CHAPTER II

LITERATURE REVIEW

This chapter mainly discusses about the problems of production related to seed cotton yield and also describes an important tool such as sustainable livelihoods framework to improve the understanding of livelihoods, particularly the livelihoods of the poor. An appropriate statistical method, multiple regression analysis is explained in this chapter to understand the relationship between dependent variable and explanatory variables.

2.1 Constraints of cotton production

Cotton is an important cash crop producing in many developing countries that supports the livelihoods of millions of poor households. In some countries, it contributes approximately 40 percent to total merchandise exports and total GDP of above 5 percent. In cotton-based farming system, there have constraints for agricultural inputs and nonagronomic constraints to cotton production. In production of cotton lint and seeds, several agronomic activities are involved suffice that cotton production is labor demanding. A high yield of cotton seed and lint depends on soil fertility, favorable climatic conditions and appropriate sowing time and sufficient application of insecticides and fungicides (Sabo *et al.,* 2009).

There are many constraint factors that affect cotton yield, namely socio-economic, biological, managerial and physical constraints. These major constraints

factors were education of the respondents, land preparation, water supply, appropriate seed rate, plant protection techniques and nutrients management. All these factors were significant on cotton productivity (Bakhsh *et al*., 2005).

The aggregate level of production is affected by the yield of cotton per hectare and the area expansion with cotton. According to high inputs requirement crop, sustainable careful management practices are required in cotton production. It requires high levels of fixed investment in cotton and also a high level of investment in each crop sown is commanded (Zhao and Tisdell, 2009).

Cotton production constraints are changed in nature, however some major production constraints could be classified as in terms of technical, institutional and economics and policy. Constraints factors which included in terms of technical were the lack of appropriate varieties with specific adaptation to differing growing seasons, poor seed quality, high yield losses due to insect pests and weed growth, insufficient use of fertilizers and limited irrigated area. According to institutional, supporting of inadequate research and insufficient of skillful extension agents were constraint factors, and receiving inadequate amount of credit, low financial returns and not satisfactory cotton procurement price were under economics and policy constraints to cotton production (Tin, 2006).

The major constraints of low productivity on the production level are due to application of hand hoe in cultivation; inadequate availability of key inputs such as fertilizer, seed and pesticides; insufficient supporting of research and extension services; limitation of credits accessibility to small farmers; land fragmentation; and declined in producer prices (COMPETE, 2002; AGSEC, 1999). Moreover, the main constraint of more cotton production is because of the lower profitability comparing

cotton to other major competing crops such as beans, maize, cassava, finger millet, sorghum, simsim and soybeans (AGSEC 1999).

Farm-level constraints are illustrated by low productivity, insufficient research and training, inadequate supply of input, limitation of access to credit for small farmers, low profitability due to unacceptable cotton price, and limited information support, insufficient government support, underutilization and technologically aging ginneries are also mentioned (You and Chamberlin, 2002).

Nyein (2004) evaluated that common constraints in cotton production of 110 sample farmers under two selected townships, namely, Meikhtila and Kyaukse in Central Myanmar were inadequate availability of improved quality seed (20.65% and 19.15%), insufficient supplementary irrigation practices (28.57% and 4.26%), high cost of input (19.15% in Kyaukse), high infestation of pests (17.46% and 23.4%), smaller amount of credit available (22.22% and 12.77%) and availability of limited farm labor and power at peak seasons of operation (4.76% and 2.13%).

Cotton production constraints in Sudan were studied by Ahmed and Kuhlmann (2004). As a result of this study, 48% of cotton yield variability was due to tenant and scheme management specific factors, 25% of this variability was due to the technical inefficiency of tenants and 23% was due to the scheme management's inefficiency. The first best way to reduce or eliminate the negative effects on cotton production caused by the tenants, scheme management, government, crop rotation and cotton marketing was certainty of the accessibility of timely and sufficient credit.

Thirtle *et al.* (2003) reported that two-thirds of the main constraints was lack of credit, only 11% was considered as lack of land that was their biggest problem and the main problem faced by labor scarcity was only 3% of the total 100 respondents.

