

DISCUSSION PAPER

Report No.: ARU 49

Land Values and Land Title
Security in Rural Thailand

by

Yongyuth Chalamwong and Garshon Feder

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

June 1985

REVISED October 1985

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 a consultant of the World Bank. 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 by the Bank (RPO 673033); they do not necessarily represent official policy of the Bank. The designations employed and the presentation of material used 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, city, area or of its authorities or concerning the delimitation of its boundaries or national affiliation.

DISCUSSION PAPER

LAND VALUES AND LAND OWNERSHIP
SECURITY IN RURAL THAILAND

by

Yongyuth Chalamwong and Gershon Feder

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

October 1985

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

LAND VALUES AND LAND OWNERSHIP
SECURITY IN RURAL THAILAND

Summary

The paper reviews the development of formal and informal land rights in Thailand over time and describes the present situation in which a significant amount of land is occupied by farmers without legally secured land rights in areas classified as forest reserves. A review of the literature on the economic implications of land rights suggests that farmers lacking secure ownership will have less incentive to invest. Furthermore, due to their inability to use land as a collateral, such farmers will face limited access to credit both for investment and working capital. Consequently, the theory predicts that land which is not legally held by its occupant will be less productive. Since the market price of land reflects its productive potential, a corollary of the received theory postulates that land which is not legally held will have a lower market price, if such land can be traded.

While the literature on this issue is mostly non-formal, the present paper develops a formal model of farmers' land acquisition, investment and input decisions assuming credit rationing. The model generates the propositions of the received theory and clarifies the relation between land values, ownership security, productivity and credit markets. Furthermore, the formal analysis shows that observed land market prices tend to over-estimate the social value of titled (legally held) owned land while they under-estimate the social value of untitled land when formal credit is priced below the opportunity cost of capital and the risk of eviction is positive. This implies that evaluation of the social benefits of land titling cannot utilize land prices without correcting for the distortions. The paper offers formulae for performing such corrections.

The empirical part of the paper utilizes cross-section land price data to estimate econometrically the value of legal ownership in three provinces of Thailand. The estimates take account of a host of variables which might affect land values (e.g., soil quality and distance from markets). The result shows a statistically significant effect of ownership security on land price in all provinces studied. The effect is of substantial magnitude in two provinces, and is much smaller in the third province. In the latter province 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.

The econometric estimates of ownership security are combined with the formulae generated by the formal model to yield estimates of the social benefit of land titling in the three provinces under the study. The calculations show substantial benefits in two of the provinces,

and much lower benefits in the third. The policy implication of the analysis is that allowing farmers to obtain full legal ownership in areas which are classified legally as forest reserve (but which are actually settled and cultivated) is a socially beneficial policy in many provinces, if the administrative cost of providing documentation of legal ownership is not too high.

LAND VALUES AND LAND OWNERSHIP SECURITY IN RURAL THAILAND

I. Introduction

The evolution of individual land rights and enforcement mechanisms to implement and maintain 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 which will allow continuous exploitation of land. Such technologies require investment of both capital and effort, and an incentive must exist for the cultivator to undertake such expenses. Such an incentive is enhanced when the right to continuously cultivate and the ability to transfer a given tract of land by will or by sale is secured not only by social custom but also by an effective state-enforced legal system. Thus, the process of population growth and agricultural progress is typically accompanied with the development of land rights enforcement mechanisms. An almost universal mechanism is a unified system of land registration and documentation 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 power of the state extends to the locality where the farmer operates (i.e., the state can effectively protect the owner from encroachment or false challenges to his ownership), then such a mechanism indeed enhances security.

Agricultural development is almost uniformly accompanied with the emergence of rural credit markets, both formal and informal. Credit

transactions often require the availability of an explicit or implicit collateral. Land is an attractive collateral (Binswanger and Rosenzweig, 1982), provided that the owner-borrower can assure the lender that he has the ability to transfer the land. 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. The purpose of the present paper is to gain both qualitative and quantitative insights on the economic implications of land titling by analyzing land values in rural Thailand. Land values obviously reflect the economic benefits which are generated by land, and are therefore a plausible indicator to investigate when studying the effects of secured (titled) ownership.

The literature dealing with the analysis of values of agricultural land focuses mainly on the situation in the United States [Reinsel and Reinsel (1979); Pope et al.(1979); Barry (1980); Castle and Hoch (1982); Shalit and Schmitz (1982), (1984); Chavas and Shumway (1982); Pope (1985)]. Most authors adopt a simple model whereby land price is the discounted sum of expected net incomes from land. The works by Shalit and Schmitz are of more relevance to the situation in LDCs, since an imperfect capital market is assumed (as is typically the case in the rural sector), and it is shown that land prices will reflect capital market parameters. However, in the U.S., as in all developed countries, land rights are well defined by an elaborate and efficient system of land registration and records of titles. Squatting on public land is rare and enforcement of laws is strict. Thus the above cited literature does not address the implications

of ownership insecurity and the value of titling, which are more relevant in many LDCs, where property rights in the rural sectors are not well defined or not strictly enforced.

A relevant line of work can be found, however, in the analysis of housing values in LDC cities where squatter settlements are common (Jimenez (1982 a, b, 1984)). Housing values in urban centers are analogous to land values in the agricultural context, and the risk of eviction plays a similar role, conceptually, in affecting decisions regarding investment in improved housing or farm capital. The impact of titled land on the supply of credit, however, may be more pronounced in the rural context, and may cause variation in land prices even when the risk of eviction is minimal.

Thailand is an interesting case study on the value of secure ownership since bureaucratic constraints on titling in certain areas created a situation where farmers with and without land documents operate side by side. This offers methodological advantages since a cross-section study can provide the insights that would otherwise require a more complicated time-series analysis. The present paper utilizes cross-section data on land values in rural Thailand in order to estimate the value of ownership security as reflected by the land market. These estimates are used to evaluate the social benefits which may be expected if a policy granting secure legal ownership to squatters is adopted.

The present paper deals with only one aspect of a wider study. Subsequent papers will report empirical work on the link between title security and capital accumulation and on the affect of title on input use and on farm productivity.

The structure of the paper is as follows: The next section presents background on land institutions in rural Thailand. It is followed by an analytical framework and a formal model which underlies the empirical discussion in the subsequent section. Policy implications and conclusions are presented in the last two sections.

II. Development of Land Titling in Thailand

Historically, all land in Thailand belonged, at least theoretically, to the King. Widespread forest clearing, settlement and cultivation were, however, tolerated with few restrictions and little government control until fairly recent times. Traditionally, when land was readily available and agricultural activity was subsistence-oriented, any Thai citizen could claim land to provide for his family, and rights to use land were by custom rather than formally recorded.

As indicated by Feeny (1982), during the first half of the 19th century land was abundant while labor was the scarce resource. Consequently, the economy was characterized by a high land/man ratio. The 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. It is interesting to observe that in that period slaves (and not land) served as collateral for loans.

The second half of the 19th century witnessed a process of transition from property rights in human labor to property rights in land. The process was initiated by the opening of the country to international trade and the increased commercialization of rice production. Land prices

started to appreciate. Title documents for rice land were established in the main rice producing areas in the 1860's through the 1880's. This system was still not satisfactory since it lacked a centrally held land record. Multiple claims and land disputes were common and increasing in frequency because of the expansion of cultivation and increased land value (Tomosugi (1980)). This led to the 1892 land law which significantly improved the security of title but did not yet establish a centralized land registration record, or a system for clear identification of holdings. In 1901 the government adopted the Torrens system of land titling which provided for cadastral surveys and central land record offices. Most of the titling effort was concentrated in the Central Plain. With the new system, the use of land as collateral for loans increased significantly (Feeny (1982, p. 96)). This system prevailed with minor modifications until the passing of the Land Code of 1954. This code defines the powers and duties of the Minister of the Interior and the Department of Lands regarding the allocation and acquisition of state land. It contains procedures for the issuance of documents recognizing title to land and the maintenance of the land register.

According to Yano (1968), the 1954 law stabilized the land tenure system which until then was marked by some degree of confusion due to several contradictory provisions. However, Kemp (1981) claims that successive pieces of legislation with varied interpretations and inconsistent attempts at implementation have created a highly complex situation. In addition, the lack of funds and inadequate administrative infrastructure to provide full titles to all eligible farmers

(problems which afflict many less developed countries) are also characteristic of Thailand. As a result, relatively few farmers have obtained full title, as will be demonstrated below.

According to the 1954 Land Code, there are two major types of secure land documents. These correspond to the two phases of land acquisition, namely, legal possession and utilization. Legal possession is documented in a full and unrestricted title deed called N.S.-4. This document enables the owner to sell, transfer and legally mortgage the land. It is issued on the basis of an accurate ground survey and is registered in the provincial land registrar, with clear identification of the property by boundary mark stones.

The documents related to the phase of utilization are N.S.-3 and N.S.-3K - "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 cannot obtain a full title deed (N.S.-4) if he does not possess an N.S.-3 or N.S.-3K document. The 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 (N.S.-3). After 1972, systematic surveys using unrectified aerial photographs were introduced (N.S.-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 N.S.-3 certificates, proposed transfers must be advertised for 30 days

before the actual transfer. Thus, although the law allows N.S.-3 transfers, according to Kemp (1981, p.9) "the transfer value of the certificate is low and commercial banks do not consider them good security." A similar opinion is expressed by Lin and Esposito (1976, p. 426). These views contrast with Williamson (1983) and Ministry of Agriculture and Cooperatives (1980, p.7) who claim that there is little difference between full title and N.S.-3 and that "banks will lend equally, irrespective of whether the land has a title or a certificate of utilization" (Williamson, p.10). Our own field survey and numerous discussions with farmers and land officers confirm that there is very little distinction between N.S.-3 and N.S.-3K documents, and that both are taken as evidence of legal ownership by banks and buyers.

