.1)	(11.0)	(0.1)	(9.7)	(2.3)	(100.0)
					Madhya Pradesh				
TE 1996-97	2388.5	1193.5	233.2	465.6	804.0	65.3	60.0	126.1	5336.3
	(44.8)	(22.4)	(4.4)	(8.7)	(15.1)	(1.2)	(1.1)	(2.4)	(100.0)
TE 2006-07	3735.5	1413.6	727.2	745.5	1334.2	22.2	274.8	180.1	8433.0
	(44.3)	(16.8)	(8.6)	(8.8)	(15.8)	(0.3)	(3.3)	(2.1)	(100.0)
TE 2015-16	12087.0	3670.4	4043.8	1995.4	3885.6	836.0	521.5	687.1	27726.8
	(43.6)	(13.2)	(14.6)	(7.2)	(14.0)	(3.0)	(1.9)	(2.5)	(100.0)
					Odisha				
TE 1996-97	3503.2	889.5	86.1	398.7	1055.9	31.6	17.3	135.2	6117.4
	(57.3)	(14.5)	(1.4)	(6.5)	(17.3)	(0.5)	(0.3)	(2.2)	(100.0)
TE 2006-07	7236.0	2107.4	561.3	613.1	1823.7	113.0	105.4	283.5	12843.4
	(56.3)	(16.4)	(4.4)	(4.8)	(14.2)	(0.9)	(0.8)	(2.2)	(100.0)
TE 2015-16	26803.8	3569.2	3275.6	1149.4	4389.6	207.3	120.4	783.0	40298.4
	(66.5)	(8.9)	(8.1)	(2.9)	(10.9)	(0.5)	(0.3)	(1.9)	(100.0)
					Punjab				
TE 1996-97	3165.4	52.1	1367.5	310.0	1667.0	694.9	1503.5	236.5	8996.8
	(35.2)	(0.6)	(15.2)	(3.4)	(18.5)	(7.7)	(16.7)	(2.6)	(100.0)
TE 2006-07	4979.1	68.6	3217.0	634.4	2483.2	1329.9	2640.7	446.1	15799.0
	(31.5)	(0.4)	(20.4)	(4.0)	(15.7)	(8.4)	(16.7)	(2.8)	(100.0)
TE 2015-16	14822.9	42.8	5989.2	1723.9	3864.5	4034.5	2395.7	870.3	33743.8
	(43.9)	(0.1)	(17.7)	(5.1)	(11.5)	(12.0)	(7.1)	(2.6)	(100.0)
					Tamil Nadu				
TE 1996-97	6835.7	847.1	1062.7	1400.8	1956.5	248.2	401.7	367.4	12866.2
	(53.1)	(6.6)	(8.3)	(10.9)	(15.2)	(1.9)	(3.1)	(2.9)	(100.0)
TE 2006-07	10543.6	737.8	3747.9	1856.8	3691.3	439.5	1161.0	590.4	22768.3
	(46.3)	(3.2)	(16.5)	(8.2)	(16.2)	(1.9)	(5.1)	(2.6)	(100.0)
TE 2015-16	24190.3	212.5	10099.6	6548.4	8731.8	1513.6	2221.5	1407.3	54924.8
	(44.0)	(0.4)	(18.4)	(11.9)	(15.9)	(2.8)	(4.0)	(2.6)	(100.0)
					Uttar Pradesh				
TE 1996-97	3278.7	573.2	543.1	587.3	1006.9	68.2	352.0	139.1	6548.4
	(50.1)	(8.8)	(8.3)	(9.0)	(15.4)	(1.0)	(5.4)	(2.1)	(100.0)
TE 2006-07	6025.9	658.8	1447.2	1340.9	1742.1	61.3	1751.8	302.4	13330.5
	(45.2)	(4.9)	(10.9)	(10.1)	(13.1)	(0.5)	(13.1)	(2.3)	(100.0)
TE 2015-16	17898.8	994.1	4479.9	3508.8	4321.1	242.4	4253.1	799.3	36497.4
	(49.0)	(2.7)	(12.3)	(9.6)	(11.8)	(0.7)	(11.7)	(2.2)	(100.0)
					West Bengal				
TE 1996-97	5296.5	1013.0	257.7	422.5	1123.3	119.7	581.7	198.0	9012.3
	(58.8)	(11.2)	(2.9)	(4.7)	(12.5)	(1.3)	(6.5)	(2.2)	(100.0)
TE 2006-07	10105.4	2492.0	724.3	697.3	2050.9	258.9	1045.4	408.8	17783.0
	(56.8)	(14.0)	(4.1)	(3.9)	(11.5)	(1.5)	(5.9)	(2.3)	(100.0)
TE 2015-16	32863.5	2006.5	3615.3	1892.8	5794.1	1191.7	2558.8	1086.5	51009.2
	(64.4)	(3.9)	(7.1)	(3.7)	(11.4)	(2.3)	(5.0)	(2.1)	(100.0)

