

Land Policies and Farm Productivity in Thailand

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Preface

This study originated in response to an operational problem faced by World Bank economists in 1983 in connection with an appraisal of a land titling project in Thailand. As is true of most Bank projects, the possibility of conducting a quantitative cost-benefit analysis was considered. Although the project costs were readily available, the quantitative assessment of expected benefits was less straightforward. A review of the literature available at the time revealed that, although the benefits of secure ownership had been discussed conceptually by many scholars, a rigorous quantification had not been attempted. There were therefore no reliable parameters to refer to in addressing the problem at hand.

Many of our colleagues at the Bank recognized the value of clarifying and quantifying the economic effects of secure ownership. It was apparent, however, that no secondary data sources existed which could be used for that purpose. Primary data would thus need to be collected at considerable cost. A request for research funds was approved by the Bank early in 1984. Thai officials were also interested in the study, and clearance was obtained without any difficulty. The main fieldwork took place during the latter part of 1984 and early in 1985, followed by an analytical phase in Thailand and in Washington.

The research underlying this report and the preparation of the report benefited from the contributions and assistance provided by many persons to whom we owe a debt of gratitude.

Fieldwork was carefully organized and supervised by Jeerakiat Apibunyopas of Kasetsart University and Veera Pak-Uthai of Khon-Kaen University. Dedicated research assistance was provided in Thailand by Prapol Patamakitsakun, Anongsiri Chaprapan, and Piangpen Pak-Uthai of the Center for Applied Economics Research at Kasetsart University, and Paitoon Sucharitchan and Viroj Na Ranong at the Human Resources Institute of Thammasat University. Boonsri Prasertwaree assisted in the translation of Thai documents.

In Washington, Apparao Katikineni of the World Bank handled efficiently and expertly the computer-related analytical work throughout the study. Tejaswi Raparla contributed to the analysis of the credit market.

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In legislation, the most important thing is security. If no direct laws are made respecting subsistence, this object will be neglected by no one. But if there are no laws regarding security, it will be useless to have made laws respecting subsistence—command cultivation, you will have done nothing; but secure to the cultivator the fruits of his labor, and you most probably have done enough.

Jeremy Bentham (1748–1832)

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1

Introduction

The evolution of individual land rights and mechanisms to enforce such rights in the rural setting is closely related to increases in population density and to advances in agricultural technology. As land becomes scarce, societies that may have practiced shifting cultivation or long fallow periods to maintain the fertility of their land must adopt fertility-restoring technologies that make possible continuous exploitation of the land. Because such technologies require investment of both capital and effort, the cultivator must have an investment incentive. For the cultivator, this incentive is enhanced when the right to cultivate continuously and the ability to transfer a given tract of land by will or by sale are secured not only by social custom but also by an effective state-enforced legal system. Thus, population growth and agricultural progress are typically accompanied by mechanisms to enforce land rights. An almost universal mechanism is a unified system of land registration and documentation whereby the state provides the landowner with proof that a given well-defined tract of land does indeed belong to him. If the registration system is effective, and if the state can protect the owner from encroachment or false challenges to his ownership, such a mechanism does indeed enhance security.

With agricultural development there is an almost universal emergence of rural credit markets, both formal and informal. Credit transactions often require explicit or implicit collateral. Land is an attractive collateral asset provided that the farmer can assure the lender that he has the ability to transfer the land. Again, a unified land-registration system is a mechanism that would provide the lender with such an assurance.

It follows that the institution of land registration and titling can have significant economic consequences in the agricultural sector. Although this proposition is generally recognized by economists and development officials, a paucity of rigorous quantitative research on the topic hampers the design and evaluation of policies. Alternative policies and investments are better assessed when some knowledge of the magnitude of their effects is available to policymakers.

This issue is acute in a country such as Thailand, where the cultivated area has rapidly expanded during the past three decades. Much of this expansion took place through the clearing of forest areas and without

proper documentation or formalization of farmers' land rights. Today perhaps a million farm households are operating on a fifth of the designated forest reserve areas owned by the state.

There is a need to know the extent to which the lack of legal ownership security affects the performance of farmers, for if the effect is significant, it merits the attention of policymakers. Further, to design efficient policies warrants information on the exact nature of the constraints imposed by lack of ownership security. Do usufruct certificates or legal long-term leases for squatters on public lands, for example, significantly improve their performance? Do titling programs or other programs that address ownership security need complementary policies in other areas, such as the rural credit system? Are there differences in the potential effects in different geographical areas? Should such differences dictate an ordering in the allocation of public funds for enhancing ownership security? The available literature does not provide relevant information for Thai policymakers. In fact, most developing countries have little quantitative information to provide a reliable basis for comparative assessment of the dimensions and implications of insecurity of ownership.

In this study data from Thailand have been used for a rigorous analysis of several aspects of landownership security. The present Thai system of land rights simplified the study considerably, allowing for an essentially cross-sectional comparison of farmers with varying degrees of ownership security. The study provides both qualitative and quantitative information on the effects of ownership security. While the quantitative results are specific to Thailand, they provide some frame of reference for effects that can be anticipated elsewhere. In addition, the methodology of the study is replicable, and it is hoped that similar studies conducted in other countries will help to broaden the knowledge on this important issue.

The study is organized as follows: the next chapter presents a conceptual model and a review of the literature. It will be followed by separate discussions of the evolution of land rights in Thailand, the methodology of the study and the nature of the data, and the credit market. A formal model of land acquisition and ownership security that follows underlies the empirical discussions to be presented in subsequent chapters on land values, capital formation and land improvements, and the use of inputs and farm productivity. The effects of usufruct certificates will then be assessed, to be followed by an analysis of the benefits and costs of land titling. Policy implications and conclusions will be presented in the last chapter.

Unless a specific source is cited for the tables and figures presented here, all data are from the survey of farmers undertaken by the authors in four provinces in Thailand.

2

A Conceptual Framework and Review of the Literature

The most obvious effect of insecurity of landownership is increased uncertainty whether the farmer will be able to benefit from the investments that he makes—in equipment, structures, irrigation infrastructure, or land conservation measures—to retain or improve the productive capacity of his farm. Investment would be expected to be related negatively to uncertainty of tenure: with increased uncertainty, investment incentives are reduced and current consumption is preferred. With lower capital accumulation, the demand for variable inputs complementary to capital is reduced. If acquisition of machinery allows fast preparation of land, for instance, then a greater area can be double-cropped and the demand for variable inputs such as labor and fertilizers will increase.

In the early stages of agricultural development, *de facto* ownership may not imply substantial uncertainty about a farmer's continued use of the land. Uncertainty tends to increase, however, as commercialization increases and as new technology increases the income-producing potential of the land. There is ample evidence that the incidence of land disputes and land grabbing—and consequently insecurity of tenure—increases as the potential return on land increases (Feeny 1982, 95; Tomosugi 1980; Tanabe 1978; Clark 1969; Baron 1978, 27; Kemp 1981, 15). Development also increases land transactions—sales and rentals—as considerations of efficiency motivate adjustment in the land input to make it compatible with other endowments, such as farming skills. But as the frequency of transactions between individuals who are not closely related increases, uncertainty over the entitlement of an owner to transfer land rights becomes a relevant factor. Individuals are therefore induced to spend resources on reducing uncertainty, and this, in turn, affects the scope and the price of land transactions. One way to reduce or eliminate ownership uncertainty is to provide landowners with titles backed by a legal system capable of enforcing those property rights.

Many have highlighted the function of a secure legal title in facilitating a farmer's access to cheaper, longer-term, and more extensive institutional

credit. Since lack of clear legal title prevents the mortgaging of land, a secure title may indeed provide easier access to credit, especially credit from lenders who do not have personal or detailed information on the borrower. As Binswanger and Rosenzweig (1986) noted, land has several attributes that make it a desirable collateral asset. A land title is often a mandatory precondition for commercial or official bank loans (Wai 1957; Dorner and Saliba 1981, 23; Sacay 1973; Aku 1986, 24; Collier 1983, 163). On the basis of a farm survey in three Thai provinces, Meyer and Chalamwong (1983) reported that farmers complained of collateral requirements for obtaining credit. Farmers without clear titles or with small farms were significantly affected.

In the informal credit market, collateral is less significant. The lenders usually base their decisions on personal familiarity with the borrower, and they can enforce repayment through social pressures and other means which are not available to formal lenders. Thus, farmers without secure ownership face fewer disadvantages in the informal credit market than in the formal market. Informal credit is typically much more expensive than formal credit, however, and is confined for the most part to relatively small short-term loans.

From the lender's point of view, farmers without secure legal titles are, other things being equal, riskier clients; interest rates for these clients therefore reflect a higher risk premium. Indeed, in some areas of India, lenders charged 8 to 16 percent on secured loans as against 18 to 37.5 percent on unsecured loans (Panandikar 1956, 75). As explained by Stiglitz and Weiss (1981), however, interest rates cannot be allowed to rise to equate supply and demand because of asymmetric information and adverse selection. Thus credit rationing is optimal.

Farmers without secure landownership therefore face constraints in gaining access to low-cost, long-term and short-term credit. Compared to situations where there is a larger supply of relatively inexpensive credit, constrained or more expensive credit tends to yield low ratios of factors to land (David and Meyer 1980; Rosegrant and Herdt 1981). Since both variable inputs and capital are less among farmers without secure ownership, their output is expected to be lower than if they did have secure ownership.

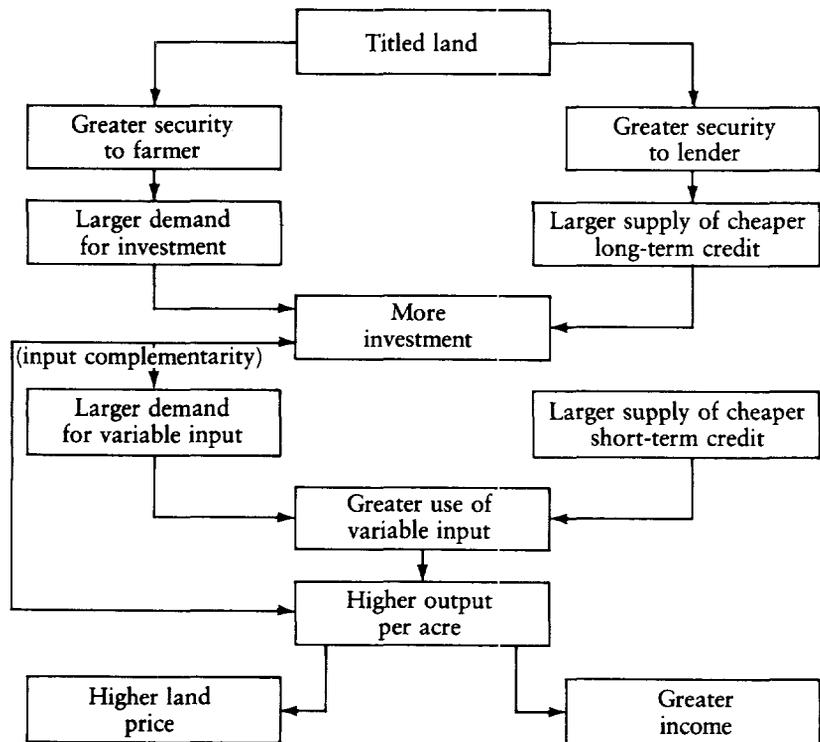
Losses in efficiency from constrained credit are also likely when the optimal mix of farm activities is affected. In general, credit constraints on working capital may yield a shift to crops and activities that require smaller outlays of cash. Constraints on long-term credit may bar a farmer from purchasing farm machinery, for example, and cause a shift to less capital-intensive crops. Similarly, lack of mechanized power may also diminish a farmer's potential for double-cropping in areas where speedy land preparation between seasons is essential.

From the foregoing discussion it is hypothesized that insecurity of own-

ership causes lower farm productivity because investment incentives are reduced and access to credit is limited (Dorner and Saliba 1981). Some commentators regard insecurity of ownership an important source of low productivity in agriculture (Mosher 1966). This conclusion implies further that the market value of land that is not securely owned—untitled land, for example—will be less than that of an identical tract of land that is securely owned. This implication follows from the fact that the value of land reflects the stream of net incomes that it generates over a long period. Since land that is securely owned has greater productivity and is a less risky asset, it has a higher market value.

The causal chain outlined in the discussion above is illustrated in figure 1 and will be rigorously developed in chapter 6. Empirical evidence to substantiate this conceptual framework was scarce at the time this study was initiated.

**Figure 1. Security of Landownership and Farm Productivity:
A Conceptual Framework**



Quantitative evidence on the link between secure legal ownership and the use of credit is limited. A study in Costa Rica by Seligson (1982) showed that before the titling program began, 18 percent of the farmers sampled had obtained credit. After the program, 31.7 percent had obtained credit. The availability of credit improved mainly for owners of large farms; the average size farm of those who obtained credit after titling was 19 hectares and 7.3 hectares of those who did not. These findings reflect not only changes in supply but also shifts in demand. Similarly, recent data on a titling program in Jamaica (IDB 1986) indicate that almost half the recipients of titles increased their borrowing over its preproject level.

In a study of land transactions in the Central Plain of Thailand, Stifel (1976) observed widespread use of title certificates as security for non-institutional loans. These loans thus involve land collateral that is neither registered in the land office nor recognized by law. The “unregistered mortgages” are prevalent for small or short-term loans. In these transactions, creditors have no legal rights to the land. Since the creditors physically possess the title deed, however, they can prevent farmers from legally transferring ownership to other parties. This practice also restricts a farmer’s access to additional credit from other lenders and therefore provides the lender with some protection against the possibility of the borrower’s incurring excessive debt. As an indication of how widespread this practice is, Stifel (1976) found in one village in the highly developed Central Plain that the number of these unregistered mortgages was three times as great as the number of registered mortgages.

The effects of secured ownership on both the availability of credit and investment incentives imply that farmers without secure ownership will have fewer investments and land improvements, lesser use of variable inputs, and lower productivity per unit of land. Empirical evidence to confirm these propositions is scant. In a study of the economic implications of land titling in Costa Rica (Salas and others 1970) positive correlations—in the range of 0.40 to 0.67—between the degree of ownership security and farm investment per unit of land were found. Similarly, data from three Brazilian states in 1978 reviewed by Villamizar (1984) revealed that capital per hectare is substantially greater on titled land than on undocumented or encroached land. The analysis was made for groups of farms of various sizes, and within most groups the proposition held.

Several studies have been focused on the effect of ownership security on output or income. In the earliest study, conducted in Costa Rica (Salas and others 1970), a positive correlation of 0.53 between income per unit of land and security of ownership was found in one province. In another province, however, the correlation was negative, although quite weak (−0.07). From a study of the Brazilian state of Maranhão (cited in IDB

1986, 186–89) it was concluded that granting full legal ownership to squatters and undocumented occupiers would increase their income 200 percent. In the same report recent data from Ecuador are quoted to indicate that income levels of titled farmers were twice those of untitled farmers, when the amount of land owned was held constant (IDB 1986, 187).

As mentioned earlier, constrained credit may produce losses in efficiency when the optimal mix of farm activities is affected. In Costa Rica, for example, it has been reported that it is easier to obtain credit using cattle as collateral than it is using land to which the farmer does not possess a full formal title. In this example, as a consequence of the credit constraints, farmers without title tended to shift from crop production to raising cattle although the land may have been better suited to growing rice and beans (Dorner and Saliba 1981, 23).

Recent survey results from Jamaica indicate that the incidence of permanent and semipermanent crops was substantially higher among titled farmers than among untitled farmers—almost twice as high. Indeed, a third of the recipients of titles under a government program reported that following the change in their status they planted more permanent and semipermanent crops than they did before the initiation of the project (IDB 1986, 189).

There are no studies in which the effects of security of ownership on agricultural land values are addressed. A recent study of the economic value of ownership security in the setting of urban housing (Jimenez 1984), however, offers a plausible approach that could be replicated in a rural setting. A hedonic price equation was estimated for the value—that is, the sale price—of housing units on fully titled lots as a function of various attributes of the dwellings: quality of structure, access to services, average neighborhood income, and so on. The parameters were then used to predict the value of dwellings with given sets of attributes that are located in urban squatter settlements. On an average, the imputed value is higher than the actual value observed in the squatter settlements, with the implication that the difference represents the market's valuation of tenure security.

Although most of the evidence cited here is compatible with the theoretical discussion, the studies pertaining to the effects of insecurity of landownership in the rural sector are not rigorous in their analytical approach. The influence of various intervening variables that can be correlated with security of ownership is not controlled for, and thus, while the statistical associations are compatible with the theory, they cannot be taken to imply causality. In the present study, both a quasi-experimental design for sample data and appropriate econometric approaches are employed to estimate the effect of security of ownership on economic performance.

3

Land Rights and Land Use in Thailand

In Thailand, as in many other developing countries, land use does not necessarily imply legally recognized land rights. The development, or evolution, of a legal system to define, award, and protect a farmer's rights in a given tract of land is spawned by numerous socioeconomic factors. As indicated in the foregoing chapters, population pressure, intensified land use, and agricultural development are some of the factors that contribute to the need for, and development of, a system of legal tenure. In this chapter we shall narrow our focus on security of ownership by providing a cursory overview of land use and land rights within the Thai setting.

Land Rights

Traditionally, all land in Thailand belonged to the king. Because land was readily available and agricultural activity was primarily for subsistence, however, any Thai citizen could claim land in order to provide for his family. Widespread clearing of forests, settlement, and cultivation were permitted with few restrictions and little government control until fairly recent times. Rights to use land were by custom rather than formally recorded. Authorities instituted registration of ownership for tax collection purposes, but not for the purpose of enforcing individual land rights.

Until the first half of the nineteenth century land was abundant, while labor was scarce (Feeny 1982). The Thai economy was characterized by a high ratio of land to man. Control of manpower formed the basis of economic, political, and social power through various patron-client relationships. Different classes of citizens were obliged by several levels of *corvée* to their patrons, and slavery was common. Public government projects required massive numbers of hired Chinese laborers, since local labor was not sufficient. During this period slaves—not land—served as collateral for loans.

The second half of the nineteenth century witnessed a transition from property rights in man to property rights in land. The process began with the opening of the country to international trade and the increased com-

mercialization of rice production. Title documents for rice land were awarded in the main rice-producing areas during the 1860s and continued into the 1880s. This system was unsatisfactory, however, since the record keeping was not centralized. Multiple claims and land disputes became ever more frequent, as cultivation expanded and land values increased (Tomosugi 1980). The 1892 Land Law significantly improved security of title, but it did not establish a centralized land registration record or a system for clearly identifying land holdings. In 1901 the government adopted the Torrens system of land titles, modeled after the Australian system, which provided for cadastral surveys and central land record offices. Titling efforts were concentrated in the Central Plain. With the introduction of this system, the use of land as collateral for loans increased significantly (Feeny 1982, 96). The land legislation prevailed with few modifications until 1954, when a comprehensive land code was passed.

The Land Code of 1954

The Land Code of 1954 is the basis for the legal system of land rights in Thailand today. The code defines the powers and duties of the minister of the interior and the Department of Lands (DOL) for the allocation and acquisition of state land. All the land registration documents for land which is not government property are issued by the DOL. The DOL, acting under the Land Code, can adjudicate land rights only for lands that are not designated officially as forest reserves, national parks, and so on.

The land documents, referred to by their Thai acronym, correspond to the phases of acquisition, use, and legal possession of land (see table 1). It is possible to distinguish between secure and unsecure documents of ownership security and land rights. Although the title document, NS-4, is the securest document, there are two other documents, NS-3 and NS-3K, that accord legal recognition and protection of a farmer's ownership rights over a given tract of land (see the appendix to this chapter). Full ownership rights enable the farmer to transact with the land freely and legally.

NS-4. Legal possession is documented in a full, unrestricted title deed called NS-4 (*Chanod*). This document enables the owner to sell, transfer, and legally mortgage the land. It is issued on the basis of an accurate ground survey, with clear identification of the property by stone boundary marks, and is registered in the provincial land register.

NS-3 and NS-3K. The secure documents related to the phase of use are NS-3 (*Nor-Sor-Sarm*) and NS-3K (*Nor-Sor-Sarm-Kor*)—"Certificate of Use" or "Exploitation Testimonial." These documents certify that the

Table 1. Land Documents Issued by Various Departments of the Thai Government

<i>Document</i>	<i>Class</i>	<i>Thai name</i>	<i>Date introduced</i>	<i>Legal status</i>	<i>Survey method</i>	<i>Transfer rights</i>	<i>Used as collateral</i>	<i>Restrictions or stipulations</i>
<i>Department of Lands: Land documents for plots outside the forest reserves</i>								
NS-4	Title deed	Chanod	1954	Most secure; full, unrestricted ownership title registered with provincial land registrar; fully negotiable—sold, rented, subdivided, or mortgaged	Land demarcated by accurate ground survey or rectified aerial photo map; property clearly identified with boundary markers	Fully negotiable	Yes	Issued only for land outside forest reserves; ownership rights can be challenged by state or other farmers if land lies fallow longer than 10 years
NS-3	Certificate of use	Nor-Sor-Sarm	1954	Secure; enables farmer to sell, transfer, or mortgage land; can be converted to title deed (NS-4)	Surveyed in isolation by triangle, tape method	Because of boundary distortions, proposed transfers must be advertised for 30 days	Yes	Issued only for land outside forest reserves; ownership rights can be challenged if land lies fallow longer than 5 years
NS-3K	Exploitation testimonial	Nor-Sor-Sarm Kor	1972	Secure; enables farmer to sell, transfer, or mortgage land; can be converted to title deed (NS-4)	Prepared from unrectified aerial photo map	Fully negotiable	Yes	Issued only for land outside forest reserves; ownership rights can be challenged if land lies fallow

NS-2	Preemptive certificate	Bai-Chong	1954	Authorizes temporary occupation of land; after prescribed period and land use, can convert to NS-3 or NS-3K	Land described by metes and bounds	Only by inheritance	No	longer than 5 years Issued only for land outside forest reserves; validity of rights conditional on use within 6 months of issuance	
SK-1	Claim certificate	Sor-Kor-Neung	1954 (during process of implementing the code)	Claim to ownership based on possession or use of land before the enactment of the Land Code; can be converted to NS-3, NS-3K, NS-4	Land described by metes and bounds	Certificate transferable, after transfer advertised	No	Issued only for land outside forest reserves	
<i>Forestry Department: Land documents for plots inside the forest reserves</i>									
STK	Temporary cultivation rights	Sor-Tor-Kor	1981	Usufruct certificate	Varies	Only by inheritance	No	Issued only for land inside forest reserves; covers only plots up to 15 rai (2.4 hectares); conversion of certificate to	

(Table continues on the following page.)

Table 1 (continued)

<i>Document</i>	<i>Class</i>	<i>Thai name</i>	<i>Date introduced</i>	<i>Legal status</i>	<i>Survey method</i>	<i>Transfer rights</i>	<i>Used as collateral</i>	<i>Restrictions or stipulations</i>
								NS-4 or NS-3 prohibited; state reserves right to revoke usufruct rights if restrictions violated
	<i>Public Welfare Department: Issued in specific areas under small official programs</i>							
14	NK-3	Nor-Kor-Sarm		Can be used legally as loan collateral but cannot be sold until 5 years after issue date		Subject to restrictions	Yes	Can be obtained after 5 years' possession of NK-2
	NK-2, NK-1	Nor-Kor-Som Nor-Kor-Neung		Usufruct		Only by inheritance	No	
	<i>Land Reform Office: Issued in specific areas under official program</i>							
	SPK	Sor-Por-Kor		Usufruct		Only by inheritance	No	

occupant has made use of the land for a prescribed period. Under the existing legislation, a farmer must first possess an NS-3 or NS-3K document before he can obtain a full-title deed (NS-4). The law allows sale, mortgage, and other transfers with the use of these documents to record the transaction.

The NS-3 certificates granted between 1954 and 1972 were mapped in isolation by tape surveys, and the land was described in the certificate by metes and bounds, with an approximate diagram showing the shape of the parcel. After 1972 systematic surveys using unrectified aerial photographs were introduced (NS-3K), where land is described on the certificate by a deed plan, and the certificate states that the holder "has possessed and made use of the land." Because of distortions in the shape and area described in NS-3 certificates, proposed transfers must be advertised for thirty days before the actual transfer.

Although NS-4, NS-3, and NS-3K are the only documents that allow the farmer to transact freely and legally with a given tract of land, there are other documents that provide evidence to support a farmer's claim of ownership. These documents, NS-2 and SK-1, do not certify secure legal ownership, however (see the appendix to this chapter).

NS-2 (Bai-Chong)—a "Preemptive Certificate." This document authorizes temporary occupation of land, which is described by metes and bounds. The certificate is not transferable except by inheritance, and it is therefore not accepted as legal collateral. It confers the validity of the rights on the condition that it is used within six months of its issuance. At least three-quarters of the land must be used for a prescribed period before the occupier can convert the NS-2 to a certificate of use (NS-3, NS-3K).

SK-1 (Sor-Kor-Neung)—"Claim Certificate." This document was not defined in the Land Code of 1954 but was issued during the process of implementation of the code. It allowed for a claim to be made within a specified period after enactment of the code, by any person who had possession and had made use of land prior to the effective date of the law. The document is convertible to a certificate of use or to a title deed.

According to Yano (1968), the 1954 law stabilized the land tenure system by eliminating the confusion of contradictory provisions. Kemp (1981), however, claims that successive pieces of legislation, each with varied interpretations, along with inconsistent attempts to implement the law have created a highly complex situation.

The Thai system of land administration shares with those of other developing countries a lack of funds and an inadequate administrative infrastructure. These constraints make it difficult to provide full titles to all eligible farmers.¹ As a result, the process of land registration has been

Table 2. Classification of Land in Thailand

<i>Category</i>	<i>Millions of rai^a</i>	<i>Percent</i>
Total area of Thailand	320.7	100
<i>Public land</i>		
Forest lands (including gazetted forests, national parks, forest parks, wildlife reserves, and forest lands pending gazettal) ^b	166.3	51
Public domain and government real estate	18.5	6
Religious land	0.3	...
Local administration land, state enterprise land	2.7	1
Ponds, swamps, lakes, and the like	11.6	4
Total public land	199.4	62
<i>Private land</i>		
Certificate of use (NS-3 and NS-3K)	64.0	20
Title deed (NS-4)	18.4	6
Total documented private land	82.4	26
Undocumented land (includes NS-2, SK-1, and other certificates outside forestry area)	38.9	12
Total private land	121.3	38

... Negligible.

Source: Government of Thailand, Department of Lands.

a. 6.25 rai = 1 hectare.

b. It is estimated that at least 33 million rai of land officially classified as forest land is actually under cultivation by squatters. Thus total land under private occupation (whether legal or not) is 121.3 + 33 = 154.3 million rai.

rather slow (see table 2). Only a small proportion—about 12 percent—of legally owned land is covered by full title (NS-4). Of the area actually documented—that is, land with either full title or certificate of use—the proportion is 53 percent. In our study areas, primarily agricultural areas, the occurrence of full-title deeds was rare. This is consistent with the observation that title deeds are more prevalent in the urban areas. Ranong (1986, 124) suggests that because boundaries are more accurately defined in the NS-4 than in the NS-3, increasing population pressure and land disputes will stimulate the demand for the NS-4.

It is perhaps because of the low occurrence of the full-title deeds that the status and usefulness of the certificates of use have risen, blurring the distinction between the NS-4 and the NS-3 or NS-3K. Although some commercial banks seem to prefer collateral documented on a full-title deed to those documented on a certificate of use, there are indications that in practice the difference between the certificate of use and the full title is rather small. Williamson (1983) and the Ministry of Agriculture and Cooperatives (Government of Thailand 1980, 7) claim that there is little difference between the full title and the NS-3 or NS-3K. As

Williamson states, "banks will lend equally, irrespective of whether the land has a title or a certificate of utilization" (Williamson 1983, 10). These views are in contrast to those of Lin and Esposito (1976, 426) and Kemp (1981). According to Kemp, although the law allows NS-3 transfers, "the transfer value of the certificate is low and commercial banks do not consider them good security" (1981, 9). Our own field survey and numerous discussions with farmers and land officers indicate that in the rural areas studied there is little distinction between NS-3, NS-3K, and NS-4 documents and that all are taken by banks and buyers as evidence of legal ownership.

Land Use and the Forest Reserves

Like many other developing countries, Thailand is faced with the problem of illegal occupation and use of state-owned land by large numbers of farmers. In Thailand the squatters encroach primarily on forest reserves, thwarting the national conservation objective of maintaining these areas in their natural state.

As stated earlier, until fairly recent times Thailand had a high land-to-man ratio. Because land was abundant, productivity was achieved largely by expansion. Feeny (1982) traces this growth by expansion as a response to favorable, changing export markets. Following the opening of the country to international trade and the signing of the Bowring Treaty (1885), the government actively encouraged expansion to meet export goals. Of this era Feeny states that "favorable prices and population growth underwrote the rapid expansion of paddy production in the nineteenth and first half of the twentieth centuries" (1984, 6). Feeny attributes the continued deforestation after World War II to favorable markets for upland crops and an even more accelerated rate of population growth.

Although steps in forest conservation were first taken in 1896 with the establishment of the Royal Forestry Department, the extent of deforestation has been substantial. Feeny estimates that forest coverage has dropped from 70 percent at the turn of the century to 50 or 60 percent in the 1960s; to 40 percent by the mid 1970s; and to less than 30 percent today (1984, 8).² This drop has occurred despite the efforts of the government. In 1961 the Thai government set a policy that 50 percent of the area of Thailand should be reserved as forest area. In 1964 the National Forest Reserve Act was passed, designating various areas within Thailand as gazetted forest reserves and detailing limitations on their exploitation. Agricultural cultivation within these areas was specifically prohibited.

Today an estimated 5.3 million hectares, or about a fifth of the land officially designated as state-owned forest reserve, is permanently occupied and cultivated by squatters. This is about 21 percent of the land under cultivation and involves about a million squatter farm households. Although many of these squatters had *de facto* possession of the land for

fifteen to twenty years, they cannot obtain titles or certificates of use. The forest reserves can be found side by side with the non-forest reserves, in identical agroclimatic zones and in areas with similar sociopolitical structures.

Since agricultural expansion in Thailand has always been through a process of forest clearing and settlement, there is no sociocultural or ethnic difference between the squatters in our study areas and their neighboring legal owners.³ In fact, some members of a given family could be squatters while other members are legal owners. In areas on the boundary of the forest reserve, an individual's landholdings could arbitrarily be split between land outside the reserve—for which he held a legal, secure land document—and land inside the forest reserve, for which he would be considered an illegal squatter.

How this occurs can be traced to the 1964 act. Following the Forest Reserve Act of 1964, areas officially designated as forest reserve did not have carefully delineated boundaries, and in many instances areas unsuitable for agriculture were not purposefully selected. In fact, many areas officially declared to be forest reserves were already partially or fully settled. In many instances it was several years before farmers learned that land that they held or had acquired had been designated as forest reserves. Beginning in 1972, when the distribution of NS-3K documents was significantly speeded up, increasing numbers of farmers discovered that they could not obtain the document of secure ownership because they were squatters and these documents could not be awarded in forest reserve areas. Concern among farmers about not being able to obtain a legal document apparently did not arise until after 1975, when a significant expansion of the institutional credit system in the rural sector took place.

Since 1981 the Royal Forestry Department has issued usufruct certificates to large numbers of squatters in the forest reserves. These certificates, known by their Thai acronym STK, provide "temporary cultivation rights." The provision of STK certificates covers only holdings up to 15 rai (2.4 hectares), they prohibit the conversion of the certificate to title deed (NS-4) or certificate of use (NS-3, NS-3K), and they restrict the transfer of holdings except by inheritance. Not only does the STK certificate prohibit the recipient himself from transacting—selling or mortgaging, for example—with land covered by an STK certificate, but failure by the recipient to report observed violations by others could cause revocation of his usufruct rights by the state.

Other Land Documents

Several documents issued by various government departments confer some rights to land within the purview of specific settlement or welfare

programs but usually do not grant full ownership. These include the NK documents distributed by the Public Welfare Department to selected beneficiaries in three series: the NK-1 and NK-2 are not transferable except by inheritance; the NK-3 can be transferred or used as collateral five years after its issuance. The Land Reform Office issues to beneficiaries of its program SPK documents similar to the STK certificate issued by the Forestry Department. Land covered by an SPK document cannot be sold or transferred. The documents issued by the Public Welfare Department and the Land Reform Office are confined to relatively small areas and small numbers of farmers.

In addition to the documents described in the foregoing paragraphs, many farmers have tax certificates to provide evidence that they have paid a land tax (PBT certificates). Tax is collected on most occupied land, whether it is occupied legally or not. Many squatters are apparently willing to pay the land tax, which is rather low, with the hope that it will help them to establish full legal rights at a later time.

Notes

1. Recently, however, the government has undertaken a significant expansion of the titling and land registration capacity through a special project funded in part by external donors.
2. The most recent estimates are at present under debate.
3. In some frontier areas close to the international borders of the country, however, the squatter population consists of hill tribes who are not ethnic Thai.

Appendix: Land Documents

Title Deed, NS-4

(น.ร.๕๙.๖)



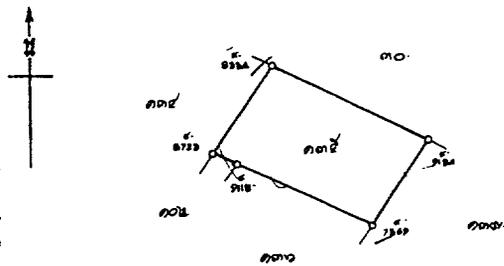
โฉนดที่ดิน

เป็นหนังสือสำคัญแสดงกรรมสิทธิ์
ของที่ดินซึ่งมีอาณาเขตตามแผนที่แนบมา

โฉนดที่ดิน
เลขที่ ๒๕๕๕
เล่ม ๒๕๕ หน้า ๒๕
ตำบล (ถนนรอบนอก)
จังหวัด นนทบุรี

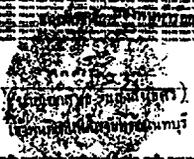
โฉนดที่ดิน
เลขที่ ๑๕๓
เล่ม ๑๑๓
หน้า ๑๑
ตำบล คลองขวาง (ใหญ่)
จังหวัด นนทบุรี

ขนาดที่ดินในระนาบ ๑๒๙.๙๐ ไร่ ๖๖๖ ตารางวา
ขนาดที่ดิน ๑๒๐๐๐ ตารางวา





นาย ...
อธิบดีกรมที่ดิน



นาย ...
ผู้ว่าราชการจังหวัดนนทบุรี

นาย ...
ผู้ขาย

นาย ...
ผู้ซื้อ

๒๗ ต.ค. ๒๕๒๖

๒๕๕๕

๒๕๕

๒๕

๒๗ ต.ค. ๒๕๒๖

นาย ...
ผู้จดทะเบียน

นาย ...
ผู้ตรวจ

๒๗ ต.ค. ๒๕๒๖

Reproduced from Burns (1985)

Translation of Title Deed, NS-4

<i>Land Location</i>	<i>Title Deed</i>
Map Sheet No. _____	No. _____
Parcel No. _____	Volume _____ Page _____
Tambon No. _____	Amphur _____
Tambon Name _____	Changwat _____

Title Deed

Certificate of Rights in Land Issued
in Accordance with the Land Code

To (Name) _____ Nationality _____ Address _____ Village No. _____
Street _____
Lane _____ Tambon _____ Amphur _____ Changwat _____
Estimated area of land _____ rai _____ ngan _____ sq wah

Map

Scale of cadastral map 1: _____ Scale 1: _____

Date of issuance _____ month _____ year _____

Governor

Changwat Land Officer

_____ Writer

_____ Drafter

_____ Examiner

_____ Map Investigator

_____ Inspector

_____ Chief

(Note that the 1985 amendments to the Land Code will mean that the titles will no longer be signed by the Changwat Governor.)

