Comparative Study of Resource use Productivity and Resource use Efficiency of Kharif Vis-a-Vis Rabi Onion in Ahmednagar District of Maharashtra, India

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Abstract

The study examined resource use efficiency of kharif vis-a-vis rabi onion in Ahmednagar district of Maharashtra state. It was observed that, the major resources viz., organic manure, potash, plant protection, machine labour and hired labour used in onion cultivation showed a positive relationship in case of rabi onion and in kharif season organic manure and potash showed a negative relationship, It was partly due to influence of climatic condition in kharif season.

Keywords
MVP, MVP to price ratio

Introduction

Onion is extremely important commercial vegetable crop not only for internal consumption, but also for highest foreign exchange. It is grown in different parts of the country mainly by small and marginal farmers. Onion is valued for its bulbs having characteristic odour, flavor and pungency. Value addition in onion is done by marketing dehydrated onions and onion flakes. Onion is grown in three seasons kharif / rainy i.e. June to September, late kharif (rangda) from September to December and rabi/winter (pol/unhali) from December to March. India is world’s second largest producer of onions, likely to have 13.06 lakh hectare under crop in 2016-17 producing 122.427 lakh million tonnes of onion with the productivity 17.32 tonnes per hectare, after China. Maharashtra contributes nearly 31.19 per cent of the total production and 39.56 per cent area of onion in India with area under onion cultivation around 481.05 thousand hectare giving the production of 6734.74 thousand MT, therefore the productivity is 14 tonnes per hectare. Total area under onion in Ahmednagar district was 69.98 thousand hectare in 2015-2016.

Objective

To study resource use productivity and resource use efficiency of kharif and rabi onion
Materials and Methods

Multistage sampling design was adopted in selection of district, tehsils and villages. In all, 60 onion growers both kharif and rabi season growing onion crop were selected for the study. Out of which 60 were kharif onion growers and 60 were rabi Onion Growers, total sample size of kharif and rabi onion grower was 120. The resource productivity and resource use efficiency for kharif and rabi onion production have been analysed with Cobb-Douglas type production function framework. Cobb-Douglas type of production was fitted to the sample data separately for kharif and rabi onion cultivation.

Results 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&2. It was observed from the table that partial regression coefficient of area under kharif onion was -0.752 and rabi onion was 1.251 which was positive and highly significant at 1 per cent level. It inferred that when one per cent increase in use of area under onion over its geometric mean, it would lead to increase production of onion by 0.467 per cent. Similarly partial regression coefficient of kharif and rabi onion of seed and irrigation were -0.450, -0.004 and -0.065, -0.006 respectively which were negative and non-significant. Partial regression coefficient kharif and rabi onion of machine labour was 0.090 and 0.043 respectively which was positive and significant at 5 per cent level, and plant protection was 0.437 and 0.470 respectively which was positive and highly significant at 1 per cent level. Partial regression coefficient on kharif onion of phosphorus was 0.863 whereas, potash was 0.158 in rabi onion which were positive and highly significant at 1 per cent level. Partial regression coefficient on kharif and rabi onion of hired human labour was 2.216 and 0.139 respectively which was positive and significant at 5 per cent level in kharif and positive and highly significant at 1 per cent level in rabi. In kharif season bullock labour and nitrogen were 0.009 and 0.0583 respectively which was positive and non significant whereas, in rabi bullock labour and nitrogen were -0.001 and -0.062 respectively which was negative and non significant. Partial regression coefficient of manure in kharif season was -0.265 which was negative whereas, positive in rabi season 0.072 and both were statistically non-significant. Coefficient of multiple determination kharif and rabi onion ($R^2$) was 0.611 and 0.99 respectively, which indicates that 61.11 and 99.00 per cent effect of all independent variables together on onion production return to scale was found to be 1.77 and 1.99 respectively which indicated that production of onion found decrease in return to scale.

Resource productivity with respect to marginal produce of area under kharif onion was 168.92 quintals it means that when increase in onion area by one hectare over its geometric mean, that could be possibility to increase in onion production by 168.92 quintals followed by that of Hired human labour (5.199), Plant protection (4.371), Phosphorus (0.0863), Machine labour (0.084), Nitrogen (0.0583) and Bullock labour (0.009). In rabi season, resource productivity with respect to marginal produce of area under kharif onion was 532.88 quintals it means that when increase in onion area by one hectare over its geometric mean, that could be possibility to increase in onion production by 532.88 quintals followed by that of Plant protection (6.167), Manure (1.223), Machine labour (1.010), Potash (0.579) and Hired human labour (0.509).
Table 1: Estimates of Cobb-Douglas production function in *Kharif* onion 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 onion             | -0.752                      | 1.276                  | -0.589  | 0.673                       | 168.92               | 144643                        | 32324.39           | 4.34              |
| 2.      | Hired human labour        | 2.216                       | 0.878                  | 2.523*  | 64.429                      | 5.199                | 4452.28                       | 200                 | 22.26             |
| 3.      | Family human labour       | -0.229                      | 0.242                  | -0.946  | 58.483                      | -0.229               | -506.874                      | 200                 | -2.53             |
| 4.      | Bullock labour            | 0.009                       | 0.018                  | 0.510   | 1.080                       | 0.009                | 1078.73                       | 1000                | 1.07              |
| 5.      | Machine labour            | 0.090                       | 0.42                   | 2.142*  | 11.800                      | 0.084                | 921.493                       | 600                 | 1.53              |
| 6.      | Seed                      | -0.450                      | 1.005                  | -0.447  | 6.062                       | -0.450               | -9609.29                      | 1500                | -6.40             |
| 7.      | Manure                    | -0.265                      | 0.304                  | -0.779  | 17.111                      | -0.265               | -2004.77                      | 160                 | -12.52            |
| 8.      | Nitrogen                  | 0.0583                      | 0.816                  | 0.071   | 89.408                      | 0.0583               | 84.408                        | 13.04               | 6.47              |
| 9.      | Phosphorus                | 0.863                       | 0.144                  | 5.993** | 158.365                     | 0.0863               | 705.417                       | 38.43               | 18.35             |
| 10.     | Potash                    | -0.140                      | 0.233                  | -0.598  | 69.4155                     | -0.140               | -261.077                      | 28.0                | -9.32             |
| 11.     | Plant protection          | 0.437                       | 0.148                  | 2.952** | 2.179                       | 4.371                | 2596.08                       | 1077                | 2.41              |
| 12.     | Irrigation                | -0.065                      | 0.125                  | -0.523  | 3704.943                    | -0.065               | -2.271                        | 2.00                | -1.135            |

