CHAPTER VII

FUNCTIONAL ANALYSIS
Multiple regression analysis was used as the analytical tool to study the input-output relationship and productivity of various farm inputs involved in the production of various crops of the sample farms. In the present chapter, an attempt is being made to determine the production elasticities of various farm inputs involved in obtaining the farm returns under different size of holdings on secured irrigated conditions and on the farm as a whole (all farms) of secured and insecure irrigated farms in the sample area.

Cobb-Douglas type of regression equation was used, as it gave a better fit. The regression equations for the farms of different size groups and the farm as a whole of secured irrigated farms have been shown as below:

Regression equation:

\[ Y = a \cdot X_1^{b_1} \cdot X_2^{b_2} \cdot X_3^{b_3} \cdot X_4^{b_4} \cdot X_5^{b_5} \]

Below 1 hectare size group:

\[ Y = 0.2450 \cdot X_1^{0.1890} \cdot 0.095 \cdot 0.3040 \cdot 0.2470 \]
\[ Y = 10.2633 \cdot X_1 \cdot X_2 \cdot X_3 \cdot X_4 \cdot X_5 \]
\[ (0.1968) \cdot (0.1709) \cdot (0.1563) \cdot (0.0954) \cdot (0.0790) \]

1 - 2 hectare size group:

\[ Y = 0.3850 \cdot 0.3090 \cdot 0.1560 \cdot 0.4100 \cdot 0.2790 \]
\[ Y = 1.2003 \cdot X_1 \cdot X_2 \cdot X_3 \cdot X_4 \cdot X_5 \]
\[ (0.2197) \cdot (0.2205) \cdot (0.1657) \cdot (0.2319) \cdot (0.1257) \]

Contd....
Contd....

2 - 4 hectare size group:

\[ Y = 4.5637 \cdot X_1 + 0.2215 \cdot X_2 + 0.1269 \cdot X_3 + 0.3313 \cdot X_4 + 0.2376 \cdot X_5 \]

\( (0.1735) (0.1052) (0.2135) (0.1791) (0.1251) \)

4 - 6 hectare size group:

\[ Y = 3.0549 \cdot X_1 + 0.2383 \cdot X_2 + 0.1289 \cdot X_3 + 0.3190 \cdot X_4 + 0.2340 \cdot X_5 \]

\( (0.2746) (0.1705) (0.1013) (0.2056) (0.1519) \)

6 hectare & above 6 hectare size group:

\[ Y = 4.5919 \cdot X_1 + 0.2362 \cdot X_2 + 0.1290 \cdot X_3 + 0.2956 \cdot X_4 + 0.2367 \cdot X_5 \]

\( (0.1951) (0.2216) (0.1056) (0.1123) (0.1026) \)

Farm as a whole (all farms):

\[ Y = 3.2218 \cdot X_1 + 0.2369 \cdot X_2 + 0.1252 \cdot X_3 + 0.3361 \cdot X_4 + 0.2529 \cdot X_5 \]

\( (0.1925) (0.1561) (0.1036) (0.1251) (0.1062) \)

\( Y = \) Value of output per hectare in rupees.
\( a = \) Constant.
\( X_1 = \) Cost of human labour in rupees per hectare.
\( X_2 = \) Cost of bullock labour in rupees per hectare.
\( X_3 = \) Cost of seed in rupees per hectare.
\( X_4 = \) Cost of manure - fertilizers in rupees per hectare.
\( X_5 = \) Cost of irrigation in rupees per hectare.

The elasticity of production along with standard error, test of significance and value of coefficient of multiple determination for each equation are given in Table VII-1.

* Significant at 5 per cent level of significance.
** Significant at 10 per cent level of significance.
Figure in parenthesis denotes value of standard error.
Table VII-1. Elasticity of production, standard error, value of 't' and coefficient of multiple determination on the farm as a whole (all farms) and for different size of holdings on secured irrigated farms.

