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Assessment of Resource Use Efficiency of rapeseed and mustard in reference to farm size in two blocks of Jaipur district, Rajasthan

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ABSTRACT
The present study determines the resource use efficiency of rapeseed and mustard in reference to farm size and was conducted in Jaipur district of Rajasthan during 2014-2015*. A total sample size of 75, based on the area under land holding (marginal, Small and medium) of the respondent. The Cobb-Douglas Production Function has been used for this study. It determined that regression-coefficient of 0.943492 was found to be maximum with 94.35 per cent on marginal and it was minimum with 80.34 per cent on overall farm size groups, as both were found significant at 1 per cent level of significance which indicates that all the selected farm size groups were having more potentiality, which is contributing more towards the returns and even the investment on the selected inputs were found with positive impact towards the returns. The value of MVP on overall farm size groups as total return was found to be positive on different farm size groups, which further indicate that additional of one unit will be contributing an amount ranging from Rs. 6.77/- to Rs. 10,083.38 /- on overall marginal farm size group, respectively, further it will be contributing toward the gross returns, so it may continue further more in the days to come.*
Keywords: Efficiency, resource use, rapeseed, mustard, Jaipur district

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INTRODUCTION

India is one of the 4th largest producer's in production of Rapeseed and mustard crop in world, Rajasthan being 1st largest producer of Rapeseed and mustard among the 29 states of India. Rapeseed and mustard is the principal oilseeds crop in Rajasthan, constituting 44.31 per cent of the total area (27.6 lack ha) in 2013-2014. It contributes 47.21 per cent of total Rapeseed and Mustard production (33.56 lac tonnes) in 2013-2014. Rapeseed and mustard crops are diverse in their agro-climatic requirements and crop management practices. The production constraints facing each of the crops are also diverse in nature. The objective of raising domestic availability of edible oil can be realized only by increasing the productivity of these oilseed crops. Enhancing the production and productivity of the crop assumes significance, not only from the farmers' viewpoint but also for the edible oil industry and other vertically and horizontally linked enterprises [3,4, 5].

Raising productivity in these crops will certainly lead to availability of edible oil food reduce their real price. Resource use Efficiency is the ability to derive maximum output per unit of resource [1]. It can also be broadly defined to include the concepts of technical efficiency, allocative efficiency and environmental efficiency. An efficient farmer allocates his land, labour, water and other resources in an optimal manner, so as to maximise his income, at least cost, on sustainable basis. However, there are countless studies showing that farmers often use their resources sub-optimally. While some farmers may attain maximum physical yield per unit of land at a high cost, some others achieve maximum profit per unit of inputs used [6] Farmers might use the resources rationally but not at the economic optimum level, which is mainly due to inadequate knowledge on resource optimization. As the aim of every agribusiness firm is to maximize profit whiles minimizing cost, it is pertinent to determine the efficiency of resource use [2]. Furthermore, future of rapeseed and mustard production in the study area depends very much on

resources use efficiency in the context of growing rapeseed and mustard. Keeping this in view the study was undertaken to assess resource use efficiency of rapeseed and mustard production in reference to farm size.

MATERIAL AND METHODS

The present study was conducted in Jaipur district of Rajasthan on 2014-2015. There are 33 districts in Rajasthan state, Jaipur ranked fourth in both area as well as production of Rapeseed and mustard crop and hence, Jaipur was selected purposively for study. Further, out of 13 blocks of Jaipur district two blocks were selected purposively and the study was undertaken. A separate list of the villages falling under the jurisdiction of both the selected blocks was prepared and three villages from each block making a total of five villages were selected randomly for this study. At final stage, a list of farmers of the selected villages will be prepared separately and 15 farmers from each selected village was considered for the study by following the random method from the list, which made a total sample size of 75 respondents a least. Selected farmers were further stratified into three groups viz; Group - I (1 - 2.00 ha), Group - II (2.01 - 4.00 ha) and Group - III (4.01 ha and above) respectively, based on the area under land holding of the respondent. The distribution of selected respondents according to holding size in the various selected villages under Rapeseed and mustard cultivation.

