

## **Economic Analysis of Rural Land Administration Projects**

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# Economic Analysis of Rural Land Administration Projects

As part of its efforts to improve the rural economies of its client countries, the World Bank is supporting programs to strengthen land administration and undertake land reform (World Bank, 1997). Programs to strengthen land administration currently underway in El Salvador, Nicaragua, and Bolivia have led to important land policy and institutional reforms in these countries. In addition the Bank is supporting land titling programs in many countries, including Bolivia, the Dominican Republic, Indonesia, Nicaragua, and Thailand.

Land administration projects can include a variety of activities. Usually, the most expensive and that which is most likely to have direct, tangible benefits is land titling. The provision of titles to landowners is only part of complex process, however. Titles by themselves are unlikely to bring lasting benefits unless there is a functioning registry and cadastre and a system to adjudicate disputes.

Although land administration projects have long been seen as an important component of rural development efforts, the results of many early land administration projects were disappointing. A 1992 review of World Bank experience with 12 rural land titling projects implemented during the 1980s found that while two projects (Thailand Land Titling I and II) were very successful, the others suffered from a range of problems, including lack of political support, conflicting bureaucratic priorities, lack of institutional capacity or support, and complex multiple objectives of which titling was only an adjunct (Wachter and English, 1992). Much has been learned since the 1980s in this area, however, and a new generation of land administration projects is now under preparation and implementation

Land titling can generate many benefits, including improved efficiency of land markets, reduction in conflict over land, enhanced access to credit, and improved incentives to invest in agricultural production. Where the conditions are appropriate, titling can bring important benefits. In Thailand, the Bank has undertaken a very successful sequence of land titling projects; the Second Land Titling Project, implemented between 1991 and 1994, was found to have had an *ex post* economic rate of return of 34%, primarily thanks to improved access to credit and the increased production it enabled (see Annex I). In Honduras, a USAID-financed titling project was found to have had a rate of return of 17%, because of the increased use of inputs it stimulated (López, 1996). Conditions, however, are not always appropriate. Moreover, land administration projects can be quite costly. Carrying out an economic analysis is necessary to determine whether the benefits to be achieved in a given situation are sufficient to justify the costs. Until recently, however, economic analyses have generally not been carried out for land administration projects. This manual explains the principles and approach that such an economic analysis should follow.

## 1. Plan of the Manual

The focus in this manual is on rural land administration activities. Many of the same principles apply to urban land administration, but differences in the institutional settings and in the types of use to which urban and rural land are put (and hence in the type of data required to examine benefits) may require slightly different approaches.

This manual begins by discussing qualitatively the benefits which *may* be generated by land titling projects. Understanding each individual case qualitatively is essential, since it cannot be assumed that the benefits of titling will be the same everywhere. A strong qualitative understanding of the benefits of land titling is particularly important early in project preparation—at the identification stage and even earlier, in economic and sector work and in policy dialogue with client countries—when decisions are being made about whether to prepare a project at all, and about what kind of project to prepare. At this stage, a qualitative understanding may be sufficient, though quantitative analysis of the kind described later in the manual may be necessary to verify that certain kinds of benefits will indeed be obtained. The next two

sections discuss how the costs and benefits of the project are to be quantified and the mechanics of introducing them into a cost-benefit analysis. These sections are of course particularly relevant during appraisal, in which the benefits must be quantified to ensure that they are sufficient to justify the project, given the projected costs. If the analysis is left until appraisal, however, all that will be possible is a yes-or-no decision on the project as prepared. In general, it would be preferable to carry out much of the economic analysis as early as possible during preparation, so that it might inform the direction of the project itself.

Two detailed case studies—of Bank-financed land titling projects in Thailand and in Guatemala's Petén region—are presented to illustrate the analysis.

- (a) **Thailand.** The Second Land Titling Project was the second in a series of projects which supported Thailand's Land Titling Program. The project issued over 2 million titles to farmers in the North, Northeast, and Central regions of the country between 1991 and 1994.
- (b) **Petén.** The Land Administration Project, currently under implementation, is financing land titling on about 11,300 square kilometers, or the entire area of the Petén not already scheduled for titling under other projects, the establishment of a land registry for Petén, and the continued maintenance and updating of the cadastre created through the titling activities.

Full economic analyses of both cases are appended to this manual and relevant examples from each are cited in the main text. These two case studies illustrate titling in two quite different contexts: a long-settled, intensive agricultural sector with relatively strong institutions and infrastructure (Thailand), and a recently-settled frontier area with weak institutions and infrastructure (Petén). They are also in many ways at the opposite ends of the spectrum in terms of data availability: Thailand is the country in which the impact of rural land titling has perhaps been the best studied; Guatemala lacks not only specific studies on the impact of titling but also fundamental data on many aspects of the agricultural sector.

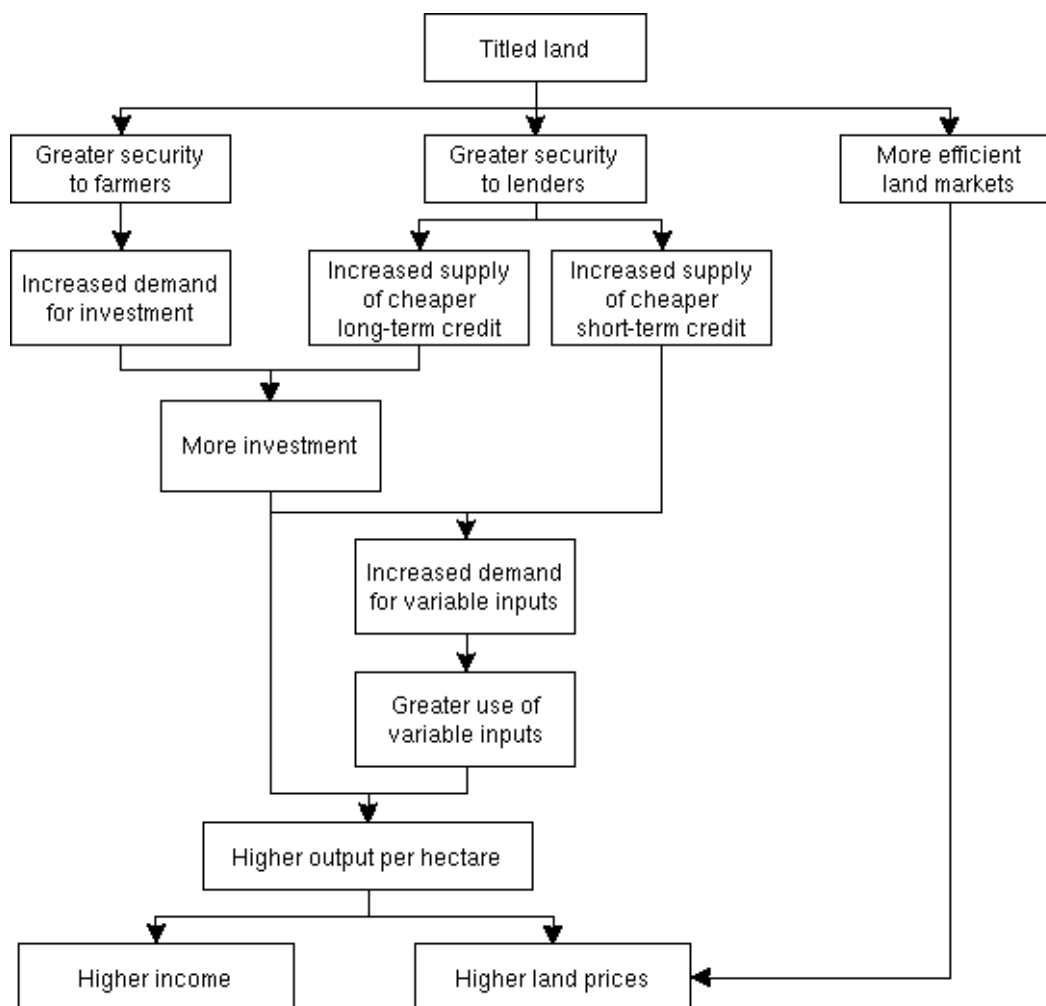
## 2. Understanding the Potential Benefits of Titling