Fifty-seven percent of the farmers determined pests as the dominant agronomic problem in the area, excessively rain in early season was 24% and 11% of the farmers concluded that weeds to be the biggest problem. Only 8% of respondents proved that droughts, floods, soil quality and plant diseases were the constraint factors, 58% of the farmers regarded the bollworm as the major pest and 16% and 20% of farmers assumed the major problem of production was caused by aphids and jassids.

Adeniji (2007) identified that there was a total of eight major constraints faced in cotton production in Katsina State, Nigeria, such as delayed planting (70%), incidence of pest and diseases (70%), shortage of finance for inputs (55%), limitation of labor during harvest (52%), unsuitable time of spraying (43%), marketing (40%), storage after harvest (39%), preparation of land (36%), respectively.

Iqbal *et al.* (2001) found that crop productivity could be increased by timely availability of inputs such as seed, fertilizer, weedicides and pesticides. There are various factors that influence cotton yield, namely physical factors and qualitative variables. Physical factors are land preparation, seed, irrigation, plant protection measures, etc. and qualitative variables are education, age, farming experience, etc.

Khan *et al*. (1986) and Hassan (1991) found that low crop yield was accepted by the lack of training by expert technicians, lack of capital and marketing facilities and high expense of agricultural inputs. Nabi (1991) concluded that the relationship between productivity in general and the input usage was the important variables in the production process such as farm size, labor, seed, fertilizer, irrigation, number of cultivation and working capital. Irrigation water, poor soil fertility, cost of weedicide and fertilizer is prominent constraints that affect seriously crop productivity. If the

good management of these variables is available, production could increase (Anwar, 1998).

Moreover, extension systems should emphasize in training farmers in the management of weeds, disease and pest attack. Extension agents' field visits and management of demonstration plots could be right steps in the right direction. There is also needed to emphasize research and extension plans. To combat disease and pest infestation on cotton crop, the provision of sufficient resources to research and extension systems is recommended for improving and promoting new technologies (Bakhsh *et al.* 2005).

Pest problem is one of the most important constraints in cotton production. It is estimated that about 20-40% loss occurs annually due to different pests of cotton. The decrease in yield is mainly contributed to heavy losses by pink bollworm (*Pectinophora gossypiella*), American bollworm (*Helicoverpa armigera*) and spotted bollworms (*Earias* spp.) (Ahmad, 1999). Due to development of insecticide resistance in *Helicoverpa armigera* and other bollworms, the losses have been increased (Ahmad *et al*., 1999).

Kooistra and Termorshuizen (2006) reported that 15 % of cotton yield loss was caused by insect infestation and fungal and bacterial plant pathogens, viruses, and nematodes were of lesser importance. They also described that 11% of the world's pesticides consumption was estimated by cotton cultivation while it was sown on only 2.4% of the world's arable land. In developing countries it was estimated that approximately 50% of all pesticides were applied in cotton cultivation.

Cotton yield is determined by a large number of factors, including: climate (temperature, amount of sunshine, rainfall distribution), the physical and chemical

characteristics of the soil and the nature and extent of the plants' natural enemies (weeds, pests, diseases). Where all conditions are favorable, the cotton plant may produce several tonnes of seed cotton per hectare in tropical Africa. However, if only one of the favorable conditions is lacking, yields are drastically reduced. The extent of yield reduction depends on the extent and the duration of the unfavorable conditions. If favorable conditions return not too late in the season, the cotton plant may 'recover', thanks to so-called compensatory growth (Ton, 2002).

2.2 Sustainable livelihoods framework

The livelihoods framework is a tool to improve the understanding of livelihoods, particularly the livelihoods of the poor. The first elaborated definition of the concept of sustainable livelihoods reads: a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: it is considered to be sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the following generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term (Chambers and Conway 1991).

The sustainable livelihoods approach is a method of thinking about the objectives, scope, and priorities for development activities. It is dependent upon thinking about the way the poor and vulnerable live their lives and the importance of policies and institutions. The sustainable livelihoods approach makes the link between people and the overall enabling environment that affects the outcomes of livelihood strategies. It brings concentration to bear on the intrinsic potential of people in terms

of their skills, social networks, access to physical and financial resources, and ability to influence core institutions (Serrat, 2008).

