Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; Sp 9(4): 42-44
Received: 27-05-2020
Accepted: 29-06-2020

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Cost of cultivation of Paddy in Pratapgarh district of Uttar Pradesh

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Abstract
Paddy (*Oryza sativa* L.) is the most important staple food crop in Asia. More than 90% of the world's paddy is grown and consumed in Asia, where 60% of the world's population lives. The area under paddy in India was reported 43.95 million hectares with the total production of 106.54 million tonnes, while productivity was recorded 24.249 quintal per hectare. The area under paddy in Utter Pradesh was 5.98 million hectares, and production was 14.63 million tonnes while productivity 24.479 qt/ha. Pratapgarh district of Uttar Pradesh was selected purposively in order to avoid operational inconvenience. One block (Aspur Deosara) having highest area under paddy crop was selected purposively and from selected block 5 villages were selected randomly. The respondents were stratified into three size groups i.e., (i) marginal (blow 1 ha), (ii) small (1-2 ha) and (iii) medium (2-4 ha).

Keywords: Tabular analysis, weighted mean finctional analysis, regression analysis

Introduction
Paddy (*Oryza sativa* L.) belongs to the Germaine family is the most important food crops of India and is likely to be continued as dominant food crop in future also. The crop has very wide physiological adaptability being grown in both tropical and temperate condition from sea level to high altitudes and from semi-arid tract of Rajasthan and Punjab to a very wet area of Assam, West Bengal, Kerala and Karnataka. A large number of varieties which are different in morphological characters are under cultivation, in India. The highest percentage of people of the country is engaged in the processing and marketing of paddy. Besides, rice consumption as food, the by- products of rice i.e. paddy husk is also used for different purpose conventionally, husk is used as fuel, soil conditioner, packaging material, animal feed and for insulation purpose. It is also used for manufacturing the building material and other chemicals. Rice bran is used for extraction of edible oil, industrial oil and animal feed. However, it has been recognized as a very useful source of proteins, carbohydrates and vitamins. Paddy straw is one of the major sources of dry fodder for animals. Paddy is the most important and extensively grown food crop in the World. It is the staple food of more than 60 percent of the world population. Rice 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 major part of rice consists of carbohydrate in the form of starch, which is about 72-75 percent of the total grain composition. The protein content of rice is around 7 percent. The protein of rice contains glutelin, which is also known as oryzenin. The nutritive value of rice protein (biological value = 80) is much higher than that of wheat (biological value = 60) and maize (biological value = 50) or other cereals. Rice contains most of the minerals mainly located in the pericarp and germ and about 4 percent phosphorus. Rice also contains some enzymes.

Rice is a high – energy food. The biological value of its protein is very high. Paddy is grown on an area of 164.72 million hectares with an annual production of 745.71 million tonnes in the world with the productivity of 45.279 q/ha during 2013. In the world, India ranks first in area but second in production after China. In India rice occupies an area of 43.95 million hectares with annual production 106.54 million tones with productivity of 24.249 q/ha (Anonymous, 2009), While area, production, and productivity in Uttar Pradesh were 5.98 million hectare, 14.63 million tonnes and 24.479 q/hectare respectively.

Methodology
Tabular analysis
Tabular analysis was used to compare the different parameters among marginal, small and medium size group of the farmers.

Family composition, investment pattern; crop-wise costs and returns etc. were computed and presented in tabular forms. In this computation weighted average were used.

$$W.A. = \frac{\sum W_i X_i}{\sum W_i}$$

Where,
W. A. = Weighted average
Xi = Variable
Wi = Weight of variable

Regression analysis
To study the effect of various independent variables on the dependent variables, various form of production function have been explored. However, Cobb-Douglas production function, elasticity of production and return to scale, has been found best fit for analysis of data.
The mathematical form of Cobb-Douglas function (power function) is as follows:

$$Y = ax_1^{b_1}.x_2^{b_2} \ldots\ldots\ldots\ldots Xn^{bn}$$

Where,
Y = Dependent variable (output value in rupees/hectare)
X_1 = i^{th} independent variable (input value rupees/hectare)
a = Constant
b_1 = Production elasticity with respect to $X_{i's}$