Since the occurrence of full title deeds (N.S.-4) is practically nil in our study areas, the N.S.-3 and N.S.3-K documents are classified as "Titled Land" in the present analysis. There are several other documents which may provide evidence of supporting a claim of ownership, but do not amount to a document of title. These documents are N.S.-2 (Pre-emptive Certificate authorizing temporary occupation of land), S.K.1 (Claim Certificate), S.T.K (Right to Farm - certificate issued since 1982 by Forestry Department in the Forest Reserves) and several others. All types of land are in practice bought and sold in spite of the fact that some types are not legally transferable. (See Lin and Esposito (1976, p.436), Kemp (1981)). It is simply beyond the capacity of the government to enforce the law.

As indicated earlier, the process of land registration has been rather slow, and only a small proportion (about 12%) of legally cultivated land is covered by full title (N.S.-4). Considering the

area actually cultivated (including illegally cultivated land), the proportion of documented land (i.e., land with either full title or certificate of utilization) is 53 percent. The extent of the titling problem is therefore quite substantial.

A complete classification of lands in Thailand is provided in Table 1.

It is estimated that at least 33 million rai of land (21 % of land under private occupation) officially classified as forest reserve land, is actually under cultivation by squatters ^{1/}. Even though many of these squatters had de-facto possession of the land for 10-20 years, they cannot obtain titles or certificates of utilization. Since these areas can be found side by side with the non-forest reserve areas (i.e. same agroclimatic and geographic areas), it enables us to use a cross-section farm level study without facing the difficulty of measuring the influence of environment and infrastructural differences, or changes over time.

In this study, two different regions, namely, the Central and Northeast of Thailand were selected. There are parts of three provinces in the present study, namely, Lop Buri, Nakhon Ratchasima, and Khon Kaen. The main reason for selecting these provinces was that they contain areas where farmers with secure land ownership (outside forest reserve) and farmers with insecure ownership (inside forest reserve) operate in proximate areas. The sample allows enough variability between farmers within each region, both in terms of title security and differences in economic environment

^{1/} There are instances where tracts of land have been declared as "forest reserve" after they have already been settled and cleared.

Table 1: Classification of Land in Thailand

	Million Rai ^{a/}	%
Total Area of Thailand	320.7	100
<u>Public Land</u>		
Forest Lands ^{b/} (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 (N.S.-3 and N.S.-3K)	64.0	20
Title Deed (N.S.-4)	<u>18.4</u>	6
<u>Total Documented Private Land</u>	<u>82.4</u>	26
Undocumented Land (includes N.S.-2, S.K.-1 and other certificates outside forestry area)	38.9	12
<u>Total Private Land</u>	<u>121.3</u>	38

a/ 6.5 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.

between areas so that hypotheses regarding the role of title security in different regional circumstances can be tested.

Lop Buri province is located in the Central Plain, while the other two provinces are located in the Northeast and are typical of other provinces in that region. The distribution of sample plots by location and type of land document are presented in Table 2. The plots which are located in forest reserve areas across the three provinces are untitled. However, plots located outside of forest reserve are mostly titled. The percentage of titled plots are 86.2, 87.2 and 87.8 for the samples in Lop Buri, Nakhon Ratchasima and Khon Kaen, respectively.

The survey district in Lop Buri was Chai Badan, where most farmers grow upland crops such as cotton, corn, upland rice, sorghum, tobacco and beans. The road from the capital city and the district capital is an all-weather road. Since these areas are about 250 kilometers from Bangkok and there are feeder roads connected to the major road from every surveyed village, it makes these areas highly commercialized in their cropping activities. The area is mostly rainfed with an annual rainfall of about 1070 mm. Most of the sample areas in Lop Buri have good soil conditions compared to the surveyed provinces in the Northeast. Since the forest reserve areas are relatively newly settled, the soil fertility may be slightly better than the area outside the forest reserve.

In Nakhon Ratchasima province, the sampled areas are located in Chok-Chai district. Lands in this district are mixed between upland and lowland. Lowland areas are mostly found in the eastern part of the district.

Table 2: Distribution of Plots by Location and Type of Land Title

Province	Lop Buri		Nakhon Ratchasima		Khon Kaen	
	Plots in Forest Reserve	Plots Outside Forest Reserve	Plots in Forest Reserve	Plots Outside Forest Reserve	Plots in Forest Reserve	Plots Outside Forest Reserve
Untitled Plots (%)	100.0	13.8	100.0	12.5	100.0	12.2
Titled Plots (%) (N.S.-3, N.S.-3K)	-	86.2	-	87.2	-	87.8
Total number of plots owned by sample farmers	781	247	245	287	153	296

The amount of rainfall in this district is about 760 mm, which is less than areas surveyed in the central plains. Rice crops are found among lowland and upland where pump irrigation is possible. The soil types of lowland areas are mostly black and slightly sandy (soils which are suitable for rice). Cassava is the most popular crop grown in upland areas where the soil type is more sandy. The feeder roads connected with rice growing areas are of relatively poorer quality than those connecting the upland areas. However, these areas have the benefit of being located near the agricultural trade center (Korat Terminal Market), especially farmers who grow upland crops.

In Khon Kaen, the Ban Phai and Kranuan districts which are located in the southern and the northern part of Khon Kaen (the provincial capital) respectively were selected for the study. The areas in both districts are mostly upland and hilly areas. Soils in these areas are mostly sandy. The annual rainfall is about 1390 mm. Ban Phai district has been settled somewhat earlier than Kranuan district. Most of the areas are rainfed, and only a few farmers in these districts have access to irrigation. The cropping patterns of the two districts are very similar except that some of the surveyed villages in the Kranuan district have soils suitable for growing sugar cane, a highly profitable crop in that area and are located close to a sugar mill. Upland crops which are typically grown in these areas are Cassava, Kenaf and Corn. Rice can also be grown widely during the wet season, especially the native variety of glutinous rice which is used mostly for domestic consumption. In general the degree of commercialization of the survey areas in Khon Kaen tends to be lower as compared with Lop Buri and Nakhon Ratchasima.

III. Tenure Security, Farm Productivity and Land Values : An Analytical Framework

Many authors point out that the main (and obvious) effect of lack of secure title is to cause uncertainty regarding the land operator's ability to benefit from the investment which he may undertake in order to improve or retain the productive capacity of his farm. Such investment may be in the form of equipment, structures, irrigation infrastructure or land conservation measures. One would expect investment to be negatively related to the level of uncertainty regarding tenure. While in early stages of development de-facto ownership may not imply a substantial uncertainty regarding the ability to utilize the land in the future, uncertainty tends to increase with increased commercialization and the higher income potential brought about by new technology. There is ample evidence that the incidence of land disputes and land grabbing by larger or more powerful farmers (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)). A clear formal title backed by a legal system capable of enforcing property rights is one obvious way to reduce or eliminate the uncertainty regarding tenure duration.

Rigorous quantitative studies focusing on the relation between farm investment, factor ratios, crop composition and tenure (title) security are practically nonexistent. Our survey of the literature identified only one study, pertaining to Costa Rica, which calculated correlations between on-farm investment and an index of tenure security (Salas et al., 1970). These correlations were positive but not statistically significant.

The possible role of secure legal title in providing farmers with access to cheaper, longer-term and more extensive credit is highlighted by many studies. Possession of a land title is often a mandatory precondition for commercial (formal) or official bank loans (U Tun Wai (1957), Dorner and Saliba (1981, p. 23), Sacay (1972)). As noted by Binswanger and Rosenzweig (1982, pp. 19-20), land has a number of attributes which make it a desirable collateral asset. Since lack of clear legal title prevents the mortgaging of land, it is apparent that a secure title may provide easy access to credit, especially from lenders who do not have personal knowledge of and detailed information on the potential borrower. Meyer and Chalamwong (1983) report on the basis of a farm survey in three provinces of Thailand that farmers complain about collateral requirements for obtaining credit. They observe that the problem affects significantly farmers with unclear titles and smaller farmers. It should be noted, however, that titles may increase the supply of both formal and informal credit. Stifel (1976) observes, in his study of land transactions in the Central Plain of Thailand, that there is widespread use of the title certificate as security for loans which are not registered or recognized by law. These "unregistered mortgages" are prevalent in cases where the loan is small and of short duration. The creditors, in these cases, have no legal rights to the land, but their physical possession of the title deeds prevents the true owner from legally transferring ownership to other parties. It also restricts the owner's access to additional credit from other lenders and therefore provides the present creditor with some protection against the possibility that the borrower will incur excessive debt. Such patterns are also well recognized in India. In one village studied by Stifel,

the number of these unregistered mortgages was three times greater than those of the registered mortgages, indicating how widespread this practice is in the highly developed Central Plain region.

It is an empirical fact that nominal interest rates in the informal rural credit market are frequently much higher than those prevailing in the formal market. Informal money lenders in Thailand, in the late 60's, for instance, charged between 36 and 120 percent per annum while the official interest rate was about 15 percent (Ingram (1971)). More recent evidence on the high interest rates in the informal rural sector of Thailand is documented in Onchan (1982) (see also Lin and Esposito (1976, p. 429) and Kemp (1981, p. 15). The present study found that informal interest rates were between 46-52 while formal sector interest rates were 14-16.

Farmers without a secure legal title are (*ceteris paribus*) more risky clients from the point of view of the lender, and one would expect interest rates to be higher for such borrowers (reflecting a higher risk premium). Indeed, in some areas of India, it was observed that lenders charged 8-16 percent on secured loans as against 18-37.5 percent on unsecured loans (Panandikar, 1956, p. 75). However, as explained by Stiglitz and Weiss (1981) interest rates cannot be allowed to rise to equate supply and demand, and credit rationing is optimal.

Like many other aspects of the land title issue, empirical research on the link between titles and use of credit is extremely limited. A study in Costa Rica by Seligson (1982) showed that before the initiation of a titling program, 18 percent of the farms sampled obtained credit while after the program, 31.7 percent had availed of

credit. Credit seems to have improved mainly for larger farms since the average farm size is 19 ha for those who post-title got credit and 7.3 ha for those who did not. These results obviously reflected not only supply changes, but also demand shifts.