The sustainable livelihoods framework (SLF) forms the heart of the sustainable livelihoods approach and serves as a tool for the investigation of poor people's livelihoods, whilst visualising the principal factors of influence. Like all models, the SLF is a simplification and does not represent the entire diversity and richness of livelihoods, which can only be comprehended by qualitative and participatory analysis at the local level (Kollmair and Gamper, 2000). A sustainable rural livelihoods (SRL) framework can be accustomed in helping the rural poor to improve their lives and strengthen the sustainability of their livelihoods (Fouracre, 2001).

The sustainable livelihoods framework guides what are the main facts that affect livelihoods of local people and how they relate to one another. The relationships between them are important to mirror that people modify assets to activities and the affect of the policies, institution and process to the fundamental components (DFID, 1999). The conceptual framework of Department for International Development gives attention to measured changes in the different factors, which contribute to livelihoods specifically human, social, financial, physical and natural capital assets (Pasteur, 2001). In the sustainable livelihoods framework, each capital asset consists of various key indicators, which are interlinked to each of the capitals. For example if a household has secure access to land, they are also likely to be well granted with financial assets, as they can use the land for productive purpose (Chambers, 1987). The livelihoods framework encompasses household assets

(human, natural, physical, social and financial) and their use in farming, non farm activities and other strategies used by a household to make a living (DFID, 1998).

Livelihoods compose of resources or assets or capital (human, natural, social, physical and financial capital and access to use these) that allow strategies to be employed in order to survive and fulfill desirable livelihood outcomes such as income, food security, well-being and sustainable use of natural resources (Carswell, 1997; Carney, 1998; DFID, 2001). This process of transforming the resources into commodities or outcomes is affected by a myriad of external factors such as laws, culture, policies, and institutions. In addition, livelihood dynamics are powerfully influenced by personal characteristics and desires, and one's relation to others. A livelihood is deemed sustainable if it meets three conditions: firstly, it should be adequate for the satisfaction of self-defined basic needs, secondly, it should be resilient to shocks and stresses (Chambers, 1995), and thirdly, it should not undermine the natural resource base that creates the basis of the future options (Hyden, 1998; Scoones, 1998). The framework for their interaction is illustrated in Figure 2.1.

2.2.1 Vulnerability context

The sustainable livelihoods framework takes notice the vulnerability context (including natural and human-led trends and shocks) as the starting point for analysis (Carney, 1998). People's livelihoods and their assets availability are basically and control of resources can be influenced by critical trends, shocks and seasonality which are largely beyond their control (DFID, 1999).

Serrat (2008) reported that vulnerability is characterized as insecurity in the well-being of individuals, households, and communities in the expression of changes

in their external environment. People move in and out of poverty and the concept of vulnerability catches the changing processes better than poverty line measurements. There have two aspects in vulnerability: an external side of shocks, seasonalities, and critical trends; and an internal side of defenselessness caused by default of ability and means to cope with these. The vulnerability context encompasses shocks, seasonalities and critical trends.

In the case of shocks, it can destroy livelihoods' assets directly, for examples, floods, storms, civil conflict, etc. They can also force people to abandon their home areas and give away assets (such as land) prematurely as part of coping strategies. Recent events have spotlighted the impact that international economic shocks, including rapid changes in exchange rates and terms of trade, can have on the very poor (DFID, 1999). According to the report of Serrat (2008), some examples of shocks are conflict, illness, floods, storms, droughts, pests and diseases.

Trend can have either positive or negative impact on livelihoods and changes can be happened over long period of time and these changes are longer than those caused by shocks or seasonality. Trends may (or may not) be more benign, though they are more predictable. They have a particularly important influence on rates of return (economic or otherwise) to chosen livelihood strategies. Examples of trends are population trends, resources trends, and economic trends, governance trends and technological trends.

Seasonality means to seasonal changes which are affecting the assets, activities, prices, production, health, employment opportunities, etc. In developing countries, seasonal shifts in prices, employment opportunities and food availability

are one of the greatest and most enduring sources of difficulty for poor people (DFID, 1999).

Vulnerability could be reduced by supporting of traditional livelihood's strategies, development of coordination of formal groups, the training of women and youth, and energetic participation of beneficiaries in the project planning and decision-making (Pérez and Cahn, 2000).

