1 Introduction

1.1 Background

Most developing countries continue to rely on their agricultural sectors for economic growth, poverty alleviation, food security, and environmental sustainability. In Indonesia, agriculture contributed 15.6 percent to the Gross Domestic Product (GDP) in 2001 (BPS, 2005). Although its contribution to economic development has a tendency to decline, agriculture remains important to the majority of the Indonesian population, particularly to those who live in rural areas. More than 50 percent of the households in Indonesia depend on agriculture activities as their main source of income. However, more than half (56.5 percent) of these farm households are categorized as smallholders with landholdings of less than 0.5 ha.

A lot of importance has been placed on the role of agricultural innovations in improving the welfare situation of the smallholders. Technology adoption significantly influences agricultural productivity and, in turn, household income. In addition to its importance in income generation, the adoption of new technology is important as an alternative to extensive agricultural practices. The extensive agricultural practices through forest encroachment still occur in some regions such as in Central Sulawesi Province and this contributes to environmental degradation.

However, to undertake productive investments in agricultural technology, smallholders require sufficient access to financial capital.

1.2 Problem Statement

In Central Sulawesi, there is a tendency to engage in forest encroachment, either by smallholders and other farmers who live in forest margin areas or by external investors who seek to exploit the forest margin for timber and tree crop plantations. The socio-economic households' survey by STORMA 2000/2001 found that 24 percent of the households in three districts cleared primary forest as one of several ways to gain access to arable land (van Rheenen et.al, 2004). Indigenous people living near protected forests gain access to land by clearing the forest, believing that the forest is ancestral land which belongs to them and, therefore, can be utilized by the community.

The problem arises because of the overlapping status of the forest. Forest can be regarded as state property; at the same time, however, the community considers forest to be communal property or, even more, as an open access resource. Therefore, the ownership of land cleared from forest is in general insecure.

Ownership insecurity can affect loss of future income due to conflicting challenges (Deininger and Feder 1998). Therefore, ownership security clearly increases the subjective payoff from productivity-enhancing long-term investments that are fixed to the land such as tree crops, terracing, and irrigation infrastructure. Apart from investment incentives, another important issue related to the security of land ownership is the access to formal credit as banks usually require land to be pledged as collateral.

To reduce the pressure of environmental degradation due to encroachment, there must be an alternative strategy for farming that does not replace forestland with cultivated areas. The adoption of a new technology such as intensifying agricultural practices can reduce the pressure of environmental degradation and simultaneously increase productivity.

Credit markets in rural areas play a crucial role in financing intensive agricultural activities. The supply of credit, especially from formal institutions, frequently depends on

the provision of collateral. For this purpose, land possesses several attributes which make it a desirable form of collateral (Feder and Onchan 1987). However, whether or not land can be used as collateral depends on the ability of borrowers to pledge titled land.

Besides providing collateral, the problems still arise, as many studies have shown, because of not all the rural societies have the opportunity to obtain financing, either from formal or informal credit institutions. In fact, one of the main reasons why farmers do not intensively apply advanced technology is the lack of capital. Smallholders may be perpetually trapped in poverty due to the lack of finances needed to undertake productive investments (Von Pischke, Adams, and Donald, 1983).

1.3 Objectives of the Study

This study is intended to contribute to an improved understanding of the interlinkages between access to land and credit and the investment and production behaviour of the farmers. By studying the situation in the vicinity of the Lore Lindu National Park, the overall objective is to study the impact of the household's access to land and the credit markets on the adoption of agricultural technology and land use decisions.

The main research questions are:

1. How do households acquire land for agricultural activities?
2. What factors contribute to the process of land possession among villagers?
3. How do rural financial markets perform?
4. What factors influence the households' access to and participation in informal credit markets?
5. What factors contribute to households being credit constrained in formal credit markets?
6. How does access to land and to formal credit influence agricultural technology adoption, and how does the adoption of technology affect the productivity in smallholder agriculture?
7. How does credit rationing influence the households' decision to allocate land to cocoa and coffee in the uplands?