Data for Thailand presented by Onchan (1982) show that interest rates paid by farmers from areas where titles are relatively rare (sample composed mostly of illegal squatters) are higher, on average, than interest rates in areas where titles are more abundant. This is compatible with the hypothesis that interest rates are higher for non-titled farmers, but the highly aggregative nature of the data and the different agro-climatic environments of the two samples require appropriate qualifications.

Constrained and more expensive credit tends to yield factor ratios and input levels which are not optimal (compared to situations where there is not a binding credit constraint or where credit is cheaper), as demonstrated by David and Meyer (1980) and Rosegrant and Herdt (1981). These in turn imply that there is a loss of potential output which is a net cost to society due to lack of adequate titling, provided that titles could be granted at a sufficiently low cost.

Efficiency losses due to constrained credit may also be incurred when the optimal mix of farm activities is affected. For instance, in Costa Rica it has been reported that obtaining credit using cattle as a collateral is easier than obtaining credit against a land collateral when the farmer does not possess a full formal title. As a consequence, farmers

without title tend to shift to cattle raising (out of crop production) even though their land may be better suited to grow rice and beans in the absence of credit constraints (Dorner and Saliba (1981, p. 23)). 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 shift to crops which are less intensive in capital (due to inability to purchase farm machinery). Lack of mechanized power may also diminish the potential for double cropping in areas where speedy land preparation between seasons is essential.

The upshot of the discussion above is the hypothesis that title insecurity causes lower farm productivity due to lack of investment incentives and limited access to credit (Dorner and Saliba (1981)). Some commentators view it as a major source of low productivity in agriculture (Mosher (1965)). Major land policy decisions are based on this premise. ^{1/} Empirical evidence linking secure titles directly to farm productivity is rather scant. Salas et al. (1971) found a positive correlation between per acre income and an index of title security in one region in Costa Rica, but a negative correlation in another region. It is obvious that the complexities of the underlying system require more detailed analysis in order to gain insights regarding causality (e.g., it was established that in one area there was a systematic relationship between tenure security and farm size), but data were apparently not sufficient for more rigorous analysis.

^{1/} Fleming (1975) notes, in reference to Kenya's agrarian reform: "The provision of security of tenure as an essential prerequisite to increased productivity was the foundation on which Kenya's successful agricultural programme was built" (p. 49). Interestingly, Okoth-Ogendo (1976), argues in reference to the same program that the change of title status per se had very little effect on farmers' perceptions of their land rights, and on their agricultural activities.

Fleming (1975, p. 55) comments on Kenya's seemingly successful titling program: "It is, of course, difficult to produce proof to show that the increase in productivity was largely due to provision of security of tenure through registration." These difficulties are apparently the reason for the paucity of quantitative empirical research to substantiate the hypotheses regarding title security and farm productivity. There are quite a few intervening factors which need to be considered, as well as the simultaneous interplay of supply and demand for credit.

A recent study of the economic value of title 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 values observed in the latter settlements, with the implication that difference represents the market's valuation of tenure security.

Since the price of land is related to its productive potential over a long horizon, the study of land values offers one possible way to analyze qualitatively the relation between land ownership security and farm productivity. Below, a formal model of farmers' decisions, farm productivity and land prices is developed, to be followed by an empirical analysis. But prior to the construction of the model, we need to confirm

that the basic prerequisites for a relation between title and land values exist in Thailand. That is, we need to confirm that farmers perceive (i) a relation between titles and security of ownership; and (ii) a relation between titles and the supply of credit.

The findings from our survey confirm the above relationships (Table 3). Both titled and untitled farmers state that the most important benefit of having title is its use as collateral for loans. The highest percentage was found in Lop Buri, 74% for all untitled farmers and 83% for all titled farmers. Khon Kaen was next and Nakhon Ratchasima was the lowest, i.e. 54% for all untitled and 49% for all titled farmers. The next ranking benefit of having title was the avoidance of eviction and the minimization of disputes. Untitled farmers in Lop Buri and Nakhon-Ratchasima have put more weight on these benefits than titled farmers. The opposite results regarding these benefits of the two groups were reported in Khon Kaen. Since in Thailand the incidence of eviction from public agricultural land in the past 25 years has been quite infrequent, the data seem to suggest that in the Thai context the main benefit of land documentation is derived through the improved access to credit. Indeed, farmers in our sample were asked whether they have experienced eviction in the past (as well as disputes regarding land boundaries and ownership) and indicated low incidence of eviction (see Table 4). As expected, the incidence of eviction is higher among farmers residing in forest reserve lands in all provinces. The picture is less clear with respect to disputes, probably because the data do not allow differentiation between disputes which have taken place before the land was titled and disputes which took place later.

Table 3: Farmers' Opinion on Principal Benefit of having Land Title

Province	Lop Buri					Nakhon Ratchasima					Khon Kaen				
Opinion Farmer Group	Sample Size	Collateral for Loans	Avoid Eviction	Minimize Disputes	Other	Sample Size	Collateral for Loans	Avoid Eviction	Minimize Disputes	Other	Sample Size	Collateral for Loans	Avoid Eviction	Minimize Disputes	Other
Untitled	89	74	12	10	4	81	54	29	21	6	74	61	19	7	13
Titled	106	83	4	9	4	86	49	20	24	7	112	50	22	17	11

Table 4: Farmers' Experience with Eviction and Disputes

Province Experience	Lop Buri		Nakhon Ratchasima		Khon Kaen	
	All Land Untitled	All Land Titled	All Land Untitled	All Land Titled	All Land Untitled	All Land Titled
	(N=100)	(N=84)	(N=89)	(N=72)	(N=91)	(N=93)
	----- Percent -----					
Evictions	7.0	2.4	9.0	1.4	6.6	2.2
Violent Disputes	1.0	3.6	0	2.8	2.2	2.2
Non-Violent Disputes	12.0	32.1	5.6	6.9	8.8	3.2

Since in this study we focus on the effect of land title security on farm land value, it must be confirmed first that the land market is sufficiently active both in and outside forest reserve areas. We already cited earlier studies suggesting that indeed all types of land (whether legally possessed or not) are being bought and sold. Our survey results (Table 5) confirmed these suggestions. Farmers of both untitled and titled categories had reported significant incidences of land sales. The land market was slightly more active in Lop Buri province as compared to Khon Kaen and Nakhon Ratchasima. The percentage of titled farmers in Lop Buri, who had engaged in land sale in the past was 43% as compared with 30% of untitled farmers. Both farmers in titled and untitled areas of Nakhon Ratchasima province had the same incidences of land sale (10%).

Table 5: Extent of Land Sales by Farmers ^{a/}

Province	Lop Buri	Nakhon Ratchasima	Khon Kaen
Farmer Group			
	----- % -----		
Untitled	30 (89) ^{b/}	10 (81)	22 (74)
Titled	43 (106)	10 (86)	18 (112)

a/ Sales were recorded through farmers' recollection for the period they were decision-makers on the farm.

b/ Numbers in parentheses indicate sample size.

For Khon Kaen province the incidence of land sale by untitled farmers was slightly higher than by titled farmers, i.e. 22% for untitled and 13% for titled farmers. Another indicator of sales activity is given by the way in which different plots of land were acquired by the respondents (Table 6). The percentage of untitled plots which were acquired by purchase was slightly higher than titled plots in all provinces. The farmers of both groups in Lop Buri had the highest percentage of land purchase. Khon Kaen farmers were next and Nakhon Ratchasima farmers were the lowest.

With this background, we can turn now to a formal model of the determination of equilibrium land prices in a market where both titled and untitled land is traded.

Table 6: Percentage of Plots which were Acquired by Purchase

Province	Lop Buri		Nakhon Ratchasima		Khon Kaen	
	Sample Size	Purchase (%)	Sample Size	Purchase (%)	Sample Size	Purchase (%)
(1) Untitled Plots	214	71.5	279	31.1	189	56.3
(2) Untitled Plots ^{a/} within Forest Reserve	156	67.0	163	26.0	110	63.0
(3) Titled Plots	211	69.5	247	24.6	258	44.6

a/ This line is a subset of (1).

IV. The Model

A. Assumptions

(a) Land Market

- (i) Land is of uniform quality but differs in its registration status. Untitled land cannot be transformed into titled land by the farmer.
- (ii) All lands can be bought and sold.
- (iii) Land is divisible. However, due to transportation considerations, the farmer can have either titled or untitled land, but not both.^{1/}
- (iv) The aggregate amounts of titled and untitled lands are fixed.

(b) Credit Market

- (i) Farmers can get long-term credit from institutional sources only. Short-term credit is obtained from both institutional and non-institutional sources. Farmers are credit rationed in both formal and informal markets.
- (ii) Interest rates are fixed.
- (iii) The supply of long-term credit is related to the value of titled land owned, which serves as a 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

^{1/} This assumption is made for simplification. Alternatively, one could construct a portfolio model where farmers may acquire both types of land. The samples in our study areas indicated that most farmers have only one type of land.

value of land owned, whether titled or not.

- (iv) Long-term credit can be used (together with initial wealth) to finance land purchase and investment in capital.

Short-term credit is used for variable inputs.

(c) Production

- (i) The production function exhibits constant returns to scale in land, capital and variable inputs.

(d) Farmers

- (i) Farmers maximize the terminal value of the farm over a lifetime. They start with a given initial endowment of wealth and have to make a choice whether to purchase titled or untitled land. Given the choice of the type of land, farmers decide the amount of land to be purchased (which determines the volume of investment in capital, given the constraint on long-term credit.

B. Notation

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 inputs

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 value of farm

: 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 net of outstanding long-term debt.
- r_1 - interest rate on long-term institutional credit.
- r_2 - interest rate on long-term institutional credit.
- m - amount of short-term non-institutional credit per acre of land owned.
- c - interest rate on non-institutional credit.
- W_0 - initial wealth.

