Analysis of Marginal value Productivity (MVP) of different Inputs under different size of farm in Paddy and Wheat Crop

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ABSTRACT: A study has been carried out on analysis of marginal value of productivity (MVP) of different inputs under different size of farm in paddy and wheat crop in the Dabra block of Gwalior district (M.P.). Multistage random sampling method was used to acquire sample farmer, at the first stage of sampling, Dabra block was selected purposively, due to comprise maximum area under paddy and wheat cultivation, at the second stage of sampling, a list of the paddy and wheat growing villages were prepared from selected block (Dabra) then 20 villages were selected randomly, and the third stage of sampling, a list of paddy and wheat growing farmers from each selected village was prepared then classified into five major categories on the basis of their land holding *i.e.* marginal (less than 1ha) small (1-2 ha), semi medium (2-4 ha), medium (4-10 ha) and large (10 ha or above). Then a sample of 30 farmers were selected in each category by simple random sampling technique under proportionate allocation from twenty villages treated as strata thus, 150 paddy and 150 wheat farmers were selected. After the analysis of data it was observed, that, in paddy production, MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour) X_4 (machinery), X_5 (plant protection), X_6 (manure) and X_7 (irrigation) on all size of farms as well as on overall farm were observed less than unity except X_5 on large farm, X_6 on marginal, semi-medium and on medium farm and X_7 on medium and large observed greater than one. While in wheat production, MVP X_1 (Seed), X_2 (fertilizer), X_3 (human labour), X_4 (machinery), X_5 (plant protection), X_6 (manure) and X_7 (Irrigation) were observed less than unity in all the size of farm as well as overall farm except X_3 on overall farm and marginal farm, X_4 on medium farm, X_5, on medium and marginal farm and X_6 on small and semi-medium farm was observed greater than one. Hence over utilized factor (MVP less than 1) may be reduced and underutilized factor (MVP greater than 1) may be increased for enhancing profit of farmers income.

Keywords: Marginal Value Productivity (MVP), factors, paddy, wheat, inputs.

INTRODUCTION

Rice (*Oryza sativa* L.) and wheat (*Triticum aestivum* L.) are two very important cereal crops. The production of paddy and wheat is an important part of the national economy because these two crops contribute more than 70 % of total cereal production in India. India is the second largest producer of paddy and wheat in the world after China (Netam *et al.*, 2019). Paddy is one of the oldest cultivate crop and has been cultivated in India for several thousand years. In India paddy is cultivated under 43.79 million hectare with the production of 112 million tones and productivity 2578 Kg/ha whereas wheat occupies an area of 29.58 million

hectare with a production and productivity of 99.70 million tonnes and 3371 kg/ha. In Madhya Pradesh, paddy is grown mainly as a kharif crop on 2.04 million hectare with the production of 4.12 million tones and productivity 2026 kg/ha whereas wheat is grown on area of 5.32 million hectare with a production and productivity of 15.91 million tonnes and 2993 kg/ha, respectively. Thus rice and wheat production not only makes the country food sufficient nation but also strengthen its agrarian economy. Since agriculture is the major source of income for most of the population of country, rice and wheat being the majorly grown crops plays key role in enhancing income of the farmers (Kumar *et al.*, 2018). Based on the above importance of

both the crops in national economy, a study was conducted on analysis of marginal value of productivity (MVP) different inputs in paddy and wheat crop under different size of farm for enhancing the income of farmers by adjusting resource use.

METHODOLOGY

The present study was confined to Gwalior district of Madhya Pradesh because this district has remarkable position under paddy and wheat crop in the gird zone, and also for the convenience of the researcher to get more accurate information. Gwalior district has four blocks namely Bhitarwar, Dabra, Morar and Ghatigaon. At the first stage of sampling, Dabra Block was selected purposively, due to maximum area under paddy and wheat crop (37710.03 ha and 47961.20 ha respectively), at the second stage of sampling, a list of the paddy and wheat growing villages were prepared from selected block (Dabra) then 20 villages namely Akbai Badi, Masudpur, Salaiya, Kardu, Beer Muhana, Lakhiya, Khareya, Girgheda, Patha Panihar, Anat Path, Beru Gawan, Kheri Parashasar, Rampura, Khidwae, Maharajpur, Chomo, Chhimak, Ikona, Patharra, and Ghamad Pura were selected randomly, and the third stage of sampling, a list of paddy and wheat growing farmers from each selected village was prepared then classified into five major categories on the basis of their land holding i.e. marginal (less than 1ha) small (1-2 ha), semi medium (2-4 ha), medium (4-10 ha) and large (10 ha or above) (Reddy *et al.,* 2018), Then a sample of 30 farmers were selected in each category by simple random sampling technique under proportionate allocation from twenty villages treated as strata with the help of given formula.

$$n_i = \frac{N_i}{N} \times n$$

Where, n_i = i[th] stratum sample size,
N_i = i[th] stratum size,
N = Population size and n = total sample size.