<table>
<thead>
<tr>
<th>Particular</th>
<th>Size groups</th>
<th>All farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below 1 - 2</td>
<td>2 - 4</td>
</tr>
<tr>
<td>1. Regression coefficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>0.2450*</td>
<td>0.3850*</td>
</tr>
<tr>
<td>$X_2$</td>
<td>0.1890**</td>
<td>0.3090*</td>
</tr>
<tr>
<td>$X_3$</td>
<td>0.0950</td>
<td>0.1560</td>
</tr>
<tr>
<td>$X_4$</td>
<td>0.3040*</td>
<td>0.4100*</td>
</tr>
<tr>
<td>$X_5$</td>
<td>0.2470*</td>
<td>0.2790**</td>
</tr>
<tr>
<td>2. Standard error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>0.1968</td>
<td>0.2197</td>
</tr>
<tr>
<td>$X_2$</td>
<td>0.1709</td>
<td>0.2205</td>
</tr>
<tr>
<td>$X_3$</td>
<td>0.1563</td>
<td>0.1657</td>
</tr>
<tr>
<td>$X_4$</td>
<td>0.0954</td>
<td>0.2319</td>
</tr>
<tr>
<td>$X_5$</td>
<td>0.0790</td>
<td>0.1257</td>
</tr>
<tr>
<td>'t' value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>4.5126</td>
<td>5.3257</td>
</tr>
<tr>
<td>$X_2$</td>
<td>3.6515</td>
<td>5.0521</td>
</tr>
<tr>
<td>$X_3$</td>
<td>1.2561</td>
<td>1.7531</td>
</tr>
<tr>
<td>$X_4$</td>
<td>6.5253</td>
<td>6.7952</td>
</tr>
<tr>
<td>$X_5$</td>
<td>5.9542</td>
<td>4.3521</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.8421</td>
<td>0.8605</td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level of significance.
** Significant at 10 per cent level of significance.

It is quite evident from Table VII-1, that coefficient of multiple determination of the farms of different size groups and
farm as a whole (all farms) under secured irrigation situation accounted for about 84 per cent, 86 per cent, 89 per cent, 85 per cent, 89 per cent and 88 per cent of the total observed variation in the value of gross return due to significant input variables particularly of manure-fertilizer and irrigation on the farms of below 1 hectare, 1 - 2 hectare, 2 - 4 hectare, 4 - 6 hectare and 6 hectare and above 6 hectares and on the farm as a whole (all farms) respectively. It is also clear from the table, that among the significant variables like human labour, bullock labour, manure-fertilizer and irrigation on the farms below 1 hectare, 1 - 2 hectare and 2 - 4 hectare and human labour, seed, manure-fertilizer and irrigation on the farm 4 - 6 hectare, 6 hectare and above 6 hectare size groups and on the farm as a whole (all farms), the highest elasticity of production was observed in irrigation, manure-fertilizer followed by human labour in almost all the size groups and on the farm as a whole. The elasticity of production of seed was observed to be non-significant on the farms below 1 hectare, 1 - 2 hectare and 2 - 4 hectare size groups while it was found to be significant at 10 per cent level of significance on the farms of 4 - 6 hectare and 6 hectare size groups. On the farm as a whole (all farms) the elasticity of production of cost of seed was observed to be significant at 5 per cent level of significance.

Marginal value productivities of inputs:

The marginal value productivity is the marginal return of an input variable expressed in monetary terms and can be defined as the additional return obtained from an additional unit of input.
Economic optimum levels:

The profits could be maximised on the farms by increasing each resource input to a point where its marginal value product is equal to its price. This is true when the available capital with the farmers is unlimited. This supposition and assumption of unlimited capital availability with the farmers is very far from reality and has little practical applicability. In the case of capital constraints, the maximum returns could be achieved by allocating the limited capital among its various competing uses in such a way that its marginal value return per rupee investment on each input variable become equal. In case, when the marginal value productivity of various farm inputs are not equal at the existing level of their uses, the return can be maximised by equating the marginal value product per rupee investment by shifting the resources having low marginal value productivity to those resource inputs which have higher marginal value productivity.

The marginal value productivity of various input variables for different size of holdings and their optimum and existing levels on the farms of secured irrigated farms have been represented in Table VII-2.

An examination of marginal value productivity, existing and optimum levels of various input variables for the farms of various size groups and for the farm as a whole under secured irrigation situation revealed that the marginal value productivities in monetarising terms of manure and fertilizer and irrigation were highest on the farms of almost all size groups and on the farms as a whole in comparison to the marginal value productivities of
Table VII-2. Marginal value productivity, existing and optimum levels of various resource inputs on the farm as a whole and for different size groups of secured irrigation condition.