C. Development of Model Results

Initially, it is assumed that the only difference between titled and untitled land is the improved access to credit. In the subsequent section, the risk of eviction will be added. The purpose of the present section is to demonstrate the implications of credit constraints related to procedures of granting formal credit.

We start with the optimization problem of a farmer who chooses to purchase untitled land (prices of output and inputs are assumed unity for convenience).

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

subject to

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

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

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:

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

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

The first order condition for optimum is:

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

Second order conditions for optimum are satisfied since

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

Differentiation with respect to the price of land P_{nt} verifies that the demand for untitled land is negatively related to the price, since

$$(7) \quad \frac{dA_{nt}}{dP_{nt}} = \left[\frac{\partial^2 V_{nt}}{\partial A_{nt}^2} \right]^{-1} \cdot \left[\frac{\partial y_{nt}}{\partial k_{nt}} - \frac{\partial y_{nt}}{\partial x_{nt}} - [1 - (1+c) \cdot m] - \frac{W_o}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} + \frac{W_o}{A_{nt}} \cdot \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right] =$$

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

where use has been made of eq. (5).

The term enclosed in the curly brackets is positive due to the concavity of the per-acre production function. Concavity also implies that the second derivative with respect to each production input is negative. The cross derivative is positive if factor complementarity is assumed between capital and variable inputs. Given that second-order conditions are satisfied, it is verified that the demand for land is negatively related to its price. It can also be shown that the optimal ratio of capital per acre of untitled land is positively related to the price of untitled land, but the overall capital per farm (given the initial assets) will decline with higher land prices. It should also be noted that there is a unique value of capital per acre (given the price of land) which is

compatible with the first order condition (5), and which is independent of the level of initial assets or of farm size. Finally, it can be trivially shown that given the price of land, the demand for land is proportionate to initial assets.

Comparison of the first order conditions and the objective function shows that the optimal terminal value of the form, say V_{nt}^* , is equal to the value of initial assets multiplied by the return to investment, i.e.:

$$(8) \quad V_{nt}^* = W_o \cdot \frac{\partial y_{nt}}{\partial k_{nt}}$$

The optimal terminal value of the farm is negatively related to the price of land since differentiation of equation (8) yields

$$(9) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_o \cdot \left[- \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} \cdot \left(\frac{W_o}{A_{nt}} \cdot \frac{dA_{nt}}{dP_{nt}} + 1 \right) + \frac{\partial^2 y_{nt}}{\partial k_{nt} \partial x_{nt}} \cdot m \right]$$

Using equation (7) in eq. (9) obtains

$$(10) \quad \frac{\partial V_{nt}^*}{\partial P_{nt}} = W_o \cdot \left[- \frac{1}{P_{nt}} \cdot \frac{A_{nt}}{W_o} \cdot \left\{ y_{nt} - \frac{\partial y_{nt}}{\partial k_{nt}} \cdot \left(\frac{W_o}{A_{nt}} - P_{nt} \right) - \frac{\partial y_{nt}}{\partial x_{nt}} \cdot P_{nt} \cdot m \right\} + \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt}}{\partial k_{nt}^2} - \frac{\partial^2 y_{nt} \cdot m}{\partial k_{nt} \partial x_{nt}} + \frac{\partial^2 y_{nt} \cdot m}{\partial k_{nt} \partial x_{nt}} \right] < 0$$

We turn now to characterize the optimization problem in the case that the farmer decides to buy titled land. The objective function is

$$(11) \quad \text{Max}_{A_t} V_t = Y(A_t, K_t, X_t) + P_t A_t - (1+r_1) \cdot s_1 \cdot P_t \cdot A_t - (1+r_2) \cdot s_2 \cdot (P_t \cdot A_t - s_1 \cdot P_t \cdot A_t) - (1+c) \cdot m \cdot P_t \cdot A_t$$

subject to

$$(12) \quad P_t \cdot A_t + K_t = W_o + s_1 \cdot P_t \cdot A_t$$

$$(13) \quad X_t = s_2 \cdot (P_t \cdot A_t - s_1 \cdot P_t \cdot A_t) + m \cdot P_t \cdot A_t$$

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

$$(14) \quad \text{Max}_{A_t} V_t = A_t \cdot \left\{ y \left[\frac{W_o}{A_t} - (1-s_1) \cdot P_t, s_2 \cdot (1-s_1) \cdot P_t + m \cdot P_t \right] + P_t \cdot \left[1 - (1+r_1) \cdot s_1 - (1+r_2) \cdot s_2 \cdot (1-s_1) - (1+c) \cdot m \right] \right\}$$

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 quite similar to equation (5)

$$(15) \quad \frac{\partial V_t}{\partial A_t} = y_t - \frac{W_o}{A_t} \cdot \frac{\partial y_t}{\partial k_t} + P_t \cdot \theta = 0$$

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

In a manner analogous to the analysis above, it is possible to demonstrate that the demand for titled land is negatively related to the price of titled land. Capital per acre is positively related to the price of land and is independent of initial wealth or of farm size. The demand for land is proportional to initial wealth at any given price.

Having observed that in the case $s_1=s_2=0$ there is no distinction between the situation on titled and untitled land^{1/}, it can be shown that with positive values of s_1 and s_2 the optimal level of terminal farm value is higher on titled lands, holding land price fixed. It is easy to show, using equations (14) and (15) that, in analogy to the case of untitled land,

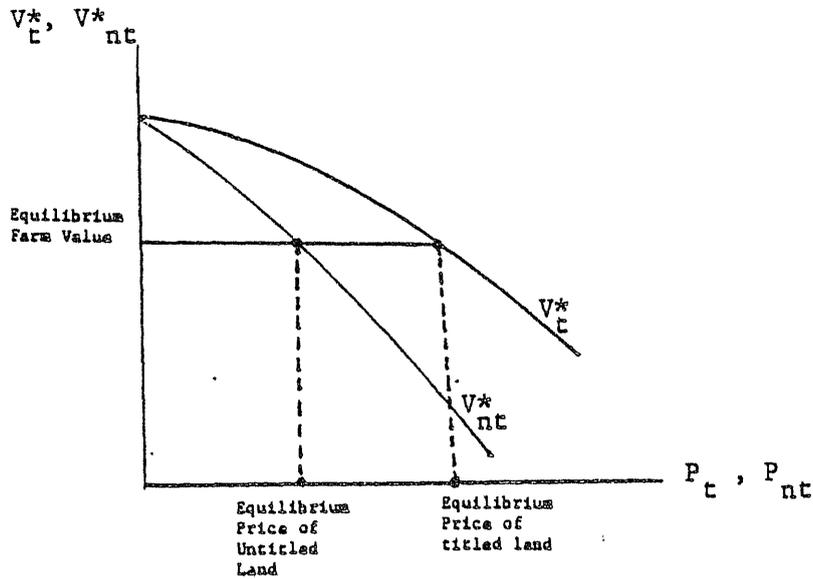
$$(16) \quad V_t^* = W_o \cdot \frac{\partial y_t}{\partial k_t}$$

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

Also, in analogy to the case of untitled land, it can be shown that $\frac{dV_t^*}{dP_t} < 0$, i.e., the terminal value of the farm on titled land is negatively related to the price of 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 $\frac{dV^*}{ds_i} > 0$, then, with $s_1 > 0, s_2 > 0$, for any given land price (identical for titled and untitled land) it must hold $V_t^* > V_{nt}^*$. But for equilibrium to prevail, the farmer must be indifferent between establishing his farm on titled or untitled land, i.e., equilibrium requires $V_t^* = V_{nt}^*$, otherwise all farmers will prefer one type of land, and the price of the other type will drop until the equality between optimal terminal land values is established. This implies that at equilibrium, the price of titled land must be higher than the price of untitled land, as intuition would suggest. This is demonstrated in Figure 1.

Figure 1

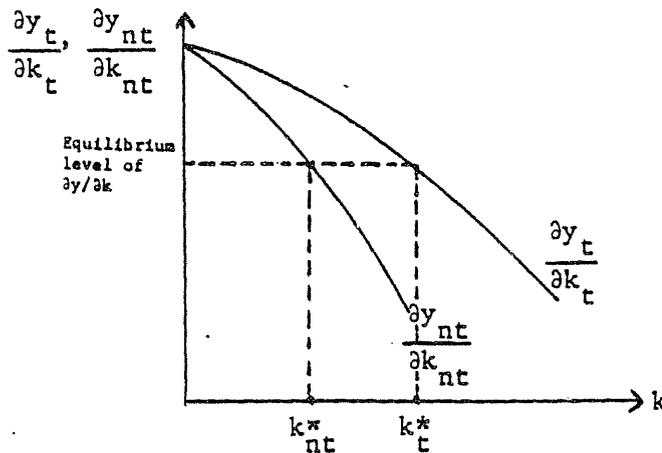


Another conclusion which can be derived from the equilibrium condition is that at equilibrium, output per acre of titled land is higher than output per acre of untitled land. This is seen by observing that $y_t^* = y_{nt}^*$ implies (using equations (8) and (16)).

$$(17) \quad \frac{\partial y_t}{\partial k_t} [k_t, (1-s_1) \cdot s_2 \cdot P_t + m \cdot P_t] = \frac{\partial y_{nt}}{\partial k_{nt}} (k_{nt}, m \cdot P_{nt})$$

Clearly, the amount of per acre variable inputs on titled land is higher than the amount on untitled land as $P_t > P_{nt}$ and $(1-s_1) \cdot s_2 > 0$. But given the production complementarity between capital and variable inputs $\frac{\partial^2 y}{\partial k \partial x} > 0$ and it must hold that for any given level of capital per acre the marginal productivity of capital on titled land will be higher than the marginal productivity of capital on untitled land. The equality (17) can thus hold only if $k_t > k_{nt}$, because the marginal productivity is decreasing in capital due to the concavity of the per-acre production function. This is depicted in Figure 2.