Thus, in all 300 farmers (150 paddy growers and 150 wheat growers) were selected. After selection of respondent the primary data (2019-20, Kharif and Rabi) in respect to quantity of input used with their price,

yield, gross income *etc*. were collected through pre-tested interview schedule by survey method. Each selected respondent were approached personally for collecting the relevant data.

A. Calculation of MVP

The Marginal Value Productivity (MVP) was find out by taking resources (X_i) as well as gross return (Y) with their geometric means. MVP was computed by multiplying the production coefficient of given resources with the ratio of geometric mean of gross return to the geometric mean of the given resources (Reddy *et al.,* 2013; Sapkota and Bajracharya, 2018)

$$\ln Y = \ln a + b_i \ln X_i$$

$$\frac{dY}{dx_i} = b_i \frac{Y}{X_i}$$

Therefore, MVP X_i = $b_i \dfrac{\overline{Y}_{(GM)}}{\overline{X}_{i(GM)}}$

Y = Mean value (GM) of gross output
X_i = Mean value of the ith variable input
ln = Natural logarithm and i =1, 2…7
GM = Geometric mean
$\frac{dY}{dY_i}$ = Slope of the production function as well MVP of ith input

RESULTS AND DISCUSSION

A. Marginal value productivity of different inputs under different size of farm in paddy crop

(i) Marginal farms. It is depicted from Table 1, that the MVP of X_4 (machinery) and X_6 (manure) is greater than unity which indicated that these factors under-utilization. The MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour) X_5 (plant protection), and X_7 (irrigation) is less than unity (Yadav *et al*., 2021) and it indicated overutilization of these factors, hence, the pattern of resource use under marginal farms of paddy cultivation in the study area needs some changes. The underutilized factors (MVP >1) *viz*. X_4 and X_6 may be raised and the over-utilized factors (MVP <1) *viz*. X_1, X_2, X_3, X_5, and X_7 may be reduced in the production process of paddy at the marginal farm for increasing yield.

Table 1: Factor wise MVP under the different size of farm in paddy production.

Factors	Size of farm					
	Marginal	Small	Semi-medium	Medium	Large	Overall
	MVP	MVP	MVP	MVP	MVP	MVP
X_1	0.005	0.644	0.899	0.439	0.067	0.438
X_2	0.047	-0.007	-0.023	0.006	-0.012	0.046
X_3	0.014	-0.052	0.012	0.037	0.058	0.190
X_4	1.079	2.254	0.732	0.039	0.011	-0.070
X_5	0.750	0.899	-3.13	-1.805	13.168	-0.846
X_6	1.546	-0.168	1.74	2.499	0.909	0.392
X_7	-0.257	0.378	-0.062	1.021	1.097	-0.3188

(ii) Small farms. The MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour), X_5 (plant protection), X_6 (manure), and X_7 (number of irrigation) was observed less than unity and it indicates the overutilization of these factors, while the MVP of X_4 (machinery) was greater than unity and it indicated that X_4 inputs have underutilization. Hence, at the small size of farms, there is only possible to increase yield by enhancing the use

of the X_4 factor and reduced the use of X_1, X_2, X_3, X_5, X_6, and X_7 in the production process.

(iii) Semi medium farms. At semi-medium farms, the MVP of all factors except X_6 are less than unity which indicates factor X_6 (manure) have underutilization and of X_1 (Seed), X_2 (fertilizer), X_3 (human labour) X_4 (machinery) X_5 (plant protection) and X_7 (irrigation) were overutilization in the cultivation of paddy.

Therefore production may be enhanced by more use of the X_6 factor and reduced the use of X_1, X_2, X_3, X_4, X_5, and X_7 to get more paddy yield in semi-medium farms.

(iv) Medium farms. The MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour) X_4 (machinery), and X_5 (Plant protection) were observed less than unity while the MVP of X_6 (manure) and X_7 (Irrigation) were observed greater than unity. This indicated that except for X_6 and X_7 all the resources (X_1, X_2, X_3, X_4, and X_5) over-utilized at a medium farm.

(v) Large farms. The MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour) X_4 (machinery), and X_6 (manure) noticed less than unity which inferred that the above sets of factors were over-utilized therefore we cannot overuse these factors. Whereas the MVP of X_5 and X_7 were observed greater than unity, it indicates that X_6 and X_7 factors can be more useful in the production of paddy in the study area on large farms.

(vi) Overall Farms. At the overall farm level, it was observed that MVP of all factors *viz.* X_1 (seed), X_2 (fertilizer) X_3 (human labour), X_4 (machinery labour), X_5 (plant protection), X_6 (manure), and X_7 (irrigation) were noted less than unity it indicated that all the above factors over-utilized in the production of paddy on over al farm, therefore, we should reduce the level of use of these resources.

