CHAPTER 4

OBJECTIVES AND METHODOLOGY OF THE PRESENT STUDY

Large numbers of studies have been conducted on the agricultural diversification at National level and a few attempts have been made at the State level of Himachal Pradesh. But these studies suffer from one or the other methodological limitations. In some of the studies, the sample size is quite small due to which the results of the studies cannot be generalized to the State or region as a whole. The present chapter deals with the need, importance and objectives of the present study, selection of sample households, and statistical tools and techniques used in this study.

4.1 Need and Importance of the Present Study

The present study is a significant attempt to make an in-depth study of diversification of agriculture in the mid-hill zone of Himachal Pradesh. The areas in the State faced with a common problem of how to diversify agriculture in order to increase production as well as productivity in the agricultural sector.

This study seeks to provide the rational for agricultural diversification as a strategy for improving the economic prospectus of the farmers in the mid-hill zone of Himachal Pradesh. Like other regions of the country agricultural sector is the major source of livelihood in the State. The hilly region of the state of Himachal Pradesh is blessed with varied topography and climatic conditions, which offers numerous opportunities for crop diversification. Since more diversified occupational structure can provide a stronger employment and income support, it has a strategic role in promoting not only agricultural diversification but also a local skill formation.

The present study deals with the comparative net returns from food grain crops and other field crops. The empirical results of the present study will prove quite helpful in identifying the most profitable cropping pattern in the State. This will be a crucial intervention for breaking the vicious circle of
poverty by increasing both the production as well as productivity of the different farm sizes and thereby the income and levels of living of the people. The marginal productivity of inputs used in the crop production will suggest that which crops are profitable and which inputs should be used more intensively and which not in order to increase the production and productivity of crops by making an optimum utilization of the existing resources.

4.2 Objectives of the Present Study

The specific objectives of the present study are:

1. To study the changes in the cropping pattern, land use pattern, production and productivity in the study area.
2. To work out the returns to scale in both foodgrain and non-food grain crops by size, class of holding.
3. To study the importance of livestock and horticultural activities in the household income and employment.
4. To study the impact of diversification on the income and employment of the selected households.
5. To analyse the factors responsible for the agricultural diversification in the study area.
6. To pin point the problems faced by the households and to explore the possibilities of agricultural diversification in the study area.

4.3 Sampling Procedure

The present study is based on both primary and secondary data. The secondary data have been collected from the different related books, journal and government reports. The primary data have been collected from the selected households with the help of a pre-tested schedule by conducting personal interview of selected farmers.

There are three zones in Himachal Pradesh viz. low- hill, mid-hill and high- hill zone. Out of these three zones, mid- hill zone has been selected for the present empirical investigation due to the reason that in this zone the
topography climate, soil, rainfall, cropping pattern etc. bear similarities in some areas to the low-hill zone and in other areas to the high-hill zone of the State. Moreover, agricultural diversification has taken place in large extent in this zone. The mid-hill zone falls in the height between 800-1600 meters and includes parts of Solan, Sirmour, Shimla, Kullu, Bilaspur, Mandi and Chamba districts. A list of development blocks falling in the mid-hill zone of the State has been arranged in an ascending order on the basis of their respective population and three blocks have been selected randomly. The development blocks randomly selected are Kandaghat in district Solan, Karsog and Gohar development blocks in district Mandi. At the second stage a list of panchayats in each of the selected block has been arranged in an ascending order on the basis of their respective population and three panchayats in each of the three selected blocks has been selected randomly. At the third stage a list of villages in all the selected panchayats has been arranged in an ascending order on the basis of their respective population and three villages in each of the selected panchayat have been selected randomly. Finally a list of households in all the selected villages has been obtained from the concerned revenue office and after arranging these households in an ascending order on the basis of their respective size of holdings they have been classified into marginal farmers (less than one hectares), small farmers (1 to 2 hectares), semi-medium farmers (2 to 4 hectares), medium farmers (4 to 10 hectares) and large farmers (More than 10 hectares). In this way a sample of 298 households in proportion to the total number of households falling in each holding groups have been selected randomly. It is important to mention here that in the present sample none of the household falls in the category of large farmers. Thus the sample consists of three development blocks, nine panchayats, twenty seven villages and 298 households.
4.4 Nature of Data Collected

