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Analysis of resource use efficiency and constraints of mustard production in Bhind district of Madhya Pradesh

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Abstract
A study was conducted during the year 2015-2016, to find out resource use efficiency and constraint of mustard production in Lahar block of Bhind district Madhya Pradesh. The Cobb Douglas production function was used for estimation of resource use efficiency of mustard production. With the help of Cobb Douglas production function MVP also work out. An Opinion survey of respondents regarding constraints responsible for low production of mustard on sample farms were also conducted by using interview schedule. The R^2 value for average production was observed to be 0.732 which indicate that function was good fit and able to explain the independent variable to an extent of 73 percent. The elasticity coefficient was found to be 0.804, which shows that return to scale, was decreasing state. The value of coefficient of fertilizer (0.664) and plant protection (0.804) was observed positive and highly significant. The value of coefficient of seed (-0.147), labour (0.211) and irrigation (-0.001) was found negative but significant, revealed that the above resources were not used at their optimum level. Marginal value productivity of resources and their ratio to their respective price was observed and found that the factor X_1, X_3 and X_4 was over utilized in the study area, whereas factor X_2 and X_5 was found underutilization and leaving scope for their increase use. The majority of mustard growers reported of High-input cost (diesel, fertilizers, agrochemicals) (95.55%), followed low and fluctuating prices (88.89%).

Keywords: mustard, cob douglas production function, regression, MVP, constraints, variables

Introduction
Rapeseed-mustard is a group of crops comprising rapeseed (toria, brown sarson and yellow sarson) cultivar of Brassica campestris; Indian Mustard (Brassica juncea); black mustard (Brassica nigra) and taramira (Eruca sativa).The crops of rapeseed group are largely cross pollinated whereas Indian mustard is largely self-pollinated. Out of these cultivars Indian mustard fits well in cropping system of rain fed areas and accounts for >75% of the total area under rapeseed-mustard cultivation in India. Other cultivars like brown sarson and yellow sarson are under cultivation over a limited areas in the Eastern part of the country including North-Easter States. Toria, a short duration crop is largely grown as a catch crop in tarai part of UP, Haryana, Assam and Odisha [4]. The acreage under brown mustard is steadily on the increase at the expense of other Brassicae due to its higher production, greater tolerance to pests and diseases and moisture stress. The seed and oil are used as a condiment in the preparation of pickles and for flavoring curries and vegetables. The oil cake is mostly used as a cattle feed. The leaves of young plants are used a green vegetable. The use of mustard oil for industrial purposes is rather limited on account of its high cost. This crop requires relatively cool temperatures for satisfactory growth.
In India, mustard are grown in the Rabi season from September to October, successfully grown in light to heavy loam soils, light soil area also good for this. A fine seed bed is required to ensure good germination. Nitrogen application in this crop in to three equal splits increase the seed, Stover and biological yield [6]. Water and fertilizers are scare and costly commodities and their judicious application is a must to achieve higher benefits under limited resource condition. Oil seed crops require more of Sulphur for their oil and protein synthesis, which indicated considerable increase in the yield and its quality [2].
India is occupied second position in area and third in production of mustard crop in the world. In India, the area under total oilseeds crops is 26.8 million hector and production is 25.45

million tons (2012-13). The mustard crops covers 72.47 lakh hectare area and 68.5 lakh tones production in India 2012-13. Major mustard producing states in India are Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, Gujarat, West Bangal and Assam. The position of Madhya Pradesh is third in area and fourth in production of mustard in India. In Madhya Pradesh the area under total oilseeds crops is 70.33 lakh hector and the production is 18219 thousand tons. The mustard covers 726.9 thousand tone productions. The major mustard growing district in Madhya Pradesh is Bhind, Morena, Shivpuri, Gwalior, Neemuch and Mandla. In Bhind district the mustard crop covers of area 180.546 thousand hectare area and 175.5 Thousand tones production and it share 24 percent area and 27 percent production in Madhya Pradesh (2014-15) [5].