Table 3. Costs and returns from wheat in major wheat producing states of India, 1994-95 to 2015-16

(Rs/ha)

Year	Cost A_2	Cost A_2+FL	Cost C_2	Gross Value	Farm Business Income	Profit over Cost A_2+FL	Net Returns	Net Returns per rupee (RPR)
					Bihar			
TE1996-97	5433	6481	10101	12391	6958	5910	2290	1.23
TE2006-07	8955	10450	15308	16264	7309	5814	956	1.06
TE2015-16	21643	26670	38884	47806	26163	21136	8923	1.23
					Haryana			
TE 1996-97	6290	8162	13937	19129	12839	10967	5192	1.37
TE 2006-07	12760	15582	25032	30627	17867	15045	5595	1.22
TE 2015-16	26098	34361	62685	78171	52072	43810	15485	1.25
					Madhya Pradesh			
TE 1996-97	4682	5719	9254	10887	6205	5168	1633	1.18
TE 2006-07	7990	9546	15556	18625	10635	9079	3069	1.20
TE 2015-16	19519	24974	41926	54837	35318	29863	12911	1.31
					Punjab			
TE 1996-97	8072	8983	15300	18656	10583	9673	3355	1.22
TE 2006-07	13511	14394	24437	30890	17380	16497	6453	1.26
TE 2015-16	26406	29246	54807	76785	50379	47539	21978	1.40
					Uttar Pradesh			
TE 1996-97	6433	7948	12184	17767	11334	9819	5583	1.46
TE 2006-07	11606	13786	20958	23341	11735	9555	2383	1.11
TE 2015-16	26053	33003	50944	55046	28993	22044	4103	1.08

Paddy

The total cost and returns from cultivation of paddy for major growing states were worked out and presented in Table 4. The cost i.e. cost A_2 increased in all the study states to nearly fourfold from 1996-97 to 2015-16. The per hectare increase in cost C_2 in cultivation of paddy from 1996 to 2016 in Andhra Pradesh, Tamil Nadu, Punjab and West Bengal came out to be Rs 58748, Rs 55778, Rs 55839 and Rs 54370, respectively which was much higher than Bihar, Madhya Pradesh, Odisha and Uttar Pradesh. This increased cost is mainly due to increased cost of human labour both hired and imputed value of family labour, machine labour, fertilizer and manure and fixed cost as well. The increase in gross value of output may be attributed to increase in output price as well as increase in yield of main product. The per hectare gross value of output in Punjab increased from Rs 19310 in TE 1996-1997 to Rs 99277 in TE. 2015-2016; whereas in Andhra Pradesh this figure increased from Rs 17223 to Rs 82044 during same period. This is due to per hectare increase in yield from 50 to 70 qtls in Punjab and 48 to 59 qtls in Andhra Pradesh during the study period. In Bihar and Madhya Pradesh the gross value of output has increased at a very low pace than other paddy producing states only because of low productivity growth.

