

DISCUSSION PAPER

Report No.: ARU 66

Land Ownership Security, Farm Productivity,  
and Land Policies in Thailand

by

Garshon Feder, Tongroj Onchan and Chira Hongladarom

Research Unit  
Agriculture and Rural Development Department  
Operational Policy Staff  
World Bank

April 1987

The views presented here are those of the author(s), and they should not be interpreted as reflecting those of the World Bank.

The authors are a staff member and consultants of the World Bank. However, the World Bank does not accept responsibility for the views expressed herein which are those of the authors and should not be attributed to the World Bank or to its affiliated organizations. The findings, interpretations, and conclusions are the results of research supported in part by the Bank; they do not necessarily represent official policy of the Bank. The designations employed and the presentation of material in this document are solely for the convenience of the reader and do not imply the expression of any opinion whatsoever on the part of the World Bank or its affiliates concerning the legal status of any country, territory, area or of its authorities, or concerning the delimitation of its boundaries, or national affiliation.

LAND OWNERSHIP SECURITY, FARM PRODUCTIVITY,  
AND LAND POLICIES IN THAILAND

By

Gershon Feder  
The World Bank  
Washington, DC

Tongroj Onchan  
Yongyuth Chalamwong  
Kasetsart University  
Bangkok, Thailand

Chira Hongladarom  
Thammasat University  
Bangkok, Thailand

April 1987

"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



## Summary

This empirical study assesses the economic implications of land ownership security in rural Thailand. Ownership security is defined in this study as the possession of legal ownership rights, certified by a title document, over a given tract of land. Ownership security entails protection from eviction, and the ability to legally sell or mortgage the land. Economic theory postulates that ownership security stimulates investment incentives and land improvements because the farmer has greater certainty of his ability to benefit from the returns on his investments. Ownership security also implies that titled farmers are able to use their land as loan collateral, and thus facilitates their access to a larger volume or longer term, low-cost institutional credit. Enhanced access to credit and better investment incentives imply more actual investment and greater use of production inputs among farmers with ownership security. Together, these factors suggest that securely owned land (i.e. titled land) is more productive than untitled land. Since titled land is a more secure asset and produces more income, its market value is higher than that of untitled land.

There has been a paucity of rigorous empirical studies which confirm these propositions or which measure the effects of ownership security on productivity. In Thailand, such information is warranted, as the lack of ownership security characterizes about one million farm households and about one-fifth of the agricultural land. Most of these households are squatters on officially designated forest reserve lands. Most squatters have been settled on their farms for over a decade. The risk of eviction is rather low for rural squatters due to socio-political constraints. Restrictions on land transactions in the forest reserves are not strictly enforced, and squatters' lands are illegally traded as frequently as legally owned land. However, squatters in Thailand cannot use their land as legal collateral for production and investment loans required to increase agricultural productivity.

To assess the implications of ownership insecurity in Thailand, farmer surveys were conducted in four provinces (Lop Buri in the central region, and Nakhon Ratchasima, Khon-Kaen and Chaiyaphum in the Northeast). In each province the sample included (1) squatters in forest reserve land, and (2) titled farmers in neighboring areas outside the forest reserves. The samples of farmers and squatters in each province thus operate in similar agroclimatic environments. In Chaiyaphum province, the sample of squatters was further delineated in order to assess what effect the government's usufruct (STK) certificate program had on squatters' productivity. Some proponents of the program believe that providing squatters in the forest reserves with a usufruct certificate will induce better ownership security. Accordingly, to examine the effect of the usufruct certificate, the squatter sample in Chaiyaphum was composed of two groups: STK certificate recipients and non-recipients.

The survey revealed that the majority of sampled farmers believe that the most important aspect of legal ownership is improved access to

institutional credit. This is compatible with the low eviction rate and corresponding low level of uncertainty about a farmer's continued access to the land. The responses suggest that secure ownership must have a substantial impact on credit access. Similarly the data would suggest that providing usufruct rights to those squatters who have used the land for a length of time would not significantly improve performance: The perceived risk to continued land use (i.e. tenure insecurity) was low to begin with, and the ability to pledge land as loan collateral is unchanged. The study addresses these propositions.

An examination of credit transactions by sample farmers indicated a marked difference between institutional and non-institutional lenders. Institutional lenders often require loan collaterals, while non-institutional lenders do not. This is because non-institutional lenders face a lower borrower-specific risk since they are familiar with the farmers in their area and have better enforcement possibilities. Titled farmers pledged land as collateral in more than half of their institutional loans. In contrast, squatters, unable to pledge land as collateral, offered mostly a collateral substitute in the form of a group guarantee. Since a group guarantee is an inferior substitute, the amount of institutional credit per unit of land obtained by squatters was less than that obtained by titled farmers. While access to non-institutional credit was not significantly affected by ownership security, the cost of such credit is substantially higher. Further, in areas where the non-institutional credit market is not well developed, the loan amounts are limited. Econometric analysis utilizing a disequilibrium model confirmed that the supply of institutional credit is significantly affected by the provision of land collateral. The credit advantages associated with land collateral were larger in provinces where production is subject to high weather risks. Legal owners thus enjoyed substantial advantages in access to cheaper institutional credit. They received significantly more longer term credit and significantly more credit from commercial banks. Commercial bank loans in almost all cases required a land collateral. The majority of borrowers were credit-rationed by institutional lenders. Usufruct certificates had no effect on increasing the squatters' access to institutional credit.

Data on land values reported by the sample farmers were used to estimate econometrically the value of legal ownership in the study areas. The estimates account for variables which might affect land values (e.g. soil quality, market proximity, etc.). In the provinces studied, ownership security had a statistically significant effect on land prices. The effect is substantial in the northeastern provinces, where the value of untitled land ranges between one half and two-thirds the value of titled land. The value of legal ownership is much smaller in Lop Buri province. In Lop Buri the informal credit market is relatively well developed, a fact which probably accounts for the lower value of secure legal title since informal creditors usually do not require a legal collateral.

Econometric analysis of capital formation established that in the three northeastern provinces, ownership security induced significantly higher capital/land ratios, holding other farmer attributes constant. The differences in capital/land ratios between titled and untitled farmers

ranged from 56 to 253 percent. In Lop Buri the impact of ownership security on capital formation was not significant. Additionally, the adoption of two types of land-improving investments was shown to be significantly affected by ownership security in three of the provinces, holding farmer and land characteristics constant.

In three provinces, data at the household level were suitable for an econometric analysis of the impact of ownership security on input and output. The results in two northeastern provinces confirmed that, ceteris paribus, titled farmers use significantly higher amounts of variable inputs (labor, power, other cash inputs) per unit of land than do untitled farmers. Crop value per unit of land was also higher, by 12 to 26 percent. Differences in Lop Buri province were smaller, and not statistically significant. However, when the analysis used a more general definition of farm income, including income from non-crop agricultural products and non-farm activities, titled farmers performed significantly better than untitled farmers in all three provinces. The differences ranged from 12 to 21 percent.

The study assesses the economic viability of issuing usufruct certificates to squatters. It was hypothesized that the STK certificate program would not significantly improve squatters' economic performance because the certificates do not confer full ownership rights and thus preclude the ability to sell or mortgage the land. Hence, no credit advantages for certificate recipients were anticipated. Further, because of the conditions stipulated in the certificate, perceptions of ownership security were expected to decline. The empirical analysis, which addressed these hypotheses, found that about half of the STK certificate recipients did not perceive benefits in their new status. Some thought that their situation has actually worsened. Perceived benefits relate mostly to an expected reduction in land disputes, a problem that has arisen infrequently in the past. Owner-assessed land values of tracts covered by STK certificates do not differ from the values of other forest reserve tracts of equal quality. This is compatible with the claim that usufruct certificates in Thailand do not confer economic benefits to recipients, as such benefits would be capitalized in the land value. The analysis also shows that capital formation by squatters with STK certificates is not significantly different from that of other squatters. Both squatter groups, however, invest significantly less than titled farmers. The extent of land improvements on tracts covered by STK certificates is the same as other squatters' tracts. The empirical evidence thus supports the contention that usufruct certificates do not affect squatters' economic performance in Thailand. Since issuing STK certificates and maintaining their records are costly activities, the net return to this public undertaking is expected to be negative.

The empirical analysis of costs and benefits associated with the provision of land ownership security uses a theoretical model relating land values, credit constraints, investment and productivity. The model indicates that observed land market prices tend to overestimate the social value of titled land and underestimate the social value of untitled land. These distortions occur when formal credit is priced below the opportunity

cost of capital and the risk of eviction is positive. Land prices cannot be used to evaluate the social benefits of land titling without first correcting for the distortions. The analysis offers formulae for making such adjustments. These formulae use the results of the econometric analysis of ownership security to yield estimates of the social benefit of land titling. The calculations show substantial benefits in the northeastern provinces and much lower, or negligible benefits in Lop Buri. These estimates are obtained with several alternative assumptions regarding the real cost of credit and the nature of farmers' attitude to risk. The social benefits are between 25 to 80 percent of the market value of squatters' land. Such benefits are much higher than the social cost of providing secure ownership (surveying, registration) which is only 5 percent of squatters' land value. The benefits of ownership security are even higher when evaluated from farmers' perspective, as the costs they pay are lower than the social costs, and the benefits include the value of subsidized credit and the reduction in uncertainty regarding land, which is a risky asset for a squatter but not for society.

The results of the study suggest that provision of full (legal) ownership to squatters in rural Thailand is a socially beneficial policy, as the productivity gap between squatters and legal owners is substantial. Because the main constraint affecting squatters is their limited access to institutional credit, policy measures which do not enable farmers to use their land as collateral to obtain institutional credit are not effective. Thus usufruct certificates, such as STK certificates, will not reduce the productivity gap. Neither will such documents per se reduce the rate of encroachment on the remaining forests. To effectively control encroachment, resources need to be allocated directly to forest preservation.

Since institutional credit enables titled land owners to obtain higher productivity levels, large-scale titling programs designed to raise the productivity of squatters will only succeed if there is a simultaneous increase in the supply of institutional credit to agriculture. As the institutional credit market in Thailand is regulated and distorted, sectoral allocations are not market-determined. One way to foster a substantial market-induced increase in the supply of institutional credit to agriculture is by relaxing the interest rate ceilings. This would make lending to farmers a more attractive business for Thai commercial banks. Some of the gain in agricultural productivity will be reduced as interest rates will be higher, but the overall productivity gain will be significant.

Other ways to increase the supply of institutional credit to agriculture include reallocating government-sponsored credit across sectors; increasing the volume of government-directed credit to agriculture; or issuing decrees forcing commercial banks to increase lending to agriculture. The last two measures are less desirable because they aggravate existing credit market distortions and may entail a welfare loss if non-agricultural activities which, at the margin, have a higher productivity, are curtailed. Such a welfare loss needs to be weighted against the gain in productivity in agriculture from the joint effect of increased land ownership security and the increased supply of credit.

While the net result may still be a gain in overall social welfare (indicated by the cost-benefit calculations of the present study), it is preferable to minimize the distortions created in the credit sector, thus increasing the welfare gain due to the removal of the distortion in the land market.

The provision of ownership to squatters should be done with due attention to environmental risks and to equity concerns, so as to avoid further degradation of the environment in fragile areas and to minimize the scope for land grabbing by those who are already better off. While such issues are important and deserve consideration, they can be incorporated in a policy designed to increase productivity through effective provision of ownership security.

### Acknowledgements

The research underlying this report, and the preparation of the report benefitted from the contributions and assistance provided by numerous individuals, to whom we owe a debt of gratitude.

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

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

Many colleagues offered helpful suggestions and comments on various parts of the analysis. Among them are Messrs. Hans Binswanger, Peter Angus-Leppan, Thomas Daves, Quill Hermans, Lynn Holstein, Emanuel Jimenez, Michael Lav, Johannes Linn, John Lindt, Gregory McColl, Charles Mehl, Jere Murray, Theodore Panayotou, William Panton, James Roumasset, Enrique Rueda-Sabater, G. Edward Schuh, Ammar Siamwalla, and Mmes. Jessica Mott and Ngozi Okonjo-Iweala. Participants in seminars at Kasetsart University, the University of Maryland, the University of Minnesota, the University of Wisconsin-Madison, the World Bank and at an interim seminar in Bangkok provided useful comments as well.

Miss Rhonda Zaharna patiently and expertly typed numerous drafts and provided valuable editorial assistance. We also thank Ms. Consuelo Tan who helped with the typing.

Last, but not least, we would like to thank the hundreds of Thai farmers who generously gave of their time to provide us with the information on which this study is based.

LAND OWNERSHIP SECURITY, FARM PRODUCTIVITY, AND  
LAND POLICIES IN THAILAND

CONTENTS

Summary	i
Acknowledgements	vi
List of Tables, Figures and Maps	viii
I. Introduction	1
II. A Conceptual Framework and Literature Review	5
III. Land Rights and Land Use in Thailand	13
<u>Appendix:</u> Land Documents	24
IV. Methodology and Description of the Study Areas	35
<u>Appendix:</u> Maps	49
V. Ownership Security and Access to Credit	54
VI. A Model of Land Acquisition and Ownership Security	89
<u>Appendix:</u> Proofs of Propositions 1 - 13	102
VII. Analysis of Land Values	111
VIII. The Impact of Ownership Security on Capital Formation and Land Improvements	123
<u>Appendix:</u> Adjustment for Land Quality	142
IX. The Impact of Ownership Security on Input Use and Farm Productivity	143
<u>Appendix:</u> Estimates of Production Functions	157
X. The Impact of Usufruct Certificates	158
<u>Appendix:</u> A Usufruct Certificate	176
XI. The Benefits and Costs of Land Ownership Security	181
<u>Appendix:</u> Distortions in Land Prices	194
XII. Policy Implications	196
References	205

List of Tables, Figures and Maps

Figure 2.1: Land Ownership Security and Farm Productivity: A Conceptual Framework	9
Table 3.1: Classification of Land in Thailand	19
Table 4.1: Distribution of Plots by Location and Type of Land Title	40
Table 4.2: Infrastructure Services in Sample Villages	41
Table 4.3: Farmers' Experience with Eviction	43
Table 4.4: Farmers' Opinion of the Principal Benefit of Acquiring Secure Legal Title	45
Table 4.5: Proportion of Land Tracts Acquired by Purchase	47
Map of Thailand	49
Map of Lop Buri Province	50
Map of Nakhon Ratchasima Province	51
Map of Khon Kaen Province	52
Map of Chaiyaphum Province	53
Table 5.1: Borrowing from Institutional and Non-Institutional Sources	64
Table 5.2: Distribution of Loans by Source	65
Table 5.3: Distribution of Loan Characteristics By Title Status and Loan Source	67
Table 5.4: Distribution of Loans by Source And Type of Collateral	69
Table 5.5: Average Loan Amount per Rai Owned, Classified by Type of Security and Lender Type	71
Table 5.6: Estimates of Institutional Credit Supply and Demand	84
Table 5.7: The Impact of Titled Ownership on the Supply of Institutional Credit	87
Figure 6.1: The Determination of Land Prices	* 92
Figure 6.2: Equilibrium Land Prices	* 93



Table 7.1:	Mean Price of Titled and Untitled Land	112
Table 7.2:	Mean Land Prices as Reported by Village Headmen	114
Table 7.3:	Parameter Estimates from Hedonic Price Analysis	118
Table 7.4:	Alternative Estimates of the Value of Ownership Security	121
Table 8.1:	Capital per Rai Owned, Classified by Title Status	130
Table 8.2:	Regressions of Capital Stock and Owned Land	132
Table 8.3:	Regressions of Capital/Land Ratios	136
Table 8.4:	Incidence of Land Improvements	138
Table 8.5:	Logit Estimates of Determinants of Land Improvements	140
Table 9.1:	Sample Means of Per-Rai Input and Output Values, Adjusted for Differences in Land Quality	145
Table 9.2:	Regression Results for Output and Inputs	149
Table 9.3:	Reduced Form Regressions of Farm Revenues from Agricultural and Non-agricultural Activities	152
Table 9.4:	An Indirect Estimate of the Output Effect of Ownership Security	156
Table 10.1:	Index Numbers for Market Value of Equal Quality Land	161
Table 10.2:	Characteristics of Sample Farmers, Chaiyaphum Province	166
Table 10.3:	Farmers' Perceptions Regarding Benefits of S.T.K. Documents	167
Table 10.4:	Price of Land, Chaiyaphum Province	170
Table 10.5:	Hedonic Price Analysis of Land Values, Chaiyaphum Province	171
Table 10.6:	Value of Capital, Chaiyaphum Province	172
Table 10.7:	Regressions of Capital, Land and Capital/Land Ratios	173
Table 10.8:	Logit Estimates of the Probability of Land Improvement	175

Table 11.1: Titling Cost to Farmers	183
Table 11.2: Gross Social Benefits of Ownership Security	189
Table 11.3: Costs of Land Documentation	191
Table 11.4: Net Social Benefits of Ownership Security Per Rai	192

# LAND OWNERSHIP SECURITY, FARM PRODUCTIVITY, AND

## LAND POLICIES IN THAILAND

### Chapter I. Introduction

The evolution of individual land rights and mechanisms to enforce such rights in the rural context is closely related to increases in population density and to advances in agricultural technology. As land becomes scarce, societies which may have practiced shifting cultivation or long fallow periods to maintain land fertility must adopt fertility-restoring technologies that allow 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 continuously cultivate, 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<sup>o</sup> whereby the state provides the land owner with proof that a given and well-defined tract of land does indeed belong to him. If the centralized system is effective, and if the state can effectively protect the owner from encroachment or false challenges to his ownership, then such a mechanism indeed enhances security.

With agricultural development there is an almost universal emergence of rural credit markets, both formal and informal. Credit transactions often require an 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 providing 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. While this proposition is generally recognized by economists and development officials, there has been a paucity of rigorous quantitative research on this topic. This lacuna 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 policy-makers.

This issue is particularly acute in a country such as Thailand, where rapid expansion of the cultivated area has occurred in the past three decades. Much of this expansion took place through clearing forest areas, and without properly documenting and formalizing farmers' land rights. Today some one million farm households are operating on one-fifth of the designated forest reserve areas owned by the state.

There is a need to know to what extent the lack of legal ownership security affects farmers' performance, for if the impact is significant, it merits policymakers' attention. Further, to design efficient policies warrants information on the exact nature of the constraints imposed by lack of ownership security. For example, do usufruct certificates or legal long-term leases for squatters on public lands significantly improve their performance? Do titling programs or other programs addressing ownership security need complementary

policies in other areas, such as the rural credit system? Are there differences in potential impacts between 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 policy makers. In fact, most developing countries have little quantitative information to provide a reliable basis for comparative assessment of the dimensions and implications of ownership insecurity.

This study uses data from Thailand to rigorously analyze several aspects of land ownership security. The present Thai land rights system simplified the study considerably, allowing for an essentially cross-sectional comparison between farmers of differing ownership security status. 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 impacts which may be anticipated elsewhere. In addition, the study methodology 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 literature review. It is followed by separate discussions on the evolution of land rights in Thailand; the study methodology and the nature of the data; and the credit market. A formal model of land acquisition and ownership security which follows underlies the empirical discussions presented in subsequent chapters on land values; capital formation and land improvements; and, input use and farm

productivity. The impact of usufruct certificates is then assessed, and is followed by an analysis of the benefits and costs of land titling. Policy implications and conclusions are presented in the last chapter.

## Chapter II.

### A Conceptual Framework and Literature Review

The most obvious effect of land ownership insecurity is increased uncertainty for the farmer as to whether he will be able to benefit from the investments that he makes to retain or improve the productive capacity of his farm. Such investments may include equipment, structures, irrigation infrastructure or land conservation measures. One would expect investment to be negatively related to tenure uncertainty: with increased uncertainty, investment incentives are reduced and current consumption is preferred. With lower capital accumulation, the demand for variable inputs which are complementary to capital is reduced. For instance, if acquisition of machinery allows fast land preparation then more area can be double-cropped, and the demand for variable inputs such as labor and fertilizers increases.

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 raises the land's income potential. There is ample evidence that the incidence of land disputes and land grabbing -- and consequently, tenure insecurity -- increases as the potential return to land increases (Feeny, 1982, p. 95; Tomosugi, 1980; Tanabe, 1978; Clark, 1969; Baron, 1978, p. 27; Kemp, 1981, p. 15). Development also increases land transactions (sales, rentals), as efficiency considerations motivate adjustment in the land input to be

compatible with other endowments such as farming skills. But as the frequency of transactions between individuals who are not closely related increases, uncertainty over ownership entitlement 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. Clearly, one way to reduce or eliminate ownership uncertainty is to provide land owners with a title backed by a legal system capable of enforcing those property rights.

Many have highlighted the role that a secure legal title plays 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 which make it a desirable collateral asset. A land title is often a mandatory precondition for commercial (formal) or official bank loans (Wai, 1957; Dorner and Saliba, 1981, p. 23; Sacay, 1972; Aku, 1986, p. 24; Collier, 1983, p. 163). Based on 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 smaller farms were significantly affected.

In the informal credit market, collaterals play a less significant role. The lenders usually base their decision on personal familiarity with the borrower and they have alternative means for enforcing repayment (e.g. social pressures) 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. However, informal credit is typically much more expensive than formal credit, and is confined mostly to short-term loans of relatively small magnitude.

From the lender's perspective, farmers without a secure legal title are, ceteris paribus, more risky clients, hence interest rates are expected to be higher for these clients (reflecting 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 (Panadikar, 1956, p. 75). However, as explained by Stiglitz and Weiss (1981), interest rates cannot be allowed to rise to equate supply and demand due to asymmetric information. Thus credit rationing is optimal.

Farmers without secure land ownership therefore face constraints in gaining access to low-cost, long- 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 factor/land ratios (David and Meyer, 1980; and Rosegrant and Herdt, 1981). Since both variable inputs and capital are lower among farmers without secure ownership, their output is expected to be lower than if they did have secure ownership.

Efficiency losses 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 less cash-input-intensive crops and activities. Constraints on longer-term credit may cause a farmer to shift to crops which are less capital-intensive (e.g. if credit constraints bar a farmer from purchasing farm machinery). Similarly, lack of mechanized power may also diminish a farmer's potential for

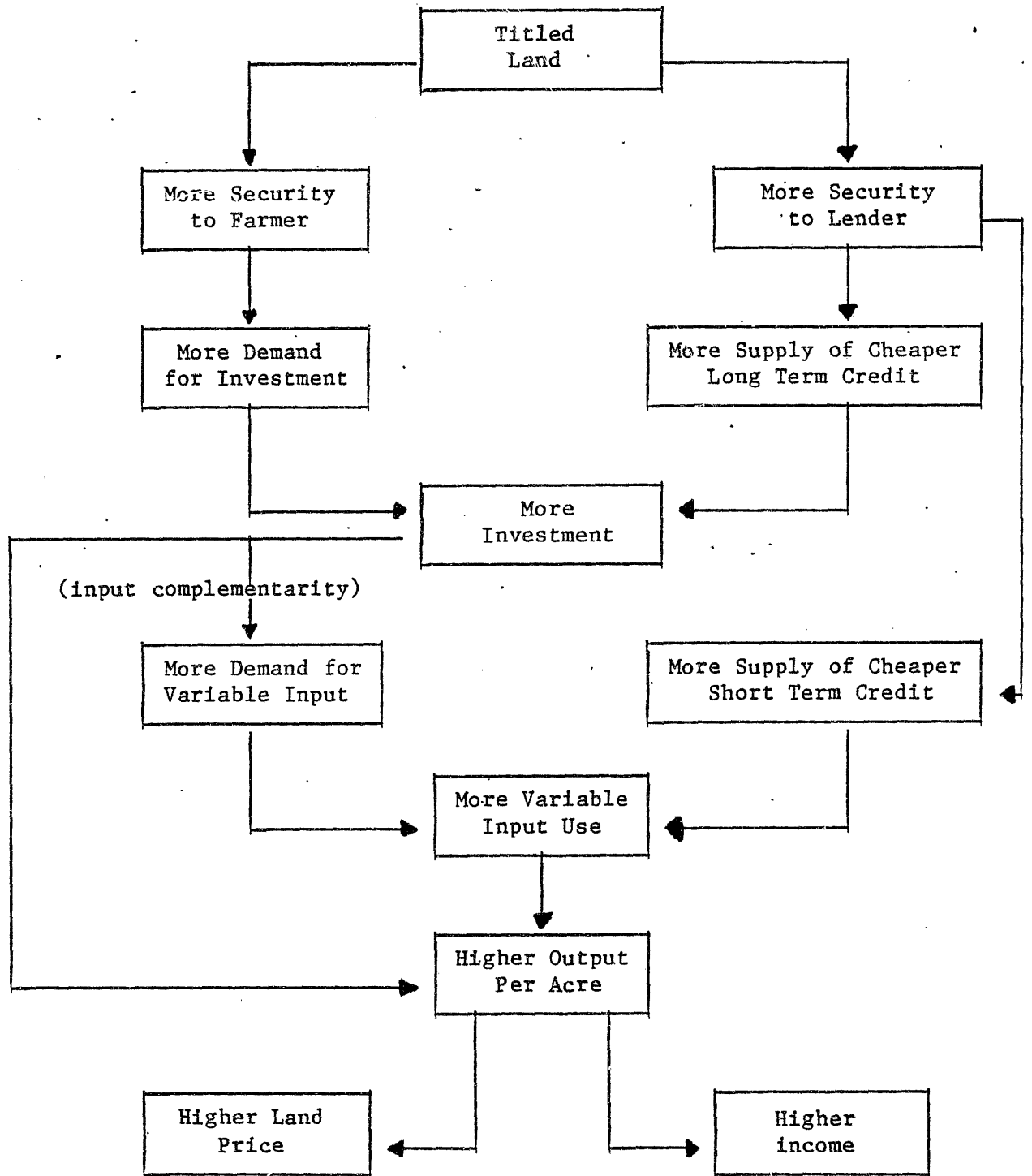
for double cropping in areas where speedy land preparation between seasons is essential.

From the discussion above, it is hypothesized that ownership insecurity causes lower farm productivity because investment incentives are reduced and access to credit is limited (Dorner and Saliba, 1981). Some commentators view ownership insecurity as a major source of low productivity in agriculture (Mosher, 1965). This conclusion implies further that the market value of land which is not securely owned (e.g. untitled land) will be less than that of an identical tract of land which is securely owned. This implication follows from the fact that the value of land reflects the stream of net incomes which it generates over a long horizon. Since land with secure ownership has higher 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 2.1, and will be rigorously developed in Chapter VI. Empirical evidence substantiating rigorously this conceptual framework has been scarce at the time this study was initiated. Below we review relevant information.

Quantitative evidence on the link between secure legal ownership and use of credit is rather 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. Credit improved mainly for owners of large farms; the average farm size for those who post-title got credit was 19 ha. and 7.3 ha. for those who did not. These results reflect not only supply changes,

Figure 2.1: Land Ownership Security and Farm Productivity:  
A Conceptual Framework



but also demand shifts. Similarly, recent data on a titling program in Jamaica (IDB, 1986) indicate that almost half of the title recipients increased their borrowing relative to the pre-project 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 a land collateral which 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. However, since the creditor physically possess the title deed, they can prevent the farmer from legally transferring ownership to other parties. This practice also restricts the farmer's access to additional credit from other lenders and therefore provides the lender with some protection against the borrower possibly incurring excessive debt. As an indication of how widespread this practice is, Stifel (1976) found in one village in the highly developed Central Plain region that the number of these unregistered mortgages was three times greater than the number of registered ones.

Both the effects of secured ownership on credit availability and the effects on investment incentives imply that farmers without secure ownership will have less investments and land improvements, lower use of variable inputs, and lower productivity per unit of land. Empirical evidence confirming these propositions is scant. A study of the economic implications of land titling in Costa Rica (Salas et al., 1970) found positive correlations (in the range of .40 to .67) between the degree of ownership security and farm investment per unit of land. Similarly, data from three Brazilian states in 1978 reviewed by Villamizar (1985) revealed

that capital per hectare is substantially higher on titled land than on undocumented or encroached land. The analysis was done for different farm size groups, and within most groups the proposition held.

Several studies have focused on the impact of ownership security on output or income. The earliest study, conducted in Costa Rica (Salas et al., 1970), found a positive correlation of .53 between income per unit of land and ownership security in one province. In another province however, the correlation was negative, although quite weak (-.07). A study of the Brazilian state of Maranhao (cited in IDB, 1986, pp. 186-189) concluded that granting full legal ownership to squatters and undocumented occupiers would increase their income by 200 percent. The same report quotes recent data from Ecuador indicating that income levels of titled farmers were double those of untitled farmers, holding the amount of land owned constant (IDB, 1986, p. 187).

As mentioned earlier, constrained credit may produce efficiency losses when the optimal mix of farm activities is affected. For instance, in Costa Rica it has been reported that it is easier to obtain credit using cattle as collateral than it is using land for 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 cattle raising even though the land may have been better suited for growing rice and beans (Dorner and Saliba, 1981, p. 23).

Recent survey results from Jamaica indicate that titled farmers had a substantially higher incidence (almost double) of permanent and semi-permanent crops as compared to untitled farmers. 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 semi-permanent crops than they did before the project (IDB, 1986, p. 189).

There are no studies addressing the impact of ownership security on agricultural land values. However, a recent study of the economic value of ownership security in the context of urban housing (Jimenez, 1984) offers a plausible approach which could be replicated in a rural setting. A hedonic price equation was estimated for the value (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, etc.). The parameters are then used to predict the value of dwellings with given sets of attributes which are located in urban squatter settlements. On average, the imputed value is higher than the actual value observed in the latter settlements, with the implication that the difference represents the market's valuation of tenure security.

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

### III. 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 over a given tract of land is spawned by numerous socio-economic factors. As the previous chapters indicated, population pressure, intensified land use, and agricultural development are some of the factors that contribute to the need and development of a legal tenure system. In this chapter we narrow our focus of ownership security by providing a cursory overview of land use and land rights within the Thai context.

#### Land Rights

Traditionally, all land in Thailand belonged to the King. However, because land was readily available and agricultural activity was subsistence-oriented, any Thai citizen could claim land to provide for his family. Widespread forest clearing, 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.

Up until the first half of the 19th century land was abundant while labor was scarce (Feeny, 1982). The Thai economy was characterized by a high land/man ratio. 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 corvee labor to their patrons and slavery was common. Public government projects required massive numbers of hired Chinese laborers, since local labor was not sufficient. Interesting to note, during this period slaves -- not land -- served as collateral for loans.

The second half of the 19th 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 commercialization 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, however, unsatisfactory since the record keeping was not centralized. Multiple claims and land disputes became increasingly frequent as cultivation expanded and land values increased (Tomosugi, 1980). This led to the 1892 Land Law. While this law significantly improved the security of title, 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 which, modeled after the Australian system, provided for cadastral surveys and central land record offices. Titling efforts were concentrated in the Central Plain region. With the introduction of this system, the use of land as collateral for loans increased significantly (Feeny, 1982, p. 96). The land registration prevailed with few modifications up 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 land rights system in Thailand today. The Code defines the powers and duties of the Minister of the Interior and the Department of Lands for the allocation and acquisition of state land. All of the land registration documents for land which is not government property are issued by the Department of Lands (DOL). The DOL, acting under the Land Code, can adjudicate land rights only for lands which are not designated officially as forest reserves, national parks, etc.

The land documents, referred to by their Thai acronym, correspond to the phases of land acquisition, utilization and legal possession. In terms of ownership security and land rights, we can distinguish between secure and unsecure documents. Although the title document (NS-4) is the most secure 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. Full ownership rights enable the farmer to freely and legally transact with the land.

NS-4

Legal possession is documented in a full unrestricted title deed called NS-4 (Chanot). 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 boundary mark stones and is registered in the provincial land register.

NS-3 and NS-3K

The secure documents related to the phase of utilization are NS-3 (Nor-Sor-Sarm) and NS-3K (Nor-Sor-Sarm-Kor) — "Certificate of Use" or "Exploitation Testimonial". These documents certify that the occupant has made use of the land for a prescribed period of time. 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 utilizing 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 comprised in NS-3 certificates, proposed transfers must be advertised for 30 days before the actual transfer.

While the above documents (NS-4, NS-3, and NS-3K) are the only documents which allow the farmer to freely and legally transact with a given tract of land, there are several other documents which provide evidence supporting a farmer's ownership claim. These documents, NS-2 and SK-1, however, do not certify secure legal ownership.

