

## RESEARCH ARTICLE

# A consumption pattern of Agrochemicals and cost and returns of Kharif paddy for variety MTU-1010 in Bastar Plateau of Chhattisgarh, India

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Manuscript details:	ABSTRACT
<p>Received: 01.12.2016 Accepted: 01.03.2017 Published : 06.04.2017</p>	<p>The present study is based on economic analysis of paddy production with the objective to work out the consumption pattern of agrochemicals, cost and returns of kharif paddy in the study area. The major findings of this study revealed that on an average, the consumption of agrochemicals of kharif paddy (variety-MTU-1010) was calculated as use of insecticide was higher in case of Imidacloprid 17.8% SL (-18.61 per cent) followed by Acephate 75% SP (-63.71 per cent) and lowest in Deltamethrin 1%+ Triazophos 35% EC (-90.19 percent), herbicide gap was higher in case of Oxadirzil (-26.51 per cent) followed by Pyrozosulphuran + Ethyl 10% WP (-33.84) and lowest in Pendimethylene -(-81.25 per cent), fungicide was higher in case of Propiconazole 25% EC (-34.18 per cent) followed by Tricyclazole (-60.13 per cent) and lowest in Carbendazim 12% +Mancozeb 63%WP (-78.39 per cent) and fertilizers gap was higher in case of nitrogen (-5.64 per cent) followed by phosphorus (-9.32 per cent) and potash (-25.52 per cent). Overall, on an average the per hectare cost of cultivation of kharif paddy (variety- MTU-1010) was calculated as Rs. 34028.99, on an average yield of kharif paddy was observed for (variety -MTU-1010) 38.59 quintals and average cost of production per quintal of kharif paddy for variety-MTU-1010 was Rs. 882.11. The input-output ratio was kharif paddy for variety- MTU-1010 was 1:1.84.</p>
<p><b>Editor:</b></p> <p><b>Cite this article as:</b> Om Kumar Netam*, Leelesh Kumar Sahu and Mukesh Kumar Seth (2017) A consumption pattern of Agrochemicals and cost and returns of Kharif paddy for variety MTU-1010 in Bastar Plateau of Chhattisgarh, India, <i>International J. of Life Sciences</i>, 5 (1): 73-81.</p>	
<p><b>Copyright:</b> © 2016   Author (s), This is an open access article under the terms of the Creative Commons Attribution-Non-Commercial - No Derivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.</p>	<p><b>Keywords:</b> Paddy, economic analysis, input wise cost of cultivation, net rupees per rupee of investment, cost concepts, measures of farm profit.</p> <p><b>INTRODUCTION</b></p> <p>Paddy is the most important and extensively grown food crop in the World. It is the staple food of more than 60 per cent of the world population. Paddy is mainly produced and consumed in the Asian region. India has the largest area under paddy in the world and ranks second in the production after China. Country has also emerged as a major rice consumer. Rice is primarily a high energy calorie food. The by-products of paddy are also used for preparing various industrial products especially in textile industries as it contains good amount of starch. The straw of paddy is used for packing. It is a good source of fodder and may be used as litter. Rice bran is a source of</p>

edible oil. The bran is also used in manufacturing cardboard. Looking to the importance of the crop, it is required to increase the production of paddy and mere attaining the level of food requirement of population is not sufficient because India is already Importing pulses and oilseeds from other countries, so we will have to produce that quantity of cereals, which can be exported after meeting the requirement of the domestic population? This will compensate with the cost incurred for the import of other crops and provide strength to Indian economy.

## MATERIALS AND METHODS

Primary data was collected for the year 2014-15. Multi-stage sampling design was adopted for the ultimate selection of paddy growing farmers. The Chhattisgarh is divided into 3 agro-climatic zones and Bastar district was randomly selected from selected Bastar plateau of Chhattisgarh, India. Two blocks Jagdalpur and Bastar were randomly selected from bastar district and a total of 100 farmers were interviewed. The zone was the first stage, district was the second stage, blocks were the third stage and villages were the fourth stage. Households of farm categories were the ultimate stage. To estimate the consumption of agrochemicals in *kharif* paddy (variety- MTU-1010) and cost of cultivation of *kharif* paddy (Variety- MTU-1010) slanted method was adopted which include cost A1, A2, B1, B2, C1, and C2. Total cost of cultivation is calculated separately for the different category of farmers as well as for overall farmers collectively. Both, variable and fixed cost is included for the calculation of cost of cultivation. Simple average method was used to analysis the data, cost concept is used for calculating costs of paddy.

