RESEARCH METHODOLOGY

1. Sampling Technique:

Multistage stratified random sampling technique has been adopted to draw a sample of 120 cultivators from 12 villages of two randomly selected blocks (Chhetra Samit) viz. RATH and GOHAND of Distt. Hamirpur.

(i) Selection of villages: There are 62 and 63 villages in block ‘Gohand’ and ‘Rath’, respectively of which 12 villages including 6 from each block have been selected randomly. Thus villages Bira, Kaimokhar, Pawai, Syawari, Taytana and ujindi from block Gohand and Badanpur, Churawa, Dhamana, Padara, Saidpur and Tikariya from of block Rath were selected for the further sampling.

(ii) Selection of cultivators: A list of all the farmers, showing their operational size of holding\(^1\) has been prepared for each selected villages for both the blocks. Further the cultivators in each village have been categorised in three size group of holdings viz. 0-2 hect., 2-4 hect. and 4 hect. and above. Above five percent cultivators from each size group of holdings from each selected village have been selected randomly. Thus 120 cultivators (respondents) i.e. 87 cultivators of 0-2 hect. size group, 21 cultivator of 2-4 hect. and 12 cultivators of 4 hect. and above size group of holding have been selected for detailed study. The detail of the selected respondents is given in Table III-1, III-2 and III-3.

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\(^1\) The area which is cultivated under single man decision taker. It may be a revenue holding or a collection of revenue holding, living under single roof. It also includes leased in and excludes leased out land.
### Table III-1

No. of Farmers in the Selected Villages of Block Gohand

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Selected Village</th>
<th>0-2 Hect.</th>
<th>2-4 Hect.</th>
<th>4 &amp; above hect.</th>
<th>Total</th>
<th>Total selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Sample</td>
<td>Total</td>
<td>Sample</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Bira</td>
<td>197</td>
<td>13</td>
<td>79</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>2.</td>
<td>Kaimokhar</td>
<td>51</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>Pawai</td>
<td>167</td>
<td>11</td>
<td>50</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>4.</td>
<td>Syawari</td>
<td>152</td>
<td>10</td>
<td>16</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>5.</td>
<td>Tyotana</td>
<td>38</td>
<td>3</td>
<td>5</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>6.</td>
<td>Ujench</td>
<td>30</td>
<td>2</td>
<td>13</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>635</td>
<td>42</td>
<td>177</td>
<td>11</td>
<td>113</td>
</tr>
</tbody>
</table>

### Table III-2

No. of farmers in the Selected Villages of Block Rath

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Selected Village</th>
<th>0-2 Hect.</th>
<th>2-4 Hect.</th>
<th>4 &amp; above hect.</th>
<th>Total</th>
<th>Total selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Sample</td>
<td>Total</td>
<td>Sample</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Badanpur</td>
<td>103</td>
<td>6</td>
<td>15</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2.</td>
<td>Churawa</td>
<td>45</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>Dhamana</td>
<td>144</td>
<td>8</td>
<td>34</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>4.</td>
<td>Padara</td>
<td>161</td>
<td>10</td>
<td>30</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>5.</td>
<td>Saidpur</td>
<td>178</td>
<td>11</td>
<td>35</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>Tikariya</td>
<td>110</td>
<td>7</td>
<td>30</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>741</td>
<td>45</td>
<td>158</td>
<td>10</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>1376</td>
<td>87</td>
<td>335</td>
<td>21</td>
<td>208</td>
</tr>
</tbody>
</table>
Table III-3

Details of the selection of cultivators

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Block</th>
<th>Village</th>
<th>No. of cultivators selected in size group of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-2 Hect.</td>
</tr>
<tr>
<td>A.</td>
<td>Gohand</td>
<td>1. Bira</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Kaimokhar</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Pawai</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Syawari</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Tyotana</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Ujneha</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>42</td>
</tr>
<tr>
<td>B.</td>
<td>Rath</td>
<td>1. Badanpur</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Churawa</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Dhamana</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Padara</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Saidpur</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Tikariya</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>87</td>
</tr>
</tbody>
</table>

Method of Enquiry and Collection of Data:

The enquiry was conducted by survey method during agricultural year 1994-95 i.e. from 1.6.94 to 31.5.95. The primary data were collected by direct personal interview of the respondents. The data were obtained on well prepared and pretested schedule and questionnaires. In the course of investigation, time to time visits were made to collect the data regarding various field operations, use of modern inputs and yields for the individual crop and plot. The data were duly verified by cross check. The help of village leaders,
village level officials like Lekhpal, Gram Vikas Adhikari and Kisan Sahayaks has also been taken during collecting the information.

