CHAPTER III
The main purpose of the present study is to examine the resource development and productivity on account of the use of production credit and changed situation of savings on farms in the context of High Yielding Varieties Programme. An effort to examine the adequacy or otherwise of production credit in the light of optimum level of input use is also a subject of this study. Multistage-stratified-purposive-random-sampling design was used and the sampling units at the respective stages, in order, were District, Blocks, villages and the cultivators.

Selection of district:

For the purpose of selection of the district for the study, it was considered that it should witness an intensive approach to the problem of agricultural development especially of the High Yielding Varieties Programme. The intensive approach subsumes the provision of a well coordinated and integrated machinery in terms of extension staff and institutional arrangements for the supply of the critical inputs necessary for agricultural development. The supply of production credit is one of the most important inputs underlying the 'package' of practices recommended to the individual farmers in the I.A.D.P. (Intensive Agricultural District Programme) areas. It was, therefore, considered necessary to conduct the study in a I.A.D.P. district. And as such, district Aligarh was isolated
for this purpose. Easy access to the farm families and understanding of local language were the additional benefits which accrued to its selection.

Selection of Blocks:

For the selection of Blocks, the district was divided into homogenous 'production zones' on the basis of resource position and differences in the soil and cropping pattern. Keeping the limited time and money at the disposal, the production zone prepared by the Expert Committee on Assessment and Evaluation for the Intensive Agricultural District Programme (see appendix I) was taken out for the purpose. The Committee has divided the whole district into four zones. The blocks that comprise the zones are as under:

Zone I: Iglas, Sasni, and Hathras;
Zone II: Akrabad, Dhanipur and Jawan-Sikandarpur;
Zone III: Atrauli, Gangiri and Sikanderao;
Zone IV: Gonda, Khair and Tappal.

However, to keep the size sample manageable, the first two zones which possess almost the same characteristics were combined together. The above Committee also asserted that 'resource position and cropping pattern obtaining in Zone II are broadly similar to those in Zone I...'. Thus, the three zones prepared along with their respective blocks were categorised in terms of the total supply of production credit through co-operatives and Government tsccavi during the reference period, i.e. 1970-71 (In 1970-71, the advances through
commercial banks were not made and, therefore, it was not possible to enlist them here.) The Block-wise advances of total production credit from each institutional agency is given in appendix II.

Finally, one block from each zone was selected, keeping in view the per hectare maximum advances of production credit made available from the above two institutional agencies working in the area. This was done with a view to representing all institutional agencies operating in the area and so that production credit may be considered as one unit. Thus, out of 12 blocks in the district Aligarh, three blocks, viz. Sasni, Atrauli and Gonda were selected purposively.

Selection of villages:

A list of villages falling under each selected block was prepared. The total number of borrowers of production credit from two institutional agencies enumerated above, viz. Co-operative and Government co-operatives, for each village and each block was taken out. The selection of villages was done on the basis of probability proportion to the number of borrowers falling under each village. The total number of selected villages for each block was three except that of block Sasni where four villages were selected owing to the larger size of its production zone. Thus, in all from three selected blocks, a total of ten villages possessing a sufficient number of borrowers, both from co-operative and Government sources was selected.

Selection of cultivators:

The cultivators of each village were categorised into two
groups, i.e., borrowers from institutional agencies mentioned above and non-borrowers, and were arranged in ascending order of their magnitude of size of farms. Each category of borrowers and non-borrowers was stratified into three size groups, viz. 0.0-2.5 hectares (small); 2.5-5.0 hectares (medium) and 5.0 and above hectares (large).

Ultimately, out of each village, ten farmers from the borrowers and five farmers from the list of non-borrowers were selected almost in proportion to the number of farms found in each stratum. The selection of farm holdings was done strictly with the help of random numbers. Thus, the total number of selected holdings from the selected ten villages was 150 in which 100 were borrowers and remaining 50 were non-borrowers. The whole sampling procedure showing the names of blocks, villages and number of holdings in each size group under two categories of borrowers and non-borrowers is shown in table III-1.

Method of enquiry and source of data:

Survey method was adopted for conducting the enquiry. Data were collected by means of personal interviews with the selected farmers (respondents). During the course of investigation, a number of visits was paid from time to time to collect the data keeping in view the convenience of the farmers. The data were collected for the year 1970-71. Well prepared, repeatedly pretested schedules and questionnaires were used for collection of data. To ensure the accuracy of data, every care was taken. The informations given by the respondents were suitably supplemented and edited through personal
Table III-1: Distribution of total sample of borrowers and non-borrowers among different size group of farms.