NS-2 - (Bai-Chong) -- a "Pre-emptive Certificate. This document authorizes temporary occupation of land. The land is described by metes and bounds. The certificate is not transferable except by inheritance, and it is therefore not accepted as a legal collateral. The validity of the rights it confers is conditional on use within six months of its issuance. At least three-quarters of the land must be used for a prescribed period of time before the occupier can convert the NS-2 to a certificate of utilization (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 in a specified period after the 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 utilization 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 land administration system shares with other LDCs the problem of funding and an inadequate administrative infrastructure to

provide full titles to all eligible farmers. <sup>1/</sup> As a result, the process of land registration has been rather slow (see Table 3.1). Only a small proportion (about 12%) of legally owned land is covered by full title (NS-4). Considering the area actually documented (i.e. land with either full title or certificate of utilization), the proportion is 53 percent. In our study areas, primarily agricultural areas, the occurrence of full title deeds (NS-4) was rare. This is consistent with the observation that title deeds are more prevalent in the urban areas. Ranong 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 NS-4 (1986, p. 124).

It is perhaps because of the low occurrence of the full title deeds, that the status and usefulness of the certificates of utilization has risen, blurring the distinction between the NS-4 and NS-3 or NS-3K. Although some commercial banks seem to prefer collaterals documented on a full title deed to those documented on a certificate of utilization, there are indications that in practice the differences between the certificates of utilization and full title are rather small. Williamson (1983) and the Ministry of Agriculture and Cooperatives (1980, p. 7) claim that there is little difference between full title and 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, p. 10). These views contrast with those Lin and Esposito (1976, p. 426) and Kemp (1981). According to Kemp, although the law allows NS-3 transfers, "the

---

<sup>1/</sup> Recently, however, the government undertook a significant expansion of the titling and land registration capacity through a special project funded partially by external donors.

Table 3.1: Classification of Land in Thailand

	Million Rai <u>a/</u>	%
Total Area of Thailand	320.7	100
<u>Public Land</u>		
Forest Lands <u>b/</u> (including gazetted forests, National Parks, Forest Parks, Wildlife reserves, and forest lands pending gazettal).	166.3	51
Public Domain and Government Real Estate Property	18.5	6
Religious Land	0.3	-
Local Administration Land, State Enterprise Land	2.7	1
Ponds, Swamps, Lakes, etc.	<u>11.6</u>	4
<u>Total Public Land</u>	<u>199.4</u>	62
<u>Private Land</u>		
Certificate of Utilization (NS-3 and NS-3K)	64.0	20
Title Deed (NS-4)	<u>18.4</u>	6
<u>Total Documented Private Land</u>	<u>82.4</u>	26
Undocumented Land (includes NS-2, SK-1 and other certificates outside forestry area)	38.9	12
<u>Total Private Land</u>	<u>121.3</u>	38

a/ 6.25 rai = 1 ha.

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.

transfer value of the certificate is low and commercial banks do not consider them good security" (1981, p. 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 as evidence of legal ownership by banks and buyers.

#### **Land Use and the Forest Reserves**

Like many other developing countries, Thailand is faced with the problem of illegal occupation and utilization of state-owned land by large numbers of farmers. In Thailand, this situation contradicts the national conservation objectives which prescribe maintaining sufficient forest reserve areas, as the squatters encroach mostly forest reserves.

As stated earlier, up 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 and changing export markets. Following the opening of the country to international trade and the signing of the Bowring Treaty (1855), the government actively encouraged expansion to meet export goals. Commenting on this era, Feeney 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, p. 6). In the post WW-II period, Feeny attributes the continued deforestation to favorable markets for upland crops and an even more accelerated rate of population growth.

Although forest conservation steps were first taken in the 1800s with the establishment of the Royal Forest Department in 1896, the extent of deforestation has been substantial. Feeny estimates that the percentage of forest coverage has dropped from 70 percent at the turn of the century, to 50 or 60 percent in the 1960; to 40 percent by the mid-1970s; to less than 30 percent today (1984, p. 8). <sup>1/</sup> 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 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 one-fifth of the land officially designated as state-owned forest reserve, is under permanent occupation and cultivation by squatters. This is about 21 percent of the land under cultivation and involves about one million squatter farm households. Even though many of these squatters had de-facto possession of the land for 15-20 years, they cannot obtain titles or certificates of utilization. The forest reserve areas can be found side by side with the non-forest reserve areas, in neighboring geographical areas located within identical agroclimatic zones and with similar socio-political structures.

As the pattern of agricultural expansion in Thailand has always been through a process of forest clearing and settlement, there is no socio-cultural or ethnic difference between the squatters in our study

---

<sup>1/</sup> The most recent estimates are currently under debate.

areas and their neighboring legal owners.<sup>1/</sup> 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 land holdings 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. It is important to note that following the Forest Reserve Act (1964), areas officially designated as forest reserve did not have carefully delineated boundaries, nor in many cases, were areas unsuitable for agriculture purposefully selected. In fact, many areas officially declared as forest reserves were already partially or fully settled. In many cases, it was several years before farmers learned that land that they held or had acquired had been designated as forest reserves. Beginning in the year 1972, when the distribution of NS-3K documents was significantly speeded up, increasing numbers of farmers discovered that they could not obtain the secure ownership document 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 did not arise apparently 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 acronymn STK, provide "temporary cultivation rights." The provision of STK certificates cover only holdings

---

<sup>1/</sup> However, in some frontier areas close to the country's international borders, the squatter population consists of hill tribes who are not ethnic Thai.



up to 15 rai (2.4 hectares), they prohibit the conversion of the certificate to title deed (NS-4) or certificate of utilization (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 (e.g. sell, or mortgaging) with land covered by an STK certificate, but the recipient's failure to report observed violations by others could result in his usufruct rights being revoked by the state.

#### Other Land Documents

There are several documents issued by various government departments which confer some rights to land within the context of specific settlement or welfare programs, but which usually do not grant full ownership. These include the N.K. documents distributed by the Public Welfare Department to selected beneficiaries in 3 series: The NK-1 and NK-2 are not transferrable except by inheritance. The NK-3 can be transferred or used as a collateral five years after its issuance. Similar to the STK certificate issued by the Forestry Department, the Land Reform Office issues SPK documents to beneficiaries of its program. 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 above documents, many farmers have tax certificates providing evidence that they have paid a land tax (PBT certificates). Tax is being collected for most occupied land (whether legally occupied 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.

**Appendix to Chapter III**

Land Documents

Department of Lands: Land Documents for Plots Outside the Forest Reserves

<u>Document</u>	<u>Class</u>	<u>Thai Name</u>	<u>Date Introduced</u>	<u>Legal Ownership Status</u>	<u>Survey Method</u>	<u>Transfer Rights</u>	<u>Can use as Collateral?</u>	<u>Restrictions/ Stipulations</u>
NS-4	Title Deed	Chanod	1954	Most secure. Full, unrestricted ownership title registered with provincial land registrar. Fully negotiable -- sold, rented, sub-divided or mortgaged	Land demarcated by accurate ground survey or rectified aerial photo map. Property clearly identified with boundary markers	fully negotiable	yes	Only issued for land outside forest reserves. Ownership rights can be challenged by State or other farmers if land lies dormant for longer than 10 years.
NS-3	Certificate of Utilization	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	Only issued for land outside forest reserves. Ownership rights can be challenged if land lies waste for 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	Only issued for land outside forest reserves. Ownership rights can be challenged if land lies waste for longer than 5 years
NS-2	Pre-emptive Certificate	Bai-Chong	1954	Authorizes temporary occupation of land. After prescribed period of time and land use, can convert to NS-3 or NS-3K	Land described by metes and bounds.	Only by inheritance	no	Only issued for land outside forest reserves. Validity of rights is conditional on use within 6 months of issuance.
SK-1	Claim Certificate	Sor-Kor-Neung	1954 (During process of implementing the Code.)	Ownership claim based on possession or use of land prior to 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	Only issued for land outside forest reserves.

Forestry Department: Land Documents (Inside the Forest Reserves)

<u>Document</u>	<u>Class</u>	<u>Thai Name</u>	<u>Date Introduced</u>	<u>Legal Ownership Status</u>	<u>Survey Method</u>	<u>Transfer Rights</u>	<u>Can use as Collateral?</u>	<u>Restrictions/ Stipulations</u>
STK	Temporary Cultivation Rights	Sor-Tor-Kor	1981	Usufruct certificate.	Varies	only by inheritance	no	Only issued for land inside forest reserves. Only covers plots up to 15 rai (2.4 ha.) Prohibit conversion of certificate to NS-4 or NS-3; State reserves right to revoke usufruct rights if restrictions violated.


Public Welfare Department: Issued in Specific Areas under Small Official Programs

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	

Office of Land Reform: Issued in Specific Areas under Official Program

SPK		Sor-For-Kor		Usufruct		only by inheritance	no	
-----	--	-------------	--	----------	--	---------------------	----	--

Figure A.1.3 Form of Title Deed, NS4



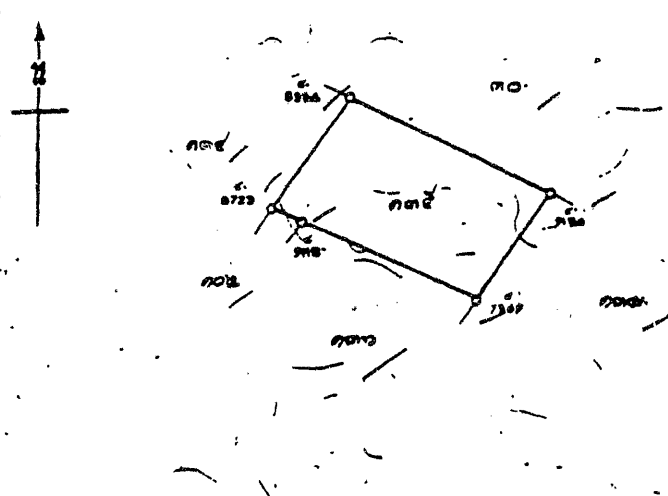
ช.ร.๕๖๖

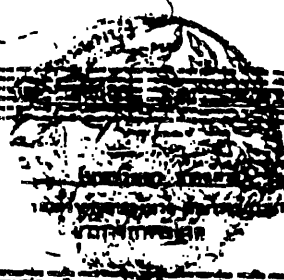
คำเช่าที่ดิน ๑๔๗ ๑๑๓ เลขที่ ๑๓๕ หน้าที่ดิน ๕๒๒๕ ตำบล ๑๓๖๖๖ (ไทยใหญ่)	<h2 style="margin: 0;">โฉนดที่ดิน</h2> <p>โฉนดที่ดิน                  เลขที่ ๒๕๕                  เลข ๒๕๕ หน้า ๖๐                  ตำบล ไทรน้อย (นาหมอก)                  อำเภอ นมทนบุรี</p>	กรมที่ดิน เลขที่ ๑๓๖ เลข ๑๓๖ หน้า ๖๐ กรมที่ดิน
---	--	--

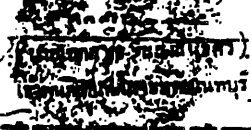
เป็นหนังสือสำคัญแสดงกรรมสิทธิ์

โฉนดที่ดิน

ขนาดที่ดินในอัตรา ๑๓๗-๑๐ **รูปแปลงที่** ขนาดที่ดิน ๑๑๐๐๐

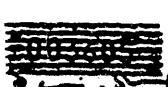






นาย [Signature]

๒๗ มิ.ย. ๒๕๒๖



๒๗ มิ.ย. ๒๕๒๖

นาย [Signature]

๒๗ มิ.ย. ๒๕๒๖

Reproduced from Burns (1985)

BEST COPY AVAILABLE

Land Location  
 Map Sheet No. \_\_\_\_\_  
 Parcel No. \_\_\_\_\_  
 Tambon No. \_\_\_\_\_  
 Tambon Name \_\_\_\_\_

Title Deed  
 No. \_\_\_\_\_  
 Volume \_\_\_\_\_ Page \_\_\_\_\_  
 Amphur \_\_\_\_\_  
 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).

. TRANSLATION

Reproduced from Burns (1985)

Figure A.2.3: Form of Certificate of Utilization, N.S.3



หนังสือรับรองการทำประโยชน์

**ที่ดินตั้งอยู่** **กระเบื้อง**

ตำบล ทุ่งยั้ง หมู่ที่ ๕ เลขที่ ๒๓๖๖  
 อำเภอ เมือง หน้า ๓๖๕  
 จังหวัด สุพรรณบุรี ตำบล ..... หน้า .....

หนังสือรับรองการทำประโยชน์ฉบับนี้ออกให้เพื่อแสดงว่า

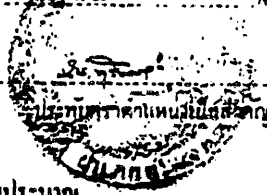
นาง ทองสุข พรหมจันทร์ เจ้าของที่ดิน ..... สัญชาติ ไทย  
 บุตร นายทองคำ นางอินทร์ อยู่กับ นางงาม เลขที่ .....  
 หมู่ที่ ..... ตำบล นางงาม อำเภอ เมือง จังหวัด สุพรรณบุรี

ได้นำหลักฐานที่ตนแปลงที่ดินอ้างตนว่าได้ทำประโยชน์ในที่ดินแล้ว ตามหลักฐานคือเป็น

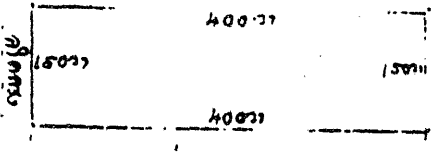
- ที่ค้ำเหนื่อ ปริมาณ ๕ ไร่ ๓๓ เส้น ๓๓ กว. **ที่ดินนายสมปอง**
- ที่ค้ำได้ ปริมาณ ๖ ไร่ ๓๓ เส้น ๓๓ กว. **ที่ดินนายสมปอง**
- ที่ค้ำตะวันออก ปริมาณ ๖ ไร่ ๓๓ เส้น ๓๓ กว. **เขตที่สวนของนายประโชชน์**
- ที่ค้ำตะวันตก ปริมาณ ๖ ไร่ ๓๓ เส้น ๓๓ กว. **ลำคลอง**

จำนวนเนื้อที่ประมาณ ๓๖ ไร่ ..... งาน .....  
 วันที่ ๑๖ เดือน กุมภาพันธ์ พ.ศ. ๒๕๑๕

นายอำเภอ .....  
 ประจําที่ตราหน้าใบนี้โดย  
 (ลายมือชื่อ)  
 นายอำเภอ



รูปที่ดินโดยประมาณ  
**ที่ดินนายสมปอง**



**ที่ดินนายสมปอง**

BEST COPY AVAILABLE

Certificate of Land Use

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

This land use certificate is issued to certify that:

Name \_\_\_\_\_ Race \_\_\_\_\_ Nationality \_\_\_\_\_

Parent's Name \_\_\_\_\_ Village \_\_\_\_\_ Address \_\_\_\_\_

Village no. \_\_\_\_\_ Tambon \_\_\_\_\_ Amphur \_\_\_\_\_ Changwat \_\_\_\_\_

Has made use of the land having the following references:

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  
Seal of the competent officer

Shape of Land (Approximate)

TRANSLATION





หนังสือรับรองการทำประโยชน์

โฉนดที่ดินสำหรับเช่าที่ดินประมงในเขตชลประทาน

ตำแหน่งที่ดิน

ครุบ่อน

ตำบล.....กิ่งหวม..... ๒๔๓๕ = ๖๓๐๖  
อำเภอ.....หวมกล..... ๒๕๓.....หน้า.....  
พื้นที่.....๓๐๐.....  
มาตรา.....๖๕๕.....หน้า.....๓๐

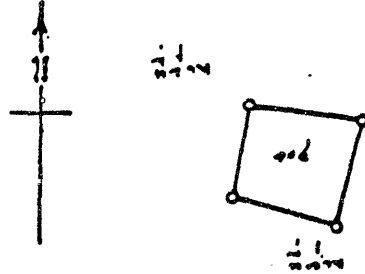
หนังสือรับรองการทำประโยชน์ฉบับนี้ออกให้เพื่อแสดงว่า

ชื่อ.....นางสมหมาย.....นางสมหมาย.....นางสาว.....นาง.....  
เลขที่.....ตำบล.....อำเภอ.....จังหวัด.....  
ได้ครอบครองและได้ทำประโยชน์ในที่ดินประเภทเช่าที่ดินชลประทาน  
จำนวน.....ไร่.....ตารางวา

รูปที่ดินและขนาดที่ดิน

มาตราส่วนแนวราบรูปถ่าย ๑ : ๕๐๐

มาตราส่วน ๑ : ๕๐๐



ออก ณ วันที่ ๑ เดือน..... พ.ศ. ๒๕๓๕



ที่ - ๒๕๓.๑๐๔

.....

Certificate of Land Use  
Issued in Accordance with the Land Code

Land Location

Tambon \_\_\_\_\_  
Amphur \_\_\_\_\_  
Changwat \_\_\_\_\_  
Aerial Photo No. \_\_\_\_\_

Registration

Tambon No. \_\_\_\_\_  
Volume \_\_\_\_\_ Page \_\_\_\_\_  
Parcel No. \_\_\_\_\_  
Map Sheet No. \_\_\_\_\_ Page \_\_\_\_\_

This land use certificate is issued to certify that:

Name \_\_\_\_\_ Nationality \_\_\_\_\_ Address \_\_\_\_\_

Village Number \_\_\_\_\_ 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 official

TRANSLATION

Figure A.4.3: Form of Pre-emptive Certificate (N.S.-2)

  
ใบของ

ที่ดินตั้งอยู่ .....  
ตำบล ไผ่ล้อม หมู่ที่ ๔  
อำเภอ อินทร์  
จังหวัด สุพรรณบุรี

ทะเบียน:  
เล่ม ๒๕ เลขที่ ๕๕๖๖  
หน้า ๒๖ ๓, ๗  
จำนวนเล่ม ..... หน้า .....

ใบของฉบับนี้ให้ไว้เพื่อแสดงว่ารัฐได้ยอมให้ นาย สมพงษ์ ธรรมรัตน์  
เชื้อชาติ ไทย สัญชาติ ไทย เป็นบุตร นายสมบุญ นางทองสุข  
อายุ ๒๒ ปี ตั้งบ้านเรือนอยู่ ตำบล หาราม  
อำเภอ อินทร์ จังหวัด สุพรรณบุรี  
เจ้าครอบครัวที่ดินแปลงดังกล่าวข้างต้นชั่วคราว ตามหลักฐานดังต่อไปนี้  
ที่ดินเนื้อ ประมาณ ๕๐๐ ไร่ ..... เงิน รก. ที่ดินนางนวน  
ที่ดินไต่ ประมาณ ๕๐๐ ไร่ ..... เงิน รก. ที่ดินนางทองสุข  
ที่ดินครุวันออก ประมาณ ๑๕๐ ไร่ ..... เงิน รก. เขตที่สาธารณประโยชน์  
ที่ดินครุวันตก ประมาณ ๑๕๐ ไร่ ..... เงิน รก. ลำคลอง  
รวมเนื้อที่ประมาณ ๑,๕๐๐ ไร่ ..... เงิน .....  
วันที่ ๕ เดือน กรกฎาคม พ.ศ. ๒๕๐๐  
(ลงชื่อ) ..... นายอำเภอ .....

สมพงษ์ ธรรมรัตน์  
บุตร

Pre-emptive Certificate

Land Location

Tambon \_\_\_\_\_ Village Number \_\_\_\_\_  
Amphur \_\_\_\_\_  
Changwat \_\_\_\_\_

Registration

Volume \_\_\_\_\_ Number \_\_\_\_\_  
Page \_\_\_\_\_  
File No. \_\_\_\_\_ Page \_\_\_\_\_

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

Name \_\_\_\_\_ Race \_\_\_\_\_ Nationality \_\_\_\_\_ Parents Name \_\_\_\_\_  
Age \_\_\_\_\_ Address \_\_\_\_\_ Tambon \_\_\_\_\_  
Amphur \_\_\_\_\_ Changwat \_\_\_\_\_

to take temporary possession in the plot of land having the following references

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

TRANSLATION

## Chapter IV.

### Methodology and Description of the Study Areas

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

However, to simply compare the economic indicators of the two groups may ignore other important differences between them, and thus invalidate the assessment of the impact of ownership security based on such comparisons. For example, one important factor is the agroclimatic environment in which the farmer operates. There is no point in comparing a titled farmer operating in a fertile valley to a squatter operating in a hilly area; the two differ not only in ownership security status, but also in soil and terrain type.

To avoid false attributions, a key element of the study methodology was to select 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 reserve areas and from adjacent areas outside the reserves -- were located within a radius not exceeding 20 miles. Great care was taken to ensure that a study site had similar terrains and infrastructural facilities.

Initially selected were sites in three provinces which 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 sampling design for each province consisted of a random selection in the pre-selected study site of ten villages in the forest reserve and ten villages in the adjacent non-forest reserve area. Within each village, about 10 farmers were randomly selected. <sup>1/</sup>

In the following year, another northeastern province, Chaiyaphum, was added to the study. The province was added in order to specifically study the 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 certificate recipients and non-recipients. These two squatter sub-samples 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.

---

<sup>1/</sup> Initial sample sizes were approximately 200 farmers per province. However, operators who did not own land were later dropped from the sample, and instances of missing data further reduced sample sizes for specific tasks of the analysis.

As noted earlier, since the pattern of agricultural expansion in Thailand has always been through a process of forest clearing and settlement, there are no socio-cultural or ethnic differences between the squatters in our study areas and their neighboring legal owners. Hence, there is no systematic difference in basic underlying characteristics between squatters and other farmers (e.g. ability, management skills), or between forest reserve lands and other lands in our study areas. This is important, as no other measure of ownership security (except for the distinction between squatters and legal owners) could be utilized in the analysis. For most of the farmers in our study areas, the location of their farm had already been determined by the time it became apparent that the squatter status entails disadvantages. We thus view the farmers' ownership status as exogenous in the context of the analysis in this study.

To account for individual differences between farmers (e.g. initial wealth, location, soil type), the empirical analyses reported in subsequent chapters utilize data on characteristics of the farmer and his farm. These analyses are essentially econometric, employing regression techniques and dichotomous choice models. Ownership security (represented in the present study by a titled status) has effects on both long-term processes (capital formation, land acquisition) and short term activities (input use, production). It is therefore important in the econometric work to determine whether variables typically treated as exogenous are not actually endogenous, in the sense that they are affected directly or indirectly by ownership security. Since this study's objective 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 which affect them directly or indirectly. The endogenous variables affected by ownership security analysed 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 surveyed villages were connected by feeder roads to the major road, the cropping activities in the area are highly commercialized. The area is mostly rainfed with an annual rainfall of about 1070mm and the rainfall pattern is stable over time. Most of the sample areas in Lop Buri have good soil conditions compared to the surveyed provinces 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 760mm. Rice crops are found in both lowland and upland areas where pump irrigation is possible. The soil of lowland areas are mostly black and slightly sandy (soil suitable for growing rice). In the upland areas where the soil is more sandy, cassava is the most common crop grown.

In Khon-Kaen, the Ban Phai and Kranuan districts were selected for the study. Both districts are mostly upland and hilly areas; the soil is mostly sandy. The annual rainfall is about 1390mm. Most of the areas are rainfed, and only a few farmers have access to irrigation. The cropping patterns of the two districts are very similar. However, some



villages in the Kranuan district 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 as their location was deemed dissimilar to 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-Kean are less commercialized than those in Lop Buri and Nakhon Ratchasima.

In Chaiyaphum province, the study area is located in Chaturat district, about 330 kilometers from Bangkok. Chaiyaphum province is characterized by plateau lands which slope from the northwest towards the south and east. The average rainfall is 1086mm. As in other northeastern provinces, agriculture is mostly 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. However, the extent of illegal encroachment of forest reserve land in the central plain 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 the south of Thailand. Similarly, frontier areas of very recent settlement have not been covered by the present study.

The distribution of sampled plots by location and ownership status is given in Table 4.1. It is apparent that farmers outside the

Table 4.1: Distribution of Plots by Location and Type of Land Title

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	Plots in Forest Reserve	Plots Outside Forest Reserve	Plots in Forest Reserve	Plots Outside Forest Reserve	Plots in Forest Reserve	Plots Outside Forest Reserve	Plots in Forest Reserve With STK Document	Plots in Forest Reserve Without STK Document	Plots Outside Forest Reserve
Untitled Plots (%)	100.0	13.8	100.0	12.5	100.0	12.2	100	100	3.7
Titled Plots (%) (NS-3, NS-3K)	-	86.2	-	87.2	-	87.8	-	-	96.3
Total number of plots owned by sample farmers	281	247	245	287	253	296	96	233	135

reserve boundaries who can acquire a secure land ownership document, are keen to do so. The overwhelming majority (close to 90 percent) of the plots outside the forest reserve are covered by a secure document, either NS-3 or NS-3K. There is thus no bias due to potential self-selectiveness in the sample of titled farmers.

Table 4.2 provides information on the availability of infrastructure services in the sampled villages. Differences are rather small and insignificant. The fact that public services are provided to villages in the forest reserve areas reflects the recognition by government agencies and officers that the squatter settlements are by and large permanent. This is compatible with the low probability of eviction in Thailand.

Eviction of squatters in forest reserve areas by government officers has been rather rare in Thailand due to socio-political constraints. While overall statistics of eviction frequencies for the country are not available, data from the four provinces surveyed in the context of the present study provide adequate information. Farmers (both squatters and titled farmers) were asked to indicate whether they have ever been evicted from land they possessed. The reference period is therefore a lifetime, and the frequencies of eviction based on the responses to this question may be viewed as lifetime probabilities of eviction. The data are presented in Table 4.3. As one would expect, eviction rates are higher among squatters (residents of forest reserves) than among legal owners in all provinces. It is clear, however, that eviction rates are low, as the probability of a squatter getting evicted over a lifetime is less than 10 percent.

Table 4.2: Infrastructure Services in Sample Villages

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		ALL	
	Forest Reserve	Villages Outside Forest Reserve	Forest Reserve	Villages Outside Forest Reserve	Forest Reserve	Villages Outside Forest Reserve	Forest Reserve	Villages Outside Forest Reserve	Forest Reserve	Villages Outside Forest Reserve
Item	----- % -----									
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
No. of villages	10	10	10	10	9	11	5	3	34	34

Table 4.3: Farmers' Experience with Eviction a/

Province Farmers' Location	Lop Buri		Nakhon-Ratchasima		Khon-Kaen		Chaiyaphum	
	Sample Size	Percent Evicted	Sample Size	Percent Evicted	Sample Size	Percent Evicted	Sample Size	Percent Evicted
i) Forest Reserve	100	7.0	89	9.0	91	6.6	120	1.7
ii) Outside Forest Reserve	84	2.4	72	1.4	93	2.2	112	0.9
iii) Differential Eviction Rate [line (i)-line (ii)]	-	4.6	-	7.6	-	4.4	-	0.8

a/ The period of reference is the farmer's lifetime.

Source: Farmer surveys, 1984-1986.

Eviction incidence among titled farmers (who are settled outside the forest reserve) reflects probably "normal" land expropriation which takes place in conjunction with public projects (roads, canals, dams). Such events cannot be avoided even by titled farmers. It is therefore appropriate to view 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 due to the fact that he does not have legal ownership. These figures are reported in Line (iii) of Table 4.3 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 the interpretation of the effects of titled ownership, as will be shown in subsequent chapters.

The low probability of eviction, combined with the fact that land tax is being collected on squatter's land, and the availability of public services are all factors which enhance the squatters' perception of ownership security.<sup>1/</sup> Indeed, when squatters were asked what they perceived as the most important advantage of possessing a secure land ownership document such as NS-3 or NS-3K, the majority stated favorable access to institutional credit (Table 4.4). Only a few suggested protection from eviction or land disputes as important aspects of legal ownership. Land disputes, in fact, have not occurred very frequently in the past. In our sample, the estimated lifetime probability of disputes is

---

<sup>1/</sup> Some of the forest reserve areas, are, however, new frontiers where settlement has been rather recent. In those areas (which are not part of the present study) the administrative infrastructure representing government control is still in the process of implementation and in the interim period, informal structures of power prevail, which control several aspects of economic activities, including land rights.

**Table 4.4: Farmers' Opinion of the Principal Benefit of Acquiring Secure Legal Title**

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum	
	Forest Reserve (N=89)	Outside Forest Reserve (N=106)	Forest Reserve (N=81)	Outside Forest Reserve (N=86)	Forest Reserve (N=74)	Outside Forest Reserve (N=112)	Forest Reserve (N=120)	Outside Forest Reserve (N=112)
	----- % -----							
Access to Institutional Credit	74	83	54	49	61	50	80	83
Avoid Eviction	12	4	29	20	19	22	4	5
Minimize Disputes	10	9	21	24	7	17	9	6

11 percent in forest reserve areas, and 13 percent outside forest reserve areas. Thus the frequency of disputes is low with little difference between forest reserve areas and other areas. <sup>1/</sup> Noteworthy, there are no significant differences 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 they will accrue 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 which theoretically should restrict their activities have not been enforced. For example, one such constraint is the prohibition of selling or transacting in land which is formally state property. Yet, several studies pointed out that this restriction is being ignored in reality (Lin and Esposito, 1976; Kemp, 1981). The survey data on land purchases among sampled farmers indicate that there are no significant differences in the incidence of sales between untitled tracts (located in the forest reserve) and titled tracts (Table 4.5). Lands in the forest reserve areas are commercially transferred as frequently as those outside the forest reserve. The ability to freely conduct these transactions augments the squatters' security perception of their de-facto owned land.

Farmers' opinion is thus compatible with the socio-political environment in rural Thailand: since eviction and disputes are minor issues of low risk, the credit advantages implicit in possession of legal

---

<sup>1/</sup> In the future, however, as land scarcity becomes a more pressing constraint, the incidence of disputes is likely to increase.



