CHARPTER III

METHODOLOGY

3.1 Scope and limitation of the study

This study focuses on many aspects concerning strawberry production as follows: farmer group in the normal system (NS) and virus free system (VFS), consumers, processors, exporters and qualities of strawberry. Special attention is paid to the assessment of economic and social impact of the Commercial Strawberry Production by Using Certified Seedlings (CSPUCS) project, which emphasizes the impact on farmer groups and the adoption of the new technology of the virus-free system.

3.2 Conceptual framework

The conceptual framework (figure 3.1) for the study is developed in ordering to assess the impact and effect from the project. The assessment is classified short term, medium term and long term.

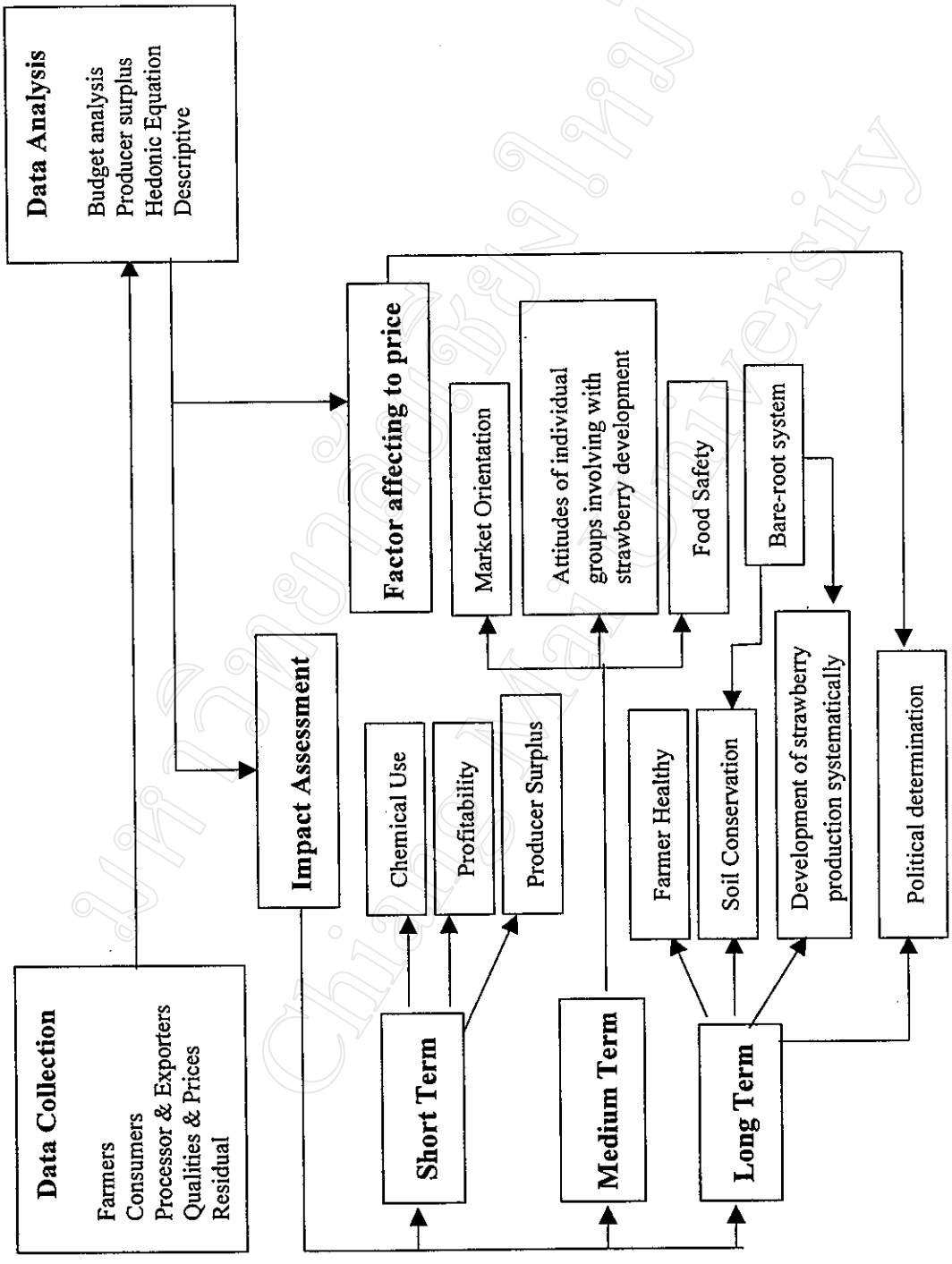


Figure 3.1 Research framework

3. Data collection

Both primary and secondary data were collected. The process of data collection is briefly explained below.