Any analysis of the potential benefits of land titling must begin with a clear understanding of the situation. In principle, land titling can bring benefits through three main mechanisms (Feder and Feeny, 1991):

- (a) By increasing security of tenure, it can remove disincentives to invest in land or capital equipment for working the land; this is sometimes known as the *investment demand* or *security* effect.
- (b) By increasing access to credit, thanks to use of the land as collateral, it can remove constraints to, and reduce the cost of, both capital for long-term investments and working capital; this is sometimes known as the *collateral* effect.
- (c) By improving the functioning of land markets, it can ease the re-allocation of land to its most productive use; this is sometimes known as the *efficiency* or *transactions* effect.

These potential mechanisms are illustrated in Figure 1.

Many titling projects have been predicated on the assumption that some or all these benefits would be obtained. In fact, whether they will be obtained or not in any given instance is an empirical issue that must be verified in each case. Figure 1 emphasizes that there are many possible paths through which titling can bring benefits. Each of these paths consists of a chain of links, each of which may or may not exist in any given situation, and the strength of which will likewise vary from case to case. For titling to be beneficial, at least one of these paths must hold. Moreover, it matters for project design which path holds.

**Figure 1. Potential Benefits of Land Titling**

### Alleviating Tenure Insecurity

Threats to farmers' tenure security might arise from the risk of government expropriation, from land grabbing by local elites, or from disputes with neighbors over boundaries or with relatives over inheritance. Farmers who are uncertain about their tenure security are unlikely to undertake investments which take several years to pay off such as tree crops or irrigation systems, to adopt conservation measures designed to protect the long-term productivity of the land, or to make any other investments which are attached to the land (for example, buildings).<sup>2</sup> The risk that they will lose their land, and hence be unable to reap the long-

<sup>2</sup> Investments which could easily be moved should farmers lose their land, such as livestock, are not affected. Indeed, when tenure is insecure such un-attached investments are likely to become relatively more attractive, and be undertaken at a higher level than they otherwise would have been. When tenure security increases, therefore, some of the increased investment in land may represent a re-allocation of investments away from unattached assets; the increase of *net* investment following increased tenure security, therefore, may not be as high as it appears. Conversely, in some instances the cause-and-effect relationship runs in the opposite direction.

term benefits of their efforts, acts in the same way as an additional discount rate. Because of this reluctance to undertake long-term investments, agricultural productivity and farmers' incomes will be lower than they would otherwise have been. Thus, for titling to bring significant economic benefits through this mechanism, two links must hold: titling must help reduce tenure insecurity, and reduced tenure insecurity must result in higher levels of investment. In Petén, farmers without titles to their land felt very insecure; in the pilot areas where titling was undertaken, planting of tree crops and of improved pasture both increased substantially subsequent to titling.

Lack of titles should not, however, automatically be equated with tenure insecurity. In many instances, farmers might feel quite secure even though they lack formal titles to their land. A substantial literature demonstrates that many traditional African land tenure systems do not result in insecurity of tenure even in the absence of titles (Place and Hazell, 1993; Bruce, Mighot-Adholla, and Atherton, 1994). In Burkina Faso, for example, Matlon (1988) found that farmers "perceive a high degree of security in their right to continuously use most land now under cultivation" despite a lack of titles. In Thailand, Feder and others (1988) found that tenure security was already very high for Thai farmers, and that titling did not improve it. The degree to which farmers without titles feel insecure should, therefore, be examined rather than assumed. This can be achieved by surveying farmers<sup>3</sup> or by examining any available data on frequency of eviction, the extent of land conflicts brought before local courts, and so on. Even more conclusive would be observations of actual investments that farmers have carried out—if attached investments are common, insecurity is unlikely to be high (the converse is not necessarily true, however; see below).

It is important to distinguish between situations in which tenure security is high in untitled areas because there are few threats (as in the case of Thailand) from situations in which tenure security is high because of the existence of traditional tenure systems, as in many African countries. In the former case, titling might still be beneficial if some of its other potential benefits, such as improved access to credit, are generated. In the latter case, titling might actually prove harmful by disrupting traditional systems. Titling can also prove harmful in extensive grazing systems characterized by non-equilibrium dynamics (Behnke and Scoones, 1993); these systems depend on mobility and flexibility to be sustainable, and giving titles to individuals or small groups risks creating rigidities that worsen vulnerability to drought, worsen asset/income distribution among pastoralists, and exacerbate any existing tendencies towards localized overgrazing (Wilson and Thompson, 1993; Behnke, 1994; Mearns, 1997).

It should also be remembered that provision of titles does not by itself automatically translate into increased tenure security. Without fair, transparent, and easily accessible mechanisms to enforce the land rights specified by titles, titles will provide few benefits.

Even if lack of titles does lead to insecurity, it does not necessarily follow that reduced insecurity would result in increased investment or higher agricultural productivity. Farmers with secure tenure may not invest for many reasons, such as inability to obtain the necessary financing (see the next section) or lack of profitable investments to undertake. For example, Gavian (1993) found that tenure security had little effect on long-term investments in land in Niger because there were simply no profitable long-term investments to be made; although tenure security did have an influence on manuring practices, whose benefits generally

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For example, land laws in many countries require farmers to "improve" or to "use productively" land in frontier areas or risk losing it. In these instances, tenure insecurity may promote investment—although such investments may be limited to low-cost, high-visibility actions until tenure security is well established.

<sup>3</sup> Note that objective and subjective security of tenure might differ. In Petén, for example, objective measures such as frequency of land disputes do not suggest that insecurity is high—although since land is increasingly scarce this may change in the future. However, farmers subjectively feel extremely insecure, and are very reluctant to undertake long-term investments.

last several years. In Kenya's Nyeri and Kakamega Districts, Place and Mighot-Adholla (1998) found that though titling increased security, it had little effect on crop yields.

Testing for the existence and strength of this mechanism can be undertaken in two ways: either by separately testing each of the links—verifying that titling leads to increased security, and that increased security leads to higher investments and, hence, income—or by testing to see whether the two links together hold—that is, by verifying that titling does lead to more investment.