<table>
<thead>
<tr>
<th>Particular</th>
<th>Size groups (in hectares)</th>
<th>All farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal value productivity (in Rs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>1.63</td>
<td>2.67</td>
</tr>
<tr>
<td>$X_2$</td>
<td>1.54</td>
<td>2.60</td>
</tr>
<tr>
<td>$X_3$</td>
<td>2.13</td>
<td>3.02</td>
</tr>
<tr>
<td>$X_4$</td>
<td>7.32</td>
<td>7.48</td>
</tr>
<tr>
<td>$X_5$</td>
<td>7.72</td>
<td>6.72</td>
</tr>
<tr>
<td>Existing levels (in Rs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>806.61</td>
<td>625.00</td>
</tr>
<tr>
<td>$X_2$</td>
<td>659.43</td>
<td>514.82</td>
</tr>
<tr>
<td>$X_3$</td>
<td>239.68</td>
<td>223.90</td>
</tr>
<tr>
<td>$X_4$</td>
<td>223.07</td>
<td>238.09</td>
</tr>
<tr>
<td>$X_5$</td>
<td>171.97</td>
<td>180.28</td>
</tr>
<tr>
<td>Optimum levels (in Rs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>476.56</td>
<td>447.27</td>
</tr>
<tr>
<td>$X_2$</td>
<td>367.63</td>
<td>358.97</td>
</tr>
<tr>
<td>$X_3$</td>
<td>184.79</td>
<td>181.23</td>
</tr>
<tr>
<td>$X_4$</td>
<td>591.33</td>
<td>476.31</td>
</tr>
<tr>
<td>$X_5$</td>
<td>480.45</td>
<td>324.12</td>
</tr>
</tbody>
</table>

human labour, bullock labour and cost of seed. The marginal value productivity of manure and fertilizer was observed to be highest being Rs. 7.48 on the farms 1 – 2 hectare size group followed by the farms below 1 hectare size group. It was minimum being Rs. 4.80 on
the farms of 2 - 4 hectare size group. On the contrary, the marginal value productivity of irrigation was found to be highest on the farms below 1 hectare size group followed by the farms 6 hectare and above 6 hectare size group being Rs.6.95. It was again minimum on the farms of 2 - 4 hectare size group.

As far as the marginal value of productivities of human labour, bullock labour and seed are concerned, no significant difference was observed on the farms of various size groups and farm as a whole. Low value of marginal value productivities of human and bullock labour on the farms below 1 hectare size group was due to high existing levels of respective inputs in comparison to the existing levels of these inputs on the farms of other size groups. On the contrary, the marginal value productivity of seed was observed to be higher on the farms of 4 - 6 hectare and 6 hectare and above 6 hectare size groups in comparison to other size groups which was due to low existing level of cost of seed on respective farms in comparison to the farms of other size groups. In view of non-significant difference in the marginal value productivities of human and bullock labour on the farms of various size groups to their respective prices, there is not much scope to increase the levels of these inputs. On the contrary, the levels of human and bullock labour should be reduced to the extent where the respective marginal value products become equal to their respective prices and the surplus funds thus available should be diverted to increase the levels of manure-fertilizer and irrigation in order to maximise the farm returns.
Thus, there is much scope to increase the use of manure-fertilizer and irrigation on the farms in almost all the size groups as well as on the farm as a whole for maximising the farm returns.

Table also reveals that the optimum levels of manure-fertilizer and irrigation on the farms of almost all the size groups and farm as a whole were significantly higher being Rs. 591.33 and Rs. 480.45, Rs. 476.31 and Rs. 324.12, Rs. 442.30 and Rs. 317.23, Rs. 288.89 and Rs. 211.93, Rs. 277.84 and Rs. 222.52 and Rs. 415.32 and Rs. 312.45 on the farms below 1 hectare, 1 - 2 hectare, 2 - 4 hectare, 4 - 6 hectare and 6 hectare and on the farm as a whole respectively as compared to their respective existing mean levels of Rs. 223.07 and Rs. 171.97, Rs. 238.09 and Rs. 180.28, Rs. 243.30 and Rs. 191.27, Rs. 143.64 and Rs. 111.38, Rs. 136.64 and Rs. 102.48 and Rs. 197.33 and Rs. 154.17. On the other hand, the existing mean levels of human labour, bullock labour and seed were observed to be significantly higher in comparison to their respective optimum levels of inputs on the farms of almost all size groups and on the farm as a whole. Thus, it can be concluded that shifting and reallocation of available farm resources from the inputs variables having lower marginal value productivity in favour of input variables having higher marginal value productivity, may maximise the returns on the farms of almost all size groups and on the farm as a whole.