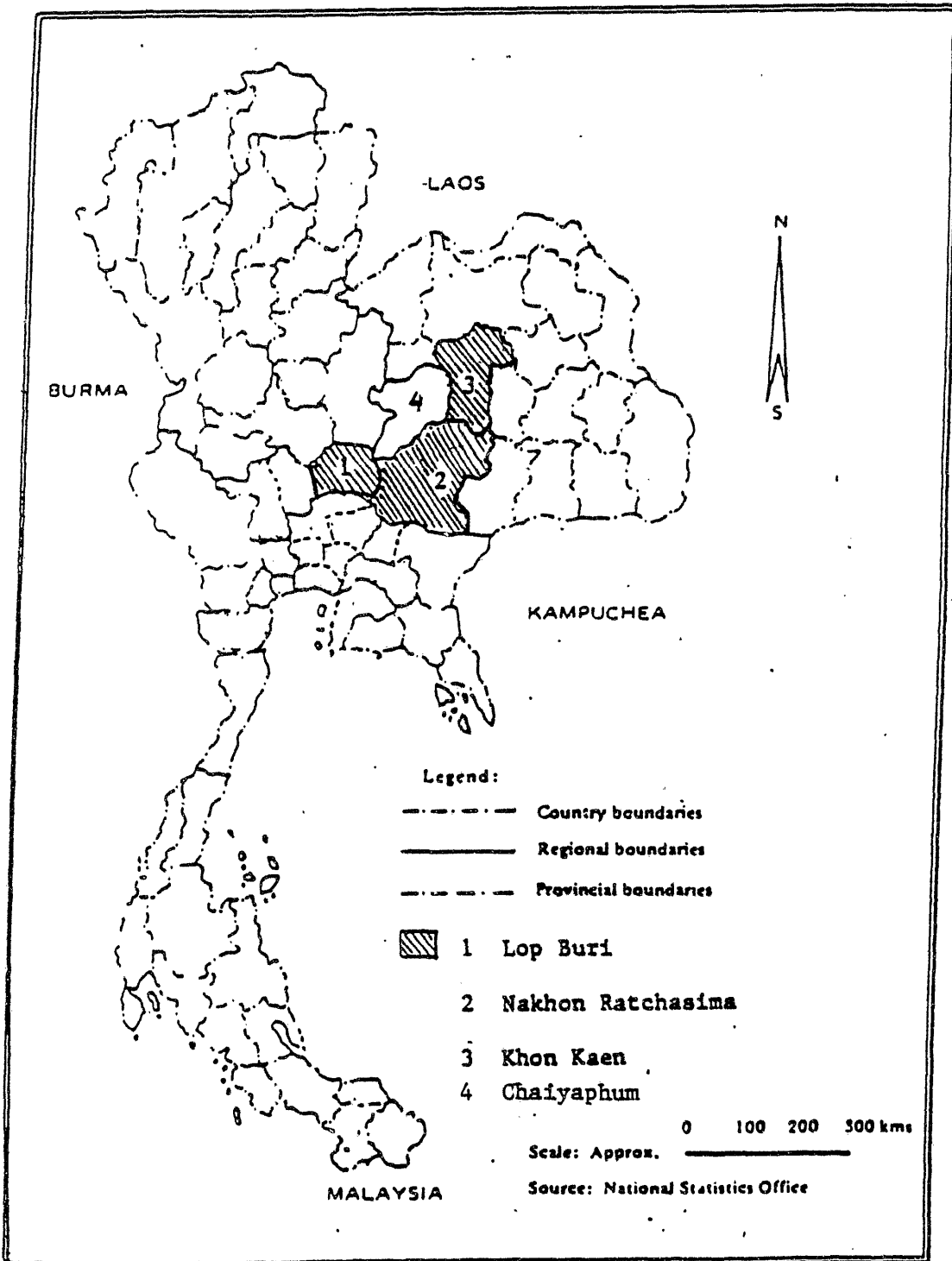
Table 4.5: Proportion of Land Tracts Acquired by Purchase

Province Land Location	Lop Buri		Nakhon-Ratchasima		Khon-Kaen		Chaiyaphum	
	Sample Size	Percent Purchased	Sample Size	Percent Purchased	Sample Size	Percent Purchased	Sample Size	Percent Purchased
Forest Reserve	156	67	163	26	110	63	441	42
Outside Forest Reserve	211	70	247	25	258	45	231	33

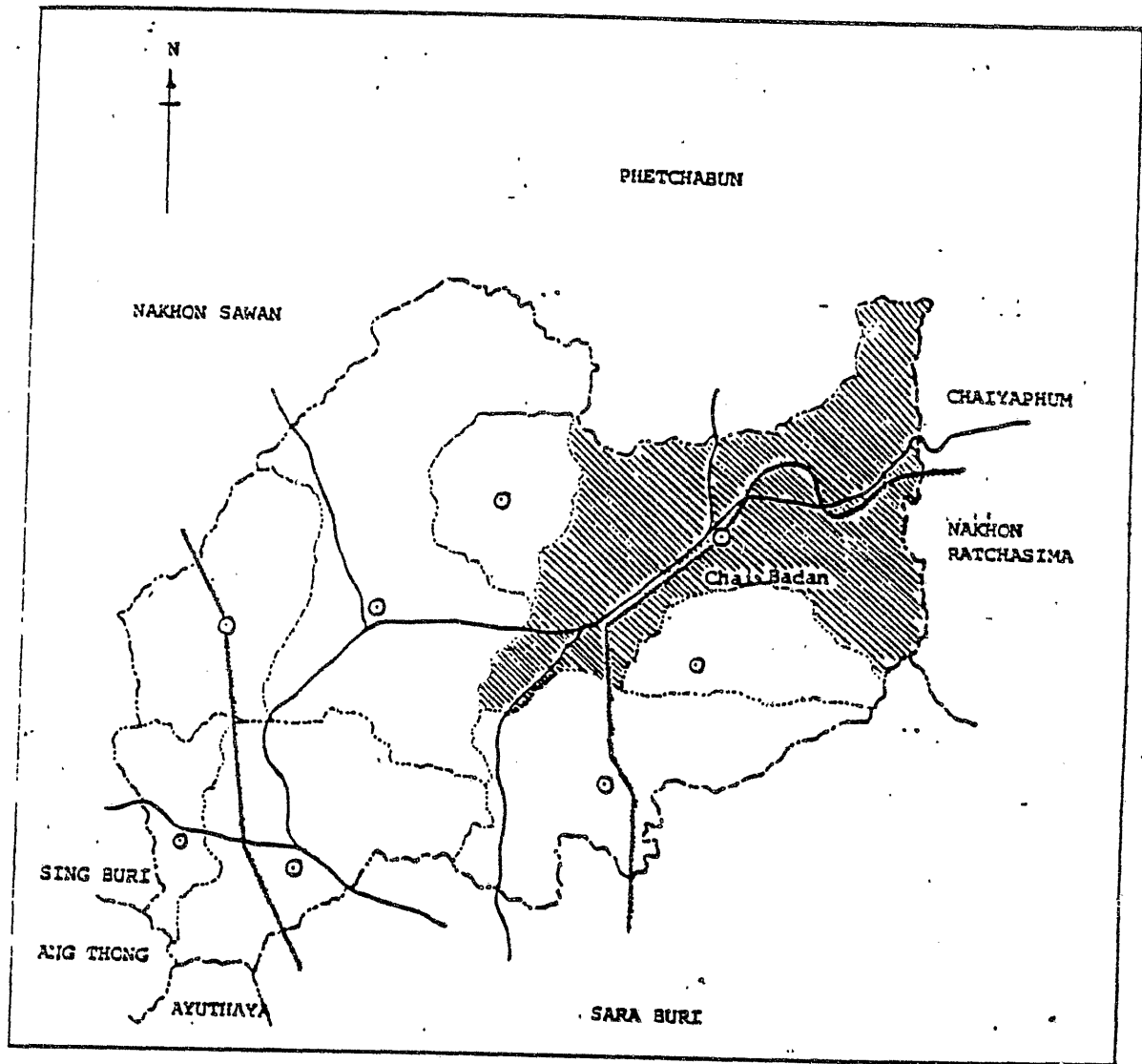
ownership documents are the important factor. That is, farmers perceive the ability to use land as collateral for loans as an important benefit, enabling them investment, production and consumption patterns which they could not otherwise attain. This suggests that the impact of collaterals on institutional credit supply is substantial, otherwise farmers would not consider this aspect of secure ownership so important. The analysis in the next chapter will examine this proposition.

The finding that credit is the dominant benefit of legal ownership in Thailand is extremely important for policy considerations, as policies may have different effects on the credit access aspect of ownership security and on security perceptions. For instance, a policy which aims 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 squatters' situation which is of minor importance in Thailand. A detailed discussion of this issue will be provided in Chapter X.



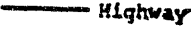


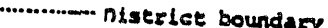
Map of Thailand



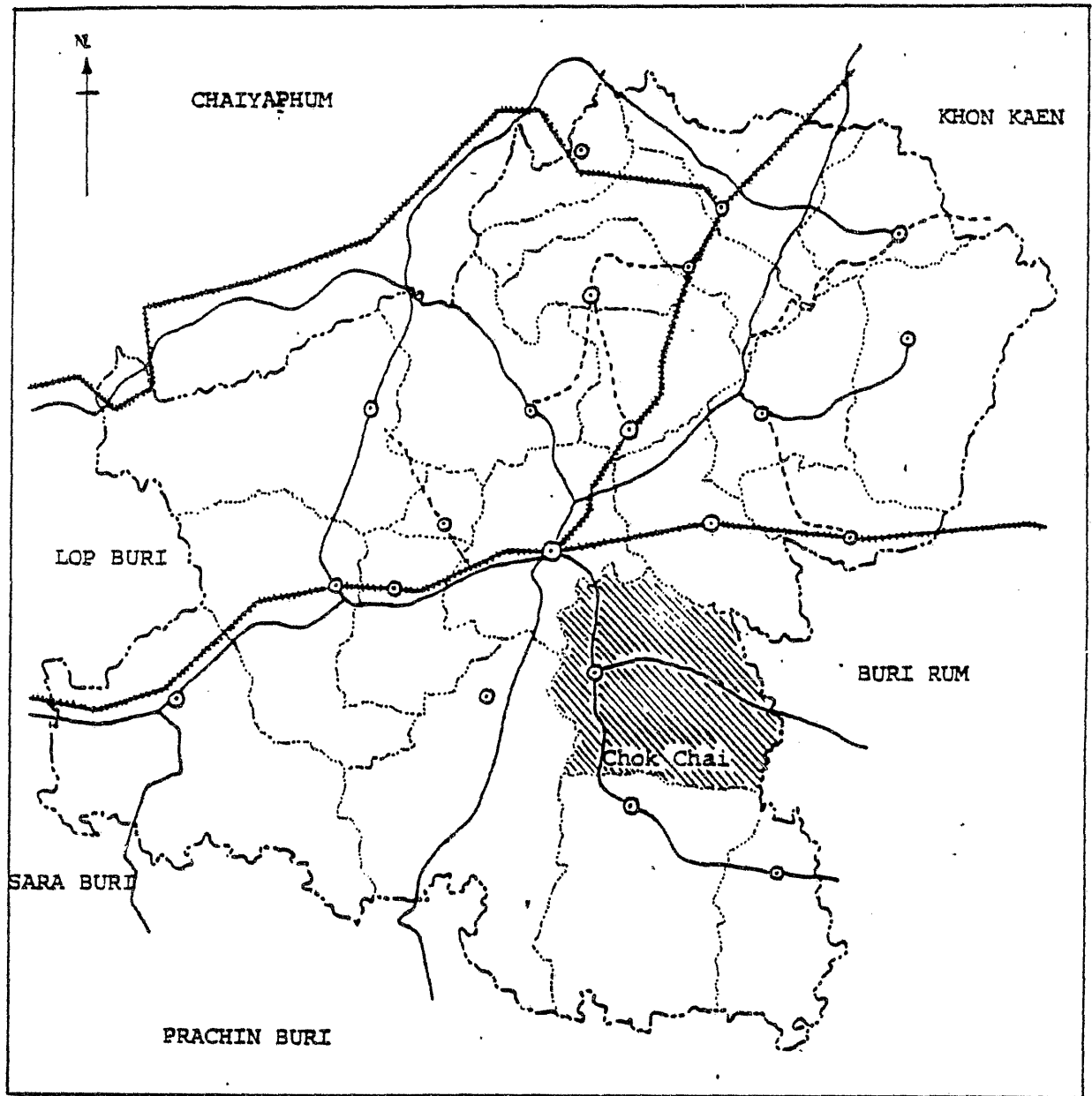
Map of Lop Buri Province.



Scale 1 : 1,000,000

-  Study Area
-  District Office
-  Highway
-  Railway
-  Province boundary
-  District boundary

Map of Nakhon Ratchasima Province



Study Area

SCALE 1 : 1,000,000



District Office



Highway



Gravel Road



Railway

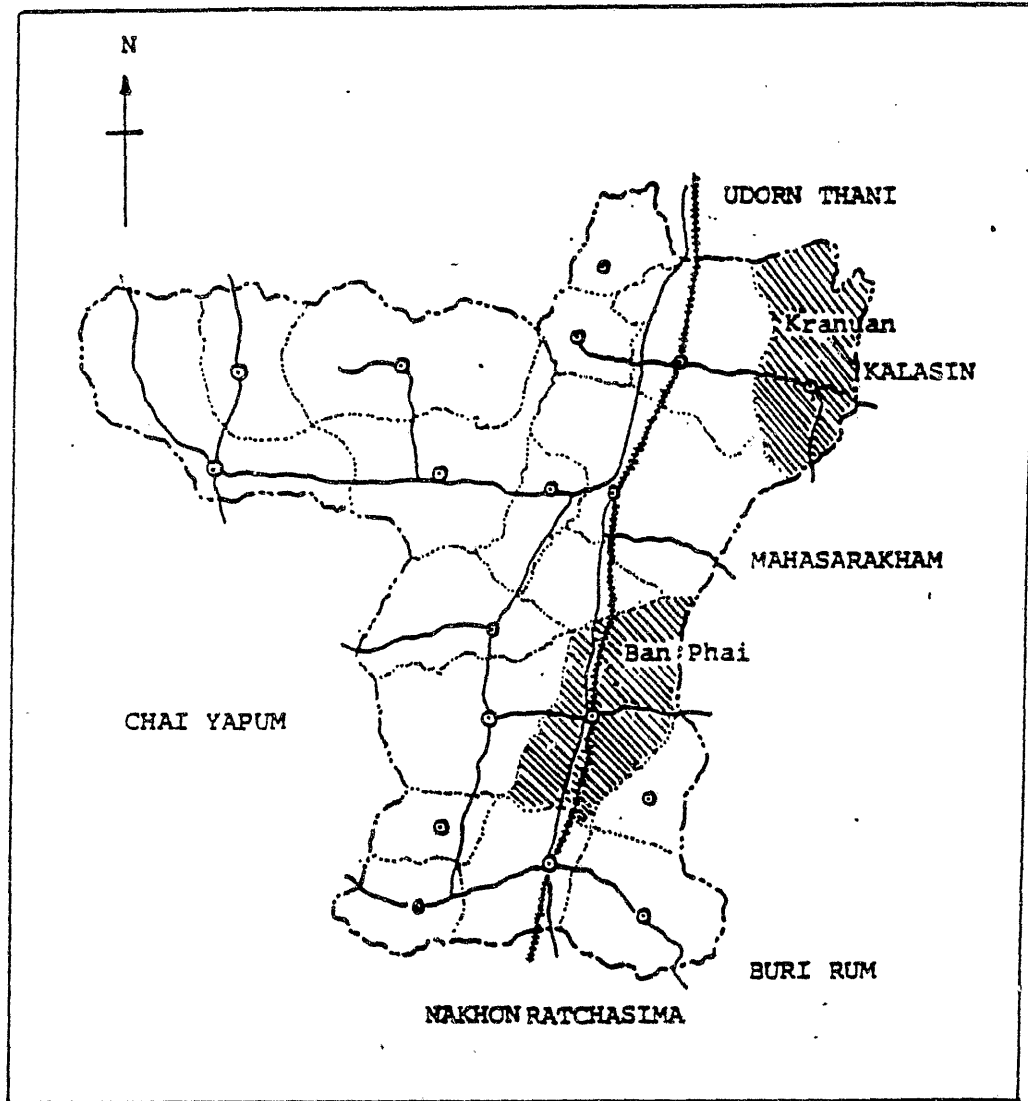


Province boundary









District boundary

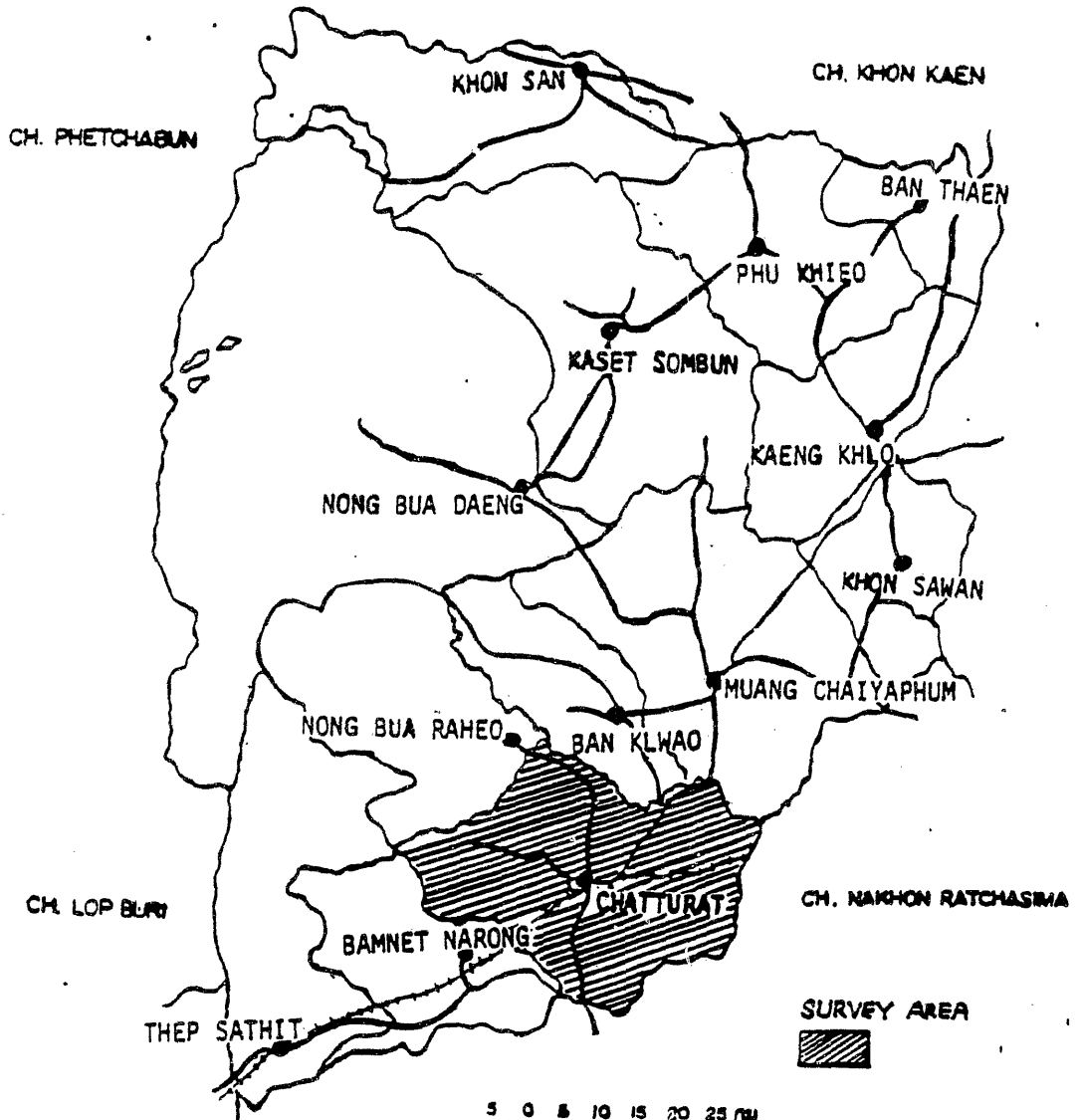
Map of Khon Kaen Province.



Scale 1: 1,800,000

-  Study Area
-  District Office
-  Highway
-  Railway
-  Province boundary
-  District boundary

### Map of Chaiyaphum Province



SOURCE : DIVISION OF REGISTRATION, DEPARTMENT OF LOCAL ADMINISTRATION,  
MINISTRY OF INTERIOR.

## Chapter V.

### Ownership Security and Access to Credit

Farming operations typically imply several months of land preparation, cultivation and harvest, followed by a short period of marketing. Corresponding to this sequence, the agricultural season is characterized by a long period of negative cash flows, followed by a peak period of positive cash inflow. Because many farmers do not have liquid resources to cover consumption and cultivation costs, acquiring short-term credit is widespread in farming. Similar to other investments, farm investments require large capital outlays up-front, followed by years of small returns once the investment becomes 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. Thus, borrowing is part and parcel of farming, and access to credit is an important determinant of a farmer's performance. In this chapter we discuss the major sources of credit and how ownership security affects a farmer's access to credit.

#### Factors Affecting Lending

It is useful to distinguish between two broad sources of farm credit, namely, institutional and non-institutional lenders. Institutional lenders include cooperatives, specialized government agencies, state-owned banks and private banks. Non-institutional lenders include friends and relatives, money lenders, traders and rich farmers. The literature on rural credit markets suggests several important distinctions between these two credit sources in terms of the credit they offer to different farmer



groups. Land ownership security, in particular, may have a different impact on lending decisions of institutional and non-institutional lenders.

Land ownership security implies the certainty of having continued access to a given tract of land. However, more important for credit purposes, ownership security enables a farmer to transfer land ownership to others. While a borrower usually knows whether there are challenging ownership claims to the land which he offers as collateral, a potential lender may not. This uncertainty is greater for a lender who resides or operates outside of the borrower's social environment. The asymmetry in information leads to welfare losses. Consequently, societies have tried to reduce the inefficiency by registering land holdings and issuing title deeds whereby the state confirms land ownership by the holder of the title.

A central hypothesis of this study asserts that secure (titled) land ownership will have a positive effect on access to credit, due to the ability to pledge land 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 squatters' access to institutional credit. This is because a usufruct certificate does not confer to the recipient the right to transfer land, except by inheritance. Without this ability to transfer ownership, usufruct certificates have no significance to lenders.

The lending decision involves many factors: the loan amount (if a loan is to be granted at all), the direct and indirect price (interest rate, or tied buying and selling deals), the loan duration, and the

collateral or other security requirements. Some of these decisions may be simultaneous and others may be recursive (e.g. the duration or the amount of the loan may depend on the type of collateral available). Since lenders face the risk of borrower default, or arrears, they naturally require borrower-specific information as well as general information which pertains to large groups of borrowers or potential borrowers (e.g. product price forecasts). The costs entailed in acquiring information are one of the main distinctions between institutional and non-institutional lenders.

For non-institutional 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 on a daily basis. They have established a close acquaintance with the farmer, his family and his social group. They may, in fact, be part of it. Thus, non-institutional 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, etc. In contrast, collecting detailed information is more costly for institutional lenders. Institutional lenders do not usually have detailed, personal familiarity with farmers, although they may gain more information over time, if the farmer borrows repeatedly (Timberg and Aiyar, 1984; Miracle, 1983). Consequently, with less information, a borrower is more risky from an institutional lender's perspective as compared to a non-institutional lender.

Another aspect which may further distinguish institutional from non-institutional lenders' risk perceptions relates to the borrower's incentive to default and the lender's ability to enforce repayment. Since a non-institutional creditor is a member of the farmer's social

environment, he can mitigate against default by exercising social norms and pressures (e.g. concern for loss of status in the community) which are not available to an institutional creditor (Von Pischke, 1983, p. 228). An informal lender can also apply threats or violent enforcement procedures which institutional lenders cannot (Bottomley, 1983, p. 284). As a result of these considerations, an institutional lender will be more inclined to use measures that reduce loan riskiness, such as requiring a loan security. The term loan security usually refers to the borrower's pledging collateral or providing a collateral substitute.

The role of collateral in lending is discussed extensively by Binswanger et al. (1985), Barro (1976), Benjamin (1978) and Plaut (1985). At a given interest rate, three effects of collateral can be identified: a 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 interest rate, the loan amount is expected to increase as the value of the collateral increases, ceteris paribus.

A 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 or long-term deposit certificates are not very common in LDCs rural areas, land is expected to be the most common collateral in rural areas.

However, for land to be suitable as collateral, the lender needs an 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 collaterals depends on the ability of the legal system as well as the socio-political environment to affect foreclosure on agricultural land. Foreclosure usually entails considerable transaction costs (legal fees, auctioneer fees, etc.). However, these costs may in fact reinforce repayment discipline and enhance the utility of collaterals if the value of the collateral exceeds that of the loan. The reason is because these foreclosure transaction costs are deducted from the proceeds of the collateral sale, and thus they are borne by the borrower. Foreclosure thus implies a significant cost to the farmer, and the lender's threat to foreclose can deter defaults or arrears. The risk of incurring a high transaction cost by an unintended default may cause farmers to forego the use of collateral even though this limits their access to credit, if the benefits of additional credit are outweighed by the potential loss implied by a default. A collateral serves as an added, implicit risk-reducing element by restricting the borrower's ability to incur additional institutional debt. Since lenders prefer that the borrower not become more indebted (unless a priority ordering of creditors can be effectively established), this restriction further enhances the usefulness of collaterals to lenders.

Farmers who operate in areas where suitable collaterals are not common, or who do not have acceptable collaterals, will resort to using collateral substitutes (Binswanger et al., 1985) to obtain loans or to

increase loan amounts. A frequent form of collateral substitute is a third party guarantee. In lieu of a collateral, the lender may accept the pledge of another person (guarantor) to assume responsibility for repayment. For this arrangement to be viable, the guarantor has to be less risky than the borrower and his risk should not be highly correlated with that of the borrower. A related collateral substitute is a "group guarantee" -- farmers form a group of farmers 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 major benefits to the lender is the possibility that intentional defaults are minimized, since other members can exert social pressures on potential defaulters. Also, because unintentional defaults of members are not perfectly correlated, there are more assets to serve as implicit collateral. However, repayment discipline on loans obtained through group guarantee may be hampered if cumbersome legal proceedings make collection from group members on one member's default difficult. Evidence from empirical studies suggests that in many cases 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 (machinery, land) serves as an implicit collateral, since the borrower may have an incentive to generate liquidity by sale of assets rather than lose future borrowing access in the case of default. Even if no formal collateral is pledged, owners of substantial assets are preferable to those who have little 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 which would not otherwise be available to him.

Institutional lenders are usually heavily regulated. In most cases they have to abide by usury laws which dictate a relatively low rate of interest (compared to that which would prevail if no constraints were imposed). Non-institutional lenders are not regulated, and in cases where regulation was attempted it proved difficult to enforce. As a result, non-institutional lenders almost always charge higher interest rates than institutional lenders. Although information costs are comparatively low for the non-institutional lender, there are factors which generate higher lending cost. A non-institutional lender, operating within a confined geographical area, has a high degree of co-variability among his clients and fewer possibilities for risk diversification than does a nation-wide bank operating in different agro-climatic zones. Further, non-institutional lenders usually fund their operations from equity rather than deposits. This stems from reasons related to the synchronic timing of deposit withdrawals and credit demand, as well as the high co-variation in incomes of borrowers and depositors (Binswanger et al., 1985). Institutional lenders, on the other hand, have more diversified sources of funding, thus they can maintain a lower reserve/lending ratio, contributing to a lower lending cost.

Transaction costs incurred by the borrower are a frequently mentioned aspect differentiating institutional credit sources from non-institutional ones. In many areas, obtaining institutional loans is a

lengthy, time consuming process: first there is the time farmers spend obtaining appropriate documentation, filling forms, meeting relevant officials, which is followed by a lengthy processing period for the loan application. Non-institutional lenders do not impose time consuming procedures. Because they may be located within the farmers' environment, they can agree upon loans and disburse them within days. This would imply that if borrowing needs are small, the farmer may prefer a non-institutional 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 of Agriculture and Cooperatives (BAAC) -- by far the largest institutional lender to farmers -- does not seem to carry high transaction cost. As indicated by Onchan (1984, p. 65), borrowing applications from BAAC are processed within a short period, as a result of streamlined procedures, increased 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 non-institutional rates, obviously farmers would prefer to borrow from an institutional source. However, because the interest rate is fixed, institutional credit is likely to be rationed and unsatisfied demand may have to be covered by non-institutional sources. As Stiglitz and Weiss (1981), Virmani (1985), and other works reviewed by Braverman and Guasch (1986) have demonstrated, even when interest rates can move freely, credit rationing can be optimal due to adverse selection and asymmetric information. It is thus possible that farmers are rationed by non-institutional lenders as well. In the case of rural areas with highly localized non-institutional lenders, asymmetry in the information between lender and borrower may be small. Hence, the likelihood of rationing by

non-institutional lenders may be lower.

The preceding chapter indicated that farmers view the ability to use land as a collateral as a major benefit of secure legal ownership. Squatters cannot offer a legal land collateral, and therefore they cannot obtain the type of loans from institutional lenders (duration, magnitude) which are available to titled farmers who can provide land as collateral. Even when land is not offered as a formal collateral, owners of titled land have a more valuable asset than holders of untitled land. Since land can be viewed as an implicit collateral, it follows that owners of titled land will have, ceteris paribus, better access to institutional credit even if they do not pledge collateral.

The usefulness of collaterals 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 back to the 19th century, and has been increasing 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, pp. 96, 189-190; Tomosugi, 1980). Evidence cited by Stifel (1976) and Mehl (1986) indicates that foreclosures do take place. Bank branch managers interviewed for this study indicated that banks (including the government bank) have, in recent years, increased the number of foreclosures enforced to demonstrate to farmers that foreclosure is a viable threat in the event of default. Some have suggested that this strategy has reduced the need to actually enforce mortgages. Thus in many cases when the loan is backed by a collateral an initial court notification is sufficient to induce a delinquent borrower to pay.



### Empirical Evidence

We now review data pertaining to credit transactions of farmers sampled in the four provinces of Thailand. The farmer sample is divided according to ownership security into two groups: untitled and titled farmers. In Chaiyaphum, the sample of untitled farmers province is disaggregated further by whether farmers have received a usufruct certificate (STK) or not. We start by observing general patterns of borrowing among sample farmers. Table 5.1 describes the composition of borrowing from different sources. It is noted that borrowing incidence is higher in Lop Buri than in the other three provinces. This accords with the fact that Lop Buri is the most commercialized province in the sample. There are no significant differences between titled and untitled farmers in the incidence of non-borrowing. These results are compatible with the possibility that many of the non-borrowers are demand constrained rather than supply constrained. Differences in the incidence of borrowing from different sources are mostly non-significant. There is, however, the somewhat puzzling fact that in Lop Buri the proportion of titled farmers borrowing solely from non-institutional sources is larger than the comparable proportion of untitled farmers.

A more detailed breakdown of loans by source is provided in Table 5.2. 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 non-institutional credit are provided by traders. By contrast, in the less commercialized northeastern provinces the role of traders is less

Table 5.1: Borrowing from Institutional and Non-Institutional Sources

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	Untitled (N=98)	Titled (N=82)	Untitled (N=89)	Titled (N=72)	Untitled (N=61)	Titled (N=82)	Untitled With STK (N=46)	Without STK (N=74)	Titled (N=112)
Borrowing from									
	----- % -----								
Non-Borrowers	13	9	32	35	52	54	52	33	42
From Institutional Source Only	15	22	45	40	18	30	22	39	36
From Non-Institutional Source Only	22	40	17	15	23	13	20	19	22
From Both Institutional and Non-Institutional	50	29	6	10	7	2	4	8	3

Table 5.2: Distribution of Loans by Source

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	Untitled (N=162)	Titled (N=120)	Untitled (N=76)	Titled (N=69)	Untitled (N=42)	Titled (N=45)	Untitled With STK (N=24)	Without STK (N=62)	Titled (N=77)
Source of Credit	----- % -----								
<b><u>Institutional Lenders</u></b>									
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	53	42	71	73	47	67	46	62	65
<b><u>Non-Institutional Lenders</u></b>									
Landlords	1	0	0	0	0	4	0	0	0
Relatives & Neighbors	2	8	20	10	43	25	17	16	7
Traders	43	48	9	16	10	2	37	21	28
Other Non-Institutional Lenders	1	1	0	1	0	2	0	0	0
Total Non-Institutional Lenders	47	58	29	27	53	33	54	38	35

a/ Bank for Agriculture and Agricultural Cooperatives.

significant. The role of relatives and neighbors declines with higher degree of commercialization. Judging by the interest rates charged, many of these loans are commercial transactions priced at market rates. However, some are intra-family transactions which carry low (or zero) interest and where lenders are motivated by other considerations (Ben-Porath, 1980).

Table 5.3 describes the mean rate of interest on loans from institutional and non-institutional 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 at 1 to 3 percentage points below the interest rate ceilings. The somewhat lower institutional rates in the Chaiyaphum sample reflect the fact that the survey was conducted in 1986, one year later than in the other provinces. In that year the interest rate ceiling was reduced by 2 percentage points. Most loans are short-term (12 months or less). Noteworthy, however, is the fact that more medium- and long-term loans are provided by institutional lenders than non-institutional lenders, and that titled farmers get such loans much more often than do untitled farmers. This is compatible with the observation that untitled farmers lack an acceptable land collateral and thus are perceived by institutional lenders as a potentially high risk client, ceteris paribus.

Our earlier discussion pointed out that because non-institutional lenders have superior information on borrowers, they are less inclined to require collateral or collateral substitutes. The discussion further

Table 5.3: Distribution of Loan Characteristics  
By Title Status and Loan Source

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	<u>Untitled</u>	<u>Titled</u>	<u>Untitled</u>	<u>Titled</u>	<u>Untitled</u>	<u>Titled</u>	<u>Untitled</u>	<u>Titled</u>	<u>Titled</u>
Item	(N=162)	(N=120)	(N=76)	(N=69)	(N=42)	(N=45)	With STK (N=24)	Without STK (N=62)	(N=77)
<u>Institutional Lenders:</u>									
Mean Interest Rate	.142	.150	.145	.141	.164	.171	.140	.137	.138
Percent of Short-Term Loans	99	88	100	94	100	60	91	95	78
<u>Non-Institutional Lenders:</u>									
Mean Interest Rate	.515	.462	.492	.497	.561	.385	.425	.568	.540
Percent of Short-Term Loans	100	100	95	100	95	100	100	100	96

suggested that because land is the most suitable collateral, it is more likely to be used as collateral if the farmer has legally registered it. These propositions are borne out in Table 5.4. Compatible with findings from other less developed countries cited by Bottomley (1983), our data revealed that an overwhelming majority of non-institutional 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 cases in which collateral was provided on non-institutional loans, land was the predominant form.