### **Increased Access to Credit**

Even when farmers have incentives to undertake long-term investments, they may be unable to undertake them because they lack the resources to do so. Access to financing is often necessary for farmers to be able to undertake investments. Access to credit can also facilitate short-term production increases by providing the working capital required to increase use of commercial inputs such as improved seed or fertilizer. For most farmers, however, access to credit tends to be very limited. Financial institutions have often been reluctant to offer credit to small farmers. An important reason for this reluctance is the risk involved; because financial institutions tend to have limited information about actual farming conditions, they are unable to evaluate the risk of loans. Land provides an ideal form of collateral in such situations, since it is valuable and immobile. Moreover, in most cases it is the only form of collateral farmers can offer. The usefulness of land as collateral, however, requires that lenders be able to clearly identify its owner and to foreclose on it and dispose of it should loans be in default. By documenting land rights, titles help provide lenders with the information they need, and may thus lead to increased supply of credit. Improved access to credit was a very important part of the benefits of titling in Thailand; titled farmers who provided land as collateral were offered from 52% to as much as 520% more formal-sector credit than untitled farmers, depending on the region (Feder and others, 1988). In Latin America, Muñoz (1993) found that titled farmers in Bolivia, Chile, Honduras, and Paraguay tended to have easier access to institutional credit.

Again, it is important to be realistic about the potential for improved credit. First, titling by itself is unlikely to be sufficient for lenders to provide additional credit. Mechanisms to register liens against property and to foreclose on property in case of default are also needed. In many instances, foreclosing on land is impossible due to either legal restrictions or social pressure. Second, titling will not reduce the high transaction costs involved in rural credit, so that financial institutions may continue to avoid them. Moreover, rural financial markets in developing countries are often in considerable disarray as a result of years of ill-advised government interventions, often leaving state-owned financial institutions too weak to provide credit and making commercial banks, where they exist at all, reluctant to participate. This was the case in Petén, for example; historically, the availability of cheap credit from state-run financial institutions, which generally placed very little importance to repayment, has acted as a disincentive to commercial bank participation in the rural financial sector. Measures to improve the functioning of rural financial markets may need to be undertaken in parallel to titling activities, as is being done in Guatemala.

On the demand side, applying for formal credit loans can impose high transaction costs on small farmers, especially since bank branches tend to be limited to larger population centers. This problem will also not be alleviated by titling. Perhaps most important, many farmers are reluctant to borrow against land even if credit were available, from fear of losing their land should adverse agricultural conditions prevent them from repaying their loans. Farmers in Petén expressed this fear, for example, as did farmers in Kenya's Kitui District. This problem is likely to be particularly marked in regions characterized by highly variable returns to agriculture, such as drought-prone areas. Finally, increased access to credit will not result in increased investment if there are few profitable investments available to farmers.

### **Increased Investment**

As a result of either increased security of tenure (and hence demand for investment), or increased access to credit (and hence supply of the resources necessary to undertake investments), or both, titling may result in increased investments. Investments which would not previously have been undertaken due to the uncertainty of long-term results, the lack of financing, or the fact that financing from informal credit sources made them uneconomic, will now be undertaken. In Thailand, titling was found to result in capital stocks per unit of land to be higher by between 56% and 250% on titled land in most provinces (Feder and others, 1988).<sup>4</sup>

The likelihood of increased investment is obviously related to the availability of credit, but not completely so. Not all investments that farmers can make require credit—some can be self-financed. In other cases, other mechanisms are available to provide the necessary financing. In Thailand, for example, active informal credit markets in the Central Region meant that many farmers had adequate access to credit even without title; as a result, returns to titling were found to be lowest in this region (Feder and others, 1988). In Kenya's Kitui District, women's labor exchange groups provided access to the manpower resources necessary to undertake labor-intensive conservation measures (Pagiola, 1994). While access to formal credit would no doubt aid farmers in undertaking them, the main input required for many investments is typically labor from the farm household; in these cases, lack of credit need not always be an important constraint. In Petén, for example, farmers in pilot titling areas have undertaken a range of investments including planting tree crops such as cashew and sowing improved pasture, despite the lack of credit.

### **Increased Working Capital**

Production may also increase due to increased use of short-term working capital. Increased access to formal credit sources may make the use of credit to finance purchases of improved seed or fertilizer affordable. If investments have been undertaken, there is also likely to be a need for higher use of complementary inputs. This aspect was important in Thailand, where titled farms were able to increase their use of labor by 8-15%, of draft power by 25-39%, and of fertilizers and pesticides by 23-34% (Feder and others, 1988). In Petén, the need for working capital is generally much lower because of the subsistence-oriented type of agriculture undertaken. However, several potential export crops, such as chilis, do require substantial inputs and are unlikely to be feasible for small farmers if financing is not available.

### **More Liquid Land Markets**

Land transactions generally increase the efficiency of resource use, since agents with higher (potential) marginal productivity are induced to acquire land from agents with lower marginal productivity.<sup>5</sup>

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<sup>4</sup> Anecdotal evidence also indicates that credit has also been used by Thai farmers to undertake a range of off-farm investments, including paying for education and small-scale commercial activities. The benefits of such investments would not be captured in farm-level analyses.

<sup>5</sup> However, this has led to fears that titling will result in the consolidation of farmland into fewer large units owned by wealthy landowners, with adverse social consequences such as increasing the size of the landless population and/or resulting in encroachment into remaining frontier areas by farmers who have sold their land. As a result of these fears, the transferability of land titles is often restricted, at least initially. If this is the case, then the efficiency benefits will clearly not be obtained. Conversely, one might plausibly expect the opposite to be true; since small farmers have generally been found to be more efficient land users, titling might be expected to result in larger, inefficient land-holdings being broken up. The extent to which either of these effects occurs in



Again, it is important to observe the reality of transactions rather than the theory. In Thailand, for example, land markets were quite active even before titling became widespread. Likewise, land transactions were common in Petén even in untitled areas: farmers sold the rights to “improvements” (*mejoras*) they had made to the land, such as clearing it for cultivation. Nevertheless, some improvements in the functioning of land markets occurred even in these cases. Land markets in Thailand appeared to be more active in areas in which the Land Titling Project operated, with a greater proportion of households either buying or selling land (Onchan and Aungsumalin, 1993). In Petén, there is anecdotal evidence that titling in the pilot areas has eased the operation of land rental markets, since farmers no longer fear tenants will be able to lay claim to rented land.

Increased land prices are sometimes cited as a benefit of titling. Increased land prices are not themselves a benefit, however, since gains to holders of titled land are exactly offset by losses to potential purchasers (Belli, 1998). Increases in land prices are, however, a *measure* of the benefits of titling, as discussed below.

The improved functioning of land markets can also generate some additional benefits. First, to the extent that land titling improves efficiency of land markets, it can facilitate the entry and exit of labor into and out of agriculture to other areas of the economy where returns to labor are greater. With insecure tenure, farmers might have been reluctant to leave their land, or been unable to obtain an acceptable price if they tried to sell it. With land titling, landowners can more readily either sell or rent out their land, without fear that tenants will be able to claim ownership rights to the land. For example, it can be argued that land titling facilitated the rural-urban migration of Thai labor to support the urban economic boom of the 1980s and first half of 1990s. Second, land titling can help remove disincentives to direct foreign investment (DFI). Lack of access to land and insecurity of land tenure have been documented by MIGA and IFC as significant barriers to foreign investment in Sub-Saharan Africa (Bachmann, 1996). Insecurity and lack of transferability of land rights are also frustrating efforts to attract foreign investment in Viet-Nam. But once again, the effect is not automatic. In El Salvador, for example, land ownership by foreigners is against the law; titling will not, therefore, increase DFI in sectors that require land (such as agricultural production for export).

### **Environmental Benefits**

Titling can have a range of beneficial environmental effects, both on-farm and off-farm. Here too, however, the nature and existence of benefits needs to be verified in each case rather than assumed.