<table>
<thead>
<tr>
<th>Production zone and name of block</th>
<th>Name of village</th>
<th>Borrowers (size group in hact.)</th>
<th>Non-borrowers (size group in hact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sasni</td>
<td>Basgoi</td>
<td>3 4 3</td>
<td>10 3 1</td>
</tr>
<tr>
<td></td>
<td>Jasrana</td>
<td>4 4 2</td>
<td>10 2 2</td>
</tr>
<tr>
<td></td>
<td>Bijhari</td>
<td>5 3 2</td>
<td>10 2 3</td>
</tr>
<tr>
<td></td>
<td>Jhulai</td>
<td>5 4 1</td>
<td>10 2 3</td>
</tr>
<tr>
<td>II Atrauli</td>
<td>Uttamgarhi</td>
<td>6 4 -</td>
<td>10 3 2</td>
</tr>
<tr>
<td></td>
<td>Kazimabad</td>
<td>4 1 5</td>
<td>10 2 2</td>
</tr>
<tr>
<td></td>
<td>Narona</td>
<td>6 4 -</td>
<td>10 3 1</td>
</tr>
<tr>
<td>III Gonda</td>
<td>Kaluabelath</td>
<td>5 3 2</td>
<td>10 2 2</td>
</tr>
<tr>
<td></td>
<td>Nagla Copardhan</td>
<td>4 4 2</td>
<td>10 3 2</td>
</tr>
<tr>
<td></td>
<td>Taleshra</td>
<td>5 4 1</td>
<td>10 4 -</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>47 35 18</td>
<td>100 26 18</td>
</tr>
</tbody>
</table>
observations, cross checks and official records. The help of the
Block Development Officers, Assistant Development Officers, Village
Level Workers, Lekhpals, Gram Pradhans and other village leaders
was sought to obtain correct and reliable informations.

The primary data were collected from the respondents, i.e.
selected cultivators and other experienced persons of the villages
under study by personal interviews. The secondary data were obtained
and compiled from Lekhpal's records, Block Head-quarters, Assistant
Registrar, Co-operative Bank, District Head-quarters, I.A.D.P. Head-
quar ters, District Gazettee r of Aligarh, U.P., Jourhal and other
publications.

Period of enquiry:
The reference period to which the study relates is 1970-71.

Limitations of the data and scope of the study:

One important limitation of the data is that they pertain
to single agricultural year. The actual borrowings by the farmers
may vary from year to year depending largely upon the weather
conditions, availability of physical inputs, farm operators' expec-
tations of prices at harvest time which influence their decision
as to acreage planted in different crops of high yielding varieties
and other cash crops. The second limitation experienced was that
it was not possible to infer definitely the relationships between
borrowings and other capital inputs and outputs which were subjected
to yearly variation. Thirdly, the study could cover only two
institutional agencies, viz. Co-operative and Government. The third agency, viz. Commercial Bank which is rather more important from the viewpoint of its early stage in operation and the production credit which is more supervised, could not be included in the study as it did not advance any sum during the period under review. Thus, in the subsequent years the situation which is predicted by this study may change due to its functioning in the area. Lastly, another universal limitation lay in the fact that farmers generally do not maintain any records of their farm business, of the inputs and the resulting output. Relevant informations on these aspects had to be gathered by the survey method whose limitations are well known to any farm management economist.

Although, the study is subjected to the above limitations, its importance as a comprehensive study on production finance which includes borrowings as well as owned operating funds may not be ruled out. As a matter of fact, this study provides useful informations on owned production fund and its pattern of utilization. The methodology which leans with production credit supply is bound to provide useful guidance for future policy decisions. However, it was not possible to increase the reference period of the study from one year to two or three years because the borrowers of one year need not be necessarily a borrower in the next. Therefore, in doing so, the size of sample may go well beyond time and resource of this study.
Statistical analysis:

The data obtained were subjected to analysis in the following ways:

(a) Tabular analysis:

The tabular analysis was used to compare the values of cost and returns of major crops and livestock enterprises, level of production finance etc. of different size group of farms.

(b) Average:

The average given refers to the average of the aggregate values.