The value of the constant (a) and coefficient (bi) in respect of independent variable in the function have been estimated by using the method of least square. The Cobb-Douglas production function in log form is as follows:

$$\text{Log } Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + \ldots\ldots + u \log e$$

Where,
Y =Value of gross returns of crops (Rs./ha)
X_1 =Expenditure on human labour (Rs./ha)
X_2=Expenditure on seed (Rs./ha)
X_3=Expenditure on manure and fertilizer (Rs./ha)
X_4=Expenditure on irrigation (Rs./ha)
e =Expenditure on variable (Rs./ha)
a =Intercept
b_i: (j = 1, 2……4) are the elasticity coefficient of the j^{th}

Table 1: Cost of cultivation of paddy on different size of sample farm (Rs/ha)

S. N.	Components of investment	Cost imputed to various components			
		Marginal below 1 ha	Small 1-2 ha	Medium 2-4 ha	Overall average
1.	**Human labour**	**8474.42 (25.3)**	**6997.33 (20.4)**	**5849.92 (17.06)**	6510.33 (19.353)
a.	Family labour	4373.30 (13.1)	2771.63 (8.08)	1737.82 (5.22)	2363.96 (7.0271)
b.	Hired labour	4101.12 (12.2)	4225.70 (12.3)	4112.10 (12.3)	4146.37 (12.325)
2.	Bullock labour	714.52 (2.13)	676.67 (1.97)	378.67 (1.14)	510.461 (1.5174)
3.	Machinery charges	4437.12 (13.3)	4869.50 (14.2)	4550.26 (13.7)	4637.11 (13.784)
4.	Seed	1110.21 (3.32)	1772.80 (5.17)	1796.02 (5.39)	1709.96 (5.083)
5.	Manure and fertilizer	3235.00 (9.66)	4502.60 (13.1)	4739.00 (14.2)	4492.26 (13.354)
6.	Irrigation	2778.90 (8.3)	2546.46 (7.42)	3169.60 (9.52)	2929.81 (8.7092)
7.	Plant protection	612.00 (1.83)	667.80 (1.95)	755.84 (2.27)	711.778 (2.1158)
8.	Total working capital	21362.17 (63.8)	22033.16 (64.2)	21239.31 (63.8)	21501.7 (63.916)
9.	Interest on working capital	854.48 (2.55)	881.32 (2.57)	849.57 (2.55)	860.064 (2.5566)
10.	Rental value of land	7500.00 (22.4)	7500.00 (21.9)	7500.00 (22.5)	7500 (22.294)
11.	Interest on fixed capital	721.22 (2.15)	776.46 (2.26)	689.92 (2.07)	720.583 (2.142)
12.	Sub-total	30437.87 (90.9)	31190.94 (90.9)	30278.80 (90.9)	30582.4 (90.909)
13.	Managerial cost of 10% sub-total	3043.70 (9.09)	3119.094 (9.09)	3027.88 (9.09)	3058.23 (9.0909)
14.	Grand total	33481.57 (100)	34310.034 (100)	33306.68 (100)	3360.6 (100)

Figure in () parenthesis indicate show in percent

Table 1 indicates that on an average, the cost of cultivation of paddy per hectare came to Rs. 33640.60. The cost of cultivation was maximum on medium farms (Rs.33306.68) followed by small farms (Rs. 34310.03) and marginal farms (Rs. 33481.57) respectively.
Per hectare cost of cultivation was highest (34310.-3) on small farms, mainly due to maximum investment on fixed capital compared to the small and marginal farms. On an average the study further reveals that major components on which maximum cost was incurred being 19.35 per cent on human labour followed by machinery charges 13.78 per cent, manures and fertilizer 13.35 per cent, irrigation 8.71 per cent, seed 5.08 per cent, bullock labour 1.52 per cent and plant protection 2.12 per cent, respectively. A similar trend indicated on all categories of sample farms.
The cost incurred on interest on working capital, rental value of land, interest on fixed capital and 10% managerial cost of sub-total was calculated as 2.56, 22.29, 2.14 and 9.10 per cent of total costs, respectively. The maximum share among these costs was rental value of owned land being 22.29 per cent of total cost per hectare.