On-farm, titling may result in more sustainable resource use by stimulating investments which improve or safeguard the long-term productivity of the land. This effect would work in the same way as the investment effect described above. In Thailand, Feder and others (1988) found that titled land was more likely to have been improved and to have conservation measures. In Petén, farmers in the pilot titling areas are also undertaking a number of investments likely to result in greater sustainability, including tree planting, pasture improvement, and intensification of crop production on cleared land by using leguminous crops.

Off-farm, the most important mechanism by which titling may have beneficial environmental effects is through greater sustainability on-farm and the ability to intensify production on existing land reducing pressure to clear additional land. Clearing relatively undisturbed land for agricultural use tends to be much more damaging to the environment than subsequent changes in land use (Pagiola and others, 1997). In Petén, the investments undertaken by farmers on titled land all appear likely to result in reduced pressure on remaining forest areas: (i) tree planting will reduce pressures to collect fuelwood and other forest

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practice, and under which condition consolidation rather than fragmentation occurs, has not been studied empirically.

products in remaining forested areas, (ii) pasture improvement will help allow pastures to be used longer, thus reducing pressure to clear additional land for pasture; and (iii) intensification of crop production on cleared land by using leguminous crops, which will also reduce pressure to clear additional land. In frontier areas, titling may also help increase the proportion of primary forest cover retained on farmers' land by removing the incentive to clear forest so as to establish ownership.

Titling will not necessarily have a beneficial effect on the environment, however. Some of the investments which were discouraged by tenure insecurity, for example, might be harmful to the environment. Likewise, increased input use might result in increased pollution. This is not to say that titling should not be undertaken—rather, where these concerns are present, titling should be accompanied by appropriate measures to mitigate the possible environmental damage that might occur. Care should also be taken in titling land in frontier areas, since it might result in a substantial influx of new migrants. In these areas, the higher profitability of agricultural production might encourage more land clearing. This concern was expressed in the case of Petén, for example. However, in-migration in Petén is already so extensive that the planned titling activities are unlikely to increase it further. On the contrary, since titling will only be carried out outside protected areas, and since settlers place considerable importance on the ability to regularize their claims, an incentive will be created for in-migrants to settle outside protected areas.

### **Information Benefits**

Land administration projects represent a investment in a country's information infrastructure. This is becoming increasingly important as transactions are less and less frequently between close acquaintances and increasingly often between strangers (Feder and Feeny, 1991). In addition to the improvements to the functioning of markets noted above, two other benefits are likely to be generated:

- (a) The land registry and cadastre system provide a framework for a substantially improved tax collection system.
- (b) The information generated in the titling process, as well as the registry and cadastre themselves, can provide useful information for land use planning. The extent of this benefit can be estimated by using the avoided cost of obtaining the required information in another way.

Improvements to the operation of registry and cadastre (for example, computerization) have almost universally been justified by the reduction in costs of storage of and access to records. Once implemented, however, these improvements have often stimulated additional demand for the information they contain (Jeffress, 1991).

### **Maintaining Benefits Over Time**

The preceding discussion and the analysis that follows assumes that the benefits of titling persist for a long time. This will only occur if there is an effective system to keep titles up to date. This requires a functioning land registry which records changes in the ownership of parcels and issues new or modified titles as appropriate. Without such a system, the ability of economic agents to rely on individual titles will rapidly decay, as will the benefits of titles. Accordingly, the establishment or improvement of a land registry is an important part of many land administration projects. Such a registry can provide some benefits in and of itself, as pointed out in the previous section, but its most important purpose is to ensure that the benefits of titling itself last a long time. Many of the benefits of the registry are already included, therefore, in the

estimated benefits of titling (which should be interpreted as being contingent on the existence of a working registry).<sup>6</sup>

### Distribution of Benefits

The effects of titling are not always distributionally neutral. Of particular concern is the extent to which they may be experienced differently across income or ethnic groups, and within households, especially by women. The concern is two-fold: First, that particularly vulnerable groups not be harmed by titling even as overall welfare increases, and second, that project benefits may be dependent on participation of these groups. For example, in many societies there is a gender distinction between different types of farming, with women typically producing food crops for household consumption and men producing cash crops for sale. Since it is these latter activities that tend to be encouraged, titling may change the balance within the household to the detriment of women. Although these issues will be covered in the project's social assessment, they should be borne in mind during the economic analysis as well.

### Summary

Understanding the specific nature of the links between land titling and benefits to farmers is particularly important during project identification and in the early stages of preparation, since the nature of these links will affect the decision to undertake a project and the design of that project. At this stage, what is needed is a good *qualitative* understanding of the specific path through which benefits are likely to be obtained. Efforts should be undertaken to gather available secondary data or, if necessary, collect primary data, so that the existence of the links can be verified and their magnitude quantified in later stages of the analysis.

## 3. Costs of Titling

The analysis should begin by organizing the project's cost information into a suitable form. Three sets of adjustments are usually necessary:

- (a) Most projects are likely to contain several components or sub-components that are not directly related to titling, so the cost of these activities needs to be omitted from the analysis. For example, an investment component that is unrelated to land titling might be omitted, and be the subject of a separate economic analysis.<sup>7</sup> In some cases, extracting such activities can be accomplished by simply omitting the cost of entire components or sub-components. In other cases—for example, with overhead costs such as project administration—some prorating will be necessary. Unless there is an obvious index to use for this purpose, it is usually simplest to make a rough division of costs, perhaps according to the relative proportion of direct costs, and then to undertake sensitivity analysis.

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<sup>6</sup> If desired, a separate estimate of the benefits of the registry can be obtained by making some assumptions about how rapidly the benefits of titling would decay in its absence, and then comparing that to the assumption that they do not decay. However, the result of such an analysis should *not* be added to the estimated benefits of titling, since that would be double-counting. Where an existing registry is improved, there will also be a benefit from reduced transaction costs. This benefit can be added to those of titling.

<sup>7</sup> In both the Thailand and Petén cases, small urban titling components were omitted from the analysis. Since the benefits of urban land activities are qualitatively and quantitatively different from those experienced in rural areas, considerable effort would have been required to undertake a separate analysis. Given the small proportion of project costs devoted to these activities, this effort was thought not to be justified.

- (b) Several activities might have benefits beyond the narrow confines of the project. For example, creation of a registry and cadastre in Petén would benefit all land in Petén, not just that titled by the project. In this case, the costs were simply prorated according to the areas covered—since the registry will cover 18,000 square kilometers but the project will only finance titling on about 11,000 square kilometers, the costs of the registry were weighted by 11/18 when considering the benefits of titling itself. More generally, many training and capacity-building activities are likely to have benefits in areas outside the project area, or after the project is completed. This is the case in the Petén project, for example, since it is explicitly designed as a pilot project for the entire country. Here too, prorating expenditures is called for, although there is usually no obvious way to allocate them. Again, a rough division followed by sensitivity analysis is probably the best way to proceed. In Thailand, for example, the base case calculations assumed that half the expenditures on institution-building and training were necessary for the titling activities proper to proceed; the sensitivity analysis then checked whether the project would still be justified if the titling activities had to bear the full cost of these activities.
- (c) Maintaining the benefits of titling will often require additional expenditures well beyond the end of the project. In Petén, for example, there will be additional costs for running the registry and cadastre, as well the municipal land offices, well beyond the end of the project—indeed, into the indefinite future. These costs will be borne by Guatemalan government agencies and will not be financed by the project. Nevertheless, they need to be included in the economic analysis. This may be simply a matter of projecting the recurrent costs in the project's last year, or it may require some analysis of what the costs are likely to be. Since these estimates are required for the analysis of the financial sustainability of the affected agencies, they are usually available. In the case of Petén, separate estimates were made of the recurrent costs of operating the registry and cadastre into the indefinite future (including the cost of periodically renewing their capital equipment). In Thailand, the project was not creating new administrative capacity in the Department of Lands, so only the cost of the one-time improvements in the Department's activities that were financed by the project were included.