Wheat

Madhya Pradesh marked the highest increase in productivity of wheat from 18 quintals per hectare to 31 quintals per hectare from 1994-95 to 2015-16; clearly depicting that Madhya Pradesh has started catching up with the well- known agriculturally advanced states i.e. Punjab and Haryana in wheat productivity; but still there exists a huge gap as the per hectare wheat productivity of Punjab and Haryana was 47 quintals and 43 quintals respectively (Table 5). The trend in farmer realized price have shown that it is the same in Haryana, Punjab

Table 4. Costs and returns from paddy in major paddy producing states of India, 1994-95 to 2014-15

(Rs/ha)

Year	Cost A_2	Cost A_2+FL	Cost C_2	Gross Value	Farm Business Income	Profit over Cost A_2+FL	Net Return	Returns per rupee (RPR)
				Andhra Pradesh				
TE 1996-97	10385	12434	18874	17223	6838	4790	-1651	0.91
TE 2006-07	15791	18553	28949	32975	17183	14422	4026	1.14
TE 2015-16	42061	50661	77622	84539	42478	33878	6916	1.09
				Bihar				
TE 1996-97	4234	5563	8746	9565	5330	4002	818	1.09
TE 2006-07	8075	10055	14460	13424	5350	3369	-1035	0.93
TE 2015-16	20907	27416	38713	37766	16859	10351	-947	0.98
				Madhya Pradesh				
TE 1996-97	4346	5667	8742	9913	5567	4246	1171	1.13
TE 2006-07	6099	8589	11986	10969	4870	2380	-1017	0.92
TE 2015-16	20556	28532	41339	41835	21279	13304	496	1.01
				Odisha				
TE 1996-97	5197	6854	9823	11625	6428	4771	1801	1.18
TE 2006-07	9616	13068	18276	17087	7471	4018	-1189	0.93
TE 2015-16	25312	41144	53632	42557	17245	1413	-11074	0.79
				Punjab				
TE 1996-97	8889	10105	16247	19310	10421	9204	3062	1.19
TE 2006-07	17383	19264	30235	39549	22166	20285	9315	1.31
TE 2015-16	34242	40152	72086	103688	69446	63536	31602	1.44
				Tamil Nadu				
TE 1996-97	11689	13721	17642	24775	13086	11055	7133	1.40
TE 2006-07	19490	22386	30910	29085	9595	6699	-1824	0.94
TE 2015-16	46272	55570	73420	77142	30871	21573	3722	1.05
				Uttar Pradesh				
TE 1996-97	4889	6849	10531	14560	9671	7711	4029	1.38
TE 2006-07	9999	13196	19297	19750	9751	6554	454	1.02
TE 2015-16	27757	37912	54585	53131	25374	15218	-1455	0.97
				West Bengal				
TE 1996-97	6837	9348	13963	16262	9426	6915	2299	1.16
TE 2006-07	12766	17991	24559	22325	9559	4334	-2234	0.91
TE 2015-16	35992	52415	68333	59273	23281	6858	-9060	0.87

Relation in Cost of production, Prices Realised and MSP

and Madhya Pradesh (approx. Rs 1525 per quintals) whereas farmers have received less price from their produce in Bihar and Uttar Pradesh (approx. Rs 1440 per quintal); which shows poor procurement in Bihar and Uttar Pradesh where farmers could not receive minimum support prices guaranteed by government of India. This has a direct bearing on margin of farmers realised price on cost A_2+FL and cost C_2. If margin of MSP over cost C_2 in wheat production is taken into account then Punjab stands at top position with 40.8

per cent followed by, Madhya Pradesh 24.7 per cent Haryana 23.1 per cent, Bihar 17 per cent and Uttar Pradesh with least i.e. 7.1 per cent, respectively. So, fixing of MSP with cost A_2+FL +50 percent will be beneficial for some states whereas it will not provide any additional benefit to farming sector of other states.

Paddy

The perusal of table 6 compares the trends in costs, realised prices, MSP and margin over MSP. The trend in productivity of paddy has shown that Punjab had marked highest productivity in the year 2015-16 followed by Andhra Pradesh. The per hectare productivity of Tamil Nadu in paddy crop was 49 quintals in 2015-16, even less by 3 quintals which the Punjab state achieved in 1994-95. The per hectare productivity of major paddy producing states i.e. Bihar, Madhya Pradesh and Odisha increased by just 5 quintals from 1994-95 to 2015-16; whereas it jumped by 11 quintals in Andhra Pradesh and West Bengal. The paddy yield of Bihar, MP and Odisha is far low from Punjab as Punjab state has reaped more benefits of green revolution than latter. Farmer realized price was higher than MSP in Andhra Pradesh and Punjab. The ratio of price realized to MSP for the year 2015-16 was more than one in Punjab (1.05), Andhra Pradesh (1.014) and Tamil Nadu (1.03); signifying that the realised price was more than the support price. This ratio varied between 0.78 to 0.87 for Bihar, Odisha, West Bengal and Uttar Pradesh; implying that the realized price was 15 to 30 percent lower than the minimum support price (MSP). If margin of MSP over cost C_2 in Paddy production is taken into