By conducting personal interview of the selected households, data pertaining to family composition, literacy, operated area (i.e. owned land, leased in and leased out land), household assets and durables, income, employment, consumption expenditure and borrowings have been recorded on a pre tested schedule as it existed at the time of survey. The information relating to the quality and value of agricultural inputs i.e. seeds, fertilizers, manures, implements, insecticides, and pesticides, family human labour days (hired in or hired out, permanent attached labour), bullock labour days, machinery charges vis-à-vis the value of main and by products of food grain crops and other field crops have been collected during the year 2009-10 for both the pre and post agricultural diversification period along with the problems faced in agricultural diversification as well as suggestions of the households for the further diversification have been recorded.

4.5 Statistical Tools of analysis

After arranging the data in homogeneous categories and by working out the averages and percentages, the following statistical tools have been used.

4.5.1 Cobb – Douglas Production Function

In order to achieve the objectives of the present study the Cobb-Douglas Production function have been used in the present study to work out the elasticity of factor inputs.

The Cobb-Douglas production function has been used in farming due to its theoretical fitness to agriculture and its computational manageability. The specification of the function is as under: $1$

$$Y = A.X_1 X_2 X_3 X_4 X_5 X_6$$

where

$Y$ = Value of output (Rupees)

$A$ = Constant
The log linear transformation of the Cobb-Douglas function is as follows:

$$\text{Log } Y = \text{Log } a + b_1 \text{ Log } X_1 + b_2 \text{ Log } X_2 + b_3 \text{ Log } X_3 + b_4 \text{ Log } X_4 + b_5 \text{ Log } X_5 + b_6 \text{ Log } X_6$$

The statistical significance level of regression coefficients have been worked out by calculating 't' values with the help of the following formula

$$t = \frac{b_i}{\sqrt{\text{Var}(b_i)}}$$

with (n-k-1) degree of freedom

The denominator in the above expression represents the standard errors of the corresponding estimates. F-test has been applied to work out the significance level of coefficients of multiple determinations ($R^2$) by the following formula: \(^2\)

$$F = \frac{R^2}{K-1} \frac{1-R^2}{N-K}$$

K = Number of b including intercept

N = Number of observations.

$R^2$ = Coefficient of multi predetermination

The calculated values of t and F-tests have been compared with the table value to find out the particular level of significance.
The definition and measurement of the above variables for individual holdings are as follows.

**Output (Y):** This dependent variable which consists of the value of gross output of food grain and other field crops (main + by products) evaluated at harvest prices in the reference year, irrespective of being consumed, sold or maintained in the stock: less the value of output paid by way of wages in kind, feed to animals and kept as seed.

**Land (X₁):** The area under different crops during the full agricultural year constitutes land input measured in hectares. The permanent pastures, fallows and wasteland have been excluded.

**Human Labour (X₂):** Human labour (i.e. family labour, casual labour and permanent labour) actually used in food-grains and other field crop production have been recorded in terms of hours. Eight working hours have been considered equal to one-man day. The women, children and old person’s working days have been converted into Standard Man Days by attaching proper coefficient of efficiency.

**Bullock Team (X₃):** Bullock team is defined in terms of eight hours a day working by a pair of bullock and a person needed to operate the bullock, the bullock labour includes both owned and hired-in bullock labour.

**Manures and Fertilizers (X₄):** The actual quantity as well as value of fertilizers has been recorded.

**Seed (X₅):** The seed value has been used by taking seed quantity multiplied by a common price for all farmers for different crops separately and then added together to arrive at seed value.