**An order-of-magnitude approximation.** It is useful to begin with an order-of-magnitude approximation of what the benefits would have to be to justify titling. This can be obtained by dividing the present value of the total costs (including all future costs borne by national agencies) by the area expected to be titled. It is then a simple matter to compute the increase in annual income per hectare necessary for the cost of titling to be repaid.<sup>8</sup> The resulting figure is an *underestimate* since (i) benefits will be felt later than costs; and (ii) some areas will have no benefits for a variety of reasons, thus requiring higher returns in other areas to justify the project as a whole. Nevertheless, it provides a useful initial measure, particularly in the early stages of project design. By comparing the estimated increase necessary to measures such as net returns per hectare, an idea can be had of how reasonable it to expect that the project will be justified. In Thailand, for example, the cost of titling in the early 1990s was about \$34-43 per hectare, depending on what proportion of the project's overhead costs are taken into consideration. The annuity required to repay

<sup>8</sup> It can be shown that the present value of an infinite stream of net benefits  $B_t$  discounted at rate  $r$  is given by

$$PV = \sum_{t=1}^{\infty} B_t / (1+r)^t = B_t / r$$

so multiplying the cost of titling by the discount rate  $r$  provides an estimate of the increase in net benefits necessary to exactly repay the cost of titling.

this cost, given a 10% discount rate, is \$3-4 per hectare per year. Since net income under irrigated rice (the most common agricultural practice, accounting for about half of all land use) was about \$120 per hectare per year, this is equivalent to an increase in net annual income of about 3%—quite likely to be achieved. In Petén, the cost of titling was estimated at about \$18 per hectare, thus requiring an increase in net annual income of about \$2 per hectare to justify the cost of titling—while apparently small, this amount represents a larger proportional increase in income than in the case of Thailand, given the much lower productivity of land in Petén.

#### **4. Quantifying the Benefits of Land Titling**

As discussed above, the critical first step is to develop a solid qualitative understanding of the likely benefits. The approach to quantification will depend partly on this qualitative understanding. If access to credit is expected to be a major benefit, then that might be the focus of the analysis. If, as in the case of Petén, credit is expected to play a very minor role (in Petén's case, because of the weakness of financial institutions and farmers' aversion to borrowing), efforts can be targeted elsewhere. To the extent possible, however, the analysis should be designed so that it will confirm the qualitative understanding as well as providing a quantitative estimate of the magnitude of the effects.

It is also important at this stage to determine whether the nature and magnitude of effects are likely to vary in different parts of the project area. In Thailand, for example, important differences were found in the expected effects of titling in the different regions. When such differences exist, separate estimates must be made for each region. Petén, on the other hand, was sufficiently homogeneous in terms of its socio-economic and agro-ecological conditions that a single estimate was deemed sufficient.

Two broad approaches are possible to measure the impact of titling. If there already exists a significant proportion of titled land, then an econometric analysis of the characteristics of titled land compared to untitled land can provide estimates of the magnitude of benefits (as well as confirming that there will be benefits). Such an analysis might either look at the effect of titling on land prices or at its effect on aspects such as use of credit, use of inputs, investments levels, and productivity. Alternatively, if certain activities are expected to be undertaken once titling has occurred, then the returns to these activities can be used as a basis for estimating the benefits of titling.

##### **Land Prices**

If titling does in fact lead to improved productivity, then it follows that the price of titled land should be higher than the price of otherwise identical land which isn't titled. In fact, it can be shown that if markets work, we can expect the difference in land prices to exactly equal the difference in present value of the net income stream that can be generated thanks to titling (Feder and Feeny, 1991). In many cases, therefore, the benefits of land titling can be estimated by comparing the differences in land prices between titled and untitled land. The advantage of this approach is that it captures the net effect of all the benefits of titling as reflected in actual producer behavior.

Since the price of land is affected by a wide variety of factors other than title, such as soil fertility, access to transportation, and so on, for the analysis to have any validity it must control for the effect of these other factors. This approach, therefore, is often very data-intensive, and usually requires original data collection.<sup>9</sup> Ideally, a panel data set should be used, with data from the same sample of farmers both before

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<sup>9</sup> This approach tends to be easier to apply in urban settings, because the value of urban property tends to depend on a narrower and more easily observable set of characteristics than that of rural property. Moreover, urban

and after titling and a control group which is not titled, since this allows farmer-specific characteristics to be best controlled for. López (1996) used this approach in Honduras, and Carter and Olinto (1996) used it in Paraguay. Unfortunately, it is rare for such a data set to exist, especially prior to the project's implementation (which is when it is needed for the analysis). Collection of such a data set prior to and following project implementation is highly recommended, however, as a way of monitoring the project's impact, as was done in the successive Thailand Land Titling Projects (for example, see Onchan and Aungsumalin, 1993). Cross-sectional data can also be used, but fully controlling for farm-specific characteristics becomes more difficult. Nevertheless, Feder and others (1988) used this approach very successfully in Thailand. It should also be recalled that once titling becomes prevalent, the premium that buyers will pay for titled land will decline (Belli, 1998).

Following this approach is not always possible, even if data could be collected. In Petén, for example, any land price data that might exist or might be collected are unlikely to give a reliable indication of the impact of department-wide regularization. Until recently, only a very small proportion of all land in Petén had been registered, making the market for such land an extremely thin one, subject to substantial fluctuation. Moreover, until recently much of the land that had been registered tended to belong to better-off farmers, to be in more favorable areas, and to be used for different purposes than those of the majority of Petén's farmer, such as extensive livestock grazing. As such, its price is unlikely to be representative of the bulk of land in Petén. A similar condition now exists in most areas of Thailand in which the land titling project has been active; in this case, very little untitled land remains, and that land tends to be unrepresentative of the bulk of land. If land that had titles prior to the project was titled as a result of the farmers' own initiative, further problems arise. One expects that farmers will be most likely to independently seek titling in cases where the benefits to doing so are greatest. The measured 'effect of titling' based on data from these farms would be an unreliable indicator of the likely effect of titling an arbitrarily-chosen field.

### Farmer Willingness to Pay

An alternative measure of the benefits of titling comes from the farmers' own willingness to pay to obtain titles. This provides a *lower-bound* estimate of the value farmers place on land titles—farmers anticipate receiving benefits at least equal to the amount they pay for the title.<sup>10</sup> These anticipated benefits might take the form of improved returns thanks to the investments that farmers anticipate undertaking or the credit they anticipate receiving, or it may take the form of avoided losses in income as a result of eviction.

Unfortunately for the use of such measures, the fees charged to farmers for provision of titles often only cover a small proportion of the actual cost of titling. In Thailand, for example, titling fees are set at a nominal level (\$3.6 per title, at the time of the Second Land Titling Project), and so provide very little useful information.<sup>11</sup> In Petén, on the other hand, the cost to farmers of obtaining title is quite high.<sup>12</sup> The cost of

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properties tend to be transacted more often, so it is more likely that suitable data will be available or can easily be collected.