Certificate of Use, NS-3



(น.ส. ๓)

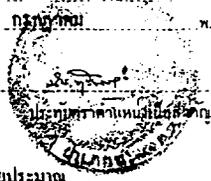
หนังสือรับรองการทำประโยชน์

ที่ดินกึ่งอยู่
 ที่ดินกึ่งอยู่
 ตำบล ห้วยยี่
 อำเภอ ฉิมแดง
 จังหวัด สุราษฎร์ธานี
 หน้ที่ ๕
 เลข ๕๒ เลขที่ ๒๒/๒๕๖๖
 หน้า ๒๓๖
 สารบบเล่ม หน้า

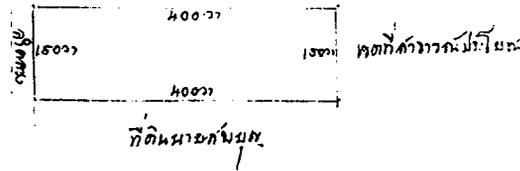
หนังสือรับรองการทำประโยชน์ฉบับนี้ออกให้เพื่อแสดงว่า

นาง นางทองอร่าม พรหมจันทร์
 น.ส. นายทองแก้ว นางจันทร์
 น.ส. ตำบล นาทวี อำเภอ ฉิมแดง จังหวัด สุราษฎร์ธานี
 ได้นำหลักฐานที่ตนแปลงที่กล่าวข้างต้นว่าได้ทำประโยชน์ในที่ดินแล้ว ตามหลักฐานดังต่อไปนี้
 ทิศเหนือ ประมาณ ๕ วา เส้น ทิศ ทิศนายสมปอง
 ทิศใต้ ประมาณ ๖ วา เส้น ทิศ ทิศนายสมปอง
 ทิศตะวันออก ประมาณ ๖ วา เส้น ทิศ เขตที่ราชวาระประโยชน์
 ทิศตะวันตก ประมาณ ๖ วา เส้น ทิศ ลำคลอง
 จำนวนเนื้อที่ประมาณ ๑.๕๐ ไร่ งาน
 วันที่ ๑๒ เดือน กรกฎาคม พ.ศ. ๒๕๖๖

มีอำนาจเป็นหลักฐานแก่ผู้เกี่ยวข้อง
 H. ลงนาม นายอำเภอ
 (นายอำเภอสุราษฎร์ธานี)
 อำเภอสุราษฎร์ธานี



ผู้ที่ดินโดยประมาณ
 ทิศนายสมปอง



๒-๒๒๒

Translation: Certificate of Use, NS-3K

Certificate of Land Use

Issued in Accordance with the Land Code

<i>Land Location</i>	<i>Registration</i>
Tambon _____	Tambon No. _____
Amphur _____	Volume _____ Page _____
Changwat _____	Parcel No. _____
Aerial Photo No. _____	Map Sheet No. _____ Page _____

This land use certificate is issued to certify that:

Name _____ Nationality _____ Address _____
 Village No. _____ Tambon _____ Amphur _____ Changwat _____

had possessed and made use of the plot of land as mentioned above.

Total area _____ rai _____ ngan _____ sq wah

Shape of Land and Boundaries

Scale of aerial photo 1: _____ Scale 1: _____

Date of issuance _____ Month _____ Year

Signature _____

Seal of the competent officer

Translation reproduced from Burns (1985)

Form of Preemptive Certificate, NS-2



(น ส ๒)

ใบจอง

ที่ดินตั้งอยู่ ตำบล โนนทรายใหญ่ หมู่ ๕ จังหวัด บุรีรัมย์
 ทะเบียนเลขที่ ๒๕ เลขที่ ๕๕๗
 หน้า ๒๖ 37
 สว.เพิ่มเติม หน้า

ใบจองฉบับนี้ให้ไว้เพื่อแสดงว่าผู้จองมิได้ นาย เอกโอง ธรรมรินทร์
 เชื้อชาติ ไทย สัญชาติ ไทย เป็นบุตร นายสมบุญ นางทองพูน
 อายุ ๒๒ ปี ตั้งบ้านเรือนอยู่ ท่าอาวาม ตำบล ท่าอาวาม
 อำเภอ ชนบท จังหวัด เพชรบูรณ์

เข้าครอบครองที่ดินแปลงดังกล่าวข้างต้นชั่วคราว ตามหลักฐานดังต่อไปนี้
 ที่ดินเนื้อ ประมาณ ๕๐๐ ไร่ เส้น ๖๖ ไร่ ๖๖ ไร่ ๖๖ ไร่
 ที่ดินได้ ประมาณ ๕๐๐ ไร่ เส้น ๖๖ ไร่ ๖๖ ไร่ ๖๖ ไร่
 ที่ดินครุฑออก ประมาณ ๑๕๐ ไร่ เส้น ๖๖ ไร่ ๖๖ ไร่ ๖๖ ไร่
 ที่ดินครุฑตก ประมาณ ๑๕๐ ไร่ เส้น ๖๖ ไร่ ๖๖ ไร่ ๖๖ ไร่
 รวมเนื้อที่ประมาณ ๑๕๐๐ ไร่

วันที่ ๕ เดือน กรกฎาคม พ.ศ. ๒๕๑๑

(ลงชื่อ)
 นายอำเภอ



Am Pison
Am Pison

Form NS-2 (Preemptive Certificate) Form of Preemptive Certificate, NS-2

Translation: Preemptive Certificate, NS-2

Preemptive Certificate

<i>Land Location</i>		<i>Registration</i>	
Tambon _____	Village No. _____	Volume _____	Number _____
Amphur _____	_____	Page _____	_____
Changwat _____	_____	File No. _____	Page _____

This document is issued to certify that the Government has allowed:

Name _____ Race _____ Nationality _____ Parent's Name _____
 Age _____ Address _____ Tambon _____
 Amphur _____ Changwat _____

to take temporary possession of the plot of land having the following reference

North (estimate) _____ sen Adjacent to _____
 South (estimate) _____ sen Adjacent to _____
 East (estimate) _____ sen Adjacent to _____
 West (estimate) _____ sen Adjacent to _____

Total area _____ rai _____ ngan _____ sq wah
 Date _____ Month _____ Year

Signature _____
 Nai Amphur

4

Methodology and Description of the Study Areas

Security of ownership is defined in this study as the possession of legal rights of ownership, certified by an appropriate state-issued document. Secure ownership entails protection from the risk of eviction and the ability to mortgage and sell the land legally. Normally, ownership security would be difficult to quantify. In Thailand, however, two groups of farmers are readily distinguishable by their ownership security status. One group is composed of squatters who operate farms in forest reserve areas; the other is composed of legally titled farmers who operate outside the boundaries of the forest reserve. Because ownership security is uniform within each group, comparisons between the two groups circumvent the need to quantify ownership security, and inferences regarding its economic implications can be made.

Simply to compare the economic indicators of the two groups, however, may mean ignoring other important differences between them and may thus invalidate the assessment of the effects of ownership security that is based on such comparisons. One important factor, for example, is the agroclimatic environment in which the farmer operates. There is no point in comparing a titled farmer operating in a fertile valley with a squatter operating in a hilly area; the two differ not only in ownership security status, but also in type of soil and terrain.

To avoid false attributions, a key element of the methodology of the study was the selection of study sites in which squatters and titled farmers operate in geographical proximity within a similar agroclimatic environment. Accordingly, all observations within a particular study site, both within the forest reserves and from adjacent areas outside the reserves, were located within a radius not exceeding twenty miles. Great care was taken to ensure that study sites had similar terrains and infrastructure.

Initially selected were sites in three provinces that met the required similarity of agroclimatic conditions and geographical proximity of the samples of legal owners and squatters. These were located in Lop Buri province on the fringe of the central plain and Nakhon Ratchasima and

Khon-Kaen provinces in the northeast. Surveys were conducted during the 1984–85 wet season. The sample design for each province consisted of a random selection in the preselected study site of ten villages in the forest reserve and ten villages in the adjacent area outside it. Within each village, about ten farmers were selected at random.¹

During the following year, another northeastern province, Chaiyaphum, was added in order to study the specific effects of usufruct (STK) certificates distributed by the Royal Forestry Department on the productivity of squatters. Thus, the squatter sample in Chaiyaphum was further delineated into recipients of certificates and nonrecipients. These two squatter subsamples were drawn from two neighboring forest reserves, one of which had been covered by the STK program since 1981, while the other was not yet covered.

As noted earlier, since the pattern of agricultural expansion in Thailand has always been through a process of clearing and settlement of the forests, there are no sociocultural or ethnic differences between the squatters in our study areas and their neighboring legal owners. Hence there is no systematic difference in the ability, management skills, or other underlying characteristics between squatters and other farmers or between forest reserve lands and other lands in our study areas. This is important, for the distinction between squatters and legal owners is the only measure of ownership security that could be used in the analysis. The location of the farms of most of the farmers in our study areas had already been determined by the time it became apparent that the squatter status entails disadvantages. We thus regard the farmers' ownership status as exogenous in the analysis.

To account for individual differences among farmers in initial wealth, location, and soil type and so on, data on characteristics of the farmer and his farm are used in the empirical analyses reported in subsequent chapters. These analyses are essentially econometric, employing regression techniques and dichotomous choice models. Security of ownership, represented in the present study by a titled status, has effects on both long-term processes, such as capital formation and acquisition of land, and short-term activities, such as production and the use of inputs. It is therefore important in the econometric work to determine whether variables typically treated as exogenous are in fact endogenous, in the sense that they are affected directly or indirectly by security of ownership. Since the objective of this study is to assess the full effects of ownership security, most of the econometric work deals with reduced forms, in which all endogenous variables are replaced by the exogenous variables that affect them, whether directly or indirectly. The endogenous variables affected by security of ownership analyzed in the present study are credit, land values, capital, land improvements, variable inputs, and output.

The survey district in Lop Buri was Chai Badan. Most farmers there

grow upland crops such as cotton, corn, upland rice, sorghum, tobacco, and beans. The roads from the capital city and the district capital are all-weather roads. Since the district is about 250 kilometers from Bangkok and all the villages surveyed were connected by feeder roads to the main road, the cropping activities in the area are highly commercial. Most of the area is rainfed, with an annual rainfall of about 1,070 millimeters, and the pattern of rainfall is stable in time. Most of the sample areas in Lop Buri have better soil conditions than the provinces surveyed in the northeast, which are subject to periodic droughts.

In Nakhon Ratchasima province, the sampled farmers are located in the Chok-Chai district. Lands in this district are mixed between upland and lowland. The average amount of rainfall is about 760 millimeters a year. Rice crops are found in both lowland and upland areas where pump irrigation is possible. For the most part the soils of lowland areas are black and slightly sandy—suitable for growing rice. In the upland areas, where the soil is sandier, cassava is the crop most commonly grown.

In Khon-Kaen, the Ban Phai and Kranuan districts were selected for the study. Both districts are principally upland and hilly areas; the soil is mostly sandy. Annual rainfall is about 1,390 millimeters. Most of the areas are rainfed, and only a few farmers have access to irrigation. The cropping patterns of the two districts are quite similar. Some villages in the Kranuan district, however, have soils suitable for growing sugarcane—a highly profitable crop—and are located close to a sugar mill. These villages were eventually excluded from the study because their location was not similar to that of the rest of the sample. The upland crops typically grown are cassava, kenaf, and corn. During the wet season, rice can also be grown widely, especially the native variety of glutinous rice used for domestic consumption. In general the survey areas in Khon-Kaen are less commercialized than those in Lop Buri and Nakhon Ratchasima.

In Chaiyaphum province, the study area is located in Chatturat district, about 330 kilometers from Bangkok. Chaiyaphum province is characterized by plateau lands that slope from the northwest toward the south and east. The average rainfall is 1,086 millimeters a year. As in other northeastern provinces, most of the agriculture is rainfed and is prone to droughts. The main crops are rice, cassava, and kenaf.

The sampled areas in the northeastern provinces are typical of this region of Thailand, which contains more than a quarter of the country's provinces. They are also similar to the less commercialized lower and upper north provinces. The highly developed Central Plain is not represented in this sample. The extent of illegal encroachment on the forest reserves in the Central Plain, however, is minor. The economy of south Thailand is quite different from that of the provinces included in this report, and results do not necessarily apply to southern Thailand. Simi-

larly, frontier areas of very recent settlement have not been covered in the present study.

The distribution of sampled plots, by location and ownership status, is given in table 3. It is apparent that farmers outside the reserve boundaries who can acquire secure landownership documents are keen to do so. The overwhelming majority—nearly 90 percent—of the plots outside the forest reserve are covered by secure documents, either NS-3 or NS-3K. There is thus no bias arising from potential self-selectiveness in the sample of titled farmers.

Table 4 provides information on the availability of infrastructure services in the sampled villages. Differences are small and insignificant. The fact that public services are provided to villages in the forest reserves reflects recognition by government agencies and officers that the squatter settlements are by and large permanent. This is compatible with the small probability of eviction in Thailand.

Eviction of squatters from forest reserves by government officers has been rare in Thailand because of sociopolitical constraints. Although overall statistics of the frequency of eviction for the country are not available, data from the four provinces surveyed in the present study provide adequate information. Farmers—both squatters and titled farmers—were asked to indicate whether they had ever been evicted from land they possessed. The reference period is therefore a lifetime, and on the basis of the responses to this question the frequencies of eviction can be regarded as lifetime probabilities of eviction. The data are presented in table 5. As would be expected, eviction rates are higher among squatters—that is, residents of forest reserves—than among legal owners in all provinces. It is clear, however, that eviction rates are low, since the probability of a squatter's being evicted in the course of a lifetime is less than 10 percent.

The incidence of eviction among titled farmers, who are settled outside the forest reserve, reflects probably "normal" expropriation of land that takes place in conjunction with public projects, such as roads, canals, and dams. Such events cannot be avoided even by titled farmers. It is therefore appropriate to regard the difference between eviction rates of untitled farmers and titled farmers as a proper estimate of the lifetime probability of eviction faced by a squatter because he does not have legal ownership. These figures are reported in line 3 of table 5 and are low. The overall probability of eviction for the pooled sample of squatters is about 4 percent. The fact that the risk of eviction in Thailand is extremely low has important implications for interpretation of the effects of titled ownership, as will be shown in subsequent chapters.

The small probability of eviction, the fact that land tax is being collected on squatters' land, and the availability of public services are all factors which enhance the squatters' perception of ownership security.²

Table 3. Distribution of Plots, by Location and Type of Land Title
(percentage of total plots in each area)

Type of land title	Province								
	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	Forest reserve	Outside	Forest reserve	Outside	Forest reserve	Outside	With STR ^a	Without STR ^a	Outside
Untitled plots	100.0	13.8	100.0	12.5	100.0	12.2	100	100	3.7
Titled plots ^b	—	86.2	—	87.2	—	87.8	—	—	96.3
Total number of plots owned by farmers in the sample	281	247	245	287	253	296	96	233	135

— Not applicable.

a. Usufruct certificate.

b. NS-3 and NS-3K.

Table 4. Infrastructure Services in Sample Villages
(percentage of total villages in each sample)

<i>Infrastructure</i>	<i>Province</i>									
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>		<i>All</i>	
	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>
Connected by all-weather road to district capital	100	100	70	90	89	82	100	100	88	91
Service by agricultural extension agents	100	100	90	90	89	100	100	100	94	97
School in village	80	50	50	40	78	91	100	100	73	65
Number of villages in sample	10	10	10	10	9	11	5	3	34	34

Table 5. The Experiences of Farmers with Eviction

<i>Location of farmers</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Sample size</i>	<i>Percent evicted</i>	<i>Sample size</i>	<i>Percent evicted</i>	<i>Sample size</i>	<i>Percent evicted</i>	<i>Sample size</i>	<i>Percent evicted</i>
1. Forest reserves	100	7.0	89	9.0	91	6.6	120	1.7
2. Outside	84	2.4	72	1.4	93	2.2	112	0.9
3. Differential rate of eviction (line 1 – line 2)	—	4.6	—	7.6	—	4.4	—	0.8

— Not applicable.

Note: The period of reference is the farmer's lifetime.

Table 6. The Opinions of Farmers as to the Principal Benefits to Be Gained by Acquiring Legal Title
(percentage of farmers in each sample)

<i>Principal benefit</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>	<i>Forest reserve</i>	<i>Outside</i>
Access to institutional credit	74	83	54	49	61	50	80	83
Avoidance of eviction	12	4	29	20	19	22	4	5
Minimization of disputes	10	9	21	24	7	17	9	6
Number of observations	89	106	81	86	74	112	120	112

Table 7. The Percentage of Land Tracts That Were Acquired by Purchase

<i>Location of land</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Sample size</i>	<i>Percent purchased</i>	<i>Sample size</i>	<i>Percent purchased</i>	<i>Sample size</i>	<i>Percent purchased</i>	<i>Sample size</i>	<i>Percent purchased</i>
Forest reserves	156	67	163	26	110	63	441	42
Outside	211	70	247	25	258	45	231	33

Indeed, when squatters were asked what they perceived as the most important advantage of possessing a secure landownership document such as NS-3 or NS-3K, the majority stated favorable access to institutional credit (see table 6). Only a few suggested protection from eviction or land disputes as important aspects of legal ownership. Land disputes, in fact, have not been frequent in the past. In our sample, the estimated lifetime probability of disputes is 11 percent in forest reserves and 13 percent outside them. Thus the frequency of disputes is low, and there is little difference between forest reserves and other areas.³ There are no significant differences, moreover, between the way squatters and titled farmers rank the merits of secured ownership. This indicates that squatters are well informed and have realistically assessed the benefits that would accrue to them if they were granted secure legal ownership.

The squatters' apparent lack of serious concern about the risk of eviction stems from a history of *de facto* ownership with little interference from authorities. Not only is eviction rare, but other official constraints that theoretically should restrict the activities of squatters have not been enforced. One such constraint is the prohibition of selling or transacting in land that is formally state property. Yet in several studies it has been pointed out that this restriction is in reality being ignored (Lin and Esposito 1976; Kemp 1981). The survey data on land purchases among the farmers sampled indicate that there are no significant differences between the incidence of sales of untitled tracts in the forest reserves and of titled tracts (see table 7). Lands in the forest reserves are transferred commercially as frequently as those outside the forest reserve. The ability to conduct these transactions freely augments the squatters' perceptions of the security of their claims to land of which they are *de facto* owners.

Farmers' opinions are thus compatible with the sociopolitical environment in rural Thailand: since eviction and disputes are minor issues of low risk, the credit advantages implicit in possession of documents of legal ownership are important. Farmers perceive the ability to use land as collateral for loans as affording them patterns of investment, production, and consumption that they could not otherwise attain. This suggests that the effect of collateral on the supply of institutional credit is substantial; otherwise farmers would not consider this aspect of secure ownership so important. This proposition will be analyzed in the next chapter.

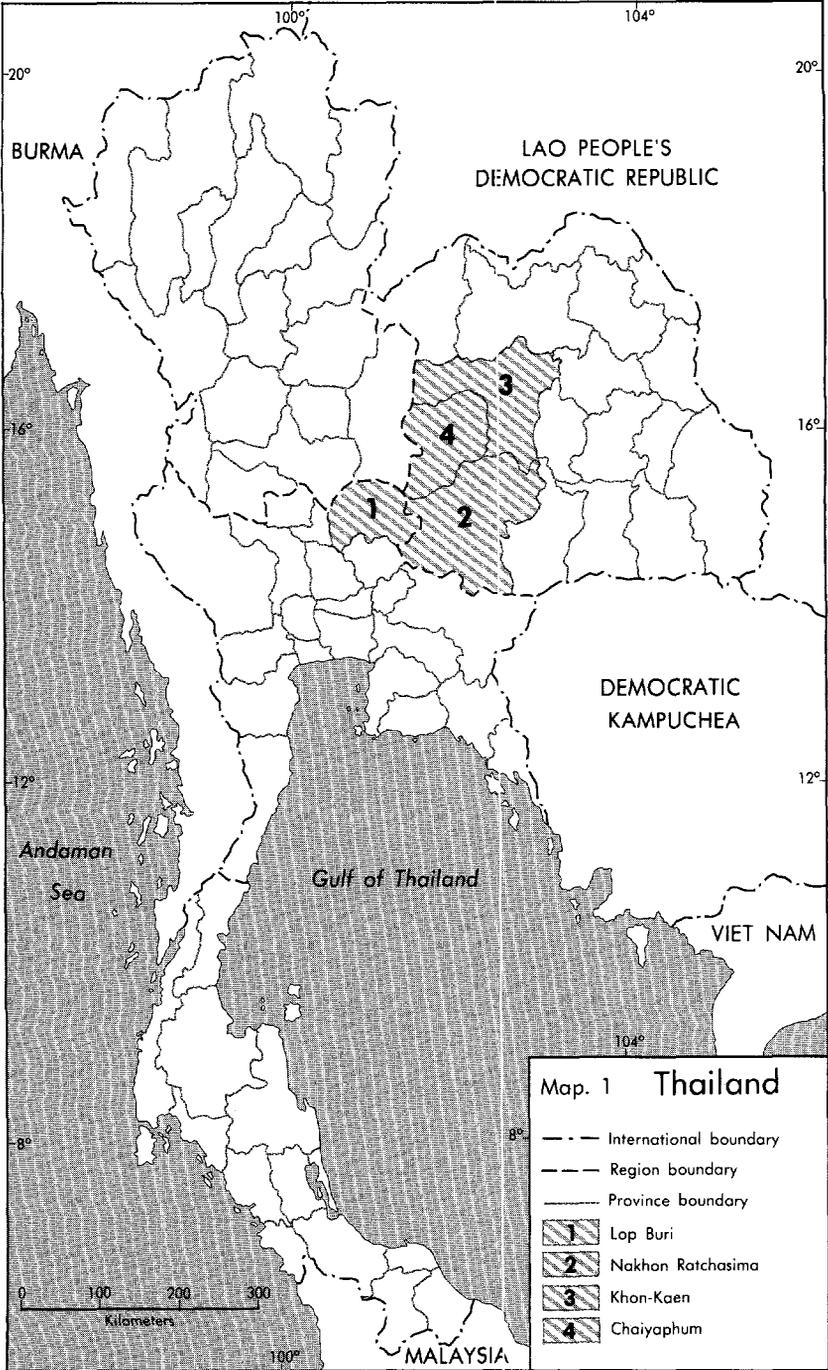
The finding that credit is the dominant benefit of legal ownership in Thailand is extremely significant for policy, because policies may have different effects on the access to credit and on perceptions of ownership security. For instance, a policy designed to improve squatters' perception of security by providing them with usufruct certificates—but not the right to sell or mortgage—will address only that aspect of the squatters' situa-

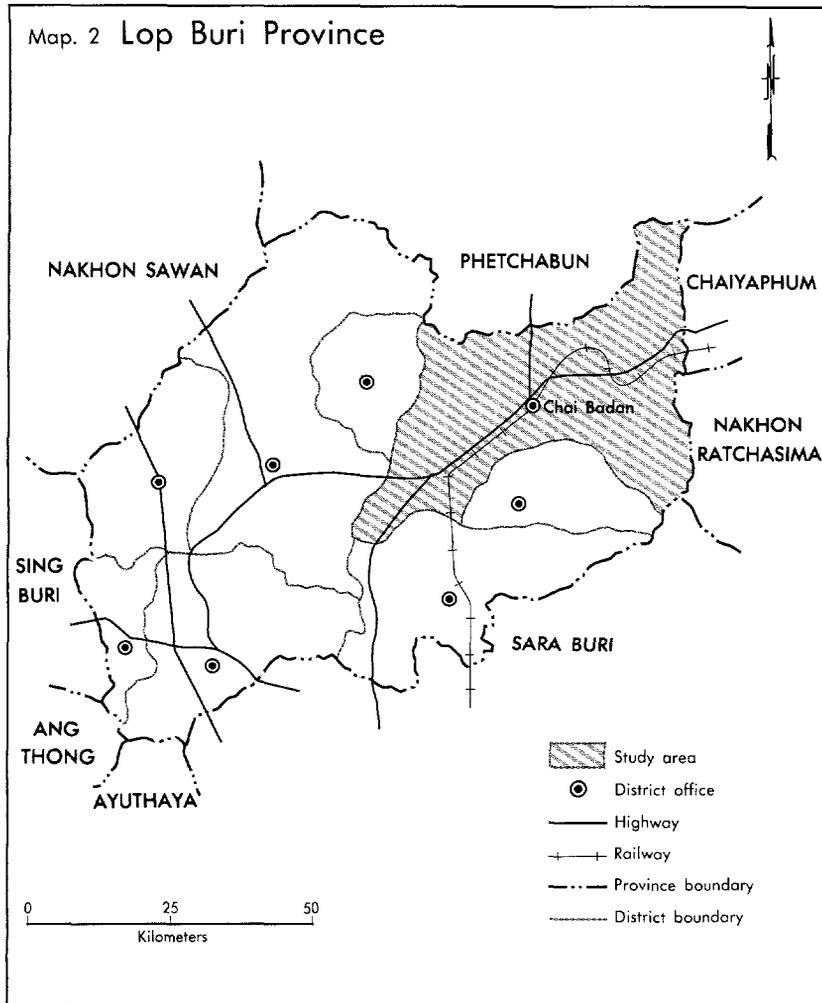
tion that is of minor importance in Thailand. This issue will be discussed in detail in chapter 10.

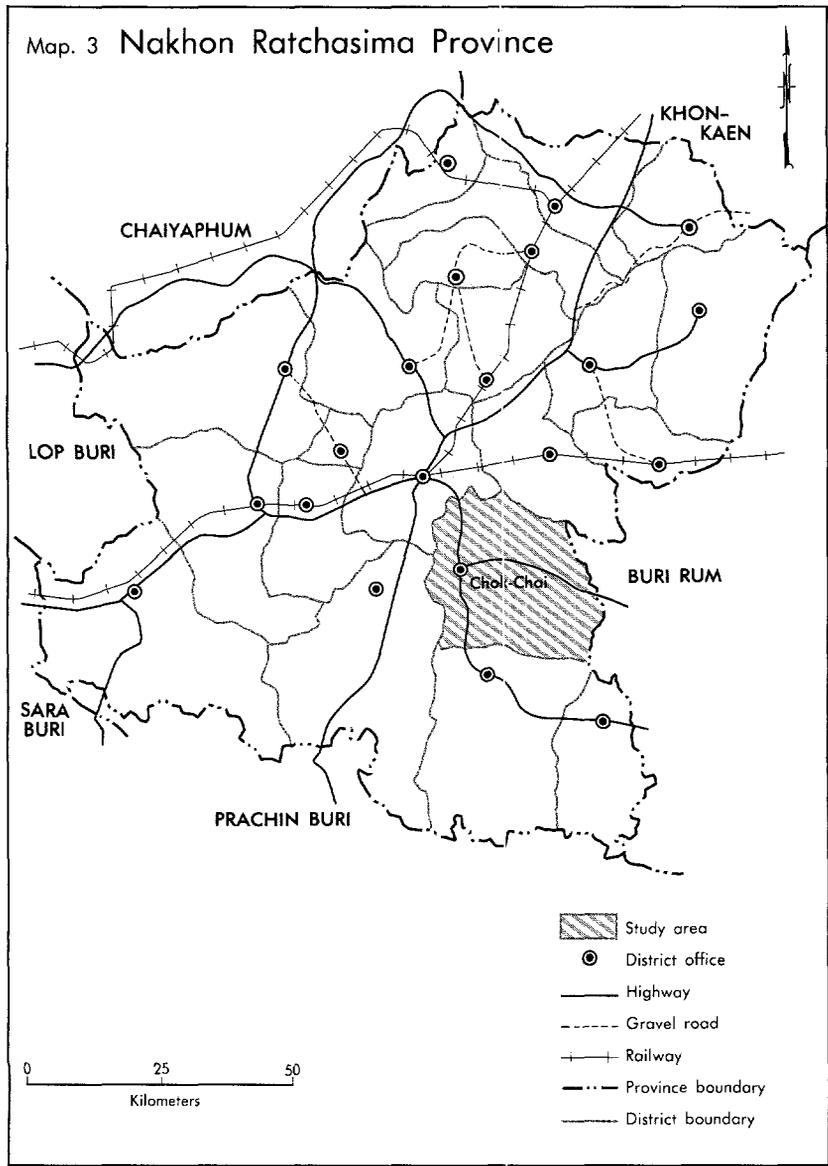
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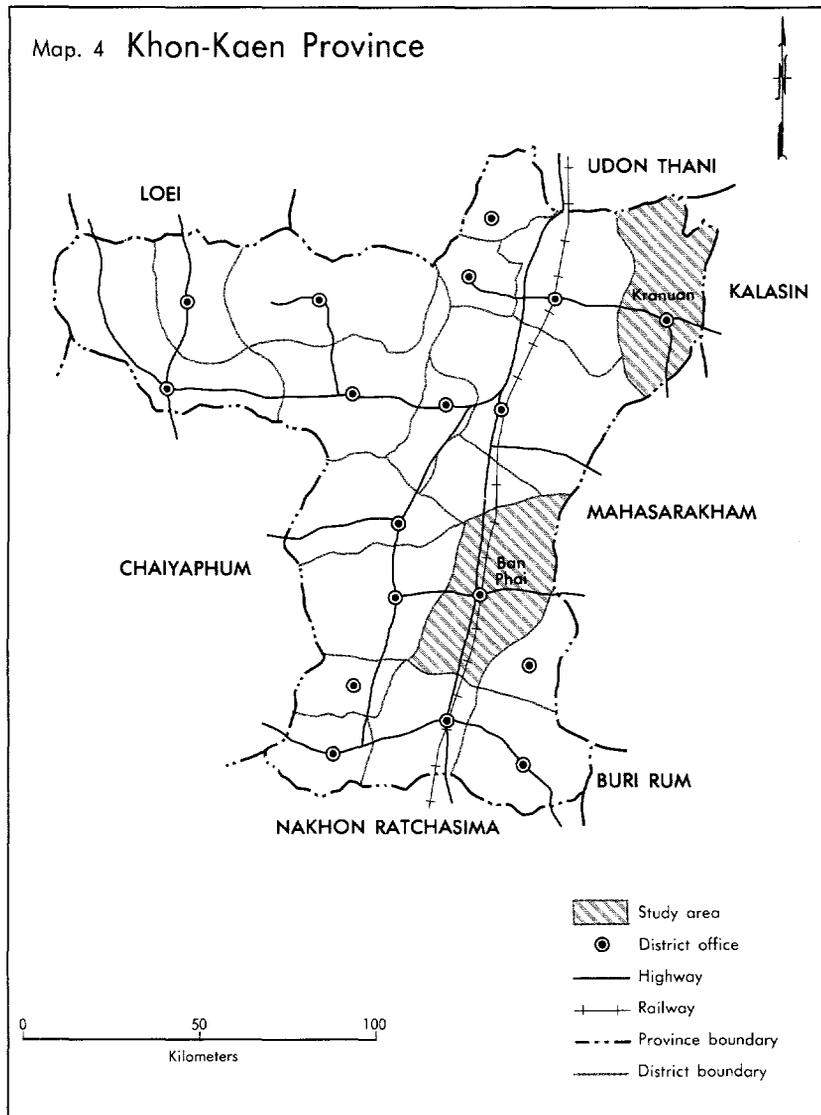
1. The actual sample sizes used in specific components of the analysis may vary because of missing data.
2. There are in Thailand areas of recent settlement, mostly near the frontiers, where squatters are less secure. The analysis does not pertain to such areas.
3. As land scarcity increases in the future, however, the incidence of disputes is likely to increase.

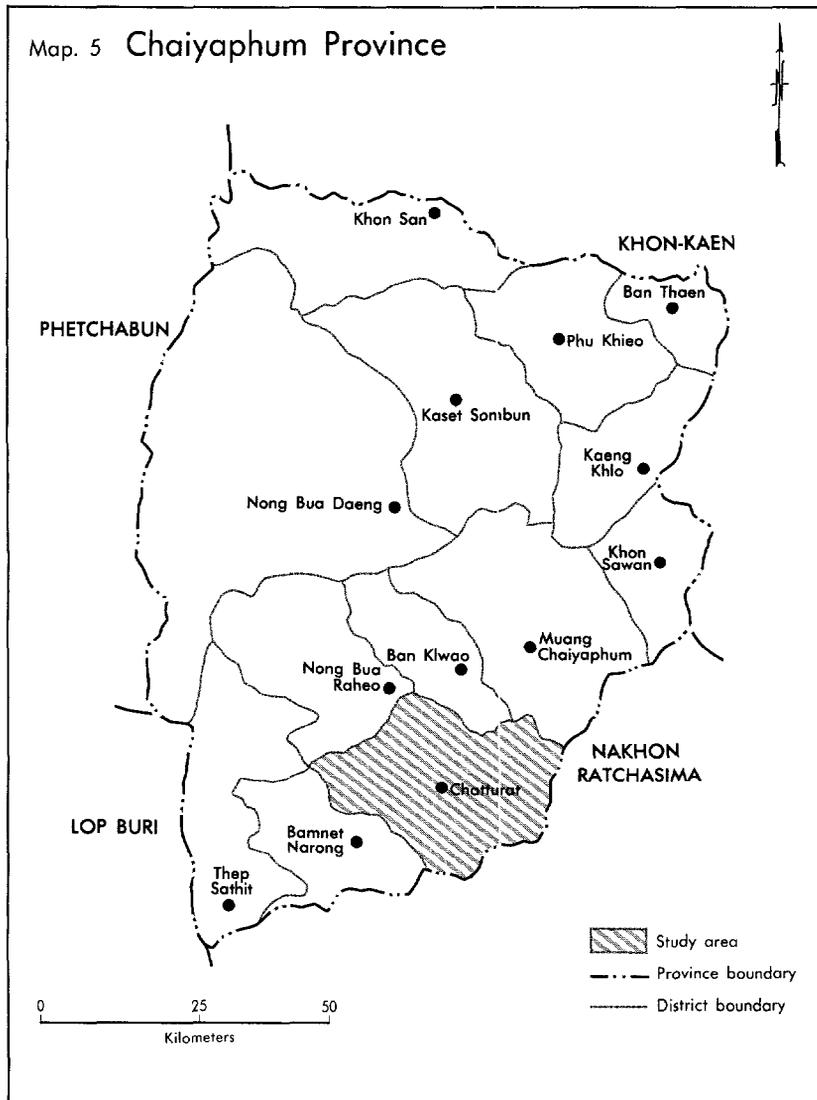
Appendix: Maps











5

Security of Ownership and Access to Credit

Farming operations typically imply several months of land preparation, cultivation, and harvest, followed by a short period of marketing. Correspondingly, the agricultural season is characterized by a long period of negative cash flow, followed by a peak period of positive cash inflow. Because many farmers do not have liquid resources to cover the costs of consumption and cultivation, the acquisition of short-term credit is widespread in farming. Like other investments, farm investments require large capital outlays at the outset, followed by years of small returns once the investment has become productive. If a farmer does not have sufficient liquid assets to implement the investment, he must secure long-term credit or rolled-over short-term credits. Borrowing is part and parcel of farming, and access to credit is an important determinant of a farmer's performance. In this chapter we shall discuss the principal sources of credit and the way ownership security affects a farmer's access to credit.

