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To Study Resource Productivity and Resource Use Efficiency in Crop and Dairy Enterprise

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ABSTRACT

The study examined resource use efficiency of dairy farmers in Latur district of Maharashtra state. Study was conducted to assess the resource use efficiency for milk production and crop production. The data pertaining to milk yield and crop yieldand value of milk and crop produce, hired labour, family labour, bullock labour,machine labour, seed, organic manure, nitrogen, potash, phosphorus and plant protection in case of crop and quantity of human labour, dry fodder, green fodder, medicine cost, miscellaneous expenses and concentrates fed to each milch animal along with price were collected from a total 60 dairy farmers.A multistage stratified random sampling procedure was employed for the selection of cropping pattern of sample farmers were collected pertained to the agricultural year 2017-2017. It was revealed that 83 per cent of the cropped area was under soybean crop and other crops shared the remaining cropped area. Obviously, majority of the available resources were diverted towards soybean crop. Hence, the resource use efficiency was examined for soybean crop only by fitting log linear type of production function to per farm input-output data. It was observed that hired labour, family labour and bullock labour, seed, nitrogen and potash had positive significant effect on the yield of soybean. However, the effect of machine labour, manure and phosphorus was negatively significant. The coefficient of multiple determinations (R^2) was 0.839 explaining 83.9 per cent variation in the production of soybean by independent variables. And for the milch animals it was observed that green fodder, concentrates and medicine cost was the only significant contributing factor. All other variables were turned out to be non-significant.

***Key words**: MPP, MVP to price ratio,coefficient of multiple determinations (R^2), Significant, Non-Significant, Log linear.*

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INTRODUCTION

Soybean (*Glycine max*) is a species of legume native to East Asia, it is an important global crop widely grown for its edible bean which has numerous uses. Soybean meal is a significant and cheap source of protein for animal feeds. Soybean is known as the "Golden bean" and "Miracle crop" etc., because of its several uses. It is an excellent because source of protein and oil. It contains about 40 per cent of good quality protein. Besides utilization of Soybean as vegetable, it is also used in oil industry where it occupies first place in the world oil production. Soybean based food products are also suitable to diabetic patients as they contain less carbohydrates and low cholesterol. Therefore, it is one of the most economical protein sources in the world. India ranked fifth after USA, both in area (11.604 million hectare) and production (8.569 million MT)in the world during 2015-2016 (Ministry of Agriculture, Government of India). The area under the crop in the Maharashtra state during 2017/08 was 3.92 million ha the production was 4.79 million MT (Soybean crop outlook- *kharif* 2017/18) [1-4].

In India, dairy development is recognized as an important activity suitable for increasing the income level of rural families, especially the small and marginal farmers. The relative low levels of yield and price variability of milk as compared to crop production activity, the spread of income over the lactation period, the availability of family labour and crop residues make bovine keeping particularly suitable to low income families. Therefore, dairy development is included as a component in many rural development programmes. The bulk of milk production in our country is in the hands of millions of small producers scattered all over. To most of them, dairying is only a supplementary or complementary enterprise. Therefore, except for a few commercialized dairy farms in the urban areas, there still exists a vast scope for improving the status of small and marginal farmers by commercializing this enterprise.

Realizing the potential, various programmes have been launched to improve milk production capacity of local cow and buffaloes [2-5]. To study resource productivity and resource use efficiency in crop and dairy enterprise.

MATERIAL AND METHODS

Multistage sampling design was adopted in selection of district, tehsils and villages. In all, 60 dairy farmers were selected for the study. The resource productivity and resource use efficiency for crop and dairy production have been analysed with Cobb-Douglas type production function frame work. Cobb-Douglas type of production was fitted to the sample data separately for crop and dairy farming.

RESULT AND DISCUSSION

Resource Productivity and Resource Use Efficiency

Partial regression coefficient with respect to various independent variables were calculated and are presented in table 1. It was observed from the table that partial regression coefficient of area under *kharif* soybean was 0.46 which was positive and highly significant at 1 per cent level. Partial regression coefficient of Soybean of Machine labour, Manure and phosphorus were -0.016, -0.18 and -0.0042 respectively which were negative and non-significant. Partial regression coefficient on Soybean of bullock labour and seed was 0.0060 and 0.58 respectively which was positive and significant at 5 per cent level, Partial regression coefficient on Soybean of nitrogen was 0.082 whereas, potash was 0.011 which were positive and highly significant at 1 per cent level. Coefficient of multiple determination soybean (R^2) was 0.839, which indicates that 83.9 per cent effect of all independent variables together on soybean production return to scale was found to be 1.5 which indicated that production of soybean found decrease in return to scale.

Resource productivity with respect to marginal produce of area under soybean was 22.66 quintals it means that when increase in soybean area by one hectare over its geometric mean, that could be possibility to increase in soybean production by 22.66 quintals followed by that of hired human labour (0.46), family labour (0.55), seed (0.166), plant protection (3.98), phosphorus (2.25), potash (0.010) machine labour (0.082), nitrogen (0.066) and bullock labour (0.15). It inferred that if area under soybean production was increased by one hectare at its geometric mean level, it would lead to increase production of soybean with 22.66.

In regard to resource efficiency MVP to price ratio with respect to nitrogen was highest as 14021.7 followed by phosphorus (7025.7), potash (5154.4), seed (3533.76), hired labour (545.22), fmily labour (331.2), machine labour (307.8), manure (99.36) and bullock labour (8.33) which are positive. It implied that there was scope to increase these resources in soybean production.