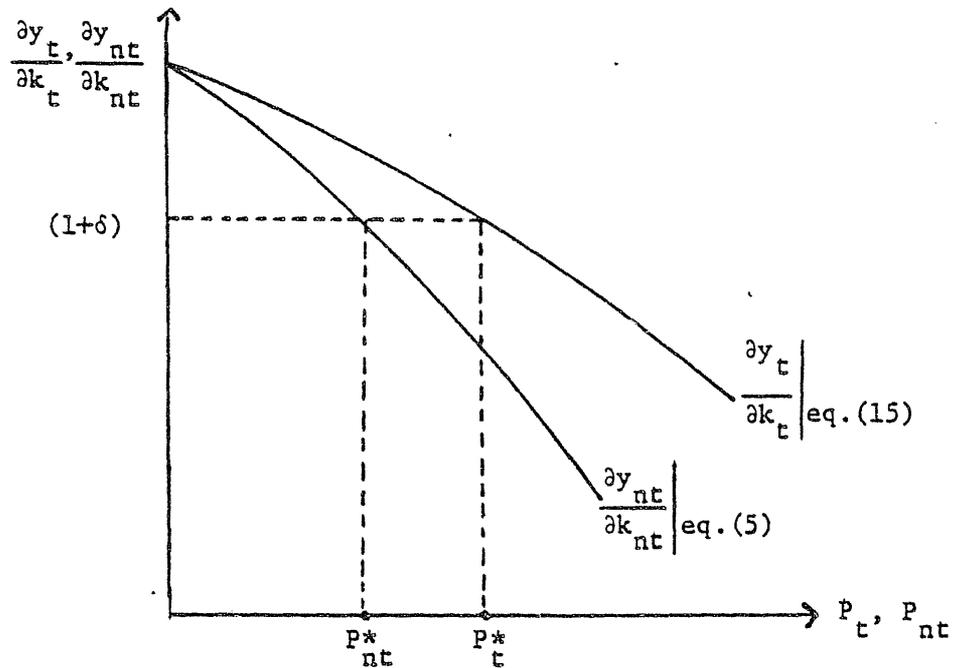
Figure 2



Since both the variable input per acre and capital per acre are higher (at equilibrium) on titled lands, it follows that output per-acre on such land is higher, i.e., $y_t^* > y_{nt}^*$ (where asterisks denote equilibrium level).

The above characterization of equilibrium does not specify the determination of unique equilibrium prices. One simple way of "closing" the model is by considering a third investment opportunity, not related to land cultivation, with a fixed rate of return, say δ . In equilibrium it must hold that both sides of equation (17) equal $(1+\delta)$, and since each of the two sides of the equation depends on land price only, a unique pair of equilibrium prices results. This is illustrated in Figure 3.

Figure 3



Introducing the risk of Eviction

We now expand the model by assuming that there is a non-zero (say ψ) probability that farms established on untitled land will lose a proportion, say $1-\gamma$, of the land due to eviction. Since the model does not allow a distinction between periods prior and after eviction, it is assumed that if eviction takes place, a proportion $1-\gamma$ of output is lost as well. The characterization of the objective function should incorporate risk preferences, and a simple way of accommodating this requirement is by assuming a mean-standard deviation utility function [Thomson and Hazell (1972)]. The utility function (say 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 farm value, and ϕ is a risk aversion parameter. Under risk-neutrality $\phi=0$, while under risk-aversion $\phi>0$.

It can be shown that

$$(18) \Sigma_{V_{nt}} = \psi^{1/2} \cdot (1-\psi)^{1/2} \cdot (1-\gamma) \cdot (y_{nt} + P_{nt}) \cdot A_{nt}$$

The objective function for farmers settling on untitled land when there is a risk of eviction is therefore:

$$(19) \text{Max } E(U_{nt}) = (1-\psi) \cdot A_{nt} [y_{nt} + P_{nt} - (1+c) \cdot m \cdot P_{nt}] + \psi \cdot A_{nt} \cdot [\gamma \cdot y_{nt} + \gamma \cdot P_{nt} - (1+c) \cdot m \cdot P_{nt}] - \phi \cdot \psi^{1/2} \cdot (1-\psi)^{1/2} \cdot (1-\gamma) \cdot (y_{nt} + P_{nt}) \cdot A_{nt}$$

The first order condition for maximum is

$$(20) [1-\psi \cdot (1-\gamma) \cdot (1+\lambda)] \cdot [y_{nt} - (\partial y_{nt} / \partial k_{nt}) \cdot (k_{nt} + P_{nt}) + P_{nt}] = (1+c) \cdot m \cdot P_{nt}$$

where $\lambda \equiv \phi \cdot (1-\psi)^{1/2} \cdot \psi^{-1/2}$. The term $\psi \cdot (1-\gamma) \cdot \lambda$ can be referred to as a risk-aversion premium, since it would vanish under risk neutrality.

Using equations (19), (20) and the budget constraint

$W_0 = K_{nt} + P_{nt} \cdot A_{nt}$, it can be shown

$$(21) E(U_{nt}^*) = W_0 \cdot [1-\psi \cdot (1-\gamma) \cdot (1+\lambda)] \cdot (\partial y_{nt}^* / \partial k_{nt}^*)$$

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, combining equations (16) and (21), obtains

$$(22) \quad \frac{\partial y_t^*}{\partial k_t^*} = [1 - \Psi \cdot (1-\gamma) \cdot (1+\lambda)] \cdot \left(\frac{\partial y_{nt}^*}{\partial k_{nt}^*} \right)$$

As before, it can be shown that $E(U_{nt}^*)$ is decreasing in the price of untitled land. It can be further shown that even if $s_1=s_2=0$, equilibrium requires that $P_t > P_{nt}$ (provided $\Psi > 0$, $\gamma < 1$), and that capital per acre and yields on untitled farms will be less than on titled farms.

V. Empirical Results

The model presented in the preceding section generates the (intuitively appealing) hypothesis that titled land will have a higher price than untitled land of identical quality. Obviously land of lower productive quality (e.g. poorer soil) or land located less favorably (e.g. further away from the market for output) will sell for a lower price, given the title status. In order to test these hypotheses, data were collected from a sample of land owners on the value of their land. The sample included both titled and untitled tracts, and the farmers were asked to assess the market value of the land given its actual registration status and its quality. In addition, farmers were asked what would the price have been if the land were to have a counter-factual registration status (e.g. owners of titled land were asked what would have been the price of the same tract if it did not have a title).^{1/} Table 7 records the mean prices of land utilizing

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

both factual and counter-factual assessments. The data are broken down by registration status and by a broad classification of quality, namely, lowland/upland. In the local jargon, lowland is a term referring generally to better lands, suitable for growing paddy rice and other crops which cannot be grown on uplands. It is, therefore, expected that lowlands will be more valuable than uplands. ^{1/} The Table confirms that the price of untitled land is substantially lower than the price of titled land and the price of upland is lower than the price of lowland. Of particular interest is the ratio, for a given tract of land, of its price without title to its price with title. This ratio is independent of the various attributes of the land. The mean ratios for the sample are reported in line (iii) of Table 7, and range from .52 to .64. The figures in Table 7 are subject to qualification, since they include both assessment of the price under the present registration status and the counter-factual price. It may be argued that land owners may be more accurate in assessing the value of the land under its present status, while they may exaggerate the impact of a hypothetical change in the registration status. Table 8 therefore records the mean prices utilizing only the price referring to the actual registration status of land. Except for the small sample of lowland tracts in Lop Buri province, (where mean prices of titled and untitled land are practically the same) the figures in the Table confirm the hypotheses.

^{1/} Taxes on agricultural land are extremely low in Thailand amounting to less than a quarter of one percent. They, therefore, have negligible effect on land value.

Table 7: Price Of Land (Includes Statements of All Farmers)

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen	
Plot Document Status	Lowland (N=79)	Upland (N=352)	Lowland (N=186)	Upland (N=350)	Lowland (N=186)	Upland (N=261)
Price Without N.S.3, N.S.3-K (Baht/Rai) <u>a/</u>	2978	2315	5434	3794	4140	3145
Price With N.S.3, N.S.3-K (Baht/Rai)	4801	3927	10079	7459	7046	5557
Mean Ratio of Price Without to Price With Document	.638	.629	.565	.521	.601	.571

a/ In 1985 the rate of exchange was 28 Baht per US\$.

Table 8 : Price of Land (Statement of Farmers Taken
Only If Referring To Their Present Situation)

Province	Lop Buri		Nakhon Ratchasima		Khon-Kaen	
	Lowland	Upland	Lowland	Upland	Lowland	Upland
Price Without N.S.3, N.S.3-K (Baht/Rai) ^{a/} (Sample Size)	3638 (42)	2632 (173)	4210 (58)	3251 (225)	4421 (48)	2787 (140)
Price With N.S.3, N.S.3-K (Baht/Rai) (Sample Size)	3599 (37)	3425 (179)	11085 (128)	9291 (125)	7086 (138)	6156 (121)

^{a/} In 1985 the rate of exchange was 28 Baht per US.\$

As a further check on the plausibility of prices reported by farmers, village headmen in the study area were asked to provide average land prices prevailing in their villages for six categories of land (irrigated and unirrigated lowland, upland, by title status). The means of these prices are reported in Table 9, and again the results demonstrate, for all categories of land, that titled land is substantially more expensive than untitled land.