3.3.1 Primary data

Primary data was mainly obtained from the field survey of the study area for 1996/1997 cropping year. They were collected by formal survey method using structured questionnaires and through interviews with farmers, consumers, processors, and exporters. In the addition, samples of strawberries were collected for laboratory analysis to measure and identify physical and chemical characteristics as well as residue.

3.3.1.1 Farmer survey

This study focuses in the social and economic aspects of the farmers involving virus-free system (VFS) and of the farmers outside the project (normal system). Hence, the data was classified into 4 groups. The first group is farmers producing strawberry runners by using normal parent plants (RNS). The second group is farmers producing by using virus free mother plants (RVFS). The third group is farmers growing strawberries by using the normal system (SNS). The fourth group is farmers growing strawberries by using the virus free system (SVFS).

As mentioned above, there are four samples of groups of farmers. The numbers of each farmer group are shown table 3.1.

Table 3.1. The numbers of individual farmer samples.

Farmer group	The numbers of sample (people)
The RNS farmers	17
The RVFS farmers	15
The SNS farmers	61
The SVFS farmers	57

Source: survey 1998

The areas, which were selected for this study, included areas in Chiang Mai and Chiang Rai provinces. They are shown in the Table 3.2 below.

Table 3.2 Study areas

Virus-free system		Normal system	
Strawberry production areas	Runner production areas	Strawberry production areas	Runner production areas
Mae Rim	Ban Mae Jae	Fang	Ang Kang RP[5]
Samoeng		Intanon RP	
Mae Sai		Huai Nam Rin RP	

Source: Survey 1998

The study of the impact of the CSPUCS project on farmers requires both social and economic information in order to meet some objectives. Therefore, the data collections concerning with farmer impact were collected as follows: 1) farm household information including farm size, experience of production (year), debt, education, household income

[5] RP is The Royal Project

and etc.; 2) information on farming practices, the numbers of damaged strawberry plants, chemical management; labor use and so on; 3) the input use and the cost of production; 4) farmers attitude towards virus-free runners including the adoption technology used by farmers and their opinion on using pesticide and fungicide.

3.3.2.2 Consumer survey

This survey also collected data on consumer tastes by panel test using a structured questionnaire. Three varieties of strawberries (P16, P50 and P70) were selected for finding out the consumers' preferences. P6 refers to an existing variety and, P70 and P50 are new varieties in Thailand. About 50 consumers were interviewed and tasted all three varieties of strawberries.

3.3.1.3 Processors and exporters survey

Processors and exporters were interviewed for the new varieties of their preference in qualities of strawberries and their attitude towards the production of new varieties in the future. The data required were quality preference, the type of process used, the production yields, market orientation etc.

List of processing and export companies

1. Doi Kham Company Limited in Fang District, Chiang Mai
2. Doi Kham Company Limited in Mae Chan District, Chiang Rai
3. Union Frost Company Limited in Lampang
4. BBD Company Limited in Chiang Rai
5. Pisittichai Company Limited in Chiang Mai
6. Lanna Industrial Company Limited in Chiang Mai

3.3.1.4 Strawberry qualities

The study in this part collected strawberries from many areas (within and without project areas) in order to analyze them in a laboratory. The data required were prices and quality data including physical and chemical characteristic such as size, shape, skin color, firmness, and sweetness. The data collection of these variables is described in below.

The prices of strawberries vary depending on the markets, time and quality. In this study time is a constant variable in order to ease data collection and analysis. Therefore, all sample collections were made in the third week of March. The data of prices of each sample were taken as baht per kilogram.

The sizes of strawberries were measured by using scales. The unit of size is given as gram per fruit.