**Capital (X₆):** It includes depreciation and interest on farm buildings, implements, machinery and irrigation in value terms.
4.5.2 Returns to Scale

The regression coefficients in the Cobb–Douglas production function are the production elasticities and their sum indicates the returns to scale. The returns to scale are increasing, constant and decreasing according to the sum of regression coefficients is greater than, equal to or less than unity. This indicates the proportion to which the output would change if all the exogenous variables are increased simultaneously by one percent. The returns to scale have been worked out as:

\[ \text{Returns to Scale} = \sum b_i \]

Where \( b_i \) = ith regression coefficient (Production elasticities)

The calculated returns to scale has been tested whether it is significantly different from unity or not. If the difference from unity was statistically insignificant, it was taken to be constant return to scale irrespective of the fact that whether the sum was more than or less than unity. This was done by applying 't' test having following form:\(^3\)

\[ T = \left( \frac{\sum b_i}{\sqrt{\left( \text{vari. } b_i \right) + 2 \text{ cov. } (b_{ij})}} \right) \]

Where \( i \) is not equal to \( j \)

and \( i = 1, 2, 3, \ldots \ldots 6 \) (Explanatory variables)

\( j = 1, 2, 3, \ldots \ldots 6 \)

4.5.3 Tabular Analysis

The net returns from food grain and other field crops have been worked out with the help of tabular analysis i.e. by deducting the total cost incurred from the total value of output at the prevailing prices in the study area.

4.5.4 Total Value of Output

It includes the value of food grains (both main and by product) as well as other field crops at local prevailing prices.

4.5.5 Total Cost:

Total cost incurred in the production of food grains and other field crops by parts i.e. cost \( A_1, A_2, B \) and \( C \) which have been worked out as follows:
Cost $A_1$: This includes value of hired human labour, value of hired bullock labour, hired machinery charges, value of owned machine labour, value of seed (both purchased and produced), value of insecticides and pesticides, value of manure (owned and purchased) value of fertilizers, depreciation of implements and farm building, irrigation charges, land revenue, taxes, interest on working capital and miscellaneous expenses.

Cost $A_2$: Cost $A_1$ plus rent paid for leased-in land.

Cost $B$: Cost $A_2$ plus imputed rental value of owned land less land revenue paid there on + imputed interest on owned fixed capital (excluding land).

Cost $C$: Cost $B$ plus imputed value of family labour used.

4.5.6 Net Returns

Thus the net returns have been worked out equal to total value of output of food-grain crops (both main and by product) and other field crops minus total cost involved in the production of these crops during the year preceding the survey in the study area.

4.5.7 Imputed Value

The imputed value of owned resources has been calculated by taking into account the owned seed and farm yard manures at village market prices prevailing at sowing time and owned bullock labour days at market rates prevailing in the study area. The family human labour cost has been imputed at the same rate as applicable to casual labour, while taking into account the statutory minimum or actual wage whichever is higher. The rate of interest on working capital has been charged at 12.5 percent per annum as per the prevailing rate for working capital being charged by all the banks during the time of survey and rental value of owned land has been calculated as one fifth of the value of output at farm gate price. The depreciation on farm implements, machinery, and buildings has been worked out by dividing their present replacement value by their expected life. The total depreciation has been distributed over different crops based on the area under each crop. The gross
farm income has been defined as gross value of output including the value of by-products at farm harvest rates. The net farm income represents the remuneration for the farmers management and has been calculated by deducting expenses (cost of cultivation) from the gross farm income.

Net Farm Income = Gross Farm Income - Cost C (total cost)

4.5.8 Standard Mandays

Due to differences in the work efficiency of male, female, children, and old persons, the family human labour days have been converted into Standard Man Days by allotting the proper co-efficient of efficiency i.e. one Woman Day (WD) will be treated equal to 0.75 Man Days (MD). One Child Day (CD) has been treated equal to one Old Person Day (OD) and both have been treated equal to 0.50 MD.

Thus:

1 CD = 1 OD = 0.50 MD
1 WD = 0.75 MD

4.5.9 Herfindahl Index

The Herfindahl Index has been used to study the extent of agricultural diversification in the present study. The specification of this method is as under:

\[ H = \sum_{i=1}^{N} P_i^2 \]

Where \( H \) = Herfindahl index

\[ P_i = \frac{A_i}{\sum_{i=1}^{N} A_i} \]

In which \( A_i = \) Area under ith crop (hectare),
\[ \sum_{i=1}^{N} A_i = \text{Total cropped area (hectare)} \]
The value of Herfindahl index (H) varies between zero to one, with the increase in diversification, the Herfindahl index would decrease. This index takes a value one when there is no diversification and when there is a complete specialization it approaches to zero as \( N \) get large i.e. if diversification is ‘perfect’. It has inverse relationship with diversification.
REFERENCES


