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Resource Use Efficiency in Onion Crop in Jaipur District of Rajasthan

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ABSTRACT: Present investigation was undertaken to study about resource use efficiency of onion crop in Jaipur district of Rajasthan as it has a considerable position in production of onion. Two tehsils namely Amber and Chomu from Jaipur district were selected on the basis of maximum production of onion. Two villages namely Maheshwas and Nangal Ladi of Amber tehsil and Rampura and Jaitpura of Chomu tehsil were selected randomly for the study. A sample size of 60 farmers was selected for study. Primary data were collected about size of holding, resource inventory, input used in and yield obtained from onion cultivation both physical and monetary terms for the period 2018-19. Resource use efficiency was estimated by using statistical tools like regression coefficient analysis, elasticity coefficient. The results indicated that human labour and value of manure were the major components which significantly contributed in the gross returns of marginal size group farmers. In case of small size group farmers, contribution of land, machine labour and cost of seed were found significant in onion production. In case of semi-medium size group farmers, contribution of human labour, machine labour and cost of seed were found significant in onion production. In case of medium size group farmers, contribution of land, human labour and machine labour were found significant in onion production while, rest of all inputs were not significant. Further results indicated that reallocation of resources like land, human labour, machine labour, seed, manure and withdrawal of other resource like bullock labour may greatly increase the gross income of the farmers through onion cultivation. The study of return to scale suggested that marginal farmers can increase the gross income by reallocation of independent variables like machine labour and value of manure. Marginal value product suggested that farmers may increase the land and machine labour in case of small farmer. In case of semi-medium size group, farmers can increase the gross income by reallocation of human labour and seed. In case of medium size group, farmers can increase the gross income by reallocation of land. Variation in gross income formed in the study area was 72, 81, 77 and 93 percent for marginal, small, semi-medium and medium farmers, respectively.

Keywords: Onion, Resource use efficiency, regression coefficient method, marginal value product, significant.

INTRODUCTION

Many of the countries have to depend much upon the development of agriculture for their economic development to meet the demand for food and agriculture raw-materials. Vegetables are important constituents of Indian agriculture and nutritional security due to their high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Onion is grown all over the world. Globally, onion accounted for 5.04 million hectares of global crop area producing 96.77 metric tonnes of onion with an average productivity of 19.20 quintals per ha in 2018 (FAOSTAT, 2020). The vast production base offers India tremendous opportunities for export during 2018-19, India exported vegetables worth Rs. 5419.48 crore. The important onion producing countries of the world are China, India, Egypt, U.S.A., Iran, Turkey. India is the second largest producer of onion in world. India is second largest major grower, producer and consumer of onion accounting about 26.2 percent of total acreage, 22.8 percent of the total global production. In India, total production of onion was 22.82 million tonnes with an area of 12.2 lakh hectare during 2018-19 (DES, DAC&FW). In India, the major onion growing states are Maharashtra, Madhya Pradesh, Karnataka, Bihar and Rajasthan. In Rajasthan, onion is grown on 59.05 thousand hectares with an annual production of 9.50 lakh tonnes with the productivity of 16.08 tonnes ha^{-1} during 2017-18 (DoA GoR, 2019). The major onion growing district in Rajasthan were Jodhpur, Sikar, Alwar, Nagaur, Jaipur, Jhunjhunu, and Bikaner. Onion prices typically exhibit a seasonal trend rising during the lean season of September-October and falling during April-May coinciding with the peak arrival season of the major *Rabi* season crop. Onion is mainly grown in *Rabi* season in north Indian plains, but due to development of *Kharif* varieties like N-53, Early Grano, pusa red, Agrifound dark red etc. it is becoming popular even in *kharif* season. Onion plays a pivotal role in the Agricultural Economy of Rajasthan state. Onion crop is grown during *Rabi* season as an irrigated crop. The term resource use efficiency in agriculture may 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 optimally, to maximize his income, at least cost on a sustainable basis. In Rajasthan, there has been a wide fluctuation in the onion productions, which is attributed to several factors such as the seasonal conditions, the area under crop, level of input used, price of onion etc. The area,

yield and price of onion play a greater role in enhancing the production of onion. The level of input use and their prices affect the profitability of the crop enterprise.

MATERIALS AND METHODS

Jaipur district was purposively selected as it has considerable higher contribution in production of onion in the state. Two tehsils namely Amber and Chomu were selected on the basis of maximum production of onion. Maheshwas and Nangal Ladi villages of Amber tehsil and Rampura and Jaitpura villages of Chomu tehsil were selected for the study. Thus, a sample of 60 farmers from four villages were selected for detailed study.

The present study was based on primary data and the required data on size of holding, resource inventory, input used in and yield obtained from onion cultivation both physical and monetary terms from selected farmers for the period 2018-19 were collected and analyzed accordingly.