To measure the shape of strawberries, a ratio of width to length was applied. If the ratio is high then it means that the shape is spherical; if the ratio is low, then it is a slender shape. The tool used for measuring the width and length is vernier (a ruler that can measure finely).

The instrument used for measuring the color of skin of the strawberries is a Chroma meter. It can measure three indexes: L, a and b. L is a light index giving 0-100. 0 is darkness and 100 is light. The index gives a positive value when the sample is red. When a index is negative, the sample is blue color. The b value shows a yellow and green index. When b is positive this means yellow, and green is negative.

The firmness of strawberries was measured by using firmness tester. It measures in kilograms. When it is high value it means that the sample is of high firmness. The firmness varies according to the pressing weight.

The last quality is sweetness measured by using a hand refractometer. This instrument can measure quantities of solid in a solution. If the quantities of solid are high that it indicates high sweetness. The unit of measuring is degree of brix (°brix).

3.3.1.5 Residue measuring

The residual measuring of the strawberries can indicate the food safety issue. It requires the sampling of the strawberry fruits of both virus-free (VFS) and normal systems in order that they would analyzed the pesticide residue. The method used is the pesticide test kit.

3.3.2 Secondary data

Secondary data was gathered from related government offices including the Office of Agricultural Extension, the Office of Agricultural Economic, the Department of Industrial promotion, Department of Commerce, and the Department of Customs. Moreover, some information was gathered from the Royal Project Foundation.

3.4 Data analysis

The data analysis of this study applies many tools to assess the project impact. The qualitative and quantitative methods are used mainly to analyze this data collected from the study sites. The analytical tools are applied to assess each of the objectives such as descriptive analysis, the farmer surplus approach, budget analysis, and hedonic price equation function. The analytical framework is shown in figure 3.2