Now, it is desired to find out as to what extent the returns on the farm can be maximised simply by reallocation of the existing farm resources. Keeping in view this objective, regression equations at optimum levels of inputs for the farms of various size group and farm as a whole of irrigated farms have been developed and are
given as below:

**Regression equation at optimum levels of various input variables for maximising returns:**

**Below 1 hectare size group:**

\[
Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5
\]

\[
= 0.2450 X_1 + 0.1890 X_2 + 0.0950 X_3 + 0.3040 X_4 + 0.2470 X_5
\]

\[
\log Y = \log 10.2633 + 0.2450 \log 476.56 + 0.1890 \log 367.56 + 0.0950 \log 184.79
\]

\[
+ 0.3040 \log 591.33 + 0.2470 \log 480.45
\]

\[
= 1.0113 + 0.2450 X_2.6781 + 0.1890 X_2.5653 + 0.0950 X_2.2667
\]

\[
+ 0.3040 X_2.7718 + 0.2470 X_2.6819
\]

\[
= 1.0113 + 0.6561 + 0.4848 + 0.2153 + 0.8246 + 0.6624
\]

\[
= 3.8545
\]

\[
Y = Rs.7153.00
\]

**1 - 2 hectare size group**

\[
Y = 0.2003 \times 625.00 \times 514.82 \times 223.90 \times 238.09 \times 0.2790
\]

\[
= 180.28
\]

\[
\log Y = -0.0793 + 0.3850 \log 625.00 + 0.3090 \log 514.82 + 0.1560 \log 223.90
\]

\[
+ 0.4100 \log 238.09 + 0.2790 \log 180.28
\]

\[
= -0.0793 + 0.3850 \times 2.7959 + 0.3090 \times 2.7117 + 0.1560 \times 2.3501
\]

\[
+ 0.4100 \times 2.3767 + 0.2790 \times 2.2559
\]

\[
= -0.0793 + 1.0764 + 0.8379 + 0.3666 + 0.9744 + 0.6244
\]

\[
= -0.0793 + 3.8797
\]

\[
= 3.8004
\]

\[
Y = Rs.6315.39
\]
2 - 4 hectare size group

\[ Y = 4.5637 \cdot 574.74 + 0.3185 \cdot 426.21 + 0.2215 \cdot 214.41 + 0.1269 \cdot 243.30 + 0.3313 \cdot 191.27 \]

\[ \log Y = 0.6593 + 0.3185 \log 574.74 + 0.2215 \log 426.21 + 0.1269 \log 214.41 + 0.3313 \log 243.30 + 0.2376 \log 191.27 \]

\[ = 0.6593 + 0.8789 + 0.5825 + 0.2958 + 0.5421 \]

\[ = 3.7491 \]

\[ = \text{Rs. 5611.77} \]

4 - 6 hectare size group

\[ Y = 3.0549 \cdot 425.35 + 0.2383 \cdot 215.79 + 0.1289 \cdot 116.73 + 0.3190 \cdot 288.89 + 0.2340 \cdot 211.93 \]

\[ \log Y = 0.4850 + 0.3592 \log 425.35 + 0.2383 \log 215.79 + 0.2383 \log 116.73 + 0.1289 \log 288.89 + 0.3190 \log 211.93 \]

\[ = 0.4850 + 0.9442 + 0.5562 + 0.2664 + 0.7899 + 0.5443 \]

\[ = 3.5860 \]

\[ = \text{Rs. 3854.78} \]

6 hectare and above 6 hectare size group

\[ Y = 4.5919 \cdot 317.05 + 0.2362 \cdot 222.05 + 0.1290 \cdot 121.26 + 0.2956 \cdot 277.84 + 0.2367 \cdot 222.52 \]
\[ \log Y = 0.6620 + 0.3380 \log 317.05 + 0.2362 \log 222.05 + 0.1290 \log 121.26 + 0.2956 \log 277.84 + 0.2367 \log 222.52 \\
= 0.6620 + 0.3380 X_1 + 0.2362 X_2 + 0.1290 X_3 + 0.2956 X_4 + 0.2367 X_5 \\
= 0.6620 + 0.8453 + 0.5542 + 0.2688 + 0.7224 + 0.5556 \\
= 3.6083 \\
Y = Rs. 4057.89 \\
\]