2.2.2 Sustainable livelihood capitals

The sustainable livelihoods framework helps to organize the factors that constrain or enhance livelihood opportunities and exhibits how they are relating each other. A central concept is that different households have different access livelihood assets, which the sustainable livelihood approach intends to expand (Serrat, 2008).

Assets are considered to be stocks of different types of capital that can be utilized directly or indirectly to generate livelihoods. They can lead to a flow of output, possibly becoming depleted as a consequence, or may be collected as a surplus to be invested in future productive activities. An analysis of the capital assets of the household is the heart of the framework, which are divided into natural, social, human, physical and financial. The central point of the asset pentagon is to force users to believe holistically rather than sectorally about the basis of livelihoods (Carney, 1998).

Based on the five capital types identified by the sustainable livelihoods framework, five livelihoods assets comprise:

(a) Human capital

Human capital represents health, nutrition, education, knowledge and skills, capacity to work and capacity to adapt (Serrat, 2008) that together enable people to persist in different livelihood strategies and achieve their livelihood objectives (DFID, 1999). Human capital is constituted by the quantity and quality of labor available. Therefore, at a household level, it is determined by household size, but also by skills, education, and health of household members (Carney, 1998).

(b) Natural capital

It is the term used for the natural resource stocks from which resource flows applicable for livelihoods are derived. A wide variation in the resources is occurred that make up natural capital, from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly for production (trees, land, water, etc.). The relationship between natural capital and the Vulnerability Context is particularly close in the sustainable livelihoods framework (DFID, 1999). The productivity of these resources may be degraded or enhanced by the management of human (Carney, 1998).

(c) Physical capital

It consists of the physical goods and basic infrastructure which are supporting livelihoods. In the context of infrastructure, changes to the physical environment help the needs of local people and to be more productive (DFID, 1999). Some components of essential infrastructure are affordable transport, vehicles, secure shelter and buildings, adequate water supply and sanitation, energy, communications. The

producer goods are tools and technology such as tools and equipment for production, seed, fertilizer, pesticides, traditional technology (Serrat, 2008).

(d) Social capital

It relates to the formal and informal social relationships. According to these relationships, people can succeed different opportunities and benefits for their livelihoods. Some benefits of social capital are communication through work or shared interests, membership of groups, relationships of trust, information access, access to influence or power, access to claims or obligation for support from others (DFID, 1999). Any assets such as rights or claims are derivative of group membership. This consists of the ability to visit on friends or kin for help in times of need, support from trade or professional associations (e.g. farmers' associations) and political claims on leaders or politicians to provide assistance (Carney, 1998).

(e) Financial capital

It is defined as the financial resources to achieve the livelihood objectives. Two main sources of financial capital are the available financial stocks such as cash, bank deposits, livestock and jewelry and the regular money flow such as pension, transfers from the state and remittances (DFID, 1999). Carney (1998) described that financial capital consists of different income levels, variability over time, and distribution within society of financial savings, access to credit, and debt levels.

2.2.3 Transforming structures and processes

Transforming Structures and Processes within the livelihoods framework refers to the institutions, organisations, policies and legislation that shape livelihoods (DFID, 1999). Livelihood strategies and outcomes are not only dependent on access to capital assets or constrained by the vulnerability context but also transformed by the environment of structures and processes. In the livelihoods framework, linking micro and the macro levels demands that policy and institutional analysis must take place at all levels (Carney, 1998). It is important to understand the structures or organizations, and the processes such as laws, policies, societal norms, and incentives. The link between the micro (individual, household and community) and the macro (regional, government, powerful private enterprise) is contributed by an understanding of structures and processes (Scoones, 1998, Carney, 1998, Ellis, 2000).

