Chapter III

RESEARCH METHODOLOGY
The present chapter deals with methodology adopted in analysis and interpretation of the feelings of the problem entitled "Production and productivity performance of pulses and their contribution in income and employment on farms in Chitrakoot Dham region of U.P. state." The methodological aspects have broadly been discussed under the following five heads:

1. **Sampling Technique**

2. **Method of enquiry and collection of data**

3. **Period of enquiry**

4. **Analytical tools and**

5. **Limitation of the study.**

1) **Sampling Technique:**

A Multi-stage stratified random sampling technique used to select the district, block, cluster of villages and the respondents i.e. pulse growers:

1) **Selection of Blocks:**

Out of 8 development blocks of district Chitrakoot Dham, two blocks namely "Kamasin" and "Jaspura" having more area under pulses were selected randomly.
(ii) Selection of Villages:

A list of all the falling under the selected blocks was prepared, out of which 10 villages i.e. 6 villages from Kamasin block and 4 from Jas pura block were selected randomly.

(iii) Selection of the Respondents:

A list of all the farmers i.e. pulse growers along with their cultivated area was prepared for each of the selected village. 100 pulse growers were selected randomly from the universe of 10 villages under three size groups, viz. below 2 ha.; 2-4 ha. and 4 ha. and above. The number of cultivators under each size group was kept in proportion to their total numbers falling under each village. The cultivators having 30 percent or more cropped area under pulses were treated as pulse growers.

Thus, the findings of the present study is based on a random sample of 100 pulse growers selected from the universe of 10 villages under three size groups, viz. below 2 ha, 2-4 ha. and 4 ha. and above from the blocks of district Chitrakoot Dham.

The number of cultivators selected from randomly from different villages under each size group.
Table III-1: Number of pulse growers selected under different size groups from selected villages.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the block</th>
<th>Name of the selected village</th>
<th>Number of cultivators selected in different size group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-2 ha</td>
<td>2-4 ha</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Kamasin</td>
<td>Sandasami</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Pachhahan</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Mawace</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Parsauli</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Bhati</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Biow</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>Jaspura</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Gajipur</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Warehata</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Sindham Khurd</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Gauri Khurd</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>70</td>
<td>20</td>
</tr>
</tbody>
</table>

(2) Method of Enquiry and Collection of Data:

The enquiry was conducted by survey method. The primary data were collected by direct personal interview with the respondents. The data were obtained on well prepared schedules and questionnaires made for the purpose of the present enquiry. Three to four visits were made to collect the information. The information so collected was duly verified with the village leaders, village level officers, progressive farmers etc.

The secondary data were obtained from the district and block headquarters and published materials.
(3) **Period of Enquiry:**

The enquiry was conducted during the agricultural year 2001-2002 covering all the agricultural seasons. It extended from 1st July, 2001 to 30th June, 2002.

(4) **Analytical Tools:**

The following analytical tools were adopted for the analysis of the present problem:

(i) **Farm Business Analysis:**

This includes the detailed analysis of costs and returns of the individual crop enterprise as well as the farm as a whole. The various measures used for the analysis included.

(a) **Total input:**

It includes all the cash and kind expenses as detailed below:

(i) Wages of hired labour paid in cash or kind.

(ii) Imputed wages for the farmer and his family used in crop and livestock production.

(iii) Value of seed, manure and fertilizers and other cash expenses.

(iv) Cost of feed, fodder and concentrates.

(v) Repairs to dead stock.

(vi) Depreciation on dead stock and live stocks.

(vii) Interest on fixed and working capital.
(viii) Rent of land whether rented or owned.

(ix) Irrigation charges.

(b) **Total Output:**

The quantity of product produced for different crops and livestock enterprise was treated as the total output. When the output is multiplied by its price then it is the output value.

(c) **Net Profit:**

It is the difference between total receipts and total expenses. It includes the pay of the farm manager and interest on capital invested in the business. It was calculated as:

\[
\text{Net income} = \text{Gross income} - \text{total expenses.}
\]

(d) **Family Labour Income:**

It includes net income or loss plus imputed value of wages for the labour of farmer and his family.

(e) **Farm Business Income:**

It is the gross income minus total expenses of production excluding wages of the family labour, interest on owned capital and rental value of land. It is a measure of the earnings of a farmer and his family for their capital investment, labour and managerial work. It can be expressed as:

\[
\text{F.B.I.} = \text{Family labour income} + \text{interest on working capital} + \text{Rental value of land.}
\]
(f) **Input – Output Ratio:**

It can be expressed as the ratio of output to input. The ratio was calculated as:

\[ \text{I/O ratio} = \frac{O}{I} \]

Where,

I = Total input,
O = Total output.

(g) **Cost of Production Per Quintal:**

It refers to total input cost divided by output value and then multiplying by the respective prices of main and by-product.