**Farm as a whole (all farms)**

\[ Y = 3.2218. \quad 398.30 \cdot 292.68 \cdot 154.68 \cdot 415.32 \cdot 312.45 \\
0.2529 \\
\]

\[ \log Y = 0.5081 + 0.3323 \log 398.30 + 0.2369 \log 292.68 + 0.1252 \log 154.68 + 0.3361 \log 415.32 + 0.2529 \log 312.45 \\
= 0.5081 + 0.3323 X_1 + 0.2369 X_2 + 0.1252 X_3 + 0.3361 X_4 + 0.2529 X_5 \\
= 0.5081 + 0.8640 + 0.5843 + 0.2741 + 0.8800 + 0.6309 \\
= 3.7414 \\
Y = Rs. 5513.15 \\
\]

An examination of the regression equations developed at optimum levels of resource inputs indicated that the value of output in rupees on the farms below 1 hectare, 1 - 2 hectare, 2 - 4 hectare, 4 - 6 hectare, 6 hectare and above 6 hectare and on the farm as a whole (all farms) can be maximised to Rs. 7153.00, Rs. 6315.39, Rs. 5611.77, Rs. 3854.78, Rs. 4057.89 and Rs. 5513.15 respectively as against to their respective value of output at existing levels of
resource inputs being Rs.5372.00, Rs.4344.00, Rs.3528.00, Rs.2852.00, Rs.3008.00 and Rs.3620.00, resulting thereby a net additional value of output per hectare of Rs.1881.00, Rs.1971.39, Rs.2083.77, Rs.1002.78, Rs.1049.89 and Rs.1693.15 respectively representing thereby additional net profit of 31.29 per cent, 45.38, 59.06, 38.66, 34.90 and 44.35 per cent over the original level of output on the various size groups in question and farm as a whole. Higher additional value of output per hectare on the farms below 1 hectare, 1 - 2 hectare and 2 - 4 hectare size groups was due to higher investment on production oriented inputs like manure-fertilizer and irrigation in comparison to the farms of other size groups and the farm as a whole. Thus, it can be concluded that from optimization and reallocation of farm resources, the value of output can be increased significantly from their existing levels of output. In view of higher optimum levels of manure-fertilizer and irrigation and higher existing level of human labour and bullock labour and seed on the farms of almost all size groups and farm as a whole, it may be suggested to the farmers of the sample area to shift a part of their available funds used for hired human labour and bullock labour to the use of manure-fertilizer and irrigation under capital constraint for maximization of farm returns.

Thus, on the basis of the results sighted above, it may be concluded that the returns can be maximised on the farms of various size groups including farm as a whole simply by reallocation of limited capital available with the farmers among various input variable. The farmers of the sample area are, therefore, advised
to allocate various farm resource inputs among various crop enterprises under various size groups in such a way that the total of each resource input per hectare may come up to the extent of optimum level of each size group in order to maximise the farm returns on the farms of respective size group.

Now, it will not be out of place here to compare the farms of secured and insecure irrigation situation in terms of production elasticities, marginal value productivity, existing and optimum levels of various input variables and to study the extent of maximization of farm returns under both the conditions within capital constraints.

Again, Cobb-Douglas type of regression equation was developed for both of secured and insecure irrigated farms as a whole and are given as below:

**Farm as a whole (all farms) of secured irrigation condition:**

\[
Y = a \cdot x_1^{b_1} \cdot x_2^{b_2} \cdot x_3^{b_3} \cdot x_4^{b_4} \cdot x_5^{b_5}
\]

\[
= 3.2218 \cdot x_1^{0.3323} \cdot x_2^{0.2369} \cdot x_3^{0.1252} \cdot x_4^{0.3361} \cdot x_5^{0.2529}
\]

\[
(0.1925) (0.1561) (0.1036) (0.1251) (0.1062)
\]

**Farm as a whole (all farms) of insecure irrigation condition:**

\[
Y = 6.5249 \cdot x_1^{0.3142} \cdot x_2^{0.3068} \cdot x_3^{0.1186} \cdot x_4^{0.2884} \cdot x_5^{0.0962}
\]

\[
(0.1263) (0.1672) (0.1016) (0.0953) (0.1352)
\]

* Significant at 5 per cent level of significance.
** Significant at 10 per cent level of significance.
The elasticity of production along with standard error, test of significance and value of coefficient of multiple determination for each equation are shown in Table VII-3.