Factors That Affect Lending

It is useful to distinguish between two broad sources of farm credit, namely, institutional and noninstitutional lenders. Institutional lenders include cooperatives, specialized government agencies, state-owned banks, and private banks. Noninstitutional lenders include friends and relatives, moneylenders, traders, and rich farmers. The literature on rural credit markets suggests several important distinctions between these two sources of credit. Security of landownership, in particular, may have different effects on lending decisions made by institutional and noninstitutional lenders.

Landownership security implies the certainty of having continued access to a given tract of land. More important for credit purposes, however, security of ownership enables a farmer to transfer landownership to others. Although a borrower usually knows whether there are challenging claims to ownership of the land that he offers as collateral, a potential lender may not. The uncertainty is greater for a lender who resides or operates outside the borrower's social environment. The asymmetry in

information leads to welfare losses. Consequently, societies have tried to reduce the inefficiency by registering landholdings and issuing title documents whereby the state confirms ownership of the land by the holder of the title.

A central hypothesis of this study is that secure—titled—landownership will have a positive effect on access to credit because land can be pledged as collateral for loans. A corollary of this hypothesis is that usufruct certificates, such as the STK certificates distributed to squatters in the forest reserve areas, do not improve the access of squatters to institutional credit. This is because a usufruct certificate does not confer on the recipient the right to transfer land, except by inheritance. Without this ability to transfer ownership, usufruct certificates have no significance for lenders.

The lending decision involves many factors: the amount of the loan (if a loan is to be granted at all), the direct and indirect price (interest rate, or tied buying and selling deals), the duration of the loan, and the collateral or other security requirements. Some of these decisions may be simultaneous and others may be recursive; the duration or amount of the loan, for example, may depend on the type of collateral available. Since lenders face the risk of default or arrears on the part of the borrower, they naturally require borrower-specific information as well as general information, such as forecasts of product prices, that pertains to large groups of borrowers or potential borrowers. The costs entailed in acquiring information are one of the main distinctions between institutional and non-institutional lending.

For noninstitutional lenders, the costs are relatively low. These lenders are frequently part of the farmer's environment. They either live in the village or are there daily. They have established close acquaintance with the farmer, his family, and his social group. They may, in fact, be part of it. Thus, noninstitutional lenders have—or can collect at low cost—detailed and reliable information on the farmer, his skills, his background, his past record, the quality of his land, and so on. In contrast, collecting detailed information is costlier for institutional lenders, who do not usually have detailed, personal familiarity with farmers, although they may gain more information in time, if the farmer borrows repeatedly (Timberg and Aiyar 1984; Miracle 1983). Consequently, with less information, a borrower is riskier from an institutional lender's point of view than from that of a noninstitutional lender.

Another aspect which may further distinguish the risk perceptions of institutional lenders from those of noninstitutional lenders is related to the borrower's incentive to default and the lender's ability to enforce repayment. Since a noninstitutional creditor is a member of the farmer's social environment, he can mitigate against default by exercising social norms and pressures, such as concern for loss of status in the

community—which are not available to an institutional creditor (Von Pischke, Adams, and Donald 1983, 228). An informal lender can also apply threats or violent enforcement procedures, which institutional lenders cannot do (Bottomley 1983, 284). As a result of these considerations, an institutional lender will be more inclined to use measures, such as requiring loan security, that reduce the riskiness of a loan. The term “loan security” usually refers to the borrower’s pledging collateral or providing a collateral substitute.

The function of collateral in lending is discussed extensively by Binswanger and others (1985), Barro (1976), Benjamin (1978), and Plaut (1985). At a given rate of interest three effects of collateral can be identified: collateral increases the expected return to the lender and reduces the expected return to the borrower, it partly or fully shifts the risk of principal loss from the lender to the borrower, and it creates an incentive for borrowers to avoid intentional default. Thus, with a fixed rate of interest, the amount of the loan is expected to increase as the value of the collateral increases, other things being equal.

Collateral is not a risk-free asset; its value may fluctuate between the time of lending and the time of repayment. Binswanger and Rosenzweig (1986) rank, from highest to lowest, the desirability of typical agricultural assets as collateral: financial assets and jewelry, land, machinery, and animals. If the farmer has liquid financial assets, it is unlikely that he will need a loan. Further, because some assets such as bonds and long-term deposit certificates are not common in rural areas of developing countries, land is expected to be the most common type of collateral offered. For land to be suitable as collateral, however, the lender needs assurance that the occupier is indeed the legal owner. Usually possession of a title deed or a similar document issued by the state provides satisfactory evidence of legal ownership.

The utility of land collateral depends on the ability of both the legal system and the sociopolitical environment to effect foreclosure on agricultural land. Foreclosure usually entails considerable transaction costs, such as legal fees and auctioneers’ fees. These costs may in fact reinforce repayment discipline, however, and enhance the utility of collateral if the value of the collateral exceeds that of the loan. The reason is that these foreclosure transaction costs are deducted from the proceeds of the collateral sale and thus are borne by the borrower. Foreclosure therefore implies a significant cost to the farmer, so the lender’s threat to foreclose can deter him from defaulting or being in arrears. The risk of incurring a high transaction cost by an unintended default may cause farmers to forgo the use of collateral, even though doing so limits their access to credit, if the benefits of additional credit are outweighed by the potential loss implied by a default. Collateral serves as an added, implicit risk-reducing element by restricting the borrower’s ability to incur additional

institutional debt. Since a lender prefers that the borrower not become more heavily indebted—unless a priority ordering of creditors can be established—this restriction further enhances the usefulness of collateral to lenders.

Farmers who reside in areas in which suitable collateral is not common or who do not have acceptable collateral will resort to using collateral substitutes (Binswanger and others 1985) to obtain loans or to increase the amounts of loans. A frequent form of collateral substitute is a third-party guarantee. In lieu of collateral, the lender may accept the pledge of another person—a guarantor—to assume responsibility for repayment. For this arrangement to be workable, the guarantor must be less risky than the borrower and his risk should not be closely correlated with that of the borrower. A related collateral substitute is a “group guarantee”—a group of farmers is formed in which at least some of the members have acceptable collateral assets. They then borrow individually, but the group as a whole is responsible for each of its members’ loans. One of the principal benefits to the lender is the possibility that intentional defaults will be minimized, since other members can exert social pressure on potential defaulters. Also, because unintentional defaults of members are not perfectly correlated, there are more assets to serve as implicit collateral. Repayment discipline on loans obtained through group guarantee may be hampered, however, if cumbersome legal procedures make collection from members of the group on one member’s default difficult. Evidence from empirical studies suggests that in many instances the repayment performance of group-guaranteed loans is no better than that of unguaranteed individual loans (Adams and Ladman 1979; Onchan and Techavatananan 1982; Desai 1983).

Ownership of tradable assets such as machinery and land serves as implicit collateral, since the borrower may have an incentive to generate liquidity by sale of assets rather than lose future access to loans in case of default. Even if no formal collateral is pledged, owners of substantial assets are preferable as borrowers to those who have few assets.

Another collateral substitute is the formation of a long-term relationship with a lender, since it helps to reduce the lender’s uncertainty. If a farmer establishes a long record of good repayment performance, he may obtain a level of credit or terms that would not otherwise be available to him.

Institutional lenders are usually heavily regulated. In most instances they have to abide by usury laws, which dictate a lower rate of interest than that which would prevail if no constraints were imposed. Noninstitutional lenders are not regulated, and when regulation has been attempted, it has proved difficult to enforce. As a result, noninstitutional lenders almost always charge interest at higher rates than institutional lenders. Although the costs of information are comparatively low for the

noninstitutional lender, there are factors that generate higher lending cost. A noninstitutional lender, operating within a confined geographical area, has a high degree of covariability among his clients and fewer possibilities for diversification of risk than does a nationwide bank that operates in different agroclimatic zones. Further, noninstitutional lenders usually fund their operations from equity rather than from deposits, the reasons for which are related to the synchronic timing of withdrawal of deposits and the demand for credit, and the high covariation in incomes of borrowers and depositors as well (Binswanger and others 1985). Institutional lenders, by contrast, have more diversified sources of funding, so they can maintain a lower ratio of reserves to lending, which contributes to a lower lending cost.

Transaction costs incurred by the borrower are a frequently mentioned aspect that differentiates institutional sources of credit from noninstitutional sources. In many areas, obtaining institutional loans is a lengthy, time-consuming process: first there is the time farmers spend obtaining appropriate documentation, filling out forms, and meeting the appropriate officials, which is followed by a lengthy period for processing the loan application. Noninstitutional lenders do not impose time-consuming procedures. Because they may be located within the farmers' environment, they can agree on loans and disburse them within days. This seems to imply that if borrowing needs are small, the farmer may prefer noninstitutional credit, even though the interest rate is higher (Ladman 1984; Adams and Nehman 1979). It should be noted that in Thailand, borrowing from the Bank for Agriculture and Agricultural Cooperatives (BAAC)—by far the largest institutional lender to farmers—does not seem to carry high transaction costs. As indicated by Onchan (1984, 65), applications to borrow from BAAC are processed within a short period, as a result of streamlined procedures, a larger lending staff, and a large number of branch offices.

If borrowing from institutional lenders entails relatively low transaction costs and the institutional interest rate is significantly lower than noninstitutional rates, farmers would obviously prefer to borrow from institutional sources. Because the interest rate is fixed, however, institutional credit is likely to be rationed, and unsatisfied demand may have to be covered by noninstitutional sources. As Stiglitz and Weiss (1981), Virmani (1986), and other works reviewed by Braverman and Guasch (1986) have demonstrated, even when interest rates can move freely, credit rationing can be optimal because of adverse selection and asymmetric information. It is thus possible that farmers are rationed by noninstitutional lenders as well. In the case of rural areas with highly localized noninstitutional lenders, asymmetry in the information between lender and borrower may be small. The likelihood of rationing by noninstitutional lenders may therefore be lower.

In the preceding chapter we indicated that farmers regard the ability to use land as collateral as a significant benefit of secure legal ownership. Squatters cannot legally offer land as collateral; therefore they cannot obtain from institutional lenders loans of the duration and magnitude of those that are available to titled farmers who can provide land as collateral. Even when land is not offered as formal collateral, owners of titled land have a more valuable asset than holders of untitled land. Since land can be regarded as implicit collateral, it follows that owners of titled land will have, other things being equal, better access to institutional credit even if they do not pledge collateral.

The usefulness of collateral in Thailand depends on the desire and ability of lenders to enforce foreclosure on defaulting borrowers. The use of agricultural land as loan collateral in Thailand dates from the nineteenth century and has increased in frequency with the commercialization and progress of the agricultural sector. Concomitant with this development, legal procedures were established to clarify and standardize mortgage transactions (Feeny 1982, 96, 189–90; Tornosugi 1980). Evidence cited by Stifel (1976) and Mehl (1986) indicates that foreclosures do take place. Bank branch managers interviewed for this study indicated that in recent years banks, including the government bank, have increased the number of foreclosures enforced to demonstrate to farmers that foreclosure is a real threat in the event of default. Some have suggested that this strategy has reduced the need actually to enforce mortgages. Thus in many instances when the loan is backed by collateral an initial notification by the court is sufficient to induce a delinquent borrower to pay.

Empirical Evidence

We shall now review data pertaining to credit transactions of farmers sampled in the four provinces of Thailand. The sample of farmers is divided, according to security of ownership, into two groups: untitled and titled farmers. In Chaiyaphum, the sample of untitled farmers in the province is disaggregated further by distinguishing farmers who have received usufruct certificates (STK) from those who have not. We shall begin by observing general patterns of borrowing among sample farmers. Table 8 describes the composition of borrowing from various sources. Note that the incidence of borrowing is higher in Lop Buri than in the other three provinces. This accords with the fact that Lop Buri is the most commercial province in the sample. There are no significant differences between titled and untitled farmers in the incidence of nonborrowing. These findings are compatible with the possibility that many of the nonborrowers are constrained by demand rather than by supply. Most of the differences in the incidence of borrowing from various sources are insignificant. There is, however, the somewhat puzzling fact that in Lop Buri the percentage of ti-

Table 8. Borrowing by Farmers from Institutional and Noninstitutional Sources
(percentage of farmers sampled)

<i>Type of Source</i>	<i>Province</i>								
							<i>Chaiyaphum</i>		
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Untitled</i>		
	<i>Untitled</i>	<i>Titled</i>	<i>Untitled</i>	<i>Titled</i>	<i>Untitled</i>	<i>Titled</i>	<i>With STK</i>	<i>Without STK</i>	<i>Titled</i>
Nonborrowers	13	9	32	35	52	54	52	33	41
Institutional sources only	15	22	45	40	18	30	22	39	35
Noninstitutional sources only	22	40	17	15	23	13	20	19	21
Both institutional and noninstitutional sources	50	29	6	10	7	3	6	9	3
Number of observations	98	82	89	72	61	82	46	74	112

tled farmers who borrow solely from noninstitutional sources is larger than the comparable percentage of untitled farmers.

A more detailed analysis of loans by source is provided in table 9. Clearly, the government-owned BAAC is the largest source of institutional credit. The table indicates that the importance of traders as a source of credit increases with the degree of commercialization of the province. In Lop Buri province nearly half of all loans and the bulk of noninstitutional credit are provided by traders. By contrast, in the less commercial north-eastern provinces the function of traders is less significant. Lending by relatives and neighbors declines with higher degrees of commercialization. To judge by the interest rates charged, many of these loans are commercial transactions priced at market rates. Some are intrafamily transactions, however, which carry low—or zero—rates of interest and in which lenders are motivated by other considerations (Ben-Porath 1980).

Table 10 describes the mean rate of interest on loans from institutional and noninstitutional lenders and the composition of lending maturities. Clearly, because institutional credit in Thailand is subject to an interest rate ceiling, loans from regulated institutional creditors are substantially cheaper. In addition, the government-owned BAAC has a fixed rate for agricultural loans which is set 1 to 3 percentage points below the interest rate ceilings. The somewhat lower institutional rates in the Chaiyaphum sample indicate that the survey was conducted in 1986—one year later than in the other provinces—when the interest rate ceiling was reduced by 2 percentage points. Most loans are for short terms—twelve months or less. Noteworthy, however, are the facts that more medium-term and long-term loans are provided by institutional lenders than by noninstitutional lenders and that titled farmers obtain such loans much more often than do untitled farmers. This is compatible with the observation that untitled farmers lack acceptable land collateral and are thus perceived by institutional lenders as potentially high-risk clients, other things being equal.

In our earlier discussion we pointed out that because noninstitutional lenders have superior information about borrowers, they are less inclined to require collateral or collateral substitutes. The discussion further suggested that, because land is the most suitable collateral, it is more likely to be used as collateral if the farmer has registered it legally. These propositions are borne out in table 11. Compatible with findings from other developing countries cited by Bottomley (1983), our data revealed that an overwhelming majority of noninstitutional loans are granted without collateral. In contrast, the majority of institutional loans in our sample are covered by collateral or collateral substitutes. In the few instances in which collateral was provided on noninstitutional loans, land was the predominant form.

The type of collateral offered for institutional loans by titled farmers

Table 9. The Distribution of Loans, by Source
(percentage of total number of loans)

Source of credit	Province								
							Chaiyaphum		
	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Untitled		
	Untitled	Titled	Untitled	Titled	Untitled	Titled	With STK	Without STK	Titled
<i>Institutional lenders</i>									
BAAC ^a	46	33	46	54	26	40	38	61	38
Commercial banks	0	6	1	9	5	9	4	0	7
Cooperatives	7	3	21	10	14	16	4	1	21
Other institutions	0	0	3	0	2	2	0	0	0
Total institutional lenders	53	42	71	73	47	67	46	62	65
<i>Noninstitutional lenders</i>									
Landlords	1	0	0	0	0	4	0	0	0
Relatives and neighbors	2	8	20	10	43	25	17	16	7
Traders	43	48	9	16	10	2	37	21	28
Other noninstitutional lenders	1	1	0	1	0	2	0	0	0
Total noninstitutional lenders	47	58	29	27	53	33	54	38	35
Number of observations	62	120	76	69	42	45	24	62	77

a. Bank for Agriculture and Agricultural Cooperatives.

Table 10. The Distribution of Loan Characteristics, by Title Status and Source

Item	Province								
							Chaiyaphum		
	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Untitled		Titled
	Untitled	Titled	Untitled	Titled	Untitled	Titled	With STK	Without STK	
<i>Institutional lenders</i>									
Mean interest rate (percent)	14.2	15.0	14.5	14.1	16.4	17.1	14.0	13.7	13.8
Number of short-term loans as percentage of total number of loans	99	88	100	94	100	60	91	95	78
<i>Noninstitutional lenders</i>									
Mean interest rate (percent)	51.5	46.2	49.2	49.7	56.1	38.5	42.5	56.8	54.0
Number of short-term loans as percentage of total number of loans	100	100	95	100	95	100	100	100	96
Number of observations	162	120	76	69	42	45	24	62	77

Table 11. The Distribution of Loans, by Source and by Type of Collateral
(percentage of loans made)

Type of collateral	Province									
	Lop Buri			Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
								Untitled		
	Untitled	Titled		Untitled	Titled	Untitled	Titled	With STK	Without STK	Titled
<i>Institutional lenders</i>										
Number of borrowers in sample	86	50		54	50	20	30	11	38	50
No collateral	14	4		48	14	25	10	0	0	0
Land	8 ^a	78		6 ^a	54	10 ^a	47	18 ^a	11 ^a	56
Third-party guarantee	1	0		2	0	0	0	0	13	0
Group guarantee	77	18		44	32	65	43	82	76	44
<i>Noninstitutional lenders</i>										
Number of borrowers in sample	74	68		22	19	22	15	13	23	27
No collateral	93	79		86	84	64	87	100	91	77
Land	7 ^a	21		9 ^a	11	4 ^a	7	0	4 ^a	15
Other	0	0		5	5	32	6	0	4	8

a. Some untitled farmers' homes—and the lots on which they are built—are located outside the boundaries of state land and may therefore be offered as collateral. The number of such farmers is small.

differs significantly from that offered by untitled farmers. Since untitled farmers cannot offer land as collateral, they are obliged to provide a collateral substitute—namely, a group guarantee—to obtain institutional loans. Titled farmers, by contrast, can—and did—offer their land as collateral in 53 percent of the institutional loans in the three northeastern provinces and in more than three-quarters of the institutional loans in Lop Buri province. The data also confirm that, while official BAAC policy does not require land collateral for short-term loans (Bhisalbutra 1984), in our sample, titled farmers used land as collateral for more than half the BAAC loans. Commercial, nongovernment banks in the sample are more inclined to require land as collateral: 85 percent of the loan transactions with such banks involved land collateral. Untitled farmers had therefore only a low incidence of credit from commercial banks. Twenty-one bank branch managers, in both commercial banks and the BAAC, interviewed during this study said they had found that land collateral improved performance in the repayment of loans and that they are thus inclined to provide more credit to a borrower who offers land as collateral.

As argued earlier, a group guarantee is less desirable than land as collateral. A group guarantee is therefore expected to provide a smaller amount of credit. This assertion is confirmed by data on loan amounts per unit of land owned presented in table 12. In all provinces, institutional loans covered by land as collateral are larger than loans without collateral or loans with group guarantees. The difference is largest in Khon-Kaen, where institutional loans secured by land as collateral are three times as large as the mean size of loans not covered by land as collateral. The comparable figure is somewhat lower—200 percent in Nakhon Ratchasima—and it is only 23 percent in Lop Buri and Chaiyaphum. It is noteworthy that in two of the provinces loans with group guarantees are smaller than loans with no guarantee. This suggests that expected repayment performance on group-guaranteed loans is no better than on unguaranteed individual loans. This has indeed been the experience in Thailand and in several other developing countries in which group lending has been practiced (Desai 1983).¹

In turning to the amounts of loans provided by noninstitutional lenders, the importance of collateral varies among the provinces. In Lop Buri, land as collateral is apparently not significant to noninstitutional lenders: the mean loan per unit of land without collateral is larger than the mean loan with collateral. In the three northeastern provinces, however, land as collateral seems to offer advantages even in the noninstitutional credit sector. Since most noninstitutional loans in the northeastern provinces are obtained without collateral, however, sample sizes are small for noninstitutional loans with collateral, so conclusions based on these figures should be properly qualified.

Although in the data presented in table 12 no distinction is made

Table 12. Average Amount of Loan per Rai Owned, by Type of Security and Type of Lender
(baht per rai)

<i>Type of loan security</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Institutional lenders</i>	<i>Non- institutional lenders</i>	<i>Institutional lenders</i>	<i>Non- institutional lenders</i>	<i>Institutional lenders</i>	<i>Non- institutional lenders</i>	<i>Institutional lenders</i>	<i>Non- institutional lenders</i>
No security	324	563	262	105	114	153	n.a.	72
Number of loans	14	137	40	41	10	49		55
Group guarantee	297	n.a.	178	n.a.	290	n.a.	259	n.a.
Number of loans	77		65		45		60	
Land collateral	372	402	427	373	776	524	319	104
Number of loans	52	21	44	4	19	4	34	5

n.a. Not available.

Note: 26 baht = 1 U.S. dollar; 6.25 rai = 1 hectare.

between loans granted to titled farmers and those made to untitled farmers, further analysis shows that even when identical types of loan security are provided, titled farmers obtain more institutional credit per unit of land than do untitled farmers. Compared with an average of 252 baht per rai that the pooled sample of untitled borrowers received for loans with group guarantees, for example, titled borrowers obtained 15 percent more, or an average of 290 baht per rai. Similarly, while untitled borrowers without loan security obtained an average of only 262 baht per rai from institutional sources, titled borrowers without loan security obtained almost twice that amount, 515 baht per rai. These findings suggest that even when land is not formally offered as collateral, titled land is more valuable as implicit collateral, allowing titled farmers to obtain more institutional credit than untitled farmers can obtain.

Note an important observation in table 12 related to the amount of noninstitutional credit available in Lop Buri. In this province the amount of noninstitutional loans per unit of land is substantially higher than the amount of the mean institutional loan for other comparable collateral categories. Similarly, unsecured noninstitutional loans in Lop Buri are substantially larger than comparable loans in other provinces. The abundance of noninstitutional credit available in Lop Buri and the fact that it can be obtained without land as collateral suggest that legal land titles have less influence on economic activity in this province than in the other provinces included in the study.

The substantial volume of noninstitutional credit in Lop Buri is related to the high level of activity of traders there. The traders' activities are apparently induced by the prevalence of cash crops of high value with stable prices and less risky agroclimatic conditions. These traders find credit transactions conducive to the conduct of their business, moreover, and indeed provide about half of all loans. In contrast to Lop Buri, traders are less prevalent and hence contribute a significantly smaller proportion of the credit transactions in the northeastern provinces.

Disequilibrium Econometric Model of Institutional Credit

The foregoing data are generally compatible with propositions formulated in the preceding sections. Comparisons among group means and between relative frequencies, however, do not allow conclusive answers. Implicit in the data are other factors besides security of ownership that may influence the supply of and demand for loans and these may affect means in a systematic manner. The standard approach to analysis of market-observed quantities and prices is to assume equilibrium and estimate supply and demand equations where price—or quantity—is the dependent variable. As argued earlier, however, credit rationing does exist, so the market may not be in equilibrium. This is particularly likely

with respect to institutional credit, where a state-enforced fixed rate of interest prevails. The observed amounts of loans to a sampled farmer, therefore, could be either supply-determined—that is, the farmer would have liked to borrow more than the lender approved—or demand-determined, which means that the farmer could have borrowed more than he did. The econometric approach suitable for dealing with data generated by disequilibrium in the market is popularly known as switching regressions. This approach uses a maximum likelihood procedure to obtain simultaneous estimates of the coefficients of supply-and-demand equations, which are efficient, consistent, and asymptotically normal. The estimated system is defined formally as:

$$(5-1) \quad L_1 = \alpha'X + \epsilon_1 \quad (\text{supply of institutional credit})$$

$$(5-2) \quad L_2 = \beta'Z + \epsilon_2 \quad (\text{demand for credit})$$

$$(5-3) \quad L = \min. (L_1, L_2) \quad (\text{observed borrowing from institutional lenders})$$

where L_1 is the amount of institutional credit lenders are willing to provide,

X is a vector of farmers' characteristics that influence the perceptions of lenders,

α is a corresponding vector of parameters,

L_2 is the amount of credit the farmer would like to have,

Z is a vector of factors that determine the farmer's credit requirements,

β is a corresponding vector of parameters, and

ϵ_1 and ϵ_2 are random error terms that are assumed to be normally distributed with mean zero.² Since transaction costs incurred by Thai farmers who request institutional credit are low, a farmer is expected to try to satisfy his total credit needs from cheaper institutional sources first. Then only if he still needs more credit—at a higher rate of interest—will he approach noninstitutional lenders. This implies that information on a farmer's transactions in the noninstitutional credit market does not affect the estimates of the parameter vectors α and β of equations 5-1 and 5-2. It also implies that equation 5-2 represents the farmer's overall demand for credit at the prevailing institutional interest rate.³

Rigorous models of the supply of and demand for credit have already been developed (Barro 1976; Bell and Srinivasan 1985); we therefore provide only an outline of the theory underlying the variables used in the empirical analysis and their expected effects. In general, supply variables incorporated in the supply equation are indicators that tend to be relatively easy for an institutional lender to observe or verify. Demand variables, by contrast, reflect variables known to the borrower but not necessarily to the lender.

Determinants of institutional credit supply

Land collateral dummy. The provision of land as formal collateral greatly reduces the risk to the lender and thus is expected to increase the amount of credit offered above the amount offered when no collateral is provided. Only titled land can be offered as collateral.

Group collateral dummy. The practice of group lending implies, theoretically, that the group is collectively responsible for repayment of the loan if a member borrower defaults. In areas in which the repayment performance of group loans has been good, the amount of credit offered is expected to be larger than the amount offered without collateral. The amount of credit offered with group collateral, however, is expected to be less than that offered with land as collateral—that is, the parameter of the land collateral dummy variable will be larger than the parameter of the group collateral dummy variable. In areas in which repayment performance on group-guaranteed loans is poor, the amount of credit offered with a group guarantee is not expected to be larger than that offered on individual unguaranteed loans. It may even be less, if the individual loans have a better repayment record. Thus, the parameter of the group collateral dummy variable could be either positive or negative, since it measures the availability of credit in comparison with the amount available for unsecured individual loans.

In Chaiyaphum province, there are no observations of institutional credit without security, but there are five observations with third-party guarantees. The group collateral was therefore made a reference dummy variable by omitting it and by introducing dummy variables for other guarantees and for land collateral. Accordingly, for Chaiyaphum the dummy for land collateral in the supply equation directly measures the difference in the supply of credit available to farmers who provide land as collateral and that available to farmers who provide group collateral.

Land value. Land is usually the most valuable asset owned by the farmer, and as such it can serve to generate cash through sale if cultivation revenues are not sufficient. Land is also a productive factor that generates cash income. Land value summarizes the productive potential of the land, such as the quality of the soil, proximity to market, and land improvements. Farmers with higher total land values are expected to be offered more institutional credit.

Capital. Farm capital indicates both the productive capacity of the farm and its cash value as an asset that can serve as implicit collateral. Farmers with more capital, measured in current value, are expected to be offered more credit.

Liabilities to formal lenders. Outstanding debt to institutional lenders drains a farmer's cash resources and is therefore expected to have a negative effect on the amount of credit a farmer is offered. Debt to informal lenders is not included as a factor that affects the supply of institutional credit because it is not easily observable or verifiable by formal lenders.

Past default dummy. Past default on payments to institutional lenders is expected to have a negative effect on a farmer's creditworthiness and hence the supply of institutional credit offered to him.

Formal liquidity. A farmer with more liquid assets is unlikely to default, since he can use his liquid resources to generate the cash required to repay a loan and thereby avoid incurring the costs of default. Most liquid assets, however, such as stores of unsold produce and jewelry, are not easy for the institutional lender to observe or verify. Thus, we define outstanding deposits in financial institutions as the only indicator of formal liquidity observable by institutional lenders. Formal liquidity is expected to increase the supply of credit.

Experience. The number of years a farmer has managed the farm is expected to increase his productivity and thus positively influence a lender's assessment. This variable is highly correlated with age, however. If younger farmers are perceived as being more innovative, the effect on the supply of credit will be negative.

Title dummy, STK dummy. We introduce these dummy variables in the equations for Chaiyaphum province to test whether squatters with usufruct certificates (STK) obtain more institutional credit than squatters without the certificate. The dummy variable is dropped for nonrecipients of STK certificates, who serve as a reference group. Our a priori hypothesis is that while land title will have a positive effect on the supply of institutional credit, the STK certificate will have no effect, since the certificate offers no advantages to the lender.

Demand variables

Number of adults. The number of adults of working age—14–65 years—in the household represents a fixed endowment in the short run that reduces the need for cash to hire labor. This variable is also an important determinant of consumption requirements, however, and could thus affect the demand for credit positively. The final effect on demand is thus undetermined.

Education. The number of years of formal schooling is an indicator of human capital that affects efficiency positively.⁴ Greater human capital increases the marginal productivity of variable inputs and thus increases the demand for inputs and the derived demand for cash.

Experience. The number of years a farmer has been the primary decisionmaker on the farm is an indicator of human capital and would thus be expected to have an effect qualitatively similar to that of education. Because experience is highly correlated with age, however, and age may be negatively related to innovativeness, the ultimate effect on the demand for credit may be either positive or negative.

Title dummy. As argued earlier, possession of a legal title increases security of ownership and thereby increases investment incentives. A larger demand for investment translates into a larger demand for credit; thus possession of title is expected to affect the demand for credit positively.

Capital. The effect of capital on the demand for credit is complex, entailing several countervailing effects. When production complementarity exists, a greater stock of capital increases the marginal productivities of variable inputs and induces a larger derived demand for credit. A larger stock of capital, however, reduces the need to hire machine and animal services and thus reduces the need for cash, so the net effect of capital stock on the demand for credit is ambiguous.

Owned land, adjusted for quality. Land is a primary determinant of a farmer's scale of operation and production potential. Land productivity differs among farmers, however, because of the diversity of land characteristics. Since land of higher quality increases the marginal productivity of variable inputs, the amount of land owned must be adjusted for differences in quality. To control for these differences, we use a land quality index derived from a hedonic price analysis of land values (see chapter 7). The index places a premium on better soils, favorable location, land improvements, and so on. It is expected that larger amounts of land owned increase the total demand for variable inputs, thereby increasing the demand for credit.

Net liquidity. The farmer's liquidity, including liquid assets such as unsold products that are not easy for the formal lender to observe or verify, will affect the demand for cash negatively. Since not all assets are equally liquid, however, there may be a countervailing effect. Some assets such as product stores, for example, can be easily converted into cash but some loss may be incurred if they are not sold at the right time. Therefore,

the farmer may prefer to keep these assets for later sale or as a reservoir of liquidity and obtain cash through a loan. By retaining a larger reservoir of potential liquidity, however, the farmer faces a lower risk of costly default. A reservoir of potential liquidity also eliminates the need for distress sales of fixed assets to avoid default. Such sales entail a very high transaction cost. Thus, a farmer's holdings of substantial imperfectly liquid assets can affect credit demand positively.

STK dummy. In the equations estimated for Chaiyaphum province, we introduce a dummy variable to test whether the demand for credit by recipients of STK certificates differs from the demand by nonrecipients.

As specified in the foregoing, the demand and supply equations can be regarded as structural equations, because several of the variables, such as capital, liquidity, and land owned, are endogenous in the long run. Since these variables are predetermined at the time of decisions about supply and demand, estimation of the model does not necessarily entail econometric problems. It is possible, however, that the demand equation is determined in part by unobserved variables, such as a farmer's ability, that are correlated with the long-run endogenous variables; a more able farmer, for example, will accumulate more capital. In such an instance, estimates of the parameters of the structural equation are biased. The problem can be addressed, however, by replacing the endogenous variables with their reduced-form equations, which include truly exogenous variables. The exogenous variables include *initial endowments* of land and capital and the wealth of the farmer's father. Replacing the endogenous variables of the demand equation by exogenous variables yields a reduced-form demand equation. There is no need to replace the endogenous variables in the supply equation, since it is unlikely that the error term of that equation includes unobserved characteristics of farmers correlated with the predetermined endogenous variables.

The exogenous variables added to the demand equation are the initial endowments of land and capital, land owned by the farmer's father, and an index of land quality. The land quality index omits improvements to the land introduced by the farmer because they are endogenous but retains other indicators of land quality such as location and soil type. Most of the coefficients in the reduced-form demand equation are expected to have ambiguous effects, since they reflect countervailing effects. Although initial capital, for example, affects both present amount of capital and amount of land owned positively, these two variables may have contradictory effects on the demand for credit. Similarly, education affects the accumulation of both capital and land. Since our purpose is to estimate the effect of landownership security on the supply of credit, the specific results for the demand equation are of little concern. The crucial consideration is that the econometric procedures reflect the possibility of

market disequilibrium, so that biases from misspecification are avoided.

The analysis does not include variables that pertain to cropping decisions—the area cultivated, the crops selected—since they are determined simultaneously with the farmer's demand for credit. The interest rate on institutional credit is nearly identical for all sampled farmers because interest rates are regulated in Thailand. It is therefore excluded from the list of explanatory variables. Also, because of limitations of the maximum likelihood program used in the estimation, households that did not borrow from institutional lenders were excluded from the sample. These households may have been rationed out by institutional lenders or they may have had no need for credit. The supply estimate thus pertains to the portion of the supply schedule that deals with positive allocations of credit.