Intercept (log a) --------------- 3.352
F value --------------- 6.16
R² --------------- 0.611
Return to scale (∑bi) --- 1.77

* Significant at 5 per cent level
** Significant at 1 per cent level

Note: Geometric mean of (Y) onion production was 151.18 q per farm and price was Rs. 856.25/q
### Table 2: Estimates of Cobb-Douglas production function in Rabi onion production

| Sr. No. | Independent variable         | Regression Coefficient (bi) | Standard error (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 onion               | 1.251                      | 0.280               | 4.467**  | 0.930                       | 532.88              | 670317.10                   | 88892               | 7.540            |
| 2.      | Hired human labour          | 0.139                      | 0.039               | 3.531**  | 0.509                       | 641.210             | 200                         | 3.20                 |                 |
| 3.      | Family human labour         | -0.008                     | 0.026               | -3.301   | 69.282                      | -0.045              | 200                         | -0.28                |                 |
| 4.      | Bullock labour              | -0.001                     | 0.001               | -8.905   | 1.0717                      | -0.369              | 1000                        | 0.006               | 0.46             |
| 5.      | Machine labour              | 0.043                      | 0.021               | 2.047*   | 16.859                      | 1.010               | 1270.991                    | 600                 | 2.11             |
| 6.      | Seed                        | -0.004                     | 0.076               | -6.284   | 8.377                       | -0.189              | -237.945                    | 1500                | -0.16            |
| 7.      | Manure                      | 0.072                      | 0.555               | 0.130    | 23.311                      | 1.223               | 1539.13                     | 160                 | 9.61             |
| 8.      | Nitrogen                    | -0.062                     | 0.247               | -2.505   | 123.172                     | -0.076              | -49.642                     | 13.04               | -3.80            |
| 9.      | Phosphorus                  | -0.053                     | 0.048               | -1.093   | 217.751                     | -0.096              | -121.575                    | 38.43               | -3.163           |
| 10.     | Potash                      | 0.158                      | 0.076               | 2.078**  | 106.778                     | 0.519               | 653.397                     | 28.00               | 28.33            |
| 11.     | Plant protection            | 0.470                      | 0.152               | 3.092**  | 3.019                       | 6.167               | 7757.91                     | 1077                | 7.20             |
| 12.     | Irrigation                  | -0.006                     | 0.200               | -0.032   | 5104.491                    | -0.0064             | 0.584                       | 2.00                | 0.29             |

Intercept (log a) -----------2.724
F value                 0.051
R²                      0.99

Return to scale (Σbi) ------- 1.99

* Significant at 5 per cent level
** Significant at 1 per cent level

Note: Geometric mean of (Y) onion production was 396.14 q per farm and price was Rs. 1257.91/q
It inferred that if area under onion production was increased by one hectare at its geometric mean level, it would lead to increase production of onion with 168.92 and 532.88 quintals.

In regard to resource efficiency in *kharif* season, MVP to price ratio with respect to hired human labour was highest as 22.26 followed by area under onion potash (18.35), nitrogen (6.47), plant protection (2.39), machine labour (1.53) and bullock labour (1.07) which are positive also in regard to resource efficiency in *rabi* season, MVP to price ratio with respect to potash was highest as 28.33 followed by area under onion manure (9.61), plant protection (7.20), hired human labour (3.20), machine labour (2.11) and irrigation (0.29) which are positive in *rabi* season. It implied that there was scope to increase these resources in onion production. On the contrary, in kharif, in regard to seed, manure, family human labour, potash, irrigation and in rabi season family human labour, bullock labour, seed, nitrogen and phosphorous MVP to price ratio was negative.

It can be concluded that *kharif* onion farming has MVP to price ratio of seed, manure, family labour, potash and irrigation were negative. It was clear that higher the MVP to price ratio, there was greater chance to increase these resources. When MVP to price ratio tends to unity at that point, there would be efficient utilization of resource.

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