The type of collateral for institutional loans differs significantly between titled and untitled farmers. Since untitled farmers cannot offer land as a collateral, they are obliged to provide a collateral substitute, namely, group guarantee to obtain institutional loans. Titled farmers, on the other hand, can -- and did -- provide 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 confirm also 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 in more than half of the BAAC loans. Commercial, non-government banks in the sample are more inclined to require land collaterals: 85 percent of 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 (both commercial and BAAC) interviewed during this study said they found that land collaterals improve loan repayment performance, and that they are thus

Table 5.4: Distribution of Loans by Source And Type of Collateral

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
	Untitled	Titled	Untitled	Titled	Untitled	Titled	With STK	Without STK	Titled
	-----		-----		-----		-----		
					%				
<b><u>Institutional Lenders</u></b>									
(Sample Size)	(86)	(50)	(54)	(50)	(20)	(30)	(11)	(38)	(50)
No Collateral	14	4	48	14	25	10	0	0	0
Land	8 <sub>a/</sub>	78	6 <sub>a/</sub>	54	10 <sub>a/</sub>	47	18 <sub>a/</sub>	11 <sub>a/</sub>	56
Third Party Guarantee	1	0	2	0	0	0	0	13	0
Group Guarantee	77	18	44	32	65	43	82	76	44
<b><u>Non-Institutional Lenders</u></b>									
(Sample Size)	(74)	(68)	(22)	(19)	(22)	(15)	(13)	(23)	(27)
No Collateral	93	79	86	84	64	87	100	91	77
Land	7 <sub>a/</sub>	21	9 <sub>a/</sub>	11	4 <sub>a/</sub>	7	0	4 <sub>a/</sub>	15
Other	0	0	5	5	32	6	0	4	8

a/ Some untitled farmers' home (and the lot on which it is built) are located outside of the boundaries of state land, and may therefore be offered as a collateral. The number of such farmers is small.

inclined to provide more credit to a borrower who provides land as collateral.

As argued earlier, group guarantee is less desirable than a land collateral. Therefore, a group guarantee is 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 5.5. In all provinces, institutional loans covered by land collaterals are larger than loans without collateral or loans with group guarantee. The difference is largest in Khon-Kaen province, where institutional loans secured by land collaterals are three times larger than the mean size of loans not covered by land collaterals. The comparable figure is somewhat lower (200 percent in Nakhon-Ratchasima), and it is only 23 percent in Lop Buri and Chaiyaphum provinces. It is noteworthy that loans with group guarantee are smaller than loans with no guarantee in two of the provinces. 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 LDCs where group lending has been practiced (Desai, 1983). <sup>1/</sup>

In turning to loan amounts provided by non-institutional lenders, the importance of collateral varies among the provinces. In Lop Buri, land collateral is apparently not significant to non-institutional lenders: the mean loan (per unit of land) without collateral is higher than the mean loan with collateral. However, in the three northeastern provinces, land

---

<sup>1/</sup> Several managers of commercial banks interviewed indicated that they experimented with group guarantees in the late 70's and early 80's, but abandoned this lending practice due to poor repayment performance.



Table 5.5: Average Loan Amount per Rai Owned,  
Classified by Type of Security and Lender Type a/

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum	
	Institutional <u>Lenders</u>	Non- Institutional <u>Lenders</u>	Institutional <u>Lenders</u>	Non- Institutional <u>Lenders</u>	Institutional <u>Lenders</u>	Non- Institutional <u>Lenders</u>	Institutional <u>Lenders</u>	Non- Institutional <u>Lenders</u>
None	324 (14) <u>b/</u>	563 (137)	262 (40)	105 (41)	114 (10)	153 (49)	n.a.	72 (55)
Group Guarantee	297 (77)	n.a.	178 (65)	n.a.	290 (45)	n.a.	259 (60)	n.a.
Land Collateral	372 (52)	402 (21)	427 (44)	373 (4)	776 (19)	524 (4)	319 (34)	104 (5)

a/ Figures are expressed as Baht per rai, where 26 Baht = 1 US dollar, and 6.25 rai = 1 hectare.

b/ Figures in parentheses indicate sample size (number of loans).

collateral seems to offer advantages even in the non-institutional credit sector. However, since most non-institutional loans in the northeastern provinces are obtained without collateral, sample sizes are small for non-institutional loans with collateral, thus conclusions based on these figures should be properly qualified.

Although the data presented in Table 5.5 do not distinguish between loans granted to titled and 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. For example, compared to an average of 252 baht per rai that the pooled sample of untitled borrowers received for loans with a group guarantee, 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 double that amount (515 baht per rai). These results suggest that even when land is not formally offered collateral, titled land is a more valuable implicit collateral, allowing titled farmers to obtain more institutional credit than untitled farmers.

We note an important observation in Table 5.5 relating to the amount of non-institutional credit available in Lop Buri. In this province non-institutional loan amount per unit of land is substantially higher than mean institutional loan amount for other comparable collateral categories. Similarly, unsecured non-institutional loans in Lop Buri are substantially higher than comparable loans in other provinces. The abundance of non-institutional credit supply in Lop Buri and the fact that

it can be obtained without a land collateral suggest that legal land titles have less influence on economic activity in this province than in the other study provinces.

The substantial volume of non-institutional credit in Lop Buri relates to the high level of activity of traders there. The traders' activities are apparently induced by the prevalence of high value cash crops with relatively stable prices and less risky agro-climatic conditions. Moreover, these traders find credit transactions conducive to their business, and indeed provide about half of all loans. In contrast to Lop Buri, traders are less prevalent, and hence they contribute a significantly lower proportion of the credit transactions in the northeastern provinces.

#### Disequilibrium Econometric Model of Institutional Credit

The data provided above are generally compatible with propositions formulated in the preceding sections. However, comparisons among group means and between relative frequencies do not allow conclusive answers. Implicit in the data are other factors besides ownership security that may influence the demand and supply of loans and these may affect means in a systematic manner. The standard approach for analyzing market-observed quantities and prices is to assume equilibrium and estimate supply and demand equations, where price (or quantity) is the dependent variable. However, as argued above, credit rationing does exist, thus the market may not be in equilibrium. This is particularly likely for institutional credit, where a state-enforced fixed rate of interest prevails. Therefore, the observed loan amounts for a sampled farmer could be either supply-determined (i.e. the farmer would have liked to borrow

more than the lender approved) or demand-determined (i.e. the farmer could have borrowed more credit than he did). The econometric approach suitable for dealing with data generated by a market disequilibrium is popularly known as "switching regressions". This approach uses a maximum likelihood procedure to obtain simultaneous estimates of supply and demand equations' coefficients which are efficient, consistent, and asymptotically normal. The estimated system is defined formally as:

$$(5.1) \quad L_1 = \alpha'X + \varepsilon_1 \quad (\text{supply of institutional credit}).$$

$$(5.2) \quad L_2 = \beta'Z + \varepsilon_2 \quad (\text{demand for credit})$$

$$(5.3) \quad L = \min. (L_1, L_2) \quad (\text{observed borrowing from institutional lenders})$$

where  $L_1$  is the amount of institutional credit lenders are willing to provide,  $X$  is a vector of farmer characteristics which influence lender perceptions,  $\alpha$  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 determining the farmer's credit requirements,  $\beta$  is a corresponding set of parameters, and  $\varepsilon_1$  and  $\varepsilon_2$  are random error terms which are assumed to be normally distributed with mean zero.<sup>1/</sup> Since transaction costs incurred by Thai farmers requesting institutional credit are low, a farmer is expected to attempt to satisfy his total overall credit needs from cheaper institutional

---

<sup>1/</sup> To the extent that there are unobserved variables which affect both supply and demand, the error terms could have a non-zero correlation. Attempts to estimate the model while allowing for correlated errors failed due to lack of convergence, except in Lop Buri province where the estimate indicated that the correlation was not significantly different from zero. Based on these results, the model was estimated under the assumption that the error terms are not correlated.

sources first. Then only if he still needs more credit (at a higher interest cost) will he approach non-institutional lenders. This implies that information on a farmer's transactions in the non-institutional credit market does not affect the estimates of the parameter vectors  $\alpha$  and  $\beta$  of equations (5.1), (5.2). It also implies that equation (5.2) represents the farmer's overall demand for credit at the prevailing institutional interest rate.<sup>1/</sup>

Rigorous models of credit supply and demand have already been developed (e.g. Barro, 1976; Bell and Srinivasan, 1985). Therefore, we 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 which tend to be relatively easy for an institutional lender to observe or verify. Demand variables, on the other hand, reflect variables known to the borrower, but not necessarily to the lender. The determinants of institutional credit supply are:

- (i) 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, relative to a case where no collateral is provided. Only titled land can be offered as a collateral.
- (ii) Group Collateral Dummy: The practice of group lending implies, theoretically, that the group is collectively responsible for loan repayment if a member borrower defaults. In areas where the repayment performance of group loans has been good, the amount

---

<sup>1/</sup> See Bell and Srinivasan (1985) for a similar model formulation.

of credit offered is expected to be larger than the amount offered without collateral. However, the amount of credit offered with a group collateral is expected to be less than that which is offered with a land collateral (i.e. the parameter of the land collateral dummy variable will be larger than the parameter of the group collateral dummy variable). In areas where repayment performance on group-guaranteed loans is poor, the amount of credit offered with group-guarantee is not expected to be higher than that which is offered on individual unguaranteed loans. It may even be less, if individual loans have a better repayment record. Thus, the parameter of the group collateral dummy variable could be positive or negative, since it measures credit availability as compared to unsecured individual loans.

In Chaityaphum province, there are no observations of institutional credit without a collateral, but there are few (5) observations with third party guarantee. Hence, the group collateral was made a reference dummy variable by omitting it, and by introducing dummy variables for other guarantees and for land collateral. Accordingly, for Chaityaphum province, the dummy for land collateral in the supply equation directly measures the difference in the supply of credit between farmers providing land as collateral and farmers providing group collateral.

(iii) 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 which generates cash income. Land value summarizes the

land's productive potential, such as soil quality, proximity to market, land improvements, etc. Farmers with higher total land values are expected to be offered more institutional credit.

- (iv) Capital: Farm capital indicates both the farm's productive capacity and its cash value as an asset that can serve as an implicit collateral. Farmers with more capital (measured in current value) are expected to be offered more credit.
- (v) Liabilities to Formal Lenders: Outstanding debt to institutional lenders drains a farmer's cash resources and is therefore expected to negatively affect the amount of credit a farmer is offered. Debt to informal lenders is not included as a factor affecting the supply of institutional credit because it is not easily observable or verifiable to formal lenders.
- (vi) Past Default Dummy: Past default on payments to institutional lenders is expected to negatively affect a farmer's creditworthiness and hence the supply of institutional credit offered to him.
- (vii) 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 to avoid incurring the costs of default. However, most liquid assets (e.g. 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 to institutional lenders. Formal liquidity is expected to increase the supply of credit.
- (viii) Experience: The number of years a farmer has managed the farm is expected to increase the farmer's productivity and thus positively

influence a lender's assessment. However, this variable is highly correlated with age. If younger farmers are perceived as being more innovative, the effect on credit supply will be negative.

- (ix) Title dummy, STK Dummy: We introduce these dummy variables in the equations for Chaiyaphum province to test whether squatters with a usufruct (STK) certificate obtain more institutional credit than squatters without the certificate. The dummy variable is dropped for non-recipients of STK certificates which 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

- (i) Number of Adults: The number of working age adults (ages 14-65) in the household represents a fixed endowment (in the short-run), that reduces the need for cash to hire labor. However, this variable is also an important determinant of consumption requirements, and, could thus affect positively the demand for credit. The final effect on demand is thus undetermined.
- (ii) Education: The number of years of formal schooling is an indicator of human capital, that affects positively efficiency.<sup>1/</sup> Higher human capital increases the marginal productivity of variable

---

<sup>1/</sup> For this reason, education would also be an indicator of credit-worthiness, and would affect the supply of institutional credit. However, sample farmers have had only a few years of elementary schooling, and it is difficult for the lender to verify that the reported number of school years is indeed accurate. It should also be pointed out that there is very little variation in the sample with respect to reported formal schooling.



inputs, and thus increases the demand for inputs and the derived demand for cash.

- (iii) Experience: The number of years that a farmer has been the primary decision maker on the farm is an indicator of human capital, and would thus be expected to have an effect qualitatively similar to that of education. However, because experience is highly correlated with age, and age is possibly negatively related to innovativeness, the ultimate effect on credit demand may be positive or negative.
- (iv) Title dummy: As argued earlier, possession of a legal title increases ownership security, and thereby increases investment incentives. A higher demand for investment translates into a higher demand for credit, thus possession of title is expected to positively affect credit demand.
- (v) Capital: The effect of capital on credit demand is complex, entailing several countervailing effects. When production complementarity exist, a higher stock of capital increases the marginal productivities of variable inputs, and induces a higher derived demand for credit. However, a higher stock of capital reduces the need to hire machine and animal services, and thus reduces cash needs. Hence, the net effect of capital stock on the credit demand is ambiguous.
- (vi) Owned land, adjusted for quality: Land is a major determinant of a farmer's scale of operation and production potential. However, land productivity differs among farmers due to the diversity of land characteristics. Since higher quality land increases the marginal productivity of variable inputs, the amount of land owned must be

adjusted for quality differences. To control for these differences, we use a land quality index derived from a hedonic price analysis of land values (see Chapter VII). The index gives premium to better soils, favorable location, land improvements, etc. It is expected that larger amounts of land owned increase total demand for variable inputs, and hence the demand for credit.

(vii) 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 negatively affect the demand for cash. However, since not all assets are equally liquid, there may be a countervailing effect. For example, some assets such as product stores, can be easily converted into cash but some loss may result 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. However, by retaining a higher reservoir of potential liquidity, 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 positively affect credit demand.

(viii) STK dummy: In the equations estimated for Chalyaphum province, we introduce a dummy variable to test whether the credit demand of STK certificate recipients differs from the demand of other non-recipients.

As specified above, the demand and supply equations may be viewed as structural equations, because several of the variables (e.g. capital, liquidity, land owned) are endogenous in a long-run context. Since these variables are predetermined at the time of supply and demand decisions, estimation of the model does not necessarily entail econometric problems. It is possible, however, that the demand equation is partially determined by unobserved variables (e.g. a farmer's ability) that are correlated with the long-run endogenous variables (e.g. a more able farmer will accumulate more capital). In such a case, estimates of the parameters of the structural equation are biased. The problem can be tackled, 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 farmer characteristics 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 land improvements 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. For instance, though initial capital positively affects both present amount of

capital and amount of land owned, these two variables may have contradictory effects on credit demand. Similarly, education affects both capital and land accumulation. Since our focus is on estimating the effect of land ownership security on credit supply, 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 mis-specification are avoided.

The analysis does not include variables pertaining to cropping decisions (i.e. area cultivated, crop selection) 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. Therefore it is excluded from the list of explanatory variables. Also, because of limitations of the maximum likelihood program utilized in the estimation, households which 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 dealing with positive credit allocations.

The estimation results are reported in Table 5.6. 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 (i.e. all observed borrowers are credit rationed). The second column presents supply and demand coefficients allowing for market-disequilibrium by using the structural specification. The third column presents supply and demand estimates under disequilibrium, where the demand equation is specified in

reduced-form.<sup>1/</sup> Except the OLS estimate for Chaiyaphum province 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 compared to the case 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 province. 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 province, the difference between a land collateral and 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 with land collaterals obtain more institutional credit than farmers providing 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 provinces, but it is not significantly different from zero in Khon-Kaen and Chaiyaphum provinces. Additionally, in Lop Buri, capital has a significant positive effect on credit supply while liabilities have a significant

---

<sup>1/</sup> In Khon-Kaen province the reduced-form disequilibrium estimate could not be obtained due to lack of convergence.

Table 5.6: Estimates of Institutional Credit Supply and Demand

Province	Lop Buri (N=116)			Nakhon Ratchasima (N=113)			Khon-Kaen (N=49) a/		Chaiyaphum (N=92)			
	Variable	Ordinary Least Squares	Disequilibrium Model		Ordinary Least Squares	Disequilibrium Model		Ordinary Least Squares	Disequilibrium Model	Ordinary Least Squares	Disequilibrium Model	
			Structural Model	Reduced Form b/		Structural Model	Reduced Form				Structural Model	Reduced Form
<b>Supply Equation</b>												
Land Collateral	.4985 (2.704)	.3643 (2.091)	.3654 (2.078)	.5342 (2.652)	1.6857 (1.712)	.8407 (7.017)	1.228 (2.524)	1.9194 (2.345)	.0603 (.492)	1.6944 (2.210)	1.6773 (2.481)	
Group Collateral	.0669 (.398)	-.0666 (.421)	-.0854 (0.526)	-.1098 (.606)	-.5620 (1.222)	-.0242 (.259)	.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.	.1896 (.759)	.1751 (.532)	.1562 (.549)	
Land Values	.1971 (3.069)	.1694 (2.547)	.2285 (3.668)	.2258 (2.699)	.3078 (1.468)	.1836 (2.946)	.0384 (.236)	-.3276 (.591)	.0350 (1.351)	.0007 (.035)	.0018 (.080)	
Capital	.0565 (2.610)	.0508 (2.368)	.0561 (2.970)	.0142 (.530)	.0236 (.394)	-.0370 (1.685)	.0233 (.347)	.2004 (.870)	.0231 (1.230)	-.00001 (.0004)	.0047 (.196)	
Debt to Formal Lender	-.0320 (1.829)	-.0404 (2.491)	-.0366 (2.200)	.0250 (.914)	.1259 (.645)	-.0146 (1.034)	.0535 (1.617)	.1086 (1.183)	.0178 (1.489)	.0033 (.409)	.0025 (.297)	
Past Default (dummy)	-.0050 (.041)	-.0205 (.182)	.0923 (.784)	.1626 (.567)	1.0175 (.209)	-.1031 (.614)	.2023 (.582)	.3861 (.319)	-.0834 (.650)	.4556 (1.815)	.4708 (1.691)	
Formal Liquidity	.0085 (.618)	.0004 (.028)	.0059 (.464)	.0294 (1.505)	.0594 (1.219)	.0009 (.084)	.0517 (1.504)	.1262 (1.534)	.0147 (.850)	.0045 (.368)	.0056 (.453)	
Experience	-.2479 (2.121)	-.2193 (1.884)	-.1075 (.939)	.0788 (.503)	.7973 (1.322)	-.1596 (1.405)	-.0846 (.283)	-1.2257 (1.273)	.0334 (.326)	.1535 (1.815)	.1512 (1.734)	
Title (dummy)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.1592 (1.280)	.1516 (1.671)	.1496 (1.616)	
STK (dummy)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.1084 (0.629)	-.0849 (.493)	-.0672 (.361)	
Constant	8.4831 (18.678)	8.8431 (17.524)	8.1113 (17.961)	7.0393 (12.233)	5.0790 (3.392)	9.0583 (20.347)	7.673 (6.836)	11.273 (2.792)	8.3245 (20.968)	8.6585 (20.986)	8.6123 (22.220)	
<b>Demand Equation</b>												
Number of Adults	--	2.2356 (1.402)	2.3322 (2.203)	--	-.2236 (.937)	.1280 (.201)	--	1.3145 (1.571)	--	-0.1429 (.550)	.0981 (.396)	
Education	--	-.4084 (1.211)	-.3096 (1.338)	--	.0137 (.154)	.4001 (2.246)	--	-.2108 (.005)	--	.1753 (1.227)	.1630 (1.006)	
Experience	--	-.9145 (.955)	-2.2675 (3.012)	--	-.2740 (.945)	.7448 (1.690)	--	.2956 (.734)	--	-.1819 (.568)	-.0466 (.161)	
Title (dummy)	--	8.0803 (.407)	.0352 (.080)	--	.2337 (1.251)	-.0869 (.172)	--	.6416 (1.226)	--	-.1492 (.625)	-.1557 (.679)	
STK (dummy)	--	n.a.	n.a.	--	n.a.	n.a.	--	n.a.	--	.2048 (.580)	-.0913 (.259)	
Capital	--	.1063 (.777)	--	--	-.0093 (.272)	--	--	-.5443 (1.592)	--	.0552 (1.215)	--	
Owned Land (adjusted for quality)	--	.3956 (.384)	--	--	.0490 (.366)	--	--	.8268 (2.120)	--	.1840 (.953)	--	
Net Liquidity	--	-.0626 (.260)	--	--	.2319 (4.672)	--	--	-.0251 (.116)	--	.1044 (.623)	--	
Land Owned by Father	--	--	-1.0834 (2.990)	--	--	.3383 (2.047)	--	--	--	--	-.0018 (.029)	
Initial Land	--	--	.0100 (.933)	--	--	.0536 (.453)	--	--	--	--	-.0245 (.277)	
Initial Capital	--	--	-.2556 (3.512)	--	--	-.0224 (.439)	--	--	--	--	(.0256) (1.131)	
Land Quality Index	--	--	-1.8020 (.499)	--	--	-1.0492 (.920)	--	--	--	--	-.7537 (1.042)	
Constant	--	11.1641 (2.292)	23.5756 (4.745)	--	8.1431 (7.815)	5.6466 (3.836)	--	10.063 (.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	

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 due to 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  $\chi^2$  distribution.

negative effect. The coefficients of these variables are not statistically significant in several of the other supply estimates. A few counter-intuitive signs are encountered, but they are not significantly different from zero at a 95 percent (two-tailed) confidence level. The amount of observable liquidity affects institutional credit supply positively in most estimates, but statistical significance (at a 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 institutional credit supply in three of the provinces. The estimates for Chaiyaphum province indicate that possessing titled land has a significant positive effect on institutional credit supply even if it is not formally pledged as collateral. However, the possession of an STK usufruct certificate 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 or 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 (over 50 percent) of being credit rationed.

The numerical results of the supply parameters indicate that compared to untitled farmers, titled farmers who provide a land collateral receive a substantially higher amount of institutional credit. The effect is composed of two components: (a) the direct effect of a land collateral and (b) the indirect effect of higher land value associated with title



possession. The credit advantage is also reflected in the direct effect of title in the equations for Chaiyaphum province. This second component is measured by using estimates from a hedonic price analysis of land values, <sup>1/</sup> which incorporated the effect of titles. Details of the calculation are provided in Table 5.7. The results show that titled farmers providing land collateral are offered significantly more institutional credit than are identical untitled farmers. In the highly commercialized Lop Buri province, titled farmers enjoy a 52 percent advantage 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 province.

The empirical evidence of this chapter indicates that in rural Thailand ownership security provides significant advantages in obtaining institutional credit. However, ownership security, or the possession of a legal land ownership document, is only possible if the occupant is not a squatter on state-owned land. Although squatters face a relatively small eviction risk, lack of ownership security bars them from providing land as collateral for institutional credit. Instead, squatters resort to collateral substitute, such as a group guarantee, or no guarantee at all. Consequently, squatters receive less institutional credit than do titled farmers providing land collaterals. Evidence also revealed 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 a valuable asset.

---

<sup>1/</sup> Reported below in Chapter VII.

Table 5.7: The Impact of Titled Ownership on the Supply of Institutional Credit

Item	Province			
	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
i) Direct effect of land collateral on supply of institutional credit <u>a/</u>	.3654	.8407	1.9194	1.6773
ii) Effect of land title on land value <u>b/</u>	.2264	.8431	.7605	.4342
iii) Effect of land value on supply of institutional credit <u>c/</u>	.2285	.1836	<u>0k/</u>	<u>0k/</u>
iv) Effect of title on supply of institutional credit through land value <u>d/</u>	.0517	.1548	0	0
v) Direct effect of title <u>e/</u>	0	0	0	.1496
vi) Effect of best alternative loan security available to untitled farmers <u>f/</u>	0	0	1.0125	0
vii) Total logarithmic difference in credit supply between titled farmers providing land collateral and untitled farmers <u>g/</u>	.4171	.9955	.9060	1.8269
viii) Percentage difference in availability of institutional credit between titled and untitled farmers <u>h/</u>	52%	171%	148%	521%

a/ From Table 5.6, first line. Reduced-form estimates are used for all provinces except Khon-Kaen where the structural model coefficient is used.

b/ From Table 7.3.

c/ From Table 5.6, third line.

d/ Line (iv) is the product of line (ii) and (iii).

e/ Line (v) is taken from Table 5.6, tenth line.

f/ If no guarantee is as good or better than group guarantee, this line is zero. If group guarantee is better than no guarantee, the coefficient of group guarantee from Table 5.6, second line, is used.

g/ Line (vii) is obtained as the sum of lines (i), (iv) and (v) minus line (vi).

h/ Line (viii) is obtained as  $\exp[\text{line (vii)}] - 1$ .

k/ Since the coefficient of land value in Table 5.6 is not statistically significant it was set to zero.

In the non-institutional credit sector the role of ownership security is much less crucial. These lenders know their clients well and often do not require a loan collateral. However, while untitled and titled farmers have almost equal access to informal credit, the interest rates in this sector are at least three times higher than those in the formal sector. Hence, untitled farmers who are more dependent on the informal credit market face relatively higher production and investment costs. Further, in areas where the informal credit market is not well-developed, the amount of credit from non-institutional sources is limited. These cumulative disadvantages lessen the untitled farmer's incentive and ability to invest; thus lowering his productivity

**Chapter VI.**  
**A Model of Land Acquisition and Ownership Security**

In this chapter we present a formal model relating ownership security, capital formation, production, credit constraints and land values. 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 of Chapter V. In the sample, institutional sources were shown to provide 92 percent of all medium- and long-term loans. A disequilibrium econometric analysis of supply and demand for institutional credit revealed that most borrowers were supply-rationed. The institutional interest rate is fixed by law, and the non-institutional interest rate varies little. The analysis concluded that land collateral and land value are important determinants of a farmer's ability to obtain institutional credit. The assumptions below reflect the results of the credit market analysis.

**A. 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. However, due to transportation

considerations in the farming of fragmented holdings, the farmer can have either titled or untitled land, but not both. <sup>1/</sup>

(2) Credit Market

- (a) Farmers can obtain short-term credit from both institutional and non-institutional sources, yet they can only obtain long-term credit 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 non-institutional 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 land purchases 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 (i.e. the marginal productivity of variable inputs increases with higher levels of capital).

---

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

(4) Farmers

(a) Farmers maximize terminal wealth over a lifetime. Starting with a given endowment, farmers choose whether to purchase titled or untitled land. Farmers then decide on the amount of land to purchase, thus determining the volume of their capital investment given the constraint on long-term credit.

B. Notation

(1) Variables (subscripts  $t$  and  $nt$  stand for titled and non-titled farms).

$A_t, A_{nt}$  -- amount of land  
 $K_t, K_{nt}$  -- capital  
 $X_t, X_{nt}$  -- variable input  
 $Y_t, Y_{nt}$  -- output

Note: Lower case letters denote per-acre values of variables.

$P_t, P_{nt}$  -- 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 non-institutional credit per value of one  
acre of land owned  
 $c$  -- interest rate on non-institutional credit  
 $W_0$  -- initial wealth

C. Development of Model Results

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

We start with the optimization problem of a farmer who decides to purchase untitled land (prices of output and inputs are assumed 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

$$(6.2) \quad P_{nt} \cdot A_{nt} + K_{nt} = W_o$$

$$(6.3) \quad X_{nt} = m \cdot P_{nt} \cdot A_{nt}$$

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

$$(6.4) \quad \begin{aligned} \text{Max}_{A_{nt}} V_{nt} &= A_{nt} \cdot \{y(k_{nt}, x_{nt}) + [1 - (1+c) \cdot m] \cdot P_{nt}\} \\ &= A_{nt} \cdot \left\{y\left(\frac{W_o}{A_{nt}} - P_{nt}, m \cdot P_{nt}\right) + [1 - (1+c) \cdot m]\right\} \cdot P_{nt} \end{aligned}$$

The first order condition for optimum is

$$(6.5) \quad \frac{\partial V_{nt}}{\partial A_{nt}} = y_{nt} - \frac{W_o}{A_{nt}} \cdot \frac{\partial y_{nt}}{\partial k_{nt}} + [1 - (1+c) \cdot m] \cdot P_{nt} = 0$$

From the first order condition, several comparative statics 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/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/land ratio which 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 if a farmer decides to buy titled land. The objective function is

$$(6.6) \quad \begin{aligned} \text{Max}_{A_t} V_t = & Y(A_t, K_t, X_t) + P_t \cdot A_t - (1 + r_1) \cdot s_1 \cdot P_t \cdot A_t - \\ & - (1 + r_2) \cdot s_2 \cdot (P_t \cdot A_t - s_1 \cdot P_t \cdot A_t) - (1 + c) \cdot m \cdot P_t \cdot A_t \end{aligned}$$

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

$$(6.9) \quad \text{Max}_{A_t} V_t = A_t \cdot \left[ y \left\{ \frac{W_0}{A_t} - (1 - s_1) \cdot P_t, s_2 \cdot (1 - s_1) \cdot P_t + m \cdot P_t \right\} + P_t \cdot \left\{ 1 - (1 + r_1) \cdot s_1 - (1 + r_2) \cdot s_2 \cdot (1 - s_1) - (1 + c) \cdot m \right\} \right]$$

Note that if  $s_1 = s_2 = 0$  (i.e. non-availability 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<sup>1/</sup>, it can be shown that 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 above, in the case of  $s_1 = s_2 = 0$ , and with  $P_t = P_{nt}$ , the optimal terminal value on titled and untitled land coincide. But since  $\frac{dV^*}{ds_1} > 0$ , then, with  $s_1 > 0$  and  $s_2 > 0$ , for any given land price (identical for

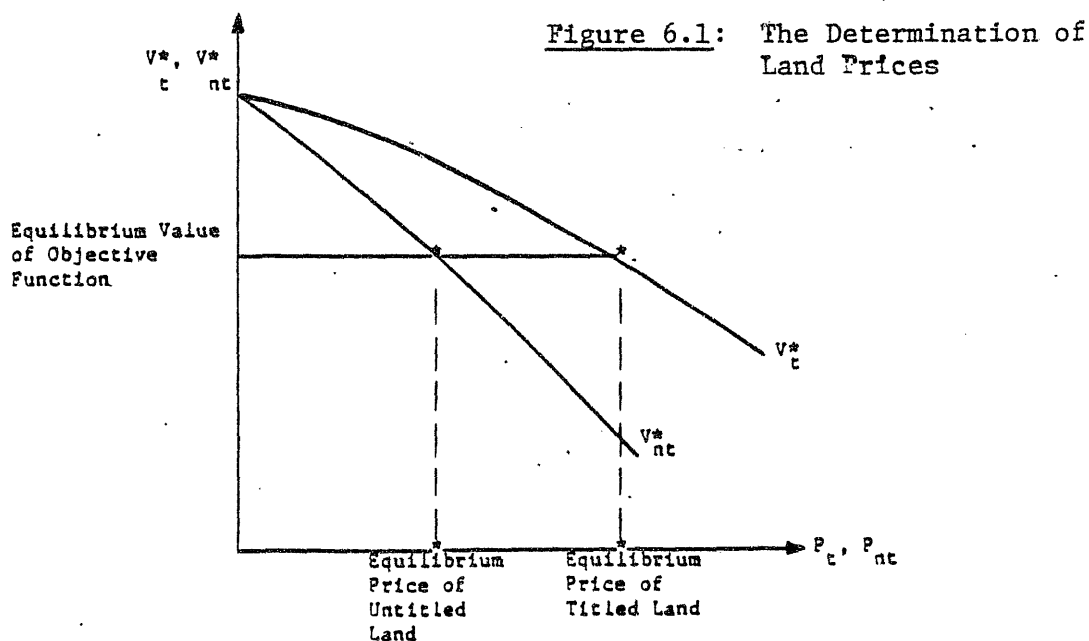
---

<sup>1/</sup> This statement is valid only when there is no risk of eviction or other losses due to lack of title. As will be shown, when such risks exist the optimal solutions on titled and untitled lands differ even if  $s_1 = s_2 = 0$ .

titled and untitled land) it must hold  $V_t^* > V_{nt}^*$  (where the asterisks denote equilibrium levels). However, for equilibrium to prevail, the farmer must be indifferent between establishing his farm on titled or untitled land (i.e. equilibrium requires  $V_t^* = V_{nt}^*$ ). 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 is established. This implies

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

Figure 6.1 illustrates Proposition 9.