The results of the estimation are reported in table 13. For each province, the first column presents the ordinary-least-squares estimates (OLS) of the institutional credit supply equation. The estimates are valid only if all observations are supply-constrained—that is, if credit to all observed borrowers is rationed. The second column presents coefficients of supply and demand, allowing for market disequilibrium by using the structural specification. The third column presents estimates of supply and demand under disequilibrium, where the demand equation is specified in reduced form.⁵ Except for the OLS estimate for Chaiyaphum in all versions, the coefficient of the land collateral dummy variable in the supply equation is significantly greater than zero at the 95 percent—one-tailed—confidence level. This confirms that pledging land as collateral significantly increases the amount of institutional credit offered above that offered when no collateral is pledged. The coefficient of the group-collateral dummy variable is not significantly different from zero in all versions, except in the structural disequilibrium specification for Khon-Kaen. The coefficient of the land collateral is larger than that of the group collateral in all estimated equations, and the difference is statistically significant at a 95 percent confidence level in all versions, except in the structural disequilibrium estimate for Khon-Kaen, where the difference is significant at the 90 percent confidence level. In Chaiyaphum the difference between land as collateral and a group guarantee is given directly by the parameter of the land collateral dummy, and the difference is significant at the 95 percent confidence level. This implies that farmers who pledge land as collateral obtain more institutional credit than farmers who provide other types of security or no security at all.

As expected, the parameter of land value in the supply equation is significantly greater than zero in Lop Buri and Nakhon Ratchasima, but it is not significantly different from zero in Khon-Kaen and Chaiyaphum. In addition, in Lop Buri, capital has a significant positive effect on the sup-

Table 13. Estimates of the Supply of and Demand for Institutional Credit

Variable	Province										
	Lop Buri (N=116)			Nakhon Ratchasima (N=113)			Khon-Kaen (N=49) ^a		Chaiyaphum (N=92)		
	Ordinary	Disequilibrium model		Ordinary	Disequilibrium model		Ordinary	Disequilibrium model	Ordinary	Disequilibrium model	
		least squares	Structural model		Reduced form ^b	least squares		Structural model		Reduced form	least squares
<i>Supply equation</i>											
Land collateral	0.4985 (2.704)	0.3643 (2.091)	0.3654 (2.078)	0.5342 (2.652)	1.6857 (1.712)	0.8407 (7.017)	1.228 (2.524)	1.9194 (2.345)	0.0603 (0.492)	1.6944 (2.210)	1.6773 (2.481)
Group collateral	0.0669 (0.398)	-0.0666 (0.421)	-0.0854 (0.526)	-0.1098 (0.606)	-0.5620 (1.222)	-0.0242 (0.259)	0.627 (1.332)	1.0125 (1.805)	n.a. n.a.	n.a. n.a.	n.a. n.a.
Other collateral	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.1896 (0.759)	0.1751 (0.532)	0.1562 (0.549)
Land values	0.1971 (3.069)	0.1694 (2.547)	0.2285 (3.668)	0.2258 (2.699)	0.3078 (1.468)	0.1836 (2.946)	0.0384 (0.236)	-0.3276 (0.591)	0.0350 (1.351)	0.0007 (0.035)	0.0018 (0.080)
Capital	0.0565 (2.610)	0.0508 (2.368)	0.0561 (2.970)	0.0142 (0.530)	0.0236 (0.394)	-0.0370 (1.685)	0.0233 (0.347)	0.2004 (0.870)	0.0231 (1.230)	-0.00001 (0.0004)	0.0047 (0.196)
Debt to formal lender	-0.0320 (1.829)	-0.0404 (2.491)	-0.0366 (2.200)	0.0250 (0.914)	0.1259 (0.645)	-0.0146 (1.034)	0.0535 (1.617)	0.1086 (1.183)	0.0178 (1.489)	0.0033 (0.409)	0.0025 (0.297)
Past default (dummy)	-0.0050 (0.041)	-0.0205 (0.182)	0.0923 (0.784)	0.1626 (0.567)	1.0175 (0.209)	-0.1031 (0.614)	0.2023 (0.582)	0.3861 (0.319)	-0.0834 (0.650)	0.4556 (1.815)	0.4708 (1.691)
Formal liquidity	0.0085 (0.618)	0.0004 (0.028)	0.0059 (0.464)	0.0294 (1.505)	0.0594 (1.219)	0.0009 (0.084)	0.0517 (1.504)	0.1262 (1.534)	0.0147 (0.850)	0.0045 (0.368)	0.0056 (0.453)

Experience	-0.2479	-0.2193	-0.1075	0.0788	0.7973	-0.1596	-0.0846	-1.2257	0.0334	0.1535	0.1512
	(2.121)	(1.884)	(0.939)	(0.503)	(1.322)	(1.405)	(0.283)	(1.273)	(0.326)	(1.815)	(1.734)
Title (dummy)	—	—	—	—	—	—	—	—	0.1592	0.1516	0.1496
									(1.280)	(1.671)	(1.616)
STK (dummy)	—	—	—	—	—	—	—	—	0.1084	-0.0849	-0.0672
									(0.629)	(0.493)	(0.361)
Constant	8.4831	8.8431	8.1113	7.0393	5.0790	9.0583	7.673	11.273	8.3245	8.6585	8.6123
	(18.678)	(17.524)	(17.961)	(12.233)	(3.392)	(20.347)	(6.836)	(2.792)	(20.968)	(20.986)	(22.220)
<i>Demand equation</i>											
Number of adults	—	2.2356	2.3322	—	-0.2236	0.1280	—	1.3145	—	-0.1429	0.0981
		(1.402)	(2.203)		(0.937)	(0.201)		(1.571)		(0.550)	(0.396)
Education	—	-0.4084	-0.3096	—	0.0137	0.4001	—	-0.2108	—	0.1753	0.1630
		(1.211)	(1.338)		(0.154)	(2.246)		(0.005)		(1.227)	(1.006)
Experience	—	-0.9145	-2.2675	—	-0.2740	0.7448	—	0.2956	—	-0.1819	-0.0466
		(0.955)	(3.012)		(0.945)	(1.690)		(0.734)		(0.568)	(0.161)
Title (dummy)	—	8.0803	0.0352	—	0.2337	-0.0869	—	0.6416	—	-0.1492	-0.1557
		(0.407)	(0.080)		(1.251)	(0.172)		(1.226)		(0.625)	(0.679)
STK (dummy)	—	n.a.	n.a.	—	n.a.	n.a.	—	n.a.	—	0.2048	-0.0913
										(0.580)	(0.259)
Capital	—	0.1063	—	—	-0.0093	—	—	-0.5443	—	0.0552	—
		(0.777)			(0.272)			(1.592)		(1.215)	
Owned land (adjusted for quality)	—	0.3956	—	—	0.0490	—	—	0.8268	—	0.1840	—
		(0.384)			(0.366)			(2.120)		(0.953)	
Net liquidity	—	-0.0626	—	—	0.2319	—	—	-0.0251	—	0.1044	—
		(0.260)			(4.672)			(0.116)		(0.623)	
Land owned by father	—	—	-1.0834	—	—	0.3383	—	—	—	—	-0.0018
			(2.990)			(2.047)					(0.029)

(Table continues on the following page.)

Table 13 (continued)

Variable	Province											
	Lop Buri (N=116)			Nakhon Ratchasima (N=113)			Khon-Kaen (N=49) ^a			Chaiyaphum (N=92)		
	Ordinary	Disequilibrium model		Ordinary	Disequilibrium model		Ordinary	Disequilibrium model		Ordinary	Disequilibrium model	
		least squares	Structural model		Reduced form ^b	least squares		Structural model	Reduced form		least squares	Structural model
Land held initially	—	—	0.0100 (0.933)	—	—	0.0536 (0.453)	—	—	—	—	—	-0.0245 (0.277)
Capital owned initially	—	—	-0.2556 (3.512)	—	—	-0.0224 (0.439)	—	—	—	—	—	0.0256 (1.131)
Land quality index	—	—	-1.8020 (0.499)	—	—	-1.0492 (0.920)	—	—	—	—	—	-0.7537 (1.042)
Constant	—	11.1641 (2.292)	23.5756 (4.745)	—	8.1431 (7.815)	5.6466 (3.836)	—	10.063 (0.061)	—	7.4229 (4.187)	9.2719 (6.740)	
Likelihood ratio statistic ^c	45.8	55.5	73.8	37.1	85.4	103.5	14.9	36.2	12.65	71.6	63.8	

— Not applicable.

Notes: Double logarithmic regressions. Numbers in parentheses are *t* values for OLS estimates and asymptotic *t* values for estimates of the disequilibrium model.

a. In the reduced-form model the demand equation is specified in its reduced form, but the supply equation is the same as in the structural model.

b. The reduced-form version for this province could not be estimated for lack of convergence.

c. The likelihood ratio statistic is twice the logarithm of the ratio of the likelihood function under the null hypothesis that all coefficients except the intercept are zero and under the alternative model specification. The statistic has a X^2 distribution.

ply of credit, while liabilities have a significant negative effect. The coefficients of these variables are not statistically significant in several of the other supply estimates. A few counterintuitive signs are encountered, but they are not significantly different from zero at the 95 percent—two-tailed—confidence level. The amount of observable liquidity affects the supply of institutional credit positively in most estimates, but statistical significance—at the 95 percent, one-tailed, confidence level—is obtained in only a couple of the estimates. Age, denoted by the experience variable, has a negative effect on the supply of institutional credit in three of the provinces. The estimates for Chaiyaphum province indicate that possessing titled land has a significant positive effect on the supply of institutional credit even if it is not formally pledged as collateral. The possession of an STK certificate, however, does not provide squatters with any significant credit advantages. In fact the parameter is negative, although not statistically significant.

The estimated parameters of the demand equation are not discussed, since their expected signs could be positive, negative, or negligible. The analysis shows that credit rationing in the formal sector is substantial: 98 percent of the borrowers in Lop Buri and nearly 60 percent of the borrowers in the other provinces had a high probability—more than 50 percent—of having credit rationed to them.

The numerical results of the supply parameters indicate that titled farmers who provide land as collateral receive a substantially larger amount of institutional credit than do untitled farmers. The effect has two components: the direct effect of land pledged as collateral and the indirect effect of greater land value associated with possession of a title. The credit advantage is also reflected in the direct effect of title in the equations for Chaiyaphum. The second component is measured by using estimates from a hedonic price analysis of land values (see chapter 7), which incorporated the effect of titles. Details of the calculation are provided in table 14. The results show that titled farmers who provide land as collateral are offered significantly more institutional credit than are identical untitled farmers. In the highly commercial province of Lop Buri, titled farmers enjoy an advantage of 52 percent over untitled farmers. The difference is much larger in the northeastern provinces: 521 percent in Chaiyaphum, 171 percent in Nakhon Ratchasima, and 148 percent in Khon-Kaen.

The empirical evidence of this chapter indicates that in rural Thailand security of ownership provides significant advantages in obtaining institutional credit. Security of ownership, however, or the possession of a legal landownership document, is possible only if the occupant is not a squatter on state-owned land. Although squatters face a relatively small risk of eviction, lack of ownership security bars them from pledging land as collateral for institutional credit. Instead, squatters resort to collateral

Table 14. The Effects of Titled Ownership on the Supply of Institutional Credit

<i>Item</i>	<i>Province</i>			
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Chaiyaphum</i>
1. Direct effect of land as collateral on supply of institutional credit ^a	0.3654	0.8407	1.9194	1.6773
2. Effect of land title on value of land ^b	0.2264	0.8431	0.7605	0.4310
3. Effect of land value on supply of institutional credit ^c	0.2285	0.1836	0 ^d	0 ^d
4. Effect of title on supply of institutional credit through value of land ^e	0.0517	0.1548	0	0
5. Direct effect of title ^f	0	0	0	0.1496
6. Effect of best alternative loan security available to untitled farmers ^g	0	0	1.0125	0
7. Total logarithmic difference between supply of credit to titled farmers who provide land as collateral and that to untitled farmers ^h	0.4171	0.9955	0.9060	1.8269
8. Percent difference between availability of institutional credit to titled farmers and to untitled farmers ⁱ	52	171	148	521

a. From table 13, first line. Reduced-form estimates are used for all provinces except Khon-Kaen, for which the structural model coefficient is used.

b. From table 17, first line.

c. From table 13, fourth line.

d. Since the coefficient of land value in table 13 is not statistically significant, it was set at zero.

e. Line 2 \times line 3 = line 4.

f. From table 13, tenth line.

g. If no guarantee is as good as or better than a group guarantee, this line is zero. If a group guarantee is better than no guarantee, the coefficient of a group guarantee from table 13, second line, is used.

h. Line 1 + line 4 + line 5 - line 6 = line 7.

i. Line 8 = exp [line 7] - 1.

substitutes, such as group guarantees, or no guarantee at all; consequently, squatters receive less institutional credit than do titled farmers who can pledge land as collateral. There is also evidence that even without formally pledging land as collateral, titled farmers are offered larger amounts of institutional credit, because lenders perceive them as less risky clients who own valuable assets.

In the noninstitutional credit sector ownership security is much less critical. These lenders know their clients well and often do not require collateral for a loan. Although untitled and titled farmers have almost equal access to informal credit, however, the interest rates in this sector are at least three times as high as those in the formal sector. Untitled farmers who are more dependent on the informal credit market therefore face higher production and investment costs. Further, in areas in which the informal credit market is not well developed, the amount of credit available from noninstitutional sources is limited. These cumulative disadvantages lessen the untitled farmer's incentives and his ability to invest, thus lowering his productivity.

Notes

1. Several managers of commercial banks interviewed indicated that they experimented with group guarantees during the late 1970s and early 1980s but abandoned this lending practice because of poor repayment performance.

2. To the extent that there are unobserved variables that affect both supply and demand, the error terms could have a nonzero correlation. Attempts to estimate the model while allowing for correlated errors failed for lack of convergence, except in Lop Buri province, where the estimate indicated that the correlation was not significantly different from zero. On the basis of these findings, the model was estimated under the assumption that the error terms are not correlated.

3. See Bell and Srinivasan (1985) for a similar model formulation.

4. For this reason, education would also be an indicator of creditworthiness and would affect the supply of institutional credit. Farmers in the sample have had only a few years of elementary schooling, however, and it is difficult for the lender to verify that the reported number of years is indeed accurate. It should also be pointed out that there is very little variation in the sample with respect to formal schooling reported.

5. In Khon-Kaen the reduced-form disequilibrium estimate could not be obtained because of lack of convergence.

6

A Model of Land Acquisition and Ownership Security

In this chapter we shall present a formal model in which security of ownership, formation of capital, production, credit constraints, and land values are related. Although the model is a highly simplified description of reality, it does capture components important to the empirical analysis. Characteristics of the credit market are based on the empirical analysis in chapter 5. In the sample, institutional sources were shown to provide 92 percent of all medium-term and long-term loans. A disequilibrium econometric analysis of supply of and demand for institutional credit revealed that most borrowers were supply-rationed. The institutional interest rate is fixed by law, and the noninstitutional interest rate varies little. From the analysis it was concluded that land collateral and land value are important determinants of a farmer's ability to obtain institutional credit. The following assumptions reflect the results of the credit market analysis.

Assumptions

1. *Land Market*

- a. Land is of uniform quality but differs in its registration status. Untitled land cannot be transformed into titled land by the farmer.
- b. All lands can be bought and sold.
- c. Land is divisible. Because of transportation problems in the farming of fragmented holdings, however, the farmer can have either titled land or untitled land, but not both.¹

2. *Credit Market*

- a. Farmers can obtain short-term credit from both institutional and noninstitutional sources, yet they can obtain long-term credit only from institutional sources. Farmers are credit-rationed in both formal and informal markets.

- b. Interest rates are fixed.
- c. The supply of long-term credit is related to the value of titled land owned that serves as collateral. The supply of short-term institutional credit is related to the value of titled land minus outstanding long-term debt. The supply of noninstitutional short-term credit is related to the value of the land owned, irrespective of title status.
- d. Long-term credit can be used with initial wealth to finance purchases of land and investments in capital. Short-term credit is used for variable inputs.

3. Production

- a. The production function exhibits constant returns to scale in land, capital, and variable inputs. The cross-second derivatives are positive—that is, the marginal productivity of variable inputs increases with higher levels of capital.

4. Farmers

- a. A farmer maximizes terminal wealth throughout a lifetime. Beginning with a given endowment, a farmer chooses whether to purchase titled or untitled land. He then decides on the amount of land to purchase, thus determining the volume of his capital investment, given the constraint on long-term credit.

Notation

1. Variables

(Subscripts t and nt stand for titled and nontitled farms.)

A_t, A_{nt}	=	amount of land
K_t, K_{nt}	=	capital
X_t, X_{nt}	=	variable input
Y_t, Y_{nt}	=	output
P_t, P_{nt}	=	price of land
V_t, V_{nt}	=	terminal wealth of the farmer

2. Parameters

s_1	=	long-term credit per value of one acre of titled land
s_2	=	short-term credit per value of one acre of titled land, net of outstanding long-term debt
r_1	=	interest rate on long-term institutional credit
r_2	=	interest rate on short-term institutional credit

- m = amount of short-term noninstitutional credit per value of
 one acre of land owned
 c = interest rate on noninstitutional credit
 W_0 = initial wealth

Development of Model Results

Initially, the only difference assumed between titled and untitled land is that titled land improves access to credit. In the following section the risk of eviction will be added. Our purpose here is to demonstrate how credit constraints are related to the determination of differential land prices.

We begin with the optimization problem of a farmer who decides to purchase untitled land. Prices of output and inputs are assumed to be unity. The terminal wealth is the value of output plus land value minus debt repayment.

$$(6-1) \quad \text{Max}_{A_{nt}} V_{nt} = Y(A_{nt}, K_{nt}, X_{nt}) + P_{nt} \cdot A_{nt} - (1 + c) \cdot m \cdot P_{nt} \cdot A_{nt}$$

subject to

$$(6-2) \quad P_{nt} \cdot A_{nt} + K_{nt} = W_0$$

$$(6-3) \quad X_{nt} = m \cdot P_{nt} \cdot A_{nt}$$

Employing the constant returns-to-scale property of production, and substituting for K_{nt} , X_{nt} , using the credit constraint, the objective function can be written as

$$(6-4) \quad \text{Max}_{A_{nt}} V_{nt} = A_{nt} \cdot \{y(k_{nt}, x_{nt}) + [1 - (1 + c) \cdot m] \cdot P_{nt}\}$$

$$= A_{nt} \cdot \left\{ y \left(\frac{W_0}{A_{nt}} - P_{nt}, m \cdot P_{nt} \right) + [1 - (1 + c) \cdot m] \cdot P_{nt} \right\}$$

where lower-case letters denote values per acre of variables.

The first-order condition for optimum is

$$(6-5) \quad \frac{\partial V_{nt}}{\partial A_{nt}} = y_{nt} - \frac{W_0}{A_{nt}} \cdot \frac{\partial y_{nt}}{\partial k_{nt}} + [1 - (1 + c) \cdot m] \cdot P_{nt} = 0$$

From the first-order condition, several comparative static results are generated. (The actual mathematical derivation is presented in the appendix to this chapter.)

PROPOSITION 1. The demand for land is negatively related to its price.

PROPOSITION 2. The capital-to-land ratio on untitled land is positively related to the price of land.

PROPOSITION 3. Given initial assets, the amount of capital per farm is negatively related to the price of land.

PROPOSITION 4. Given the price of land, there is a unique optimal capital-to-land ratio that is independent of initial wealth and farm size.

PROPOSITION 5. Given the price of land, the demand for land is proportional to initial assets.

PROPOSITION 6. The value of the objective function at optimum is equal to the value of initial wealth multiplied by the optimal marginal return to capital.

PROPOSITION 7. The optimal value of the objective function is negatively related to the price of land.

We now characterize the optimization problem of a farmer who decides to buy titled land. The objective function is

$$(6-6) \quad \text{Max}_{A_t} V_t = Y(A_t, K_t, X_t) + P_t \cdot A_t - (1 + r_1) \cdot s_1 \cdot P_t \cdot A_t \\ - (1 + r_2) \cdot s_2 \cdot (P_t \cdot A_t - s_1 \cdot P_t \cdot A_t) - (1 + c) \cdot m \cdot P_t \cdot A_t$$

subject to

$$(6-7) \quad P_t \cdot A_t + K_t = W_0 + s_1 \cdot P_t \cdot A_t$$

$$(6-8) \quad X_t = s_2 \cdot (P_t \cdot A_t - s_1 \cdot P_t \cdot A_t) + m \cdot P_t \cdot A_t$$

Expressing production in per-acre terms and incorporating the constraints, the objective function is

$$(6-9) \quad \text{Max}_{A_t} V_t = A_t \cdot \left\{ y \left[\frac{W_0}{A_t} - (1 - s_1) \cdot P_t \cdot s_2 \cdot (1 - s_1) \cdot P_t + m \cdot P_t \right] \right. \\ \left. + P_t \cdot [1 - (1 + r_1) \cdot s_1 - (1 + r_2) \cdot s_2 \cdot (1 - s_1) - (1 + c) \cdot m] \right\}$$

Note that if $s_1 = s_2 = 0$ —that is, nonavailability of institutional credit—the objective function becomes identical to that of a farmer buying untitled land. The first-order condition for maximization is similar to equation 6-5.

$$(6-10) \quad \frac{\partial V_t}{\partial A_t} = y_t - \frac{W_0}{A_t} \cdot \frac{\partial y_t}{\partial k_t} + P_t \cdot \theta = 0$$

where $\theta \equiv [1 - (1 + r_1) \cdot s_1 - (1 + r_2) \cdot s_2 \cdot (1 - s_1) - (1 + c) \cdot m]$

By using an analysis similar to the one above, it is possible to demonstrate that propositions 1 through 7 are valid in the case of titled land.

Having observed that when $s_1 = s_2 = 0$, no distinction between the solution on titled and untitled land exists,² proposition 8 can be demonstrated.

PROPOSITION 8. Given initial wealth and a unique land price, when s_1 and s_2 are positive, the optimal value of the objective function is higher on titled land.

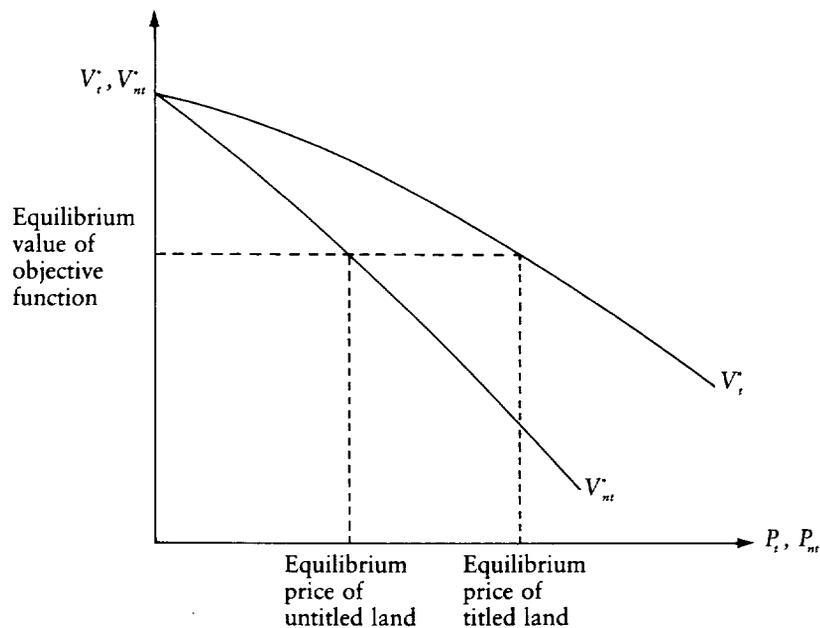
As observed in the case of $s_1 = s_2 = 0$, and with $P_t = P_{nt}$, the optimal terminal value of titled land and that of untitled land coincide. But since $dV^*/ds_i > 0$, then, with $s_1 > 0$ and $s_2 > 0$, for any given land price (identical for titled and untitled land) it must hold that $V_t^* > V_{nt}^*$, where the asterisks denote equilibrium levels. For equilibrium to prevail, however, the farmer must be indifferent whether his farm is established on titled or on untitled land—that is, equilibrium requires that $V_t^* = V_{nt}^*$. Without this equality, all farmers would prefer one type of land, and the price of the other type would drop until the equality between optimal terminal land values was established. This implies

PROPOSITION 9. In equilibrium, the price of titled land is higher than the price of untitled land. Figure 2 illustrates this proposition.

The equilibrium condition requiring equalization of optimal objective function values can also be shown to imply

PROPOSITION 10. When land prices are at equilibrium levels, the capital-to-land ratio on titled farms is higher than that on untitled farms.

Figure 2. The Determination of Land Prices



PROPOSITION 11. When land prices are at equilibrium levels, output per acre on titled farms is greater than that on untitled farms.

This equilibrium condition does not determine *unique* equilibrium prices, since there are infinite pairs that satisfy $V_t^* = V_{nt}^*$. One way of "closing" the model is by introducing a third investment opportunity that is not related to the cultivation of land and that has a fixed rate of return, δ . Equilibrium implies, in view of proposition 6,

$$\begin{aligned} (6-11) \quad (1 + \delta) \cdot W_0 &= W_0 \cdot \frac{\partial y_t^*}{\partial k_t^*} [k_{t'}^* (1 - s_1) \cdot s_2 \cdot P_t^* + m \cdot P_t^*] \\ &= W_0 \cdot \frac{\partial y_{nt}^*}{\partial k_{nt}^*} (k_{nt}^* m \cdot P_{nt}^*) \end{aligned}$$

Because the optimal capital-to-land ratios are independent of initial wealth levels (proposition 4) and because the optimal value of the objective function and land prices are monotonically related (proposition 7), there is a unique pair of equilibrium land prices for titled and untitled land satisfying equation 6-11. This is illustrated in figure 3.

Introducing the Risk of Eviction

We shall now expand the model by assuming that there is a nonzero probability (Ψ) that farms established on untitled land will lose a proportion $(1 - \gamma)$ of the land from being evicted. Since the model does not distinguish between periods before and after eviction, if eviction occurs it is assumed that a proportion $(1 - \gamma)$ of output is lost as well. The objective function should incorporate risk preferences. This requirement is met by assuming a mean standard deviation utility function (Thomson and Hazell 1972). The utility function (U) is then $U = E(V_{nt}) - \Phi \cdot \Sigma_{V_{nt}}$ where E is the expectations operator, $\Sigma_{V_{nt}}$ is the standard deviation of terminal wealth, and Φ is a risk-aversion parameter. With risk neutrality, $\Phi = 0$, while under risk aversion $\Phi > 0$.

It can be shown that

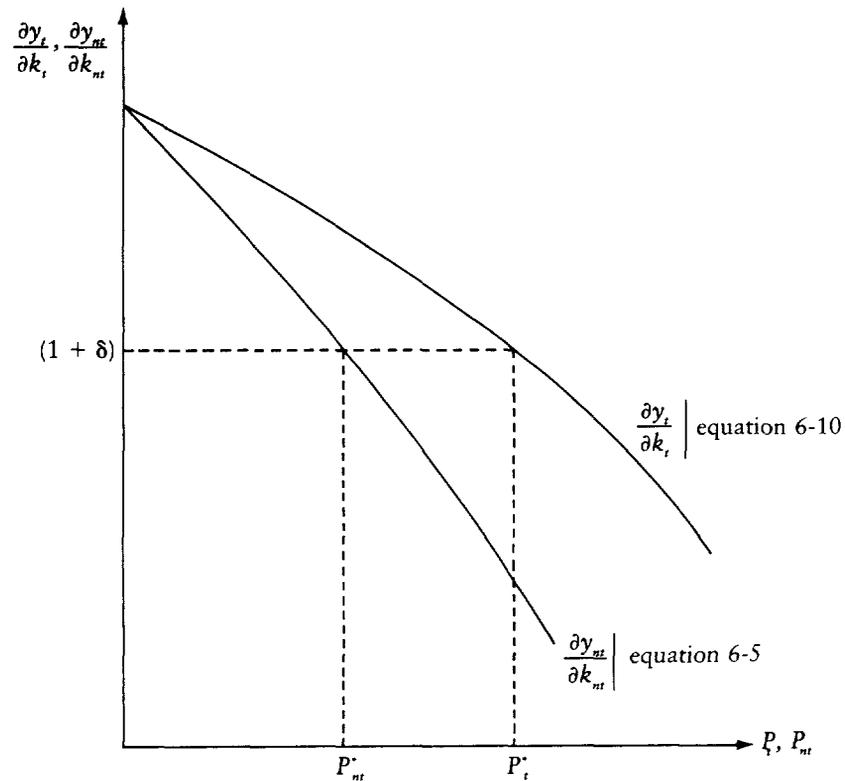
$$(6-12) \quad \Sigma_{V_{nt}} = \Psi^{1/2} \cdot (1 - \Psi)^{1/2} \cdot (1 - \gamma) \cdot (y_{nt} + P_{nt}) \cdot A_{nt}$$

Therefore the objective function for farmers who settle on untitled land when there is risk of eviction is

$$\begin{aligned} (6-13) \quad \text{Max } (U_{nt}) &= (1 - \Psi) \cdot A_{nt} \cdot [y_{nt} + P_{nt} - (1 + c) \cdot m \cdot P_{nt}] \\ &+ \Psi \cdot A_{nt} \cdot [\gamma \cdot y_{nt} + \gamma \cdot P_{nt} - (1 + c) \cdot m \cdot P_{nt}] \\ &- \Phi \cdot \Psi^{1/2} \cdot (1 - \Psi)^{1/2} \cdot (1 - \gamma) \cdot (y_{nt} + P_{nt}) \cdot A_{nt} \end{aligned}$$

The first-order condition is

Figure 3. Equilibrium Land Prices



$$(6-14) \quad [1 - \Psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \cdot$$

$$[y_{nt} - (\partial y_{nt} / \partial k_{nt}) \cdot (k_{nt} + P_{nt}) + P_{nt}] = (1 + c) \cdot m \cdot P_{nt}$$

where $\lambda \equiv \Phi \cdot (1 - \Psi)^{1/2} \cdot \Psi^{-1/2}$. The term $\Psi \cdot (1 - \gamma) \cdot \lambda$ signifies a risk-aversion premium, since it vanishes with risk neutrality.

Using equations 6-13, 6-14, and the budget constraint, $W_0 = K_{nt} + P_{nt} \cdot A_{nt}$, in analogy with proposition 6 yields

$$(6-15) \quad (U_{nt}^*) = W_0 \cdot [1 - \Psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \cdot (\partial y_{nt}^* / \partial k_{nt}^*)$$

where asterisks denote optimal values. In equilibrium, the expected utility of the terminal value of farms established on untitled land should equal that of farms established on titled land. Thus, the analog of equation 6-11 is

$$(6-16) \quad \partial y_t^* / \partial k_t^* = [1 - \Psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \cdot (\partial y_{nt}^* / \partial k_{nt}^*) \\ = (1 + \delta)$$

Propositions 1 through 11 hold under the modified formulation. It can be shown further that

PROPOSITION 12. The equilibrium price of untitled land is negatively affected by the risk of eviction.

PROPOSITION 13. Even in the case $s_1 = s_2 = 0$ (no credit advantages from titling), the equilibrium price of untitled land, the optimal capital-to-land ratio, and the output per acre are all lower than those of titled farms, if the probability of eviction is greater than zero.

To gain further insights into the relation between the prices of titled and untitled land, we specify the production function. Production is characterized by a Cobb-Douglas function of the form

$$(6-17) \quad Y = K^\alpha \cdot X^\beta \cdot A^{1-\alpha-\beta} \cdot e^\mu$$

where Y , K , X , and A were defined earlier and μ is a composite indicator of land quality.

Using the equilibrium condition 6-16 obtains

$$(6-18) \quad R \cdot \alpha \cdot k_{nt}^{\alpha-1} \cdot x_{nt}^\beta \cdot e^\mu = (1 + \delta)$$

where $R \equiv [1 - \Psi \cdot (1 - \gamma)(1 + \lambda)] < 1$. Note that $\Psi = 0$ implies $R = 1$.

$$(6-19) \quad \alpha \cdot k_t^{\alpha-1} \cdot x_t^\beta \cdot e^\mu = (1 + \delta)$$

The short-term credit constraints imply that $x_{nt} = m \cdot P_{nt}$ and $x_t = [s_2 \cdot (1 - s_1) + m] \cdot P_t$. Substituting for x_t and x_{nt} in equations 6-18 and 6-19 and solving for k_{nt} and k_t , respectively, obtains

$$(6-20) \quad k_{nt} = R^{1/(1-\alpha)} \cdot [\alpha/(1 + \delta)]^{1/(1-\alpha)} \cdot m^{\beta/(1-\alpha)} \cdot P_{nt}^{\beta/(1-\alpha)} \cdot e^{\mu/(1-\alpha)}$$

$$(6-21) \quad k_t = [\alpha/(1 + \delta)]^{1/(1-\alpha)} \cdot [m + (1 - s_1) \cdot s_2]^{\beta/(1-\alpha)} \\ \cdot P_t^{\beta/(1-\alpha)} \cdot e^{\mu/(1-\alpha)}$$

Using equations 6-20 and 6-21, output per acre of titled land and of untitled land can be expressed as parameters and the prices P_t and P_{nt} , respectively. Inserting these expressions of output per acre into the first-order conditions 6-10 and 6-14, respectively, and employing the equilibrium condition 6-16 yields corresponding representations of the first-order conditions

$$(6-22) \quad [(\alpha \cdot R)^{\alpha/(1-\alpha)} - (\alpha \cdot R)^{1/(1-\alpha)}] \cdot (1 + \delta)^{-\alpha/(1-\alpha)} \cdot m^{\beta/(1-\alpha)} \\ \cdot e^{\mu/(1-\alpha)} \cdot P_{nt}^{\beta/(1-\alpha)} = [\delta + (1 + c) \cdot m] \cdot P_{nt}$$

$$\begin{aligned}
(6-23) \quad & [\alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}] \cdot (1 + \delta)^{-\alpha/(1-\alpha)} \\
& \cdot [m + s_2 \cdot (1 - s_1)]^{\beta/(1-\alpha)} \cdot e^{\mu/(1-\alpha)} \cdot P_t^{\beta/(1-\alpha)} \\
& = [(1 + r_2) \cdot s_2 \cdot (1 - s_1) + (1 + c) \cdot m \\
& + \delta + s_1 \cdot (r_1 - \delta)] \cdot P_t
\end{aligned}$$

Equations 6-22 and 6-23 provide a solution for the equilibrium prices of untitled and titled land as functions of parameters of the model.

$$\begin{aligned}
(6-24) \quad P_{nt}^* &= \left[\frac{(\alpha R)^{\alpha/(1-\alpha)} - (\alpha R)^{1/(1-\alpha)}}{\delta + (1 + c) \cdot m} \right]^{(1-\alpha)/(1-\alpha-\beta)} \\
& \cdot (1 + \delta)^{-\alpha/(1-\alpha-\beta)} \cdot m^{\beta/(1-\alpha-\beta)} \cdot e^{\mu/(1-\alpha-\beta)}
\end{aligned}$$

(6-25)

$$\begin{aligned}
P_t^* &= \left[\frac{\alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}}{\delta + (1 + c) \cdot m + (1 + r_2) \cdot s_2 \cdot (1 - s_1) + s_1 \cdot (r_1 - \delta)} \right]^{(1-\alpha)/(1-\alpha-\beta)} \\
& \cdot (1 + \delta)^{-\alpha/(1-\alpha-\beta)} \cdot [m + s_2 \cdot (1 - s_1)]^{\beta/(1-\alpha-\beta)} \cdot e^{\mu/(1-\alpha-\beta)}
\end{aligned}$$

Equations 6-24 and 6-25 offer insights into factors that affect land prices.