## RESULTS AND DISCUSSION

### Consumption of agrochemicals in *kharif* paddy (Variety- MTU-1010)

The consumption of agrochemicals in cultivation of *kharif* paddy (variety- MTU-1010) grown in the study area (tables 1, 2, 3 and 4) shows use of insecticide in *kharif* paddy was higher in case of Imidacloprid 17.8% SL (-24.18 per cent) followed by Chlorpyrifos 50% + Cypermethrin 5% EC (-72.97) and lowest in Deltamethrin 1% + Triazophos 35% EC (-91.04 per cent), use of herbicide in *kharif* paddy gap was higher

in case of Oxadirzil (-23.84 per cent) followed by Pyrozosulphuran + Ethyl 10% WP (-41.40) and lowest in Pendimethylene (-81.40 per cent), use of fungicide in *kharif* paddy was higher in case of Propiconazole 25% EC (-35.18 per cent) followed by Tricyclazole (-69.60) and lowest in Carbendazim 12% + Mancozeb 63% WP (-79.40 per cent) and use of fertilizers in *kharif* paddy percentage gap was higher in case of nitrogen (-18.05 per cent) followed by phosphorus (22.31 per cent) and potash (-37.06 per cent).

### Input wise cost of cultivation of *kharif* paddy for variety- MTU-1010

The present section deals with the economics of cultivation of *kharif* paddy (Variety- MTU-1010) grown in the study area. table 5 clearly shows input wise cost of cultivation of paddy (Variety- MTU-1010) per hectare, which is highest in case of medium farms and lowest in case of small farms. Cost of cultivation showed increasing trend from marginal to medium farmers. It is due to the fact that medium farmers could incur more expenditure on modern farm inputs like quality seed, fertilizers, plant protection chemicals, hired labours etc. The major share of cost among different cost items were found in labour which is 47.61 per cent to the total cost of cultivation out of which 36.06 per cent contribution was of human labour and bullock and machine labour together contribute 11.55 per cent. Total labour cost was increased from marginal to large farms but its contribution in total cost was found maximum in case of medium and large farms which was 47.92 and 48.00, respectively. Total input cost was found 69.40 per cent, whereas total fixed cost was 30.60 per cent to the total cost. Rental value of land is highest among fixed costs, which is 29.39 per cent to the total cost of cultivation.

### Cost concept wise income over different cost in *kharif* paddy (Variety- MTU-1010)

The cost and returns on the basis of cost concept in the production of paddy have been presented in the table 6, which portrays that, on an average Cost A<sub>1</sub>, Cost A<sub>2</sub>, Cost B<sub>1</sub>, Cost B<sub>2</sub>, Cost C<sub>1</sub>, Cost C<sub>2</sub> and Cost C<sub>3</sub> were worked to Rs. 20478.11, Rs. 20478.11, Rs. 20715.55, Rs. 30715.55, Rs. 24029.02, 34029.02 and 34029.12 per hectare respectively on the sample farms. It was noted that rupees 10000 were considered as imputed rental value of owned land for one crop season. Cost A<sub>1</sub> is showing increasing trend from marginal to large sized farms because of more use of hired labour, plant protection chemicals, manure and fertilizers etc.

**Table 1 : Insecticide quantity used in paddy for different varieties during *kharif* season (a.i.per/ha).**

S. No	Name of insecticide	Recommended Dose	Name of insect	Insecticide quantity used in different varieties during <i>kharif</i> season (per/ha)					
				Arize-6444	MTU-1010	MTU-1001	Karma Masuri	Safri	Overall
1.	Acephate 75% SP	337.50 gm a.i./ha	Cutworm, Stemborer	78.34	122.47	126.84	113.21	16.52	91.47
	Gap			-259.16	-215.03	-210.66	-224.29	-320.98	-246.03
	Gap %			-76.78	-63.71	-62.42	-66.45	-95.11	-72.89
2.	Chlorpyariphos50%+Cypermethrin 5%EC	550 ml a.i./ha	Leaf folder	148.64	152.44	159.87	144.28	112.34	143.52
	Gap			-401.36	-397.56	-390.13	-405.72	-437.66	-406.48
	Gap %			-72.97	-72.28	-70.93	-73.76	-79.57	-73.91
3.	Imidacloprid 17.8% SL	22.25ml a. i./ha	Plant hopper	16.87	18.11	19.54	17.64	15.47	17.53
	Gap			-5.38	-4.14	-2.71	-4.61	-6.78	-4.72
	Gap %			-24.18	-18.61	-12.18	-20.72	-30.47	-21.21
4.	Chlorpyariphos 20%EC	510gm a.i./ha	Stemborer, Gallmidge	95.34	110.21	115.45	85.24	64.25	94.09
	Gap			-414.66	-399.79	-394.55	-424.76	-445.75	-415.91
	Gap%			-81.31	-78.39	-77.36	-83.28	-87.40	-81.55
5.	Deltamethrin1%+Triazophos 35% EC	432 ml a.i./ha	Plant hopper, Cutworm	38.71	42.34	43.51	36.84	10.24	34.33
	Gap			-393.29	-389.66	-388.49	-395.16	-421.76	-397.67
	Gap%			-91.04	-90.19	-89.93	-97.47	-97.63	-92.05