Comparisons of average prices are valid only if the distribution of various attributes of land which may affect the price are identical. In order to remove this rather restrictive assumption, we utilize the data on the attributes of each tract provided by the farmers in a hedonic price analysis. By entering the title status of each tract as a dummy variable, the ceteris-paribus effect of title security can be estimated. In fact, an even more refined hypothesis can be tested using this approach: there are some holdings in the sample which are not titled, but which are located outside the boundaries of the forest reserves. These tracts can be titled and there is at present no risk of eviction to the owner. The perceived security of ownership of these plots is fairly similar to that of titled plots as far as the owner is concerned, since there is no governmental challenge to their land rights. However, in the absence of formal ownership documents, institutional lenders must treat the owners of such holdings the same as farmers with holdings in forest reserve areas. It can be shown in the framework of the model developed in the preceding section that such holdings will have a price lower than that of titled land, but higher than the price of untitled land which is located in forest reserve (and which is therefore subject to a risk of eviction). Technically, a dummy variable is introduced in the regression (in addition to the dummy variable representing title) which takes the value one if the tract is untitled, but is

Table 9: Mean Land Prices as Reported by Village Headman (Baht/Rai)

Province (document status)	Lop Buri		Nakhon Ratchasima		Khon Kaen	
	with document	without document	with document	without document	with document	without document
Type of land						
Irrigated lowland	5100	3300	12325	6700	n.a.	n.a.
Unirrigated lowland	3970	2265	8675	4200	6816	4789
Upland	2950	1740	4300	1775	4316	2200
Mean Ratio of price without document to price with document:						
Irrigated lowland		.670		.590		n.a.
Unirrigated lowland		.609		.511		.663
Upland		.607		.506		.628
Sample size		20		20		20

located outside forest reserve. We hypothesize that the coefficient of this variable is positive but smaller in size than the coefficient of title.

The set of land characteristics which may affect productivity or farm gate prices are :

a. Natural attributes:

- (i) Soil type (black, not black).
- (ii) Slope (flat, not flat).

a. Natural Attributes (Cont'd)

- (iii) Lowland/upland.
- (iv) Irrigation (year-round irrigation, seasonal irrigation, rainfed).
- (v) Suitable for sugarcane (only in Khon Kaen province).

b. Land Improvements

- (i) Bunds.
- (ii) Land levelled by farm machinery.
- (iii) Fruit trees present on the land.
- (iv) Cleared of stumps.

c. Location and Transportation

- (i) All weather road to the nearest market.
- (ii) Time required to reach the nearest market.
- (iii) All weather road to the village.
- (iv) Time required to reach the village.

Most of the variables listed above affect the productive potential of the land or the cost of cultivation (e.g., slope, bunds). Fruit trees provide an additional source of income. Favorable location increases the farm gate price of output or reduces the effective cost of inputs. Suitability for sugar cane cultivation can possibly affect land price since the

crop is highly profitable, but not all tracts meet the moisture and soil requirements to allow cultivation of the crop.

The specification of hedonic price equations is arbitrary, as there is no theoretical formulation of the price equation. Most of the analyses of farm land prices have used a linear or logarithmic formulation. Since most of the explanatory variables in the present study are categorical (dummy), the difference between logarithmic and linear specifications is reflected only in the dependent variable and two explanatory variables. ^{1/}

Results of the logarithmic and linear regressions are presented in Table 10. Results do not differ qualitatively between these two specifications, but the logarithmic formulation seems to provide a better fit and the interpretations below correspond to it.

It is eminently clear that legal title is a most significant factor in explaining the variation in land prices. In all three provinces, the parameter for title is significantly greater than zero with 99% confidence level. There is a substantial difference between Lop Buri province where the value of the parameter is less than one-third of its value in the other two provinces. Possible reasons for this difference will be discussed below.

^{1/} In urban housing research, Box-Cox procedures are used to estimate the maximum likelihood non-linear formulation of the hedonic price equation, where at the limit a logarithmic formulation emerges (Jimenez, 1984). We experimented with a range of such transformations and concluded that they vary very little with respect to their implications regarding the key explanatory variables (title and location in forest reserve), and in overall explanatory power.

Table 10 : Parameter Estimates from Hedonic Price Analysis

Variable	Province	Logarithmic Formulation			Linear Formulation		
		Lop-Buri	Nakhon-Ratchasima	Khon-Kaen	Lop-Buri	Nakhon-Ratchasima	Khon-Kaen
<u>(i) Ownership security variables</u>							
Title (D) ^{a/}		.2264 (5.48) ^{b/}	.8431 (14.29)	.7605 (11.10)	.6978 (5.24)	5.200 (11.45)	3.099 (9.31)
Untitled out of forest reserve (D)		.0516 (.67)	.1597 (1.63)	.2018 (1.77)	.3652 (1.49)	.5259 (.68)	.8876 (1.60)
<u>(ii) Natural attributes</u>							
Black soil (D)		.0351 (.55)	.1855 (2.84)	.0424 (.51)	.0640 (.31)	1.045 (2.05)	.0213 (.03)
Flat slope (D)		.0516 (.90)	.0102 (.18)	.1210 (1.66)	.2247 (2.48)	.2122 (.4849)	.6819 (1.92)
Lowland (D)		.1722 (2.51)	-.0304 (.47)	.1257 (1.70)	.5545 (2.48)	-.3124 (.61)	.3127 (.86)
Year-round irrigation (D)		.1398 (2.29)	.2884 (2.60)	.1112 (.62)	.4440 (2.24)	2.613 (3.02)	-.0713 (.08)
Seasonal irrigation (D)		.0865 (1.79)	.2723 (4.30)	-.0454 (.25)	.2355 (1.50)	1.7670 (3.59)	.6577 (.73)
Suitability for sugarcane (D)		<u>c/</u>	<u>c/</u>	.0450 (.51)	<u>c/</u>	<u>c/</u>	-.2610 (.60)
<u>(iii) Land improvements</u>							
Bunds (D)		-.0579 (1.21)	.4148 (6.80)	.2474 (3.48)	-.1830 (1.17)	1.799 (3.755)	1.160 (3.347)
Levelling (D)		.1030 (1.75)	-.0122 (.20)	-.076 (.93)	.4540 (2.37)	-.3572 (.74)	-.7082 (1.77)
Fruit trees (D)		.0649 (1.47)	-.0082 (.15)	.0751 (1.17)	.2684 (1.94)	-.5887 (1.34)	.2632 (.34)
Cleared of stumps (D)		<u>d/</u>	.1226 (1.69)	.0163 (.22)	<u>d/</u>	.9176 (1.64)	.4839 (1.32)
<u>(iv) Location and transportation</u>							
All-weather road to market (D)		<u>d/</u>	.1027 (1.32)	.2122 (2.25)	<u>d/</u>	.6627 (1.09)	1.148 (2.49)
Travel time to market		-.1053 (3.62)	.0395 (1.19)	.0012 (.027)	-.0082 (3.10)	.0031 (.63)	-.002 (.04)
All-weather road to village (D)		.0937 (2.19)	.0924 (1.88)	-.1005 (1.46)	.3209 (2.51)	.4542 (7.18)	-.5182 (1.548)
Travel time to village		-.0277 (1.57)	-.0440 (1.67)	-.0355 (1.14)	-.0001 (.02)	-.0031 (.46)	.0058 (.91)
<u>(v) Constant</u>							
		1.1910 (10.24)	.5316 (2.78)	.6659 (2.77)	2.482 (13.40)	.7252 (.76)	1.207 (1.71)
R ²		.183	.578	.389	.163	.440	.320
F - value		7.165	47.410	17.090	6.261	27.270	12.67
no. of observations		431	536	447	431	536	447

^{a/} (D) = Dummy variable.

^{b/} Numbers in parentheses are student "t" values.

^{c/} Sugarcane not grown in the province.

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

The parameter of the dummy variable for untitled plots outside of forest reserve is positive and significantly smaller (at the 95% confidence level) than the parameter of titled land, as hypothesized for all three provinces. It is significantly greater than zero in Nakhon Ratchasima and Khon Kaen provinces (at 94% and 95% confidence levels, respectively) implying that untitled land outside of forest reserve is more valuable than untitled land in forest reserve, apparently because ownership is not challenged by the state and there is no risk of eviction. In Lop Buri province, there is no statistically significant difference between the value of untitled land within and outside the forest reserve, but the parameter for the latter type of land is about one-fifth of the parameter of title, a ratio almost identical to that which is observed in the other two provinces. Following the interpretation discussed above, the results suggest that the value of title which is due to security from eviction is only a small component (one-fifth) of the total value of title, and most of the value derives from improved access to credit. One should qualify this assertion however, if account is taken of the possibility that land disputes among individuals may be more frequent on untitled tracts. In that case, some of the value of title which we attribute to credit advantages is in fact due to protection from the cost of disputes.

The results for the other explanatory variables are mostly reasonable: out of 38 parameters estimated (for the three provinces combined), 29 have the expected sign, and of those that have a counter-intuitive sign none are (statistically) significantly different from zero. Among the parameters with the expected sign, 17 are significant at the 95% (one tailed) confidence level.

As a further check for the robustness of the results with respect to quantitative importance of titles, we replicated the method applied by Jimenez (1984). That is, the parameters of land characteristics are estimated within the sub-sample 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. ^{1/} The prediction is that, if these plots were titled, the imputed value would have reflected their sale value. Calculating the difference between the imputed value and the actual (observed) value, and averaging over the sub-sample of untitled plots, one obtains an estimate of the value of title. Similarly, if parameters of land characteristics are obtained by regression utilizing the sub-sample of untitled holdings, imputed values of titled holdings can be generated, and the mean difference between actual and imputed values can be calculated. The results of this procedure are presented in Table 11, which demonstrates remarkable robustness, as compared to Table 10. Not only are the rankings of estimated parameters across provinces similar, but in two provinces the mean differences between the imputed values of land and the actual values are within an interval of plus/minus one standard deviation from the estimate of Table 10. In the third province 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. Expressed as percent of titled land price, the regression results imply that the value of untitled land is eighty, forty-three, and forty-seven of the value of titled in Lop Buri, Nakhon Ratchasima and Khon Kaen, respectively.

^{1/} More precisely, the logarithm of price is imputed.

Table 11 : Alternative Estimates of the Value Title a/

Method	Province		
	Lop Buri	Nakhon Ratchasima	Khon Kaen
Direct Estimate (from Table 10)	.226	.843	.760
Estimate based on imputation from titled to untitled sub-sample	.252	.779	.725
Estimate based on imputation from untitled to titled sub-sample	.195	.925	.723

a/ The estimates are expressed in terms of the logarithm of price.