Material and Methods

A research was conducted during 2015-2016 in Bhind district of M.P. The Bhind district comprises six blocks viz. Bhind, Lahar, Mihona, Mehgaow, Ater and Gohad. Among all these blocks, lahar block has been selected purposively due to this block occupies maximum area and production under mustard crop in the district. After selection of block a list of villages were prepared with the help of the record of RAEO / Panchyat Secretary *etc*. and five villages namely shyampura, lalpura, sikri, kathghara and mehra, were select randomly. After selection of villages a list of mustard growers was prepared and further classified into three size of group based on size of land holdings viz. small (up to 2ha) medium (2.01 to 4 ha) and large (above 4 ha) from each size of group 15 farmers were selected by random sampling method which totaled to 45 in number of respondents The primary data was collected from the selected mustard growers with the help of pre-tested interview schedule and the information was record as related to constraints and cost of different field operations Such as Types of labour engaged for different field operations, Material cost involved, Returns from main and by products, Price of main and by products.

Analysis of data

The collected data were compiled, processed, analyzed and tabulated to estimate resources productivity and constraints related to cultivation of mustard. The Cobb Douglas production function was used for work out MVP and estimation of resource use efficiency of mustard production. And an Opinion survey of respondents regarding constraints responsible for low production of mustard on sample farms were also conducted by using interview schedule [1].

Description of variables

The dependent and independent variables included in the function are given below

$$Y = aX1^{b1}\ X2^{b2} X3^{b3} X4^{b4} X5^{b5}$$

Where

Y= gross values of output (main product +by product) estimated at market Price of the product in rupees /ha

a = constant

Independent variables

X_1= Labour cost (in Rs/ha)

X_2= Seed cost (in Rs/ha)

X_3 =Irrigation (in Rs/ha)

X_4= Fertilizer (in Rs/ha)

X_5=Plant protection (in Rs/ha)

Marginal productivity of the resources (MVP)

From the above production function the M.V.P of each resource was worked out. The marginal productivity or particular input "X_1 at geometric mean of input and output expressed in following equation.

$$\text{MVP XI} = \text{bi} = \frac{\bar{y}i}{\bar{x}i} pxi$$

Where

$\bar{Y}$i = Gross value of output (Rs.)

$\bar{X}$i = Factor of production

Bi = Regression coefficient of Xi

Pxi = Price of Xi

Perceived constraints in cultivation of Mustard

An attempt was also undertaken to find out the various constraints, which come across in cultivation of mustard. Opinion survey of respondents regarding constraints responsible for low production of mustard on sample farms were also conducted by using interview schedule.

Result and Discussion

The resource use efficiency of mustard production was worked out by using Cobb Douglas production function. Five independent variables (resources) were considered for analysis of the resource use efficiency namely seed (x_1), manure & fertilizer (x_2), labour (x_3), irrigation (x_4) and plant protection (x_5).

Table 1: Resource use efficiency of mustard

Items	Coefficient	t Value	P- Value	Price of Input	MVP
Intercept	5.646	3.982	0.000		
X_1	-0.147	-1.298	0.202	31	-218.21
X_2	0.664	3.950*	0.000	6	167.76
X_3	-0.211	-2.720	0.010	149	-175.92
X_4	-0.001	-0.010	0.992	881	-2.25
X_5	0.499	3.062*	0.004	0.11	5.43
∑bi	0.804	-	-	-	-
R^2	0.732	-	-	-	-

*Significant at 5 per cent level

The R^2 value for average production was observed to be 0.732 which indicate that function was good fit and able to explain the independent variable to an extent of 73 percent.

The elasticity coefficient was found to be 0.804, which shows that return to scale, was decreasing state. The value of coefficient of fertilizer (0.664) and plant protection (0.804) was observed positive and highly significant [7].