(c) Correlation:

Simple correlation coefficients were calculated for the purpose of comparison and inferring trend and casual association. The following formula was used to work out the coefficients of Correlation:

\[ r = \frac{\sum(xy)}{\sqrt{\sum x^2 \cdot \sum y^2}} \]

(d) Functional analysis:

In order to examine the regression of credit on the level of farm technology and productivity, linear and Cobb-Douglas functional equations were used. Only those equations were included in the findings of this study, the value of \( R^2 \) were greater. And as such, one linear and six Cobb-Douglas equations were used. The general
forms of the equation were as under:

(i) **Linear**:

\[ PC = A + b_1X_1 + b_2X_2 + \ldots + b_nX_n \]

Where, \( PC \) = Amount of production credit,
\( A \) = Constant in equation,
\( X_1 \ldots X_n \) = Independent variables,
\( b_1 \ldots b_n \) = Regression coefficients of respective variables.

(ii) **Cobb-Douglas**:

\[ Y = AX_1^{b_1} \cdot X_2^{b_2} \ldots X_n^{b_n} \]

In the logarithm, the equation takes the following form:

\[ \log Y = \log A + b_1 \log X_1 + b_2 \log X_2 + \ldots + b_n \log X_n \]

Where, \( Y \) = Independent variable,
\( A \) = Constant in equation,
\( X_1 \ldots X_n \) = Independent variables,
\( b_1 \ldots b_n \) = Regression coefficients or elasticity coefficients.

(iii) **Test of significance**:

(i) The significance of \( \bar{R}^2 \) was tested with the help of 'F' value calculated as under:

\[ F = \frac{\frac{\bar{R}^2}{N - P}}{\frac{1 - \bar{R}^2}{P - 1}} \]

\[ \bar{R}^2 = 1 - (1-R^2) \left( \frac{N-1}{N-P} \right) \]

Where, \( R^2 \) = Coefficient of multiple determination,
\( \bar{R}^2 \) = Adjusted coefficient of multiple determination,
\( N \) = Number of observations,
\( P \) = Number of characters.
(ii) The following formulae were used to work out the elasticities and to test their significance:

1. Elasticity of $X_i = b_i \frac{\bar{X}_i}{\bar{Y}}$

2. $t = \frac{\text{Elasticity of } X_i}{\sqrt{\text{Var, elasticity } X_i}}$

Where, \text{var. elasticity} = \text{Var.} (b_i) \left( \frac{\bar{X}_i}{\bar{Y}} \right)^2$

(f) **Marginal value product:**

The marginal value products of input variables were estimated by taking partial derivatives of returns with respect to the input concerned at the mean level of input factor. Let:

$$Y = f (X_1 X_2 \ldots \ldots X_n)$$

The equation was finally obtained of the following order:

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} \ldots \ldots X_n^{b_n}$$

The partial derivatives of return ($Y$) with respect to the input $X_i$ was obtained as under:

$$\text{MVP of } X_i = b_i \frac{\bar{Y}}{\bar{X}_i}$$

Where, $b_i =$ Respective input elasticity of production, 
$\bar{Y} =$ Mean level of the output, 
$\bar{X}_i =$ Mean level of $X_i$ variable.
(g) Optimum level of input use:

To examine the optimum level of input use, the following model was used in the study:

Since the optimum level of input use could be obtained only when value of marginal product = price of the input factor and the function used was of the following type:

\[ f = a X_1^{b_1} X_2^{b_2} \]

\[ \frac{\partial f}{\partial X_1} = a b_1 X_1^{b_1-1} X_2^{b_2} = P_1 \]

\[ = a b_2 X_1^{b_1} X_2^{b_2-1} = P_2 \]

\[ = \frac{b_1}{b_2} \cdot \frac{X_2}{X_1} = \frac{P_1}{P_2} \]

\[ \frac{X_2}{X_1} = \frac{b_2 P_1}{b_1 P_2} \]

Where, \( X_1 \) = Amount of \( X_1 \) input used,
\( X_2 \) = Amount of \( X_2 \) input used,
\( b_1 \) = Elasticity coefficient of \( X_1 \) input,
\( b_2 \) = Elasticity coefficient of \( X_2 \) input
\( P_1 \) = Price of \( X_1 \) input
\( P_2 \) = Price of \( X_2 \) input.

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