VI. Policy Implications

Having estimated the impact of titles on land prices, we turn now to evaluate two policy variables in the framework of the model of Section IV. The evaluation must consider two different time horizons which are defined with respect to farmers' ability to change asset composition and production decisions. We define the short-run as a period in which farmers cannot change their land holdings or volume of capital. In the long run, however, no constraints prevail.

An expansion of short-term institutional credit would imply in the short run (under the assumption that the credit constraint is binding) higher use of the variable input on titled lands and thus higher output per acre. Clearly, such a change would cause disequilibrium, since owners of titled lands gain more (with given initial wealth) than owners of untitled lands (and more than the reference yield to initial wealth). This will cause upward pressure on the price of titled lands in the longer run. In the context of Figure 3, an increase in s_2 , the parameter of short-term credit, is reflected by an upward shift of the curve $\left\{ \frac{\partial y_t}{\partial k_t} \Big|_{\text{eq. (15)}} \right\}$, and it is obvious that as a consequence the long-run equilibrium price of titled land will increase. It can be shown further that the new equilibrium level of capital per acre on titled land will be higher (given the complementarity between variable inputs and capital), thus, in the long-run output per acre will be higher as a result of the credit expansion:

An increase in long-term credit (s_1) will not have short-term effects in the present model if it is not accompanied with an increase in

the availability of short term credit. It can be shown that the equilibrium price of land will increase. This is so because the increase in profits afforded by higher credit availability would increase the terminal value of a farm established on titled land (and increase the demand for such land). The increase in land prices brings the terminal value down to the equilibrium level. It can be shown further that the optimal ratio of capital per acre on titled land does not necessarily increase as a result of improved long-term credit availability and, may in fact decline, because the optimal size of a farm established on titled land increases, and it may increase relatively more than the increase in optimal investment. In that case, output per acre of titled land can be shown to decline. This result would not obtain if increases in long-term credit are accompanied with sufficient expansion of short-term credit.

The other policy variable, which is the focus of interest in the present study, is the granting of titles. We assume that there is no environmental impact (e.g., loss of forest land and soil erosion), since, our discussion refers only to untitled lands which have already been settled for many years, but which are artificially classified as "forest reserve lands". ^{1/} Presently the law does not allow the granting of title on such lands. If the law is changed, and such lands are released for full formal titling, the immediate short-term effect would be a capital gain to the owners (as the price will immediately go up from P_{nt}^* to P_t^*). Since short-term credit availability to owners of formerly untitled land will increase,

^{1/} Where environmental degradation can still be arrested by maintaining government ownership of land, consideration should obviously be given to this aspect.

(higher variable input use) but will still be lower than the yield observed on lands which have been titled for a long time, since capital per acre has not been adjusted yet to the optimal long-term level. In the long run, all titled land will have the same yield level.

The calculation of the contribution to social welfare generated by one raí of untitled land requires a specification of what public benefit is derived from lands which are confiscated by the state. Assuming that such benefits are zero, equation (19) can be rearranged so that the left-hand side represents expected social benefits.

$$(23) \quad [1 - \Psi \cdot (1 - \gamma)] \cdot y_{nt}^* - k_{nt}^* \cdot (1 + \delta) - (1 + c) \cdot m \cdot P_{nt}^* = \delta \cdot P_{nt}^* + \Psi \cdot (1 - \gamma) \cdot P_{nt}^* + \Psi \cdot (1 - \gamma) \cdot \lambda \cdot (y_{nt}^* + P_{nt}^*)$$

where use has been made of the equilibrium condition

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

The left-hand side of equation (23) represents the expected contribution of a unit of land to social welfare, net of the cost of resources consumed in the process of production. Note that real capital is evaluated in terms of its social opportunity cost, $(1 + \delta)$. It is implicitly assumed that the social opportunity cost of short-term non-institutional credit is equal to its nominal cost. Denoting the left-hand side of equation (23) by Π_{nt} , and using the opportunity rate of return to capital (δ) as a discount rate, the discounted value of the benefits derived from a raí of untitled land over an infinite horizon is

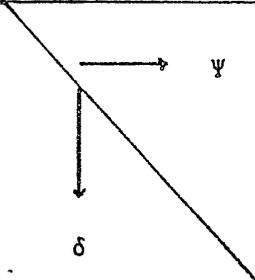
$$(24) \quad \int_0^{\infty} e^{-\delta \cdot i} \cdot \Pi_{nt} \cdot di = P_{nt}^* \cdot \left[1 + \frac{\Psi \cdot (1-\gamma)}{\delta} + \frac{\lambda}{\delta} \left(1 + \frac{y_{nt}^*}{P_{nt}^*} \right) \cdot \Psi \cdot (1-\gamma) \right]$$

where i denotes time.

Thus, when the probability of eviction is non-zero, the observed price of untitled land under-estimates the expected discounted value of social benefits forthcoming from such land. The extent of under-estimation could be substantial if the probability of eviction is high.

Some estimate of the extent of undervaluation implicit in observed market prices of untitled land can be obtained by using hypothetical (but fairly reasonable) values for the parameters Ψ (probability of eviction), γ (proportion of land not expropriated) and δ (the opportunity cost of capital). The probability of eviction is very low in Thailand, and we utilize the range of values .02 - .08 observed in Table 4. Given that the government rarely confiscates complete holdings, and that farmers split holdings among family members to minimize the amount of land from which they are evicted, we assume γ to take the value .7. The parameter of risk-aversion ϕ is reported by Binswanger (1980) to be typically around .5, and we also make calculations for the case of risk-neutrality. Values of y_{nt}^*/P_{nt}^* in our sample are in the range .17 - .23, and we use the value .2. Table 12 describes plausible values of the extent of undervaluation.

Table 12 : Extent of Undervaluation of Untitled Land ^{a/}

	.02		.04		.06		.08	
	Risk Neutrality	Risk Aversion	Risk Neutrality	Risk Aversion	Risk Neutrality	Risk Aversion	Risk Neutrality	Risk Aversion
.19	.032	.164	.063	.249	.095	.320	.124	.383
.21	.029	.149	.057	.225	.086	.289	.116	.347
.23	.026	.136	.052	.206	.078	.264	.104	.317
.25	.024	.125	.048	.189	.072	.243	.096	.291

^{a/} Expressed as percent of the market price of untitled land.

In analogy to equation (23), the optimality condition for titled land [equation (15)] can be used to express on the LHS the social value of production (net of production costs) generated in one period by a rai of titled land.

$$(25) \quad y_t^* - k_t^* \cdot (1+\delta) - (1+r_2) \cdot s_2 \cdot (1-s_1) \cdot P_t^* - (1+c) \cdot m \cdot P_t^* = P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1)]$$

As with equation (23), the LHS is the social benefit from one rai in one period provided that r_2 and c represent respectively the opportunity cost of short-term credit from formal and informal sources. ^{1/}

Denoting the left-hand-side of (25) by π_t , and calculating the discounted value of contributions to social welfare generated by a rai of titled land over an infinite horizon yields

$$(26) \quad \int_0^{\infty} e^{-\delta \cdot i} \cdot \pi_t \cdot di = \int_0^{\infty} e^{-\delta \cdot i} \cdot P_t^* \cdot [\delta - s_1 \cdot (\delta - r_1)] \cdot di = P_t^* \cdot [1 - s_1 \cdot (\frac{\delta - r_1}{\delta})]$$

Since the opportunity cost of capital (δ) is higher than the formal sector's interest rate on long-term credit (r_1) in a situation of a binding credit constraint, it is evident that the market price of titled land is higher than the social value. A rough idea of the extent of overvaluation can be obtained by assigning reasonable values to the parameters in the square brackets, on the LHS of equation (26). In the

^{1/} Supposing that the opportunity cost of short-term credit is c , then equation (25) can be written:

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

Thai context, s_1 , for long and medium term loans is about .35, while the institutional interest rate is 15 percent. Table 13 describes the proportion of observed market price for titled land which reflects true social value corresponding to different values of the opportunity cost of capital.

Table 13: Extent of Overvaluation of Titled Land
(as percent of the price of titled land)

Value of δ	$s_1 \cdot \frac{\delta - r_1}{\delta}$
.19	.07
.21	.10
.23	.12
.25	.14

Note: $s_1 = .35$

$r_1 = .15$

The magnitude of the gross increase in social welfare resulting from allowing the legal registration of a unit of forest reserve land of given quality, expressed as a proportion (say, b) of the equilibrium price of untitled land of such quality is obtained by calculating the ratio of the RHS of eq. (26) and eq. (24), minus one^{1/}

$$(27) \quad b = \frac{P_t^*}{P_{nt}^*} \cdot \left\{ \frac{[\delta - s_1 \cdot (\delta - r_1)]}{\delta + \psi \cdot (1 - \gamma) + \lambda \cdot \psi \cdot (1 - \gamma) \cdot [1 + (y_{nt}^* / P_{nt}^*)]} \right\} - 1$$

Note that with a logarithmic specification of the hedonic price equation the ratio P_t^* / P_{nt}^* is independent of land attributes, and is given by e^α where α is the parameter of land title in the logarithmic regression reported in Table 10. We can therefore calculate for the three provinces

1/ The calculation of social benefits generated by titling as presented here does not take in account general equilibrium effects which are likely to take place following large scale release of forest reserve land (e.g., fall in the price of titled land, increase in the cost of short term credit).

studied the value of b, assuming alternative values of the opportunity cost of capital. The probability of eviction can be taken as the differential in the rate of eviction between titled and untitled farmers as reported in Table 4, since the rate of eviction reported by titled farmers reflects probably "normal" eviction with compensation which accompanies road construction and other public projects. Other parameters are given the same values underlying Tables 12 and 13. The estimates are reported in Table 14. Clearly, the relative magnitude of benefits is much lower in Lop Buri province and is possibly nil.