Conclusion
Paddy is the most important staple food crop in Asia. More than 90% of the world's paddy is grown and consumed in Asia, where 60% of the world's population lives. Paddy accounts for between 35-60% of the caloric intake of three billion. Over 164.72 million hectares of paddy are planted annually, covering about 10% of the world's arable land. India is the second largest producer of paddy after China. The area under paddy in India was reported 43.95 million hectares (2013-14) with the total production of 106.54 million tonnes, while productivity per hectare was recorded 22.25 quintal during, (2013-14).
In Uttar Pradesh the area of paddy is about 13.84 million hectares and production is 14.41 million tonnes, with productivity of 23.58 quintal per hectare (Anonymous 2013). It has second position in country where as first West Bengal is (14.96 mt). (Directorate of Agriculture U.P. statistical bulletin, 2012-13). L Pratapgarh district is also an important

rice producing district of U. P. The area under paddy in the district during 2012-13 was reported 185991 hectare with production of 452575 metric tonnes while productivity was 24.41qt/ha. (Arth Evam Sankhya Prabhag, Pratapgarh district, U.P. 2013-14).

Pratapgarh district of Uttar Pradesh was selected purposively because of convenience of investigator and to avoid difficulties for collection of data due to time and budget constraints. A list of all the 17 Blocks of Pratapgarh district was prepared and one Block namely Aspur Deosara having highest area under paddy crop was selected purposively for the study. A list of all the villages of the selected block was prepared separately along with the area under paddy and 5 villages were selected randomly. A separate list of all paddy growers of the 5 selected villages was prepared and classified according to size of holdings into three categories i.e. marginal (below 1.0 ha), small (1.0-2.0 ha) and medium (2.0 to 4.0 ha). From this list a sample of 100 respondents were selected following the proportionate random sampling technique. A list of all the Mandi Samiti of regulated market of the district was prepared one Mandi Samiti namely Aspur Deosara / Dhakwa Mrket Mandi Pratapgarh situated near by block were selected purposively. A sizeable number of intermediaries were selected and interviewed for assessing imperfections of paddy marketing system. Primary data were collected through personal interview method on well structured pretested schedule specially designed for the study while secondary data were collected from published/ unpublished record of District and Block, Headquarter, Books, Journals, Periodicals, News bulletins etc.

Tabular analysis was used to compare the different parameters among marginal, small and medium size group of the farmers. Family composition, investment pattern; crop-wise costs and returns etc. computed and presented in tabular forms. In this computation weighted average were used.

To study the effect of various independent variables on the dependent variables, various form of production function has been dealt. However, Cobb-Douglas function, due to its convenience in estimating elasticity of production and return to scale, has been found best fit to analyse the productivity of resources in this study.

The samples of 100 farmers of selected block were considered for study. Average size of holding varied 0.54, 1.47 and 2.96 hectare in respect of marginal, small and medium farms respectively. The cost of cultivation per hectare cost of cultivation was highest (34310.03) on small farms, mainly due to maximum investment on fixed capital compared to the medium and marginal farms. On an average the study further reveals that major components on which maximum cost was incurred being 19.35 per cent on human labour followed by machinery charges 13.78 per cent, manures and fertilizer 13.35 per cent, irrigation 8.71 per cent, seed 5.08 per cent, bullock labour 1.51 per cent and plant protection 2.11 per cent, respectively. A similar trend indicated on all categories of sample farms.

The cost incurred on interest on working capital, rental value of land, interest on fixed capital and 10% managerial cost of sub-total was calculated as 2.55, 22.29, 2.42 and 9.09 per cent of total costs, respectively. The maximum share among these costs was rental value of owned land being 22.29 per cent of total cost per hectare.

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