Group	Land holding(ha)	No.of selected farmers			
		Block-01	Block-02	Total	Cumulative total
Marginal	Less than 2.00	6	12	18	18
Small	2.01-4.00	14	18	32	50
Medium	More than 4.00	10	15	25	75
Total		30	45	75	

The Cobb-Douglas Production Function has been used in the present study for the assessment of the resource use efficiency of different farm size groups in the selected area. The production function of different input level was fitted as regressing gross return i.e. (Y), X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, and X_9 in terms of rupees per unit as independent variables on marginal, small, medium and overall farm size group, respectively. The equation of Cobb-Douglas Production Function is as follows:

$Y= aX_1^{b1}, X_2^{b2}, X_3^{b3}, X_4^{b4}, X_5^{b5}, X_6^{b6}, X_7^{b7}, X_8^{b8}, X_9^{b9}$

Where, Y = Total returns from the rapeseed and mustard (Rs/ha)

X_1= Cost of human labour utilized (Rs/man days),

X_2= Cost of machine labour (Rs/day),

X3= Cost of Animal labour utilized (Rs/day),

X_4= Cost of seed used/utilized (Rs/kg),

X_5= Cost of FYM used/utilized (Rs/qtl),

X6= Cost of fertilizer used/utilized (Rs/qtl),

X_7= Cost of plant protection measures used/utilized (Rs/kg/lit),

X_8= Cost of irrigation charge incurred (Rs/m^3),

X_9= Cost of land revenue paid (Rs/ha)

The marginal value product (MPV) of the factors was computed by multiplying the regression co-efficient of that resource with geometric mean of gross return to the geometric mean of each resource.

RESULTS AND DISCUSSION

Resource use efficiency of rapeseed and mustard

A. Resource use-efficiency on different farm size groups:

The ordinary least square (OLS) estimates of parameters of Cobb-Douglas type of production with respect to different farm size groups as well as overall farm size group are presented in Table 1.

Further table reveals that the value of co-efficient of multiple determination (R^2) ranged from 94.35 per cent as maximum on marginal farm size group to 80.34 per cent as minimum on overall farm size group which was explaining the variation on the dependent variable (Y) by the selected nine numbers of independent variable (X_1 to X_9) and has chosen in the equation on different farm size groups. The present selected equation, clearly indicates that it was a good fit of selected model by providing clear cut efficiency of sample farm selected for the purpose with minimum of 80.34 per cent to the maximum of 94.35 per cent, whereas the remaining variation of the dependent variable might not represented due to outliner or may be other reason too, even it was also some time due to excess used of resources and it was not properly used/utilized.

The regression co-efficient of input as constant was found positive significant at 10 per cent level of significance on small farm size groups, which indicate that the model is a good fit to very combination of dependent variables over the independent variables. While, the negative and non-significant values, indicates the adverse result or very little contribution toward the gross returns, so the contribution of constant was having important role in all the selected input variables.

Table 1.: Elasticity co-efficient of strategic inputs of rapeseed and mustard of size groups

S. No.	No's of observation	Variable	Regression co-efficient	t-stat	R^2
(c)	**Marginal farm**				
1	18	a	-1566.83NS (9663.716)	-0.16213	0.943492*** (14.84154)
2		X_1	1.330964* (1.332037)	0.999195	
3		X_2	23.00407* (13.54726)	1.698061	
4		X_3	6.207971* (13.54726)	1.106712	
5		X_4	-8.06616NS (9.525919)	0.84676	
6		X_5	1.502566NS (8.584076)	0.175041	
7		X_6	11.773*** (2.815517)	4.18147	
8		X_7	-17.4563NS (38.20754)	-0.45688	
9		X_8	-44.239NS (37.31384)	-1.18559	
10		X_9	4.38086NS (13.38631)	0.327264	
(b)	**Small farm**				
1	32	a	-7687.88NS (13317.56)	-0.57727	0.81543*** (10.79958)
2		X_1	2.094155NS (-4.12644)	-1.97046	
3		X_2	15.72406NS (-3.15252)	-0.20049	
4		X_3	6.694825NS (-1.70146)	-0.25415	
5		X_4	4.212477NS (1.929311)	0.457999	
6		X_5	3.39633NS (-7.35048)	-2.16424	
7		X_6	11.74807NS (-11.879)	-1.01115	
8		X_7	65.25666* (56.30946)	0.862892	
9		X_8	95.9288NS (-88.2071)	-0.91951	
10		X_9	15.63547*** (51.21847)	3.275786	
(c)	**Medium farm**				
	25	a	18724.46* (21927.89)	0.85391	0.932225*** (22.92454)
		X_1	-3.23399NS (1.101455)	-2.93611	
		X_2	-14.2478NS (6.754059)	-2.10951	
		X_3	-14.2608NS (6.827822)	-2.08863	
		X_4	27.41558*** (10.60456)	2.585263	
		X_5	-41.0387NS (12.06619)	-3.40114	