**Source:** Improved cultivation practices for Dry land crops in Bastar plateau Agro-climatic Zone of C.G. (IGKV/Pub./T.bl./2014/18)

Table 2 : Herbicide quantity used in different varieties during *kharif* season (a.i. per ha).

S.No	Name of insecticide	Recommended dose	Name of Weeds	Insecticide quantity used in different varieties during <i>kharif</i> season (per/ha)						
				Arize-6444	MTU-1010	MTU-1001	Karma	Masuri	Safri	Overall
1.	Oxadirzil	90 gm a.i. /ha	Gengarva, Narjava	68.54	66.14	71.36	67.81	64.35	67.64	
	Gap			-21.46	-23.86	-18.64	-22.19	-25.65	-22.36	
	Gap%			-23.84	-26.51	-20.71	-24.65	-28.5	-24.84	
2.	Pyrozosulphuran +Ethyl 10% WP	25 gm a.i./ha	Sanwa,Motha, Chunchuniya, Jalkumbhi, Tinpatiya	14.65	16.54	18.12	15.47	13.22	15.60	
	Gap			-10.35	-8.46	-6.88	-9.53	-11.78	-9.40	
	Gap %			-41.40	-33.84	-27.52	-38.12	-47.12	-37.60	
3.	Butachlore	1250gm a.i./ha	Narrow leaf- Sanva, Wild, Kodo, Motha, Bhengra	587.58	598.17	612.32	581.65	577.47	591.44	
	Gap			-662.42	-651.83	-637.68	-668.35	-672.53	-658.56	
	Gap%			-52.99	-52.15	-51.01	-53.47	-53.80	-52.68	
4.	Pendimethylene-	1000 gm a.i./ha	Sanwa, Choti dudhi, Jangli chaulai	185.98	187.45	192.85	184.68	181.14	186.42	
	Gap			-814.02	-812.55	-807.15	-815.32	-818.86	-813.58	
	Gap%			-81.40	-81.25	-80.72	-81.53	-81.88	-81.36	
5.	Ethoxysulfuran (15 WDG)	15 gm a.i./ha	Narjava, Motha, kaonwakaini, Chunchuniya	5.72	7.86	8.56	6.78	4.98	6.78	
	Gap			-9.28	-7.14	-6.44	-8.22	-10.02	-8.22	
	Gap%			-61.86	-47.60	-42.93	-54.08	-66.80	-54.80	
6.	Chlorymuron 10% + Metasulfuron	4 gm a.i./ha	Jalkumbhi, Motha, Narjava, Bhengra	1.22	1.24	1.35	1.19	1.12	1.23	
	Gap			-2.78	-2.76	-2.65	-2.81	-2.88	-2.77	
	Gap%			-69.50	-69.00	-66.25	-70.25	-72.00	-69.25	
7.	2,4-D	625 gm a.i./ha	Motha, Jalkumbhi, Bhengra, Gokhru	168.89	171.65	176.12	167.24	165.14	169.81	
	Gap			-456.11	-453.35	-448.88	-457.76	-459.86	-455.19	
	Gap%			-72.97	-72.54	-71.82	-73.24	-73.57	-72.83	

**Source:** Improved cultivation practices for Dry land crops in Bastar plateau Agro-climatic Zone of C.G. (IGKV/Pub./T.bl./2014/18).