1. The prices of titled and untitled land are related positively to land quality yet related negatively to the opportunity cost of capital and to the interest rate on informal credit.

2. The price of titled land is related negatively to the interest rate on formal credit.

Dividing equation 6-25 by equation 6-24 yields the ratio of the price of titled land to the price of untitled land, expressed here in a logarithmic form:

$$\begin{aligned}
(6-26) \quad \ln [P_t^*/P_{nt}^*] &= \frac{(1 - \alpha)}{(1 - \alpha - \beta)} \cdot \ln \left\{ \frac{(\alpha^{-1} - 1)}{[\alpha^{-1} \cdot R^{\alpha/(1-\alpha)} - R^{1/(1-\alpha)}]} \right\} \\
& + \frac{\beta}{(1 - \alpha - \beta)} \cdot \ln \left[1 + \frac{s_2 \cdot (1 - s_1)}{m} \right] + \frac{(1 - \alpha)}{(1 - \alpha - \beta)} \\
& \cdot \ln \left[\frac{\delta + (1 + c) \cdot m}{\delta + (1 + c) \cdot m + (1 + r_2) \cdot s_2 \cdot (1 - s_1) + s_1 \cdot (r_1 - \delta)} \right]
\end{aligned}$$

Equation 6-26 demonstrates that the logarithmic difference between the prices of titled and of untitled land is decomposable to two components. The first component, implicit in the first term on the right-hand side of equation 6-26, reflects the risk of eviction. If the risk of eviction (Ψ) is zero, then $R = 1$, and the first term on the right-hand side of equation 6-26 vanishes. If the risk of eviction is positive, however, ($\Psi > 0$),

then $R < 1$ and the first term becomes positive. The larger the Ψ , the larger the component.

The other component, which is related to differences in access to credit, is represented by the last two terms on the right-hand side of equation 6-26. If there are no advantages in access to institutional credit, then $s_1 = s_2 = 0$ —or alternatively, the numerators and denominators in the last two terms on the right-hand side of equation 6-26 are identical. These terms would then vanish. If s_1 and s_2 are positive, then the second term is positive, since the item in square brackets is greater than 1. The third term is more complex; $r_1 < \delta$ when institutional credit is subsidized or held below the opportunity cost of capital by usury laws, while the term $(1 + r) \cdot s_2 \cdot (1 - s_1)$ is clearly positive. Thus, the third term on the right-hand side of equation 6-26 could theoretically be negative. Following proposition 9, however, the combined effect of the last two terms is positive when titled farmers have credit advantages.

The main propositions developed in this chapter are that on titled farms capital accumulation, productivity, and land value will be greater than on untitled farms. These propositions will be substantiated empirically in subsequent chapters.

Appendix: Proofs of Propositions 1–13

The second-order conditions for a maximum related to the optimization problem of a farmer settling on untitled land (equations 6-4 and 6-5) are given by

$$(6-27) \quad \frac{\partial^2 V_{nt}}{\partial A_{nt}^2} = \frac{W_0^2}{A_{nt}^3} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} < 0$$

We proceed now to prove the propositions of the text.

PROPOSITION 1. The demand for land is negatively related to its price.

PROOF. Differentiation of the first-order condition, 6-5, with respect to the price of land yields

$$(6-28) \quad \frac{dA_{nt}}{dP_{nt}} = \left(\frac{\partial^2 V_{nt}}{\partial A_{nt}^2} \right)^{-1} \cdot \left\{ \frac{\partial y_{nt}}{\partial k_{nt}} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot m - [1 - (1 + c) \cdot m] - \frac{W_0}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} + \frac{W_0}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k \partial x} \cdot m \right\}$$

$$= \frac{1}{P_{nt}} \cdot \left(\frac{\partial^2 V_{nt}}{\partial A_{nt}^2} \right)^{-1} \cdot \left\{ \left[y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \left(\frac{W_0}{A_{nt}} - P_{nt} \right) - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot P_{nt} \cdot m \right] + \frac{W_0 \cdot P_{nt}}{A_{nt}} \left(\frac{\partial^2 y_{nt}}{\partial k \partial x} \cdot m - \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \right) \right\}$$

where the second step uses equation 6-5. Note that $[(W_0/A_{nt}) - P_{nt}] = k_{nt}$ by equation 6-2, while $m \cdot P_{nt} = x_{nt}$ by equation 6-3. It thus follows that the term within braces is positive, because of the concavity of the per-acre production function. Concavity also implies $\partial^2 y_{nt} / \partial k_{nt}^2 < 0$. The second cross-derivative of the production function is positive if production complementarity is assumed. It thus follows that the term in square brackets in equation 6-28 is positive. The term $\partial^2 V_{nt} / \partial A_{nt}^2$ is negative (see 6-27), and it is therefore confirmed that $dA_{nt} / dP_{nt} < 0$.

PROPOSITION 2. The capital-to-land ratio on untitled land is positively related to the price of land.

PROOF. By equation 6-2, $k_{nt} = (W_0/A_{nt}) - P_{nt}$. Differentiating with respect to P_{nt} yields

$$(6-29) \quad \frac{dk_{nt}}{dP_{nt}} = - \frac{W_0}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} - 1$$

Using equations 6-27 and 6-28 in 6-29 obtains

$$(6-30) \quad \frac{dk_{nt}}{dP_{nt}} = \frac{1}{P_{nt}} \left(\frac{-A_{nt}}{W_0 \cdot (\partial^2 y_{nt} / \partial k_{nt}^2)} \right) \left[\left(y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right) + \frac{W_0 \cdot P_{nt}}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k \partial x} \right]$$

The term in the square brackets is positive (see proof of proposition 1), and $-\partial^2 y_{nt} / \partial k_{nt}^2 > 0$. It thus follows that $dk_{nt} / dP_{nt} > 0$.

PROPOSITION 3. Given initial assets, the amount of capital per farm is related negatively to the price of land.

PROOF. By equation 6-2, $K_{nt} = W_0 - P_{nt} \cdot A_{nt}$. Differentiation yields

$$(6-31) \quad \frac{dK_{nt}}{dP_{nt}} = - A_{nt} \cdot \left(\frac{P_{nt}}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} + 1 \right)$$

From equation 6-28, using 6-27, can be obtained

$$(6-32) \quad \frac{P_{nt}}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} = - \frac{A_{nt}^2}{W_0^2} \left[\left(y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right) + \frac{W_0}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \right] / \left(\frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \right) - 1$$

From equation 6-32 it follows that the term in parentheses on the right-hand side of equation 6-31 is positive. The right-hand side of equation 6-31 is therefore negative.

PROPOSITION 4. Given the price of land, there is a unique optimal capital-to-land ratio independent of initial wealth and size of farm.

PROOF. Equation 6-31 can be written as

$$(6-33) \quad y_{nt}(k_{nt}, m \cdot P_{nt}) - (k_{nt} + P_{nt}) \cdot \frac{\partial y_{nt}}{\partial k_{nt}} + [1 - (1 + c) \cdot m] \cdot P_{nt} = 0$$

Note that if P_{nt} is fixed, the only variable in the equation that describes the optimality condition is k_{nt} . It can be trivially shown that with P_{nt} constant, the left-hand side of equation 6-33 is monotonically increasing in k_{nt} , so there is a unique value, k_{nt}^* , which maintains equation 6-33. Since equation 6-33 is independent of W_0 or A_{nt} , the unique optimal value of k_{nt} is not affected by these two variables.

PROPOSITION 5. Given the price of land, the demand for land is proportional to initial assets.

PROOF. The budget constraint, equation 6-2, can be written

$$(6-34) \quad A_{nt} = W_0 / (P_{nt} + k_{nt}^*)$$

where k_{nt}^* is the optimal value of the capital-to-land ratio. By proposition 4, k_{nt}^* is independent of W_0 or A_{nt} , thus with fixed P_{nt} , the demand for land, A_{nt} , is proportional to W_0 .

PROPOSITION 6. The value of the objective function at optimum is equal to the value of initial wealth multiplied by the marginal return to capital.

PROOF. Multiplying equation 6-5 by A_{nt} and rearranging the two sides of the equation yields

$$(6-35) \quad y_{nt} \cdot A_{nt} + [1 - (1 + c) \cdot m] \cdot P_{nt} \cdot A_{nt} = W_0 \cdot \frac{\partial y_{nt}}{\partial k_{nt}}$$

The left-hand side of equation 6-35 is equal to V_{nt} , the value of the objective function. Since equation 6-5 holds only in the optimum, it follows that

$$(6-36) \quad V_{nt}^* = W_0 \cdot \frac{\partial y_{nt}^*}{\partial k_{nt}^*}$$

where asterisks denote optimality.

PROPOSITION 7. The optimal value of the objective function is negatively related to the price of land.

PROOF. Differentiation of equation 6-36 yields

$$(6-37) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_0 \left[-\frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \cdot \left(\frac{W_0}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} + 1 \right) + \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right]$$

Using equation 6-28 in equation 6-37 obtains

$$(6-38) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_0 \cdot \left\{ -\frac{1}{P_{nt}} \cdot \frac{A_{nt}^2}{W_0} \right. \\ \cdot \left[y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \left(\frac{W_0}{A_{nt}} - P_{nt} \right) - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot P_{nt} \cdot m \right] \\ \left. + \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt} \cdot m}{\partial k_{nt} \partial x_{nt}} \right\} < 0$$

REMARK. Propositions 1–7 hold also in the case of titled land. This follows trivially from the observation that the optimization condition for the case of titled land (equation 6-10) is essentially the same as the optimization condition for untitled land (equation 6-5); only the parameters multiplying the price differ.

PROPOSITION 8. Given initial wealth and unique land price, when s_1 and s_2 are positive, the optimal value of the objective function is greater on titled land than on untitled land.

PROOF. To prove this proposition, it is sufficient to show $dV_t/ds_i > 0$, since in the case $s_1 = s_2 = 0$ the optimization problem on titled land is identical to the optimization problem on untitled land. We begin by differentiating equation 6-10 with respect to s_1 and s_2 to measure the effect of changes in these parameters on the demand for land.

$$(6-39) \quad \frac{dA}{ds_2} = - \left(\frac{W_0^2}{A_t^3} \cdot \frac{\partial^2 y_t}{\partial k_t^2} \right)^{-1} \cdot \left\{ \left[\frac{\partial y_t}{\partial x_t} - (1 + r_2) \right] \right. \\ \left. - \frac{W_0}{A_t} \cdot \frac{\partial^2 y_t}{\partial k \partial x} \right\} \cdot (1 - s_1) \cdot P_t$$

$$(6-40) \quad \frac{dA}{ds_1} = - \left(\frac{W_0^2}{A_t^3} \cdot \frac{\partial^2 y_t}{\partial k_t^2} \right)^{-1} \cdot \left\{ \left[\frac{\partial y_t}{\partial k_t} - (1 + r_1) \right] \right. \\ \left. - \left[\frac{\partial y_t}{\partial x_t} - (1 + r_2) \right] \cdot s_2 - \frac{W_0}{A_t} \cdot \frac{\partial^2 y_t}{\partial k_t^2} + \frac{W_0}{A_t} \cdot \frac{\partial^2 y_t}{\partial k_t \partial x_t} \cdot s_2 \right\} \cdot P_t$$

Next, we differentiate the objective function at its optimum value. By proposition 7, this value is equal to $W_0 \cdot \partial y_t / \partial k_t$.

$$(6-41) \quad \frac{\partial V_t}{\partial s_2} = - \frac{\partial^2 y_t}{\partial k_t^2} \cdot \frac{W_0^2}{A_t^2} \cdot \frac{dA_t}{ds_2} + \frac{\partial^2 y_t}{\partial k_t \partial x_t} \cdot (1 - s_1) \cdot P_t \cdot W_0$$

$$(6-42) \quad \frac{\partial V_t}{\partial s_1} = - \frac{\partial^2 y_t}{\partial k_t^2} \cdot \left(\frac{W_0^2}{A_t^2} \cdot \frac{dA_t}{ds_1} + P_t \cdot W_0 \right) - \frac{\partial^2 y_t}{\partial k_t \partial x_t} \cdot s_2 \cdot P_t \cdot W_0$$

Inserting equation 6-39 into equation 6-41 yields

$$(6-43) \quad \frac{\partial V_t}{\partial s_2} = A_t \cdot \left[\frac{\partial y_t}{\partial x_t} - (1 + r_2) \right] \cdot (1 - s_1) \cdot P_t$$

Clearly, the marginal productivity of the variable input is greater than the rate of interest on short-term credit when the short-term credit constraint is binding—that is, $\partial y_t / \partial x_t > (1 + r_2)$. It thus follows that $\partial V_t / \partial s_2 > 0$.

Inserting equation 6-40 into equation 6-42 yields

$$(6-44) \quad \frac{\partial V_t}{\partial s_1} = A_t \cdot P_t \left\{ \left[\frac{\partial y_t}{\partial k_t} - (1 + r_1) \right] - \left[\frac{\partial y_t}{\partial x_t} - (1 + r_2) \right] \cdot s_2 \right\}$$

In the present model, in which a binding constraint on long-term credit is assumed, the marginal productivity of capital is greater than the rate of interest on long-term credit—that is, $\partial y_t / \partial k_t > (1 + r_1)$. Furthermore, in the present case the marginal cost of credit consists not only of the rate of interest but also of the loss in profit caused by the marginal reduction in the supply of short-term credit. The latter component is equal to $[(\partial y_t / \partial x_t) - (1 + r_2)] \cdot s_2$. Since the long-term credit constraint is assumed to be binding in the present model, it must hold that the term in the braces in equation 6-44 is positive.

PROPOSITION 9. In equilibrium, the price of titled land is higher than the price of untitled land.

PROOF. The proof of this proposition has already been sketched out. Essentially, the proof follows from propositions 8 and 7. If an identical land price prevails for titled and untitled lands, then, by proposition 8, the optimal value of the objective function is higher on titled land ($V_t^* > V_{nt}^*$). But in equilibrium, the value of the objective function should be equal on both types of land ($V_t^* = V_{nt}^*$). To restore equilibrium, the value of the objective function on titled land should be decreased, the value of the objective function on untitled land should be increased, or both. Following proposition 7, this is accomplished by P_t rising and P_{nt} declining—that is, $P_t > P_{nt}$ at equilibrium.

PROPOSITION 10. When land prices are at equilibrium levels, the capital-to-land ratio on titled farms is greater than that on untitled farms.

PROOF. Equilibrium requires $V_t^* = V_{nt}^*$. By proposition 6, this implies

$$(6-45) \quad \frac{\partial y_t}{\partial k_t} [k_t \cdot (1 - s_1) \cdot s_2 \cdot P_t + m \cdot P_t] = \frac{\partial y_{nt}}{\partial k_{nt}} (k_{nt} \cdot m \cdot P_{nt})$$

Since $P_t > P_{nt}$ (by proposition 9), and $(1 - s_1) \cdot s_2 > 0$, it follows that variable input use is higher per acre on titled farms—that is, $x_t > x_{nt}$. But by the assumption of production complementarity between capital and variable inputs $\partial^2 y_t / \partial k_t \partial x_t > 0$, and if $k_t \leq k_{nt}$, then $\partial y_{nt} / \partial k_{nt} < \partial y_t / \partial k_t$ and the equality 6-45 is violated. To restore equality, the marginal productivity of capital on titled land must be increased, or the marginal productivity of capital on untitled land must be reduced. Given the concavity of the production function, this is accomplished by increasing k_t and reducing k_{nt} —that is, $k_t^* > k_{nt}^*$ at equilibrium.

PROPOSITION 11. When land prices are at equilibrium levels, output per acre on titled farms is greater than that on untitled farms.

PROOF. As indicated in the proof of proposition 10, $x_t > x_{nt}$. In addition, proposition 10 established $k_t^* > k_{nt}^*$. Since both capital per acre and variable inputs per acre are greater on titled farms, it follows, trivially, that output per acre on titled land is greater—that is, $y_t^* > y_{nt}^*$.

PROPOSITION 12. The equilibrium price of untitled land is negatively affected by the risk of eviction.

PROOF. Using the definition of λ and the characterization of equilibrium, equation 6-15 can be written as

$$(6-46) \quad (1 + \delta) = \{1 - (1 - \gamma) \cdot [\Psi + \Phi \cdot \Psi^{1/2} \cdot (1 - \Psi)^{1/2}]\} \cdot (\partial y_{nt}^* / \partial k_{nt}^*)$$

Denote the term in square brackets by $G(\Psi)$. A straightforward derivation establishes that

$$(6-47) \quad \frac{\partial G}{\partial \Psi} = 1 + \Phi \cdot [\Psi \cdot (1 - \Psi)]^{-1/2} \cdot (1 - 2\Psi)/2$$

To show that $\partial G / \partial \Psi > 0$ in the interval of interest $(0, 0.5)$, simply note that all terms on the right-hand side of equation 6-47 are positive provided that $\Psi \leq 0.5$. Differentiation of equation 6-46 yields

$$(6-48) \quad (1 - \gamma) \cdot \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \frac{\partial G}{\partial \Psi} = [1 - (1 - \gamma) \cdot G(\Psi)] \cdot \left(\frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \cdot \frac{dk_{nt}}{dP_{nt}} + \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right) \cdot \frac{dP_{nt}}{d\Psi}$$

Inserting equation 6-30 into equation 6-48 yields

$$(6-49) \quad (1 - \gamma) \cdot \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \frac{\partial G}{\partial \Psi} = [1 - (1 - \gamma) \cdot G(\Psi)] \cdot \left[\frac{A_{nt}}{W_0 P_{nt}} \left(y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right) \right] \cdot \frac{dP_{nt}}{d\Psi}$$

The left-hand side of equation 6-49 is positive, as shown earlier. The term in the square brackets on the right-hand side is positive by the concavity of the per-acre production function. It thus follows that $dP_m/d\Psi > 0$.

PROPOSITION 13. Even in the case $s_1 = s_2 = 0$, the equilibrium price of untitled land, the optimal capital-to-land ratio, and the output per acre are all less than those of titled farms if the probability of eviction is greater than zero.

PROOF. Note that in the case $s_1 = s_2 = \Psi = 0$, the optimization problems on titled and untitled land are identical. Consider now the case $\Psi > 0$ and the equilibrium condition.

$$(6-50) \quad (1 + \delta) = \partial y_t^* / \partial k_t^* = [1 - (1 - \gamma) \cdot G(\Psi)] \cdot \partial y_m^* / \partial k_m^*$$

In proposition 12 it has already been established that the price of untitled land will decline if Ψ increases. By proposition 2, this will cause k_m^* to decline. Thus, both $P_t^* > P_m^*$ and $k_t^* > k_m^*$, implying that $y_t^* > y_m^*$, even when $s_1 = s_2 = 0$.

Notes

1. This is a simplification. In our sample fewer than 20 percent of the farmers had both titled and untitled land. Since our sample was deliberately taken in areas adjacent to boundaries of the forest reserves, the average incidence of mixed ownership in other areas is likely to be even lower.

2. This statement is valid only when there is no risk of eviction or other losses because of lack of title. As will be shown, when such risks exist, the optimal solutions on titled and untitled lands differ even if $s_1 = s_2 = 0$.

Analysis of Land Values

The model in the preceding chapter generated the proposition that titled land carries a higher price than untitled land of identical quality. Irrespective of title status, however, land of lower productive quality or land in less favorable locations sells for a lower price than land of higher quality or land more favorably located. To test these hypotheses, data were collected from titled and untitled farmers on the value of their land. The farmers were asked to assess the market value of their land given its actual registration status and quality.¹

The mean prices reported by farmers are recorded in table 15. The data are analyzed by registration status and by a broad classification of quality, namely, whether the land is lowland or upland. Locally, lowland is perceived as better land, since it is suitable for growing paddy rice and other crops that cannot be grown on uplands; lowlands are therefore expected to be more valuable than uplands.² The data confirm that the mean price of titled land is substantially higher than the mean price of untitled land. The only exception was a small sample of lowland tracts in Lop Buri: there the mean prices of titled and untitled land are virtually the same. As expected, in all provinces the price of lowland is higher than the price of upland.

As a further check on the plausibility of prices reported by the farmers, village headmen were asked to estimate the average prices for three categories of land—irrigated lowland, unirrigated lowland, and upland—by title status. The means of these prices are reported in table 16. Again, for all categories of land, titled land is substantially more expensive than untitled land.

To compare average land prices, the distribution of various attributes of land that affect the price must be identical. This is a restrictive assumption, however. To circumvent the restriction, we used data on the attributes of each tract provided by the farmers in a hedonic price analysis.

The specification of hedonic price equations is usually arbitrary. In urban housing research, Box-Cox transformations are used, which converge at the limit to a logarithmic formulation (Jimenez 1984). For our purposes here, however, the model of land acquisition and investment presented earlier allows for an exact specification of the land price equation by assuming a Cobb-Douglas production function. The econometric

formulation of the price equation is developed by rewriting equations 6-24 and 6-25 in logarithmic form

$$(7-1) \quad \ln P_{nt}^* = \eta_{nt} + [\beta/(1 - \alpha - \beta)] \cdot \ln m - [\alpha/(1 - \alpha - \beta)] \\ \cdot \ln(1 + \delta) + [\mu/(1 - \alpha - \beta)]$$

$$(7-2) \quad \ln P_t^* = \eta_t + [\beta/(1 - \alpha - \beta)] \cdot \ln[m + s_2 \cdot (1 - s_1)] \\ - [\alpha/(1 - \alpha - \beta)] \cdot \ln(1 + \delta) + [\mu/(1 - \alpha - \beta)]$$

where η_{nt} and η_t are constants given by the terms in square brackets on the right-hand sides of equations 6-24 and 6-25. Clearly, for lands of equal quality—the same value of μ —but different ownership security status, only the constant term differs, not the parameters related to land quality. If the quality index μ is assumed to be a linear combination of attributes, then the hedonic price equation can be estimated as a logarithmic equation. The right-hand side of the equation includes a dummy for titled tracts—representing the shift in constants—and a vector of attributes of physical quality. By using a dummy variable to represent the title status of each tract, the effect of ownership security on land value, other things being equal, can be estimated. We hypothesize that this dummy variable is significantly greater than zero.

Our data allow us to test an even more refined hypothesis by means of this model. In the sample there are some holdings located outside the boundaries of the forest reserves that have not yet been titled. Because these tracts can be titled, the owners do not face the risk of eviction. Thus, perceptions of ownership security for these plots are similar to those for titled plots. From the institutional lenders' point of view, however, these untitled farmers, although located outside forest reserves, still lack formal documents of ownership and are therefore treated the same as untitled farmers with holdings inside forest reserves.

In the framework of the model, these untitled holdings outside the forest reserves are characterized by $R = 1$ (identical to titled plots) and $s_1 = s_2 = 0$ (identical to untitled tracts). Upon comparison of equations 6-24 and 6-25, it becomes apparent that the prices of these lands will be lower than the prices of titled land but higher than the prices of untitled land located within forest reserves and subject to the risk of eviction.

To test this hypothesis, another dummy variable is introduced into the regression in addition to the dummy variable that represents title. This new dummy variable takes the value 1 if the tract is untitled but is located outside the forest reserves. The model in chapter 6 indicates that the coefficient of this dummy variable is positive but smaller in size than the coefficient of title. This is because it reflects only a positive difference in value in relation to the absence of the risk of eviction yet no difference in the availability of credit.

Table 15. Mean Prices of Titled and Untitled Land
(baht per rai)

<i>Status of plot document</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Lowland</i>	<i>Upland</i>	<i>Lowland</i>	<i>Upland</i>	<i>Lowland</i>	<i>Upland</i>	<i>Lowland</i>	<i>Upland</i>
Price without NS-3 or NS-3K	3,638	2,632	4,210	3,251	4,421	2,787	2,297	1,832
Number of plots in sample	42	173	58	225	48	140	131	203
Price with NS-3 or NS-3K	3,599	3,425	11,085	7,086	6,156	5,557	3,675	2,547
Number of plots in sample	37	179	128	125	138	121	62	68

Note: In 1985 the rate of exchange was 26 baht to the U.S. dollar; 6.25 rai = 1 hectare.

Table 16. Mean Land Prices, as Reported by Village Headmen
(baht per rai)

<i>Type of land</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>With document</i>	<i>Without document</i>	<i>With document</i>	<i>Without document</i>	<i>With document</i>	<i>Without document</i>	<i>With document</i>	<i>Without document</i>
Irrigated lowland	5,100	3,300	12,325	6,700	n.a.	n.a.	n.a.	n.a.
Unirrigated lowland	3,970	2,265	8,675	4,200	6,816	4,789	3,750	2,050
Upland	2,950	1,740	4,300	1,775	4,316	2,200	2,412	1,431
<i>Mean ratio of price without document to price with document</i>								
Irrigated lowland	0.670		0.590		n.a.		n.a.	
Unirrigated lowland	0.609		0.511		0.663		0.547	
Upland	0.607		0.500		0.628		0.593	
Number of plots in sample	20		20		20		8	

n.a. Not available.

Note: In 1985 the rate of exchange was 26 baht to the U.S. dollar; 6.25 rai = 1 hectare.

The set of land characteristics that may affect productivity or farmgate prices is categorized below.

Natural land attributes

- Soil type—black, not black
- Slope—flat, not flat
- Lowland or upland
- Irrigation—year-round irrigation, seasonal irrigation, rainfed
- Suitable for sugarcane (only in Khon-Kaen province)

Land improvements

- Bunds in place
- Leveled by farm machinery
- Fruit trees planted
- Cleared of stumps

Location and transportation

- All-weather road to the nearest market
- Length of time required to reach the nearest market
- All-weather road to the village
- Length of time required to reach the village

Most of these variables affect the productive potential of the land or the cost of cultivating it. Fruit trees, for example, provide an additional source of income. Similarly, favorable location increases the farmgate price of output or reduces the effective cost of inputs. Suitability for the cultivation of sugarcane possibly affects the price of the land, since the crop is highly profitable. Not all tracts, however, meet the moisture and soil requirements needed to grow sugarcane.

Results of the regressions are presented in table 17. Legal title stands out as the most significant factor in explaining the variation in land prices. In all four provinces, the parameter for title is significantly greater than zero at the 99 percent confidence level. A substantial difference exists between Lop Buri and the northeastern provinces, however. The value of this parameter in Lop Buri is less than a third of its value in Nakhon Ratchasima and Khon-Kaen and about half its value in Chaiyaphum. An earlier discussion of credit markets gave a possible reason for this difference: since Lop Buri is characterized by an abundance of informal credit, formal ownership—with a title—is less significant.

The parameter of the dummy variable for untitled plots outside the forest reserves is positive and lies within the interval spanned by zero and the parameter of the title dummy variable as suggested by the model. It is significantly smaller—at the 95 percent confidence level—than the parameter of titled land for Lop Buri, Nakhon Ratchasima, and Khon-Kaen. It is significantly greater than zero at a 90 percent one-tailed confidence level in all provinces except Lop Buri, implying that untitled land *outside* the forest reserves is more valuable than untitled land *within* the forest

Table 17. Parameter Estimates from Hedonic Land Price Analysis

Variable	Province			
	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
<i>Ownership security</i>				
Titled (D)	0.2264 (5.48)	0.8431 (14.29)	0.7605 (11.10)	0.4310 (8.52)
Untitled, outside forest reserves (D)	0.0516 (0.67)	0.1597 (1.63)	0.2018 (1.77)	0.2957 (1.49)
<i>Natural attributes</i>				
Black soil (D)	0.0351 (0.55)	0.1855 (2.84)	0.0424 (0.51)	0.2050 (3.51)
Flat slope (D)	0.0516 (0.90)	0.0102 (0.18)	0.1210 (1.66)	0.0939 (1.90)
Lowland (D)	0.1722 (2.51)	-0.0304 (0.47)	0.1257 (1.70)	0.1035 (2.00)
Year-round irrigation (D)	0.1398 (2.29)	0.2884 (2.60)	0.1120 (0.62)	0.3709 (1.10)
Seasonal irrigation (D)	0.0865 (1.79)	0.2723 (4.30)	-0.0454 (0.25)	0.2199 (1.37)
Suitability for sugarcane (D)	— ^a	— ^a	0.0450 (0.51)	— ^a
<i>Land improvements</i>				
Bunds in place (D)	-0.0579 (1.21)	0.4148 (6.80)	0.2474 (3.48)	0.1398 (2.69)
Land leveled (D)	0.1030 (1.75)	-0.0122 (0.20)	-0.0760 (0.93)	0.0068 (0.10)
Fruit trees planted (D)	0.0649 (1.47)	-0.0082 (0.15)	0.0751 (1.17)	-0.0389 (0.43)
Cleared of stumps (D)	— ^b	0.1226 (1.69)	0.0163 (0.22)	0.1934 (1.43)
<i>Location and transportation</i>				
All-weather road to market (D)	— ^b	0.1027 (1.32)	0.2122 (2.25)	0.0141 (0.21)
Travel time to market	-0.1053 (3.62)	0.0395 (1.19)	0.0012 (0.027)	-0.0858 (2.04)
All-weather road to village (D)	0.0937 (2.39)	0.0924 (1.88)	-0.1005 (1.46)	-0.0176 (0.39)
Travel time to village	-0.0277 (1.57)	-0.0440 (1.67)	-0.0355 (1.14)	0.0058 (0.22)
Constant	8.0988 (10.24)	7.4396 (2.78)	7.5737 (2.77)	7.3362 (33.88)
R ²	0.183	0.578	0.389	0.243
F value	7.165	47.410	17.090	9.534
Number of observations	431	536	447	461

(D) Dummy variable; numbers in parentheses are Student *t* values.

a. Sugarcane is not grown in the province.

b. The value of this variable is the same in nearly all observations.

Table 18. Alternative Estimates of the Value of Security of Ownership

(difference between logarithm of price titled land and of untitled land)

<i>Method</i>	<i>Province</i>			
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Chaiyaphum</i>
Direct estimate ^a	0.226	0.843	0.760	0.431
Estimate based on imputation from titled to untitled subsample	0.252	0.779	0.725	0.434
Estimate based on imputation from untitled to titled subsample	0.195	0.925	0.723	0.419

a. From table 17.

reserves. This is apparently because ownership is not challenged by the state and the possibility of titling does exist.

In Lop Buri there is no statistically significant difference between the value of untitled land within and outside the forest reserves. The parameter for untitled land outside the reserve, however, is equal to about a fifth of the parameter of title—a ratio nearly identical to those in Khon-Kaen and Nakhon Ratchasima. Although the ratio is higher in Chaiyaphum, we cannot make firm statements on the basis of the estimated coefficient there, since we have only five observations of untitled plots outside the forest reserves for this province. The data results suggest that only one-fifth of the total value of title stems from increased security from eviction: most of the value of title is derived from greater access to credit.

Most of the results for the other explanatory variables are reasonable. Out of fifty-one parameters estimated for all four provinces combined, forty have the expected sign. Of those that have a counterintuitive sign, none are significantly different statistically from zero. Among the parameters with the expected sign, twenty-two are significant at the 95 percent (one-tailed) confidence level.

We further checked the robustness of the results for the quantitative importance of titles, by replicating a method used by Jimenez (1984) to estimate the value of security of ownership of city dwellings in legal and illegal settlements. First, the parameters of land characteristics are estimated only within the subsample of titled holdings—or only within the subsample of untitled holdings. These parameters are then used to impute the value of untitled plots.³ The prediction is that, if these plots were

titled, the imputed value would reflect their sale value. By calculating the difference between the imputed value and the actual, or recorded, value and averaging over the subsample of untitled plots, an estimate of the value of title is obtained. Similarly, if parameters of land characteristics are obtained through a regression using the subsample of untitled holdings, imputed values of titled holdings can be generated, and the mean difference between actual and imputed values can be calculated.

Compared to the directly estimated value of ownership security (see table 17), the results of this procedure demonstrate remarkable robustness (see table 18). Not only are the rankings of estimated parameters across provinces similar, but also in three provinces the mean differences between the imputed values of land and the actual values are within an interval of plus or minus one standard deviation from the estimates of table 17. In Lop Buri the mean differences between imputed and actual values are within an interval of two standard deviations of the direct estimate of the value of title. This finding increases our confidence in the validity of the quantitative estimates of the value of title.

The regression results imply that the value of untitled land, expressed as a percentage of the value of titled land, is 80 percent in Lop Buri, 43 percent in Nakhon Ratchasima, 47 percent in Khon-Kaen, and 64 percent in Chaiyaphum. Thus, legal security of ownership is an important factor in the rural economy of Thailand. Since differential land values, moreover, reflect in part differences in productivity, we expect—at least in the northeastern provinces—that other indicators of economic performance will demonstrate significant differences as well. We shall address the issues of economic performance, such as investment and output, in the next few chapters.

Notes

1. In the absence of specialized assessors in the rural areas of Thailand, there was no other way to obtain the current market value of land. Jimenez(1984) used data obtained in a similar manner for values of urban dwellings in both legal and illegal settlements.

2. Taxes on agricultural land are extremely low in Thailand, amounting to less than a quarter of 1 percent of land value. They therefore have a negligible effect on land values.

3. More precisely, the logarithm of price is imputed.

8

The Effects of Ownership Security on Landownership and the Formation of Capital

As a basis for the discussion in chapter 2 and the formal model presented in chapter 6, it is postulated that titled farmers accumulate more capital and invest more in land improvements than do untitled farmers. The reason is that titled farmers have comparatively better investment incentives because of perceptions of ownership security and better access to cheaper and longer-term credit. The data presented so far indicate that, although Thai squatters may face relatively little insecurity of ownership, they are significantly more constrained in their ability to obtain institutional credit, especially medium- and long-term credit.

In this chapter we shall provide empirical evidence to substantiate the theoretical propositions. Since the formal model of chapter 6 contained only one aggregate capital input, however, we shall expand the model to include investments in equipment and land improvements. The model will then serve as a basis for the subsequent econometric work.

The Model

Farmers are assumed to own a given area of land, A . Ownership is not secure and there is a nonzero probability of eviction, Φ . A two-period model, in which farmers invest in the first period and produce in the second, is assumed. The farmers' objective is to maximize their expected terminal wealth, as measured by the combined value of output, capital, and land, minus debt repayment. Farmers are assumed to be risk averse, with decreasing absolute risk aversion (Arrow 1965). They can invest in three types of activity, all of which constitute assets: *capital*, K —equipment, draft animals, machinery—which is not totally lost in the event of eviction, but may lose value in distress sales; *land improvements and structures*, M —fencing, ground leveling, clearing of trees and stumps, and so on—which, although they increase the productive capacity of land, are lost if the farmer is evicted; and *nonagricultural activities and assets*, Z , which are not affected by eviction and serve as risk-free assets. Since the

following empirical analysis is based on cross-sectional data that contain no variation in price among farmers, prices are set at unity.