Table VII-3. Elasticity of production, standard error, value of 't' and coefficient of multiple determination for the farm as a whole under secured and insecure irrigation situation.

<table>
<thead>
<tr>
<th>Particular</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
<th>$X_5$</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secured irrigated farm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression coefficient</td>
<td>0.3323</td>
<td>0.2369</td>
<td>0.1252</td>
<td>0.3361</td>
<td>0.2529</td>
<td></td>
</tr>
<tr>
<td>Standard error</td>
<td>0.1925</td>
<td>0.1561</td>
<td>0.1036</td>
<td>0.1251</td>
<td>0.1062</td>
<td></td>
</tr>
<tr>
<td>'t' value</td>
<td>4.9521</td>
<td>3.2567</td>
<td>2.5237</td>
<td>7.1592</td>
<td>5.2958</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.8825</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecure irrigated farm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression coefficient</td>
<td>0.3142</td>
<td>0.3068</td>
<td>0.1186</td>
<td>0.2884</td>
<td>0.0962</td>
<td></td>
</tr>
<tr>
<td>Standard error</td>
<td>0.1263</td>
<td>0.1672</td>
<td>0.1016</td>
<td>0.0953</td>
<td>0.1352</td>
<td></td>
</tr>
<tr>
<td>'t' value</td>
<td>5.7921</td>
<td>4.9523</td>
<td>2.4327</td>
<td>6.0952</td>
<td>1.9523</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.8612</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level of significance.
** Significant at 10 per cent level of significance.

Table VII-3 clearly reveals that coefficient of multiple determination in the case of secured irrigated farms was observed to be higher being 0.8825 as compared to 0.8612 of the farms as a whole under insecure irrigation condition, accounting thereby, 88 and 86 per cent variation in the value of gross return due to significant input variables of secured and insecure irrigated farms.
FIG-4 - MARGINAL VALUE PRODUCTIVITY OF VARIOUS INPUT VARIABLES ON SECURED AND INSECURED IRRIGATED FARMS

- SECURED
- INSECURED

<table>
<thead>
<tr>
<th>Input Variable</th>
<th>Secured Value</th>
<th>Insecured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Labour</td>
<td>2.10</td>
<td>2.33</td>
</tr>
<tr>
<td>Bullock Labour</td>
<td>1.99</td>
<td>2.25</td>
</tr>
<tr>
<td>Seed</td>
<td>2.61</td>
<td>2.67</td>
</tr>
<tr>
<td>Manure</td>
<td>6.51</td>
<td>5.68</td>
</tr>
<tr>
<td>Irrigation</td>
<td>6.27</td>
<td>6.27</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>2.80</td>
<td>2.80</td>
</tr>
</tbody>
</table>
respectively. The elasticity of production of almost all the input variables except of bullock labour of secured irrigated farms was found to be higher in comparison to the farms of insecure irrigated condition. The regression coefficient of cost of irrigation in the case of insecure irrigated condition was found to be non-significant. It was due to non-variability in the cost of irrigation on the farms of different size group as the source of irrigation of insecure irrigated farms was canal and hence no effect of irrigation was found on these farms.

Marginal value productivity, existing and optimum levels of input variables for both of secured and insecure irrigated farms as a whole have been given in Table VII-4.

Table VII-4. Marginal value productivity, existing and optimum levels of various input variables on secured and insecure irrigated farms.

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Secured irrigated farms</th>
<th>Insecure irrigated farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Optimum</td>
</tr>
<tr>
<td></td>
<td>(in Rs.)</td>
<td>(in Rs.)</td>
</tr>
<tr>
<td>Cost of human labour $X_1$</td>
<td>2.10</td>
<td>586.07</td>
</tr>
<tr>
<td>Cost of bullock labour $X_2$</td>
<td>1.99</td>
<td>453.14</td>
</tr>
<tr>
<td>Cost of seed $X_3$</td>
<td>2.61</td>
<td>182.72</td>
</tr>
<tr>
<td>Cost of manure &amp; fertilizer $X_4$</td>
<td>6.51</td>
<td>197.33</td>
</tr>
<tr>
<td>Cost of irrigation $X_5$</td>
<td>6.27</td>
<td>154.17</td>
</tr>
</tbody>
</table>

It is quite evident from Table VII-4, that the marginal value productivity of manure-fertilizer and irrigation of secured
irrigated farms was found to be significantly higher being Rs.6.51 and 6.27 respectively as compared to respective marginal value productivity of insecured irrigated farms.

