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Profitability and Resource Use Efficiency of Mustard in Jammu District of J&K (UT)

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ABSTRACT

A study was conducted in Jammu district of JK- UT where out of 20 development blocks falling in Jammu district, R.S. Pura and Bishnah blocks were selected randomly. Mustard crop is among the oldest cultivated plants in human Civilization. Biologically, the Mustard plants belongs to the family Cruciferous and under the genus *Brassica*. The mustard crop grows all over the world but their cultivation is mainly confined to India, China, Canada, Germany, France, Australia, USA, etc. Mustard has largest area of 8 million ha in Canada followed by China (7 million ha) and India (6 million ha). Area of mustard crop in world is 355.20 lakh hectares, its Production is 714.50 lakh tones and Productivity is 2010 kg/ha respectively for the year 2015-16 (Kumrawat *et al*. 2018). The primary data on inputs involved in production of Mustard were collected by surveying through an interview with the help of pre-tested questionnaire. The results related to the production function analysis revealed that machine labor, seed and fertilizers made significant impact on the gross returns and have positive values of regression coefficient and human labor have negative but significant value in case of all farms. But it is found in the study that all factors have significant effect on the gross return except human labor.

Keywords: Mustard, Production Function, Regression Coefficient, Gross Returns.

The Indian agriculture is considered to be the backbone of Indian economy. The agricultural sector is the largest employer in India's economy and employed 42.74 % of its total workforce in 2017 but contributes to a declining share of its GDP (17.00 per cent in 2017-18). A large number of important industries like jute, textiles, edible oils, tobacco, sugar, etc. receive the raw materials produced by agriculture sectors. Edible oilseeds are an essential part of Indian agriculture and contribute more than 10.00 percent to agriculture GDP (Kumrawat *et al*. 2018). Mustard is an important *Rabi* oilseed crop of India and is grown on an area of 6.02 million hectares (approx.) with an average productivity of 13.97 kg/ha during the year 2017-18 (Anonymous, 2018). The three types of *Brassica* species are grown in Jammu region namely *Brassica compestris* var. *rapa* commonly known as Toria, *Brassica napus* viz. Gobhi Sarson, *Brassica juncea* viz. Indian mustard and *Brassica juncea* var. Brown Sarson. The toria crop is mostly grown as a catch crop in Maize-Toria-Wheat crop rotation in the rain fed areas, whereas Indian mustard is grown as sole crop in mid aoctober both

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in irrigated as well as rain fed areas of the Jammu region mostly. The *Brassica napus* is confined to the irrigated areas and mid hill regions of Jammu. The Brown sarson is confined to temperate hilly region of J&K UT in both Jammu and Kashmir provinces where it is sown as a cover crop in the month of September-October where it remains in the dormant stage for few months under the snow and later on harvested in the month of May-June with very low productivity. The present average yield of oilseeds is just about 8.0 quintals per hectare, which is mainly due to low productivity in *Brown sarson* in the temperate areas. The average productivity of the whole Jammu and Kashmir needs to be increased to at least 12 quintals per hectare by the year 2030 to meet the shortfall of 70 % in the J&K UT which is to be minimized either by increasing the area under oilseeds or by increasing the productivity levels of oilseeds (Bharat *et al.* 2020*)*. India ranks third among the major rapeseed mustard growing countries of the world with 9.98 % of the world's area under Rapeseed mustard cultivation. During 2017-18, rapeseed-mustard contributed 27.00 per cent to the total oilseeds production. Globally, India account for 19.29 per cent and 11.27 per cent of the total area and production of mustard (Kumar *et al*. 2017). Nearly 30.70% area under mustard is under rainfed farming. In India, it is cultivated in Rajasthan, Uttar Pradesh, Madhya Pradesh, Maharashtra, Andhra Pradesh and some part of Punjab, Haryana and also Jammu region of Jammu and Kashmir. Leading state in the mustard production is Rajasthan. As per the latest estimates, In Jammu and Kashmir Union Territory (J&K UT) the total area under mustard cultivation is more than 55000 hectares with the estimated production of 37000 metric tonnes (approx.) and productivity of 697 kg/ha (Anonymous, 2018).

MATERIALS AND METHODS

The present study was conducted inJammu district of JK-UT. A multistage sampling technique was used for the present study and Jammu district was purposively selected for the present investigation because the district occupies an important place in production of the mustard, at the first stage of sampling. As per the information available from District info.officer, Jammu, out of 20 development blocks falling in Jammu district, R.S. Pura and Bishnah blocks were selected randomly at the first stage of sampling. At the second stage of sampling, 4 villages each from these two development blocks were selected randomly to constitute a total of 8 villages. At the third stage of sampling, 10 farmers from each village were selected through random sampling technique without replacement to constitute a sample size of 80 farmers in total. Both primary as well as secondary data were used as per the requirements of the study. The primary data were collected by survey method by interviewing the mustard growers directly through a pre-tested schedule.