Agricultural output, Y , is produced by a constant-returns-to-scale production function with three inputs: land, capital, and land improvements. Productivity is also affected by human capital, S .

$$(8-1) \quad y = y(k, m, S); \quad y_i \equiv \partial y / \partial i > 0; \quad y_{ii} < 0; \quad y_{ij} > 0 \text{ for } i \neq j; \quad i = k, m, S$$

where lowercase letters denote per-acre variables. For simplicity variable inputs are ignored. The return to the risk-free activity is subject to a concave yield function:

$$(8-2) \quad F = F(Z); \quad F' \equiv dF/dZ > 0; \quad F'' < 0$$

Land-improving investments increase the terminal value of land, as shown in chapter 7, but with decreasing marginal returns:

$$(8-3) \quad P = P(m); \quad P' \equiv dP/dm > 0; \quad P'' < 0$$

Farmers are assumed to be credit-rationed. The amount of credit available to them, L , is related negatively to the risk of eviction, Φ , and is related positively to the amount of land owned. The negative effect of the risk of eviction on the supply of credit holds, even when the risk is low, if the lack of formal ownership prevents the use of land as collateral.

$$(8-4) \quad L = L(\Phi, A); \quad \partial L / \partial \Phi < 0; \quad \partial L / \partial A > 0$$

The budget constraint implies that the total of investments equals initial wealth (W_0), plus borrowed funds:

$$(8-5) \quad L(\Phi, A) + W_0 = k \cdot A + m \cdot A + Z$$

If eviction does not take place, the terminal wealth is

$$(8-6) \quad V_1 = A \cdot y(k, m, S) + P(m) \cdot A + F(Z) - (1 + r) \cdot L(\Phi, A)$$

where r is the rate of interest. For simplicity, the residual value of capital is set at zero. If eviction takes place, land and output are lost. The terminal value is then

$$(8-7) \quad V_2 = F(Z) - (1 + r) \cdot L(\Phi, A)$$

The expected terminal wealth, $E(V)$, is the probability-weighted sum of equations 8-6 and 8-7. Using the budget constraint, equation 8-5, to substitute initial wealth, capital, and land improvements for Z , the objective function is

$$(8-8) \quad \begin{aligned} \text{Max}_{k, m} E(V) = & (1 - \Phi) \cdot \{A \cdot y(k, m, S) + P(m) \cdot A + F[L(\Phi, A) \\ & + W_0 - k \cdot A - m \cdot A] - (1 + r) \cdot L(\Phi, A)\} \\ & + \Phi \cdot \{F[L(\Phi, A) + W_0 - k \cdot A - m \cdot A] - (1 + r) \cdot L(\Phi, A)\} \end{aligned}$$

First-order conditions for a maximum require that

$$(8-9) \quad \partial E(V)/\partial k = [(1 - \Phi) \cdot (y_k - F') - \Phi \cdot F'] \cdot A = 0$$

$$(8-10) \quad \partial E(V)/\partial m = [(1 - \Phi) \cdot (y_m + P' - F') - \Phi \cdot F'] \cdot A = 0$$

Rewrite the first-order conditions 8-9 and 8-10 as

$$(8-11) \quad A \cdot [(1 - \Phi) \cdot y_k - F'] = 0$$

$$(8-12) \quad A \cdot [(1 - \Phi) \cdot (y_m + P') - F'] = 0$$

The Hessian matrix of the system 8-11 and 8-12 is given by

$$(8-13) \quad H = \begin{bmatrix} H_{11} & H_{12} \\ H_{21} & H_{22} \end{bmatrix}$$

where

$$(8-14) \quad H_{11} = A \cdot (1 - \Phi) \cdot y_{kk} + A \cdot F'' < 0;$$

$$H_{22} = A \cdot (1 - \Phi) \cdot (y_{mm} + P'') + A \cdot F'' < 0$$

$$H_{12} = H_{21} = A \cdot (1 - \Phi) \cdot y_{mk} + A \cdot F''$$

The second-order conditions for a maximum require that the determinant of H be positive:

$$(8-15) \quad \begin{aligned} H_{11} \cdot H_{22} - H_{12}^2 &= A^2 \cdot (1 - \Phi)^2 \cdot (y_{mm} + P'') \cdot (y_{kk}) + A^2 \cdot (1 - \Phi) \cdot F'' \\ &\cdot (y_{kk} + y_{mm} + P'') + A^2 \cdot (F'')^2 - A^2 \cdot (1 - \Phi)^2 \cdot y_{mm}^2 - A^2 \cdot (F'') - 2 \\ &\cdot A^2 \cdot (1 - \Phi) \cdot y_{mk} \cdot F'' = A^2 \cdot (1 - \Phi)^2 \cdot [(y_{mm} \cdot y_{kk} - y_{mk}^2) + (P'' \\ &\cdot y_{kk})] + A^2 \cdot (1 - \Phi) \cdot F'' \cdot (y_{kk} + y_{mm} + P'' - 2y_{mk}) \end{aligned}$$

By the concavity of the per-acre production function, $y_{mm} \cdot y_{kk} > y_{mk}^2$. All the other terms are clearly positive, so the determinant is positive.

The Effect of the Risk of Eviction, Φ

The effect of ownership insecurity is demonstrated by assuming a small increase in the probability of eviction, Φ . Differentiation of equations 8-11 and 8-12 obtains

$$(8-16) \quad \begin{bmatrix} H_{11} & H_{12} \\ H_{21} & H_{22} \end{bmatrix} \cdot \begin{bmatrix} \frac{dk}{d\Phi} \\ \frac{dm}{d\Phi} \end{bmatrix} = A \cdot \begin{bmatrix} y_k + F'' \cdot \frac{\partial L}{\partial \Phi} \\ (y_m + P') + F'' \cdot \frac{\partial L}{\partial \Phi} \end{bmatrix}$$

By equations 8-11 and 8-12, $y_m + P' = y_k$. Denoting $y_k + P' \cdot \partial L / \partial \Phi \equiv \lambda$, and employing Cramer's rule, equation 8-16 yields

$$(8-17) \quad \frac{dk}{d\Phi} = \frac{\lambda}{\Delta} \cdot A \cdot (H_{22} - H_{12}) \\ = \frac{\lambda}{\Delta} \cdot A^2 \cdot (1 - \Phi) \cdot (y_{mm} + P'' - y_{mk}) < 0$$

where Δ is the determinant of the Hessian matrix. Since $\lambda > 0$, $\Delta > 0$, and $y_{mm} + P'' - y_{mk} < 0$, it follows that $dk/d\Phi < 0$.

A similar calculation yields

$$(8-18) \quad \frac{dm}{d\Phi} = \frac{\lambda \cdot A}{\Delta} \cdot (H_{11} - H_{12}) = \frac{\lambda \cdot A^2}{\Delta} \cdot (1 - \Phi) \cdot (y_{kk} - y_{mk}) < 0$$

Since $\lambda > 0$ even when $\Phi = 0$, the positive effect of the legal status of land on the supply of credit is sufficient to generate inequalities 8-17 and 8-18, even when the actual risk of eviction, Φ , is low. Conversely, even when the supply of credit is not binding— $\partial L / \partial \Phi = 0$ —the existence of a nonzero probability of eviction is sufficient to generate inequalities 8-17 and 8-18.

Econometric Specification

Equations 8-11 and 8-12 are implicit—and highly nonlinear—functions defined over the endogenous variables K and M and the exogenous variables Φ , W_0 , A , and S . They can be regarded as structural equations. Solving these equations for K and M in terms of the exogenous variables yields the reduced-form equations

$$(8-19) \quad K = K(\Phi, W_0, A, S)$$

$$(8-20) \quad M = M(\Phi, W_0, A, S)$$

The exact specification of 8-19 and 8-20 requires an explicit specification of $L(\Phi, A)$, $P(M)$, $Y(A, K, M, S)$, and $F(Z)$. Since these functions are nonlinear, the resultant specification of equations 8-19 and 8-20 is not tractable for econometric purposes. We therefore estimate a log-linear approximation of equation 8-19. Land improvements, M , present a further difficulty. The data are given in a binary format—that is, with the presence or absence of a land improvement—rather than as a value for the improvement. This dictates a dichotomous-choice econometric model. Since the theoretical model considers only a two-period horizon, the time dimension is missing in the reduced-form equations 8-19 and 8-20. This is accounted for in the empirical analysis by the addition of a variable for the number of years the farmer has been the principal

Table 19. Capital per Rai Owned, by Title Status

<i>Item</i>	<i>Province</i>							
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>	
	<i>Untitled farmers</i>	<i>Titled farmers</i>	<i>Untitled farmers</i>	<i>Titled farmers</i>	<i>Untitled farmers</i>	<i>Titled farmers</i>	<i>Untitled farmers</i>	<i>Titled farmers</i>
Capital value (baht per rai)	729	915	809	1,332	700	1,378	694	738
Capital value adjusted for differences in land quality ^a	729	906	809	1,177	700	1,238	694	738
Mean land-quality index ^b	92	93	76	86	71	79	83	83
Number of plots in sample	100	84	89	72	61	82	120	112

Note: 6.25 rai = 1 hectare.

a. To adjust for differences in quality of land, the capital per rai of the titled farmers is divided by the ratio of the quality index of titled land to the quality index of untitled land.

b. The quality index is based on parameters estimated in the hedonic price equations reported in chapter 7.

decisionmaker on the farm—denoted as “experience.” It is expected that, other things being equal, a longer period as decisionmaker will facilitate accumulation of more capital and land-improving investments.

The central hypothesis is that legal security of ownership affects investments positively. Since all squatters in a province face the same risk of eviction, this risk is represented by a dummy variable that takes a value of zero for squatters (positive risk) and a value of 1 for legal owners (zero risk).¹

Comparisons of mean levels of capital per unit of land owned, where capital is measured as the current value of equipment and animals and land is considered to be owned whether or not it is legally possessed, show that the capital-to-land ratio is higher for titled farmers than for untitled farmers. The difference is 25 percent in Lop Buri, 63 percent in Nakhon Ratchasima, 97 percent in Khon-Kaen, and 6 percent in Chaiyaphum (see table 19). Similar differences prevail, even when the measure of land owned is adjusted to reflect differences in the quality of the land and access to markets. The procedure for adjusting the amount of land owned to account for differences in quality is described in the appendix to this chapter.

Although these statistics are compatible with theory, a more rigorous test is required. Other attributes and factors that may differ systematically among farmers need to be controlled for. We thus estimate a log-linear specification of the reduced-form equation 8-19, where $1 - \Phi$ is represented by the dummy variable that indicates ownership of titled land, W_0 is the farmer's initial capital adjusted for differences in the cost of living with the passage of time, and S is the number of years of schooling. The amount of land owned, A , is adjusted for differences in quality and for access to markets. Differences in the time span during which capital has accumulated are also measured by the variable *experience*. The dependent variable is the current value of capital owned.

Regression results are presented in columns 1–4 of table 20. The estimates for the three northeastern provinces confirm that security of ownership induces greater accumulation of capital: the coefficient of the ownership security variable—the title dummy—is significantly greater, statistically, than zero at the 95 percent one-tailed confidence level for Nakhon Ratchasima and Khon-Kaen and at the 94 percent one-tailed confidence level for Chaiyaphum. In Lop Buri, the coefficient of ownership security is not significantly different, statistically, from zero. This finding is compatible with the ample supply of *noninstitutional* credit in the province, which diminishes the importance of ownership titles (see the discussion in chapter 5). As expected, the amount of land owned has a positive—and statistically significant—effect on the accumulation of capital. Similarly, the more years the farmer has been the decisionmaker on the farm, the greater the amount of capital owned, although the effect is

Table 20. Regressions of Capital Stock and Owned Land

Explanatory variable	Capital stock (variant 1)				Capital stock (variant 2)				Owned land (adjusted for differences in quality)			
	Lop Buri (1)	Nakhon Ratchasima (2)	Khon- Kaen (3)	Chaiya- phum (4)	Lop Buri (5)	Nakhon Ratchasima (6)	Khon- Kaen (7)	Chaiya- phum (8)	Lop Buri (9)	Nakhon Ratchasima (10)	Khon- Kaen (11)	Chaiya- phum (12)
Constant	1.433 (0.988)	1.354 (0.776)	2.605 (1.787)	4.130 (3.164)	6.237 (4.439)	2.625 (1.459)	2.655 (1.746)	4.660 (3.580)	2.819 (8.172)	1.277 (4.063)	0.674 (1.934)	1.608 (5.714)
Owned land ^a	1.659 (6.254)	1.328 (4.196)	0.782 (2.477)	0.660 (2.262)	—	—	—	—	—	—	—	—
Experience	0.159 (0.490)	0.695 (1.679)	0.925 (2.321)	0.603 (1.991)	0.416 (1.137)	1.007 (2.389)	1.221 (3.258)	0.851 (2.920)	0.205 (2.287)	0.195 (2.653)	0.459 (5.342)	0.370 (5.833)
Education	0.349 (2.363)	0.034 (0.146)	-0.001 (0.003)	0.023 (0.140)	0.345 (2.117)	0.087 (0.365)	0.031 (0.189)	-0.013 (0.077)	0.005 (0.118)	0.046 (1.103)	0.042 (1.119)	-0.060 (1.662)
Capital owned initially	-0.007 (0.201)	0.006 (1.326)	0.054 (1.226)	0.062 (1.444)	0.032 (0.833)	0.056 (1.061)	0.065 (1.472)	0.070 (1.624)	0.211 (2.234)	-0.025 (0.275)	0.017 (1.633)	0.025 (2.674)
Land owned initially	—	—	—	—	-0.012 (0.116)	0.225 (1.438)	0.045 (0.399)	0.237 (1.517)	0.044 (1.789)	0.243 (8.902)	0.090 (3.464)	0.144 (4.245)
Land owned by father	—	—	—	—	0.057 (0.393)	0.337 (1.436)	0.324 (1.545)	0.067 (0.560)	-0.031 (0.364)	0.090 (2.200)	0.140 (2.917)	0.039 (1.499)
Title dummy	0.032 (0.087)	0.972 (2.103)	1.444 (3.490)	0.608 (1.609)	0.353 (0.880)	0.987 (2.070)	1.402 (3.180)	0.787 (2.094)	0.159 (1.612)	0.019 (0.223)	-0.080 (0.788)	0.239 (2.946)
F value	9.60	7.27	6.74	5.18	1.25	3.81	4.92	3.92	2.87	19.57	9.90	15.52
R ²	0.20	0.15	0.17	0.10	0.04	0.10	0.15	0.09	0.08	0.36	0.24	0.29
Number of observations	199	219	171	232	199	219	171	232	199	219	171	232

— Not applicable; numbers in parentheses are *t* values.

a. Adjusted for differences in quality.

not significant in Lop Buri. Greater initial capital implies greater present capital in the three northeastern provinces. Education has the expected effect on capital in Lop Buri (significant coefficient) and Khon-Kaen.² The systematic content of the estimated equation is significant: *F* statistics are much higher than the critical value, although only a small portion of the variation in capital is explained by the model. Such a result is common in cross-sectional studies.

Similar to the theoretical model, the specification employed in the regressions reported here assumes that land now owned by a farmer is either exogenously given or predetermined to the accumulation of capital. If the present amount of land owned is an endogenous decision variable accumulated in time, however, as assumed in the model in chapter 6, then the estimation procedure above is invalid. Owned land can then be correlated with the error term in the capital equation 8-19, yielding biased estimates. As estimated earlier, the capital equation is then a semireduced form, with one endogenous variable, *A*, on the right-hand side. To overcome this potential problem we have formulated a reduced-form equation for owned land, adjusted for quality. The equation includes the initial amount of land owned by the farmer and the land owned by the farmer's father as well as the exogenous variables in equation 8-19. These exogenous variables are expected to affect the amount of land owned at present. Specifically, titled land may have been used as collateral for loans to acquire additional land. Substituting for owned land in the capital equation 8-19 by using the reduced-form equation of land yields a full reduced-form equation for capital that includes initial land and the father's land as additional explanatory variables.

Table 20 presents the results of this variant of the capital equation (columns 5–8) and the coefficients for the reduced-form land equation (columns 9–12). These coefficients change little from those in variant 1. The main difference is a substantial increase in the title dummy coefficient in Lop Buri, though it is still not statistically significant. In the reduced-form equation for land in Lop Buri and Chaiyaphum, the title coefficients are significantly greater than zero at the 90 percent confidence level. This suggests that in these two provinces some of the credit advantages from holding titled land are used to acquire more land.

In Khon-Kaen and Nakhon Ratchasima, however, possession of a secure title does not induce the acquisition of land. As the reduced-form equation for land in these provinces shows, possession of a title has an insignificant effect on the amount of land owned. A statistical test confirms that even when the amount of land owned is an endogenous variable, owners of titled land in the three northeastern provinces accumulated more capital *per unit of land* than did owners of untitled land. The formal test is simply the zero hypothesis that the coefficient of the title dummy in the reduced-form land equation (columns 9–12 in table 20) is

not different from the coefficient of title in the reduced-form capital equation (columns 5–8 in table 20) versus the alternative hypothesis that the coefficient in the capital equation is larger than that in the land equation. Since the two estimates are independent, the variance of the difference is the sum of the individual variances. The zero hypothesis is rejected at the 95 percent confidence level in Nakhon Ratchasima and Khon-Kaen and at the 90 percent confidence level in Chaiyaphum. In Lop Buri, however, the hypothesis that possession of formal titles does not induce changes in ratios of capital to land cannot be rejected. The same conclusions are derived from a reduced-form estimate of the equation for the capital-to-land ratio, which differs from the preceding test because continuous variables are expressed per rai. The coefficients of the title dummy variable in three northeastern provinces are significantly greater than zero at the 95 percent confidence level (see table 21).

The estimated parameters of the title dummy variable in table 21 indicate that in Nakhon Ratchasima and Chaiyaphum, the capital stock per unit of land held by a farmer with a land title is about 105 percent and 56 percent greater, respectively, than that of a farmer without secure ownership, holding all other attributes identical.³ The effect of title is greater in Khon-Kaen province; the capital-to-land ratio is about 253 percent

Table 21. Regressions of Capital-to-Land Ratios

Explanatory variable	Province			
	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
Constant	3.701 (3.898)	2.985 (2.499)	2.741 (2.558)	3.626 (4.209)
Experience	0.258 (1.031)	0.595 (2.014)	0.649 (2.350)	0.463 (2.180)
Education	0.324 (2.858)	0.068 (0.414)	-0.005 (0.046)	0.039 (0.335)
Capital owned initially	-0.024 (0.562)	0.055 (1.028)	0.081 (1.687)	0.070 (1.579)
Land owned by father	-0.158 (1.176)	-0.097 (0.531)	0.439 (0.364)	0.158 (1.014)
Title dummy	0.044 (0.160)	0.718 (2.163)	1.262 (4.040)	0.444 (1.664)
F value	1.79	2.36	4.66	1.91
R ²	0.05	0.06	0.15	0.05
Number of observations	199	219	171	232

Note: Numbers in parentheses are *t* values.

higher for a titled farmer. The difference in Lop Buri, only 5 percent, is not statistically significant.

Land Improvements

Land improvements are land-embodied investments that either maintain or enhance the productive capacity of land by preventing erosion and loss of moisture. Our data cover two main types of land improvement: bunding, in which the field is divided into subplots by raised earth walls, thus making possible better water control and moisture retention, and the clearing of stumps, which increases the productive surface area and facilitates better and faster preparation of the soil using mechanized power. Since such improvements require labor and mechanized or draft power, cash or credit is needed.⁴ And since the risk of eviction is an obvious disincentive to improvement of untitled tracts, some degree of ownership security is required. These two aspects thus imply a greater likelihood of land improvements on titled tracts.

The incidence of land improvements on titled and untitled plots of land is compared in table 22. In Nakhon Ratchasima and Khon-Kaen bunding and clearance of stumps are significantly more common on titled plots. In Lop Buri and Chaiyaphum improvements are not significantly more common on titled plots. For the pooled data, however, the frequency of bunding and stump clearing is significantly greater on titled plots. These findings indicate that land improvements are related to security of ownership, as theory suggests.

Several important differences among the plots may affect land improvement decisions, however. Similarly, differences among farmers may also affect land improvements. Thus, in analogy to the foregoing regression equations, logit estimates of the coefficients of variables that affect land improvements are obtained. The interpretation of the parameter of the title dummy variable in the logit equation is similar to the one in the capital regression in that the parameter measures the effect of legal ownership status on the probability of land improvements, other things being equal. To maintain consistency with the theoretical decision model, only unimproved plots and the plots improved by the present decision-maker are considered in the analysis.

In addition to characteristics of farmers, used earlier, several plot-specific variables are incorporated in the analysis as explanatory variables. First, the number of years since the present decisionmaker acquired the plot is expected to be related positively to land improvements. This is because land improvements require time for accomplishment. Second, because of technical incentives or economies of scale, plot size is expected to be related positively to bunding. Larger plots gain more from bunding than do smaller plots, for example, since unequal retention of water is

Table 22. The Incidence of Land Improvements
(percent)

<i>Improvement</i>	<i>Province</i>									
	<i>Lop Buri</i>		<i>Nakhon Ratchasima</i>		<i>Khon-Kaen</i>		<i>Chaiyaphum</i>		<i>Pooled</i>	
	<i>Titled plots</i>	<i>Untitled plots</i>	<i>Titled plots</i>	<i>Untitled plots</i>	<i>Titled plots</i>	<i>Untitled plots</i>	<i>Titled plots</i>	<i>Untitled plots</i>	<i>Titled plots</i>	<i>Untitled plots</i>
Bunding	39	32	66	44	71	49	67	64	61	49
Clearance of stumps	77	76	63	29	50	38	76	76	64	56
Number of plots in sample	211	216	251	284	258	189	129	332	549	1,021

more prevalent on larger plots. The effect of plot size on stump clearing is expected to be negative, since the cultivable area on a larger plot is greater and hence requires less clearing. The overall productive quality of the plot is expected to have a positive effect on investment incentive for land improvements, since the return on the improvement is greater. We have therefore introduced a plot-specific quality index to account for attributes such as type of soil, slope, availability of irrigation, and location. The index has been constructed using coefficients from a hedonic price analysis of land values (see the appendix to this chapter). We have also introduced a dummy variable for lowland plots in the bunding equation, since bunding is more likely to be done on lowland plots suitable for paddy cultivation.

Estimated coefficients are presented in table 23. The results show that in Nakhon Ratchasima and Khon-Kaen, the probability of bunding is significantly greater—at the 95 percent confidence level—on titled plots than on untitled plots. The magnitude of the effect of title is substantial. In Nakhon Ratchasima and Khon-Kaen, the probability of bunding on a titled plot is greater by 31 and by 20 percentage points, respectively, than on an identical untitled plot owned by an identical farmer.⁵ The effect of security of ownership on the probability of bunding is not statistically significant in Chaiyaphum and Lop Buri. As expected, however, the sign of the coefficient is positive.

In the estimates for improvement of the land by stump clearing, land titles have a statistically significant effect—at a 90 percent one-tailed confidence level—in all provinces except Chaiyaphum. The coefficients imply that the probability of stump clearing on titled plots is greater by 9 percentage points in Lop Buri, by 14 percentage points in Khon-Kaen, and by 11 percentage points in Nakhon Ratchasima, than for identical untitled plots and identical farmers.

Among the other variables in the logit equation, the quality of the plot and the number of years the plot has been owned consistently exert a positive—and often highly significant—influence on the probability of land improvements. Plot area has the expected sign in the two equations. Most farmers' characteristics are not statistically significant in explaining investment in land improvements. As expected, the likelihood of bunding is greater on lowland plots.

Overall, the empirical evidence supports the hypothesis that security of landownership induces higher levels of improvements to the land. This finding is consistent with the evidence presented earlier on the effects of landownership security on the formation of capital.

The empirical analysis thus indicates that the possession of a legal land title contributes significantly to greater capital formation and increased land improvements. These findings imply that provision of secure legal ownership to squatters will increase the productivity of their land, since

Table 23. Logit Estimates of Determinants of Land Improvements

Variable	<i>Bunding</i>				<i>Clearing of stumps</i>			
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Chaiyaphum</i>	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Chaiyaphum</i>
Constant	-5.973 (3.328)	-5.903 (3.691)	-4.561 (2.175)	-0.782 (0.639)	0.371 (0.219)	-1.596 (0.910)	-4.260 (2.375)	0.298 (0.304)
Education	-0.034 (0.282)	-0.284 (1.797)	-0.168 (1.194)	-0.090 (0.777)	0.055 (0.435)	-0.119 (0.753)	-0.032 (0.283)	-0.0036 (0.033)
Land owned by father	-0.137 (1.229)	0.017 (0.115)	-0.221 (1.072)	-0.176 (1.911)	-0.057 (0.474)	-0.331 (2.046)	-0.014 (0.067)	-0.0535 (0.660)
Capital owned initially	-0.010 (0.338)	-0.056 (1.674)	0.009 (0.235)	-0.050 (1.471)	0.037 (1.276)	-0.042 (1.220)	0.012 (0.347)	-0.0074 (0.240)
Land owned initially	0.001 (0.015)	-0.091 (0.755)	-0.253 (2.114)	-0.284 (2.244)	-0.121 (1.454)	0.229 (1.504)	-0.159 (1.423)	-0.192 (1.802)
Experience	0.350 (1.008)	0.198 (0.573)	-0.070 (0.175)	-0.767 (2.137)	0.236 (0.649)	0.513 (1.231)	0.106 (0.281)	0.293 (1.130)

Plot type	2.587	1.690	2.852	1.895	—	—	—	—
(lowland/upland)	(5.463)	(4.045)	(5.395)	(5.171)				
Number of years	0.058	0.072	0.060	0.065	0.009	0.015	0.025	0.021
plot has been owned	(2.678)	(3.719)	(2.691)	(3.279)	(0.409)	(0.774)	(1.309)	(1.396)
Quality of land	2.717	4.313	1.072	2.619	0.227	1.605	4.720	0.583
	(2.009)	(4.136)	(0.612)	(2.446)	(0.208)	(1.688)	(3.391)	(0.749)
Area of plot	0.197	0.655	1.452	1.402	-0.072	-0.570	-0.090	-0.053
	(0.934)	(3.366)	(5.581)	(5.653)	(0.349)	(2.784)	(0.440)	(0.267)
Title dummy	0.271	1.242	0.806	0.077	0.516	0.667	0.472	0.022
	(0.862)	(4.131)	(2.081)	(0.228)	(1.715)	(2.139)	(1.371)	(0.079)
Likelihood								
ratio statistic	202.4	77.5	144.0	127.8	43.7	76.4	28.9	13.9
Number of								
observations	365	361	267	308	242	259	204	292

— Not applicable.

Note: Numbers in parentheses are *t* values.

ratios of capital to land will increase once all adjustments have been made.

Appendix: Adjustment for Land Quality

Land quality, as defined in this study, pertains to soil characteristics and other physical attributes of the land that make one plot more productive than another. The index of quality used in this chapter incorporates the following attributes:

- Soil (black, not black)
- Slope (flat, not flat)
- Upland or lowland location
- Access to irrigation (year-round, seasonal, rainfed)
- Availability of an all-weather road to market
- Length of travel time to nearest market
- Availability of an all-weather road to village
- Length of travel time to the village

The weights for combining these attributes into a composite index are the coefficients of the hedonic land price equation reported in chapter 7. The quality index of a plot is a weighted sum of these indicators. Multiplying the quality index of a plot by its area and adding together the results for all the plots owned by a given farmer provides the area of land owned, adjusted for quality.

Notes

1. The sample contains a small number—18 percent—of farmers who held both titled land outside the forest reserves and untitled land within the forest reserves. Since the titled holdings could serve as collateral, these farmers were grouped with the fully titled farmers in the title-dummy variable.

2. The lack of significance of the parameter of education in the northeastern provinces may be a result of the very small degree of variation in number of years of schooling; most farmers have had the mandatory four years of schooling.

3. Since the regressions are logarithmic, the coefficients must be converted from natural logarithm to percentages; for Nakhon Ratchasima, for example, $1.05 = [\exp(0.718)] - 1$.

4. Although family labor could be used for these improvements in the slack dry season, it does have an opportunity cost: off-farm work in the cities during the dry season is common among farmers in the sample.

5. The effect of a variable in a logit equation is calculated as follows: The logit specification is $P = \exp(\Theta'x) / [1 + \exp(\Theta'x)]$, where P is the probability of adoption, x is a vector of explanatory variables, and Θ is a vector of coefficients. $dP/dx_i = \Theta_i \cdot x_i \cdot P_i \cdot (1 - P_i)$. In the case of title, $x_i = 1$. The level of P used in the calculation is the sample mean rate of adoption for the untitled farmers.

9

The Effects of Ownership Security on Farm Productivity and the Use of Inputs

The theory presented in chapters 2 and 6 and the empirical results of the analyses of land values and capital formation suggest that productivity is greater on lands for which the farmer has secure, or titled, ownership. The analysis of the supply of credit indicated that titled farmers receive a significantly larger volume of institutional credit, which is cheaper than alternative sources of credit, than do untitled farmers. This implies that the effective cost of inputs to titled farmers is lower than that to untitled farmers. In addition, if production complementarity exists between capital and variable inputs—that is, if cross derivatives in the production function are positive—the higher level of capital formation on titled farms would induce a greater demand for variable inputs.

In this chapter we shall seek to validate the hypothesis that productivity and the use of inputs per unit of land are greater among titled farmers than among untitled farmers. The analysis is restricted to Lop Buri, Nakhon Ratchasima, and Khon-Kaen, using data obtained for the 1984–85 wet season. The data for Chaiyaphum obtained in 1986 for the 1985–86 season could not be used because the province suffered a severe drought, and more than 75 percent of the farmers sampled were affected, so any analysis of data on inputs and outputs in Chaiyaphum would be unreliable.

Because many of the farmers sampled have more than one plot of land, and because most grow several crops simultaneously on a given plot, the analysis pertains to the aggregate value of agricultural output produced by the *household* and to the aggregate volumes of various inputs used by the *household*. The implicit assumption is that each household uses the resources at its disposal optimally, so comparisons of aggregate input and output values across households are valid.

In the analysis that follows differences in quality and other physical and economic characteristics of the land are controlled for by using a land quality index, which is based on the analysis of land values in chapter 7. The index gives premium to better soil, flatter slope, availability of

Table 24. Sample Means of Input and Output Values per Rai, Adjusted for Differences in Quality of Land

Item	Province								
	Lop Buri			Nakhon Ratchasima			Khon-Kaen		
	Untitled farmers	Titled farmers	Ratio of titled to untitled	Untitled farmers	Titled farmers	Ratio of titled to untitled	Untitled farmers	Titled farmers	Ratio of titled to untitled
Value of output (baht) ^a	671	747	1.113	687	744	1.083	554	701	1.265
Labor days ^b	6.30	7.50	1.190	11.80	13.85	1.140	14.50	16.00	1.103
Cost of draft power ^c	162	161	0.994	364	530	1.456	185	250	1.351
Costs of other inputs ^d	336	341	1.014	80	114	1.425	68	96	1.412
Number of farmers in sample	93	84	—	87	72	—	65	77	—

— Not applicable.

a. Cash costs are measured in Thai baht; in 1985 the rate of exchange was 26.3 baht to the dollar.

b. Includes family labor, hired labor, and exchange labor.

c. Includes the costs of hired animals and machinery plus the imputed cost of using family-owned animals and machinery.

d. Include the costs of, among others, fertilizers, pesticides, herbicides, and fuels.

irrigation, and favorable market and village location (see the appendix to chapter 7). Land with a higher quality index is expected to generate greater output than land with a lower quality index.

In table 24 the sample means for value of output and use of inputs for households classified as headed by titled or untitled landholders are presented. In all provinces output per rai (6.25 rai = 1 hectare) of titled farmers is greater than that of untitled farmers. Similarly, the use of various inputs by titled farmers is greater in all provinces except for the use of draft power in Lop Buri. While these means are compatible with the hypothesis stated earlier, they cannot be taken as conclusive proof of it for two reasons. First, as in any cross-sectional sets of data on inputs and outputs, standard deviations are quite large, and the statistical significance of the differences cannot be established. Second, although land quality is controlled for, there may be other factors that vary systematically among farmers in the two subsamples. Thus, the characteristics of farmers must be controlled for.

To test more rigorously whether levels of output and use of inputs by titled farmers differ significantly from those by untitled farmers, we performed a regression analysis of output and use of inputs per unit of land. Since the effect of titled ownership on productivity is derived in part through the greater capital intensity it induces, capital cannot be perceived as an exogenous variable in the present context. A reduced-form specification, in which only exogenous variables or variables predetermined in a long-run sense were included as explanatory variables, has therefore been used. The explanatory variables are listed below.

1. *Education*—a standard measure of human capital. As shown by Jamison and Lau (1982), Thai farmers with more formal schooling were more productive. There is relatively little variation for this variable, however, since most farmers attended the mandatory four-year elementary school program.

2, 3. *Land owned initially, capital owned initially*—measure of initial wealth estimated through the farmer's recollection of the endowments he had when he became the decisionmaker for the current family farm enterprise. These initial endowments affect positively the amount of capital and land owned at present (see chapter 8), which in turn, affect productivity.

4. *Land owned by father*—an indicator of the initial wealth of the farmer, which may have affected the farmer's accumulation of capital positively.

5. *Land quality index*—in this analysis excludes quality indicators that represent improvements introduced by the farmer, since these, like capital, are endogenous variables affected by ownership of titled land. Land of higher quality is more productive and would contribute positively to observed levels of output, other things being equal.

6. *Experience*—the number of years the farmer has been the primary decisionmaker on the family farm. This variable is highly correlated with age and represents both a measure of experience, which may increase productivity, and a time dimension related to capital accumulation. The analysis in chapter 8 showed that more experienced farmers, or older farmers, have more capital.

7. *Number of adults*—the number of adult members of the family (ages 14–65) actively involved in the agriculture. This variable represents a fixed family resource that can be augmented with hired laborers. In contrast to hired laborers, however, members of the family are more strongly motivated and also perform supervisory roles (Feder 1985).

8. *Problem dummy*—represents adverse conditions, such as floods or attacks by pests, which may have affected the farmer's output negatively. A dummy variable was constructed with the value 1 for farmers affected by a problem, zero for those who were not.

9. *Title dummy*—represents the effect of legal, or secure, ownership. This dummy variable takes the value 1 if the farmer owns titled land, zero if he does not.¹

In a regression with the foregoing specification the effect of title represents both long-term and short-term effects, since neither the present capital owned nor land improvements are included among the explanatory variables. Thus, the title dummy variable accounts for the long-term effect of secure ownership through the accumulation of capital as well as for the short-term effect on the use of variable inputs through improved access to short-term credit.