Table 5. Trends in cost of production, prices realised and MSP of wheat crop in major wheat producing states of India

Year	Yield (Qtl/ha)	Farmers realised price (FRP) (Rs/Qtl)	Cost A_2+FL (Rs/Qtl)	Cost C_2 (Rs/Qtl)	MSP (Rs/Qtl)	Margin of MSP over cost A_2+FL (Per cent)	Margin of MSP over cost C_2 (Per cent)	Margin of FRP over cost A_2+FL (Per cent)	Margin of FRP over cost C_2 (Per cent)
					Bihar				
1994-95	21	471	250	337	360	44	6.7	88.4	39.6
2004-05	23	630	399	592	640	60.5	8.1	57.9	6.4
2015-16	27	1440	882	1303	1525	73	17	63.4	10.5
					Haryana				
1994-95	39	359	154	263	360	133.5	36.7	133.1	36.5
2004-05	39	641	330	523	640	93.8	22.4	94	22.6
2015-16	43	1526	652	1249	1525	133.9	23.1	134.1	22.2
					Madhya Pradesh				
1994-95	18	404	245	384	360	47.1	-6.3	65.2	5.2
2004-05	22	677	370	584	640	73	9.6	83.1	16
2015-16	31	1519	744	1222	1525	105.1	24.7	104.3	24.3
					Punjab				
1994-95	39	360	173	299	360	108.4	20.5	108.4	20.6
2004-05	43	634	305	494	640	110.1	29.5	108.1	28.3
2015-16	47	1525	566	1083	1525	169.6	40.8	169.6	40.8
					Uttar Pradesh				
1994-95	29	458	206	315	360	75	14.2	122.6	45.3
2004-05	29	620	399	598	640	60.2	7.1	55.3	3.8
2015-16	32	1493	909	1423	1525	67.8	7.1	64.3	4.9

Table 6. Trends in cost of production, prices realised and MSP of paddy crop in major paddy producing states of India

Year	Yield (Qtl/ha)	Farmers realised price (FRP) (Rs/Qtl)	Cost A_2+FL (Rs/Qtl)	Cost C_2 (Rs/ Qtl)	MSP (Rs/ Qtl)	Margin of MSP over cost A_2+FL (Per cent)	Margin of MSP over cost C_2 (Per cent)	Margin of FRP over cost A_2+FL (Per cent)	Margin of FRP over cost C_2 (Per cent)
Andhra Pradesh									
1994-95	48	193	216	342	340	57.3	-0.5	-10.7	-43.5
2004-05	54	591	323	504	560	73.4	11.2	83	17.3
2015-16	59	1430	858	1322	1410	64.4	6.7	66.7	8.2
Bihar									
1994-95	21	355	206	325	340	64.8	4.5	72.2	9.3
2004-05	23	504	381	552	560	47	1.5	32.2	-8.7
2015-16	27	1141	887	1271	1410	58.9	10.9	28.6	-10.3
Madhya Pradesh									
1994-95	21	369	216	331	340	57.4	2.7	71	11.6
2004-05	13	693	582	784	560	-3.8	-28.6	19.2	-11.6
2015-16	22	1355	1267	1710	1410	11.2	-17.5	6.9	-20.7
Odisha									
1994-95	30	331	187	259	340	81.8	31.2	76.9	27.6
2004-05	31	474	356	494	560	57.5	13.4	33.3	-4
2015-16	35	1107	1129	1450	1410	24.9	-2.8	-2	-23.7
Punjab									
1994-95	52	361	176	290	340	92.8	17.1	104.9	24.4
2004-05	71	599	297	449	560	88.8	24.8	101.9	33.5
2015-16	70	1494	585	1062	1410	140.9	32.8	155.3	40.7
Tamil Nadu									
1994-95	47	456	237	401	340	43.4	-15.3	92.3	13.7
2004-05	44	566	451	612	560	24.2	-8.5	25.5	-7.6
2015-16	49	1451	1068	1435	1410	32	-1.8	35.9	1.1
Uttar Pradesh									
1994-95	31	431	187	285	340	81.4	19.3	130.1	51.4
2004-05	32	542	394	571	560	42	-1.9	37.4	-5.1
2015-16	36	1223	1081	1541	1410	30.5	-8.5	13.2	-20.6
West Bengal									
1994-95	34	378	205	315	340	66.1	8	84.7	20
2004-05	36	534	422	578	560	32.8	-3.1	26.6	-7.6
2015-16	45	1216	1100	1423	1410	28.1	-0.9	10.5	-14.6