Cobb-Douglas Production Function

Cobb-Douglas regression model was used to estimate the production function and find out the factor affecting mustard production in the selected district. To measure the contribution of the most important variables in the production process of mustard, the following type of Cobb-Douglas production function was used in the study.

$$Y = \beta_0 X_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} X_4^{\beta_4} X_5^{\beta_5} X_6^{\beta_6} e^{U_i}$$

For the present empirical exercise, the Cobb-Douglas production function was converted into the following logarithmic (double log) form:

$$lnY = ln\beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + \beta_5 lnX_5 + \beta_6 lnX_6 + U_i$$

Where, *ln* = Natural logarithm, Y = Yield of mustard (kg ha^{-1}), X_1= Amount of Seed (kg ha^{-1})

X_2= Land preparation cost (₹ ha^{-1}), X_3= Number of labour (Man days ha^{-1})

X_4= Amount of Fertilizer (kg ha^{-1}), X_5 = Cost of Irrigation (₹ ha^{-1})

X_6= Cost of Insecticide (₹ ha^{-1}), β_0 = Constant or intercept term

β_1, β_2, β_3, β_4, β_5, β_6= Coefficients of the respective variables; and U_i= Error term

The explanatory variables for this study were selected considering expectations to be achieved as yield is likely to be influenced by these factors most (Sampa *et al.* 2020).

Resource use efficiency

The productivity of different resource factors used in mustard production was examined by calculating marginal value of productivity of inputs which was estimated at geometric mean level of inputs.

$$MVP(X_i) = b_i \frac{Y(G.M)}{X_i(G.M)} P_y$$

Where,

MVP (X_i) is the marginal value productivity of i^{th} resources

b_i is the regression Coefficient (estimated)

GM (Y) is the Geometric Mean of Output (yield)

GM (X_i) is the Geometric Mean of i^{th} resources

P_y is the price per unit of output

RESULTS AND DISCUSSION

Resource use efficiency

Results of regression analysis and marginal value product of Costs and returns of mustard production in study area is estimated and presented in Table 1.

Table 1: Estimated regression coefficients of various factors, their standard error and Marginal Value of Productivity (MVP) for mustard cultivation on overall sampled farms

Variables	Regression Coefficients	Standard Error	MVP
Constant (α)	2.72	2.94	–
Human labour (X_1)	-0.38	0.16	-1.06
Machine labour (X_2)	0.69*	0.31	1.51
Seeds (X_3)	1.52**	0.99	3.46
Fertilizer (X_4)	0.61**	0.12	1.77
Coefficient of Determination (R^2) = 0.701			

* Significant at 5% level of significance; ** Significant at 1 % level of significance.

Regression analysis and resource use efficiency for mustard

Yield of mustard was regressed on various factors of production viz., human labour, machine labour, seed and fertilizer except irrigation and plant protection chemicals. As there was no need of irrigation because the crop is grown mostly under rainfed condition. There was also no application of plant protection chemicals at that time because of plenty of rainfall during that time, so no attack of aphids and other insect pests. Therefore we have used only four variables for our investigation. These variables were taken as the explanatory variables. The perusal of the data depicted in Table 1 reveals that in the analysis of crop production function, coefficient of determination (R^2)value was calculated to be 0.701 which is statistically highly significant, meaning that 70.10 per cent of the total variation is due to above mentioned variables.

The findings revealed that the regression coefficient of machine labour was found to be significant at 5 per cent level of probability and seed and fertilizer were found to be significant at 1 per cent level of probability and their values were recorded at 0.69, 1.52 and 0.61respectively. The regression coefficient of human labour was found to be non-significant and its value was -0.38. It is further observed that the marginal value of productivity of machine labour, seed and fertilizers were positive with their values at 1.51, 3.46 and 1.77 respectively and the resource use efficiency estimated for human labour was negative with their values at -1.06, the negative sign revealed its reverse relation with the output, as 1 per cent increase in human labour cause 0.06 per cent decrease in output. There is further scope of increasing the productivity and return by using more machine labour, seeds and fertilizers in mustard.

CONCLUSION

Yield of Mustard was regressed on various factors of production viz., human labour, machine labor, seed and fertilizer. These variables were taken as the explanatory variables. The analysis of crop production function, coefficient of determination (R^2) value was 0.701 which is statistically highly significant, meaning that 70.10 per cent of the total variation is due to above mentioned variables. The regression coefficient of machine labour was found to be positively significant at 5.00 per cent level of probability and its value was estimated at 0.69 and seed and fertilizer was found to be positively significant at 1.00 per cent level of probability

and their values were recorded at 1.52 and 0.61, respectively.

The regression coefficient of human labor was non-significant with value recorded at -0.38. The marginal value productivities of machine labor,seed and fertilizers were positive with their values at 1.51, 3.46, and 1.77 respectively and the marginal value productivity estimated for human labor was negative with their values recorded at -1.06, respectively. There is further scope of increasing the productivity and return by using more machine labour, seeds and fertilizers in Mustard.

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