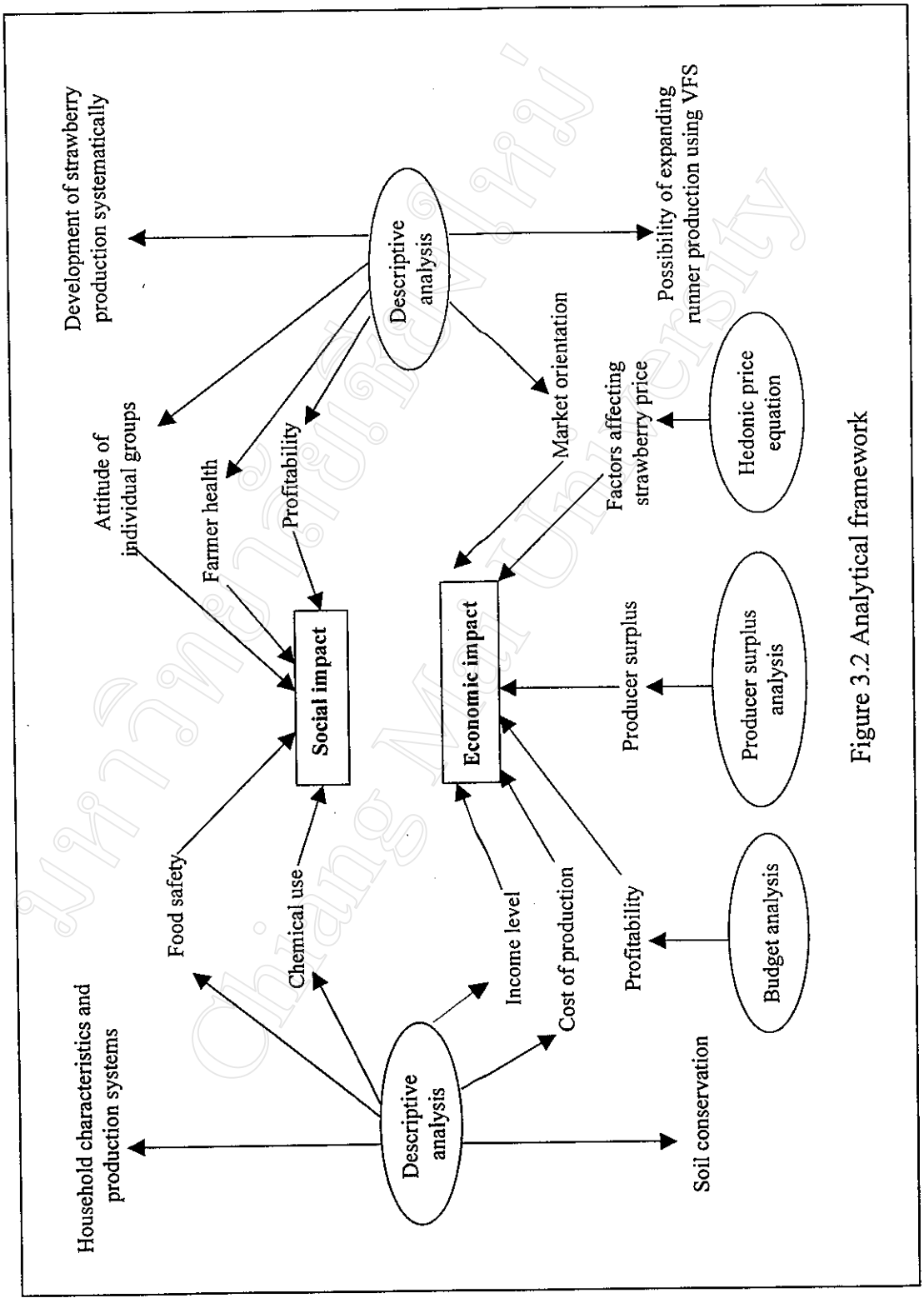


Figure 3.2 Analytical framework

3.4.1. Descriptive analysis

The descriptive analysis including average, percentage, maximum, minimum and frequency is the major analytical tool for objectives one, three and four in chapter 1, which are identifying: 1) household characteristics, 2) production systems of strawberry and runner, 3) development of strawberry production systematically, 4) and the possibility of expanding runner production using VFS. Moreover, the economic impact study applies this method to evaluate income level, cost of production and market orientation. Changes in the input utilization of farmers, food safety, farmers health, the attitudes of farmers about chemical use, and attitudes of individual groups involved with strawberry development (consumers, processors and exporters) are evaluated to assess the social impact. These are also estimated by using descriptive analysis.

3.4.2. The farmer surplus approach

The farmer surplus gained from variety improvement will be analyzed by the formula shown below;

$$G = FS_n - FS_o \qquad \text{----------(3.1)}$$

G = Farmer surplus gain from technological change

FS_n = Farmer surplus of new technology in production

FS_o = Farmer surplus of original production (normal)

$$G = \left(P_n^* y_n^* - \int_0^Q y_n^* dp \right) - \left(P_o^* y_o^* - \int_0^Q y_o^* dp \right) - - - (3.2)$$

p_N^* = Price of production improved variety at equilibrium point

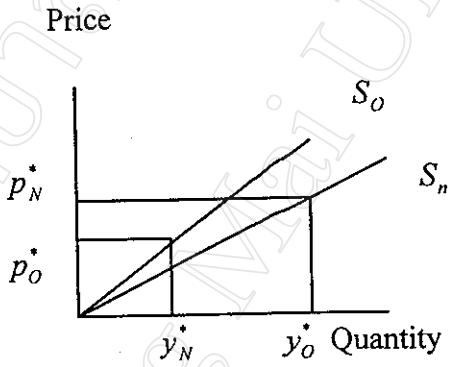
p_O^* = Price of original (normal) production at equilibrium point

y_N^* = Quantity of production improved varieties at equilibrium point

y_O^* = Quantity of normal production at equilibrium point

S_0 = Original supply curve

S_n = New supply curve (Technological change)



Supply curves are derived from respective marginal cost curves. The marginal cost curves are estimated from cost equations of both two systems.