The value of coefficient of seed (-0.147), labour (0.211) and

irrigation (-0.001) was found negative but significant, revealed that the above resources were not used at their optimum level.

Marginal value productivity of resources and their ratio to their respective price was observed and found that the factor X_1, X_3 and X_4 was over utilized in the study area, whereas factor X_2 and X_5 was found underutilization and leaving scope for their increase use[3].

The majority of mustard growers reported of High-input cost (diesel, fertilizers, agrochemicals) (95.55%), followed by low and fluctuating prices (88.89%), incidence of diseases (68.89%), lack of credit (62.22%), Mustard less profitable compared with other crops (57.78%), poor quality of soil (55.55%)Non-availability of suitable varieties (55.55%), incidence of insect & pest (51.11%), Lack of irrigation facilities (44.44%), shortage of human labor (42.22%), Mustard more risky compared with other crops (28.89%) and weed infestation (22.22%)

Table 2: Constraints in cultivation of mustard

S. No.	Constraints	Categories			Total (n=45)
		Small	Medium	Large	
1	Non-availability of suitable varieties	4(26.67)	9(60.00)	12(80.00)	25.00(55.55)
2	Lack of irrigation facilities	11(73.33)	6(40.00)	320.00)	20.00(44.44)
3	Incidence of diseases	12(80.00)	11(73.33.00)	8(53.33)	31.00(68.89)
4	Incidence of insect pests	10(66.67)	7(46.66)	6(40.00)	23.00(51.11)
5	Weeds Infestation	00(0.00)	3(20.00)	7(46.66)	10.00(22.22)
6	Poor quality of soils	00(00.00)	13(86.67)	12(80.00)	25.00 (55.55)
7	High-input cost (diesel, fertilizers, agrochemicals)	14(93.33)	15(100.00)	14(93.33)	43.00(95.55)
8	Shortage of human labor	0(0.00)	9(60.00)	10(66.67)	19.00(42.22)
9	Low and fluctuating prices	15(100.)	13(86.67)	12(80.00)	40.00(88.89)
10	Mustard less profitable compared with other crops	9(60.00)	9(60.00)	8(53.33)	26.00(57.78)
11	Mustard more risky compared with other crops	2(13.33)	5(33.33)	6(40.00)	13.00(28.89)
12	lack of credit	12(80.00)	10(66.67)	6(40.00)	28.00 (62.22)

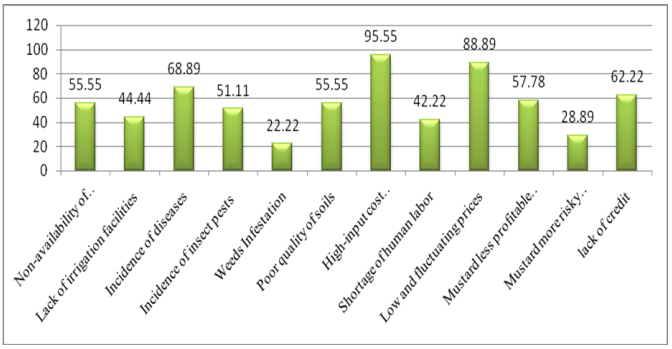

Fig 1: Constraints in cultivation of mustard (Total N=45)

Conclusion

The R2 value for average production was observed to be 0.732 which indicate that function was good fit and able to explain the independent variable to an extent of 73 percent.

Resource use efficiency analysis revealed that the production function was good fitted and returns to scale were found in decreasing state for sample farmers.

The value of coefficient of fertilizer (0.664) and plant protection (0.804) was observed positive and highly significant. The value of coefficient of seed (-0.147), labour (-0.211) and irrigation (-0.001) was found negative and non-significant, revealed that the above resources were not used at their optimum level.

Marginal value productivity of resources and their ratio to their respective price was observed and found that the factor X_1, X_3 and X_4 was over utilized in the study area, whereas factor X_2 and X_5 was found underutilization and leaving scope for their increase use.

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