<sup>10</sup> Since titling fees are set administratively, rather than as a result of market clearing, they do not provide a measure of the actual benefit of titling, but only a lower-bound—unless farmers refuse to pay the fees, in which case the fees provide an upper bound estimate of the benefit of titling.

<sup>11</sup> Fees for sporadic adjudication are substantially higher and do provide evidence that some farmers think titling is so beneficial that they are willing to pay more in order simply to get their title sooner (since they could simply wait until the titling program reaches their area). While suggestive, however, these fees should not be used as the basis for estimates of benefits that all farmers will receive, because the farmers using sporadic adjudication are likely to be those who expect to gain most from titling.

obtaining a title can be calculated from the payment schedule (most farmers pay in installments over 11 years), taking into account all the fees involved and the effects of future inflation. For a farm of less than 90 hectares, this cost is about \$19 per hectare (because of low productivity and the frequent use of fallow, farms in Petén tend to be large). For farmers with farms between 90 and 135 hectares, the cost of titling is \$67 per hectare, and for farmers with 135-180 hectares the cost is \$113 per hectare. Although these are substantial amounts for small farmers in Petén, uptake of titles by farmers in the pilot titling areas has been almost universal. In the earlier pilot areas, many farmers have now made their second payment. That farmers are willing to pay these fees demonstrates that they expect titling to be financially profitable from their perspective. Bearing in mind that the fees farmers pay are a lower-bound estimate of the benefits they foresee from titling, evidence that farmers pay these fees provides strong evidence of the likely existence of substantial benefits.

Several aspects of using measures based on either increased land prices or willingness-to-pay for title must be borne in mind.

- (a) First, these are estimates of the *total* benefits of land titling on the farms concerned. They should be used alone, therefore, and not supplemented by additional measures such as the benefits of increased crop production. The expected benefits of increased crop production thanks to titling are already included in the land price differential; including it again would double-count the benefits. This is not to say that attempts should not be made to estimate what effects titling will have on output or productivity, however, since such estimates will increase confidence in the results and are probably of interest to policymakers in their own right.
- (b) Second, these estimates are of the *present value* of total benefits. They are not annual benefits. The increase in land prices on titled land, for example, represents the present value of the increased flow of net benefits achievable on titled land compared to untitled land. Applying these estimates annually would, therefore, result in a vast over-estimation of benefits. For the purposes of the analysis, it is often convenient to convert them to an annual flow. This can be done by converting them to an annuity, for example. See the Petén analysis for an example of this.

### Increased Productivity

An alternative approach to looking at land prices is to compare changes in use of inputs or outputs, yields, or farmer income resulting from titling. Although this only captures a portion of the potential benefits of titling, it is often easier to implement since data tend to be more readily available. Moreover, in many cases land markets may be constrained by legal or social problems and thus be thought to provide an unreliable indication of the value of the land, making direct examination of productive activities the only viable approach. As for an analysis based on land prices, considerable amounts of data are needed to control for other factors which might influence the variables being measured, and the same potential problems with self-selection bias arise. An additional issue with this kind of measure is that the benefits of titling are unlikely to arise at once. It will take time for farmers to use their titles to secure credit and to undertake investments, and in the case of long-term investments it will take time for their benefits to be obtained. Data from Thailand indicate that the extent of benefits is greatest in land that has been titled longest.

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<sup>12</sup> In principle, the fees farmers pay in Petén are to buy the land itself, not for the title *per se*. Since the farmers concerned are already farming the land being titled, however, in practical terms they are paying for the title.

An important question is the degree to which this kind of analysis can be done with available *secondary* data. Unfortunately, the answer is that secondary data are often insufficient for this purpose. Secondary data are generally only available at relatively aggregated levels. This makes it extremely difficult to identify the effects of land titling. Titling is only one of the factors that affects each administrative unit. If sufficiently disaggregated data are available, some of the site-specific effects can be controlled for by carrying out paired comparisons of titled and untitled areas with similar socio-economic and agro-economic conditions. This may be possible in areas where the administrative units for which data are available are relatively small and homogeneous and where past titling efforts have been carried out on the basis of these units. This was the case in Thailand, for example, where each region contains about a dozen provinces, some of which were titled in the first Bank-financed Land Titling Project (1985-90), some in the second (1991-94), and some in the third (1995-99). The ex-post economic analysis of the Second Land Titling Project (see Annex 1) took advantage of this 'natural experiment' to examine the impact of titling on credit. This approach has limitations, however. First, it is dependent on the existence of cases in which the extent of titling varies substantially across administrative units, but most other characteristics do not. Even in the case of Thailand, in which titling activities were undertaken in different administrative units in turn, there were difficulties, since the extent of titling activities varied substantially within provinces. For example, the second Land Titling Project covered almost 70% of the area of Lampang Province but only 5% of the area of nearby Phrae Province. Moreover, no data are available on either the initial or the final percentage of area or parcels titled in each province. Where a substantial proportion of a province already had titles prior to the project, one expects a lower impact from titling; likewise, one expects a lower impact where a substantial proportion of a province remains untitled after completion of project activities. Second, as titling becomes prevalent carrying out paired comparisons of titled and untitled areas becomes increasingly difficult. Remaining untitled areas tend to be scattered and often have particular constraints, such as location in areas where forest boundaries are uncertain or the existence of disputes over inheritance, which may make them unrepresentative. This is the situation throughout the North, Northeastern, and Central parts of Thailand today. In Petén, the opposite problem was encountered: most of the department had not been titled yet, so titled areas were likely to be unrepresentative (in any case, since Petén is a department in its own right and secondary data are reported on a departmental basis, an analysis such as that carried out in Thailand would not have been possible there).

Once measures of the increased input levels, yields, or income are obtained, incorporating them into the analysis is relatively straightforward. Income increases are the simplest to use; they are simply entered as annual benefits, multiplied by the number of households affected. Input or yield increases must be entered into crop production budgets to compute the resulting income increases, which are then multiplied by the area affected. This was the procedure used in the Thailand analysis, using production budgets for rice, the most common crop in the project area. Since yield increases will not be possible on all land, for a variety of reasons, an allowance should be made for areas which will achieve no or lower benefits. In Honduras, López (1996) found that only 46% of titled farmers were in fact be able to secure credit (the main mechanism by which benefits were derived in that instance). Thus, while farmers who were able to secure credit experienced an increase in annual income of \$203, the *average* increase in income was only \$93. In the case of Thailand, it appeared likely that some farmers would be unable to increase production because of insufficient access to water. Since no data were available on the extent of areas which were likely to receive low benefits, an admittedly arbitrary adjustment was used under which 25% of title land was assumed to have no benefits from titling; the robustness of results to this crude assumption was then examined with sensitivity analysis.