Statistical tools

Resource use efficiency of onion was calculated with the given formula:

$$\text{Log } Y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + u \log e$$

Where,

Y = Gross income (rupees)

X_1 = Land (hectares)

X_2 = Value of human labour (rupees)

X_3 = Value of bullock labour (rupees)

X_4 = Value of machine labour (rupees)

X_5 = Value of seeds (rupees)

X_6 = Value of manure (rupees)

a = Constant

e = Random variable

b_1 to b_6 are elasticity coefficients of respective inputs.

$$\text{MVP of Xi} = b_i \frac{\text{Geometric mean of } Y_i}{\text{Geometric mean of } X_i}$$

Where,

b_i = Elasticity coefficient of i^{th} variable

Y_i = Gross income

X_i = i^{th} independent variable

$$SE_x = S \div \sqrt{n}$$

Where,

X = Independent variable

S = Standard deviation

N = No. of observation

RESULTS AND DISCUSSION

The value of regression coefficient of different variables for onion production under different size groups (Table 1) reveals values of coefficients of adjusted R square and were found to be quite high in all the size groups i.e. (72 to 93 percent), which indicated fraction of the variation in the value of Y that is explained by explanatory variables. Return to scale is the sum of the elasticities of resources included in the power function, indicating the percentage change in total production due to one percent change in the selected variable input. The sum of the regression coefficient of selected variables were estimated to be 0.928, 1.166, 1.440 and 1.109 for marginal, small, semi-medium and medium farm size group's, respectively. These results indicated decreasing returns to scale in marginal size group and increasing returns to scale in all other size groups. The values of regression coefficients of land were found to be significant i.e. 0.426 and 0.340 for small and medium size groups, respectively (Sharma and Joginder, 1990). The values of regression coefficient of human labour were found to be significant i.e. -0.054, 0.513 and 0.525 for marginal, semi-medium and medium size groups, respectively. Similar study was conducted by Chandrashekhara *et al.*, 1991, Sharma *et al.*, 1992, Deshmukh, 2002, Ghulghule *et al.*, 2003, Verma *et al.*, 2004, Abdu *et al.*, 2015 and Bapri *et al.*, 2016. The value of regression coefficient of machine labour were found to be significant i.e. 1.185, 0.458 and -0.206 for small, semi-medium and medium size groups, respectively. The value of regression coefficient of manure was found to be significant i.e. 0.339 for marginal size group. The similar results were inconsonance with the results of Sharma and Joginder, 1990, Ghulghule *et al.*, 2003, Verma *et al.*, 2004. The value of regression coefficient for cost of seed were found to be 0.285 and 0.030 for small and semi-medium size groups, respectively (Verma *et al.*, 2004). The value of regression coefficients for bullock labour were found non-significant for all size groups. The similar study was conducted by Sharma *et al.*, 1992. In case of marginal farmer group, the value of human labour and manure were found significant at 10 percent and 5 percent level of significance respectively (Chandrashekhara *et al.*, 1991). However, manure has positive contribution in onion yield (Deshmukh, 2002) but human labour has negative contribution in the production of onion due to unskilled labour and the rest of all inputs were found not significant in onion production. In case of small farmer group, the value of land, machine labour and cost of seed. were found significant at 10 percent, 10 percent and 5 percent level of significance, respectively Similar results were inconsonance with the results of Lokapur *et al.*, 2014, Abdu *et al.*, 2015, Bapri *et al.*, 2016, Saleh *et al.*, 2016, Verma *et al.*, 2004 and Shelke *et al.*, 2011. All inputs have positive contribution in the onion production due to fertile land, good quality seed and proper amount of seed and use of high technology machineries. In case of semi-medium farmer group, the value of human labour, machine labour and seed cost were found significant at 10 percent,10 percent and 5 percent level of significance, respectively. All inputs have positive contribution in the yield due to fertile land, adequate size of land, skilled labour and high technology machineries. In case of medium farmer group, the value of land, human labour and machine labour were found significant at 1 percent, 10

percent and 5 percent, respectively. Land and human labour have positive contribution in production due to fertile land, large size of land holding and skilled labour. However, the machine labour has negative contribution in the production due to high technology.

Table 1: Regression coefficient of selected variable for onion production.