The public and private sector organizations are the hardware of structures in the framework that set and implement policy and legislation; deliver services; and purchase, trade, and perform all manner of other functions that influence livelihoods. If structures can be thought of as hardware, processes can be thought of as software (DFID, 1999). Examples of processes are the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, define the way in which structures operate (Serrat, 2008).
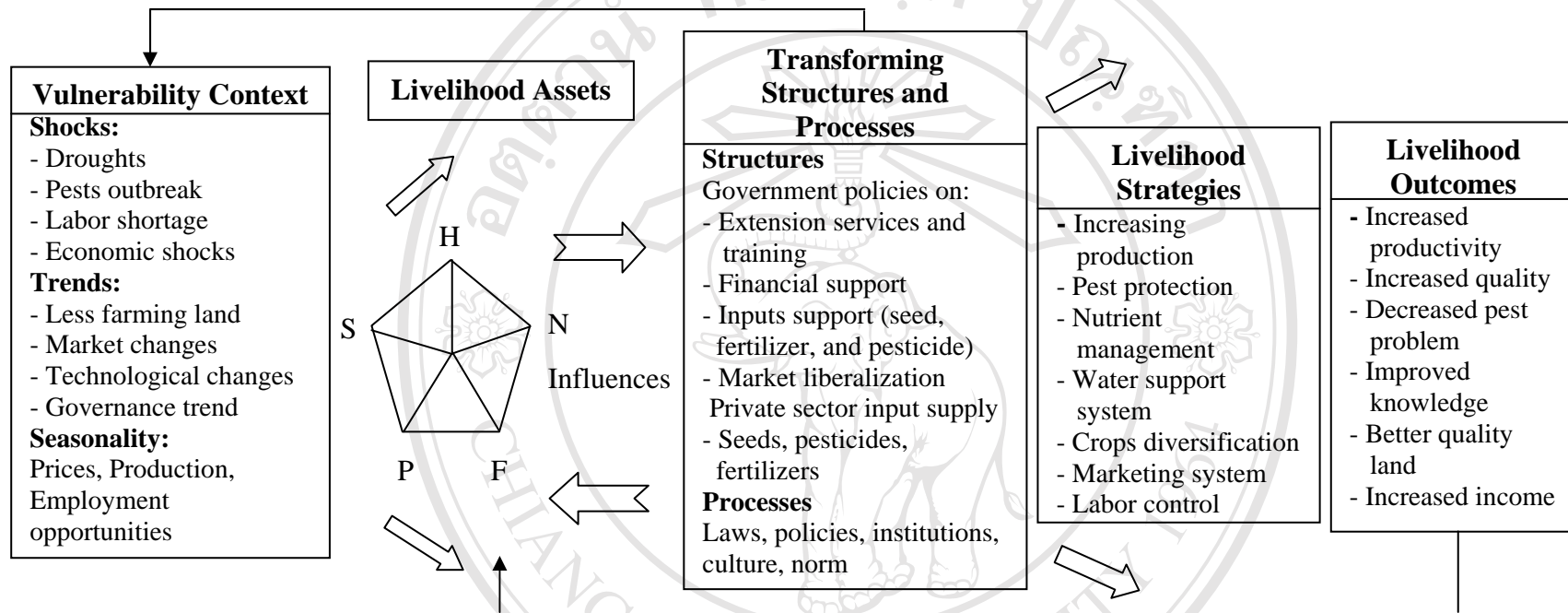
2.2.4 Livelihood strategies

The aim of livelihood strategies is to achieve livelihood outcomes. Livelihood strategies are the range and combination of activities and choices that people create or undertake in order to achieve their livelihood goals (including productive

activities, investment strategies, reproductive choices, etc.) (DFID, 1999). Decisions on livelihood strategies may invoke activities of natural-resource based, non-natural resource based and off-farm activities, migration and remittances, pensions and grants, intensification versus diversification, and short-term versus long-term outcomes, some of which may compete (Serrat, 2008).

Livelihood strategies can change according to the external environment over which people have little control changes. Occasionally unsustainable and unproductive livelihood strategies continue because of tradition and habit (Pérez and Cahn, 2000) at other times livelihood activities are introduced as coping strategies in difficult times. Three types of rural livelihood strategies are identified by Scoones (1998) such as agricultural intensification or extensification, livelihood diversification including both paid employment and rural enterprises, and migration (including income generation and remittances). Carney (1998) described that these categories of livelihood strategies as natural resource based, non natural resource based and migration.

Within the sustainable livelihoods framework, three broad clusters of livelihood strategies are seen to cover the range of options open to rural people, for example, either receiving more livelihood from agriculture (including livestock rearing, aquaculture, forestry etc.) through processes of intensification (more output per unit area through capital investment or increases in labour inputs) or extensification (more land under cultivation), or diversifying a range of off-farm income earning activities, or moving away and seeking a livelihood, either temporarily or permanently, elsewhere, or, more commonly, pursuing a combination of strategies together or in sequence (Scoones, 1998).