The main research tasks are:

1. To describe and classify the types of acquisition and exchange of farmland

Above all, this research will explore in detail different systems of acquisition and the exchange of farmland and forest and their impact on the equity of land distribution among different socio-economic groups (local people, migrants, urban dwellers investing in cash-crop farming).

2. To describe and analyse the performance of rural financial services and the behaviour of borrowers.
3. To analyse the determinants of the households' access to land, particularly the accumulation of land over time.
4. To analyse the determinants of the households' access to and participation in informal and formal credit markets.
5. To analyse the determinants of the households' credit-constraints in formal credit markets
6. To analyse the effect of the households' access to land and formal credit on the adoption of technology, including aspects of land use that particularly affect the protected forest frontier of the Lore Lindu National Park.

1.4 Organisation of the Study

This study is organized in eight chapters. Chapter 1 provides an introduction and background to the important issues investigated, followed by the objectives and research questions.

After the introduction in Chapter 1, Chapters 2 presents the basic theoretical framework and concepts of property rights in the land market, characteristics of the rural credit market, credit rationing, and imperfect information. This chapter also presents recent studies focusing on the impact of access to financial markets on different production and welfare outcomes. Based on these concepts and empirical evidence, the chapter proposes a conceptual framework for guiding the empirical analysis in this dissertation.

Chapter 3 focuses on the detailed methodology used for the analysis. The chapter presents a sampling frame for the selection of survey households and the process of data entry and cleaning to obtain reliable data for the analysis. This is followed by a presentation of the different tools of descriptive data analysis which is followed by a

discussion of methodological issues concerning the econometric models. The chapter gives an explanation of the mechanisms used to determine whether a household is credit constrained. The chapter ends with the focus on the different econometric models as tools for undertaking causal analysis such as Tobit, Probit, selection bias, and the switching regression model.

An overview of the Central Sulawesi Province and the study area is the main focus of Chapter 4. Socio-economic dimensions and land use characteristics are briefly reviewed in the chapter. This is followed by an exploration of the present development process, particularly in the agricultural sector, and its contributions to economic growth.

Chapter 5 presents detailed analyses of the modes of the households' acquisition of land. Land tenure systems as well as land use are discussed. A better understanding of land distribution is gained by the analysis of the Lorenz curve to graphically show the land distributions and calculate the Gini Index. This section specifically seeks to explore the determinants of the different pathways through which households acquire their land holdings by estimation using a Tobit model.

Chapter 6 provides general information about rural financial markets in the research area which are characterized as dual markets: formal and informal credit markets. In the case formal credit markets, the focus is on the performance of three local branches of the village banking (Unit Desa) system of BRI, the major rural public bank in Indonesia. The descriptive analyses following this section explore in detail the different activities related to the outreach, i.e, the distribution of loans by different indicators of formal and informal credit markets. The analyses of the households' access to and participation in both markets are given and differentiated by socio-economic characteristics. This chapter concludes with a discussion of the results from the econometric analyses of the determinants of households' access to and participation in informal credit markets.

Chapter 7 concentrates on the analyses of the impact of the households' access to credit on the adoption of agricultural technologies by using a recursive model. Descriptive analyses of different types of technology applied and factors influencing the adoption of technology are provided in order to present an overview of the agricultural practices, particularly respecting irrigated land where rice is the main crop. This is followed by the

analyses of the determinants of the households' access to formal credit and the amount of money borrowed as a part of the recursive model. One of the central objectives of this study is to combine a theoretical analysis of credit rationing with the empirical analyses. In section 7.6, the analyses of the determinants of credit constraint and its impact on land use decisions are presented, particularly on the area of upland devoted to cocoa and coffee as a proxy for the pressure on the protected area of the Lore Lindu National Park. For this analysis of the impact of credit constraints on forest encroachment and tree crop investment, a switching regression model is used.

Chapter 8 summarizes the findings of the study and presents their policy implications.

2 LITERATURE REVIEW AND THEORITICAL FRAMEWORK

This chapter develops several theoretical frameworks based on different theoretical concepts that offer different building blocks which are useful for analysing the relationship between land and credit markets. The first topic concerns the relationship between property rights and access to land. The second topic is related to the different taxonomies of credit constraints and access to credit and their impacts on different things such as the adoption of technology and land use decisions.