Particulars	Size group			
No. of farmers	**Marginal (<1 ha.) (19)**	**Small (1-2 ha.) (17)**	**Semi-Medium (2-4 ha.) (12)**	**Medium (4-10 ha.) (12)**
Intercept (A)	4.129 (1.218) [3.39] {0.27}	3.143 (6.294) [4.170] {0.004}	3.694 (0.874) [-3.080] {0.06}	4.603 (2.995) [3.539] {0.31}
Regression coefficient (b) of				
Land (ha) X_1	0.064 (0.074) [0.860] {0.32}	0.426* (0.780) [0.901] {0.07}	0.392 (1.943) [0.475] {0.28}	0.340*** (0.230) [1.478] {0.003}
Human labour (') X_2	-0.054* (0.301) [-1.820] {0.08}	-0.438 (0.901) [-1.042] {0.34}	0.513* (0.216) [0.060] {0.06}	0.525* (0.808) [0.031] {0.07}
Machine labour (`) X_3	0.452 (0.302) [1.496] {0.21}	1.185* (0.589) [-2.010] {0.06}	0.458* (0.227) [2.016] {0.08}	-0.206** (0.231) [-1.326] {0.03}
Value of manure (`) X_4	0.339** (0.114) [-2.962] {0.02}	0.057 (0.498) [0.115] {0.40}	-0.046 (0.202) [0.230] {0.26}	-0.176 (0.208) [-1.327] {0.32}
Cost of seed (`) X_5	0.173 (0.145) [1.191] {0.28}	0.285** (0.294) [2.330] {0.04}	0.030** (0.178) [0.171] {0.02}	0.328 (0.298) [1.768] {0.36}
Bullock labour (`) X_6	-0.046 (0.121) [-0.382] {0.43}	-0.349 (0.149) [-1.547] {0.24}	0.093 (0.103) [0.905] {0.33}	0.284 (0.213) [-0.863] {0.21}
Sum of elasticities [∑bi] (return to scale)	0.928	1.166	1.440	1.109
Adjusted R square	0.72	0.81	0.77	0.93

(Figures in brackets indicate standard error of regression coefficient); *, **, *** shows level of significance at 10, 5 and 1 percent respectively; [Figures in square brackets indicate t-value of regression coefficient] ; {Figures in brackets indicate P-value of regression coefficient}

Marginal Value Product . The marginal value productivity (MVP) for each input was estimated at geometric mean of gross output and their respective input factors. Table 2 reveals that the marginal value productivity of land was found to be 0.096, 2.180, 0.978 and 1.633 for marginal, small, semi-medium and medium size group, respectively. The similar study was conducted by Woseor *et al*., 2012, Lokapur *et al.*, 2014. The marginal value productivity of human labour was found to be -0.658, -1.120, 1.154, 0.023 for marginal, small, semi-medium and medium group, respectively (Deshmukh, 2002). The marginal value productivity of machine labour were found to be 0.557, 1.589, 0.552 and -0.359 for marginal, small, semi-medium and medium group, respectively. The Marginal value productivity of manure were found to be 0.425, 0.074, -0.062 and -0.298 for marginal, small, semi-medium and medium group, respectively. The study was inconsonance with the study of Woseor *et al*., 2012, Lokapur *et al.*, 2014. The marginal value productivity of seed was found to be 0.237, 0.924, 1.040 and 0.310 for marginal, small, semi-medium and medium group, respectively. The similar results were found by Woseor *et al.*, 2012, Lokapur *et al.*, 2014. The marginal value productivity of bullock labour were found to be -0.070, -0.009, 0.144 and 0.218 for marginal, small, semi-medium and medium group, respectively. The results were inconsonance with the results of Woseor *et al.*, 2012, Lokapur *et al.*, 2014.Deshmukh, 2002 verma *et al*., 2004. The ratio of MVP to factor cost were greater than one for those inputs indicating that still there exists scope for higher utilization of these inputs which in turns would increase the gross income. This would help to maximize their profit in onion cultivation. The ratio of MVP to factor cost found less than unity indicating restricted application of these inputs in respective area and the MVP was negative for those inputs indicating overused than requirement, there was need to reduce those to optimize returns.

Table 2: MVP of different size group.

S. No.	Resource	MVP			
		Marginal	**Small**	**Semi-Medium**	**Medium**
1.	Land X_1	0.096	2.180	0.978	1.633
2.	Human labour X_2	-0.658	-1.120	1.154	0.023
3.	Machine labour X_3	0.557	1.589	0.552	-0.359
4.	Manure X_4	0.425	0.074	-0.062	-0.298
5.	Seed X_5	0.237	0.924	1.040	0.310
6.	Bullock labour X_6	-0.070	-0.009	0.144	0.218

CONCLUSIONS

Onion resource use efficiency showed that resources, human labour and value of manure was significant in case of marginal farmer group. The sum of regression coefficient indicated decreasing returns to scale. In case of small size group farmers, land, machine labour and cost of seed was significant. The sum of regression coefficients indicated increasing returns to scale. In case of semi- medium size group farmers, contribution of human labour, machine labour and cost of seed was significant. In case of medium size group farmers, contribution of land, human labour and machine labour was significant. The study will create a path to farmers about allocation of resources in an efficient manner with least cost and maximization of output and returns.

Conflict of interest. The authors have no conflict of interest.

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