B. Marginal value productivity of different inputs under wheat crop

(i) Marginal farms. It was noted from Table 2 that the MVP of, X_3 (Human labour), and X_5 (Plant protection) were greater than unity while MVP of X_1 (seed), X_2 (fertilizer), X4 (Machinery), and X_7 (irrigation) were less than unity which implied X_3 and X_5 were underused and X_1, X_2, X_4 X_6, and X_7 are overused hence for increasing yield. Underutilized factors may be raised and the over-utilized factors may be reduced in the production process of wheat at marginal farms.

Table 2: Factor wise MVP under the different size of farm in wheat production.

Factors	Size of farm					
	Marginal	Small	Semi Medium	Medium	Large	Overall
	MVP	MVP	MVP	MVP	MVP	MVP
X_1	0.048	0.002	0.002	0.08	0.0799	0.044
X_2	-0.003	0.001	0.001	0.0006	0.0289	0.019
X_3	2.719	0.252	0.214	0.427	0.7376	1.011
X_4	0.275	-0.165	-0.132	1.28	0.0596	0.817
X_5	3.381	-0.050	-0.091	6.76	-0.7742	-0.098
X_6	-0.495	3.016	7.00	0.41	0.0736	0.2930
X_7	0.408	0.036	0.029	0.154	0.2844	0.0837

(ii) Small farms. The MVP of X_1 (seed kg/ha), X_2 (fertilizer) (Rathnayake *et al.,* 2016), X_3 (Human labour), X_4 (Machinery labour) X_5 (Plant protection), and X_7 (irrigation) were seen less than unity and only X_6 (manure) was greater than unity which inferred that yield could be enhanced by more use of X_6 factor and reduces the use of remained six sets of variables (X_1, X_2, X_3, X_4, X_5, and X_7) in small size of farm.

(iii) Semi medium farms. The MVP of X_7 (Number of irrigation/ha) was observed greater than unity which indicates X_7 factor have underutilization and the MVP of X_1 (seed), X_2 (fertilizer), X_3 (Human labour man-days/ha), X_4 (Machinery labour), X_5 (Plant protection chemical) and X_6 (manure) were less than unity and it indicates the overutilization of the above six factors. Therefore at semi-medium farms required some modification, particularly in the use of the X_7 factor should be increased to obtain more yields. While the use of the remaining six variables such as X_1, X_2, X_3, X_4, X_5, and X_6 may be reduced to get more yield of wheat production.

(iv) Medium farms. It was observed at medium-size farms that MVP of all factors except X_4 (Machinery) and X_5 (Plant protection) was found to be less than unity which inferred that X_1 (seed), X_2 (fertilizer) X_3 (Human labour), X_6 (manure), and X_7 (irrigation) were over-utilized hence yield could be increased by more use of X_4 and X_5 and less use of the remaining five variables in the production.

(v) Large Farms. In the large size of farm MVP of all factors *viz.* X_1 (seed), X_2 (fertilizer), X_3 (Human labour), X_4 (Machinery labour), X_5 (Plant protection), X_6

(manure tone/ha), and X_7 (irrigation) were observed less than unity it means all factors were seen over-utilized and none of the factors were found to be underutilized at a large farm.

(vi) Overall farms. At the overall farm level, it was observed that MVP of factors *viz.* X_1 (seed), X_2 (fertilizer) X_4 (Machinery labour), X_5 (plant protection), X_6 (manure), and X_7 (irrigation) were noted less than unity it indicated that all the above factors over-utilized in wheat production, therefore, a farmer should reduce the level of use these resources in the production and the MVP of X_3 (human labour) is greater than one indicated that we should additionally use of X_3 for increasing the yield of wheat (Reddy *et al.*, 2013).

CONCLUSION

It is concluded after the research that, in paddy production, MVP of X_1 (seed), X_2 (fertilizer), X_3 (human labour) X_4 (machinery), X_5 (plant protection), X_6 (manure) and X_7 (irrigation) on all size of farms as well as on overall farm were observed less than unity except X_5 on large farm, X_6 on marginal, semi -small and on medium farm, X_7 on medium and large farm size were observed greater than one, whereas in wheat production, MVP of X_1 (seed) X_2 (fertilizer) X_3, (human labour) X_4 (machinery) X_5 (plant protection) X_6 (manure) and X_7 (Irrigation) were observed less than unity in all the size of farm as well as overall farm except X_3 on overall farm and marginal farm, X_4 on medium farm, X_5, on medium and marginal farm and X_6 on small and semi-medium farm was observed

greater than one. Hence over utilized factor (MVP less than 1) may be reduced and underutilized factor (MVP greater than 1) may be increased for enhancing profit of farmers. So, underutilized factors (MVP>1) may be raised and the over-utilized factors (MVP<1) may be reduced for enhancing farmers income.

FUTURE SCOPE

The research done by me may be helpful for the farmers to take the right decision on the level of use resource so that maximum yield can be achieved by rational use of resources.

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