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Mustard: Economic study on resource use efficiency analysis in Lakhimpur Kheri district of Uttar Pradesh

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Abstract
Mustard is originated from China and spread over India from there. The study based on 100 respondents of different categories falling in Lakhimpur Kheri Dist., India is one of the largest producers of mustard in the world. India produces 7.96 million tons from 9.89 million hectares with 11.88 qtl/ha productivity (D.E.S., New Delhi, 2013-14) While in Uttar Pradesh, it is grown over an area of 1.67 million hectare with total production of about 0.77 million tones and productivity 11.62 qtl/ha. In Lakhimpur Kheri district mustard is grown in 1999 hectare with a production 19010 M.T. and productivity 6.95 qtl/ha. (Arth Evam Sankhykiya Prabhag, 2015-16). India is facing scarcity of edible oil. Enhanced mustard cultivation strategy can improve the supply of edible oil in India, in general and U.P., in particular. The primary data were collected by survey method through personal interview technique with use of pre-structured and pre- tested schedule while secondary data were collected from journals, reports and record of district and block head quarter. The study covers agricultural year 2016-17. Five variables, namely, per hectare seed cost(X_1), per hectare machinery charges (X_2), per hectare manure & fertilizer charges(X_3), per hectare irrigation charges(X_4) and per hectare human labour cost (X_5) were used in functional analysis for analyzing the resource use efficiency with help of Cobb- Douglas production function. The functional analysis was observed as diminishing return to scale. High value of R^2 ranging from 0.84 to 0.72 indicates 84 to72% variation in yield is explained by included factors. The value of MVP for X_1, X_2 and X_3, were observed more than unity indicating that there is further scope of investment on these factors to obtain optimum return of mustard in the study area. While MVP value of X_4 and X_5 variable were found less than unity indicating that excessive investment was made on these factors. X_1, X_2 and X_5 variables were found statistical significant while X_3 and X_4 were found statistically non-significant. Mustard crop seems to be lucrative and suitable for doubling the income of the farmers in the study area.

Keywords: Resource use efficiency, coefficient of multiple determination, MVP, Return to scale

Introduction

Mustard is originated from China and spread over India from there. India is one of the largest producers of mustard in the world. The production of mustard in India is around 16.2 million tones which accounts 18% of the total oil seed production of the world. Mustard is the major *Rabi* oilseed crops of India. It occupies a prominent place being next in importance to groundnut, both in area and production, meeting the fat requirement of about 50 per cent population in the state of Uttar Pradesh, Punjab, Rajasthan, Madhya Pradesh, Bihar, Orissa, West Bengal and Assam. Seed are known by different names in different places e.g. sarson, rai or raya, toria or lahi. While sarson and toria (lahi) are generally termed as rapeseed, rai or raya or laha is termed as mustard. The oil content varies from 37 to 49 per cent. The oil is utilized for human consumption throughout northern India in cooking and frying purposes. It is also used in preparation of hair oil and medicines. Rapeseed oil is used in the manufacture of greases. The leaves of young plants are used as green vegetable as they supply enough sulphur and minerals in the diet. The oil cake is used as a cattle feed and manure. India is one of the largest producers of rape seed and mustard in the world. India's contribution in the world's rape seed and mustard production is the highest of any country. The oil is utilized for human consumption throughout northern India in cooking and frying purpose.

Rapeseed and mustard growing countries of the world are India, Canada, China, Pakistan, Poland, Bangladesh, and Sweden. India ranks first in the world in respect of acreage and second in production next to Canada. India produces 7.96 million tonnes from 9.89 million hectares with 11.88 qtl/ha productivity. In India its cultivation is mainly confined to Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh, West Bengal, Gujarat, Assam, Bihar, and Punjab.

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In Uttar Pradesh, it is grown over an area of 1.67 million hectare with total production of about 0.77 million tonnes and productivity 11.62 qtl/ha. Rajasthan, and Uttar Pradesh are the major mustard producing state in the country. Rajasthan is the largest mustard producer in the country with a contribution of (54%) to the country's total mustard production followed by Punjab and Haryana which simultaneously contributes (14%) in India, (D.E.S, New Delhi, 2014). In Lakhimpur Kheri district mustard is grown in 1999 hectare with a production 19010 M.T. while productivity 6.95 qtl/ha. (Arth evam Sankhykiy Prabhag, 2016). Since an scientific study has been conducted during recent year on economic aspects of mustard cultivation in the district. Thus seeing the importance of the crop in regards of income and employment generation. This study was conducted with the objective, "to workout resource use efficiency of mustard crop in the study area".