**Investment analysis.** When data on the experiences of previous titling efforts are not available for analysis, estimates of the benefits of titling can be made by examining the benefits of activities likely to be undertaken after titling has occurred. If activities such as planting tree crops or building irrigation systems



would not be implemented in the absence of titles, then it is reasonable to ascribe the net benefits of these activities to titling. The actual calculations are standard cost-benefit analysis calculations for the activities concerned. Thus, cashew nut production in Petén—an activity which is rarely undertaken on untitled land but appears to be popular with farmers in pilot titling areas—is estimated to have a rate of return of 35% and a net present value of \$1,500; once full production is reached after 8 years, it will generate a net annual income of about \$300. The biggest concerns here are two-fold. First, if predictions of what activities will be undertaken are not based on actual observed behavior following titling, there is a danger that the predictions may be incorrect. A solid qualitative understanding of the situation is necessary for this kind of prediction to be made with confidence. In particular, it is important to try to determine whether other binding constraints might be encountered once the titling constraint is removed. Orange production in Petén appears to be quite profitable, for example, but is limited by a scarcity of planting material. A weak transport infrastructure also limits the areas in which fresh orange production can be undertaken profitably. Second, predicting the extent to which the new activities will be undertaken is often difficult. It would clearly be unreasonable to expect that all 18,000 square kilometers of Petén will be planted to cashew nut once they have been titled. Indeed, most farmers seem to be planting less than 1 hectare of their 45-90 hectare farms to these crops.

**Environmental benefits.** A full discussion of how to measure the environmental benefits that might result from titling is outside the scope of this manual. Once the likely environmental impacts have been identified, methods such as those outlined by Dixon and Pagiola (1998) can be used to quantify them. They would then be introduced in the cost-benefit analysis in the same way as any other benefit.

**With and without.** As with all economic analysis, it is important to compare the expected benefits of titling to an appropriate counterfactual—what would have happened had the project not been implemented. In practice, it has generally proven simplest to express both costs and benefits in terms of the incremental costs or benefits resulting from titling activities. This approach follows naturally from the main econometric techniques used in measuring the benefits of titling, which usually provide results in the form of increases in benefits. Both the Thailand and the Petén analyses use this approach.

## 5. Monitoring Results

Monitoring the results of land administration projects is important. Because of the complexity of the relationship between titling and other land administration activities and the ultimate objective of improving rural incomes and welfare, bottlenecks or constraints may arise during execution that were not evident during project preparation. By monitoring the extent to which the project is succeeding in generating benefits, it is possible not only to judge the success of the project itself, but if necessary to adjust it to overcome problems. Monitoring is particularly important in cases where the project is a pilot or an initial phase of a longer-term land administration program—though it should be borne in mind that the results of titling in one area of a country should not be carried over blindly to other areas, since variations in conditions might change both the qualitative and quantitative relationships at work.

Farmer participation rates are an obvious indicator to monitor, but they are often insufficient as an indicator of project benefits. Only in cases in which farmers have to pay substantial fees to obtain titles, such as in the case of the Petén project, does the extent to which farmers participate in the program and pay the fees provide a strong indicator of the existence of benefits. Since titling fees are often nominal, however, other indicators will usually be necessary.

Simply monitoring individual variables such as land prices, amount of investment, or use of credit is also insufficient to determine whether the project's activities are in fact beneficial, since these variables depend on a great many factors, as noted above. Panel data sets, which contain data for a number of households over time, are an ideal tool to monitor the many dimensions of the benefits of land

administration projects since they allow other factors to be corrected for. As noted above, such datasets rarely exist prior to project implementation, but can easily be collected during implementation. An initial baseline set of observations should be collected before titling occurs, and additional data should be collected as the project proceeds. The sample should be designed so that it includes at least some households whose land is scheduled to be titled late in the project's execution, so that a control group of untitled land is available as late as possible. It would also be useful to monitor households at more than just two time periods (i.e. not just 'before' and 'after' titling) for two reasons. First, if the follow-up survey is only carried out once, following completion of the project, the opportunity to undertake mid-course corrections is lost. A single follow-up during project implementation is also insufficient, since it would not allow the success of any mid-course corrections to be gauged. Second, some effects of titling, such as increased investment, will take time to occur. Repeated observations will provide a better understanding of the dynamics of this process.

Several different dependent variables might be used in such an analysis. The price of land is an obvious one; as discussed above, when land markets function well, the price of land captures all the benefits that land users expect to achieve. Other dependent variables can shed light on the specific mechanisms through which titling brings benefits. For example, it would be interesting to test formally the degree to which titling affects various kinds of investments are undertaken, the level of use of variable inputs, or the ability to obtain credit. Examples of these various kinds of tests can be found in Feder and others' (1988) work on Thailand.

## **6. Summary**

Land administration programs can bring important benefits, but they do not always do so, and even when they do the benefits may not be sufficient to justify the costs involved. A thorough economic analysis is necessary, therefore, to determine whether a land administration project is justified. This analysis should begin with a strong qualitative analysis that seeks to identify the specific mechanisms by which land administration activities might bring benefits in the specific case under consideration, and then be supplemented by quantitative analysis that confirms the existence of benefits and measures their magnitude. Such an analysis is most useful when carried out early in project preparation, so that it might not only provide a 'yes-or-no' answer to question of whether to proceed, but also inform the nature of the project itself.

## Annex 1: Thailand Second Land Titling Project

The Second Land Titling Project (LTP2, Loan 3254-TH) in Thailand issued over 2 million titles to farmers in the North, Northeast, and Central regions of the country between 1991 and 1994. This project assisted the Government of Thailand in carrying out the second phase of its Land Titling Program. It had been preceded by the Land Titling Project (LTP1) and was followed by the Third Land Titling Project (LTP3). Neither LTP2 nor the earlier and later projects made any attempt to estimate a rate of return for the land titling activities they undertook. This annex reviews the available evidence on the economic benefits provided by the land titling activities and estimates a rate of return.<sup>13</sup> Only the rural land titling activities are covered in this analysis; neither the much smaller urban land titling activities nor the valuation activities of LTP2 are included.

### Costs

Table A1-1 shows the costs incurred by the project in its land titling activities. Taken alone, these amount to US\$32 per title, or US\$34 per hectare, as shown in Table A1-2.<sup>14</sup> To these costs, it would be reasonable to add at least a portion of the other project costs, such as institution building, technical assistance, and training. Without these overhead expenditures, it is likely that the project would have been less effective. Conversely, it would be inappropriate to charge the entirety of these costs to the current land titling activities, since they are also intended to benefit future titling activities (including the Third Land Titling Project, currently underway).<sup>15</sup> Adding half the overhead costs results in a cost per title of US\$36, and a cost per hectare of US\$39.

**Table A1-1: Costs of Titling**

	B million
Base cadastral mapping	552
Ground survey (incl NS3K conv)	1,027
Depreciation of equipment	57
Land administration	209
Institution building	96
TA and training	140
Total overhead	445

*Notes:* Data show actual costs incurred

**Table A1-2: Cost per Title and Per Hectare**

	% of overhead cost included		
	0	50	100
Total Cost (B million)	1,636	1,859	2,081
Cost per title			
B/title	801	910	1,019
US\$/title	32	36	40
Cost per hectare			
B/ha	860	977	1,094
US\$/ha	34	39	43

*Notes:* Unit cost estimates based on 2 million titles issued, covering 1.9 million ha

<sup>13</sup> The analysis in this annex was carried out as part of an audit of the completed project, and so uses ex post data on costs and achievements rather than ex ante data. The techniques used to estimate the benefits are similar in both cases, however.

<sup>14</sup> The exchange rate at the time of the project's completion, Thai Bhat (B) 25.3 = US\$1, is used throughout this annex. All prices are in constant 1995 values unless otherwise indicated.