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

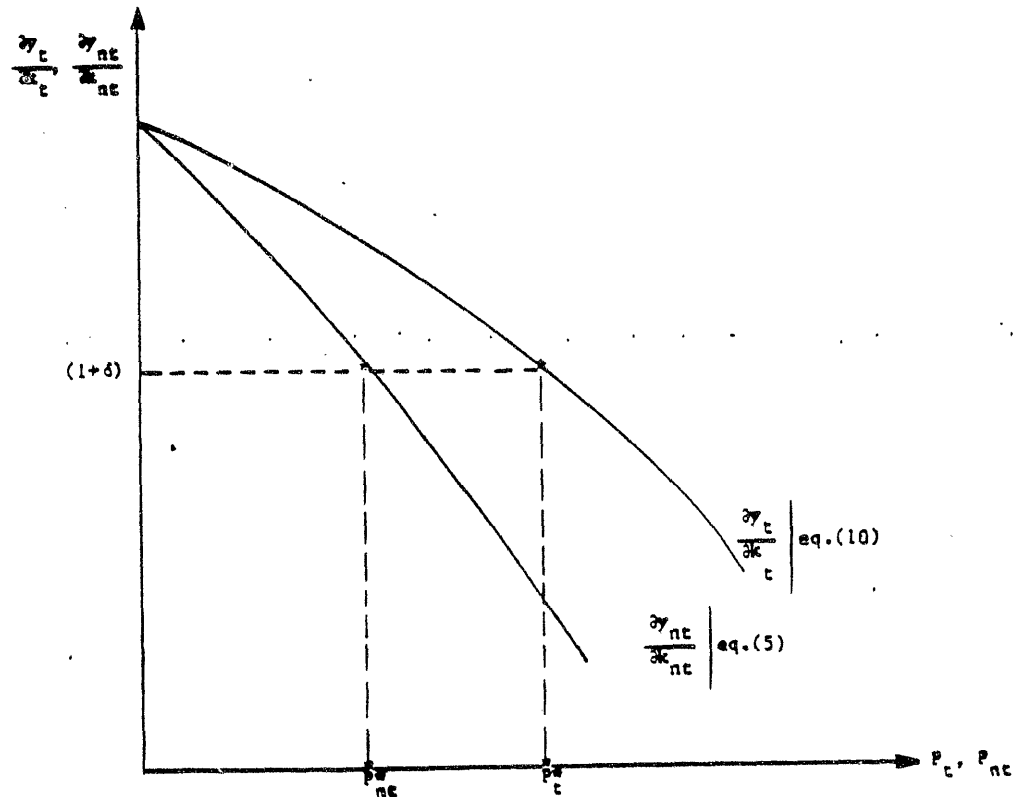
Proposition 10: When land prices are at equilibrium levels, the capital/land ratio on titled farms is higher than that on untitled farms.

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

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

$$(6.11) \quad (1+\delta) \cdot W_0 = W_0 \cdot \frac{\partial y_t^*}{\partial k_t^*} \{k_t^*, (1-s_1) \cdot s_2 \cdot P_t^* + m \cdot P_t^*\} = W_0 \cdot \frac{\partial y_{nt}^*}{\partial k_{nt}^*} (k_{nt}^*, m \cdot P_{nt}^*)$$

Because the optimal capital/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 6.2.



D. Introducing the Risk of Eviction

We now expand the model by assuming that there is a non-zero probability ( $\psi$ ) that farms established on untitled land will lose a proportion  $(1-\gamma)$  of the land due to eviction. 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  $\phi$  is a risk aversion parameter. Under 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 settling on untitled land when there is risk of eviction is

$$(6.13) \quad \begin{aligned} \text{Max } E(U_{nt}) = & (1-\psi) \cdot A_{nt} \cdot [y_{nt} + P_{nt} - (1+c) \cdot m \cdot P_{nt}] + \\ & + \psi \cdot A_{nt} \cdot [\gamma \cdot y_{nt} + \gamma \cdot P_{nt} - (1+c) \cdot m \cdot P_{nt}] \\ & - \phi \cdot \psi^{1/2} \cdot (1-\psi)^{1/2} \cdot (1-\gamma) \cdot (y_{nt} + P_{nt}) \cdot A_{nt} \end{aligned}$$

The first order condition is

$$(6.14) \quad [1-\psi \cdot (1-\gamma) \cdot (1+\lambda)] \cdot [y_{nt} - (\partial y_{nt} / \partial k_{nt}) \cdot (k_{nt} + P_{nt}) + P_{nt}] = (1+c) \cdot m \cdot P_{nt}$$

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 under risk neutrality.

Using equations (6.13), (6.14) and the budget constraint,

$W_0 = K_{nt} + P_{nt} \cdot A_{nt}$ , in analogy to Proposition 6 yields

$$(6.15) \quad E(U_{nt}^*) = W_0 \cdot [1 - \psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \cdot (\partial y_{nt}^* / \partial k_{nt}^*)$$

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 to equation (6.11) is

$$(6.16) \quad \partial y_t^* / \partial k_t^* = [1 - \psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \cdot (\partial y_{nt}^* / \partial k_{nt}^*) = (1 + \delta)$$

The above propositions 1 through 11 hold under the modified formulation. It can be further shown 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/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 on the relationship between titled and untitled land prices, 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  $\mu$  is a composite indicator of land quality.

Utilizing 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  $x_{nt} = m \cdot P_{nt}$  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)

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

Utilizing equations (6.20) and (6.21), output per acre of titled and untitled land can be expressed in terms of parameters and the prices  $P_t$  and  $P_{nt}$ , respectively. Inserting these expressions of output per acre in the first order conditions (6.10) and (6.14), respectively, and employing the equilibrium condition (6.6), yields corresponding representations of the first order conditions

$$(6.22) \quad [(\alpha \cdot R)^{\alpha/(1-\alpha)} - (\alpha \cdot R)^{1/(1-\alpha)}] \cdot (1+\delta)^{-\alpha/(1-\alpha)} \cdot m^{\beta/(1-\alpha)} \cdot e^{\mu/(1-\alpha)} \cdot P_{nt}^{\beta/(1-\alpha)} = [\delta + (1+c) \cdot m] \cdot P_{nt}$$

$$(6.23) \quad [\alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}] \cdot (1+\delta)^{-\alpha/(1-\alpha)} \cdot [m + s_2 \cdot (1-s_1)]^{\beta/(1-\alpha)} \cdot e^{\mu/(1-\alpha)} \cdot P_t^{\beta/(1-\alpha)} = [(1+r_2) \cdot s_2 \cdot (1-s_1) + (1+c) \cdot m + \delta + s_1 \cdot (r_1 - \delta)] \cdot P_t$$

Equations (6.22) and (6.23) provide a solution for the equilibrium prices of untitled and titled land in terms of model parameters.

$$(6.24) \quad P_{nt}^* = \left\{ \frac{(\alpha R)^{\alpha/(1-\alpha)} - (\alpha R)^{1/(1-\alpha)}}{\delta + (1+c) \cdot m} \right\}^{(1-\alpha)/(1-\alpha-\beta)} \cdot (1+\delta)^{-\alpha/(1-\alpha-\beta)} \cdot m^{\beta/(1-\alpha-\beta)} \cdot e^{\mu/(1-\alpha-\beta)}$$

$$(6.25) \quad P_t^* = \left\{ \frac{\alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}}{\delta + (1+c) \cdot m + (1+r_2) \cdot s_2 \cdot (1-s_1) + s_1 \cdot (r_1 - \delta)} \right\}^{(1-\alpha)/(1-\alpha-\beta)} \cdot (1+\delta)^{-\alpha/(1-\alpha-\beta)} \cdot [m + s_2 \cdot (1-s_1)]^{\beta/(1-\alpha-\beta)} \cdot e^{\mu/(1-\alpha-\beta)}$$

Equations (6.24) and (6.25) offer insights into factors affecting land prices.

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

Dividing equation (6.25) by equation (6.24) yields the ratio of the price of titled land to untitled land, expressed here in a logarithmic form:

$$(6.26) \quad \ln \left[ \frac{P_t^*}{P_{nt}^*} \right] = \frac{(1-\alpha)}{(1-\alpha-\beta)} \cdot \ln \left\{ \frac{(\alpha^{-1} - 1)}{[\alpha^{-1} \cdot R^{\alpha/(1-\alpha)} - R^{1/(1-\alpha)}]} \right\} + \frac{\beta}{(1-\alpha-\beta)} \cdot \ln \left[ 1 + \frac{s_2 \cdot (1-s_1)}{m} \right] + \frac{(1-\alpha)}{(1-\alpha-\beta)} \cdot \ln \left\{ \frac{\delta + (1+c) \cdot m}{\delta + (1+c) \cdot m + (1+r_2) \cdot s_2 \cdot (1-s_1) + s_1 \cdot (r_1 - \delta)} \right\}$$

Equation (6.26) demonstrates that the logarithmic difference between the price of titled and 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 eviction risk. If the eviction risk ( $\Psi$ ) is zero, then  $R=1$ , and the first term on the right-hand side of equation (6.26) vanishes. However, if the eviction risk is positive ( $\Psi>0$ ), then  $R<1$  and the first term becomes positive. The larger  $\Psi$ , the larger the component.

The other component, which relates 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 then would 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. However, following Proposition 9, 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 titled farms will have higher capital accumulation, higher productivity and higher land value compared with untitled farms. These propositions will be substantiated empirically in the subsequent chapters.



**Appendix to Chapter VI  
Proofs of Propositions 1-13**

General: The notations and equation numbers referred to are those of the text. Equations developed in this Appendix have a prefix A. 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)] of the text are given by

$$(A6.1) \quad \frac{\partial^2 V_{nt}}{\partial A_{nt}^2} = \frac{W_o^2}{A_{nt}^3} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} < 0$$

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

$$(A6.2) \quad \frac{dA_{nt}}{dP_{nt}} = \frac{\partial^2 V_{nt}}{\partial A_{nt}^2}^{-1} \cdot \left| \frac{\partial y_{nt}}{\partial k_{nt}} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot m \cdot [1 - (1+c) \cdot m] - \frac{W_o}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} + \frac{W_o}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right| =$$

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

where the second step utilizes equation (6.5). Note that  $[(W_o/A_{nt}) \cdot P_{nt}] = k_{nt}$  by eq. (6.2), while  $m \cdot P_{nt} = x_{nt}$  by eq. (6.3). It thus follows that the term in the curly brackets is positive, due to 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 eq. (A6.2) is

positive. The term  $\partial^2 v_{nt} / \partial A_{nt}^2$  is negative [see (A6.1)], and it is therefore confirmed that  $dA_{nt} / dP_{nt} < 0$ .

Proposition 2: The capital/land ratio on untitled land is positively related to the price of land.

Proof: By eq. (6.2)  $k_{nt} = (W_o / A_{nt}) \cdot P_{nt}$ . Differentiating with respect to  $P_{nt}$  yields:

$$(A6.3) \quad \frac{dk_{nt}}{dP_{nt}} = - \frac{W_o}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} - 1$$

Utilizing (A6.1) and (A6.2) in (A6.3) obtains

$$(A6.4) \quad \frac{dk_{nt}}{dP_{nt}} = \frac{1}{P_{nt}} \left( \frac{-A_{nt}}{W_o \cdot (\partial^2 y_{nt} / \partial k_{nt}^2)} \right) \left[ y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right] + \frac{W_o \cdot P_{nt}}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}}$$

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

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

Proof: By eq. (6.2),  $K_{nt} = W_o \cdot P_{nt} \cdot A_{nt}$ . Differentiation yields:

$$(A6.5) \quad \frac{dK_{nt}}{dP_{nt}} = - A_{nt} \cdot \left[ \frac{P_{nt}}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} + 1 \right]$$

From eq. (A6.2) one can obtain, using (A6.1)

$$(A6.6) \quad \frac{P_{nt}}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} = - \frac{A_{nt}^2}{W_o^2} \left[ y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right] + \frac{W_o}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \Bigg/ \left( \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \right) - 1$$

From eq. (A6.6) it follows that the term in the square brackets on the right hand side of eq. (A6.5) is positive. The right hand side of eq. (A6.5) is therefore negative.

Proposition 4: Given the price of land, there is a unique optimal capital/land ratio independent of initial wealth and farm size.

Proof: Equation (6.5) can be written as

$$(A6.7) \quad y_{nt}(k_{nt}, m \cdot P_{nt}) - (k_{nt} + P_{nt}) \cdot \frac{\partial y_{nt}}{\partial k_{nt}} + [1 - (1+c) \cdot m] \cdot P_{nt} = 0$$

Note that if  $P_{nt}$  is fixed, the only variable in the equation which describes the optimality condition is  $k_{nt}$ . It can be trivially shown that with  $P_{nt}$  constant, the LHS of eq. (A6.7) is monotonically increasing in  $k_{nt}$ , thus there is a unique value  $k_{nt}$  which maintains eq. (A6.7). Since eq. (A6.7) 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 [eq. (6.2)] can be written

$$(A6.8) \quad A_{nt} = W_0 / (P_{nt} + k_{nt}^*)$$

where  $k_{nt}^*$  is the optimal value of the capital/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

$$(A6.9) \quad y_{nt} \cdot A_{nt} + [1-(1+c) \cdot m] \cdot P_{nt} \cdot A_{nt} = W_o \cdot \frac{\partial y_{nt}}{\partial k_{nt}}$$

The left hand side of eq. (A6.9) is equal to  $V_{nt}$ ; the value of the objective function. Since equation (6.5) holds only in the optimum, it follows

$$(A6.10) \quad V_{nt}^* = W_o \cdot \frac{\partial y_{nt}^*}{\partial k_{nt}^*}$$

where asterisks denote optimality.

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

Proof: Differentiation of eq. (A6.10) yields

$$(A6.12) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_o \cdot \left[ - \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \cdot \left( \frac{W_o}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} + 1 \right) + \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right]$$

Using equation (A6.2) in eq. (A6.11); obtains

$$(A6.12) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_o \cdot \left| - \frac{1}{P_{nt}} \cdot \frac{A_{nt}^2}{W_o} \cdot \left\{ y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \left( \frac{W_o}{A_{nt}} - P_{nt} \right) - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot P_{nt} \cdot m \right\} + \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt} \cdot m}{\partial k_{nt} \partial x_{nt}} \right| < 0$$

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 [eq. (6.10)] is essentially the same as the optimization condition for untitled land [eq. (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 higher on titled land compared to untitled land.

Proof: To prove this proposition, it is sufficient to show  $dV_t/ds_1 > 0$ , 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 start by differentiating eq. (6.10) with respect to  $s_1$  and  $s_2$  to measure the effect of changes in these parameters on the demand for land.

$$(A6.13) \quad \frac{dA}{ds_2} = - \left[ \frac{W_o^2}{A_t^3} \cdot \frac{\partial^2 y_t}{\partial k_t^2} \right]^{-1} \left\{ \left[ \frac{\partial y_t}{\partial x_t} - (1+r_2) \right] - \frac{W_o}{A_t} \cdot \frac{\partial^2 y_t}{\partial k_t \partial x_t} \right\} \cdot (1-s_1) \cdot P_t$$

$$(A6.14) \quad \frac{dA}{ds_1} = - \left[ \frac{W_o^2}{A_t^3} \cdot \frac{\partial^2 y_t}{\partial k_t^2} \right]^{-1} \left\{ \left[ \frac{\partial y_t}{\partial k_t} - (1+r_1) \right] - \left[ \frac{\partial y_t}{\partial x_t} - (1+r_2) \right] \cdot s_2 - \frac{W_o}{A_t} \cdot \frac{\partial^2 y_t}{\partial k_t^2} + \frac{W_o}{A_t} \cdot \frac{\partial^2 y_t}{\partial k_t^2 \partial x_t} \cdot s_2 \right\} \cdot P_t$$

Next, we differentiate the objective function at its optimum value. By Proposition 7, this value is equal to  $W_o \cdot \frac{\partial y_t}{\partial k_t}$ .

$$(A6.15) \quad \frac{\partial V_t}{\partial s_2} = - \frac{\partial^2 y_t}{\partial k_t^2} \cdot \frac{W_o^2}{A_t^2} \cdot \frac{dA_t}{ds_2} + \frac{\partial^2 y_t}{\partial k_t \partial x_t} \cdot (1-s_1) \cdot P_t \cdot W_o$$

$$(A6.16) \quad \frac{\partial V_t}{\partial s_1} = - \frac{\partial^2 y_t}{\partial k_t^2} \cdot \left( \frac{W_o^2}{A_t^2} \cdot \frac{dA_t}{ds_1} + P_t \cdot W_o \right) - \frac{\partial^2 y_t}{\partial k_t \partial x_t} \cdot s_2 \cdot P_t \cdot W_o$$

Inserting eq. (A6.13) in eq. (A6.15) yields

$$(A6.17) \quad \frac{\partial V_t}{\partial s_2} = A_t \cdot \left[ \frac{\partial y_t}{\partial x_t} - (1+r_2) \right] \cdot (1-s_1) \cdot P_t$$

Clearly, the marginal productivity of the variable input is higher than the rate of interest on short term credit when the short-term credit constraint is binding, i.e.,  $\frac{\partial y_t}{\partial x_t} > (1+r_2)$ . It thus follows  $\frac{\partial V_t}{\partial s_2} > 0$ .

Inserting eq. (A14.6) in eq. (A16.6) yields

$$(A6.18) \quad \frac{\partial V_t}{\partial s_1} = A_t \cdot P_t \left\{ \left[ \frac{\partial y_t}{\partial k_t} - (1+r_1) \right] - \left[ \frac{\partial y_t}{\partial x_t} - (1+r_2) \right] \cdot s_2 \right\}$$

In the present model, which assumes a binding constraint on long-term credit, the marginal productivity of capital is higher than the rate of interest on long-term credit, i.e.,  $\frac{\partial y_t}{\partial k_t} > (1+r_1)$ . 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 due to the marginal reduction in the supply of short-term credit. The latter component is equal to  $\left[ \left( \frac{\partial y_t}{\partial x_t} \right) - (1+r_2) \right] \cdot s_2$ . Since the long-term credit constraint is assumed to be binding in the present model, it must hold that the term in the curly brackets in eq. (A6.18) is positive.

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

Proof: The proof for this proposition was already sketched out in the text. 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 and/or the value of the objective function on untitled land should be increased.

Following Proposition 7, this is accomplished by  $P_t$  rising and  $P_{nt}$  declining, i.e.  $P_t > P_{nt}$  at equilibrium.

Proposition 10: When land prices are at equilibrium levels, the capital/land ratio on titled farms is higher than that on untitled farms.

Proof: Equilibrium requires  $V_t^* = V_{nt}^*$ . By Proposition 6, this implies

$$(A6.19) \quad \frac{\partial y_t}{\partial k_t} [k_t, (1-s_1) \cdot s_2 \cdot P_t + m \cdot P_t] = \frac{\partial y_{nt}}{\partial k_{nt}} (k_{nt}, m \cdot P_{nt})$$

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 (i.e.  $x_t > x_{nt}$ ). 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 (A6.19) is violated. To restore equality, the marginal productivity of capital on titled land has to be increased, or the marginal productivity of capital on untitled land has to be reduced. Given the concavity of the production function, this is accomplished by increasing  $k_t$  and reducing  $k_{nt}$ , i.e.,  $k_t^* > k_{nt}^*$  at equilibrium.

Proposition 11: When land prices are at equilibrium levels, output per acre on titled farms is higher 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 per-acre capital and per-acre variable inputs are higher on titled farms, it follows trivially that output per acre on titled land is higher, i.e.  $y_t^* > y_{nt}^*$ .

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

Proof: Using the definition of  $\lambda$  and the characterization of equilibrium, equation (6.15) of the text can be written as

$$(A6.20) \quad (1+\delta) = \{1-(1-\gamma) \cdot [\psi + \phi \cdot \psi^{1/2} \cdot (1-\psi)^{1/2}]\} \cdot (\partial y_{nt}^* / \partial k_{nt}^*)$$

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

$$(A6.21) \quad \frac{\partial G}{\partial \psi} = 1 + \phi \cdot [\psi \cdot (1-\psi)]^{-1/2} \cdot (1-2\psi)/2$$

To show that  $\frac{\partial G}{\partial \psi} > 0$  in the interval of interest  $(0, .5)$ , simply note that all terms on the right-hand side of (A6.21) are positive provided  $\psi \leq 0.5$ . Differentiation of eq. (A6.20) yields

$$(A6.22)$$

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

Inserting equation (A6.4) in eq. (A6.22) yields

$$(A6.23) \quad (1-\gamma) \cdot \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \frac{\partial G}{\partial \psi} = [1-(1-\gamma) \cdot G(\psi)] \cdot \left| \frac{A_{nt}}{W_{o,nt} P_{nt}} \left( y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot k_{nt} - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot x_{nt} \right) \right| \cdot \frac{dP_{nt}}{d\psi}$$

The left hand side of eq. (A6.23) is positive as shown above. The term in the square brackets on the right hand side is positive by the concavity of per-acre production function. It thus follows  $dP_{nt}/d\psi > 0$ .



Proposition 13: Even in the case  $s_1 = s_2 = 0$ , the equilibrium price of untitled land, the optimal capital/land ratio, and the output per acre are all lower 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 problem on titled and untitled land is identical. Consider now the case  $\Psi > 0$ , and the equilibrium condition

$$(A6.24) \quad (1+\delta) = \partial y_t^* / \partial k_t^* = [1 - (1-\gamma) \cdot G(\Psi)] \cdot \partial y_{nt}^* / \partial k_{nt}^*$$

Proposition 12 already established that the price of untitled land will decline if  $\Psi$  increases. By Proposition 2, this will cause  $k_{nt}^*$  to decline. Thus, both  $P_t^* > P_{nt}^*$  and  $k_t^* > k_{nt}^*$ , implying  $y_t^* > y_{nt}^*$  even when  $s_1 = s_2 = 0$ .

## Chapter VII. Analysis of Land Values

The model of the preceding chapter generated the proposition that titled land has a higher price than untitled land of identical quality. Obviously, however, land of lower productive quality or land in less favorable locations sells for a lower price, given its title status. 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.<sup>1/</sup>

Table 7.1 records the mean prices reported by farmers. The data are broken down by registration status and by a broad classification of quality, namely, lowland/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. Therefore, lowlands are expected to be more valuable than uplands.<sup>2/</sup> The data confirm that the mean price of titled land is substantially higher than the price of untitled land. The only exception was a small sample of lowland tracts in Lop Buri province: 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.

---

<sup>1/</sup> 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 legal and illegal settlements.

<sup>2/</sup> Taxes on agricultural land are extremely low in Thailand, amounting to less than a quarter of one percent of land value. They, therefore, have a negligible effect on land value.

Table 7.1: Mean Price of Titled and Untitled Land

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum	
	Lowland	Upland	Lowland	Upland	Lowland	Upland	Lowland	Upland
Plot Document Status								
Price Without NS-3, NS-3K (Baht/Rai) <u>a/</u>	3638	2632	4210	3251	4421	2787	2297	1832
Sample Size	(42)	(173)	(58)	(225)	(48)	(140)	(131)	(203)
Price With NS-3, NS-3K (Baht/Rai)	3599	3425	11085	7086	6156	5557	3675	2547
Sample Size	(37)	(179)	(128)	(125)	(138)	(121)	(62)	(68)

a/ In 1985 the rate of exchange was 26 Baht per US\$. 6.25 rai = 1 hectare.

To further check the plausibility of prices reported by the farmers, village headmen were asked to estimate the average land prices for three categories of land (irrigated lowland, unirrigated lowland, and upland) by title status. The means of these prices are reported in Table 7.2. 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 affecting the price must be identical. This, however, is a rather restrictive assumption. To circumvent this restriction, we utilize 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 adequately 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

$$(7.1) \quad \ln P_{nt}^* = \eta_{nt} + [\beta/(1-\alpha-\beta)] \cdot \ln m - [\alpha/(1-\alpha-\beta)] \cdot \ln(1+\delta) + [\mu/(1-\alpha-\beta)]$$

$$(7.2) \quad \ln P_t^* = \eta_t + [\beta/(1-\alpha-\beta)] \cdot \ln [m + s_2 \cdot (1-s_1)] - [\alpha/(1-\alpha-\beta)] \cdot \ln(1+\delta) + [\mu/(1-\alpha-\beta)]$$

Table 7.2: Mean Land Prices as Reported by Village Headmen (Baht/Rai)

Type of Land	Province (document status)	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum	
		with document	without document	with document	without document	with document	without document	with document	without document
Irrigated Lowland		5100	3300	12325	6700	n.a.	n.a.	n.a.	n.a.
Unirrigated Lowland		3970	2265	8675	4200	6816	4789	3750	2050
Upland		2950	1740	4300	1775	4316	2200	2412	1431
Mean Ratio of price without document to price with document									
Irrigated Lowland			.670		.590		n.a.		n.a.
Unirrigated Lowland			.609		.511		.663		.547
Upland			.607		.500		.628		.593
Sample Size			20		20		20		8

where  $\eta_{nt}$  and  $\eta_t$  are constants given by the terms in curly brackets on the right-hand side of equations (6.24) and (6.25). Clearly, for lands of equal quality (same value of  $\mu$ ) but of differing ownership security status, only the constant term differs, but not the parameters related to land quality. If the quality index  $\mu$  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 physical quality attributes. By using a dummy variable to represent the title status of each tract, the ceteris paribus effect of ownership security on land value 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 using this model. In the sample there are some holdings located outside the boundaries of the forest reserves which are not yet titled. Because these tracts can be titled, the owners are not faced with the risk of eviction. Thus, perceptions of ownership security for these plots are similar to those of titled plots. However, from the institutional lenders' perspective, these untitled farmers, albeit located outside forest reserves, still lack formal ownership documents, therefore, they are treated the same as untitled farmers with holdings inside forest reserve areas.

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). By comparing equations (6.24) and (6.25), it is apparent that the price for these lands will be lower than titled land, but higher than untitled land located within forest

reserve and subject to eviction risk.

To test this hypothesis, another dummy variable is introduced in the regression in addition to the dummy variable representing title. This new dummy variable takes the value one if the tract is untitled but is located outside the forest reserve. The model of Chapter VI 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 relative to the absence of eviction risk, yet no difference in credit availability.

The set of land characteristics which may affect productivity or farm gate prices are categorized below.

1. Natural Land Attributes

- (a) Soil type (black, not black)
- (b) Slope (flat, not flat)
- (c) Lowland/upland
- (d) Irrigation (year-round irrigation, seasonal irrigation, rainfed)
- (e) Suitable for sugarcane (only in Khon-Kaen province)

2. Land Improvements

- (a) Bunds
- (b) Land levelled by farm machinery
- (c) Fruit trees
- (d) Cleared of stumps

3. Location and Transportation

- (a) All-weather road to the nearest market
- (b) Time required to reach the nearest market
- (c) All-weather road to the village

(d) Time required to reach the village

Most of these variables affect the productive potential of the land or the cost of cultivation. For example, fruit trees provide an additional source of income. Similarly, favorable location increases the farm gate price of output or reduces the effective cost of inputs. Suitability for sugarcane cultivation possibly affects the land price 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 7.3. 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. However, a substantial difference exists between Lop Buri province and the northeastern provinces. The value of the parameter in the Lop Buri province is less than one-third of its value in Nakhon Ratchasima and Khon-Kaen, and about half of its value in Chaiyaphum province. An earlier discussion on credit markets gave a possible reason for this difference: since Lop Buri province is characterized by relative abundance of informal credit, formal ownership (title) is less relevant.

The parameter of the dummy variable for untitled plots outside of forest reserve 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



Table 7.3: Parameter Estimates from Hedonic Price Analysis

Variable	Lop Buri	Nakhon-Ratchasima	Khon-Kaen	Chaiyaphum
<u>1) Ownership security variables</u>				
Title (D) <u>a/</u>	.2264 (5.48)b/	.8431 (14.29)	.7605 (11.10)	.4310 (8.52)
Untitled, outside of Forest Reserve (D)	.0516 (.67)	.1597 (1.63)	.2018 (1.77)	.2957 (1.49)
<u>ii) Natural Attributes</u>				
Black soil (D)	.0351 (.55)	.1855 (2.84)	.0424 (.51)	.2050 (3.51)
Flat slope (D)	.0516 (.90)	.0102 (.18)	.1210 (1.66)	.0939 (1.90)
Lowland (D)	.1722 (2.51)	-.0304 (.47)	.1257 (1.70)	.1035 (2.00)
Year-round irrigation (D)	.1398 (2.29)	.2884 (2.60)	.112 (.62)	.3709 (1.10)
Seasonal irrigation (D)	.0865 (1.79)	.2723 (4.30)	-.0454 (.25)	.2199 (1.37)
Suitability for sugarcane (D)	c/	c/	.0450 (.51)	c/
<u>iii) Land Improvements</u>				
Bunds (D)	-.0579 (1.21)	.4148 (6.80)	.2474 (3.48)	.1398 (2.69)
Land levelled (D)	.1030 (1.75)	-.0122 (.20)	-.076 (.93)	.0068 (.10)
Fruit trees (D)	.0649 (1.47)	-.0082 (.15)	.0751 (1.17)	-.0389 (.43)
Cleared of stumps (D)	d/	.1226 (1.69)	.0163 (.22)	.1934 (1.43)
<u>iv) Location and Transportation</u>				
All-weather road to market (D)	d/	.1027 (1.32)	.2122 (2.25)	.0141 (.21)
Travel time to market	-.1053 (3.62)	.0395 (1.19)	.0012 (.027)	-.0858 (2.04)
All-weather road to village (D)	.0937 (2.39)	.0924 (1.88)	-.1005 (1.46)	-.0176 (.39)
Travel time to village	-.0277 (1.57)	-.0440 (1.67)	-.0355 (1.14)	.0058 (.22)
Constant	8.0988 (10.24)	7.4396 (2.78)	7.5737 (2.77)	7.3362 (33.88)
<hr/>				
R <sup>2</sup>	.183	.578	.389	.243
F-value	7.165	47.410	17.090	9.534
Number of Observations	431	536	447	461

a/ (D) = Dummy variable.

b/ Numbers in parentheses are student "t" values.

c/ Sugarcane is not grown in the province.

d/ Practically all observations have the same value for this variable.

outside of forest reserve is more valuable than untitled land in forest reserve. This is apparently because ownership is not challenged by the state and the possibility of titling does exist.

In Lop Buri province, there is no statistically significant difference between the value of untitled land in and outside the forest reserve. However, the parameter for untitled land outside the reserve is about one-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 province, we cannot make firm statements based on the estimated coefficient there since we only have five observations of untitled plots outside the forest reserve for this province. Based on the data results, these interpretations suggest that only a small component (one-fifth) of the total value of title stems from increased security from eviction: most of the value of title is derived from improved access to credit.

The results for the other explanatory variables are mostly reasonable. Out of 51 parameters estimated for all four provinces combined, 40 have the expected sign. Of those that have a counter-intuitive sign, none are (statistically) significantly different from zero. Among the parameters with the expected sign, 22 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 Jimenez (1984) used to estimate the value of ownership security of city dwellings in legal and illegal settlements. First, the parameters of land characteristics are estimated within the subsample of titled holdings only (or, alternatively, within the sub-sample of untitled holdings only).

These parameters are then used to impute the value of untitled plots.<sup>1/</sup> 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 (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 utilizing 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 (Table 7.3), the results of this procedure demonstrate remarkable robustness (Table 7.4). Not only are the rankings of estimated parameters across provinces similar, but also in three provinces the mean differences between the imputed land values and the actual values are within an interval of plus/minus one standard deviation from the estimates of Table 7.3. 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 result 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 percentage of the value of titled land, is 29% in Lop Buri, 43% in Nakhon Ratchasima, 47% in Khon-Kaen and 64% in Chaiyaphum. Thus, legal ownership security is an important factor in the rural economy of Thailand.

---

<sup>1/</sup> More precisely, the logarithm of price is imputed.

Table 7.4: Alternative Estimates of the Value of Ownership Security (Title) a/

Province				
Metho	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
Direct Estimate (from Table 7.3)	.226	.843	.760	.431
Estimate based on imputation from titled to untitled sub-sample	.252	.779	.725	.434
Estimate based on imputation from untitled to titled sub-sample	.195	.925	.723	.419

a/ The estimates are expressed in terms of the difference in the logarithm of prices of titled and untitled land.

Moreover, since differential land values reflect in part, differences in productivity, we expect -- at least for the northeastern provinces -- that other indicators of economic performance will demonstrate significant differences as well. We address the issues of economic performance, such as investment and output, in the next few chapters.

**Chapter VIII.**  
**The Impact of Ownership Security on**  
**Capital Formation and Land Improvements**

The discussion in Chapter II, and the formal model presented in Chapter VI, postulate that titled farmers accumulate more capital and invest more in land-improvements than do untitled farmers. This is because titled farmers have comparatively better investment incentives due to ownership security perceptions and better access to cheaper and longer term credit. The data presented thus far indicate that, although Thai squatters may face relatively little ownership insecurity, they are significantly more constrained in their ability to obtain institutional credit, especially medium- and long-term credit.