Partial regression coefficient with respect to various independent variables was calculated and is presented in table 2. It was observed from the table that partial regression coefficient of milch animals was -7.716 which was negative and non-significant at 1 per cent level. Partial regression coefficient of milch animals of human labour, dry fodder and miscellaneous expenses were -0.347, -0.536 and -0.133 respectively which were negative and non-significant. Partial regression coefficient of milch animal green fodder, concentrate and medicine cost was 7.99, 6.00 and 0.133 respectively which was positive and significant at 5 per cent level. Coefficient of multiple determination formilch animal (R^2) was 0.822, which indicates that 82.2 per cent effect of all independent variables together on milch animal production return to scale was found to be 5.399 which indicated that production of soybean found increased in return to scale.

Resource productivity with respect to marginal produce of milk was 6962.79 lit. it means that when increase in milk by one lit over its geometric mean, that could be possibility to increase in milk production by 6962.79 lit. followed by that of concentrate (27.40), medicine cost (2.49) and green fodder (1.460) and for human labour (-4.45), dry fodder (-0.152) and for miscellaneous expenses (-2.512) is negative.

In regard to resource efficiency MVP to price ratio with respect to medicine cost was highest as 14.46 followed by green fodder(1.46) and concentrate (0.040) which are positive. It implied that there was scope to increase these resources in milk production and human labour (-4.45), dry fodder (-0.152) and miscellaneous expenses (-2.512) which are negative.

Table 1. Estimates of Cobb-Douglas production function in Soybean production

Sr. No.	Independent variable	Regression Coefficient (bi)	Standard error bi (SE)	T Value	Geometric Mean of input (xi)	Marginal Product (q)	Marginal Value Product (Rs.)	Price of input (Rs.)	MVP to Price Ratio
1.	Area of Soybean	0.46	0.17	2.65*	1.93	10.06	6948	200	34.74
2.	Hired human labour	0.33	0.22	1.49	30.29	0.46	109044	200	545.22
3.	Family human labour	0.24	0.14	1.66	18.40	0.55	66240	500	331.2
4.	Bullock labour	0.0060	0.005	1.16	1.62	0.15	5832	700	8.33
5.	Machine labour	-0.016	0.04	-0.34	5.13	0.082	18468	60	307.8
6.	Seed	0.58	0.23	2.45**	147.24	0.166	530064	190	3533.16
7.	Manure	-0.18	0.053	-3.51	8.28	0.92	29808	300	99.36
8.	Nitrogen	0.082	0.070	1.17	50.79	0.066	182844	13.04	14021.7
9.	Phosphorus	-0.0042	0.046	-0.09	75.00	2.25	270000	38.43	7025
10.	Potash	0.011	0.046	0.25	40.09	0.010	144324	28	5154.4

Intercept (log a) ---------- 5.95
F value ---------- 5.41
R^2 ---------- 0.83
Return to scale (∑bi) ------- 1.53

Note: Geometric mean of (Y) Soybean production 22.66 q per farm and price was Rs. 3600/q
* Significant at 5 per cent level
** Significant at 1 per cent level

Table 2. Estimates of Cobb-Douglas production function in dairy

Sr. No.	Independent variable	Regression Coefficient (bi)	Standard error bi (SE)	T Value	Geometric Mean of input (xi)	Marginal Product (q)	Marginal Value Product (Rs.)	Price of input (Rs.)	MVP to price ratio
1.	No of animals	-7.716	0.000057	-0.000021	4.17	-12883.66	-	-	-
2.	Human labour	-0.347	0.385	-0.90	542.72	-4.45	-801	140	-4.45
3.	Dry fodder	-0.536	0.000029	-0.0000012	24394.39	-0.152	-0.182	1.2	-0.152
4.	Green fodder	7.997	0.000077	0.000016	38116.24	1.460	2.336	1.6	1.46
5.	Concentrates	6.001	0.000079	0.0000083	1524.64	27.405	1.054	26	0.040
6.	Medicine cost	0.133	0.055	0.24	371.29	2494	1072.81	123.61	14.46
7.	Miscellaneous expenses	-0.133	0.20	-0.65	368.59	-2.512	138.16	91.67	-2.512

Intercept (log a) ----------0.771
Note: Geometric mean of (Y) milk production was
F value ---------- 2.95
6962.79 lit per animal and price was Rs. 60/lit
R^2---------- 0.822
Return to scale (∑bi) ------- 5.399
* Significant at 5 per cent level
** Significant at 1 per cent level

CONCLUSION

As cropping pattern of study area is dominated by *kharif* Soybean, the major resources of the farmers were diverted in Soybean production. Therefore, resource use efficiency only in respect of Soybean was worked out. The functional analysis revealed that 83.9 per cent variation in soybean production was explained by the various resources. There were significant impact of area, hired labour, family labour, seed, nitrogen, potash and bullock labour on Soybean production. Regarding utilization of resources at overall level, the MVP of all resources was greater than their factor costs indicating underutilization.

The functional analysis in dairy enterprise revealed that in case of milch animals, green fodder, concentrates, medicine cost, had significant effect on milk production while in case of other coefficient

like no. of animals, human labour, dry fodder and miscellaneous expenses had significant effect. Regarding utilization of resources, MVP of green fodder and medicine costs was greater than its factor costs indicating underutilization of these resources. Utilization of human labour, dry fodder and concentrates were below their optimum level, indicating excess use of these resources

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