Table 14 : Gross Social Benefits of Titling as a Proportion of the Price of Untitled Land

Opportunity Cost of Long-term Credit (δ)	Benefits (as proportion of P_{nt}^*) (b)					
	Lop Buri		Nakhon Ratchasima		Khon Kaen	
	<u>risk neutrality</u>	<u>risk aversion</u>	<u>risk neutrality</u>	<u>risk aversion</u>	<u>risk neutrality</u>	<u>risk aversion</u>
.19	.075	-.090	.919	.570	.853	.574
.21	.051	-.098	.883	.566	.812	.559
.23	.032	-.104	.854	.562	.777	.547
.25	.015	-.109	.828	.559	.748	.537
P_{t}^*/P_{nt}^*	1.254		2.324		2.139	

The reason for the small, if any, benefits to titling in Lop Buri (or the relatively small difference in prices of titled and untitled lands) seems to lie in the structure of the credit market in that province, as the risk of eviction is not much smaller than in other provinces. Analysis of credit transactions in the three provinces, as reported by our sample farmers, reveals that in Lop Buri, farmers without titled land have access to substantial amounts of credit in the informal market through traders, who account there for about 90 percent of all informal loans and about half of total loans. In other provinces, traders are a negligible source of credit, because the extent of high-value cash crop cultivation is much more limited. In Lop Buri, the amount borrowed per unit of land from all credit sources is higher among untitled farmers as compared to titled farmers, while in the other two provinces borrowing per unit of land is higher among titled farmers. This may indicate that in Lop Buri the credit constraint is less binding, especially for short-term credit or that farmers without titled land are not subject to significant disadvantages with respect to credit availability as compared to titled farmers. Following the prediction of the model of Section 4, this implies that the price of titled and untitled land will differ less (recall that in the absence of credit constraints, prices will differ only due to the risk of eviction).

VII. Summary and Conclusions

The paper presented an analysis of land prices in rural Thailand, focusing on the value of secure legal titles. Using econometric analysis, it was shown that prices of legally documented land are significantly higher than prices of equal quality untitled land which is illegally held. The difference

in land values is mainly due to the credit advantages accruing to owners of documented land, and to a lesser extent due to the risk of eviction, which is minor in Thailand.

A formal model of investment and production was constructed to provide an analytical framework for the empirical work, and to facilitate a discussion of the impact of policy. It is shown that the divergence between the nominal cost of credit and the opportunity cost of capital will cause the equilibrium price of titled land to be higher than the social value of benefits generated by a unit of such land. The risk of eviction from untitled land will cause the market price of untitled land to be lower than the social value of benefits from such land. Utilizing formulae derived from the model, the social benefits of releasing lands which are presently considered government property for de-jure private ownerships (these lands are de facto privately owned) are estimated. It is shown that significant variation between benefits in different provinces is possible, but in provinces where the informal credit market is less developed benefits are substantial, amounting to more than 50 percent of the value of untitled land.

The results of the present paper provide an economic justification for a major change in land policy in Thailand. The methodology allows rankings of different areas in terms of the amount of benefits expected, for the purpose of determining priority in providing registration services. This is of significant practical relevance, since the government does not yet have the administrative infrastructure to provide speedy legal registration all over the country, and expansion of the infrastructure is expected to be accomplished in stages over a long period. To the extent that a phasing of titling effort is required, the priority ordering should take in account the differential benefits in different areas.

The paper does not address the issue of the costs which are involved in land registration, but since these can be estimated, a formal cost-benefit analysis can be performed using the present methodology to calculate benefits. Neither is account being taken of the greater efficiency in administration of various government activities which is facilitated by land titling and registration (e.g., taxation). Other costs which are occasionally mentioned in the context of the debate on land policy in Thailand relate to potential negative equity implications. Some observers are concerned that with the granting of formal ownership smaller farmers are more likely to lose their land through sales and foreclosures. The data presented in the paper show that illegally held forest reserve lands are being traded as frequently as other lands at present. There is therefore no reason to expect increased landlessness due to the granting of formal land rights to farmers who have already owned the land and cultivated it for many years.

REFERENCES

- Baron, D., Land Reform in Sub-Saharan Africa: An Annotated Bibliography, Office of Rural Development, Agency for International Development, 1978.
- Barry, P.J. "Capital Asset Pricing and Farm Real Estate", American Journal of Agricultural Economics, Vol. 62, No.3, 1980, pp. 549-553.
- Binswanger, H.P. "Attitudes towards Risk: Experimental Measures in Rural India," American Journal of Agricultural Economics 62 (3) : 395-407, 1980.
- Binswanger, H.P., and M.R. Rosenzweig, "Production Relations in Agriculture", Report No.: ARU 5 (The World Bank: Washington, D.C.), June 1982.
- Castle, E.N. and I. Hoch, "Farm Real Estate Price Components, 1920-1978", American Journal of Agricultural Economics, Vol. 64, No.1, pp. 8-18.
- Chavas, J.P. and R.C. Shumway, "A Pooled Time-Series Cross-Section Analysis of Land Prices", Western Journal of Agricultural Economics, Vol. 7, No. 1, 1982, pp. 31-41.
- Clark, R.J., "Problems and Conflicts Over Land Ownership in Bolivia", Inter-American Affairs, 22(4), Spring 1969.
- David, C. and R. Meyer, "Measuring the Farm Level Impact of Agricultural Loans", in Howell, J., ed., Borrowers and Lenders: Rural Financial Markets and Institutions in Developing Countries (Overseas Development Institute: London), 1980.
- Dorner, P. and Saliba, B., "Interventions in Land Markets to Benefit the Rural Poor", Land Tenure Center, September 1981.
- Feeny, D., The Political Economy of Productivity: Thai Agricultural Development 1880-1975, (University of British Columbia Press, Vancouver: 1982).
- Fleming, J.T.; "Tenurial Reform as a Prerequisite to the Green Revolution", World Development 3(1), January 1975, 47-58.
- Government of Thailand, Ministry of Agriculture and Cooperatives, The Foreign Loan Project Office, "Land Reform Areas Development Project, Draft Report" (Bangkok, Thailand), October 1980
- Ingram, J., Economic Development in Thailand 1850-1970, (Stanford University Press), 1971.
- Jimenez, E. "The Value of Squatter Dwellings in Developing Countries", Economic Development and Cultural Change, Vol. 30, No. 4, 1982a,
- Jimenez, E., "Urban Squatting and Community Organizations in Developing Countries: A Conceptual Framework", Centre for the Study of International Economic Relations, Working Paper No. 8209C DSU (1982 b).

REFERENCES (Cont'd)

- Jimenez, E., "Tenure Security and Urban Squatting", The Review of Economics and Statistics, Vol. LXVI, No. 4, November 1984, pp. 556-567.
- Kemp, J., "Legal and Informal Land Tenures in Thailand", Modern Asian Studies 15(1), 1981, 1-23.
- Lin, S. and B. Esposito, "Agrarian Reform in Thailand: Problems and Prospects", Pacific Affairs, 49(3), Fall 1976, 425-42.
- 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.
- Mosher, A.T., "Getting Agriculture Moving: Essentials for Development and Modernization", (Agricultural Development Council: New York), 1966.
- Okoth-Ogendo, H.W.O., "African Land Tenure Reform", in Heyer, J. and J.K. Maitha and W.M. Senga, eds., Agricultural Development in Kenya: An Economic Assessment (Oxford University Press: Nairobi), 1976.
- Onchan, T., "The Burden of Debt of Thai Farmers: An Overview", (Kasetsart University, Bangkok, Thailand), June 1982.
- Panandikar, A., Banking in India (Orient Longmans Ltd.: Madras), 1956.
- Pope, R.D., R.A. Kramer, R.D. Green and B.D. Gardner, "An Evaluation of Econometric Models of U.S. Farmland Prices", Western Journal of Agricultural Economics, Vol. 4, No.1, 1979, pp. 107-120.
- Ratanakhon, S., "Legal Aspects of Land Occupation and Development in Northern Thailand", in Kunstader, et. al., eds., Farmers in the Forest (East-West Center: Honolulu), 1978.
- 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), pp. 655-65.
- 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, D.C.: U.S. Agency for International Development, 1973.
- Salas, O.A. 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), Spring 1982, pp. 31-56.
- Shalit, H. and A. Schmitz, "Farmland Accumulation and Farmland Prices", American Journal of Agricultural Economics, Vol. 64, No.2, 1982, pp. 710-719.

- Shalit, H. and A. Schmitz, "Farmland Price Behavior and Credit Allocation", Western Journal of Agricultural Economics, Vol. 9, No.2, 1984, pp. 303-313.
- Stifel, L.D., "Patterns of Land Ownership in Central Thailand During the Twentieth Century", Journal of the Siam Society, January 1976, Vol. 64, pp. 237-274.
- Stiglitz, J. and A. Weiss, "Credit Rationing and Markets with Imperfect Information", American Economic Review 71 (3), June 1981, pp. 393-410.
- Tanabe, S., "Land Reclamation in the Chao Phraya Delta", in Ishii, Y., ed., Thailand: A Rice Growing Society, Translated by Peter and Stephanie Hawkes (University Press of Hawaii: Honolulu), 1978, pp. 40-82.
- 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.
- Tomosugi, T., "A Structural Analysis of Thai Economic History: Case Study of a Northern Chao Phraya Delta Village", (Institute of Developing Economies: Tokyo), 1980.
- Wai, U Tun, "Interest Rates Outside the Organized Money Markets of Underdeveloped Countries", IMF Staff Papers 6(1), November 1957, pp. 80-142.
- Williamson, Ian, "Cadastral Survey Techniques in Developing Countries - With Particular Reference to Thailand", World Bank, 1983 (mimeo).
- 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 Garshon 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 Garshon 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

Behavioral 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
Development 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 Judit Katona-Apte, September 1983.

Discussion Papers (Cont'd.)

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 Protection 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
Labor, Supervision and Credit Constraints*
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 Oct. 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 and 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 August 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, India, 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 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 1, 1985.

Report No.: ARU 41

Eastasian Financial Systems as a Challenge to Economics: The Advantages
of 'Rigidity', with particular reference to Taiwan, by Robert 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 19, 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 Hans Binswanger, 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 H. 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 Chalamwong
and Gershon Feder, June 1985. Revised October 1985.