**Table 3 : Fungicide quantity used in different varieties during *kharif* season (a.i.per/ha).**

S.no.	Name of Fungicide	Recommended dose	Name of diseases	Fungicide quantity used in different varieties during <i>kharif</i> season (per/ha)					
				Arize-6444	MTU-1010	MTU-1001	Karma Masuri	Safri	Overall
1.	Hexaconazol 5% EC	75ml a.i./ha	Blast and Sheath blight	20.65	23.51	25.11	27.51	24.17	24.19
	Gap			-54.35	-51.49	-49.89	-47.49	-50.83	-50.81
	Gap %			-72.46	-68.65	-66.52	-63.32	-67.77	-67.75
2.	Propiconazole 25% EC	125ml a.i./ha	Sheath rot	80.64	82.27	84.15	85.78	78.31	82.23
	Gap			-44.36	-42.73	-40.85	-39.22	-46.69	-42.77
	Gap %			-35.48	-34.18	-32.68	-31.37	-37.35	-34.21
3.	Tricyclazole	15 gm a.i./ha	Blast	4.56	5.98	7.68	6.87	3.85	5.78
	Gap			-10.44	-9.02	-7.32	-8.13	-11.15	-9.22
	Gap %			-69.60	-60.13	-48.80	-54.20	-74.33	-61.46
4.	Carbendazim 12% +Mancozeb 63%WP	562.50gm a.i./ha	Blast, Brownspot, Sheath blight ,false smut	115.86	121.54	124.65	126.47	123.10	122.33
	Gap			-446.64	-440.96	-437.85	-436.03	-439.40	-440.17
	Gap %			-79.40	-78.39	-77.84	-77.52	-78.12	-78.25

**Source-** Improved cultivation practices for Dry land crops in Bastar plateau Agro-climatic Zone of C.G. (IGKV/Pub./T.bl./2014/18).

**Table 4 : Fertilizer quantity used in different variety during *kharif* season.**

Fertilizer (Kg/ha)	Kharif Season					Overall
	Arize-6444	MTU-1010	MTU-1001	Karma Masuri	Safri	
<b>RIL</b>						
N	120	80	100	100	100	100
P	80	50	60	60	60	62
K	50	40	40	40	40	42
<b>FIL</b>						
N	98.34	74.92	87.10	83.98	81.03	85.07
P	62.15	44.41	52.03	49.89	49.91	51.67
K	31.47	29.79	31.35	31.26	28.96	30.56
<b>Gap %</b>						
N	-21.66	-5.08	-12.9	-16.02	-18.97	-14.93
P	-17.85	-5.59	-7.97	-10.11	-10.09	-10.32
K	-18.53	-10.21	-8.65	-8.74	-11.04	-11.43
<b>Gap %</b>						
N	-18.05	-5.64	-12.09	-16.02	-18.97	-14.15
P	-22.31	-9.32	-13.28	-16.85	-16.82	-15.72
K	-37.06	-25.52	-21.62	-21.85	-27.6	-26.73

**Note:** FIL= Field Input Level, RIL= Recommended Input Level

**Source:** Improved cultivation practices for Dry land crops in Bastar plateau Agro-climatic Zone of C.G. (IGKV/Pub./T.bl./2014/1

**Table 5: Input wise cost of cultivation of *kharif* paddy for variety- MTU-1010 at sampled households.**

S. No.	Particulars	Kharif season				(Rs./ha)
		Marginal	Small	Medium	Large	Overall
<b>1</b>	<b>Human labour</b>					
	a) Family	5363.24 (15.92)	3076.43 (9.08)	2125.12 (6.14)	689.75 (1.98)	3313.46 (9.74)
	b) Hired	6752.12 (20.04)	9154.12 (27.02)	10303.31 (29.77)	11986.22 (34.42)	8956.28 (26.32)
	Total human labour	12115.36 (35.96)	12230.55 (36.10)	12428.43 (35.91)	12675.97 (36.40)	12269.75 (36.06)
<b>2</b>	<b>Bullock and Machinery</b>					
	a) Bullock labour	978.24 (2.91)	688.67 (2.03)	312.14 (0.91)	-	644.94 (1.90)
	b) Machine power	2855.24 (8.47)	3198.32 (9.44)	3839.79 (11.10)	4039.79 (11.60)	3284.73 (9.65)
	Total Machine and Bullock labour	3833.48 (11.38)	3886.99 (11.47)	4151.93 (12.01)	4039.79 (11.60)	3929.67 (11.55)
3	Total labour cost	15948.84 (47.34)	16117.54 (47.57)	16580.36 (47.92)	16715.76 (48.00)	16199.42 (47.61)
4	Seed cost	1420.81 (4.22)	1457.34 (4.30)	1513.24 (4.37)	1601.01 (4.60)	1468.82 (4.32)
5	Manure & Fertilizers	3690.61 (10.95)	3742.35 (11.04)	3898.96 (11.27)	3901.21 (11.20)	3767.92 (11.07)
6	Plant protection	855.21 (2.54)	882.98 (2.61)	971.12 (2.81)	988.87 (2.84)	899.04 (2.64)
7	Irrigation charges	1021.31 (3.03)	1017.39 (3.00)	1001.12 (2.89)	989.74 (2.84)	1013.46 (2.98)
8	Interest on working	234.31 (0.07)	268.81 (0.79)	291.19 (0.84)	313.42 (0.90)	267.26 (0.78)
	Sub total	23171.09 (68.78)	23486.41 (69.32)	24255.99 (70.10)	24510.01 (70.38)	23615.95 (69.40)
<b>B</b>	<b>Fixed Cost</b>					
9	Land Revenue	10 (0.03)	10 (0.03)	10 (0.03)	10 (0.03)	10 (0.03)
10	Interest on Fixed Capital	239.85 (0.71)	237.06 (0.69)	235.93 (0.68)	235.20 (0.67)	237.44 (0.70)
11	Depreciation on implements	269.17 (0.8)	149.11 (0.44)	101.33 (0.29)	70 (0.21)	165.63 (0.48)
12	Rental value of land	10000 (29.68)	10000 (29.51)	10000 (28.90)	10000 (28.71)	10000 (29.39)
	Sub total	10519.02 (31.22)	10396.17 (30.68)	10347.26 (29.90)	10315.20 (29.62)	10413.07 (30.60)
	Total Cost (A+B)	33690.11 (100)	33882.58 (100)	34603.25 (100)	34825.21 (100)	34029.02 (100)