(h) **Cost Concept:**

The cost of production of pulses has been presented in terms of cost A, cost B and cost C. The new cost concepts are given below:

**Allocation of Joint Cost:**

In case of mixed cropping the cost of various operation jointly. For the sake economic analysis of individual crops, the joint cost has been allocated among the various mixed crops in proportion to the gross income obtained by the same crops.

(i) **Cost A:**

Labour, charges for both hired and owned bullock labour, charges of both hired and owned and tractor power, this included all the
cash and kind expenses actually incurred by the owner cultivator. These are charges for hired human cost of seed, manures and fertilizer, plant protection, miscellaneous costs, land revenue and cess, depreciation charges and interest on working capital (on only paid out costs).

(ii) Cost B:

This is cost A, plus rental value of owned land and interest on owned fixed capital (including land).

(iii) Cost C:

This is cost B plus imputed value of family labour. It is commercial cost of production.

(II) Tabular Analysis:

Tabular analysis was used to compare the values of costs, returns and cost of production of crops of different size groups.

(III) Averages:

The average given in the present study relates to the weighted average. The following formula was used for calculating the weighted average of different items:

\[
\text{Weighted average} = \frac{W_1X_1 + W_2X_2 + \ldots + W_nX_n}{W_1 + W_2 + \ldots + W_n}
\]

Weighted mean

\[
\text{Weighted average} = \frac{\Sigma WX}{\Sigma W}
\]
Where,

\[ X = \text{Weighted value of an item.} \]
\[ W = \text{Weight of } X. \]
\[ \sum W = N = \text{Total value of weight.} \]

(IV) Production Function Analysis:

Production function analysis was carried out to examine the productivity and efficiency of different resources used in the process of production on the sample pulse growing farms. Multiple regression analysis was done to examine the cost-benefit relationship and productivity of farm inputs on pulse crop.

The production function equations; viz. Cobb-Douglas, linear and quadratic were tried. Cobb-Douglas type of production function was finally fitted. Because of the higher \( R^2 \) value obtained, adequate fit of the data and computational feasibility in the Cobb-Douglas type of production function, this form was finally retained for economic analysis, eliminating the other two farms; viz. linear and quadratic types of production functions, from the findings. An additional advantage of this type of function was the information which it provided in respect of returns, to scale in farming operation. The Cobb-Douglas type of production function took the form of:

\[ Y = a X_1^b 1 X_2^b 2 \cdots X_n^b \ n \]

Where,

\[ Y = \text{Department variable} \]

(Output values in rupees/hectare)
\[ X_i = \text{th independent variable} \]

(Input values in rupees/hectare)

\[ a = \text{Constant} \]

\[ b_i = \text{th production elasticity with respect to } X_i. \]

The values of the constant \((a)\) and coefficients \((b_i)\) in respect of independent variables in the function have been estimated by using the method of least squares.

(V) **Estimation of Marginal Value Product:**

The marginal value product of inputs was estimated by taking partial derivatives of returns with respect to the input concerned, at the geometric level of the inputs. The steps involved for the estimation of marginal value product of inputs have been dealt with in Chapter VI. The marginal value product was calculated by using the formula as:

\[(MVP)_i = b_i \frac{Y}{X_i}\]

Where,

\[b_i = \text{Production elasticity with respect to } X_i\]

\[Y = \text{Geometric mean of } Y.\]

(output values in rupees/hectare).

\[X_i = \text{Geometric mean value of } X_i\]

(input values in rupees/hectare).
(VI) Estimation of Optimal Levels of Inputs and Returns:

To suggest the resource adjustment, optimal levels of various inputs with the existing capital have been calculated with the help of following equation:

\[ X_i \text{(Optimum level)} = \frac{b_i}{\sum b_i} \cdot C \]

Where,

\[ C = \text{Capital (sum of geometric means of all inputs), and the remaining symbols have their usual meanings.} \]

(VII) Compound Growth Rate:

Annual compound growth rates in area, production and productivity of pulses were worked out in the state of Uttar Pradesh as well as in district Chitrakoot Dham by fitting an exponential function of the following form was used:

\[ Y = A \cdot B^t \]

\[ \log Y = \log A + t \log B. \]

Where,

\[ Y = \text{area/production/productivity} \]
\[ A = \text{constant} \]
\[ B = \text{regression coefficient} \]
\[ t = \text{time in years.} \]

\[ \text{Compound growth rate} = (\text{Anti-log of B-1}) \times 100 \]
(6) Limitation of the study:

During the course of investigation several difficulties were faced in the collection of data from cultivators. The cultivators generally did not maintain any farm record and supply the data on the basis of their memory which may not be very correct. The illiteracy of the farmers also added to this problem. Some of the farmers did not cooperate in giving data because of some misunderstanding regarding agricultural taxes, ceiling etc. They were biased in giving data towards higher side for the investment and lower side towards productivity. However, sufficient care was taken to collect correct data by cross checking with the educated neighbouring farmers and other village leaders, gram pradhans etc.