An intensive interview of the sample farmers was taken regarding the social, economical and technological factors, restricting growth in area, production and productivity of pulses, oilseeds and course grain in the study area.

An interview schedule was administered to all the respondents covering following major aspects -

(i) Resource structure of cultivator including size of holding, irrigation structure, fixed capital investment etc.

(ii) Cropping pattern and area under high yielding/improved varieties.

(iii) Yield of various crops on individual plots.

(iv) Personal background of cultivator

(v) Communication media.

(vi) Institutional membership and

(viii) Use of modern inputs and machinery, etc.

In addition to the above, the needful information required to fulfill the objectives of study were collected by direct interview of the selected farmers. The convenience of farmers and time of important farm operation was the prime considerations in collecting the data.

Since, study is partly based on primary data and partly on secondary data.
Secondary data in respect of size of holdings of famers, land utilisation, irrigation structure, cropping pattern, literacy etc. were noted from the related government offices.

Time series data regarding area, production, productivity and prices of various crop of district Hamirpur, for the period of 1970-71 to 1994-95 have been recorded from U.P. Statistical diary, Deptt. of Agricultural Marketing and others related offices of U.P. State and District Headquarter.

In addition to this the annual rainfall in the study area was noted from the office of S.D.O. Canal irrigation, Rath division.

The secondary data with regards to potential in the level and kind of resource use and yield per unit of area on various slow growth crops have been recorded from the results of demonstrations conducted on farmers fields of the study area under the supervision and guidance of the Sub-divisional Officer Agricultural Extension (Training and Visit) at Rath (Distt. Hamirpur). These data will be useful to findout the bridgagle gap in resource use and yield of the related crops and finally for framing the suitable strategy of their possible maximum production.

**Analytical Tools:**

The following analytical tools have been used for the analysis of data and interpretation of the finding.

(a) **Tabular analysis:**

Tabular analysis has been made to compare (i) the value of costs and returns of various crops, (ii) cost of production of different commodities, (iii) the various socio-
economical, technological and institutions constraints responsible for the slow growth in pulses, oilseeds and course grain on different size group of holdings.

(ii) Averages:

The average refers in this study the average of aggregate values i.e. weighted average.

\[
\text{Weighted average} = \frac{\sum WX}{\sum W}
\]

where

\[X = \text{Value of an item}\]
\[W = \text{Weight of } X\]
\[\Sigma = \text{Sum}\]

(iii) Trend value:

A straight line trends (linear equation) has been worked for various time series data which is described by an equation of the type:

\[Y_e = a + bX\]

where

\[X = \text{independent variable (years)}\]
\[Y_e = \text{trend value of dependent variable}\]
\[a, b = \text{unknown coefficients}\]

(iv) Compound growth rate:

Annual Compound Growth Rate in area, production and productivity of various slow growth crops in Distt. Hamirpur has been worked out by fitting exponential function of the following form:

\[Y = AB^t\]
Y = dependent variable i.e. area/production/productivity
A = constant
B = regression coefficient
t = time in years.

Correlation:

To work out the correlation in between the variation in the area, production and productivity and prices of slow growth crops with the variation in the area, production, productivity and prices of competitive crops and annual rainfall have been worked out with the use of following formula:

\[ r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}} \]

where \( r \) = correlation coefficient
\( N \) = no. of observation
\( X \) = variation in variable x
\( Y \) = variation in variable y
\( \Sigma \) = sum

Index Number Analysis:

To examine the variation in area, production, productivity and prices of various commodities (crops) and in annual rainfall over a given period of time, index number analysis has also been made by using the formula:

\[ \text{Index No.} = \frac{\text{Value of current year}}{\text{Value of base year}} \times 100 \]
Frequency distribution analysis:

Frequency distribution analysis has been made to explore the communication channels, institutional framework, social and economical variable affecting slow growth in the adoption of modern technology of Agriculture in pulses, oilseed and course grain.

Fluctuation:

The fluctuation in area, production and productivity of various slow growth crops for each of the year of time series has been worked out in absolute terms, using following formula

\[
\text{Fluctuation (variation)} = Y - Ye
\]

\[Y = \text{Original value}\]

\[Ye = \text{Trend value worked out from linear equation developed from original data}\]

Concepts used in the Analysis:

1. Cost of Cultivation of a Crop:

   It includes all the expenses incurred due to the use of variable and fixed resources in the cultivation of a crop during a crop season and presented in rupees per hectare.