Materials and Methods
Lakhimpur kheri district of Uttar Pradesh was purposively selected Lakhimpur block was enjoying highest acreage under mustard crop was selected. A list of mustard growing villages falling under selected block was prepared and 5 villages (Rausa, Murtiha, Khamhoul, Rajaura and Bail) were randomly selected. Again a list of all mustard growers of selected villages was prepared and stratified into marginal small and medium categories according to land holding. Ultimately 100 farmers (marginal 62, small 28 and medium 10) were selected following proportionate random sampling. Tabular and functional analysis were applied for arriving the results. Cobb- Douglas production function was applied for the analysis of resource use efficiency in the study area. The formula used for Cobb – Douglas production function was as follows:

Result and Discussion
Table-1 reflects the production elasticities of included factors, returns to scale and coefficient of multiple determinations. Magnitude of returns to scale was found less than unity on all categories of farms indicating that this functional analysis is of diminishing return to scale. High value of R^2 ranging from 0.84 to 0.72 indicates 84 to72% variation in yield is explained by included factors. High value of R^2 of the fitted function revealed that selection of included factors in the functional analysis was nicely done by researcher. X_1, X_2 and X_5 variables were found statistically significant at 1% probability level while X_3 and X_4 variables reflects statistically non-significant.

Table 1: Resource use efficiency analysis of mustard on different size of farms in the Study area.

Size group of sample farms	Production Elasticity					Sum of Elasticity/ return to scale	R^2
	X_1	X_2	X_3	X_4	X_5		
Marginal	0.191861** (0.041755)	0.324444** (0.028382)	0.196413 (0.073809)	0.009269 (0.014741)	0.12773** (0.02642)	0.849717	0.808577
Small	0.186047** (0.051508)	0.286624** (0.035053)	0.189792 (0.440136)	0.09708 (0.097657)	0.110208* (0.038029)	0.869753	0.838339
Medium	0.118652 (0.051644)	0.280187** (0.039166)	0.192859 (0.077864)	0.023597 (0.019166)	0.113973* (0.032039)	0.729268	0.851175

* Five variables, namely, per hectare seed cost(X_1), per hectare machinery charges (X_2), per hectare manure & fertilizer charges(X_3), per hectare irrigation charges(X_4) and per hectare human labour cost (X_5) respectively.

Table 2: Marginal value productivity (MVP) of included factors in Production process of mustard crop in the study area

Size group of farms	Marginal Value Productivity of input / factors				
	X_1	X_2	X_3	X_4	X_5
Marginal	10.81599	5.795488	3.272149	0.108606	0.687738
Small	10.48828	5.119923	3.161854	1.13746	0.593397
Medium	2.998411	2.043033	1.291447	0.116398	0.426936

*Five variables, namely, per hectare seed cost(X_1), per hectare machinery charges (X_2), per hectare manure & fertilizer charges(X_3), per hectare irrigation charges(X_4) and per hectare human labour cost (X_5)

Table-2 revealed MVP of various included factors in the functional analysis. The value of MVP for X_1, X_2 and X_3, were observed more than unity indicating that there is further scope of investment on these factors to obtain optimum return of mustard in the study area. While MVP value of X_4 and X_5 variable were found less than unity indicating that excessive investment was made on these factors. it is concluded that there is further scope of adjusting use of inputs in the study area for harvesting optimum production of mustard crop in the study area.

Summary and Conclusion
Enhanced mustard cultivation strategy can improve the supply of edible oil in India, in general and U.P., in particular. The primary data were collected by survey method through personal interview technique with use of pre-structured and pre- tested schedule while secondary data were collected from journals, reports and record of district and block head quarter. The study covers agricultural year 2016-17. Five variables, namely, per hectare seed cost, per hectare machinery charges, per hectare manure & fertilizer, per hectare irrigation charges and per hectare human labour cost were used in functional analysis for analyzing the resource use efficiency with help of Cobb- Douglas production function. The functional analysis was observed as diminishing return to scale. High value of R^2 ranging from 0.84 to 0.72 indicates 84 to72% variation in yield is explained by included factors. The value of MVP for X_1, X_2 and X_3, were observed more than unity indicating that there is further scope of investment on these factors to obtain optimum return of mustard in the study area. While MVP value of X_4 and X_5 variable were found less than unity indicating that excessive investment was made on these factors. X_1, X_2 and X_5 variables were found statistical significant while X_3 and X_4 were found statistically non-significant. Mustard crop seems lucrative and suitable for doubling the income of the farmers in the study area.

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