On the contrary, no significant difference in marginal value productivity of human labour, bullock labour and seed was observed for both the situations.

Table further indicates that optimum levels of human, bullock labour and seed were found to be significantly higher on the farms of insecured irrigation condition being Rs.425.70, Rs.415.73 and Rs.160.64 as compared to respective values being Rs.390.30, Rs.292.68 and Rs.154.68 of secured irrigated farms. On the other hand, the optimum levels of manure-fertilizer and irrigation being Rs.415.32 and Rs.312.45 on secured irrigated farms were quite higher as compared to respective levels of Rs.390.76 and Rs.130.39 of insecured irrigated farms.

Thus, it can be concluded from the above discussion that the returns on the farms of insecured irrigated condition can be maximised by simply shifting of human and bullock labour to the cost of manure and fertilizer to the extent as given above. In the case of irrigation under insecured irrigated condition, no addition can be possible in cost of irrigation, (irrigated by canal) as cost of irrigation is fixed irrespective of number of irrigation. Hence, no effect of irrigation was observed in the case of insecured irrigation condition whereas it was an effective and production oriented input of the secured irrigated farms.
Regression equation at optimum levels of various input variables for maximising returns of insecured irrigated farms as a whole

\[
Y = a_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5
\]

\[
= 6.5249 + 0.3142x_1 + 0.3068x_2 + 0.1186x_3 + 0.2884x_4 + 0.0962x_5
\]

\[
\log Y = 0.8146 + 0.3142 \log x_1 + 0.3068 \log x_2 + 0.1186 \log x_3 + 0.2884 \log x_4 + 0.0962 \log x_5
\]

\[
= 0.8146 + 0.3142 \times 2.6291 + 0.3068 \times 2.6189 + 0.1186 \times 2.2059 + 0.2884 \times 2.5919 + 0.0962 \times 2.1152
\]

\[
= 0.8146 + 0.8261 + 0.8034 + 0.2616 + 0.7475 + 0.2035
\]

\[
= 3.6567
\]

\[
Y = Rs. 4536.28
\]

The regression equation at optimum levels of input variables of insecured irrigated farms clearly indicated that the value of output can be maximised to Rs. 4536.28 as against to its original value at existing levels of inputs being Rs. 3796.00. This resulted an additional return to Rs. 740.28, per hectare whereas the additional return in case of secured irrigated farms was observed to be Rs. 1693.15. The low level of additional return in the case of insecured irrigated farms as compared to secured irrigated farms was due to ineffective affect of irrigation in the former case.

Thus, it can be concluded that from optimization and re-allocation of farm resources, the farm returns can also be increased to some extent on the farms of insecured condition. The low level of farm returns which can be maximised on insecured irrigated farms, is due to limited scope to reduce the expenses incurred on seed on the one hand and to increase the level of
irrigation cost on the other because the irrigation cost in the case of insecure irrigated farms is more or less the constant.

In view of significant value of regression coefficient of manure-fertilizer even on 1 per cent level of significance and higher marginal value of productivity of manure-fertilizer in comparison to other input variables, it is suggested that the farmers of insecure irrigated farms should shift a part of their available fund used for hired human and bullock labour to the use of manure and fertilizer under capital constraint to maximise the farm returns.

The above findings confirm the views of various economists that there is excessive pressure of population as reflected by low marginal value product of human labour on Indian farms. The study further showed that the bullocks are being kept even under capital constraint due to social prestige of the farmers. In view of high marginal value productivity of manure-fertilizer and irrigation in the case of secured irrigated farms and of manure-fertilizer in the case of insecure irrigated farms, the farmers of the sample area are advised to reduce the strength of bullock power and the fund thus available may be used in enhancing the level of manure-fertilizer and irrigation under capital constraint. The surplus of family human labour may be used in complementary or supplementary enterprises like dairy, poultry farming and agro-based cottage small scale industries.

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