**Note:** Figure in the parenthesis indicate percentage to the total cost of cultivation (A+B).

**Table 6: Cost concepts in *kharif* paddy for (variety- MTU-1010) among various categories of farms (Rs./ha).**

Particulars	Kharif season (Rs./ha)				
	Marginal	Small	Medium	Large	Overall
Cost A <sub>1</sub>	18087.02	20569.09	22242.2	23900.26	20478.11
Cost A <sub>2</sub>	18087.02	20569.09	22242.2	23900.26	20478.11
Cost B <sub>1</sub>	18326.87	20806.15	22478.13	24135.46	20715.55
Cost B <sub>2</sub>	28326.87	30806.15	32478.13	34135.46	30715.55
Cost C <sub>1</sub>	23690.11	23882.58	24603.25	24825.21	24029.02
Cost C <sub>2</sub>	33690.11	33882.58	34603.25	34825.21	34029.02
Cost C <sub>3</sub> +10%	33690.21	33882.68	34603.35	34825.31	34029.12

**Table 7: Cost and return of *kharif* paddy on the sample farms for different group of farms (Variety- MTU-1010).**

S. No.	Particulars	Kharif Season (Rs./ha)				
		Marginal	Small	Medium	Large	Overall
1	Total Cost	33690.11	33882.58	34603.25	34825.21	34029.02
2	Gross Income	57779.70	61751.60	64818.90	67537.10	61707.56
3	Net Income	24089.59	27869.02	30215.65	32711.89	27678.54
4	Family labour income	29452.83	30945.45	32340.77	33401.64	30992.01
5	Farm Business Income	39692.68	41162.51	42576.70	43636.84	41219.53

**Table 8 : Net returns per rupee of investment by size of farms in *kharif* paddy for MTU-1010. (Rs./ha)**

Category	Input (Rs.)	Output (Rs.)	Input-Output Ratio
Marginal	33690.11	57779.70	1:1.72
Small	33882.58	61751.60	1:1.82
Medium	34603.25	64818.90	1:1.87
Large	34825.21	67537.10	1:1.94
Overall	34029.02	62664.52	1:1.84

**Measures of farm profit in *kharif* paddy for variety- MTU-1010**

It is quite evident from table 7 that on an average, the total average cost, value of net income, family labour income and farm business income per hectare came to Rs. 34029.02, Rs. 27678.54, Rs. 30992.01 and Rs 41219.53 respectively from paddy crop. Gross income

of the farms by main product and by product together was found to be Rs 61707.56 per hectare, which was found increasing from marginal to large farms. Whereas, net income was found maximum on large farms (32711.89 Rs./ha.) and minimum on Marginal farms (24089.59 Rs./ha.). Family labour income was found showing decreasing trend from marginal to

large farms as contribution of family labour was more on marginal farms and decreased gradually with the increase in farm size.

#### **Net returns per rupee of the investment of *kharif* paddy for variety- MTU-1010**

Net returns per rupee of the investment for each category have been presented in table 8. Input output ratio was found maximum in case of marginal farms being 1:1.94 and shows a decreasing trend from large to marginal sized farms. It is due the fact that increased productivity on small to large farms was the result of extra cost incurred, which decreased the input output ratio. Secondly, family labours do work more efficiently on the farms and marinal farmers were using more family labours as compared to hired labours whereas contribution of family labour found decreasing with the increase in farm size. Overall input-output ratio was found 1:1.84 in the cultivation of paddy crop.

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