2.1 Property Rights in Land Markets

In agrarian societies, land is an essential factor for production along with labour, capital, and other agricultural inputs. However, land cannot be treated the same way as other inputs of production due to its peculiarities. The embedded characteristic of land is that the quantity or supply of land is fixed. Land cannot be produced, and the amount of land available can also not be increased, decreased, or destroyed. The implication of these characteristics of land is that supply is perfectly inelastic (vertical) and completely unresponsive to the demand.

This situation leads individuals to hold a certain amount of land. As (Deininger and Binswanger 2001) assert, there are some advantages of access to land through individual ownership:

1. Land is an effective tool to accumulate wealth and to transfer wealth to the next generation.
2. Land ownership serves as collateral for access to credit.
3. Land ownership is a source of self-insurance and old-age social security: land can be sold, rented out, or pawned for smoothing consumption in response to shock and life cycle stages.
4. Land ownership is a source of security in the case of continued access to the same plot of land, offering the possibility of capitalizing on long-term investments and a source of local social capital.
5. Land ownership is a source of social status and bargaining power.

However, as some cases show, individual land ownership is often completely without tenure security, due to the process of land acquisition. Place, Roth, and Hazell (1994:19) define land tenure security as existing when an individual perceives that he or she has the right to a piece of land on a continuous basis, free from interference from outside sources. Bromley (1992) defines property rights as the rights to have access to or control over a resource from which some form of benefit stream is expected. (Pejovich 1990) emphasized further that the right of ownership consists of four elements : (1) the right to use an asset (usus); (2) the right to capture benefits from assets (usus fructus); (3) the right to change its form and substance (abusus); and (4) the right to transfer all or some of the rights specified under points (1), (2), and (3).

In principal, there are four basic ideal analytical types of land property rights according to (Feder and Feeny 1993): a) none (open access), b) communal property, c) private property, and d) state property. These rights include right to use and to exclude use, right to the outputs from the land and the right to transfer the land or its outputs to other users. Under open access, rights are left unassigned and, therefore, imply a lack of incentives to conserve and may lead to degradation of resources. Under communal property, exclusive rights are assigned to a group of individuals. Under state property, the management of the

land is under the authority of the public sector. With private property, an individual is assigned the rights.

The institution of property rights, particularly in the case of private property, can be divided into two types: informal (customary tenure based on orally assigned rights) and formal institution (based on land records and land titles). In Central Sulawesi, particularly in the rural areas, the institutions of property rights are commonly an informal institution. One of the reasons behind this is that the landholdings belonging to the households were acquired by encroachments upon the forest or more frequently, were incidences of land transfers through inheritance of what was formerly also encroached land. Insecurity of land property rights associated with the lack of well-defined property rights can be understood as a random probability of loss of future income due to conflicting challenges (Deininger and Feder 1998). Eliminating such a threat through formal institutions (land titles) clearly increases the subjective payoff from productivity-enhancing long-term investments by prohibiting land loss in the future.

Furthermore, if land ownership is followed by secure property rights, this could lead to at least three embedded effects according to (Braselle, et al. 2002). First is the assurance effect which means that farmers have greater incentive to undertake investments if they feel more secure about their right to maintain long-term use of their right. Second is the reliability effect which shows that when land can be more easily converted into liquid assets through sale, it is easier to make improvements through investments. Last is the collateralisation effect which means that farmers are in a better position to invest because land acquires collateral values and access to credit is easier when freehold titles are established.

Place, Roth, and Hazell (1994) describe the consequences of land tenure security on different factors as depicted in Figure 2.1.

Increasing tenure security affects the demand and supply sides simultaneously. The demand side represents incentives influencing the farmers through two channels: (1) with higher tenure security, farmers are more likely to capture the investment return; and (2) increased tenure security is expected to reduce potential conflicts. Therefore, there is an incentive for farmers to demand more inputs for enhancing their agricultural activities.