Vulnerability Context

Shocks:
- Droughts
- Pests outbreak
- Labor shortage
- Economic shocks

Trends:
- Less farming land
- Market changes
- Technological changes
- Governance trend

Seasonality:
Prices, Production, Employment opportunities

Livelihood Assets

H
S
N
P
F
Influences

Transforming Structures and Processes

Structures
Government policies on:
- Extension services and training
- Financial support
- Inputs support (seed, fertilizer, and pesticide)
- Market liberalization
  Private sector input supply
- Seeds, pesticides, fertilizers

Processes
Laws, policies, institutions, culture, norm

Livelihood Strategies

- Increasing production
- Pest protection
- Nutrient management
- Water support system
- Crops diversification
- Marketing system
- Labor control

Livelihood Outcomes

- Increased productivity
- Increased quality
- Decreased pest problem
- Improved knowledge
- Better quality land
- Increased income

Key assets

H = Human Capital – Household size, age, labor, education, experience, knowledge and skills.

N = Natural Capital – Total land holdings, total irrigated areas, water availability, fertile soil.

P = Physical Capital – Inputs (seed, fertilizers, pesticides), transport, local market, farm equipments, irrigation system, livestock, communication and information flows.

S = Social Capital – Community support, participation in organizations.

F = Financial Capital – Income (farm, off-farm), savings, credit.

Figure 2.1 Sustainable Livelihoods Framework (DFID, 1999)

2.2.5 Livelihood outcomes

The achievements or outputs of livelihood strategies are livelihood outcomes. In the generic framework, livelihood outcomes appear effective categories that introduced to make this section of the framework manageable. Each one may or may not be relevant in any given situation - this can only be established through participatory enquiry (DFID, 1999).

The typical livelihood outcomes can include more income, increased well-being, reduced vulnerability, improved food security, more sustainable use of the natural resource base, and recovered human dignity, between which there may again also be conflict (Serrat, 2008).

2.3 Use of multiple regression analysis in relationship between dependent variable and independent variables

Multiple regression is a flexible method of data analysis that may be suitable whenever a quantitative variable (the dependent or criterion variable) is to be examined in relationship to any other factors (expressed as independent or predictor variables). Relationships may be non-linear, independent variables may be quantitative or qualitative, and one can observe the effects of a single variable or multiple variables with or without the effects of other variables taken into account (Cohen *et al*., 2003).