account, then Madhya Pradesh, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal suffered a loss of 17.5, 2.8, 1.8, 8.5 and 1 per cent, respectively in the year 2015-16.

Conclusion and Policy Implications

The competitiveness and comparative advantages of wheat and paddy crop in terms of cost of cultivation, the cost structure and changes in cost over years 1994-95 and 2015-16 were studied. It was revealed that cost of cultivation increased more than threefold from TE 1996-97 to TE 2015-16. The major contributing factors for the change in operational cost has been increased in wage rate, quantity and price of fertilizers, seeds and substitution of bulk labour by machine labour. Punjab has been marked as highest profitable state with return per rupee of 1.40 in wheat and 1.44 in paddy. The trend in farmer realized price shows that it is the same in Haryana, Punjab and Madhya Pradesh (approx. Rs 1525 per quintals) whereas farmers have received less price from their produce in Bihar and Uttar Pradesh (approx. Rs 1440 per quintal); which shows poor procurement in Bihar and Uttar Pradesh where farmers could not receive minimum support prices guaranteed by government of India. This has a direct bearing on margin of farmers realised price on cost A_2+FL and cost C_2. The margin of MSP over cost A_2 +FL is more than 100 per cent in states such as Punjab, Haryana and MP in the year 2015-16 whereas this margin was just 70 per cent in Bihar and Uttar Pradesh. No doubt, the recent announcement by government of India for fixing MSP of agricultural commodities on fixed formula of cost A_2+FL plus 50 per cent will be beneficial for Bihar and Uttar Pradesh and but on flipside it will put Punjab and Haryana at disadvantageous position as their margin over cost A_2+ FL is already higher than 130 per cent. If margin of MSP over cost C_2 in wheat production is taken into account then Punjab stands at top position with 40.8 per cent followed by, Madhya Pradesh 24.7 per cent Haryana 23.1 per cent, Bihar 17 per cent and Uttar Pradesh with least i.e. 7.1 per cent, respectively. So, fixing of MSP with cost A_2+FL +50 per cent will be beneficial for some states whereas it will not provide any additional benefit to farming sector of other states. In the year 2015-16, the production cost for paddy at the A_2+FL level was Rs 585 per quintal in Punjab, whereas it was Rs 1267 per quintal in Madhya Pradesh. The farmers of Punjab could produce a quintal of paddy at 116 per cent lower cost than Madhya Pradesh. The farmers of Tamil Nadu, Uttar Pradesh and West Bengal produces paddy at a double cost than Punjab farmers. The margin of MSP over cost A_2+FL reveals that with an MSP of Rs 1410 per quintal of paddy in the year 2015-16 resulted in a profit of 141 per cent to a farmer in Punjab and resulted only into a profit of 32, 30 and 28 per cent respectively in Tamil Nadu, Uttar Pradesh and West Bengal respectively. If margin of MSP over cost C_2 in Paddy production is taken into account, then Madhya Pradesh, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal suffered a loss of 17.5, 2.8, 1.8, 8.5 and 1 per cent, respectively in the year 2015-16. Thus the policy makers must probe this formula of fixing MSP again. This will help in bushing the farmer's income and reduce rural poverty.

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