The dependent variables, expressed per unit of cultivated land, are:

1. *Value of output* of crops grown during the wet season on all plots of land cultivated by the household. Farmers may grow more than one type of crop on any of their plots.

2. *Number of labor days* of both members of the family and hired laborers applied on all crops grown and all plots cultivated by the household.

3. *Expenditure on "power" inputs*, defined as the cost of machinery hours or animal days used to grow the crops defined in variable 1. In the case of family-owned machinery or animals, the value of the service was imputed using the mean price of these services for the sample in the respective province. As in variable 2, this input is aggregated to the household level.

4. *Expenditure on other inputs*, such as fertilizers, pesticides, and herbicides, aggregated to the household level.

The results of four reduced-form logarithmic regressions, with all continuous variables defined per rai of cultivated land, are reported in table 25. In all equations for the northeastern provinces, the title dummy variable is significantly larger than zero at the 90 percent, one-tailed, confi-

dence level. In Lop Buri, however, the effect of ownership security is positive in three equations but is statistically significant only in the labor equation. The results imply that in Nakhon Ratchasima the value of output per rai is about 12 percent higher on land cultivated by titled farmers than on land cultivated by untitled farmers. In Khon-Kaen the difference is greater, about 27 percent. Use of inputs per rai is consistently greater on land cultivated by titled farmers. In Nakhon Ratchasima and Khon-Kaen, labor use is greater by about 15 percent and 8 percent, respectively, the use of draft power is greater by about 39 percent and 25 percent, and the use of other inputs, such as fertilizers and pesticides, is greater by more than 23 percent and more than 34 percent.²

A Broader Definition of Output

In the analysis of output value reported here, agricultural revenues related to cropping activities were considered. The data are reasonably accurate because activities were enumerated on a plot-by-plot basis and, within each plot, on a crop-by-crop basis. The survey also covered additional household income data pertaining to agricultural activities other than cropping—the sale of fruits and vegetables from home gardens, the sale of poultry and related by-products, and the sale of other livestock, for example—and nonagricultural activities, such as the making of charcoal and bamboo products. These data are possibly less accurate than data on cropping activity because they were obtained from an aggregate estimate made by the farmers without detailing the specific activities. Only about half the farmers sampled had any income from activities other than cropping, and on the average, excluding off-farm employment, this income amounted to less than a third of such a household's revenue. Nonetheless, some farm capital, such as transport equipment, is used to generate these revenues, and credit may be used as well. Since capital and credit are affected positively by the ownership of titled land, it can be postulated that, in addition to cropping income, other farm incomes are also related to ownership of titled land and to the other factors used in the reduced-form regressions reported in table 25.

Estimates analogous to the first three columns of table 25, but based on a broader conception of farm revenue, are presented in table 26.³ The estimated title effects for the two northeastern provinces show relatively little change from the parameters reported earlier. The main difference is in the results for Lop Buri. In this province, the regression with the narrower definition of revenue indicated a small positive productivity advantage—not significantly greater than zero—for titled farmers. The estimate reported in table 26, however, is substantially larger and is significantly greater than zero at a 90 percent, one-tailed, confidence level. The results are thus similar for the three provinces, indicating that farm revenue from

Table 25. Regression Results for Output and Inputs

Explanatory variable	Dependent variable											
	(1) Value of output per rai			(2) Labor days per rai			(3) Cost of draft power per rai			(4) Cost per rai of other inputs		
	Lop Buri	Nakhon Ratchasima	Khon- Kaen	Lop Buri	Nakhon Ratchasima	Khon- Kaen	Lop Buri	Nakhon Ratchasima	Khon- Kaen	Lop Buri	Nakhon Ratchasima	Khon- Kaen
Constant	6.4050 (19.050)	6.5830 (27.520)	6.0620 (20.070)	1.7280 (4.941)	2.5620 (10.800)	2.1530 (9.742)	4.8510 (14.250)	4.0440 (7.319)	3.8070 (8.312)	4.7370 (7.221)	4.2860 (13.780)	4.0680 (8.974)
Education	0.0506 (1.256)	0.0204 (0.615)	0.0318 (1.042)	0.0061 (0.145)	-0.0232 (0.705)	-0.0055 (0.250)	-0.0387 (0.948)	0.0688 (0.899)	0.0100 (0.217)	0.0871 (1.106)	0.0423 (0.981)	-0.0234 (0.510)
Land owned initially	-0.0488 (0.459)	-0.0442 (0.923)	-0.0414 (0.673)	-0.0081 (0.734)	0.0439 (0.925)	-0.0030 (0.066)	0.0665 (0.618)	-0.0511 (0.462)	0.1329 (1.423)	-0.0603 (0.291)	-0.0089 (0.144)	0.0202 (0.219)
Land owned by father	0.0903 (1.833)	-0.0779 (1.879)	-0.0073 (0.171)	0.0785 (1.531)	0.0035 (0.0862)	-0.0239 (0.760)	0.0165 (0.332)	-0.1766 (1.845)	0.0395 (0.606)	0.0556 (0.578)	-0.0214 (0.397)	0.0176 (0.373)

Capital owned initially	0.0042 (0.293)	-0.0103 (0.976)	-0.0119 (1.013)	0.0242 (1.619)	0.0088 (0.844)	-0.0154 (1.785)	0.0130 (0.894)	0.0075 (0.309)	0.0130 (0.730)	0.0466 (1.658)	0.0080 (0.583)	0.0164 (0.928)
Land quality	-0.0852 (0.223)	0.3899 (2.165)	0.2614 (1.132)	-0.526 (1.327)	0.0223 (0.125)	0.1899 (1.124)	0.4475 (1.159)	-0.2221 (0.534)	-0.1443 (0.412)	-2.035 (2.736)	0.3753 (1.602)	-0.2602 (0.751)
Experience	-0.0612 (0.693)	-0.0238 (0.308)	0.0509 (0.726)	-0.1415 (1.539)	-0.0861 (1.417)	0.1436 (2.797)	0.0343 (0.384)	0.3650 (2.578)	0.3166 (2.977)	-0.1735 (1.006)	0.0605 (0.759)	-0.1436 (1.364)
Number of adults	-0.1096 (0.207)	0.6331 (2.676)	0.2867 (1.690)	1.894 (3.443)	0.7572 (3.229)	0.8439 (6.799)	0.3659 (0.683)	-0.7961 (1.457)	0.3290 (1.279)	0.8835 (0.856)	0.3303 (1.074)	0.8508 (3.342)
Problem dummy	-0.5110 (3.753)	-0.8373 (8.131)	-0.4884 (3.208)	-0.1453 (1.026)	-0.2953 (2.893)	-0.1510 (1.355)	0.0419 (0.304)	-0.1191 (0.501)	0.1669 (0.723)	0.0683 (0.257)	-0.2915 (2.176)	0.4263 (1.866)
Title dummy	0.0441 (0.453)	0.1118 (1.645)	0.2364 (2.854)	0.1368 (1.351)	0.1368 (2.032)	0.0786 (1.298)	-0.0528 (0.536)	0.3268 (2.082)	0.2386 (1.900)	0.1687 (0.889)	0.2200 (2.490)	0.2984 (2.401)
R^2	0.102	0.314	0.178	0.137	0.143	0.342	0.026	0.105	0.128	0.072	0.088	0.176
F value	2.39	10.61	3.87	3.32	3.89	9.28	0.57	2.73	2.64	1.633	2.25	3.81
Number of observations	199	219	171	199	219	171	199	219	171	199	219	171

Note: Numbers in parentheses are t values.

Table 26. Reduced-Form Regressions of Farm Revenues from Both Agricultural and Nonagricultural Activities

<i>Explanatory variable</i>	<i>Province</i>		
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>
Constant	6.5410 (20.390)	6.5760 (23.760)	5.7680 (16.130)
Education	0.00850 (0.220)	0.0554 (1.443)	0.0367 (1.015)
Land owned initially	-0.1160 (1.133)	-0.0101 (0.182)	-0.1274 (1.748)
Land owned by father	0.0928 (1.968)	-0.0043 (0.089)	-0.0051 (0.098)
Capital owned initially	-0.0062 (0.451)	-0.0168 (1.373)	-0.0370 (0.266)
Land quality	0.0491 (0.135)	0.5544 (2.661)	0.3848 (1.407)
Experience	-0.0573 (0.679)	-0.0173 (0.244)	0.1428 (1.720)
Number of adults	1.1650 (2.306)	0.8141 (2.975)	0.9528 (4.745)
Problem dummy	-0.4277 (3.295)	-0.6803 (0.571)	-0.1090 (0.605)
Title dummy	0.1351 (1.447)	0.1196 (1.522)	0.1889 (1.926)
R ²	0.14	0.24	0.29
F value	3.321	7.424	7.229
Number of observations	196 ^a	219	171

Note: Income from off-farm employment is excluded.

a. Three observations were dropped because data on other incomes were missing.

cropping and other productive activities is 12 to 20 percent higher among titled farmers than among untitled farmers.

Although this is an observation from a single cross-sectional study, it is compatible with other results focused on differences in capital-to-land ratios (see chapter 8) and differences in land values (see chapter 7). It is thus quite plausible to regard as permanent the estimated gap in productivity between titled and untitled farmers. As long as the distortion that causes differential factor ratios—and thus differential levels of productivity—remains, the economy sustains a significant welfare loss from unrealized potential output. This distortion is the result of classifying lands that are being cultivated—and that will continue to be cultivated—as forest reserves, where legal titles cannot be granted.

Alternative Calculation of Output Effects

The results in table 25, columns 1–3, and table 26 provide a direct estimate of the effect of ownership security on productivity, given by the estimated parameter of the title dummy variable. There is, however, an alternative way of calculating the productivity effect indirectly by using the estimated effects of ownership security on production inputs, capital, and land improvements. This alternative calculation is undertaken to check the robustness of the results.

Suppose that the value of output is related to production through a Cobb-Douglas production function given by

$$(9-1) \quad Y = K^\alpha \cdot (Z \cdot A)^\beta \cdot V^\gamma \cdot X^\eta \cdot L^\lambda$$

where K is capital, A is land area, Z is a composite land quality index involving attributes used in the hedonic price analysis of chapter 7, including land improvements, V is the draft power input, X is other variable inputs, L is labor, and α , β , γ , η , and λ are corresponding output elasticities.

Since the adoption of land improvements is defined probabilistically, the quality index should properly be defined as the expected quality index—that is, $E(Z)$. To calculate the proportionate increase in output as a result of the granting of land title to a squatter, holding A constant, equation 9-1 is log-differentiated, yielding

$$(9-2) \quad \frac{dY/dT}{Y} = \alpha \cdot \left[\frac{dK/dT}{K} \right] + \beta \cdot \left[\frac{dE(Z)/dT}{E(Z)} \right] \\ + \gamma \cdot \left[\frac{dV/dT}{V} \right] + \eta \cdot \left[\frac{dX/dT}{X} \right] + \lambda \cdot \left[\frac{dL/dT}{L} \right]$$

where T denotes title. Note that the derivation of equation 9-2 from 9-1 maintains a fixed land area, $dA = 0$.

The calculations pertain only to Nakhon Ratchasima and Khon-Kaen provinces because the effect of titles on capital-to-land ratios and other inputs was not statistically significant in Lop Buri. The values of $(dK/dT)/K$ are based on the parameter for the title dummy in table 21. The effect of title on various variable inputs— $(dV/dT)/V$, $(dX/dT)/X$, $(dL/dT)/L$ —is derived from the coefficients of the title dummy in the reduced-form input equations of table 25. In the calculation of $dE(Z)$ it is assumed that the probabilities of bunding and land clearing, as estimated in table 23, are independent. This implies

$$(9-3) \quad dE(Z)/dT = \sum_{i=1}^2 \delta_i \cdot (dP_i/dT)$$

Table 27. Estimates of Production Functions

<i>Explanatory variable</i>	<i>Province</i>	
	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>
<i>Constant</i>	5.791 (13.230)	4.2750 (8.126)
<i>Human Capital</i>		
Education	0.0524 (1.453)	0.0569 (1.762)
Experience	0.0268 (0.420)	0.1581 (1.836)
<i>Physical Inputs</i>		
Land (adjusted for quality)	0.4414 (4.926)	0.1938 (1.826)
Capital	0.0151 (1.370)	0.0418 (2.506)
Labor	0.1349 (1.865)	0.5050 (4.098)
Power	0.0422 (1.310)	-0.0794 (1.306)
Other variable inputs	0.1452 (2.520)	0.2047 (3.404)
Production problem dummy	-0.5976 (5.268)	-0.1480 (0.8476)
R^2	0.570	0.544
F value	34.86	26.32
Number of observations	219	171

Note: Numbers in parentheses are t values.

where i is bunding or land clearing, δ_i s are the respective weights of the two land improvements in the land quality composite index, and dP_i/dT is the change in the adoption probability of a formerly untitled farmer who is granted title. In the calculation of dP_i/dT the logit specification of the adoption equations and figures derived from table 23 are relied on. The weights δ_i for the two provinces are reported in table 17.

Output elasticities are obtained from estimates of production functions based on our sample data and reported in table 27. The various components of equations 9-2 and 9-3 are summarized and the results of the alternative calculations of the productivity effect of ownership security are reported in table 28. The logarithmic difference between productivity of titled and untitled farms is 0.159 in Nakhon Ratchasima and 0.168 in Khon-Kaen. These indirect estimates are within less than one standard deviation of the direct estimates of the effects of secure titled ownership

Table 28. An Indirect Estimate of the Effect of Ownership Security on Output

Item	Mathematical notation	Province	
		Nakhon Ratchasima	Khon-Kaen
1. Effect on capital formation ^a	$\frac{dK/dT}{K}$	0.718	1.262
2. Output elasticity with respect to capital ^b	α	0.015	0.042
3. Effect on output of an increase in capital	$\alpha \cdot \frac{dK/dT}{K}$	0.011	0.053
4. Effect on probability of adopting bunding ^c	dP_1/dT	0.306	0.201
5. Weight of bunding in land quality index ^d	δ_1	0.415	0.247
6. Effect on probability of adopting land clearing ^c	dP_2/dT	0.137	0.111
7. Weight of land clearing in land quality index ^d	δ_2	0.123	0.016
8. Expected change in land quality index	$\sum_{i=1}^2 \delta_i \cdot (dP_i/dT)$	0.144	0.051
9. Mean quality index of untitled farmers ^e	$E(Z)$	0.76	0.71
10. Elasticity of output with respect to land ^b	β	0.441	0.194
11. Effect on output of increased land improvements	$\beta \cdot \frac{\sum \delta_i (dP_i/dT)}{E(Z)}$	0.084	0.014
12. Effect on power input ^f	$\frac{(dV/dT)}{V}$	0.327	0.239
13. Output elasticity with respect to power ^b	γ	0.042	0 ^g

(Table continues on the following page.)

Table 28 (continued)

Item	Mathematical notation	Province	
		Nakhon Ratchasima	Khon-Kaen
14. Effect on output of an increase in power	$\gamma \cdot \frac{dV/dT}{V}$	0.014	0
15. Effect on other variable inputs ^f	$\frac{dX/dT}{X}$	0.220	0.298
16. Output elasticity with respect to other variable inputs ^b	η	0.145	0.205
17. Effect on output of an increase in other variable inputs	$\eta \cdot \frac{dX/dT}{X}$	0.032	0.061
18. Effect on labor ^f	$\frac{dL/dT}{L}$	0.137	0.078
19. Output elasticity of labor ^b	λ	0.135	0.505
20. Effect on output of an increase in labor	$\lambda \cdot \frac{dL/dT}{L}$	0.018	0.040
21. Total effect on output ^h	$\frac{(dY/dT)}{Y}$	0.159	0.168

a. Based on table 21.

b. Based on a production function estimate in table 28.

c. Based on table 23.

d. Based on table 17.

e. From table 19.

f. From table 25.

g. Parameter set to zero, because its estimated value is negative.

h. Sum of lines 3, 11, 14, 17, and 20.

in these two provinces—namely, the coefficients of the title variable in the reduced-form output equations of tables 25 and 26. This demonstrates that our estimates of the effects of ownership security on productivity are robust. Furthermore, the indirect calculation shows that the estimates of title effects on input and capital variables are consistent with the estimates of productivity effects, thus increasing the validity of the results.

The empirical analysis in this chapter confirmed a frequently stated but rarely validated proposition, namely, that legal security of ownership significantly enhances productivity. The effect of ownership security is substantial, since it represents a permanent productivity differential of 12 to 27 percent—the equivalent of the logarithmic difference estimated in table 25. Such a substantial difference certainly warrants the attention of policymakers.

Notes

1. A small number of farmers in the sample—less than 18 percent—had both titled and untitled land. Since the titled holdings could serve as collateral, these farmers were grouped with the fully titled farmers in the title dummy variable.

2. Since the regressions are logarithmic, the parameters of explanatory variable are converted to percentages using the calculation $\exp B - 1$, where B is the regression parameter and \exp is the exponential operator.

3. Income from off-farm employment, which is quite common in our study areas in the off-season months, is not included in this analysis, because in most instances it does not require capital or credit.

10

The Effects of Usufruct Certificates

The foregoing analyses demonstrated that the economic performance of Thai squatters is significantly below that of farmers with legal ownership. This productivity gap, which affects an estimated 1 million farm households, or about 21 percent of the land under cultivation, could not be ignored by policymakers.

In 1981 the Thai government began issuing to squatters in the forest reserves certificates awarding them usufructuary rights. These certificates, however, known by their Thai acronym STK, do not allow the squatters to sell or mortgage their land. Proponents of the STK certificate program expected that the certificates would enhance squatters' perceptions of security and thereby stimulate investment. Some hoped that recipients of STKs would gain better access to institutional credit. Others believed that some of the restrictions imposed on recipients of the certificates would reduce further encroachment on forest lands.

The purpose of this chapter is to assess the effectiveness of the STK program in improving the productivity of squatters. Data from Chaiyaphum, which pertain both to squatters covered by the STK program and to squatters not covered, are used in the analysis.

As pointed out in chapter 4, the sociopolitical environment of Thailand does not support a consistent policy of eviction for enforcing forest reserve boundaries. Consequently, the incidence of eviction of squatters from forest reserves has been low (see table 5).

Data from our survey areas indicated that the majority of the squatters believe the most important advantage of acquiring a legal title document to be better access to institutional credit. Only a minority suggested protection from eviction as the main benefit. Titled farmers responded similarly, suggesting that the squatters' opinions are based on a realistic assessment of the politico-economic environment rather than on misinformed expectations.

Economic theory indeed predicts that one advantage of secure, legally documented ownership is better access to institutional credit, because institutional lenders prefer collateral as a device for reducing riskiness, especially of medium- and long-term loans. The econometric analysis of

credit transactions in our study areas (see chapter 5) confirms that the supply of institutional credit is significantly affected by the provision of land as collateral. In two provinces, group guarantees, a form of loan security accepted by the government-owned agricultural bank (BAAC), do not significantly increase squatters' access to institutional credit. In the other two provinces, land as collateral increased the availability of credit significantly more often than did group guarantees. Squatters are thus at a disadvantage since they cannot legally provide land as collateral. The analysis also confirmed that the possession of an STK certificate does not affect the supply of institutional credit, since the amount of credit available to recipients of STK certificates was the same as that available to other squatters, holding other attributes constant. Because noninstitutional lenders rarely require legal collateral, squatters have the same access to noninstitutional credit as do other farmers. Noninstitutional credit is three times as expensive, however, and in many provinces, the amount available is limited.

Because the eviction rate in areas in which squatters have been settled for many years has been low, many squatters have tended to consider their occupation of the land as permanent and themselves as "owners."¹ This notion of ownership was recognized in local customs and social norms pertaining to land transactions. Survey data revealed that land in the forest reserves was being traded—illegally—as frequently as legally held private land (see table 6). The survey also shows that more than 90 percent of the farmers in the forest reserves were paying land tax. Some could have interpreted this as implicit official recognition of their ownership.

The data thus suggest that most Thai squatters were reasonably sure of their continued access to the land they occupied and of their *de facto* ability to transact with it freely. It is thus not surprising that squatters opined that the main advantage of acquiring full legal status would be better access to institutional credit.

The hedonic land price analysis in chapter 7 established that there is relatively little difference between the price of land inside the forest reserves and that of private land outside forest reserves which has not yet been legally titled. Both types of land are substantially cheaper than legally titled land, however. The results of the price analysis are presented as index numbers in table 29. The only difference between owners of undocumented land outside the forest reserves and squatters is that those outside the reserves have stronger perceptions of security because they do not face state challenges to their ownership and because they can secure proper documentation in due time. Both groups face similar constraints on their access to institutional credit, since neither group can use its land as loan collateral. Owners of the legally titled land differ from owners of undocumented land outside the forest reserves essentially in their favor-

Table 29. Index Numbers for the Market Value of Land of Equal Quality

<i>Status of land</i>	<i>Province</i>		
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>
Documented land ^a	100	100	100
Undocumented land outside the forest reserves ^b	84	50	57
Land inside the forest reserves	80	43	47

Note: The numbers are based on the hedonic price analysis presented in table 17. Results for Chaiyaphum have been omitted because there were only five undocumented tracts outside the forest reserve.

a. Land covered by an NS-3 or an NS-3K document.

b. Land covered by an SK-1 or an NS-2 document or by no document.

able access to credit. The numbers illustrate that changing the status of land from forest reserve to private yet undocumented does not change perceptions of security by much, for the change in the value of the land is small. The effect of the improved perceptions of security from such a change is, in fact, even smaller than the numbers imply, since the price of undocumented land outside the forest reserves reflects in part the benefits that will accrue when the land is documented.

The foregoing discussion suggests that in Thailand any land policy that addresses squatters but does not change their land rights so that they can use their land as loan collateral will not significantly affect their performance. In 1981, however, a policy was introduced that was aimed specifically at squatters but did not address the credit constraints. Although granting full formal ownership to squatters in areas suitable for permanent agriculture was seen as a desirable ultimate aim, it was perceived that a useful interim step would be to distribute to squatters certificates granting usufructuary rights but not ownership. These certificates, known as STK certificates, were expected to enhance squatters' perceptions of security and thus affect investment incentives and productivity positively. Some proponents of the STK program also claimed that institutional lenders would regard recipients of STK certificates as more stable operators and would be inclined to extend more credit to them.

The data presented earlier suggest that these expectations are unlikely to be realized in most forest reserve areas. It may be argued further—contrary to expectations—that the conditions under which the STK certificates are issued may affect squatters' perceptions of ownership security, their efficiency, and their productivity negatively. To understand why this

is possible, we shall examine the exact terms and conditions surrounding the issuance of usufruct certificates.

The STK certificate confers upon the squatter, literally, “temporary occupation status” (see the appendix to this chapter). Although no date for ending this status is given, the word *temporary* may not contribute to the holder’s perceptions of security. Furthermore, certificates cover holdings only up to 15 rai (2.4 hectares). If a squatter has more than 15 rai, the area exceeding 15 rai is not covered. There is an intention to regard the squatter’s possession of up to 35 additional rai as an indefinite lease from the state. In our study areas, however, we observed that squatters were not being told clearly what the status of their land in excess of 15 rai was. As a result, considerable uncertainty often ensued over their continued ownership and their ability to transfer the land. This problem affects many squatters: in our sample of squatters, the average holding is between 35 and 50 rai, and more than 75 percent of the farmers hold land in excess of 15 rai. Thus, as a result of the STK program, security of ownership may be reduced for land not covered by the document. This is in contrast to the situation in the past, which, despite its negative implications for investment and productivity, was characterized by reasonably secure ownership.

Conditions stipulated in the STK certificates may further reduce the efficiency of squatters. Land covered by STK certificates can be transferred by inheritance only to direct descendants. It cannot be sold, rented out, or given to others. If enforced, these restrictions would make the farmer’s efficiency lower than it was in the past, when the same restrictions nominally applied but were not enforced. The STK certificate lists all the transfer restrictions and requires recipients to report to the forestry authorities all illegal activities that they may observe in their areas. If the recipient fails to do so, the document states that the rights of occupancy will be revoked without recourse to appeal or compensation. This threat may further reduce the sense of security acquired by the squatters after years of very little interference from the authorities.²

To demonstrate these hypotheses concerning the expected ineffectiveness of the STK program in areas in which squatters have been long established, we used data from Chaiyaphum. The survey focused on a district with two neighboring forest reserves. In one reserve the squatters had been covered by the STK program since 1981. On the average, recipients in our sample had held the document for 3.5 years. In the neighboring reserve, squatters had not been incorporated into the program and did not have usufruct certificates. Table 30 provides comparative indicators for the two subsamples of squatters. The two groups are almost identical in all indicators presented.

Squatters in the area covered by the STK program were asked to indicate what benefits, if any, they perceived in possessing STK certificates.

Table 30. Characteristics of the Sample of Squatters, Chaoyaphum Province

<i>Characteristic</i>	<i>Squatter group</i>	
	<i>Recipients of STK certificates</i>	<i>Nonrecipients of STK certificates</i>
Age (years)	45.1	44.4
Education (years)	3.76	3.85
Occupancy of the land (years)	18.13	17.57
Average size of holding (rai)	33.12	35.56
Land held initially ^a (rai)	26.46	28.25
Number of observations	46	74

Note: 6.25 rai = 1 hectare.

a. Amount of land held by the farmer when he became chief decisionmaker on the farm.

Their responses, described in table 31, show that nearly a third of them did not perceive any benefits from the program. Another 15 percent could not identify the benefits that are entailed in possession of an STK certificate, even though the program has been in the area since 1981. Thus, almost half the recipients of STK certificates could not cite any benefits to be realized from having them. If there were any clear-cut benefits, such a response would not be expected.

About 24 percent of respondents expected the document to reduce land disputes, apparently because some demarcation of boundaries is made in the process of issuance of the certificate. Since only a portion of the squatters' area is typically covered by the document however—less than half in our sample area—the probability of disputes is affected only in part.

Table 31. Squatters' Perceptions of the Benefits of Possessing STK Documents

<i>Response</i>	<i>Frequency (percent)</i>
Reduces incidence of boundary disputes	24
Reduces the risk of eviction	13
Provides better access to credit	4
No benefits	30
Don't know	15
Other	14
Number of squatters in sample	46

Furthermore, the incidence of land disputes in the province is low: a 16 percent probability throughout a lifetime in forest reserves and an 11 percent probability outside forest reserves. Tracts outside forest reserves are typically demarcated, yet demarcation reduces disputes only slightly. It is therefore unlikely that usufruct certificates will reduce land disputes significantly.

Only 13 percent of the squatters felt that possession of an STK certificate reduced their risk of eviction. This apparently reflects two complementary factors. First, the incidence of eviction among squatters in Chaiyaphum has been extremely low—only 1.8 percent—making eviction an issue of little concern to local squatters. Second, the certificate does not protect recipients from eviction. In fact, it explicitly threatens eviction. Indeed, 15 percent of the recipients of STK certificates said that the program entailed negative aspects that made their situation worse.

As demonstrated in chapter 6, economic theory postulates that land values reflect the productive potential of land. In chapter 7 it was shown that in Thailand, titled land is significantly more valuable than squatters' land, primarily because it enables greater access to institutional credit but also because it eliminates the risk of eviction. If land covered by an STK certificate offers any amenities, either in improved access to credit or in enhanced perceptions of ownership security, it should have a higher value than other squatters' land. We contend that no difference in value between different types of squatters' land—either with or without STK certificate—can be expected because there are no credit advantages or significant improvements in perceptions of ownership security.

There is some difficulty in testing this proposition because land covered by STK certificates cannot be legally sold. Like any other squatters' land it is formally state property. The reality, however, is that all lands in Thailand, including forest reserve land, are being traded freely. Even land covered by STK certificates is being bought and sold without formal registration (Mehl 1986). A relevant question is whether the benefits implicit in a tract of land covered by an STK certificate are retained once an illegal transfer has been made. If they are not, that should be reflected in the sales price. The values of land recorded in our survey are not based on actual transactions, however; they reflect instead the occupier's asking price. If a squatter perceives benefits in the status of his plot, this will be translated into an asking price higher than that of a plot not covered by an STK certificate.

A comparison of mean prices of land (see table 32) shows that the price of STK land is in fact lower than that of other squatters' land. The comparison of means is not a rigorous test, however. One simple way to test rigorously whether an STK certificate increases the perceived value of land is to add a dummy variable for STK plots in the hedonic price equation for

Table 32. Asking Prices of Land, Chaiyaphum Province
(baht per rai)

<i>Type of land</i>	<i>STK certificate issued</i>	<i>No STK certificate issued</i>
Lowland	2,244	2,326
Number of plots in sample	46	85
Upland	1,786	1,847
Number of plots in sample	50	153
All	2,005	2,018
Number of plots in sample	96	238

Note: In 1985 the rate of exchange was 26 baht to the U.S. dollar;
6.25 rai = 1 hectare.

Chaiyaphum (presented earlier in table 17). If there are any benefits to be realized from having an STK certificate, the coefficient of the dummy variable should be significantly greater than zero.

The results of the regression are presented in column 1 of table 33. The parameter of the STK dummy variable is negligible and has extremely low significance. The results are virtually identical when the equation is estimated for the subsample of squatters only (column 2). The analysis of land values thus indicates that possession of an STK certificate does not offer significant economic benefits.

The foregoing discussion suggests that there is no reason to expect that investments—in equipment, animals, or land improvements—will differ among squatters who possess STK certificates and those who do not. Table 34 presents data on ownership of capital among the sampled squatters. The capital stocks of recipients of STK certificates are lower in value

Table 33. Hedonic Price Analysis of Land Values, Chaiyaphum Province

<i>Variable</i>	<i>Coefficient</i>	
	<i>Full sample (1)</i>	<i>Squatter sample (2)</i>
<i>Land status dummies</i>		
Title ^a	0.4342 (8.051)	n.a.
Untitled, outside forest reserves ^a	0.2990 (1.496)	n.a.

Table 33 (continued)

Variable	Coefficient	
	Full sample (1)	Squatter sample (2)
STK ^a	0.0100 (0.170)	0.0122 (0.203)
<i>Natural attributes</i>		
Soil type ^a	0.2052 (3.513)	0.2106 (3.160)
Slope ^a	0.0945 (1.904)	0.1409 (2.453)
Lowland ^a	0.1028 (1.979)	0.0596 (0.997)
Year-round irrigation ^a	0.3688 (1.090)	0.3707 (1.117)
Seasonal irrigation ^a	0.2216 (1.374)	0.3173 (1.895)
<i>Land improvements</i>		
Bunding in place ^a	0.1391 (2.661)	0.1607 (2.682)
Land leveled ^a	0.0068 (0.102)	0.0229 (0.300)
Land cleared of stumps ^a	0.1918 (1.411)	0.2431 (1.747)
Fruit trees planted ^a	-0.0393 (0.432)	-0.0674 (0.645)
<i>Location and transportation</i>		
All-weather road to market ^a	0.0137 (0.198)	0.0481 (0.638)
Travel time to market (minutes)	-0.0863 (2.044)	-0.0761 (1.631)
All-weather road to home ^a	-0.0185 (0.407)	-0.0248 (0.468)
Travel time to home (minutes)	0.0060 (0.223)	0.0355 (1.163)
Constant	7.3375 (33.829)	7.1282 (30.227)
R ²	0.243	0.154
F value	8.92	4.12
Number of observations	461	332

n.a. Not available.

Note: All continuous variables, including the dependent variable, are expressed in natural logarithm. Numbers in parentheses are *t* values.

a. Dummy variable.

Table 34. The Value of Capital, Chaiyaphum Province
(baht)

<i>Item</i>	<i>Group of squatters</i>	
	<i>Recipients of STK certificates</i>	<i>Nonrecipients of STK certificates</i>
Value of capital per household	15,717	20,135
Value of capital per rai of land owned ^a	676	705
Number of squatters in sample	46	74

a. 6.25 rai = 1 hectare.

Table 35. Regressions of Capital, Land, and Capital-to-Land Ratios

<i>Explanatory variable</i>	<i>Dependent variable</i>		
	<i>Capital stock</i>	<i>Land owned (adjusted for quality)</i>	<i>Ratio of capital to land^a</i>
<i>Land status dummies</i>			
Title dummy	0.7780 (2.060)	0.2373 (2.906)	0.4357 (1.627)
STK dummy	-0.1098 (0.279)	-0.0243 (0.286)	-0.1284 (0.469)
Capital owned initially	0.0693 (1.596)	0.0248 (2.641)	0.0680 (1.527)
Land owned initially	0.0231 (1.465)	0.1423 (4.164)	0.1290 (0.658)
Land owned by father	0.0684 (0.571)	0.0390 (1.507)	0.1601 (1.028)
Years as decisionmaker	0.8644 (2.927)	0.3718 (5.823)	0.4720 (2.210)
Education (years)	-0.0137 (0.082)	-0.0602 (1.663)	0.0388 (0.331)
Constant	4.7008 (3.581)	1.6173 (5.698)	3.6578 (4.226)
R ²	0.095	0.293	0.050
F value	3.354	13.257	1.666
Number of observations	232	232	232

Note: Numbers in parentheses are *t* values.

a. Continuous explanatory variables in this column are expressed per acre. Regressions are specified in double-log form.

than those of other squatters. The mean values thus do not indicate any superior performance by squatters covered by the STK program. Since squatters may differ in their initial positions, however, or in other attributes that affect the formation of capital, a regression similar to that in chapter 8 is required. Accordingly, we have estimated the regression model presented in tables 20 and 21, adding a dummy variable for recipients of STK certificates. The regression results are reported in table 35. The estimate indicates that no significant difference in accumulation of capital and land or in capital-to-land ratios between recipients of STK certificates and other squatters exists. The parameter of the STK dummy is in fact negative, although it is not significant.

The analysis of land improvements is focused on those forest reserve tracts that were still unimproved in 1980, before the STK program began. Logit analysis is used to test whether the probability of land improve-

Table 36. Logit Estimates of the Probability of Land Improvement

<i>Explanatory variable</i>	<i>Type of improvement</i>	
	<i>Bunding</i>	<i>Stump clearing</i>
Constant	-1.9658 (0.870)	1.7010 (0.634)
Education	0.0362 (0.1632)	0.0705 (0.1743)
Land owned by father	0.2576 (0.914)	-0.3096 (1.506)
Capital owned initially	-0.0630 (0.818)	0.0006 (0.0082)
Land owned initially	-0.2588 (0.979)	-0.2350 (0.908)
Years as decisionmaker	2.1686 (3.454)	-0.3243 (0.745)
Plot quality index	-0.5515 (0.221)	-3.6684 (1.719)
Area of plot	1.8244 (2.990)	-0.6377 (1.224)
Lowland dummy	1.8370 (1.948)	—
STK dummy	0.2540 (0.300)	-1.1235 (1.452)
Likelihood ratio statistic	29.46	11.70
Number of observations	134	93

— Not applicable.

Note: Numbers in parentheses are *t* values.