Hair *et al*. (2006) also describes that multiple regression analysis is the appropriate statistical technique used to analyze the relationship between a single dependent variable and two or more independent variables. The purpose of multiple
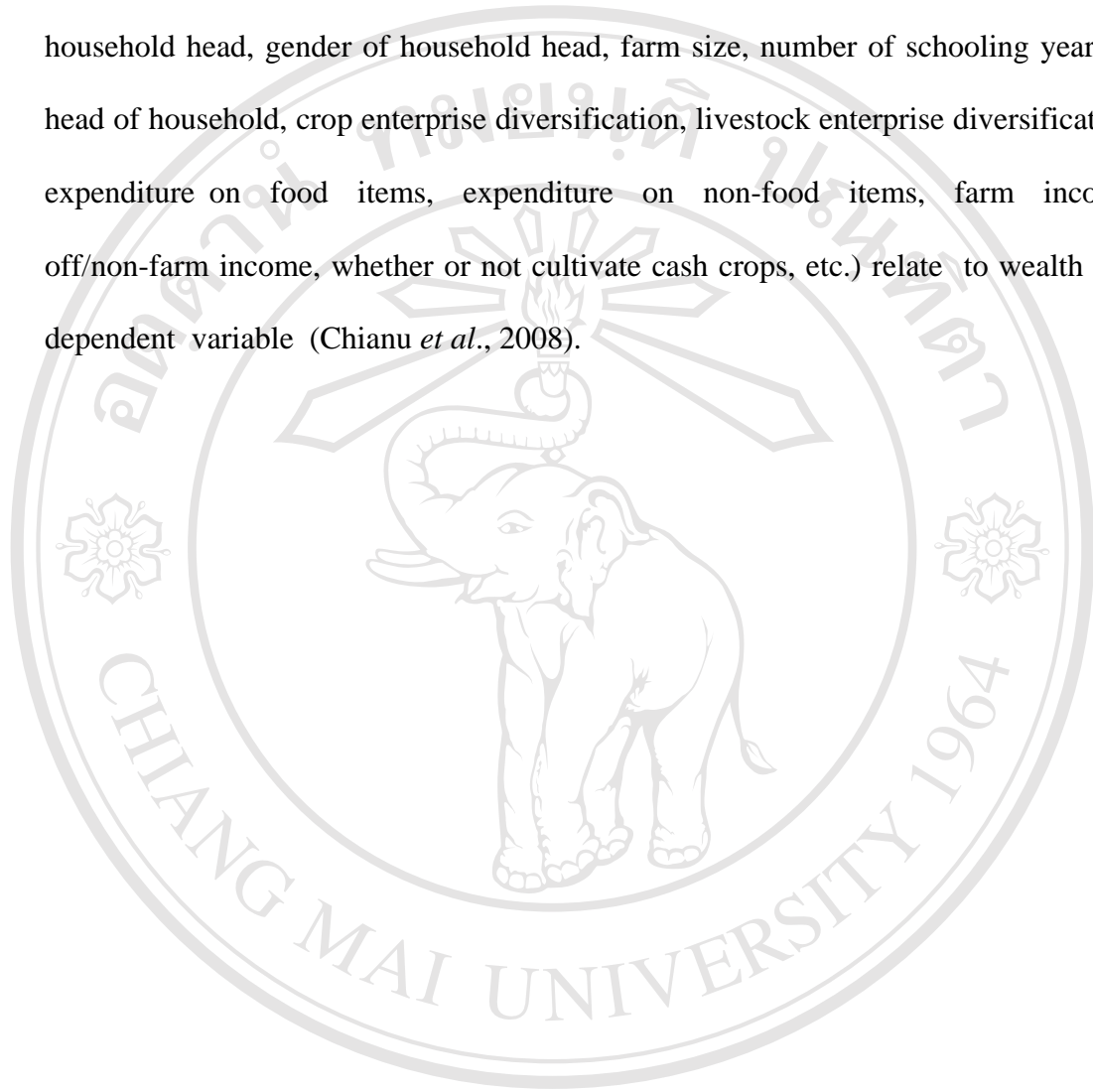
regression analysis is the prediction of the changes in the dependent variable in response to changes in the independent variables.

Several variations of multivariate regression analysis were applied to study the interrelationships of livelihood capital and livelihood outcomes. Soini (2006) used multiple regression analysis to determine the effects of livelihood assets and livelihood outcome denoted by farm revenue in the Kilimanjaro study. In analysis of the effects of production variables on cotton yields, linear regression models were used to investigate the impact of organic cotton farming on the livelihoods of smallholders (Eyhorn *et al*., 2005).

Adesoji and Farinde (2006) also used multiple regression analysis to determine the influences of socio-economic factors as independent variables on yield of arable crop as dependent variable in Osun State, Nigeria. To identify the determinants of income and crop diversification, multiple regression analysis was used among farming households in a rural area of North Central Nigeria (Ibrahim *et al*., 2009).

Income from cotton production was also examined by using multiple regression analysis in Adamawa State, Nigeria. Explanatory variables used in the model were cost of production such as cost of land rent, cost of ploughing, cost of seeds, cost of planting, cost of pesticides, cost of fertilizer, cost of transportation and cost of fertilizer application (Sabo *et al*., 2009). Multiple regression analysis was applied to determine the relationship between cotton income variance and human capital (age, sex, education, household size and knowledge score), physical capital (size of arable land) and financial capital (cattle and credit) (Mutandwa and Mpangwa, 2004).

A multiple linear regression model was fitted to see whether and how a vector of independent variables such as socio-economic and demographic (age of household head, gender of household head, farm size, number of schooling years of head of household, crop enterprise diversification, livestock enterprise diversification, expenditure on food items, expenditure on non-food items, farm income, off/non-farm income, whether or not cultivate cash crops, etc.) relate to wealth as a dependent variable (Chianu *et al.*, 2008).