In this chapter we provide empirical evidence to substantiate the theoretical propositions. However, since the formal model of Chapter VI contained only one aggregate capital input, we expand the model to include investments in equipment and land improvements. The model then serves 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 non-zero probability of eviction,  $\phi$ . A two period model is assumed in which farmers invest in the first period and produce in the second. 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 risk averse, with decreasing absolute risk aversion (Arrow, 1971). They can invest in three types of activities (assets): (a) Capital (K) - equipment, draft animals, machinery. These are not totally lost in the event of eviction, but some loss in value may arise from distress sales; (b) Land improvements and structures (M) - fencing, ground levelling, clearing of trees and stumps, etc. Although these increase the productive capacity of land, they are lost in the case of eviction; and (c) Non-agricultural activities and assets (Z) - these are not affected by eviction and serve as a risk-free asset. Since the following empirical analysis is based on cross-sectional data which contain no price variation 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 lower-case 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 VII), 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, such that the amount of credit ( $L$ ) is negatively related to the eviction risk ( $\phi$ ) and is positively related to the amount of land owned if the lack of formal ownership prevents the use of land as collateral. The negative impact of eviction risk on credit supply holds even when the risk is low.

$$(8.4) \quad L = L(\phi, A); \quad \partial L / \partial \phi < 0; \quad \partial L / \partial A > 0$$

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 occur, 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 to zero. If eviction occurs, 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 [eq. (8.5)] to substitute initial wealth, capital and land improvements for  $Z$ , the objective function is

$$(8.8) \quad \text{Max}_{k, m} E(V) = (1-\phi) \cdot \{A \cdot y(k, m, S) + P(m) \cdot A + F[L(\phi, A) + W_0 - k \cdot A - m \cdot A] - (1+r) \cdot L(\phi, A)\} + \phi \cdot \{F[L(\phi, A) + W_0 - k \cdot A - m \cdot A] - (1+r) \cdot L(\phi, A)\}$$



First order conditions for a maximum require

$$(8.9) \quad \partial E(V) / \partial k = [(1-\phi) \cdot (y_k - F') - \phi \cdot F'] \cdot A = 0$$

$$(8.10) \quad \partial E(V) / \partial m = [(1-\phi) \cdot (y_m + P' - F') - \phi \cdot F'] \cdot A = 0$$

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

$$(8.13) \quad H = \begin{vmatrix} H_{11} & H_{12} \\ H_{21} & H_{22} \end{vmatrix}$$

where

$$(8.14) \quad H_{11} = A \cdot (1-\phi) \cdot y_{kk} + A \cdot F'' < 0; \quad H_{22} = A \cdot (1-\phi) \cdot (y_{mm} + P'') + A \cdot F'' < 0$$

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

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

$$(8.15) \quad H_{11} \cdot H_{22} - H_{12}^2 = A^2 \cdot (1-\phi)^2 \cdot (y_{mm} + P'') \cdot (y_{kk}) + A^2 \cdot (1-\phi) \cdot F'' \cdot (y_{kk} + y_{mm} + P'') \\ + A^2 \cdot (F'')^2 - A^2 \cdot (1-\phi)^2 \cdot y_{mm}^2 - A^2 \cdot (F'')^2 - 2 \cdot A^2 \cdot (1-\phi) \cdot y_{mk} \cdot F'' \\ = A^2 \cdot (1-\phi)^2 \cdot [(y_{mm} \cdot y_{kk} - y_{mk}^2) + (P'' \cdot y_{kk})] + A^2 \cdot (1-\phi) \cdot F'' \cdot (y_{kk} + y_{mm} + P'' - 2y_{mk})$$

By the concavity of the per-acre production function,  $y_{mm} \cdot y_{kk} > y_{mk}^2$

All the other terms are clearly positive, and thus the determinant is positive.

The effect of eviction risk ( $\phi$ ):

The effect of ownership insecurity is demonstrated by assuming a small increase in the probability of eviction ( $\phi$ ). Differentiating equations (8.11) and (8.12), obtains

$$(8.16) \quad \begin{vmatrix} H_{11} & H_{12} \\ H_{21} & H_{22} \end{vmatrix} \cdot \begin{vmatrix} \frac{dk}{d\phi} \\ \frac{dm}{d\phi} \end{vmatrix} = A \cdot \begin{vmatrix} y_k + F'' \cdot \frac{\partial L}{\partial \phi} \\ (y_m + P') + F'' \cdot \frac{\partial L}{\partial \phi} \end{vmatrix}$$

By equations (8.11) and (8.12),  $y_m + P' = y_k$ . Denoting  $y_k + F'' \cdot \frac{\partial L}{\partial \phi} \equiv \lambda$ , and employing Cramer's rule, eq. (16.8) 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  $\Delta$  is the determinant of the Hessian matrix. Since  $\lambda > 0$ ,  $\Delta > 0$  and

$y_{mm} + P'' - y_{mk} < 0$ , it follows  $\frac{dk}{d\phi} < 0$ .

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 impact of the legal status of land on credit supply is sufficient to generate inequalities (8.17) and (8.18) even when actual eviction risk ( $\phi$ ) is low. Conversely, even when credit supply is not binding ( $\partial L / \partial \phi = 0$ ), the existence of a non-zero eviction probability is sufficient to generate inequalities (8.17) and (8.18).

Econometric specification

Equations (8.11) and (8.12) are implicit (and highly non-linear) functions defined over the endogenous variables  $K$  and  $M$ , and the exogenous variables  $\phi$ ,  $W_0$ ,  $A$  and  $S$ . They may be viewed 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 non-linear, the resulting specification of equations (8.19) and (8.20) is not tractable for econometric purposes. Therefore, we estimate a log-linear approximation of eq. (8.19). Land-improvements ( $M$ ), present a further difficulty. The data are given in a binary format (i.e. 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). The empirical analysis accounts for this by adding a variable for the number of years the farmer has been the principal decision-maker on the farm (denoted as "experience"). It is expected that ceteris paribus, a longer period as decision-maker will facilitate more capital accumulation and land-improving investments.

The central hypothesis is that legal ownership security positively affects investments. Since all squatters in a province face the same risk of eviction, this risk is represented by a dummy variable taking

a value of zero for squatters (positive risk) and one for legal owners (zero risk).<sup>1/</sup>

Comparisons of mean levels of capital per unit of owned land (where capital is measured as the current value of equipment and animals, and land is considered owned whether or not it is legally possessed) show that the capital/land ratio is higher for titled farmers than for untitled farmers. This difference is 25% for Lop Buri, 63% for Nakhon Ratchasima, 97% for Khon-Kaen and 6% for Chaiyaphum (Table 8.1). Similar differences prevail even when the measure of owned land is adjusted to reflect land quality and market access differences. (The appendix to this chapter describes the procedure for adjusting the amount of land owned to account for differences in quality.)

Although these statistics are compatible with theory, a more rigorous test is required. Other attributes and factors, which may systematically differ 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 indicating ownership of titled land,  $W_0$  is the farmer's initial capital adjusted for cost-of-living differences over time, and  $S$  is the years of schooling. The amount of land owned ( $A$ ) is adjusted for differences in quality and market access. Differences in the time span over 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 8.2. The

---

<sup>1/</sup> The sample contains a small number (18 percent) of farmers who had both titled land outside the forest reserve and untitled land within the forest reserve. Since the titled holdings could serve as collateral, these farmers were grouped with the fully titled farmers in the title dummy variable.

Table 8.1: Capital per Rai Owned, Classified by Title Status a/

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		
Item	Farmer Group	Untitled Farmers	Titled Farmers	Untitled Farmers	Titled Farmers	Untitled Farmers	Titled Farmers	Untitled Farmers	Titled Farmers
(i) Capital value (Baht/rai)		729	915	809	1332	700	1378	694	738
(ii) Capital value adjusted for differences in land quality <u>b/</u>		729	906	809	1177	700	1238	694	738
Mean land quality index <u>c/</u>		92	93	76	86	71	79	83	83
Sample size		100	84	89	72	61	82	120	112

a/ 6.25 Rai = 1 hectare

b/ To adjust for quality differences, the capital per rai of the titled farmers is divided by the ratio (quality index of titled land/quality index of untitled land).

c/ The quality index is based on parameters estimated in the hedonic price equations reported in Chapter VII.

estimates for the three northeastern provinces confirm that ownership security induces higher capital accumulation: the coefficient of the ownership security variable (the title dummy) is (statistically) significantly greater 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 for ownership security is not (statistically) significantly different from zero. This result is compatible with the ample supply of non-institutional credit in the province, which diminishes the importance of ownership titles (see discussion in Chapter V). As expected, the amount of owned land has a positive (and statistically significant) effect on capital accumulation. Similarly, the more years the farmer has been the decision maker on the farm, the larger the amount of capital owned, although the effect is not significant in Lop Buri. Higher initial capital implies higher present capital in the three northeastern provinces. Education has the expected effect on capital in Lop Buri (significant coefficient) and Khon-Kaen. <sup>1/</sup> The systematic content of the estimated equation is significant: F statistics are much higher than the critical value, even though 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 above assumes that land presently owned by a farmer is either exogenously given or is predetermined to capital accumulation. However, if the present amount of owned land is an endogenous decision

---

<sup>1/</sup> The lack of significance for the parameter of education in the northeastern provinces may be due to the very small degree of variation in number of years of schooling (most farmers have the mandatory 4-year schooling level).

Table 8.2: Regressions of Capital Stock and Owned Land

Dependent Variable	Capital Stock (Variant I)				Capital Stock (Variant II)				Land (Adjusted for Quality Differences)			
	Lop Buri (1)	Nakhon Ratchasima (2)	Khon-Kaen (3)	Chaiyaphum (4)	Lop Buri (5)	Nakhon Ratchasima (6)	Khon-Kaen (7)	Chaiyaphum (8)	Lop Buri (9)	Nakhon Ratchasima (10)	Khon-Kaen (11)	Chaiyaphum (12)
Province												
Explanatory Variable												
Constant	1.433 (.988)	1.354 (.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)	.674 (1.934)	1.608 (5.714)
Owned Land <u>a/</u>	1.659 (6.254)	1.328 (4.196)	.782 (2.477)	.660 (2.262)	-	-	-	-	-	-	-	-
Experience <u>b/</u>	.159 (.490)	.695 (1.679)	.925 (2.321)	.603 (1.991)	.416 (1.137)	1.007 (2.389)	1.221 (3.258)	.851 (2.920)	.205 (2.287)	.195 (2.653)	.459 (5.342)	.370 (5.833)
Education	.349 (2.363)	.034 (.146)	-.001 (.003)	.023 (.140)	.345 (2.117)	.087 (.365)	.031 (.189)	-.013 (.077)	.005 (.118)	.046 (1.103)	.042 (1.119)	-.060 (1.662)
Initial Capital	-.007 (.201)	.006 (1.326)	.054 (1.226)	.062 (1.444)	.032 (.833)	.056 (1.061)	.065 (1.472)	.070 (1.624)	.211 (2.234)	-.025 (.275)	.017 (1.633)	.025 (2.674)
Initial Land	-	-	-	-	-.012 (.116)	.225 (1.438)	.045 (.399)	.237 (1.517)	.044 (1.789)	.243 (8.902)	.090 (3.464)	.144 (4.245)
Father's Land	-	-	-	-	.057 (.393)	.337 (1.436)	.324 (1.545)	.067 (.560)	-.031 (.364)	.090 (2.200)	.140 (2.917)	.039 (1.499)
Title Dummy	.032 (.087)	.972 (2.103)	1.444 (3.490)	.608 (1.609)	.353 (.880)	.987 (2.070)	1.402 (3.180)	.787 (2.094)	.159 (1.612)	.019 (.223)	-.080 (.788)	.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 <sup>2</sup>	.20	.15	.17	.10	.04	.10	.15	.09	.08	.36	.24	.29
Number of Observations	199	219	171	232	199	219	171	232	199	219	171	232

Note: Figures in parentheses indicate 't' values.

variable accumulated over time (as assumed in the model of Chapter VI), then the estimation procedure above is invalid. Owned land may then be correlated with the error term in the capital equation (8.19), yielding biased estimates. As estimated above, the capital equation is then a semi-reduced form, with one endogenous variable (A) on the right-hand side. To overcome this potential problem we formulate a reduced-form equation for owned land adjusted for quality. The equation includes the initial amount of land owned by the farmer, 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 loan collateral 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 8.2 presents the results for 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 I. 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 provinces, the title coefficients are significantly greater than zero at the 90 percent confidence level. This suggests that in these two provinces the credit advantages provided by titled land are partially used to acquire more land.



In Khon-Kaen and Nakhon Ratchasima provinces however, a secure title does not induce land acquisition. As the reduced-form equation for land of these provinces shows, title possession has a small and insignificant effect on the amount of land owned. A statistical test confirms that, even when the amount of land owned is an endogenous variable, titled land owners in the three northeastern provinces accumulated more capital per unit of land than untitled land owners. 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 8.2] is not different from the coefficient of title in the reduced form capital equation [columns (5)-(8) in Table 8.2], versus the alternative hypothesis that the coefficient in the capital equation is larger than that of 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 province, however, one cannot reject the hypothesis that possession of formal titles does not induce changes in capital/land ratios. The same conclusions are derived from a reduced-form estimate of the equation for the capital/land ratio, which differs from the above test because continuous variables are expressed in per-rai terms. The coefficients of the title dummy variable in three northeastern provinces are significantly greater than zero at the 95 percent confidence level (Table 8.3).

The estimated parameters of the title dummy variable in Table 8.3 indicate that in Nakhon Ratchasima and Chaiyaphum provinces, the capital stock per unit of land of a farmer with land title is about 105 percent and

56 percent higher, respectively, than that of a farmer without secure ownership holding all other attributes identical. <sup>1/</sup> The impact of title is larger in Khon-Kaen province; the capital/land ratio is about 253 percent higher for a titled farmer. The difference in Lop Buri is only 5 percent, and is not statistically significant.

#### Land improvements

Land improvements are land-embodied investments which either maintain or enhance the productive capacity of land by preventing erosion and moisture loss. Our data cover two major types of land improvements: (a) bunding, in which the field is divided into sub-plots by raised earth walls, thus allowing better water control and moisture retention; and (b) clearing of stumps, which increases the productive surface area and facilitates better and faster soil preparation using mechanized power. Since such improvements require labor and mechanized or draft power, cash or credit is needed. <sup>2/</sup> And since the risk of eviction is an obvious disincentive for improving untitled tracts, a sufficient degree of ownership security is required. These two aspects thus imply a higher likelihood of land improvements on titled tracts.

Table 8.4 presents the frequency of land improvements on titled and untitled plots of land. In Nakhon Ratchasima and Khon-Kaen both types of land improvements are significantly more common on titled plots. In Lop

---

<sup>1/</sup> Since the regressions are logarithmic, one needs to convert the coefficient from natural logarithm to percents, e.g., for Nakhon Ratchasima  $1.05 = [\exp(.718)] - 1$ .

<sup>2/</sup> While 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 sample farmers.

Table 8.3: Regressions of Capital/Land Ratios

Province	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
Explanatory Variable				
Constant	3.701 (3.898)	2.985 (2.499)	2.741 (2.558)	3.626 (4.209)
Experience	.258 (1.031)	.595 (2.014)	.649 (2.350)	.463 (2.180)
Education	.324 (2.858)	.068 (.414)	-.005 (.046)	.039 (.335)
Initial Capital	-.024 (.562)	.055 (1.028)	.081 (1.687)	.070 (1.579)
Father's Land	-.158 (1.176)	-.097 (.531)	.439 (.364)	.158 (1.014)
Title Dummy	.044 (.160)	.718 (2.163)	1.262 (4.040)	.444 (1.664)
F Value	1.79	2.36	4.66	1.91
R <sup>2</sup>	.05	.06	.15	.05
Number of Observations	199	219	171	232

Buri and Chaiyaphum improvements are not significantly more common on titled plots. However, for the pooled data, the frequency of bunding and stump clearing is significantly higher on titled plots. These findings indicate that land improvements relate to ownership security, as suggested by theory.

However, several important differences among the plots may affect land improvement decisions. Similarly, differences among farmers may also affect land improvements. Thus, in analogy to the preceding regression equations, logit estimates are obtained of the coefficients of variables affecting land improvements. 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 ceteris paribus effect of legal ownership status on the probability of land improvements. To maintain consistency with the theoretical decision model, the analysis considers only the plots improved by the present decision-maker and unimproved plots.

In addition to farmer characteristics used earlier, several plot-specific variables are incorporated in the analysis as explanatory variables. First, the number of years since the present decision-maker acquired the plot is expected to be positively related to land improvements. This is because land improvements are accomplished over time. Second, due to technical incentives or economies of scale, plot size is expected to be positively related to bunding. For example, larger plots gain more from bunding than do smaller plots since unequal water retention is more prevalent on smaller 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

**Table 8.4: Incidence of Land Improvements  
(Percent)**

Province  Farmer Group	Lop Buri		Nakhon Ratchasima		Khon-Kaen		Chaiyaphum		Pooled	
	Titled Plots	Untitled Plots	Titled Plots	Untitled Plots	Titled Plots	Untitled Plots	Titled Plots	Untitled Plots	Titled Plots	Untitled Plots
Bunding	39	32	66	44	71	49	67	64	61	49
Clearance of Stumps	77	76	63	29	50	38	76	76	64	56
Sample Size	211	216	251	284	258	189	129	332	549	1021

quality of the plot is expected to have a positive effect on investment incentive for land improvements, since the return on the improvement is higher. Therefore, we introduce a plot-specific quality index to account for attributes such as soil type, slope, availability of irrigation and location. The index is constructed using coefficients from a hedonic price analysis of land values (see appendix to this chapter). We also introduce a dummy variable for lowland plots in the bunding equation since bunding is more likely on lowland plots suitable for paddy cultivation.

Estimated coefficients are presented in Table 8.5. The results show that in Nakhon Ratchasima and Khon-Kaen provinces, the probability for bunding is significantly higher (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 for a titled plot is higher by 31 and 20 percentage points, respectively, than on an identical untitled plot, owned by an identical farmer.<sup>1/</sup> The effect of ownership security on the probability of bunding is not statistically significant in Chaiyaphum and Lop Buri provinces. However, as expected, the sign of the coefficient is positive.

In the estimates for land improvement by stump clearing, land titles have a statistically significant effect (at a 90 percent one-tailed

---

<sup>1/</sup> 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  $\theta$  is a vector of coefficients.  $dP/dx_1 = \beta_1 \cdot x_1 \cdot P_1 \cdot (1 - P_1)$ . In the case of title  $x_1 = 1$ . The level of  $P$  used in the calculation is the sample mean rate of adoption for the untitled farmers.

Table 8.5: Logit Estimates of Determinants of Land Improvements

Land Improvement Province Variable	Bunding				Clearing of Stumps			
	Lop Buri	Nakhon Ratchasima	Khon- Kaen	Chaiya- phum	Lop Buri	Nakhon Ratchasima	Khon- Kaen	Chaiya- phum
Constant	-5.973 (3.328)	-5.903 (3.691)	-4.561 (2.175)	-.782 (.639)	-.371 (.219)	-1.596 (.910)	-4.260 (2.375)	-.298 (.304)
Education	-.034 (.282)	-.284 (1.797)	-.168 (1.194)	-.090 (.777)	.055 (.435)	-.119 (.753)	-.032 (.283)	-.0036 (.033)
Father's Land	-.137 (1.229)	.017 (.115)	-.221 (1.072)	-.176 (1.911)	-.057 (.474)	-.331 (2.046)	-.014 (.067)	-.0535 (.660)
Initial Capital	-.010 (.338)	-.056 (1.674)	.009 (.235)	-.050 (1.471)	.037 (1.276)	-.042 (1.220)	.012 (.347)	-.0074 (.240)
Initial Land	.001 (.015)	-.091 (.757)	-.253 (2.114)	-.284 (2.244)	-.121 (1.454)	.229 (1.504)	-.159 (1.423)	-.192 (1.802)
Experience	.350 (1.008)	.198 (.573)	-.070 (.175)	-.767 (2.137)	.236 (.649)	.513 (1.231)	.106 (.281)	.293 (1.130)
Plot Type (lowland/upland)	2.587 (5.463)	1.690 (4.045)	2.852 (5.395)	1.895 (5.171)	n.a.	n.a.	n.a.	n.a.
No. of Years Plot is Owned	.058 (2.678)	.072 (3.719)	.060 (2.691)	.065 (3.279)	.009 (.409)	.015 (.774)	.025 (1.309)	.021 (1.396)
Quality of Land	2.717 (2.009)	4.313 (4.136)	1.072 (.612)	2.619 (2.446)	.227 (.208)	1.605 (1.688)	4.720 (3.391)	.583 (.749)
Plot Area	.197 (.934)	.655 (3.366)	1.452 (5.581)	1.402 (5.653)	-.072 (.349)	-.570 (2.784)	-.090 (.440)	-.053 (.267)
Title Dummy	.271 (.862)	1.242 (4.131)	.806 (2.081)	.077 (.228)	.516 (1.715)	.667 (2.139)	.472 (1.371)	.022 (.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

confidence level) in all provinces except Chaiyaphum. The coefficients imply that the probability of stump clearing on titled plots is higher 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 plot quality and the number of years the plot is 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 land ownership security induces higher levels of land improvements. This result is consistent with the evidence on the effects of land ownership security on capital formation presented earlier.

The empirical analysis thus indicates that the possession of a legal land title contributes significantly to higher capital formation and increased land improvements. These results imply that provision of secure legal ownership to squatters will increase the productivity of their land, since capital/land ratios will increase once all adjustments have been made.



Appendix to Chapter VIII

Adjustment for Land Quality

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

- (a) soil (black, not black)
- (b) slope (flat, not flat)
- (c) whether land is upland or lowland
- (d) access to irrigation (year-round, seasonal, rainfed)
- (e) availability of all-weather road to market
- (f) travel time to nearest market
- (g) availability of all-weather road to village
- (h) 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 VII. The quality index of a plot is a weighted sum of these indicators. Multiplying the quality index of a plot by the area of the plot, and summing over all the plots owned by a given farmer provides the area of land owned, adjusted for quality.

**Chapter IX.**  
**The Impact of Ownership Security on**  
**Input Use and Farm Productivity**

The theory presented in Chapters II and VI, as well as the empirical results of the analyses of land values and capital formation, suggest that productivity is higher on lands for which the farmer has secure (titled) ownership. The analysis of credit supply indicated that compared to untitled farmers, titled farmers receive a significantly larger volume of institutional credit which is cheaper than alternative sources of credit. This implies that the effective input cost for titled farmers is lower than that for untitled farmers. In addition, if production complementarity exists between capital and variable inputs (i.e. if cross derivatives in the production function are positive), then, the higher level of capital formation on titled farms would induce a higher demand for variable inputs.

In this chapter we seek to validate the hypothesis that productivity and input use per unit of land are higher among titled farmers than untitled farmers. The analysis is restricted only to Lop Buri, Nakhon Ratchasima and Khon-Kaen provinces, using data obtained for the 1984/85 wet season. The data for Chaiyaphum province obtained in 1986 for the 1985/86 season could not be used because the province was afflicted by a severe drought, and more than 75 percent of sampled farmers in the province were affected. Thus, any analysis of input and output data in Chaiyaphum would be unreliable.

Because many sampled farmers 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 in an optimal way so that comparisons of aggregate input and output values across households are valid.

In the analysis below, differences in land quality and other physical and economic characteristics of the land are controlled for by using a land quality index (based on the analysis of land values in Chapter VII). The index gives premium to better soil, flatter slope, availability of irrigation, favorable market and village location, etc. (see appendix to Chapter VIII). Land which has a higher quality index is expected to generate more output than land of a lower quality index.

Table 9.1 presents the sample means for output value and input use for households classified by titled or untitled land holders. In all provinces output per rai (6.25 rai = 1 hectare) is higher for titled farmers than for untitled farmers. Similarly, the use of various inputs is higher among titled farmers in all provinces except for the case of draft power in Lop Buri. While these means are compatible with the hypothesis stated earlier, there are two reasons why they cannot be taken as a conclusive proof. First, as in any cross-sectional sets of data on inputs and outputs, standard deviations are very large and statistical significance of the differences cannot be established. Second, although land quality is controlled for, there may be other factors which vary systematically across farmers in the two subsamples. Thus, farmer characteristics need to be controlled for.

Table 9.1: Sample Means of Per-Rai Input and Output Values,  
Adjusted for Differences in Land Quality

Province	Lop Buri			Nakhon Ratchasima			Khon-Kaen		
	Untitled Farmers (N=93)	Titled Farmers (N=84)	Ratio of titled to untitled	Untitled Farmers (N=87)	Titled Farmers (N=72)	Ratio of titled to untitled	Untitled Farmers (N=65)	Titled Farmers (N=77)	Ratio of titled to untitled
1. Output Value (B)	671	747	1.113	687	744	1.083	554	701	1.265
2. Labor Days	6.30	7.50	1.190	11.80	13.45	1.140	14.50	16.00	1.103
3. Cost of Draft Power (B)	162	161	.994	364	530	1.456	185	250	1.351
4. Other Input Costs (B)	336	341	1.014	80	114	1.425	68	96	1.412

- Notes:
1. Output value is the aggregate of all crops grown on all household plots.
  2. "Labor days" includes family labor, hired labor and exchange labor.
  3. Cost of draft power includes the costs of hired animal and machinery plus the imputed cost of using family owned animals and machinery.
  4. Other input costs include fertilizers, pesticides, herbicides, fuels and other inputs.
  5. Cash costs are measured in Thai Baht (B). In 1985, 26.3 B = \$1 US.

To more rigorously test whether output levels and input use differ significantly between titled and untitled farmers, we performed a regression analysis of output and input use per unit of land. Since the effect of titled ownership on productivity is partially derived through the higher capital intensity it induces, capital cannot be perceived as an exogenous variable in the present context. The specification used is therefore a reduced-form, in which only exogenous variables or variables predetermined in a long-run sense, were included as explanatory variables. 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 had higher productivity. However, there is relatively little variation for this variable, since most farmers attended the mandatory 4-year elementary school program.
- (2),(3) Initial land, Initial capital -- measures of initial wealth estimated through the farmer's recollection of the endowments he had when he became the decision-maker for the current family farm enterprise. These initial endowments affect positively the amount of capital and land owned at present (see Chapter VIII), which in turn, affect productivity.
- (4) Father's land -- an indicator of the initial wealth of the farmer which may have positively affected the farmer's accumulation of capital.
- (5) Land quality -- The land quality index used for this analysis excludes quality indicators which represent land improvements introduced by the farmer, since these, like capital, are endogenous

variables affected by ownership of titled land. Higher quality land is more productive, and would contribute positively to observed levels of output, ceteris paribus.

- (6) Experience -- the number of years the farmer has been the primary decision-maker 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 VIII showed that more experienced farmers, or older farmers, have more capital.
- (7) Number of Adults -- the number of adult family members (ages 14-65) actively involved in the agriculture. This variable represents a fixed family resource which can be augmented by hired laborers. However, in contrast to hired laborers, family members are more motivated and also perform supervisory roles (Feder, 1985).
- (8) Problem dummy -- represents adverse conditions such as pest attacks or floods which may have negatively affected the farmer's output. A dummy variable was constructed with the value 1 for farmers affected by a problem and zero otherwise.
- (9) Title dummy -- represents the impact of legal (secure) ownership. This dummy variable takes the value 1 if the farmer owns titled land and zero otherwise.<sup>1/</sup>

---

<sup>1/</sup> A small number of farmers in the sample (less than 18%) had both titled land outside the forest reserve. Since the titled holdings could serve as collateral, these farmers were grouped with the fully titled farmers in the title dummy variable.

In a regression with the above specification the effect of title represents both long-term and short-term effects, since the present capital owned and land improvements are not included among the explanatory variables. Thus, the title dummy variable accounts for the long-term effect of secure ownership through capital accumulation as well as for the short-term effect on variable input use 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 for both family members and hired laborers used for 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 (1) above. In the case of family-owned machinery or animal, the value of the service was imputed using the mean price of these services for the sample in the respective province. As in (2) above, this input is aggregated to the household level.
- (4) The expenditure on other inputs, such as fertilizers, pesticides, herbicides, etc., aggregated to the household level.

Table 9.2 reports the results of four reduced-form logarithmic regressions, with all continuous variables defined per rai of cultivated land. In all equations for the northeastern provinces, the title dummy

Table 9.2: Regression Results for Output and Inputs

Dependent Variable	Output Value per Rai			Labor Days per Rai			Draft Power Cost Per Rai			Other Input Cost per Rai		
	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	.0506 (1.256)	.0204 (.615)	.0318 (1.042)	.0061 (.145)	-.0232 (.705)	-.0055 (.250)	-.0387 (.948)	.0688 (.899)	.0100 (.217)	.0871 (1.106)	.0423 (.981)	-.0234 (.510)
Initial Land	-.0488 (.459)	-.0442 (.923)	-.0414 (.673)	-.0081 (.734)	.0439 (.925)	-.0030 (.066)	.0665 (.618)	-.0511 (.462)	.1329 (1.423)	-.0603 (.291)	-.0089 (.144)	.0202 (.219)
Father Land	.0903 (1.833)	-.0779 (1.879)	-.0073 (.171)	.0785 (1.531)	.0035 (.0862)	-.0239 (.760)	.0165 (.332)	-.1766 (1.845)	.0395 (.606)	.0556 (.578)	-.0214 (.397)	.0176 (.373)
Initial Capital	.0042 (.293)	-.0103 (.976)	-.0119 (1.013)	.0242 (1.619)	.0088 (.844)	-.0154 (1.785)	.0130 (.894)	.0075 (.309)	.0130 (.730)	.0466 (1.658)	.0080 (.583)	.0164 (.928)
Land Quality	-.0852 (.223)	.3899 (2.165)	.2614 (1.132)	-.526 (1.327)	.0223 (.125)	.1899 (1.124)	.4475 (1.159)	-.2221 (.534)	-.1443 (.412)	-2.035 (2.736)	.3753 (1.602)	-.2602 (.751)
Experience	-.0612 (.693)	-.0238 (.308)	.0509 (.726)	-.1415 (1.539)	-.0861 (1.417)	.1436 (2.797)	.0343 (.384)	.3650 (2.578)	.3166 (2.977)	-.1735 (1.006)	.0605 (.759)	-.1436 (1.364)
No. of Adults	-.1096 (.207)	.6331 (2.676)	.2867 (1.690)	1.894 (3.443)	.7572 (3.229)	.8439 (6.799)	.3659 (.683)	-.7961 (1.457)	.3290 (1.279)	.8835 (.856)	.3303 (1.074)	.8508 (3.342)
Problem Dummy	-.5110 (3.753)	-.8373 (8.131)	-.4884 (3.208)	-.1453 (1.026)	-.2953 (2.893)	-.1510 (1.355)	.0419 (.304)	-.1191 (.501)	.1669 (.723)	.0683 (.257)	-.2915 (2.176)	.4263 (1.866)
Title Dummy	.0441 (.453)	.1118 (1.645)	.2364 (2.854)	.1368 (1.351)	.1368 (2.032)	.0786 (1.298)	-.0528 (.536)	.3268 (2.082)	.2386 (1.900)	.1687 (.889)	.2200 (2.490)	.2984 (2.401)
R	.102	.314	.178	.137	.143	.342	.026	.105	.128	.072	.088	.176
F-Value	2.39	10.61	3.87	3.32	3.89	9.28	.57	2.73	2.64	1.633	2.25	3.81
No. of Obs.	199	219	171	199	219	171	199	219	171	199	219	171



variable is significantly larger than zero at the 90 percent (one-tailed) confidence level. However, in Lop Buri province, 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 output value per rai is about 12 percent higher on land cultivated by titled farmers than by untitled farmers. In Kohn-Kaen the difference is higher, about 27 percent. Input use per rai is consistently higher on land cultivated by titled farmers. In Nakhon Ratchasima and Khon-Kaen provinces, respectively, labor use is higher by about 15 percent and 8 percent, draft power use is higher by about 39 percent and 25 percent, and other input use, such as fertilizers and pesticides, is higher by more than 23 percent and more than 34 percent.<sup>1/</sup>

The analysis of output value reported above considered agricultural revenues related to cropping activities. 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 on agricultural activities other than cropping (e.g. sale of fruits and vegetables from home gardens, poultry and related by-products, sale of other livestock) and non-agricultural activities (e.g. charcoal making, bamboo products). These data are possibly less accurate than cropping activity data because they were obtained as an aggregate estimate by the farmers without detailing the

---

<sup>1/</sup> 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.

specific activities. Only about half of the sampled farmers had any income from non-cropping activities, and on average, excluding off-farm employment, it amounted to less than one-third of such a household's revenue. Nonetheless, some farm capital (e.g. transport equipment) is used to generate these revenues, as well as credit. Since capital and credit are positively affected 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 9.2.

Estimates analogous to the first three columns of Table 9.2, but based on a broader concept of farm revenue, <sup>1/</sup> are presented in Table 9.3. 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 province. In this province, the regression with the narrower revenue concept indicated a small positive productivity advantage (not significantly greater than zero) for titled farmers. The estimate reported in Table 9.3, 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 cropping and other productive activities is 12 to 20 percent higher among titled farmers than untitled farmers.