Overhead Cost:

Overhead cost on the crop cultivation includes the value of depreciation on fixed capital, interest on owned capital and repairs to dead stock. To avoid duplicacy, the overhead costs on cattle shed, pair of bullocks, machinery shed, tractor and its attachment and on pumpset etc. has not been included in the overhead cost on the crops because it
has been included during calculating cost of maintenance of a pair bullock and cost of operating of tractor and pumpsets etc.

**Cost of Human Labour:**

All the three types of human labour viz. male, female and children were found engaged in the farm business. The female and children labour days were converted into male labour day using conversion factor 1 male labour day = 1.25 female labour day = 1.50 children labour day. Eight working hrs. have been treated as one human labour day. The actual wages paid by the cultivators were taken into consideration for calculating the cost of human labour.

The cost of family labour was charges at the rate of wages paid to the permanent labour. The wages varied from Rs. 25.00 to 35.00 per day depends upon the type of farm operation. However, family labour wages were charged @ Rs. 30.00 per day.

**Bullock Labour Cost:**

The cost of maintenance of a pair of bullock per day has been worked out and charged accordingly against the utilisation of own bullock labour days on his farm. However, on an average, it was Rs. 60.00 per bullock labour day.

**Cost of Operation of Tractor:**

Actual cost of operation in case of owned tractor and prevailing rate for the hired tractor were charged, which were Rs. 110.00 and Rs. 125.00 per hr. respectively.
Cost of Pumpset:

Pumpset is generally used for lifting the irrigation water. The actual cost of operation in case of owned pumpset i.e. Rs. 20.00 per hr. and prevailing rate of Rs. 25.00 per hr for hired pumpset has been charged.

Cost of Manure:

It has been charged @ Rs. 100.00 per bullock cart having a weight of 5 quintals.

Allocation of Joint Costs\(^2\)

The expenditure incurred on, or imputed for some of the cost items relate to the farm as a whole like Depreciation on farm buildings and implements, land rents, land revenue, cesses and taxes, interest on owned fixed capital. Such costs are allocated to individual crop enterprises in proportion to their areas.

Apportionment of Joint Costs\(^2\)

The apportionment of total costs incurred jointly for different crops grown in crop mixtures is done in proportion to the total value of output contributed by individual crops in the crop mixtures. The apportionment of total cost of cultivation between the main product and the by-products is done in proportion to their contribution to the total value of output.

Cost of Production:

It include total cost of cultivation plus marketing and storage costs, if any, cost of production in Rs. per quintal refers to the total cost of production divided by physical yield of the commodity.

\[
\text{Cost of Production in Rs. per Qnt.} = \frac{\text{Total cost of production in Rs.}}{\text{Total yield in Quintal}}
\]

In case of joint product like wheat grain and wheat straw

\[
\begin{align*}
\text{if total cost of production} &= TP \\
\text{Income of main product} &= Om \\
\text{Income of by-product} &= Ob \\
\text{Yield of main product} &= Ym \\
\text{Yield of by-product} &= Yb \\
\text{Gross output} &= Ot (Om + Ob) \\
\text{Cost of production of main product in Rs./Qnt.} &= \frac{TP \times Om}{Ot \times Ym} \\
\text{Cost of production of by-product in Rs./Qnt.} &= \frac{TP \times Ob}{Ot \times Yb}
\end{align*}
\]

Rental Value of Land:

It has been charged at the prevailing rate in the area called BALKAT rate. It depends upon the type of soil and availability of irrigation water.
**Cost Concept Used for the Analysis:**

'C' cost concept was used for calculating the cost of cultivation of crop, which is given below:

Cost A:

- Hired human labour cost
- Bullock labour cost
- Cost of tractorisation
- Cost of seed
- Cost of manure and fertilizers
- Cost of irrigation
- Cost p.p. measure
- Interest on working capital
- Depreciation on fixed capital
- Revenue
- Repairs to dead stock

Cost B:

Cost A + Rental value of land and Interest on owned capital

Cost C = Cost B + imputed value of family labour

Net Income = Gross Income - Total cost (Cost C)

FLI = Gross Income - Total cost excluding the imputed value of family labour

FBI = Gross Income - Total cost of cultivation excluding the family labour cost, rental value of land and interest on owned capital