		X_6	42.00882* (22.81455)	1.841317	
		X_7	-51.8094NS (85.84439)	-0.60353	
		X_8	-31.076NS (76.22965)	-0.40766	
		X_9	31.80223*** (7.279923)	4.368485	
(d)	**Overall farm**				
	75	a	3145.09NS (6950.266)	0.452514	0.803411*** (29.51547)
		X_1	-2.65259NS (0.770787)	-3.44141	
		X_2	-4.53122NS (3.750972)	-1.20801	
		X_3	1.623021NS (3.103861)	0.522904	
		X_4	3.676013* (3.211873)	1.144508	
		X_5	-3.21293NS (1.511795)	-2.12524	
		X_6	4.29939* (3.287623)	1.30775	
		X_7	-15.325NS (36.57399)	-0.41901	
		X_8	-45.9775NS (39.58875)	-1.16138	
		X_9	30.50095*** (5.293785)	5.761653	

*** Significant at 1 per cent; ** Significant at 5 per cent level & * Significant at 10 per cent
(*Figures in the parenthesis indicates the Standard Error of Regression Co-efficient*)

As the regression-coefficient of 0.943492 was found to be maximum with 94.35 per cent on marginal and it was minimum with 80.34 per cent on overall farm size groups, as both were found significant at 1 per cent level of significance which indicates that all the selected farm size groups were having more potentiality, which is contributing more towards the returns and even the investment on the selected inputs were found with positive impact towards the returns. Therefore, further more investment can be done on this input for the better gross return in days to come, which was possible only by re-arranging or re-plan for the investment of these inputs after shifted from less potential inputs to more potential input sides, therefore re-allocation of investment can be suggested due to further potentiality inputs with regards to have more profit in days to come.

In case of X_6 it was found significant at 1 per cent level, which indicate the best contribution towards the net return, even the input variables viz. X_1,X_2, and X_3 all here were found statistically significant at 10 per cent level on marginal farm size group, whereas the remaining inputs were contributes less towards the gross returns, so re-allocate of the resource can be done, which indicate that we can further, explore better option of more income these inputs by reshuffled them due to having less potentiality and further input resource may further contribute better level toward the total output.

While in case of small farm size group X_9 was found positive significant at 1 per cent level, which shows the best contribution toward the net returns, even the input variable X_7 was statistically significant at 10 per cent level on small farm size group, which indicate that we can further explore more income from these inputs, due to having more potentiality towards the output, therefore, less input resources me be re-arranged by shifting them from the remaining input were indicate less contribution or nominal level of profit towards the gross returns, so further re-investment or re-allocation from the present status towards the potentially areas.

In case of X_4 and X_9 both the inputs were found statistically significant at 1 per cent level of significance, which shows best contribution toward the net returns, also the input variable X_6 was found statistically significant at 10 per cent level on medium farm size group, which indicate that we can further, explore better/more income from the input level due to having more potentiality so that it will contribute best towards the total output or return by re-allocating of less inputs towards the potential inputs in the days to come for the betterment of farmers.

Whereas in case of overall farm size group it was found statistically positive significant at 1 per cent level on X_9 variable, which indicates the best contribution towards the net return among the selected input level, while the input variable X_4 and X_6 both were found statistically significant at 10 per cent level on overall farm size group, further indicate that we can explore more income from the available input resources due to having more potentially toward the net returns by re-allocating the less contributed inputs towards the more gross income variables, as the remaining inputs were indicates less contribution or nominal level of profit towards the gross returns, so further re-investment may be re-allocate from the present status for the better output in the days to come.