While this is an observation from a single cross-sectional study, it is compatible with other results focusing on differences in

---

<sup>1/</sup> Income from off-farm employment, which is quite common in our study areas in the off-season months, is not included in this analysis since in most cases it does not require capital or credit.

Table 9.3: Reduced Form Regressions of Farm Revenues from Agricultural and Non-agricultural Activities a/

Province	Lop Buri	Nakhon Ratchasima	Khon-Kaen
Explanatory Variable			
Constant	6.5410 (20.390)	6.5760 (23.760)	5.7680 (16.130)
Education	.00850 (.220)	.0554 (1.443)	.0367 (1.015)
Initial Land	-.1160 (1.133)	-.0101 (.182)	-.1274 (1.748)
Father Land	.0928 (1.968)	-.0043 (.089)	-.0051 (.098)
Initial Capital	-.0062 (.451)	-.0168 (1.373)	-.0370 (.266)
Land Quality	.0491 (.135)	.5544 (2.661)	.3848 (1.407)
Experience	-.0573 (.679)	-.0173 (.244)	.1428 (1.720)
No. of Adults	1.1650 (2.306)	.8141 (2.975)	.9528 (4.745)
Problem Dummy	-.4277 (3.295)	-.6803 (.571)	-.1090 (.605)
Title Dummy	.1351 (1.447)	.1196 (1.522)	.1889 (1.926)
R <sup>2</sup>	.14	.24	.29
F Value	3.321	7.424	7.229
No. of Observations	196 <u>b/</u>	219	171

a/ Excludes income from off-farm employment.

b/ Three observations dropped due to missing data on other incomes.

capital/land ratios (Chapter VIII) and differences in land values (Chapter VII). It is thus quite plausible to view the estimated productivity gap between titled and untitled farmers as a permanent one. As long as the distortion causing differential factor ratios (and thus differential productivity levels) remains, the economy sustains a significant welfare loss from unrealized potential output. This distortion is the result of classifying lands which are being cultivated -- and which will continue to be cultivated -- as forest reserves, where legal titles cannot be granted.

Alternative calculation of output effects

The results in Table 9.2 (Columns 1-3) and Table 9.3 provide a direct estimate of the impact 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 utilized in the hedonic price analysis of Chapter VII (including land improvements), V is the draft power input, X is other

variable inputs, L is labor and  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\eta$ ,  $\lambda$  are corresponding output elasticities.

Since the adoption of land improvements is defined in probabilistic terms, the quality index should more properly be defined as the expected quality index [i.e.  $E(Z)$ ]. To calculate the proportionate output increase resulting from 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 only pertain to Nakhon Ratchasima and Khon-Kaen provinces because the impact of titles on capital/land ratios and other inputs was not statistically significant in Lop Buri. The values of  $\frac{dK/dT}{K}$  are based on the parameter for the title dummy in Table 8.3. The impact of title on various variable inputs ( $\frac{dV/dT}{V}$ ,  $\frac{dX/dT}{X}$ ,  $\frac{dL/dT}{L}$ ) is derived from the coefficients of the title dummy in the reduced-form input equations of Table 9.2. The calculation of  $dE(Z)$  assumes that the probabilities of bunding and land clearing, as estimated in Table 8.5, are independent. This implies

$$(9.3) \quad dE(Z)/dT = \sum_{i=1}^2 \delta_i \cdot (dP_i/dT) \quad i = \text{bundling, land clearing}$$

where  $\delta_i$  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. The calculation of  $dP_i/dT$  relies on the logit specification of the adoption equations and on figures derived from Table 8.5. The weights  $\delta_i$  for the two provinces are reported in Table 7.3.

Output elasticities are obtained from estimates of production functions based on our sample data and reported in the appendix to this chapter. Table 9.4 summarizes the various components of equations (9.2) and (9.3), and reports the results of the alternative calculations of the productivity effect of ownership security. The logarithmic difference between productivity of titled and untitled farms is .159 in Nakhon Ratchasima and .168 in Khon-Kaen. These indirect estimates are within less than one standard deviation of the direct estimates of the impact of secure titled ownership in these two provinces; namely, the coefficients of the title variable in the reduced-form output equations of Table 9.2 and 9.3. This demonstrates that our estimates of ownership security effects 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 ownership security significantly enhances productivity. The impact 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 9.2). Such a substantial difference certainly warrants policymakers' attention.

Item	Mathematical Notation	Province	
		Nakhon Ratchasima	Khon-Kaen
(i) Effect on Capital Formation <u>a/</u>	$\frac{dK/dT}{K}$	.718	1.262
(ii) Output Elasticity with Respect to Capital <u>b/</u>	$\alpha$	.015	.042
(iii) Effect on Output due to Capital Increase	$\alpha \cdot \frac{dK/dT}{K}$	.011	.053
(vi) Effect on Probability of Adopting Bunding <u>c/</u>	$dP_1/dT$	.306	.201
(v) Weight of Bunding in Land Quality Index <u>d/</u>	$\delta_1$	.415	.247
(vi) Effect on Probability of Adopting Land Clearing <u>c/</u>	$dP_2/dT$	.137	.111
(vii) Weight of Land Clearing in Land Quality Index <u>d/</u>	$\delta_2$	.123	.016
(viii) Expected Change in Land Quality Index	$\sum_{i=1}^2 \delta_i \cdot (dP_i/dT)$	.144	.051
(ix) Mean Quality Index of Untitled Farmers <u>e/</u>	$E(Z)$	.76	.71
(x) Elasticity of Output with Respect to Land <u>b/</u>	$\beta$	.441	.194
(xi) Effect on Output Due to Increased Land Improvements	$\beta \cdot \frac{\sum \delta_i (dP_i/dT)}{E(Z)}$	.084	.014
(xii) Effect on Power Input <u>f/</u>	$\frac{dV/dT}{V}$	.327	.239
(xiii) Output Elasticity with Respect to Power <u>b/</u>	$\gamma$	.042	0 <u>g/</u>
(xiv) Effect on Output due to Power Increase	$\gamma \cdot \frac{dV/dT}{V}$	.014	0
(xv) Effect on Other Variable Inputs <u>f/</u>	$\frac{dX/dT}{X}$	.220	.298
(xvi) Output Elasticity with Respect to Other Variable Inputs <u>b/</u>	$\eta$	.145	.205
(xvii) Effect on Output due to Increase in Other Variable Inputs	$\eta \cdot \frac{dX/dT}{X}$	.032	.061
(xviii) Effect on Labor <u>f/</u>	$\frac{dL/dT}{L}$	.137	.078
(xix) Output Elasticity of Labor <u>b/</u>	$\lambda$	.135	.505
(xx) Effect on Output due to Labor Increase	$\lambda \cdot \frac{dL/dT}{L}$	.018	.040
(xxi) Total Effect on Output <u>h/</u>	$\frac{dY/dT}{Y}$	.159	.168

a/ Based on Table 8.3.

b/ Based on a production function estimate in appendix to this chapter.

c/ Based on Table 8.5

d/ Based on Table 7.3.

e/ From Table 8.1.

f/ From Table 9.2.

g/ Parameter set to zero as its estimated value is negative.

h/ Sum of lines (iii), (xi), (xiv), (xvii), (xx).

Appendix to Chapter IX

Estimates of Production Functions

Province	Nakhon Ratchasima	Khon-Kaen
<u>Explanatory Variable</u>		
<u>Constant</u>	5.791 (13.230)	4.2750 (8.126)
<u>Human Capital</u>		
Education	.0524 (1.453)	.0569 (1.762)
Experience	.0268 (.420)	.1581 (1.836)
<u>Physical Inputs</u>		
Land (Adjusted for quality)	.4414 (4.926)	.1938 (1.826)
Capital	.0151 (1.370)	.0418 (2.506)
Labor	.1349 (1.865)	.5050 (4.098)
Power	.0422 (1.310)	-.0794 (1.306)
Other Variable Inputs	.1452 (2.520)	.2047 (3.404)
Production Problem Dummy	-.5976 (5.268)	-.1480 (.8476)
R <sup>2</sup>	.570	.544
F Value	34.86	26.32
No. of Observations	219	171

Note: Numbers in parentheses are "t" values.



## Chapter X.

### The Impact of Usufruct Certificates

The preceding analyses demonstrated that the economic performance of Thai squatters is significantly less than 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 forest reserve areas certificates awarding them usufructuary rights. However, these certificates, 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' perception of security and thereby stimulate investments. Some hoped that STK recipients would gain better access to institutional credit. Others believed that some of the certificates' restrictions would effectively reduce further encroachment on forest lands.

The purpose of this chapter is to assess the effectiveness of the STK program in improving squatters' productivity. The analysis utilizes data from Chaiyaphum province, which pertain to squatters covered by the STK program as well as other squatters not covered.

As Chapter IV pointed out, the socio-political environment of Thailand does not support a consistent policy of eviction for enforcing forest reserve boundaries. Consequently, the incidence of squatter eviction from forest reserve areas have been rather low (Table 4.3).

Data from our survey areas indicated that the majority of the squatters believe that the most important advantage of acquiring a legal title document is improved 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 political-economic environment rather than on misinformed expectations.

Economic theory indeed predicts that one advantage of secure, legally-documented ownership is improved access to institutional credit. This is because institutional lenders prefer collaterals as a device for reducing loan riskiness, especially for medium- and long-term loans. The econometric analysis of credit transactions in our study areas (Chapter V) confirms that the supply of institutional credit is significantly affected by the provision of land collaterals. 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 collaterals increase credit availability significantly more than did group guarantees. Squatters are thus at a disadvantage since they cannot provide legal land collaterals. The analysis also confirmed that the possession of an STK certificate does not affect the supply of institutional credit, since the amount of credit to STK recipients was the same as that for other squatters, holding other attributes constant. Because non-institutional lenders rarely require legal collaterals, squatters have the same access to non-institutional credit as other farmers. However, non-institutional credit is three times more expensive, and in many provinces, its quantity is limited.

Because the eviction rate in areas where squatters have been settled for many years is low,<sup>1/</sup> many squatters tended to view their occupation of the land as permanent, and considered themselves "owners." Local customs and social norms recognized this notion of ownership in land transactions. Survey data revealed that forest reserve land was being (illegally) traded as frequently as legally held private land (Table 4.5). The survey also shows that more than 90 percent of the farmers in the forest reserve 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 secure of their continued access to the land they occupy and of their de-facto ability to transact freely with it. Hence, it is not surprising that squatters opined that the main advantage of acquiring full legal status would be improved access to institutional credit.

The hedonic land price analysis of Chapter VII established that there is relatively little difference between the price of land inside the forest reserve and private land outside forest reserves which is not yet legally titled. However, both types of land are substantially cheaper than legally titled land. The results of the price analysis are presented as index numbers in Table 10.1. The only difference between owners of undocumented land outside the forest reserve and squatters is that those outside the reserve have higher perceptions of security because they do not

---

<sup>1/</sup> In the four provinces surveyed under the present study, more than half of the villages in the forest reserve areas were established more than 20 years ago, and less than 20% of the villages were less than a decade old.

Table 10.1: Index Numbers for Market Value  
of Equal Quality Land a/

	Lop Buri	Nakhon Ratchasima	Khon-Kaen
Documented Land <u>b/</u>	100	100	100
Undocumented Land Outside Forest Reserve <u>c/</u>	84	50	57
Land in Forest Reserve	80	43	47

a/ Based on the hedonic price analysis in Table 7.3, Chapter VII.  
Results for Chaiyaphum province are omitted as there were only five  
undocumented tracts outside the forest reserve.

b/ Land covered by NS-3 or NS-3K document.

c/ Land with SK-1, NS-2 or no document.

face state challenges to their ownership and because they can secure proper documentation in due time. Both groups face similar constraints to institutional credit, since neither can use their land as loan collateral. Owners of legally titled land differ from owners of undocumented land outside forest reserve essentially in their favorable access to credit. The numbers illustrate that changing land status from forest reserve to private, yet undocumented, land does not change security perceptions by much, as the change in land value is small. The impact of the improved security perceptions of such a change is, in fact, even smaller than the numbers imply, since the price of undocumented land outside forest reserves partially reflects the benefits that will be accrued when the land is documented.

The preceding discussion suggests that, in Thailand, any land policy addressing squatters which does not change squatters' 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 specifically targeting squatters, which did not address the credit constraints. Although granting full formal ownership to squatters in areas suitable for permanent agriculture was a desired 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' security perceptions and thus positively affect investment incentives and productivity. Some proponents of the STK program also claimed that institutional lenders would view STK recipients as more stable operators, and would be inclined to extend more credit to the recipients.

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 negatively affect squatters' perceptions of ownership security, their efficiency and their productivity. To understand why this is possible, we examine the exact terms and conditions surrounding the usufruct certificates.

The STK certificate, literally, confers upon the squatter "temporary occupation status" (see Appendix to this chapter). Even though no end date for this status is given, the term "temporary" may not contribute to security perceptions. 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 view the squatter's possession of up to 35 additional rai as an indefinite lease from the state. However, in our study areas, we observed that squatters are not being told clearly as to what the status of their land in excess of 15 rai is. As a result, considerable uncertainty may ensue over their continued ownership and ability to transfer the land. This problem affects many squatters: in our sample of squatters, the average holding is between 35 to 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, ownership security may be reduced for land not covered by the document. This contrasts with 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 squatters' efficiency. Land covered by STK certificates can only be transferred by inheritance to direct descendants. It cannot be sold, rented out, or given to others. If enforced, these restrictions would reduce efficiency compared to the past when the same restrictions nominally applied but were not enforced. The STK certificate lists all of the transfer restrictions and requires recipients to report all illegal activities that they observe in their areas to the forestry authorities. If the recipient fails to do so, the document states that the occupier rights 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 by authorities.<sup>1/</sup>

To demonstrate empirically the above hypotheses on the expected ineffectiveness of the STK program in areas where squatters have been long established, we use data from Chaiyaphum province. The survey focused on a district with two neighboring forest reserves. In one reserve the squatters have been covered by the STK program since 1981. On average, recipients in our sample have held the document for 3.5 years. In the neighboring reserve, squatters had not been incorporated in the program, and did not have the usufruct certificates. Table 10.2 provides comparative indicators for the two subsamples of squatters. The two groups are almost identical in all indicators presented.

---

<sup>1/</sup> Mehl (1986, p. 48) documents a conversation with recipients of S.T.K. in Petchabun province in which farmers stated that they are more concerned about eviction after receiving the certificate.

Table 10.2: Characteristics of Sample Squatters,  
Chaiyaphum Province

Squatter Group	Squatters	
	Recipients of STK (N=46)	Non-recipients of STK (N=74)
Age (years)	45.1	44.4
Education (years)	3.76	3.85
No. of years occupy the land	18.13	17.57
Average holding size (Rai)	33.12	35.56
Initial land <u>a/</u> (Rai)	26.46	28.25

a/ Amount of land held by the farmer when he became the chief decision-maker on the farm.



Squatters in the area covered by the STK program were asked to indicate what, if any, benefits they perceived in possessing an STK certificate. Their responses, described in Table 10.3, show that nearly a third of them do not perceive benefits from the program. Another 15 percent could not identify what benefits are entailed in possessing an STK certificate, even though the program has been in the area since 1981. Thus, almost half of the STK recipients could not cite any benefits of the STK certificate. If there were any clear-cut benefits, one would not expect such a response.

About 24 percent of respondents expected the document to reduce land disputes. This is apparently because some demarcation of boundaries occurs in the process of issuing the certificate. However, since only a portion of the squatters' area is typically covered by the document -- less than half in our sample area -- the probability of disputes is only partially affected. Furthermore, the incidence of land disputes in the province is rather low: a 16 percent probability over a lifetime in forest reserves, and an 11 percent probability outside of forest reserves. Tracts outside forest reserves are typically demarcated, yet demarcation reduces disputes only slightly. Therefore, it is unlikely that usufruct certificates will significantly reduce land disputes.

Only 13 percent of the squatters felt that possession of an STK certificate reduces their risk of eviction. This apparently reflects two complementary factors. First, the incidence of eviction among squatters in Chaiyaphum province 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

Table 10.3: Squatters' Perceptions Regarding Benefits of STK Documents

<u>Responses</u>	<u>Frequency (%)</u>
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
<u>Sample size</u>	<u>46</u>

explicitly threatens eviction. Indeed, 15 percent of the STK recipients said that the program entails negative aspects that worsen their situation.

As demonstrated in Chapter VI, economic theory postulates that land values reflect the productive potential of land. In Chapter VII it was shown that in Thailand, titled land is significantly more valuable than squatters' land, primarily because it enables better access to institutional credit, and also because it eliminates eviction risk. 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 can be expected between different types of squatters' land -- either with or without STK certificate -- because there are no credit advantages, or significant improvements in ownership security perceptions.

There is some difficulty in testing the above proposition because land covered by STK 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 freely being traded. 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 occurs. If they are not, then the sales price should reflect this. However, the values of land recorded in our survey are not based on actual transactions; rather, they reflect the occupier's asking price. If a squatter perceives benefits in the status of his plot, then this will be translated into an asking price higher than that for a plot not covered by an STK certificate.

A comparison of mean prices of land (Table 10.4) shows that the price of STK land is in fact lower than that of other squatters' land. However, the comparison of means is not a rigorous test. One simple way to rigorously test 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 Chaiyaphum province (presented earlier in Table 7.3). If there are any benefits of the STK certificate, then the coefficient of the dummy variable should be significantly greater than zero.

The results of the regression are present in column 1 of Table 10.5. 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 the possession of an STK certificate does not offer significant economic benefits.

The discussion above suggests that there is no reason to expect that investments, either in equipment, animals, or land improvements will differ among squatters with or without STK certificates. Table 10.6 presents data on capital ownership among the sampled squatters. The capital stocks of STK recipients are lower than those of other squatters. The mean values thus do not indicate any superior performance for squatters covered by the STK program. However, since squatters may differ in their initial positions or in other attributes that affect capital formation, a regression similar to that of Chapter VIII is required. Accordingly, we estimate the regression model presented in Tables 8.2 and 8.3, adding a dummy variable for STK recipients. The regression results are reported in Table 10.7. The estimate indicates that no significant difference exists

Table 10.4: Asking Price of Land, Chaiyaphum Province

(Baht per rai)

Land Type	Land Document	
	STK	No STK
	Certificate	Certificate
Lowland	2244 (46)	2326 (85)
Upland	1786 (50)	1847 (153)
All	2005 (96)	2018 (238)

Note: Numbers in parentheses indicate sample sizes.

Table 10.5: Hedonic Price Analysis of Land Values,  
Chaiyaphum Province

Variable	Coefficients	
	(1) Full Sample	(2) Squatter Sample
<u>Land Status Dummies</u>		
(i) Title (D)	.4342 (8.051)	n.a.
(ii) Untitled, outside of Forest Reserve (D)	.2990 (-1.496)	n.a.
(iii) STK (D)	.0100 (.170)	.0122 (.203)
<u>Natural Attributes</u>		
(i) Soil type (D)	.2052 (3.513)	.2106 (3.160)
(ii) Slope (D)	.0945 (1.904)	.1409 (2.453)
(iii) Lowland (D)	.1028 (1.979)	.0596 (.997)
(iv) Year-round irrigation (D)	.3688 (1.090)	.3707 (1.117)
(v) Seasonal irrigation (D)	.2216 (1.374)	.3173 (1.895)
<u>Land Improvements</u>		
(i) Bunding (D)	.1391 (2.661)	.1607 (2.682)
(ii) Land levelled (D)	.0068 (.102)	.0229 (.300)
(iii) Cleared of stumps (D)	.1918 (1.411)	.2431 (1.747)
(iv) Fruit trees (D)	-.0393 (.432)	-.0674 (.645)
<u>Location and Transportation</u>		
(i) All-weather road to market (D)	.0137 (.198)	.0481 (.638)
(ii) Travel time to market (minutes)	-.0863 (2.044)	-.0761 (1.631)
(iii) All-weather road to home (D)	-.0185 (.407)	-.0248 (.468)
(iv) Travel time to home (minutes)	.0060 (.223)	.0355 (1.163)
Constant	7.3375 (33.829)	7.1282 (30.227)
<hr/>		
R <sup>2</sup>	.243	.154
F-value	8.92	4.12
Number of Observations	461	332

Note: D denotes dummy variables. All continuous variables (including the dependent variable) are expressed in natural logarithm. Numbers in parentheses denote "t" values.

Table 10.6: Value of Capital, Chaiyaphum Province  
(Baht)

Farmer Group	Squatters	
	Recipients of STK (N=46)	Non-recipients of STK (N=74)
Item		
Capital value per household	15,717	20,135
Capital value per rai of owned land	676	705

Table 10.7: Regressions of Capital, Land and Capital/Land Ratios

Explanatory Variable	Dependent Variable Capital Stock	Land Owned (adjusted for quality)	Capital/land Ratio <u>a/</u>
<u>Land Status Dummies</u>			
Title dummy	.7780 (2.060)	.2373 (2.906)	.4357 (1.627)
STK dummy	-.1098 (.279)	-.0243 (.286)	-.1284 (.469)
Initial capital	.0693 (1.596)	.0248 (2.641)	.0680 (1.527)
Initial land	.0231 (1.465)	.1423 (4.164)	.1290 (.658)
Father's land	.0684 (.571)	.0390 (1.507)	.1601 (1.028)
Years as decision-maker	.8644 (2.927)	.3718 (5.823)	.4720 (2.210)
Education (years)	-.0137 (.082)	-.0602 (1.663)	.0388 (.331)
Constant	4.7008 (3.581)	1.6173 (5.698)	3.6578 (4.226)
R <sup>2</sup>	.095	.293	.050
F-value	3.354	13.257	1.666
Number of Observations	232	232	232

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



in capital and land accumulation or in capital/land ratios between STK recipients and other squatters. The parameter of the STK dummy is in fact negative, although not significant.

The analysis of land improvements focuses on those forest reserve tracts which were still unimproved in 1980, before the STK program began. Logit analysis is used to test whether the probability for land improvements in 1986 is significantly affected by providing a usufruct STK certificate. In addition to an STK dummy variable, the estimated equations contain farmer and plot characteristics used in the land improvement equations of Chapter VIII.

The estimated coefficients, presented in Table 10.8 show that the probability of bunding is not significantly affected by whether the plot is covered by an STK certificate or not. 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 decision-maker," plot area, 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 is compatible with the earlier observations that the certificate neither enhances squatters' ownership security perceptions significantly nor improves credit availability. The empirical analysis in this chapter substantiated the contention that, in Thailand, usufruct certificates do not significantly affect squatters' performance because they do not improve squatters' access to institutional credit.

Table 10.8: Logit Estimates of the Probability of Land Improvement

Explanatory Variable	Improvement Type	
	Bunding	Stump Clearing
Constant	-1.9658 (.870)	1.7010 (.634)
Education	.0362 (.1632)	.0705 (.1743)
Father's land	.2576 (.914)	-.3096 (1.506)
Initial capital	-.0630 (.818)	.0006 (.0082)
Initial land	-.2588 (.979)	-.2350 (.908)
Years as decision-maker	2.1686 (3.454)	-.3243 (.745)
Plot quality index	-.5515 (.221)	-3.6684 (1.719)
Plot area	1.8244 (2.990)	-.6377 (1.224)
Lowland dummy	1.8870 (1.948)	n.a.
STK dummy	.2540 (.300)	-1.1235 (1.452)
Likelihood Ratio Statistic	29.46	11.70
Number of Observations	134	93

Appendix to Chapter X

A Usufruct Certificate (S.T.K.)





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

## Chapter XI.

### The Benefits and Costs of Land Ownership Security

The purpose of this chapter is to analyze the economic costs and benefits entailed in providing secured ownership in Thailand. The preceding chapters provided evidence that increasing the ownership security of untitled farmers by granting them full legal ownership would increase their productivity. The benefit of titled ownership to a farmer can thus be calculated as the present value of the increments to net income which will accrue to him over a lifetime. The increments are defined relative to the stream of net incomes expected under his present insecure ownership status. If the farmer incurs any costs in changing his status, then these need to 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 ownership status change, minus the costs of implementing the change.

The official fee for processing and awarding a secure ownership document, such as NS3-K, to an eligible farmer is relatively low; 20 to 30 baht per plot. Since plots average about 15 to 25 rai, the official fee translates into 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 individuals implementing the ground survey and adjudication process. An estimate of these costs was obtained from the sampled farmers. Mean figures for the provinces in the study are presented in Table 11.1. The figures for NS3-K and NS3 documents are listed separately,



since mostly NS3-K documents were issued after 1972. The procedure for issuing NS3-K documents implies lower costs to farmers, because the ground survey and the adjudication are done for the whole village at one time. The data confirm that the costs of acquiring an NS3 are considerably higher than those for an NS3-K. However, when expressed per rai of land, the monetary costs of acquiring a secure document are still low, amounting to less than 1 percent of the value of land. The increase in land value due to the acquisition of title (estimated in Chapter VII) ranges from 25 percent of untitled land value in Lop Buri to 132 percent in Nakhon Ratchasima. Clearly, the net benefit of ownership security to farmers is substantial.<sup>1/</sup> This suggests that the government fee charged to farmers for survey, adjudication and documentation can be increased significantly from its current low levels. 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 above, could differ from the net benefit to society. This is because of distortions both in the market valuation of land prices and in the discrepancy between the costs paid by farmers for titling services and the real public costs of providing those titling services.

---

<sup>1/</sup> A relevant issue is the value of the farmers' time invested in acquiring secure documents. This opportunity cost is not included in the cost calculations of Table 11.1. However, only 15 percent of the sampled recipients of secured documents indicated that the process of obtaining the document was time consuming.

Table 11.1: Titling Cost to Farmers

Province	Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
Item				
Average plot size (rai)	25	15	16	22
Cost of NS3 per plot (Baht)	277 (24) <sup>a/</sup>	204 (56)	450 (74)	328 (7)
Cost of NS3 per rai (Baht)	11	14	28	15
Cost of NS-3K per plot (Baht)	203 (191)	49 (191)	120 (188)	21 (73)
Cost of NS-3K per rai (Baht)	8	3	8	1

<sup>a/</sup> Figures in parentheses indicate sample sizes.

We use the model of Chapter VI 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 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 farmers. 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

$$\frac{\partial y_{nt}^*}{\partial k_{nt}^*} = (1 + \delta) / [1 - \Psi \cdot (1 - \gamma) \cdot (1 + \lambda)] \text{ and of the budget constraint } \frac{W_o}{A_{nt}} = k_{nt} + P_{nt}.$$

The left-hand side of 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 non-institutional credit is equal to its nominal cost. Thus the right-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  $\Pi_{nt}$ , and using the opportunity rate of return to

capital ( $\delta$ ) as a discount rate, the discounted value of the social benefits derived from a unit of untitled land over an infinite horizon is

$$(11.2) \int_0^{\infty} e^{-\delta \cdot i} \cdot \Pi_{nt} \cdot di = P_{nt}^* \cdot \left[ 1 + \frac{\psi \cdot (1-\gamma)}{\delta} + \frac{\lambda}{\delta} \cdot \left( 1 + \frac{y_{nt}^*}{P_{nt}^*} \right) \cdot \psi \cdot (1-\gamma) \right]$$

where  $i$  denotes time. It is observed that if the probability of eviction is zero ( $\psi=0$ ), then the social value of land is equal to the market value. However, if the probability of eviction is non-zero, the observed price of untitled land underestimates 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 as compared to the price they would be willing to pay under risk neutrality. If farmers were risk-neutral then  $\lambda = 0$ , and one source of the undervaluation of untitled land would vanish. The second source for undervaluation, however, would remain even when farmers are risk-neutral, or as long as the risk of eviction is non-zero. The reason why private valuation and social valuation of land deviate is because 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 is low (see appendix to this chapter). With the probability of eviction not exceeding 7 percent, distortions of up to one-third of the market price are possible. If risk aversion were considered, the distortion would be even higher.

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  $\delta$ .

$$(11.3) \quad y_t^* - k_t^* \cdot (1+\delta) - (1+\delta) \cdot s_2 \cdot (1-s_1) \cdot P_t^* - (1+c) \cdot m \cdot P_t^* = \\ = P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1) - s_2 \cdot (1-s_1) \cdot (\delta - r_2)]$$

As with 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 non-institutional credit.

Denoting the left-hand side of (11.3) by  $\Pi_t$ , the calculation of the discounted value of contributions to social welfare generated by a unit of titled land over an infinite horizon yields

$$(11.4) \quad \int_0^{\infty} e^{-\delta \cdot i} \cdot \Pi_t \cdot di = \int_0^{\infty} e^{-\delta \cdot i} \cdot P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1) - s_2 \cdot (1-s_1) \cdot (\delta - r_2)] \cdot di \\ = P_t^* \cdot \left[ 1 - s_1 \cdot \frac{\delta - r_1}{\delta} - s_2 \cdot (1-s_1) \cdot \frac{(\delta - r_2)}{\delta} \right]$$

If the credit market is not distorted, then  $\delta = r_1 = r_2$ , and the market price of titled land would equal its social value. However, in a credit market such as that in Thailand, where interest rate ceilings and other interventions are present (Hanson and Neal, 1985) the opportunity cost of capital ( $\delta$ ) is higher than the formal sector's interest rate on both long-term and short-term credit. 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 the appendix, 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 resulting from allowing the legal registration of a unit of forest reserve land of a given quality [expressed as a proportion ( $\beta$ ) 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 one

$$(11.5) \quad \beta = \frac{P_t^*}{P_{nt}^*} \cdot \left\{ \frac{[\delta - s_1 \cdot (\delta - r_1) - s_2 \cdot (1 - s_1) \cdot (\delta - r_2)]}{[\delta + \Psi \cdot (1 - \gamma) + \lambda \cdot \Psi \cdot (1 - \gamma) \cdot [1 + (y_{nt}^*/P_{nt}^*)]]} \right\} - 1$$

The term in curly brackets represents the adjustment that needs to 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  $e^\alpha$  where  $\alpha$  is the parameter of land title in the logarithmic regression reported in Table 7.3. By assuming alternative values of the opportunity cost of capital, we can therefore calculate the value of  $\beta$  for the four provinces.

The probability of eviction ( $\Psi$ ) can be taken as the difference in the lifetime rate of eviction between titled and untitled farmers as

reported in Table 4.3. Because the government rarely confiscates complete holdings, and because farmers split holdings among family members to minimize the amount of land lost from eviction, we assume  $\gamma$  to take the value of 0.7. The parameters  $s_1$  and  $s_2$  are set at .1 which is the ratio of borrowing to land price observed in the sample. The nominal institutional interest rate in Thailand is presently 13 percent. However, taking into account inflation, the real interest rate is about 8 percent. The typical parameter of risk aversion ( $\phi$ ) is .5 (Binswanger, 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 .17 and .23.

The estimates of social benefit, reported in Table 11.2, show significant social benefits in the northeastern provinces, but little or no benefits in Lop Buri province. 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 one-quarter of the private benefits.

The reason for the negligible benefit to titling in Lop Buri, seems to lie in the province's distinct credit market structure, as 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 collateral. In the other provinces, traders are not as prevalent as a source of credit, and there is a greater dependency on institutional creditors, for whom land collaterals are a significant consideration. Therefore, compared to the other provinces, squatters in Lop Buri encounter less significant

Table 11.2: Gross Social Benefits of Ownership Security

Opportunity Cost of Credit	Benefits (as proportion of $P_{nt}^*$ ) ( $\beta$ )							
	Lop Buri		Nakhon Ratchasima		Khon Kaen		Chaiyaphum	
( $\delta$ )	risk neutrality	risk aversion	risk neutrality	risk aversion	risk neutrality	risk aversion	risk neutrality	risk aversion
.10	.060	-.210	.821	.320	.818	.379	.446	.254
.12	.053	-.184	.829	.380	.805	.421	.413	.253
.14	.048	-.163	.836	.428	.796	.454	.390	.252
.16	.045	-.147	.841	.468	.788	.481	.372	.251
Private Benefit ( $P_t^*/P_{nt}^*$ ) -1	.254		1.324		1.139		.539	



disadvantages in obtaining credit. This also implies that the price of titled and untitled land will differ less in this province.

The direct costs to society which are 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. These estimates are replicated in Table 11.3. 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 (Table 11.4) shows that even when farmers are assumed risk-averse, the net social benefit is substantial, ranging from 397 baht per rai in Chaiyaphum province, to 1237 baht per rai in Khon-Kaen province (i.e. from 21 to 40 percent of untitled land value, assuming risk aversion). The benefit/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 a secure ownership produces an extremely high social rate of return.