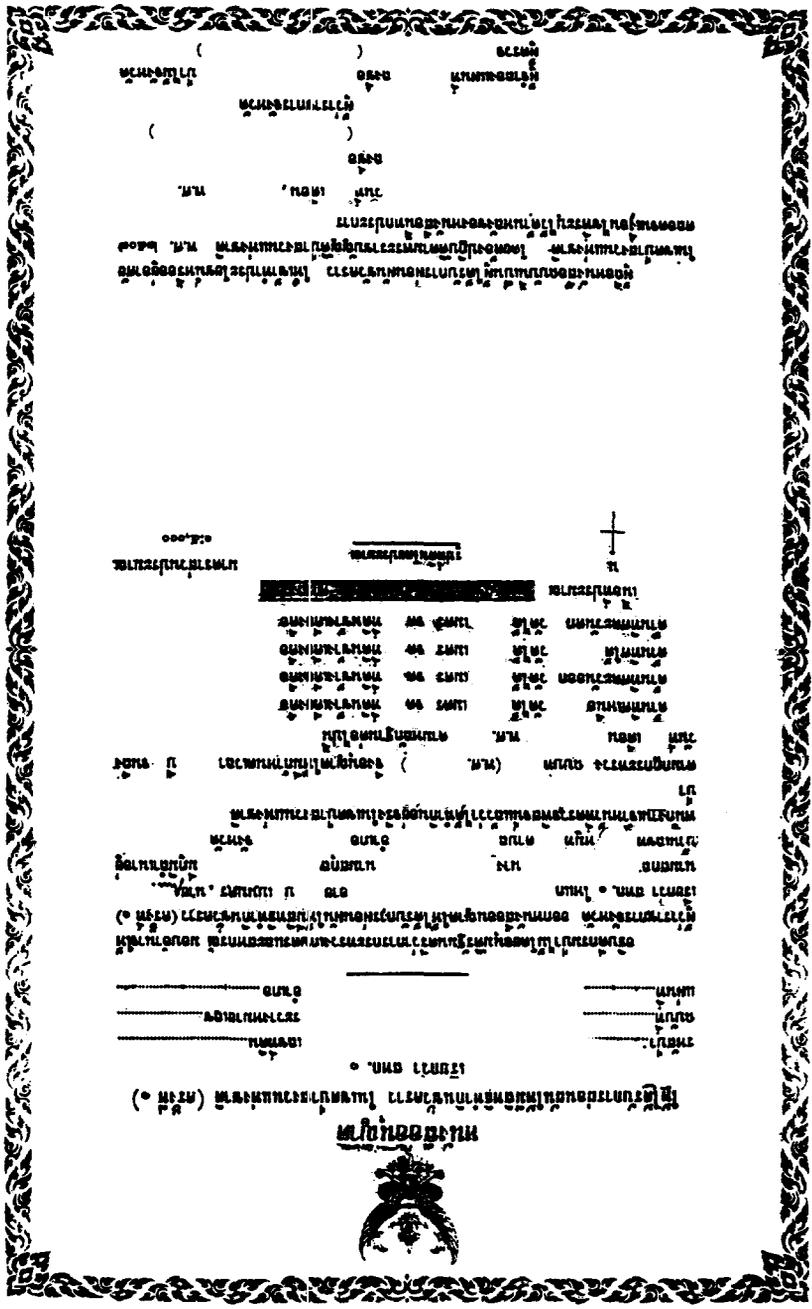
ments in 1986 is significantly affected by provision of a usufruct STK certificate. In addition to an STK dummy variable, the estimated equations contain characteristics of farmers and plots used in the land improvement equations of chapter 8.

The estimated coefficients, presented in table 36, show that the probability of bunding is not significantly affected by whether or not the plot is covered by an STK certificate. For stump clearing, the STK dummy variable has a negative coefficient, but it is not significant at a 95 percent confidence level. Except for years as decisionmaker, area of plot, and the lowland dummy variable, most of the other coefficients are not significant.

These results thus confirm the hypothesis that possession of an STK certificate does not induce more investment. This observation is compatible with earlier observations that the certificate neither enhances squatters' perceptions of ownership security significantly nor increases the availability of credit. The empirical analysis in this chapter substantiated the contention that in Thailand usufruct certificates do not significantly affect the performance of squatters because they do not improve squatters' access to institutional credit.

Notes

1. In the four provinces surveyed in the course of the present study, more than half the villages in the forest reserves were established more than twenty years ago; fewer than 20 percent of the villages were less than a decade old.
2. Mehl (1986, 48) documents a conversation with recipients of STK certificates in Petchabun province in which farmers stated that their concern about eviction was greater after receiving the certificate.



Appendix: A Usufruct Certificate (STK)

Permission
 Temporary Utilization Authorization
 in Forest Reserve Area (STK 1)

Forest Code _____ Land # _____
 Page _____ District _____

Director-General of Forestry Department through authority of Ministry of MAAC authorizes Government of the Province to issue this Permission (STK 1).

To _____ Age _____ Child of Mr. _____
 Family Name _____ Mrs. _____ Family Name _____ Address _____
 House No. _____ Tambon _____ District _____ Province _____

The officer has investigated and approved that the recipient is indeed occupying this land in forest reserve area.

According to Minister's rule (_____) is permitted occupation within _____ years until _____.

	Measured Meter	Neighbor's Land
North		
East		
South		
West		

(Drawing of Plot)

The holder of this permit was granted temporary permission to utilize or to occupy land in the forest reserve area by following the national forest reserve rules and regulations of 2507 and the conditions indicated on the back of this document.

Governor

Conditions

The recipient of this STK 1 cannot share or transfer the ownership or rent to others this land covered by STK 1 except to direct legal descendants by inheritance under the approval of the Forestry Department.

The recipient must agree to allow the forestry officer to inspect compliance at all times.

The recipient of this STK 1 must carefully observe that there will be no encroachment on neighboring land or at the boundary of this STK 1 land. If there is any illegal action or violation of the rules in this said area the recipient must immediately report to the forestry officer.

If the recipient does not comply with the above conditions the governor of the province will cancel this permit (STK 1) and the recipient cannot appeal for any compensation under any circumstances.

List of Transfers

The Benefits and Costs of Landownership Security

The purpose of this chapter is to analyze the economic costs and benefits entailed in providing secure ownership in Thailand. In the preceding chapters evidence that increasing the ownership security of untitled farmers by granting them full legal ownership would increase their productivity was presented. The benefit to a farmer of titled ownership can thus be calculated as the present value of the increments to net income that would accrue to him in the course of a lifetime. The increments are defined in relation to the stream of net incomes expected under his present insecure ownership status. If the farmer incurs any costs in changing his status, these must be subtracted from the benefit of secure ownership. An equivalent measure of the net benefit to farmers is the difference in the value of their land before and after the change in ownership status minus the costs of implementing the change.

The official fee for processing and awarding a document of secure ownership, such as an NS-3K document, to an eligible farmer is relatively low—20 to 30 baht per plot. Since plots average about 15 to 25 rai, the official fee amounts to about 2 baht or less per rai. In reality, however, farmers pay not only the official fee, but also for the gifts and hospitality that they provide to those who take care of the ground survey and the adjudication process. An estimate of these costs was obtained from the farmers surveyed. Mean figures for the provinces in the study are presented in table 37. The figures for NS-3K and NS-3 documents are listed separately, since most of the documents issued after 1972 were NS-3K. The procedure for issuing NS-3K documents implies lower costs to farmers, because the ground survey and the adjudication are made at one time for the whole village. The data confirm that the costs of acquiring an NS-3 are considerably higher than those of acquiring an NS-3K. Expressed per rai of land, however, the monetary costs of acquiring a secure document are still low, amounting to less than 1 percent of the value of the land. The resultant increase in the value of the land (estimated in chapter 7) ranges from 25 percent of the value of the untitled land in Lop Buri to 132 percent in Nakhon Ratchasima. Clearly, the net benefit of ownership security to farmers is substantial.¹ This suggests that

Table 37 The Cost to Farmers of Securing Title to Their Landholdings

<i>Item</i>	<i>Province</i>			
	<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Charyaphum</i>
Average size of plot (rai)	27	15	16	22
Cost of NS-3 per plot (baht)	277	204	450	328
Cost of NS-3 per rai (baht)	11	14	28	15
Number of plots in sample	24	56	74	7
Cost of NS-3K per plot (baht)	203	49	120	21
Cost of NS-3K per rai (baht)	8	3	8	1
Number of plots in sample	191	191	188	73

Note In 1985 the rate of exchange was 26 baht to the U S dollar, 6.25 rai = 1 hectare

the fee charged by the government to farmers for survey, adjudication, and documentation can be increased significantly from its present low level. Such revenues can reduce the pressure on public budgets associated with any large-scale land-titling efforts.

For policy purposes, however, an assessment of the benefits of providing secure legal ownership should be based on the social costs and benefits rather than on the benefits as perceived by farmers. The net benefits to farmers, as calculated here, could differ from the net benefit to society. This is because of distortions in the market valuation of land prices and the discrepancy between the costs paid by farmers for titling services and the real public costs of providing those services.

We shall use the model in chapter 6 to establish the relation between market valuation of land prices and the social benefit of ownership security. To calculate the contribution to social welfare generated by a rai of untitled land requires a specification of the public benefit derived from state-confiscated lands, if they are left idle. Assuming for the sake of simplicity that such benefits are zero, equation 6-14 can be rearranged so that the left-hand side represents expected social benefits per rai per period. Risk neutrality is assumed for the society, but not for the individual farmer. The social benefit in one period is the value of production

$$(11-1) \quad [1 - \Psi \cdot (1 - \gamma)] \cdot y_{nt}^* - k_{nt}^* \cdot (1 + \delta) - (1 + c) \cdot m \cdot P_{nt}^* \\ = \delta \cdot P_{nt}^* + \Psi \cdot (1 - \gamma) \cdot P_{nt}^* + \Psi \cdot (1 - \gamma) \cdot \lambda \cdot (y_{nt}^* + P_{nt}^*)$$

where use has been made of the equilibrium condition

$\partial y_{nt}^* / \partial k_{nt}^* = (1 + \delta) / [1 - \Psi \cdot (1 - \gamma) \cdot (1 + \lambda)]$ and of the budget constraint $W_0 / A_{nt} = k_{nt}^* + P_{nt}^*$. The left-hand side of the equation 11-1 includes the expected output of one unit of land, net of the cost of resources consumed in the process of production. These resources include real capital valued in terms of its social opportunity cost, $1 + \delta$, and the expenditure on variable inputs. It is implicitly assumed that the social opportunity cost of short-term noninstitutional credit is equal to its nominal cost. Thus the left-hand side of equation 11-1 describes the net contribution to society generated by one unit of untitled land in one period. Denoting the left-hand side of equation 11-1 by Π_{nt} and using the opportunity rate of return on capital, δ , as a discount rate, the discounted value of the social benefits derived from a unit of untitled land over an infinite horizon is

$$(11-2) \quad \int_0^{\infty} e^{-\delta \cdot i} \cdot \Pi_{nt} \cdot di = P_{nt}^* \cdot \left[1 + \frac{\Psi \cdot (1 - \gamma)}{\delta} \right. \\ \left. + \frac{\lambda}{\delta} \cdot \left(1 + \frac{y_{nt}^*}{P_{nt}^*} \right) \cdot \Psi \cdot (1 - \gamma) \right]$$

where i denotes time. It is observed that if the probability of eviction is zero— $\Psi = 0$ —the social value of land is equal to the market value. If the probability of eviction is nonzero, however, the observed price of untitled land is an underestimate of the expected discounted value of social benefits forthcoming from such land. The overvaluation stems from two sources. One source is the fact that farmers are risk averse, while society is risk neutral. Risk aversion implies that the farmers require an additional discount on the price of the risky asset from the price they would be willing to pay under risk neutrality. If farmers were risk neutral then λ would be equal to zero and one source of the undervaluation of untitled land would vanish. The second source of undervaluation, however, would remain even if farmers were risk neutral, or as long as the risk of eviction was nonzero. The reason private valuation and social valuation of land deviate is that the risk to the farmer is not the same as the risk to society. When a farmer is evicted, he loses both a portion of the stream of outputs and the value of the land. In contrast, society loses a portion of the output but retains the productive potential of the land. The extent of underestimation could be substantial even if the probability of eviction were low (see table 38). With the probability of eviction not exceeding 7 percent, distortions of as much as a third of the market price are possible. If risk aversion were considered, the distortion would be even greater.

In analogy to equation 11-1, the optimality condition for titled land (equation 6-10) can be used to express on the left-hand side the social value of production, net of production costs, generated in one period by a unit of titled land, assuming that the opportunity cost of short-term institutional credit is δ .

$$(11-3) \quad y_t^* - k_t^* \cdot (1 + \delta) - (1 + \delta) \cdot s_2 \cdot (1 - s_1) \cdot P_t^* - (1 + c) \cdot m \cdot P_t^* \\ = P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1) - s_2(1 - s_1) (\delta - r_2)]$$

Table 38. Undervaluation of Untitled Land, with Risk Neutrality

Cost of capital (δ)	Probability of eviction (Ψ)					
	$\gamma = 0.7$			$\gamma = 0.5$		
	0.03	0.05	0.07	0.03	0.05	0.07
0.10	0.090	0.150	0.210	0.150	0.250	0.350
0.12	0.075	0.125	0.175	0.125	0.208	0.292
0.14	0.064	0.107	0.150	0.107	0.179	0.250

Note: Figures in the table represent the deviation of the social price from the market price, expressed as a percentage of the price of untitled land.

As in equation 11-1, the left-hand side is the social benefit from one unit of land in one period, provided that c represents the opportunity cost of short-term noninstitutional credit.

Denoting the left-hand side of 11-3 by Π_t , the calculation of the discounted value of contributions to social welfare generated by a unit of titled land over an infinite horizon yields

$$(11-4) \quad \int_0^\infty e^{-\delta \cdot i} \cdot \Pi_t \cdot di = \int_0^\infty e^{-\delta \cdot i} \cdot P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1) - s_2 \cdot (1 - s_1) \cdot (\delta - r_2)] \cdot di = P_t^* \cdot \left[1 - s_1 \left(\frac{\delta - r_1}{\delta} \right) - s_2(1 - s_1) \frac{(\delta - r_2)}{\delta} \right]$$

If the credit market is not distorted, then $\delta = r_1 = r_2$, and the market price of titled land is equal to its social value. In a credit market such as that in Thailand, however, where interest-rate ceilings and other interventions are present (Hanson and Neal 1985) the opportunity cost of capital, δ , is higher than the interest rate on both long-term and short-term credit in the formal sector. As is evident from equation 11-4, the market price of titled land is higher than its social value when the opportunity cost of capital exceeds the interest rates paid by farmers. As demonstrated in table 39, the magnitude of the distortion could be substantial. It thus follows that the calculation of the social benefits of land titling cannot be based on a simple comparison of the market prices of titled and untitled land. Such a comparison could grossly overstate the social benefit.

The magnitude of the gross increase in social welfare as a result of allowing the legal registration of a unit of forest reserve land of a given

Table 39. Overvaluation of Titled Land When Credit Markets Are Distorted

Opportunity cost of capital (δ)	Credit supply (s)					
	$s_1 = s_2 = 0.1$			$s_1 = s_2 = 0.2$		
	Institutional interest rate (r)					
	$r = 0.04$	$r = 0.06$	$r = 0.08$	$r = 0.04$	$r = 0.06$	$r = 0.08$
0.10	0.886	0.924	0.962	0.784	0.856	0.928
0.12	0.873	0.905	0.937	0.760	0.820	0.880
0.14	0.864	0.891	0.919	0.743	0.794	0.846

Note: For the sake of simplicity it is assumed that $s_1 = s_2$ and that $r_1 = r_2$. The figures in the table describe the social value of titled land as a percentage of its market price.

Table 40. Gross Social Benefits, B, of Ownership Security as a Proportion of P_{nt}^*

Opportunity cost of credit (δ)	Province							
	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum	
	Risk neutrality	Risk aversion	Risk neutrality	Risk aversion	Risk neutrality	Risk aversion	Risk neutrality	Risk aversion
0.10	0.060	-0.210	0.821	0.320	0.818	0.379	0.446	0.254
0.12	0.053	-0.184	0.829	0.380	0.805	0.421	0.413	0.253
0.14	0.048	-0.163	0.836	0.428	0.796	0.454	0.390	0.252
0.16	0.045	-0.147	0.841	0.468	0.788	0.481	0.372	0.251
Private benefit ($P_t^*/P_m^*)-1$	0.254		1.324		1.139		0.539	

quality (expressed as a proportion, β , of the equilibrium price of untitled land of the same quality) is obtained by calculating the ratio of the right-hand side of equation 11-4 to the right-hand side of equation 11-2, minus 1:

$$(11-5) \quad \beta = \frac{P_t^*}{P_{nt}^*} \cdot \left\{ \frac{[\delta - s_1 \cdot (\delta - r_1) - s_2 \cdot (1 - s_1) \cdot (\delta - r_2)]}{[\delta + \Psi \cdot (1 - \gamma) + \lambda \cdot \Psi \cdot (1 - \gamma) \cdot [1 + (y_{nt}^*/P_{nt}^*)]]} \right\} - 1$$

The term in braces represents the adjustment that must be applied to market prices in order to correct for price distortions. Note that with a logarithmic specification of the hedonic price equation the ratio P_t^*/P_{nt}^* is independent of land attributes and is given by e^α , where α is the parameter of land title in the logarithmic regression reported in table 17. By assuming alternative values of the opportunity cost of capital, therefore, it is possible to calculate the value of β for the four provinces.

The probability of eviction, Ψ , can be taken as the difference in the lifetime rate of eviction between titled and untitled farmers, as reported in table 5. Because the government rarely confiscates complete holdings and because farmers split holdings among members of their families to minimize the amount of land lost from eviction, we assume γ to take the value of 0.7. The parameters s_1 and s_2 are set at 0.1, which is the ratio of borrowing to land prices observed in the sample. The nominal institutional interest rate in Thailand is 13 percent at present. When inflation is taken into account, however, the real rate of interest is about 8 percent. The typical parameter of risk aversion, Φ , is 0.5 (Einswanger 1980). The case of risk neutrality is also calculated: $\Phi = 0$. Estimates of the ratio y_{nt}^*/P_{nt}^* obtained from the four sampled provinces range between 0.17 and 0.23.

The estimates of social benefit, reported in table 40, show significant social benefits in the northeastern provinces but little or no benefits in Lop Buri. Although the gross social benefits in the northeastern provinces are large, they are much smaller than the private benefits. In Nakhon Ratchasima, for instance, if risk aversion prevails, the gross social benefits amount to only a quarter of the private benefits.

The reason for the negligible benefit of titling in Lop Buri seems to lie in the distinct structure of the credit market in the province, because the risk of eviction is nearly the same as in other provinces. In Lop Buri, farmers without titled land have access to substantial amounts of informal credit through traders, who rarely require land as collateral. In the other provinces, traders are not as prevalent a source of credit, and there is a greater dependency on institutional creditors, for whom land as collateral is a significant consideration. Squatters in Lop Buri therefore encounter less significant disadvantages in obtaining credit than those in the other

Table 41. The Costs of Land Documentation

<i>Item</i>	<i>Cost per rai (baht)</i>	<i>Cost as a percentage of the price of untitled land</i>			
		<i>Lop Buri</i>	<i>Nakhon Ratchasima</i>	<i>Khon-Kaen</i>	<i>Chaiyaphum</i>
<i>Cost of issuing full title (NS-4)</i>					
Estimate 1 ^a	110.9	3.9	3.3	3.5	5.6
Estimate 2 ^b	82.5	2.9	2.4	2.6	4.1
<i>Cost of issuing utilization certificate (NS-3K)</i>					
Estimate 1 ^a	19.4	0.6	0.5	0.6	1.0
Estimate 2 ^b	30.6	1.1	0.9	1.0	1.5

a. Based on Burns (1985, 85).

b. Based on Ranong (1986, 39). Figures are inflated to the 1985 price level, using the consumer price index.

provinces. This also implies that the prices of titled and untitled land will differ less in this province.

The direct costs to society incurred in the process of providing farmers with title documentation were recently estimated by Burns (1985) and Ranong (1986), using data from the Department of Lands. Their estimates are replicated in table 41. The cost to society to provide a full title does not exceed 5.6 percent of the market value of untitled land in any of the provinces studied. The calculation of the net social benefits (see table 42) shows that even when farmers are assumed to be risk averse, the net social benefit is substantial, ranging from 397 baht per rai in Chaiyaphum to 1,237 baht per rai in Khon-Kaen—from 21 to 40 percent of untitled land value, assuming risk aversion. The benefit-to-cost ratio for a policy of titling squatters ranges from 4.5 in Chaiyaphum to 12.0 in Khon-Kaen under the assumption of risk aversion. This implies that providing secure ownership produces an extremely high social rate of return.

In devising a procedure for calculating benefits we ignored general equilibrium adjustments that might be caused by large-scale titling of squatters. Theoretically, if large numbers of farmers are affected, the increases in the demand for inputs and the supply of outputs would change the prices of both inputs and outputs, at least in the short run. Since most Thai inputs and outputs are traded in highly competitive international markets, these price effects are not significant. Rice, in contrast, is a commodity for which Thailand faces a finite elasticity of demand. An increase in the supply of rice would therefore depress its price and reduce the absolute volume of benefits. The areas in which squatters are numerous, however, are not the main rice-producing areas. The total change in the output of rice is therefore expected to be small in relation to Thailand's output of rice.

Another general equilibrium consideration is related to assumptions regarding the credit market. The foregoing calculation of net social benefits is based on an implicit assumption that newly titled farmers will receive the same amount of credit now available to titled farmers. This implies an infusion of additional institutional credit into the agricultural sector. Although credit markets are distorted, the real opportunity cost of capital is considered in the present calculation. The results imply that the gain in agricultural productivity from titling accompanied by expansion of agricultural credit outweighs the losses in other sectors of the economy, represented by the opportunity cost of capital. Possible developments in the credit market that might accompany land policies will be discussed further in the remaining chapter.

Table 42. Net Social Benefits of Ownership Security

<i>Province</i>	<i>Gross social benefit as percentage of P_{nt}^a</i>		<i>Social cost as percentage of P_{nt}^b</i> (2)	<i>Net social benefit as percentage of P_{nt}^c</i>		<i>Mean price of untitled land (p_{nt})^d</i> (4)	<i>Net social benefit in baht per rai^e</i>	
	<i>Risk neutrality</i> (1)	<i>Risk aversion</i>		<i>Risk neutrality</i> (3)	<i>Risk aversion</i>		<i>Risk neutrality</i> (5)	<i>Risk aversion</i>
Nakhon								
Ratchasima	82.9	38.6	3.3	79.6	35.3	3,448	2,745	1,217
Khon-Kaen	80.5	42.1	3.5	77.0	38.6	3,204	2,467	1,237
Chaiyaphum	41.3	25.3	5.6	35.7	19.7	2,014	719	397
Pooled northeast sample	68.2	35.1	4.1	64.1	31.0	2,889	1,852	896

a. From table 40; the opportunity cost of capital is assumed to be 12 percent.

b. From table 41.

c. Column 1 minus column 2.

d. From table 15.

e. Column 3 times column 4 divided by 100.

Note

1. A relevant issue is the value of the farmers' time invested in acquiring secure documents. This opportunity cost is not included in the calculations in table 37. Only 15 percent of the recipients of secured documents sampled, however, indicated that the process of obtaining the document was time-consuming.

12

Policy Implications

The foregoing analyses have demonstrated that security of landownership in Thailand has a substantial effect on the agricultural performance of farmers. It was also shown that providing full legal ownership to farmers who lack such status—that is, squatters—brings a very high economic return in most of the areas studied: the benefits far outweigh the relatively small costs of certifying legal ownership. The data also indicate that the main source of greater productivity on lands owned legally is the better access to cheaper and longer-term institutional credit enjoyed by titled owners.

Since limited access to institutional credit is the main constraint that affects the productivity of squatters in rural Thailand, some observers argue that the productivity of squatters can be increased by forcing banks, especially the government bank, to relax their collateral policies. Even if such a decree could be enforced, it would probably involve a substantial cost in further subsidies to banking operations. Repayment of loans on which no collateral is offered is worse than that of loans for which collateral is pledged. As a result, banks will incur greater losses that will have to be covered by the public. Even more likely is the possibility that such a policy would be largely circumvented by lending officers and branch managers, since the desire to minimize losses or to maximize profits dictates a preference for loans backed by collateral, and these preferences will not be fully suppressed by bureaucratic interventions.

Similarly, policies that provide squatters with limited formal status—a nontransferable lease from the state, for example, or a usufruct certificate—but which do not entail the ability to transfer or mortgage land, will not significantly improve the performance of squatters because their access to institutional credit will not have been approved. As the analysis in chapter 10 demonstrated, providing usufruct certificates to squatters in Thailand in areas in which they are well established is not an effective policy tool for improving their economic performance.

The STK program is costly: usufruct certificates must be issued, records must be maintained, and recipients' compliance with the conditions under which the certificates are issued must be monitored. As the empirical analysis demonstrated, recipients of STK certificates do not accrue any economic benefits directly. There is therefore no direct gain to society,

because there is no increase in agricultural output. Indirect benefits to society must therefore be found if the public expenditure on such a program is to be justified.

Proponents claim that STK certificates will reduce further encroachment on the remaining forest lands. Since preserving virgin forests is a national objective, success on this front could be a worthy argument. The likelihood that the STK program will, by itself, reduce encroachment, however, is doubtful. The root cause of the steady decline in forest areas is the growth of population in rural areas and insufficient enforcement of restrictions on the use of forest lands. This dynamic process will not be arrested by the issuance of usufruct certificates. The stipulations of the STK certificates that prohibit further encroachment and require the recipient to report encroachment by others were the law even before the program. These legal restrictions were not enforced because of limited budget, manpower, and political ability. It is difficult to envision how the present conservation-inspired measures of the STK program will be enforced when success rides on these same limited resources. If these resources and political backing were now made available, moreover, there would be no need for usufruct certificates or for the extra costs of issuing them and maintaining records of them. Instead, the resources could be allocated directly to enforcement of forest conservation.

Another claim made by supporters of the STK program is that the program will prompt forest reserve authorities to provide development services, such as extension services and roads, to squatters and that these services will bring an economic return. The fact is that many forest reserves already have development services comparable to those in other areas. In principle, however, the economic viability of providing infrastructure development services to squatters in the forest reserves should be judged separately from the STK program, and the benefits of such investments should not be attributed to the STK program.

Although in this study we have focused on areas in which squatters have long been settled, special consideration of the frontier areas, where encroachment by squatters has been fairly recent, is warranted. Some argue that these squatters' perceptions of ownership are less secure and that STK certificates, as a form of official recognition, might enhance perceptions of security more significantly than in other areas. The insecurity of squatters in these frontier areas, however, stems mainly from the fact that the government has not yet established an effective presence there. In the absence of a strong government presence, local informal systems for enforcement of land rights have emerged that imply greater uncertainty than in older established squatter areas. The government's effective assertion of its presence and control, rather than the mere issuance of certificates, is therefore a condition of the expected positive effects of the STK program in such areas. It is arguably unnecessary to spend public

resources to provide usufruct certificates when the focus of policy in the frontier areas should be to enhance government control through extension of its legal and administrative infrastructure. A policy designed to increase government presence could increase perceptions of security without the need for usufruct certificates and the associated costs of issuing them.

The foregoing discussion applies to another public policy concerned with land rights in Thailand, namely, the land reform program. Under this program, public land that has been released from the status of forest reserve—"degazetted"—is given by the Land Reform Office to eligible recipients. Most recipients are being issued "user certificates" (SPK), which are similar in many respects to the STK certificate. Recipients of SPK certificates clearly benefit from acquisition of rights to the use of land which they did not have before. In many instances, however, *part* of the land "given" has already been de facto held by them. Productivity could be increased if full rights of ownership were given to the recipients of SPK certificates, since they would then have better access to institutional credit. Potential credit constraints among the beneficiaries of land reform are now masked by the fact that these farmers are eligible for special institutional credit programs not open to other farmers. The availability of such special credit programs in the long run is not certain, however, nor is it desirable, for it introduces a further distortion in the credit market. Ultimately, enhancing the access of beneficiaries of land reform to credit in nonpreferential markets will become necessary.

A logical policy would be to provide full rights of ownership to squatters in agriculturally suitable areas that are not expected to be reforested. The effectiveness of such a policy—if it were adopted on a large scale—would require complementary policies to increase the aggregate supply of institutional credit to agriculture. If squatters are expected to achieve the superior agricultural performance now enjoyed by titled landowners, they will need a larger amount of institutional credit. To accommodate this need would require an increase in the supply of institutional credit to agriculture. To assess ways in which such an increase might be achieved—and the implications for other sectors as well—would require a careful review of the Thai institutional credit sector.

At present Thai government interventions in the financial sector present a number of distortions. The most obvious distortion is the interest rate ceiling in lending institutions. The ceiling applies to both the agricultural and nonagricultural sectors. While the ceiling is perhaps not binding on short-term credit to prime borrowers, it is below the market rate that would have prevailed for riskier and costlier lending operations, such as lending to small and medium-size farmers (Hanson and Neal 1985, 135).

Direct credit programs maintained by the government form another type of intervention. These programs are sizable—about a third of total credit—and their purpose is to stimulate sectors that have been given priority by the government—housing, agriculture, industrial development, export. Much of the credit administered through direct government programs is even subsidized, so it is offered at rates that are below the interest rate ceiling. Another form of intervention is the regulations that require commercial banks to direct a certain proportion of their lending to agriculture. This constraint is apparently binding at the margin, since banks use a low-profit option to make deposits into the government agricultural bank (BAAC) rather than lend directly to farmers.

Interest rate ceilings and the subsidization of credit entail a welfare loss. From the point of view of static welfare analysis they induce investments which might not be viable if the real opportunity cost of capital were considered. Sector-specific subsidies distort allocations of investments and inputs because the effective costs of these factors differ across sectors. Interventions such as sectoral or subsectoral direction of credit volume may also involve welfare losses, since they prevent market forces from determining allocation of credit to the best uses and equality of marginal productivities across sectors. In the past, proponents of interventions have used “second best” arguments, claiming that subsidizing credit or directing it toward agriculture was justified because agricultural terms of trade were distorted by taxation and exchange rate policies against agriculture. Recently, however, these price distortions in Thailand have been significantly reduced.

In this setting of credit market distortions, the gain in productivity to be realized from removing the land market distortion—that is, eliminating the illegal status of squatters by granting them full ownership—must be considered. In the absence of environmental considerations, the lack of secure legal ownership implies deviation from optimality in the agricultural sector: a squatter who is otherwise identical in all respects to a titled farmer receives less credit, uses lower ratios of factors to land, and is less productive. With the granting of full ownership, even if the overall supply of credit to agriculture were unchanged, some credit would be shifted at the margin from farmers already titled to some who have newly been titled. This would imply an increase in total output, provided that marginal productivities were declining—a plausible assumption. The gain would be smaller than the difference so far observed in the productivity of titled and untitled farmers, since the total amount of credit would be held constant.

There may be some market-determined increase in the supply of institutional credit if legal ownership is granted to large numbers of squatters. As the pool of farmer-borrowers is augmented by large numbers of poten-

tial clients with viable collateral, commercial banks may be more inclined to increase lending in agriculture. Such an expectation is supported by data presented in chapter 5, which show that a majority of the loans made by commercial banks to farmers in our sample were backed by land as collateral. Since lending by commercial banks is not subsidized, such a credit shift from nonagricultural sectors into agriculture does not necessarily involve a welfare loss. This is because the economic activities that are curtailed or are not undertaken do not necessarily bring a higher return than agricultural activities. Similarly, if subsidized government credit were shifted from nonagricultural sectors to agriculture following a large-scale titling program, there would be no obvious welfare loss. Again, the investments or activities forgone would not necessarily have brought a higher return. The gain in agriculture following such reallocation of credit would be greater than if the total supply of credit in the sector were not increased.

A welfare loss would be encountered, however, if additional credit were shifted to agriculture by new decrees affecting commercial banks, or if additional subsidized credit were directed to the agricultural sector through the government bank. Such measures involve implicit or explicit subsidies to farmers, and the return on activities forgone in other sectors might be higher, at the margin, than the return on agricultural activities. The total gain in agricultural productivity might, however, exceed the welfare loss in other sectors, making such a policy worthwhile. Indeed, the estimates in chapter 11, which are based on land values and on the assumption that former squatters could obtain additional institutional credit equal to that available to titled farmers, show that with several plausible levels of the *real* cost of credit, the net gains in productivity from titling could still be substantial. Nonetheless, to expand the extent of distortions in the credit market would not be desirable.

To remove interest rate ceilings, or relax them considerably, would generate a market-induced increase in the supply of institutional credit to agriculture. Farmers who provided collateral would still have an advantage, because loans secured by collateral are less risky for lenders. Thus titled farmers would be more productive, even in an unregulated institutional credit market. The difference in productivity would be less because the cost of institutional credit would be higher in the absence of regulations. Provision of full legal ownership to squatters accompanied by relaxation of interest rate ceilings would still be a socially beneficial policy. These policies would be more effective if administrative and legislative measures were taken to reduce the transaction costs involved in registering and enforcing land mortgages.

There are additional factors to consider. Some squatters have settled in areas in which continuing cultivation causes damage to the environment. In these areas control of the land may be better left to the state. It is ar-

gued that to grant amnesty to present squatters might encourage further encroachment on forest lands that have not yet been cultivated, with additional degradation of the environment. Environmental concerns can be satisfied, however, by selective coverage of an ownership provision and better enforcement of encroachment control.

Another set of considerations is related to equity. Experience in other countries indicates that when squatters are provided with opportunities for legal ownership, land grabbing by wealthy or powerful elements of the society is a real risk. The design and implementation of a policy to provide ownership to squatters should therefore contain safeguards, such as limiting the amount of land that can be claimed, against negative equity implications. As would be true of any major policy, there would be both winners and losers associated with the policies recommended here. Incentives for distorting or curtailing the policy thus exist, and sociopolitical factors must be borne in mind when the specific elements of the policy are designed. The potential net benefits to society from providing legal ownership are too significant, however, to let these possible complications become a reason for delaying the formulation of an effective land policy in Thailand.

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THE WORLD BANK

Although land rights are passionately debated in many developing countries, the empirical knowledge needed to assess and design optimal land policies is limited. To add to that knowledge, this book presents both quantitative and qualitative evidence of how security of landownership affects farm productivity.

The authors first develop a conceptual framework for exploring how ownership security affects the behavior and performance of farmers. Using farm data from Thailand, they then present an econometric analysis of investment patterns and the resulting differences in productivity between farmers with and without secure ownership. The authors highlight the importance of institutional credit, which farmers with legal ownership can obtain more easily by using their land as collateral. Their analysis shows that security of ownership significantly affects farm investments, land improvements, use of farm inputs, productivity, and land values and that economic benefits generated by providing secure landownership greatly exceed the costs.

Although the results are specific to Thailand, they provide a frame of reference for effects that can be anticipated in other developing countries. The methodology used in this study can be replicated to provide information for assessing the dimensions and implications of insecurity of ownership elsewhere.

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