By aggregating the cross-sectional data of all the farms in various farm size groups, production has been estimated for all the selected sample farms. The ordinary least square (OLS) estimates of parameters have been showed in table. The value of R^2 in all farm size of groups was found to be 0.803411, which shows 80.34 per cent of variation of dependent variable explained by the independent variation chosen in the equation.

Resource use efficiency:

Table 2. reveals that how to evaluate the efficiency by farmers in the study area have been utilizing their resources, marginal value product (MVP) of an input was compared with the respective factor cost the optimal uses of that factor was indicated as the ratio approach of unity. The value of ratio is greater than unity means that returns could be increased by using more than the resources potentiality as an under-utilized and for the value of ratio it is less than unity, which indicates improper use of resources.

The marginal value product of a particular resources indicate the expected addition of the resources contributing towards the gross return caused by an addition of one unit of the resources, while other inputs were kept constant. The marginal value product of these factors was computed by multiplying the regression coefficient of that resource with the geometric mean of gross return to the geometric mean of each resource. The computed MVP of different strategic variable is shown in table.

The value of MVP on overall farm size groups as total return was found to be positive on different farm size groups, which further indicate that additional of one unit will be contributing an amount ranging from Rs. 6.77/- to Rs. 10,083.38 /- on overall marginal farm size group, respectively, further it will be contributing toward the gross returns, so it may continue further more in the days to come.

The value of MVP for X_1 was found to be positive on different farm size group, indicates that addition of one unit of this input would be supplementing an amount ranging from Rs. 1.91/- to Rs. 25.99/- on different farm size group and further will be contributing toward gross return, also the value of MVP for X_2 was found positive on different farm size group, which indicates the addition of one unit of this inputs would be supplementing an amount ranging from Rs. 0.19/- to Rs. 3.43/- on different farm size group and further it will be contributing toward the gross return, so it may be continue further in days to come.

The value of MVP for X_3 was found to be positive on different farm size group, indicates that addition of one unit of this input, will be supplementing an amount ranging from Rs. 0.21/- to Rs. 2.36/- on different farm size group, which is contributing towards the gross return. The value of MVP for X_4 was found to be positive on different farm size group, indicates that addition of one unit of this input would be supplementing an amount ranging from Rs. 0.22/- to Rs. 3.03/- on different farm size group and further it will be contributing toward the gross return, so it may be continue in the days to come.

The value of MVP for X_5 was found to be positive on different farm size group, indicates that addition of one unit of this input, will be supplementing an amount ranging from Rs. 0.15/- to Rs. 1.44/- on different farm size group and further will be contributing toward gross return, also the value of MVP for X_6 was found to be positive on different farm size group, indicates that addition of one unit of this input would be supplementing an amount ranging from Rs. 0.98/- to Rs. 1.63/- on different farm size group and further it will be contributing toward the gross return, so it may be continue in the days to come.

The value of MVP for X_7 was found to be positive on different farm size group, indicates that addition of one unit of this input, will be supplementing an amount ranging from Rs. 0.03/- to Rs. 0.57/- on different farm size group and further will be contributing toward gross return, the value of MVP for X_8 was found to be positive on different farm size group, indicates that addition of one unit of this input would be supplementing an amount ranging from Rs. 0.02/- to Rs. 0.30/- on different farm size group and further it will be contributing toward the gross return, so it may be continue in the days to come, the value of MVP for X_9 was found to be positive on different farm size group, indicates that addition of one unit of this input would be supplementing an amount ranging from Rs. 0.39/- to Rs. 4.98 /- on different farm size group and further it will be contributing toward the gross return, so it may be continue in the days to come.

The above result showed that further in shift of the resources which provide the optimum level of marginal value product in compare of factor cost ratio to unity, it is further need to shift of input variables for getting better prospects from the same investment of inputs after re-shuffle of input.