The procedure for calculating benefits ignored general equilibrium adjustments which might result from large scale titling of squatters. Theoretically, if large numbers of farmers are affected, the increases in input demand and output supply would change input and output prices, at least in the short-run. As 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 demand elasticity. An increased supply of rice would therefore depress its price and reduce the absolute volume of benefits. However, the areas where squatters are numerous are not the main rice-producing areas.

Table 11.3: Costs of Land Documentation

Item	Cost per rai	Cost as % of Price of Untitled Land			
		Lop Buri	Nakhon Ratchasima	Khon-Kaen	Chaiyaphum
<u>Cost of Issuing Full Title (NS-4)</u>		----- % -----			
Estimate (i) <u>a/</u>	110.9	3.9	3.3	3.5	5.6
Estimate (ii) <u>b/</u>	82.5	2.9	2.4	2.6	4.1
<u>Cost of Issuing Utilization Certificate (NS-3K)</u>					
Estimate (i) <u>a/</u>	19.4	0.6	0.5	0.6	1.0
Estimate (ii) <u>b/</u>	30.6	1.1	0.9	1.0	1.5

a/ Based on Burns (1985, p. 85).

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

Table 11.4: Net Social Benefits of Ownership Security Per Rai

Province	Gross Social Benefit as % of $P_{nt}$ <u>a/</u> risk neutrality		Social Cost as % of $P_{nt}$ <u>b/</u>	Net Social Benefit as % of $P_{nt}$ <u>c/</u> risk neutrality		Mean price of Untitled Land ( $P_{nt}$ ) <u>d/</u>	Net Social Benefit in Baht/Rai <u>e/</u> risk neutrality	
	(1)	risk aversion	(2)	(3)	risk aversion		(4)	(5)
Nakhon- Ratchasima	82.9	38.6	3.3	79.6	35.3	3448	2745	1217
Khon-Kaen	80.5	42.1	3.5	77.0	38.6	3204	2467	1237
Chaiyaphum	41.3	25.3	5.6	35.7	19.7	2014	719	397
Pooled Northeast Sample	68.2	35.1	4.1	64.1	31.0	2889	1852	896

a/ From Table 11.2. Opportunity cost of capital is assumed 12%.

b/ From Table 11.3.

c/ Column (1) minus Column (2).

d/ From Table 7.1.

e/ Column (3) x Column (4)/100.

Therefore, total change in rice output is expected to be small relative to Thailand's rice output.

Another general equilibrium consideration relates to assumptions regarding the credit market. The above calculation of net social benefits implicitly assumes that newly titled farmers will receive the same amount of credit that is currently available to titled farmers. This implies an infusion of additional institutional credit into the agricultural sector. While credit markets are distorted, the present calculation considers the real opportunity cost of capital. The results imply that the gain in agricultural productivity due to titling accompanied by agricultural credit expansion outweighs the losses in other sectors of the economy (represented by the opportunity cost of capital). Possible developments in the credit market which might accompany land policies are discussed further in the next chapter.

Chapter XI Notes: page 1

1/ A relevant issue is the value of the farmers' time invested in acquiring secure documents. This opportunity cost is not included in the cost calculations of Table 11.1. However, only 15 percent of the sampled recipients of secured documents indicated that the process of obtaining the document was time consuming.

Appendix to Chapter XI

Table A.11.1: Undervaluation of Untitled Land  
With Risk Neutrality

Probability of Eviction ( $\Psi$ )	<u>.03</u>	<u>.05</u>	<u>.07</u>	<u>.03</u>	<u>.05</u>	<u>.07</u>
	$\gamma = .7$			$\gamma = .5$		
Cost of Capital ( $\delta$ )						
.10	.090	.150	.210	.150	.250	.350
.12	.075	.125	.175	.125	.208	.292
.14	.064	.107	.150	.107	.179	.250

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

Appendix to Chapter XI

Table A.11.2: Overvaluation of Titled Land  
When Credit Markets are Distorted

Credit Supply (s)	$s_1 = s_2 = .1$			$s_1 = s_2 = .2$		
	$r=.04$	$r=.06$	$r=.08$	$r=.04$	$r=.06$	$r=.08$
Institutional Interest Rate (r)						
Opportunity Cost of Capital ( $\delta$ )						
.10	.886	.924	.962	.784	.856	.928
.12	.873	.905	.937	.760	.820	.880
.14	.864	.891	.919	.743	.794	.846

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

## Chapter XII.

### Policy Implications

The preceding analyses have demonstrated that land ownership security in Thailand has a substantial impact on farmers' agricultural performance. It was also shown that providing full legal ownership to farmers lacking such status (i.e. squatters) has a very high economic pay-off in most of the areas studied: The benefits far outweigh the relatively small costs of certifying legal ownership. The data also indicated that the main source of higher 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 affecting squatters' productivity in rural Thailand, some observers argue that squatters' productivity can be increased by forcing banks, and especially the government bank, to relax their collateral policies. Even if such a decree could be enforced, it would likely involve a substantial cost in further subsidizing banking operations. Repayment performance on non-collateralized loans is worse than on collateralized loans. As a result, banks will incur higher losses that will have to be covered by the public. More likely, 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 collaterals, and these preferences will not be fully suppressed by bureaucratic interventions.



Similarly, policies which provide squatters with limited formal status (e.g. a non-transferable lease from the state, or usufruct certificate) but which do not entail ability to transfer or mortgage land, will not significantly improve squatters' performance because their access to institutional credit has not been approved. As the analysis of Chapter X demonstrated that in Thailand providing usufruct certificates to squatters in areas where 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 certificate's conditions must be monitored. As the empirical analysis demonstrated, STK recipients do not accrue any economic benefits directly. There is therefore no direct gain to society as there is no increase in agricultural output. Thus, indirect benefits to society must 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. However, the likelihood that the STK program will, by itself, reduce encroachment is doubtful. The root cause of the steady decline in forest areas is population growth in rural areas and insufficient enforcement of restrictions on the use of forest lands. This dynamic process will not be arrested by usufruct certificates. The stipulations of the STK certificates which prohibit further encroachment and which require the recipient to report encroachment by others were the law even before the program. These legal restrictions were not effectively 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. Moreover, if these resources and political backing were now made available, then there is no need for usufruct certificates per se, and the extra costs for issuing and maintaining their records. Instead, the resources could be allocated directly to enforcing forest conservation.

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

Although this study focused on areas where squatters have long been settled, special consideration is warranted for the frontier areas, where squatter encroachment is relatively recent. Some argue that these squatters' ownership perceptions are less secure and that STK certificates, as a form of official recognition, may enhance security perceptions more significantly than in other areas. However, squatters' insecurity in these frontier areas 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 of land rights enforcement have emerged which imply greater uncertainty than

in older established squatter areas. Therefore, the expected positive impact of the STK program in such areas is conditional to the government's effectively asserting its presence and control, rather than on merely issuing certificates. It is arguably unnecessary to spend public resources on providing usufruct certificates, when the policy focus in the frontier areas should be to enhance government control through extending its legal and administrative infrastructure. A policy designed to increase government presence could increase security perceptions without the need for usufruct certificates and the associated costs of issuing them.

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

A logical policy would be to provide full ownership rights to squatters in agriculturally suitable areas that are not expected to be reforested. The effectiveness of such a policy -- if it adopted on a large scale -- would require complementary policies affecting the aggregate supply of institutional credit to agriculture. If squatters are expected to achieve the superior agricultural performance presently enjoyed by titled land owners then they will need a higher amount of institutional credit. Accommodation of this need requires an increase in the supply of institutional credit to agriculture. To assess how such an increase might be achieved, as well as the implications in other sectors, requires a careful review of the Thai institutional credit sector.

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

Direct credit programs maintained by the government form another type of intervention. These programs are sizable (about one-third of total credit), and they attempt to stimulate sectors which are given priority by the government (i.e. housing, agriculture, industrial development, export). Much of the credit administered through direct government programs is even subsidized below the interest rate ceiling. Another form

of intervention are the regulations which 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 a static welfare analysis perspective, they induce investments which may not be viable if the real opportunity cost of capital were considered. Sector-specific subsidies distort investment and input allocations because the effective costs of these factors differ across sectors. Interventions such as sectoral or sub-sectoral targeting of credit volume may also involve welfare losses, since the targeting prevents market forces from determining credit allocation 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 targeting credit to 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 were significantly reduced.

Within this context of credit market distortions, the potential gain in productivity from removing the land market distortion (i.e. eliminating the illegal status of squatters by granting them full ownership) needs to 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 gets less credit, uses lower

factor/land ratios and has a lower level of productivity. With the granting of full ownership, even if the overall supply of credit to agriculture is unchanged, some credit will be shifted at the margin from already titled to newly titled farmers. This would imply an increase in overall output, provided that marginal productivities are declining (a plausible assumption). The gain will be smaller than the presently observed difference in the productivity levels of titled and untitled farmers since the overall amount of credit is held constant.

Some market-determined increase in the supply of institutional credit may occur following the granting of legal ownership to large numbers of squatters. As the pool of farmers-borrowers will be augmented by large numbers of potential clients with viable collaterals, commercial banks may be more inclined to increase lending in agriculture. Such an expectation is supported by data presented in Chapter V showing that a majority of commercial banks' loans to sample farmers were backed by land collateral. Since commercial bank lending is not subsidized, such a credit shift from non-agricultural sectors into agriculture does not necessarily involve a welfare loss. This is because the economic activities which are curtailed, or not undertaken, do not necessarily have a higher return than agricultural activities. Similarly, if subsidized government credit were shifted from non-agricultural sectors to agriculture following a large-scale titling program, there would be no obvious welfare loss. Again, the foregone investments or activities do not necessarily have a higher return. The gain in agriculture following such credit reallocations would be higher than if overall credit supply in the sector were not increased.

A welfare loss would be encountered, however, if additional credit were shifted to agriculture by new decrees on 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 to foregone activities in other sectors may be higher, at the margin, than the return to agricultural activities. The overall productivity gain in agriculture may, however, exceed the welfare loss in other sectors, making such a policy worthwhile. Indeed, the estimates in Chapter XI, which are based on land values and which assume that former squatters obtain additional institutional credit equal to that of titled farmers, show that with several plausible real costs of credit, the net productivity gains from titling can still be substantial. Nonetheless, expanding the extent of distortions in the credit market is not desirable.

Removing interest rate ceilings, or relaxing them considerably, will generate a market-induced increase in the supply of institutional credit to agriculture. Farmers providing collateral will still have an advantage, as collateralized loans are less risky for lenders. Thus titled farmers will have higher productivity even in an unregulated institutional credit market. The difference in productivity will be less because the cost of institutional credit will be higher in the absence of regulations. Provision of full legal ownership to squatters accompanied by relaxation of interest rate ceilings is therefore a socially beneficial policy. These policies will be more effective if administrative and legislative measures are 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 where continuing cultivation causes environmental damage. In these areas control of the land may be better left to the state. It is argued that to grant amnesty to present squatters may encourage further encroachment on forest lands which are not yet cultivated, with additional environmental degradation. However, environmental concerns can be satisfied by a selective coverage of an ownership provision and better enforcement of encroachment control.

Another set of considerations relates to equity issues. 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. Therefore the design and implementation of a policy providing ownership to squatters should contain safeguards against negative equity implications, such as limiting the amount of land which can be claimed. As with any major policy, there will both winners and losers associated with the policies recommended above. Incentives for distorting or curtailing the policy thus exist, and socio-political factors need to 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.



### References

- Adams, D., D. Graham and J.D. Von Pischke (Eds.). Undermining Rural Development with Cheap Credit. Boulder, Colorado: Westview Press, 1984.
- Adams, D. and J. Ladman. "Lending to Rural Poor Through Informal Groups: A Promising Financial Market Innovation?" Paper presented at the 17th International Conference of Agricultural Economists, Banff, Canada, 1979.
- Adams, D. and G. Nehman. "Borrowing Costs and the Demand for Rural Credit," Journal of Development Studies 15 (2), January 1979.
- Aku, P.S. "Lending to Farmers through the Commercial Banks in a Developing Economy: The Nigerian Experience." Agricultural Systems 22 (1986):23-32.
- Arrow, K.J. "Aspects of the Theory of Risk Bearing," Yrjo Johnson Lectures Helsinki, 1965.
- Baron, D. Land Reform in Sub-Saharan Africa: An Annotated Bibliography. Office of Rural Development, U.S. Agency for International Development. Washington, DC, 1978.
- Barro, R. "The Loan Market, Collateral and Rates of Interest," Journal of Money Credit and Banking 8 (4), November 1985.
- Bell, C. and T. N. Srinivasan. "Agricultural Credit Markets in Punjab: Segmentation, Rationing and Spillover," World Bank, RPO-671-89 Working Paper No. 7, June 1985.
- Benjamin, D.K. "The Use of Collateral to Enforce Debt Contracts," Economic Inquiry (16) 3:333-359, July 1978.
- Ben-Porath, Y. "The F-Connection: Families, Friends and the Organization of Exchange," Population and Development Review 6 (1), March 1980.

- Bhisalbutra, L. "Thailand: National Policies for and Objectives of Farm Credit," in Farm Credit Situation in Asia, Asian Productivity Organization, Tokyo, 1984.
- Binswanger, H.P. "Attitudes towards Risk: Experimental Measures in Rural India," American Journal of Agricultural Economics 62 (3):395-407, 1980.
- Binswanger, H., V. Balaramania, B. Rao, M. Bhende and K. Kashirsagar. "Credit Markets in Rural India: Theoretical Issues and Empirical Analysis," World Bank, Agricultural Research Unit Discussion Paper No. ARU-45, July 1985.
- Binswanger, H.P. and M.R. Rosenzweig. "Behavioral and Material Determinants of Production Relations in Agriculture," Journal of Development Studies, forthcoming, 1986.
- Bottomley, A. "Interest Rate Determination," Chapter 27 in J.D. Von Pischke et. al., 1983.
- Braverman, A. and L. Guasch. "Rural Credit Markets and Institutions in Developing Countries: Lessons for Policy Analysis from Practice and Modern Theory," World Development, (forthcoming, 1986).
- Burns, A.F. Report on Land Adjudication in Thailand. ADAB/IBRD Thailand Land Titling Project, Report No. R1, Department of Land, Bangkok, December 1985.
- Clark, R.J. "Problems and Conflicts Over Land Ownership in Bolivia," Inter-American Affairs 22 (4), Spring 1969.
- Collier, Paul. "Malfunctioning of African Rural Factor Markets: Theory and A Kenyan Example." Oxford Bulletin of Economics and Statistics 45 (2):141-173, May 1983.
- David, C. and R. Meyer, "Measuring the Farm Level Impact of Agricultural Loans," in J. Howell (Ed.), Borrowers and Lenders: Rural Financial Markets and Institutions in Developing Countries. London: Overseas Development Institute, 1980.
- Desai, B. "Group Lending in Rural Areas," Chapter 33 in J. Von Pischke et. al., 1983.

Dorner, P. and B. Saliba. "Interventions in Land Markets to Benefit the Rural Poor," Discussion Paper, Land Tenure Center, University of Wisconsin, September 1981.

Feder, Gershon. "The Relation Between Farm Size and Farm Productivity: The Role of Family Labor, Supervision and Credit Constraints." Journal of Development Economics 18 (1985) 297-313.

Feeny, D. The Political Economy of Productivity: Thai Agricultural Development 1880-1975. Vancouver: University of British Columbia Press, 1982.

\_\_\_\_\_. Agricultural Expansion and Forest Depletion in Thailand, 1900-1975. Economic Growth Center, Yale University. June 1984. (Forthcoming in J. Richards and R. Tucker (Eds.), World Forests and the Global Economy in the 20th Century. Durham: Duke University Press, 1987.)

Government of Thailand, Ministry of Agriculture and Co-Operatives, the Foreign Loan Project Office. "Land Reform Areas Development Project, Draft Report." Bangkok, Thailand, October 1980.

Hanson, J.A. and C.R. Neal. "Interest Rate Policies in Developing Countries, 1970-1982," World Bank Staff Working Paper No. 753, 1985.

Inter-American Development Bank (IDB). "Jamaica Land Titling Project - Feasibility Report," January 20, 1986.

Jamison, D. and L. Lau. Farm Education and Farm Efficiency. Baltimore: Johns Hopkins University Press, 1982.

Jimenez, E. "The Value of Squatter Dwellings in Developing Countries," Economic Development and Cultural Change 30 (4), 1982.

\_\_\_\_\_. "Tenure Security and Urban Squatting," The Review of Economics and Statistics LXVI (4):556-567, November 1984.

Kemp, J. "Legal and Informal Land Tenures in Thailand," Modern Asian Studies 15 (1):1-23, 1981.

Ladman, J. "Loan Transactions Costs, Credit Rationing, and Market Structure: The Case of Bolivia," Chapter 9 in D. Adams et. al., 1984.

Lin, S. and B. Esposito. "Agrarian Reform in Thailand: Problems and Prospects," Pacific Affairs 49 (3):425-442, Fall 1976.

Mehl, C. Social and Cultural Aspects of Land Transactions in Rural Thailand. World Bank, Agricultural Research Unit Discussion Paper No. ARU-52, June 1986.

Meyer, R. and Y. Chalamwong. "Off-Farm and Non-Farm Employment in Thailand: A Summary of Key Research Results," Department of Agricultural Economics and Rural Sociology, Ohio State University, Columbus, May 1983.

Miracle, M. "Economic Incentives for Loan Agents," Chapter 24 in J. Von Pischke et. al., 1983.

Mosher, A. T., "Getting Agriculture Moving: Essentials for Development and Modernization," Agricultural Development Council, New York, 1966.

Onchan, T. "Credit Problems of Farmers in Thailand," in Farm Credit Situation in Asia, Asian Productivity Organization, Tokyo, 1984.

Onchan, T. and V. Techavatananan. "Economics of Group Lending in Thailand: A Case Study in Suphanburi Province," Center for Applied Economic Research, Kasetsart University, Bangkok, 1982.

Panandikar, A. Banking in India. Madras: Orient Longmans, 1956.

Plaut, S.E. "The Theory of Collateral," Journal of Banking and Finance, Vol. 9, No. 3:349-475, September 1985.

Ratanakhon, S. "Legal Aspects of Land Occupation and Development in Northern Thailand," in Kundstader, et al. (Eds.), Farmers in the Forest. Honolulu: East-West Center (University of Hawaii), 1978.

Ranong, V.N. Land Title Acquisition: A Case Study of Thailand, Unpublished M.A. Thesis, Department of Economics, Thammasat University, Bangkok, February 1986.

Rosegrant, M. and R. Herdt. "Simulating the Impacts of Credit Policy and Fertilizer Subsidy in Central Luzon Rice Farms, the Philippines," American Journal of Agricultural Economics 63 (4):655-65, 1981.

- Sacay, O. "Credit and Small Farmer Development in the Philippines," Spring Review of Small Farmer Credit: Small Farmer Credit in the Philippines, Vol. 13. Washington, DC: U.S. Agency for International Development, 1973.
- Salas, O. and F. Knight and C. Saenz. "Land Titling in Costa Rica: A Legal and Economic Survey," University of Costa Rica Law School, San Jose, April 1970.
- Seligson, M.A. "Agrarian Reform in Costa Rica: The Impact of the Titles Security Program," Inter-American Economic Affairs 35 (4):31-56, Spring 1982.
- Stifel, D.L. "Patterns of Land Ownership in Central Thailand During the Twentieth Century," Journal of the Siam Society 64 (1), January 1976.
- Stiglitz, J. and A. Weiss. "Credit Rationing and Markets with Imperfect Information," American Economic Review 71 (3), June 1981.
- Tanabe, S. "Land Reclamation in the Chao Phraya Delta," in Y. Ishii (ed.), Thailand: A Rice Growing Society (Trans. by P. Hawkes and S. Hawkes). Honolulu: University Press of Hawaii, 1978.
- Thomson, K.J. and P.B.R. Hazell. "Reliability of Using the Mean Absolute Deviation to Derive Efficient E.V. Farm Plans," American Journal of Agricultural Economics, 54 (3):503-506, 1972.
- Timberg, T. and C. V. Aiyar. "Informal Credit Markets in India," Economic Development and Cultural Change 33 (1), October 1984.
- Tomosugi, T. "A Structural Analysis of Thai Economic History: A Case Study of a Northern Chao Phraya Delta Village," Institute for Developing Economies, Tokyo, 1980.
- Villamizar, F. "IBD Financing in Land Administration Programs," Paper presented at the International Workshop on Land Tenure Administration, Salvador, Brazil, August 20-24, 1984.
- Virmani, A. "Adverse Selection, Competitive Rationing and Government Policy in Credit Markets," World Bank Development Research Department Discussion Paper No. DRD 143, January 1986.

Von Pischke, D. Adams and G. Donald (Eds.). Rural Financial Markets in Developing Countries. Baltimore: The Johns Hopkins University Press, 1983.

Wai, U Tun. "Interest Rates Outside the Organized Money Markets of Underdeveloped Countries," IMF Staff Papers 6 (1):80-142, November 1957.

Williamson, Ian. "Cadastral Survey Techniques in Developing Countries -- With Particular Reference to Thailand." Mimeo, World Bank, Washington, DC. 1983.

Yano, T. "Land Tenure in Thailand," Asian Survey, 1968.

DISCUSSION PAPERS  
AGR/Research Unit

Report No.: ARU 1

Agricultural Mechanization: A Comparative Historical Perspective  
by Hans P. Binswanger, October 30, 1982.

Report No.: ARU 2

The Acquisition of Information and the Adoption of New Technology  
by Gershon Feder and Roger Slade, September 1982.

Report No.: ARU 3

Selecting Contact Farmers for Agricultural Extension: The Training and  
Visit System in Haryana, India  
By Gershon Feder and Roger Slade, August 1982.

Report No.: ARU 4

The Impact of Attitudes Toward Risk on Agricultural Decisions in Rural  
India  
by Hans P. Binswanger, Dayanatha Jha, T. Balaramaiah and Donald A.  
Sillers, May 1982.

Report No.: ARU 5

Behavior and Material Determinants of Production Relations in Agriculture  
by Hans P. Binswanger and Mark R. Rosenzweig, June 1982  
(Revised July 22, 1985).

Report No.: ARU 6

The Demand for Food and Foodgrain Quality in India  
by Hans P. Binswanger, Jaime B. Quizon and Gurushri Swamy, November  
1982.

Report No.: ARU 7

Policy Implications of Research on Energy Intake and Activity Levels with  
Reference to the Debate of the Energy Adequacy of Existing Diets in  
Developing Countries  
by Shlomo Reutlinger, May 1983.

Report No.: ARU 8

More Effective Aid to the World's Poor and Hungry: A Fresh Look at  
United States Public Law 480, Title II Food Aid  
by Shlomo Reutlinger, June 1983.

Report No.: ARU 9

Factor Gains and Losses in the Indian Semi-Arid Tropics: A Didactic  
Approach to Modeling the Agricultural Sector  
by Jaime B. Quizon and Hans P. Binswanger, September 1983  
(Revised May 1984).

Report No.: ARU 10

The Distribution of Income in India's Northern Wheat Region  
By Jaime B. Quizon, Hans P. Binswanger and Devendra Gupta, August 1983  
(Revised June 1984).

Report No.: ARU 11

Population Density, Farming Intensity, Patterns of Labor-Use and  
Mechanization  
by Prabhu L. Pingali and Hans P. Binswanger, September 1983.

Report No.: ARU 12

The Nutritional Impact of Food Aid: Criteria for the Selection of Cost-  
Effective Foods  
by Shlomo Reutlinger and Judith Katona-Apte, September 1983.

Report No.: ARU 13

Project Food Aid and Equitable Growth: Income-Transfer Efficiency First!  
by Shlomo Reutlinger, August 1983.

Report No.: ARU 14

Nutritional Impact of Agricultural Projects: A Conceptual Framework for  
Modifying the Design and Implementation of Projects  
by Shlomo Reutlinger, August 2, 1983.

Report No.: ARU 15

Patterns of Agricultural Projection  
by Hans P. Binswanger and Pasquale L. Scandizzo, November 15, 1983.

Report No.: ARU 16

Factor Costs, Income and Supply Shares in Indian Agriculture  
by Ranjan Pal and Jaime Quizon, December 1983.

Report No.: ARU 17

Behavioral and Material Determinants of Production Relations in Land  
Abundant Tropical Agriculture  
by Hans P. Binswanger and John McIntire, January 1984.

Report No.: ARU 18

The Relation Between Farm Size and Farm Productivity: The Role of Family  
by Gershon Feder, December 1983.

Report No.: ARU 19

A Comparative Analysis of Some Aspects of the Training and Visit System  
of Agricultural Extension in India  
by Gershon Feder and Roger Slade, February 1984.

Report No.: ARU 20

Distributional Consequences of Alternative Food Policies in India  
by Hans P. Binswanger and Jaime B. Quizon, August 31, 1984.

Report No.: ARU 21

Income Distribution in India: The Impact of Policies and Growth in the  
Agricultural Sector  
by Jaime B. Quizon and Hans P. Binswanger, November 1984  
(Revised October 1985).



Report No.: ARU 22

Population Density and Agricultural Intensification: A Study of the Evolution of Technologies in Tropical Agriculture  
by Prabhu L. Pingali and Hans P. Binswanger, October 17, 1984.

Report No.: ARU 23

The Evolution of Farming Systems in Agricultural Technology in Sub-Saharan Africa  
by Hans P. Binswanger and Prabhu L. Pingali, October 1984.

Report No.: ARU 24

Population Density and Farming Systems — The Changing Locus of Innovations and Technical Change.  
by Prabhu L. Pingali and Hans P. Binswanger, October 1984.

Report No.: ARU 25

The Training and Visit Extension System: An Analysis of Operations and Effects  
by G. Feder, R. H. Slade and A. K. Sundaram, November 1984.

Report No.: ARU 26

The Role of Public Policy in the Diffusion of New Agricultural Technology  
by Gershon Feder and Roger Slade, October 1984.

Report No.: ARU 27

Fertilizer Subsidies: A Review of Policy Issues with Special Emphasis on Western Africa  
by Haim Shalit and Hans P. Binswanger, November 1984  
(Revised November 1985).

Report No.: ARU 28

From Land-Abundance to Land Scarcity: The Effects of Population Growth on Production Relations in Agrarian Economies  
by Mark R. Rosenzweig, Hans P. Binswanger and John McIntire, November 1984.

Report No.: ARU 29

The Impact of Rural Electrification and Infrastructure on Agricultural Changes in India, 1966-1980  
by Douglas F. Barnes and Hans P. Binswanger, December 1984.

Report No.: ARU 30

Public Tractor Hire and Equipment Hire Schemes in Developing Countries (with special emphasis on Africa). A study prepared by the Overseas Division, National Institute of Agricultural Engineering (OD/NIAE)  
by P. J. Seager and R. S. Fieldson, November 1984.

Report No.: ARU 31

Evaluating Research System Performance and Targeting Research in Land Abundant Areas of Sub-Saharan Africa  
by Hans P. Binswanger, January 1985.

Report No.: ARU 32

On the Provision of Extension Services in Third World Agriculture  
by Alastair J. Fischer (Consultant), January 1985.

Report No.: ARU 33

An Economic Appraisal of Withdrawing Fertilizer Subsidies in India  
by Jaime B. Quizon, April 1985 (Revised August 1985).

Report No.: ARU 34

The Impact of Agricultural Extension: A Case Study of the Training and  
Visit Method (T&V) in Haryana  
by Gershon Feder, Lawrence J. Lau and Roger H. Slade, March 1985.

Report No.: ARU 35

Managing Water Managers: Deterring Expropriation, or Equity as a Control  
Mechanism  
by Robert Wade, April 1985

Report No.: ARU 36

Common Property Resource Management in South Indian Villages  
by Robert Wade, April 1985.

Report No.: ARU 37

On the Sociology of Irrigation: How do we Know the Truth about Canal  
Performance?  
by Robert Wade, May 1985.

Report No.: ARU 38

Some Organizations Concerned with Animal Traction Research and  
Development in Sub-Saharan Africa  
by Paul Starkey, April 1985.

Report No.: ARU 39

The Economic Consequences of an Open Trade Policy for Rice in India  
by Jaime B. Quizon and James Barbieri, June 1985.

Report No.: ARU 40

Agricultural Mechanization and the Evolution of Farming Systems in  
Sub-Saharan Africa  
by Prabhu L. Pingali, Yves Bigot and Hans P. Binswanger, May 1985.

Report No.: ARU 41

Eastasian Financial Systems as a Challenge to Economics: The Adventures  
of "Rigidity," with particular reference to Taiwan  
by Rober Wade, June 1985.

Report No.: ARU 42

Education, Experience and Imperfect Processing of Information in the  
Adoption of Innovations  
by Alastair J. Fischer, June 1985.

Report No.: ARU 43

A Review of the Literature on Land Tenure Systems in Sub-Saharan Africa  
by Raymond Noronha, July 1985.

Report No.: ARU 44

Policy Options for Food Security.  
by Shlomo Reutlinger, July 1985.

Report No.: ARU 45

Credit Markets in Rural South India: Theoretical Issues and Empirical Analysis.  
by H. Binswanger, T. Balaramaiah, V. Bashkar Rao, M.J. Bhende and K.V. Kashirsagar, July 1985.

Report No.: ARU 46

The Impact of Agricultural Extension: The Training and Visit System in India.  
by Gershon Feder and Roger Slade, June 1985.

Report No.: ARU 47

Methodological Issues in the Evaluation of Extension Impact.  
by Gershon Feder and Roger Slade, July 1985.

Report No.: ARU 48

Estimation of Aggregate Agricultural Supply Response.  
by Hans Binswanger, Yair Mundlak, Maw-Cheng Yang and Alan Bowers August 1985 (Revised October 1985).

Report No.: ARU 49

Land Values and Land Title Security in Rural Thailand.  
by Yongyuth Chalawong and Gershon Feder, June 1985 (Revised October 1985).

Report No.: ARU 50

Land Ownership Security and Capital Formation in Rural Thailand.  
by Gershon Feder and Tongroj Onchan, December 1985 (Revised February 1986).

Report No.: ARU 51

Land Ownership Security and Farm Productivity in Rural Thailand.  
by Gershon Feder, April 1986.

Report No.: ARU 52

Social and Cultural Aspects of Land Inheritance and Transactions in Rural Thailand.  
by Charles B. Mell, June 1986.

Report No.: ARU 53

Land Ownership Security and Access to Credit in Rural Thailand.  
by Gershon Feder, Tongroj Onchan and Tejaswi Raparla, April 1986.

Report No.: ARU 54

The Management of Common Property Resources: Collective Action as an  
Alternative to Privatization or State Regulation.  
by Robert Wade, May 1986.

Report No.: ARU 55

Land Policies and Farm Productivity in Thailand's Forest Reserve Areas  
by Gershon Feder, Tongroj Onchan and Yongyuth Chalamwong, August 1986.

Report No.: ARU 56

On the Determinants of Cross-Country Aggregate Agricultural Supply  
by Hans Binswanger, Yair Mundlak, Maw-Cheng Yang and Alan Bowers,  
September 1986.

Report No.: ARU 57

What Can Agriculture Do for the Poorest Rural Groups? by Hans P. Binswanger,  
and Jaime B. Quizon, September 1986.

Report No.: ARU 58

Population Density, Market Access and Farmer-Generated Technical Change  
in Sub-Saharan Africa by Prabhu L. Pingali and Hans P. Binswanger,  
September 1986.

Report No.: ARU 59

Credit Markets, Wealth and Endowments in Rural South India by Hans P.  
Binswanger and Mark R. Rosenzweig, December 1-5, 1986.

Report No.: ARU 60

Resource Endowments, Farming Systems and Technology Priorities for  
Sub-Saharan Africa by Hans P. Binswanger and Prabhu Pingali, November  
1986.

Report No.: ARU 61

Rural Factor Markets in China After the Household Responsibility System  
Report by Justin Yifu Lin, November 1986.

Report No.: ARU 62

Determinants of Women's Time Allocation in Rural Bangladesh by Shahidur  
R. Khandker, February 1987.

Report No.: ARU 63

Management Problems in Irrigated Java: Beyond Rice Self-Sufficiency  
by Andrew Stone, March 1987.

Discussion Papers  
(continued)

Report No.: ARU 64

Land Rights Systems and Agricultural Development in Sub-Saharan Africa by Gershon Feder and Raymond Noronha, February 1987.

Report No.: ARU 65

Land Registration and Titling from an Economist's Perspective: A Case Study in Rural Thailand by Gershon Feder, February 1987.

Report No.: ARU 66

Land Ownership Security, Farm Productivity, and Land Policies in Thailand by Gershon Feder, Tongroj Onchan and Chira Hongladarom, April 1987.