For a production function $y = f(x_{11}\ x_{21}\ x_3)$ and using translog specification, the cost function of strawberry production for given technology (3 inputs) can written as (Johnston, 1984).

$$\ln C = \alpha_0 + \alpha_1 \ln y + \beta_1 \ln w_1 + \beta_2 \ln w_2 + \beta_3 \ln w_3 + \frac{1}{2}\rho_{11}(\ln w_1)^2$$
$$+ \rho_{12}(\ln w_1)(\ln w_2) + \rho_{13}(\ln w_1)(\ln w_3) + \rho_{23}(\ln w_2)(\ln w_3)$$
$$+ \frac{1}{2}\rho_{33}(\ln w_3)^2 + \frac{1}{2}\rho_{yy}(\ln y)^2 + \rho_{1y}(\ln y)(\ln w_1)$$
$$+ \rho_{2y}(\ln y)(\ln w_2) + \rho_{3y}(\ln y)(\ln w_3) \qquad (3.3)$$

For a cost function to be well behaved, it must be homogenous of degree 1 in input prices, given y. This implies the following restrictions on equation (3.3)

$$\sum_{i=1}^{n} \beta_i = 1 \quad , \quad \sum \rho_{ij} = \sum \rho_{ji} = 0$$

$$\text{i.e. } \beta_3 = 1 - (\beta_1 + \beta_2)$$

Equation (3.3) also implies homogeneity of a constant degree in output i.e. $\rho_{yy} = 0$ (Bernt, 1991). Assuming constant-return to scale implies each $\rho_{ij} = 0$. With above restrictions, equation (3.3) becomes

$$\ln C - \ln w_3 = \alpha_0 + \alpha_1 \ln w_3 + \beta_1(\ln w_1 - \ln w_3) + \beta_2(\ln w_2 - \ln w_3)$$
$$+ \rho_{1y} \ln y(\ln w_1 - \ln w_3) + \rho_{2y} \ln y(\ln w_2 - \ln w_3) \quad \text{Define}$$

$\ln C' = (\ln C - \text{Ln } W_3)$, then

$$\ln C' = \alpha_0 + \alpha_1 \ln w_3 + \beta_1(\ln w_1 - \ln w_3) + \beta_2(\ln w_2 - \ln w_3)$$
$$+ \rho_{1y} \ln y(\ln w_1 - \ln w_3) + \rho_{2y} \ln y(\ln w_2 - \ln w_3) \qquad (3.5)$$

Take partial differentiation of equation (3.5) with respect to input price and with respect to output, we obtain cost-share equations (3.6) revenue-share equations (3.7) respectively.

$$\theta_1 = \beta_1 + \rho_1 \ln y \qquad (3.6.1)$$

$$\theta_2 = \beta_2 + \rho_2 \ln y \qquad (3.6.2)$$

$$\pi = \alpha_1 + \rho_1(\ln w_1 - \ln w_3) + \rho_2(\ln w_2 - \ln w_3) \qquad (3.6.3)$$

Where θ represents cost-share and $\rho_1 = \rho_{1y}, \rho_2 = \rho_{2y}$ and π = represent revenue-share.

Equations (3.6) and (3.7) are estimated using Seemingly Unrelated Regression technique with cross-equation restrictions, i.e, ρ_1, ρ_2 are the same in both equations.

3.4.3. Budget analysis

The budget analysis is applied for estimating and comparing the profitability of different farmer groups using virus free and normal strawberry runners to assess the economic impact from a production change in technology. The formula given below is employed:

$$\pi_i I = TR_i - TVCI_i \qquad \text{-------(3.7)}$$

$$\pi_i II = TR_i - TVCII_i \qquad \text{-------(3.8)}$$

π_i = Profitability or net farm income

TR_i = Total income

$TVCI_i$ = Total variable cost excluding imputed labor cost

$TVCII_i$ = Total variable cost including imputed labor cost

3.4.4. Hedonic price equation function

The expected relationship of quality characteristics to strawberry price is based on observed price which reflect consumer preference (Unnevehr, 1986). The physical and chemical characteristics of strawberry required are size, shape, skin color, firmness, and sweetness. The hedonic equation function is employed for analyzing the relationship. The hedonic price equation can be shown as:

$$P = \beta_0 + \beta_1 SI + \beta_2 SP + \beta_3 CL + \beta_4 FN + \beta_5 SW + e \qquad \text{--------(3.9)}$$

P = Price of strawberry (baht/kg)

SI = Size of strawberry (gram)

SP = Ratio of width and length of each strawberry fruit

LD = Light density (between 0-100 units)

RB = Index of red and blue measuring (a index)

YG = Index of yellow and green measuring (b index)

FN = Firmness of strawberry fruit (kilogram)

SW = Sweetness (°brix).

e = error term