Table 2: Result of Marginal Value Product analysis of rapeseed and Mustard growers

S. No.	Variables	Geometric Mean	MVP	MFC	Efficiency
(a)	**Marginal farm**				
1	X_1	422.59	24.08278	103.305	4.289579
2	X_2	26.47	1.534444	1816.224	1183.636
3	X_3	38.5	2.361111	518.5288	219.6122
4	X_4	51.61	3.03	-644.975	-212.863
5	X_5	21.81	1.315	123.3875	93.83077
6	X_6	38.06	2.615	1101.685	421.2946
7	X_7	10.09	0.574444	-1353.56	-2356.29
8	X_8	5.02	0.302778	-3634.07	-12002.4
9	X_9	85.24	4.861667	340.3053	69.99765
10	Y	1361.97	10083.38	-1.6E+07	-1566.83
(b)	**Small farm**				
1	X_1	233.83	7.92375	1075.011	135.6695
2	X_2	34.38	0.625625	441.0345	704.9502
3	X_3	79.69	1.221563	200.5122	164.1441
4	X_4	78.13	1.227813	-233.09	-189.841
5	X_5	37.5	0.971875	1464.54	1506.922
6	X_6	46.88	0.978125	1905.435	1948.049
7	X_7	10.94	0.176563	-6986.65	-39570.4
8	X_8	6.25	0.08625	9358.132	108500.1
9	X_9	112.41	1.8925	-6629.25	-3502.9
10	Y	1753.13	38.6125	1301748	33713.13
(c)	**Medium farm**				
1	X_1	633.62	25.9976	-2484.58	-95.5694
2	X_2	83.84	3.438	-10939.8	-3182.04
3	X_3	45.75	2.2236	-12978.3	-5836.62
4	X_4	49.7	2.1612	22322.62	10328.81
5	X_5	33.99	1.44	-32554.8	-22607.5
6	X_6	39.99	1.6332	32124.6	19669.73
7	X_7	6.76	0.2768	-39722.5	-143506
8	X_8	5.89	0.2424	-23947	-98791.3
9	X_9	120.32	4.9872	24682.31	4949.131
10	Y	1552.59	70.6944	15964181	225819.6
(d)	**Overall farm**				
1	X1	128.61	1.9112	-123.975	-5.14788
2	X_2	11.36	0.1972	-247.387	-161.222
3	X_3	12.82	0.209867	83.56274	35.39128
4	X_4	14.67	0.217333	171.2799	56.52801
5	X_5	8.28	0.147067	-179.481	-136.487
6	X_6	11.92	0.172667	195.8719	74.9032
7	X_7	2.32	0.031867	-662.037	-1152.48
8	X_8	1.38	0.019867	-2081.73	-6875.44
9	X_9	27.4	0.398933	1396.678	287.2837
10	Y	490.77	6.770133	136453.7	13.53253

CONCLUSION

In the study it determined that regression-coefficient of 0.943492 was found to be maximum with 94.35 per cent on marginal and it was minimum with 80.34 per cent on overall farm size groups, as both were found significant at 1 per cent level of significance which indicates that all the selected farm size groups were having more potentiality, which is contributing more towards the returns and even the investment on the selected inputs were found with positive impact towards the returns

The variable X_6 (Cost of fertilizer used/utilized in Rs/qtl) in marginal size group, X_9 (Cost of land revenue paid in Rs/ha) in small size group, X_4 (Cost of seed used/utilized in Rs/kg) and X_9 (Cost of land revenue paid in Rs/ha) both the variable in case of medium and X_9 variable in case of overall farm was found significant at 1 per cent level, which indicate the best contribution towards the net return. Even the other

variables viz. X_1, X_2, and X_3 in case of marginal farm size group, X_7 in case of small size group, X_6 in case of medium farm size group and in case of overall farm size group both X_4 and X_6 were found statistically significant at 10 per cent level. The value of MVP on overall farm size groups as total return was found to be positive on different farm size groups, which further indicate that additional of one unit will be contributing an amount ranging from Rs. 6.77/- to Rs. 10,083.38 /- on overall marginal farm size group, respectively, further it will be contributing toward the gross returns, so it may continue further more in the days to come. And the value of MVP for all the variables was found positive. From the findings and results it can also be concluded that further in shift of the resources which provide the optimum level of marginal value product in compare of factor cost ratio to unity, it is further need to shift of input variables for getting better prospects from the same investment of inputs after re-shuffle of input.

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