<sup>15</sup> The overhead expenses include US\$5.4 million for training and technical assistance. Although this amount was financed by a grant from the Australian International Development Assistance Bureau (AIDAB), it is included in the costs for two reasons: First, it is unlikely that this grant had no opportunity cost; if the funding had not been used for the titling program, it might have been available for other purposes. Second, including the costs of technical assistance provides a better estimate of the returns to titling that might be obtained if the Government of Thailand were to continue the program with its own resources or if another country in the region were to undertake a similar program.

At a 10% discount rate, these costs are equivalent to an annuity of US\$3.6 per title or US\$3.9 per hectare. In other words, as a first approximation, an increase in annual net benefits per hectare of about US\$3.9 per hectare is required for titling to break even. This provides an order of magnitude for the benefits estimates, although the actual break-even point will be slightly higher, since costs are borne early in the project and the benefits will be received in future.

## **Benefits**

The role of land titling in Thailand has been unusually well studied. In particular, a comprehensive study was undertaken in the mid-1980s by Feder and others (1988). A second study was commissioned under LTP1 to examine the effects of that project's titling activities, and undertaken in the late 1980s (Onchan and Aungsumalin, 1993). A third study was commissioned under LTP2, but its results are not yet available.

These studies show that:

- (a) Increasing security of tenure was a relatively minor consideration for Thai farmers. The study by Feder and others in particular argues that tenure security is already very high and that titling does not improve it. On the other hand, the Onchan and Aungsumalin study notes that about 10% of farmers in the Northeastern region cited "avoiding eviction" as a perceived benefit of titling, and that about 30% of farmers in both the Northern and Northeastern regions cited "avoiding disputes" as a benefit.
- (b) Increasing access to credit was a major benefit of land titling. The impact of titling on access to credit was found to be particularly strong in the study by Feder and others. It was less marked, though still positive, in the Onchan and Aungsumalin study (whose results, however, were probably affected by exogenous factors).
- (c) Although land titles are not necessary for land transactions to occur, the Onchan and Aungsumalin study did find that land markets appeared to be more active in areas where titling had occurred.

The results of these factors were increased investment, improved productivity, and higher land values:

- (a) Investment both in land and in other capital assets was generally higher in areas that had been titled, although the magnitude of the impact varied across areas and types of investments.
- (b) Farmers generally used more inputs and had higher output and productivity on titled land, although again the magnitude of the impact varied.
- (c) The value of titled land was higher than that of untitled land, confirming that land users perceive considerable benefits in having titles.

Although these studies showed relatively strong benefits to titling, there was a need to update them to verify that they still apply under the changed conditions experienced in the 1990s. Several factors might have changed the role of titling. The rural sector as a whole has undergone significant structural change as a result of the economic boom experienced in Thailand during most of the 1990s. The growth of off-farm income opportunities has affected both the rural supply of labor and, because of remittances, the availability of capital. The availability of rural credit has grown, thanks in particular to the expansion of the Bank for Agriculture and Agricultural Cooperatives (BAAC), and the terms on which credit is available have evolved; group credit schemes, for example, are now more common. In some areas, demand for land for non-agricultural use has also grown substantially.

As was noted above, surveys of selected provinces where LTP2 worked were undertaken before and after the project. However, these surveys have not yet been analyzed. Until the data from these surveys become available, the only way to examine the effects of land titling during the 1990s is to use available secondary data. Unfortunately, such data is only available at relatively aggregated levels, typically at the provincial level. This makes it extremely difficult to identify the effects of land titling. Provinces typically have substantial internal diversity; if data were available for smaller land units, it would be easier to control for differences in agro-ecologic and socio-economic conditions. Titling is only one of the factors that affected each province. Moreover, the extent of titling activities varied substantially within provinces. In some provinces, a large proportion of total area was titled. For example, in Lampang province almost 70% of total area was titled under LTP2. In other provinces, such as nearby Phrae, only 5% of total area was titled under the project. Moreover, no data are available on either the initial or the final percentage of area or parcels titled in each province. Where a substantial proportion of a province already had titles prior to the project, one expects a lower impact from titling; likewise, one expects a lower impact where a substantial proportion of a province remains untitled after completion of project activities. Finally, with titling becoming almost universal throughout the North, Northeast, and Central regions, it has become increasingly difficult to carry out paired comparisons of titled and untitled areas. Remaining untitled areas tend to be scattered and often have particular constraints, such as location in areas where forest boundaries are uncertain or the existence of disputes over inheritance, which may make them unrepresentative.

Data on household credit use in the 1991/92 and 1995/96 crop years obtained from household surveys carried out by the Office of Agricultural Economics of the Ministry of Agriculture were used to examine whether land titling still had a positive impact on credit, as was found in the earlier studies, during the period of LTP2.<sup>16</sup> The results show that:

- (a) In every region, total credit use per household increased faster between 1991/92 and 1995/96, on average, in provinces where LTP2 worked than in the region as a whole. In provinces where LTP1 had worked, credit use increased faster still. Overall, the average increase in credit use in non-LTP provinces was 22%. In LTP2 provinces, average credit use increased by 31%; in LTP1 provinces, it increased by 95% (the average increase for all provinces was 27%). These results, however, mask very considerable disparities within each group.
- (b) On average, the use of formal credit increased in both absolute and relative terms. In absolute terms, use of formal credit increased faster in provinces where titling was undertaken, once again with the increase being greatest in LTP1 provinces. The average increase in formal credit use was 37% in non-LTP provinces, 50% in LTP2 provinces, and 111% in LTP1 provinces. The results in terms of changes in the relative share of formal credit are very mixed, however, because of different initial conditions (in some cases the share of formal credit was already so high that it could not increase much; in LTP2 provinces in the North and Northeast, for example, formal credit already accounted for over 90% of total credit in 1991/92). Again, there are substantial disparities within each group.

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<sup>16</sup> For the purposes of this analysis, the provinces considered as LTP2 provinces were: Chachoengsao, Chai Nat, Chanthaburi, Chon Buri, Nakhon Sawan, Prachin Buri, Rayong, and Trat in Central Region; Chiang Rai, Lampang, Nan, Phrae, and Uthai Thani in Northern Region; and Kalasin, Maha Sarakham, Mukdahan, Roi Et, Ubon Rathchathani, and Yasothorn in Northeastern Region. The LTP1 provinces were Chiang Mai, Lamphun(\*), Mae Hong Son(\*), and Phayao(\*) in Northern Region and Buri Ram, Nakhon Ratchasima, Si Sa Ket(\*), and Surin(\*) in Northeastern Region; titling in provinces marked (\*) was begun under LTP1 and completed during the first year of LTP2.

- (c) Use of informal credit dropped in relative terms, though not always in absolute terms. Overall, the share of informal credit in total credit dropped fastest in LTP1 provinces.
- (d) Provinces where LTP1 worked had substantially lower than average levels of credit at the beginning of the study period. This is as expected, since an important criterion in selection of provinces for LTP1 was their relative level of poverty. By 1995/96, the difference was still present but smaller.
- (e) The increase in credit use, both overall and in LTP2 provinces, was lowest in Central region provinces. These provinces are among the richest farming regions in the country, and have a much longer history of credit use. Already in 1991/92, they had the highest average credit use (almost twice the national average). These provinces also had the highest share of informal credit use (24% in 1991/92, dropping to 14% in 1995/96). This is consistent with the results in the study by Feder and others, which found that credit use increased least as a result of titling in the Central region study site of Lop Buri, which had high levels of commercialization and a thriving informal credit market to support it.

These results show that the broadly positive impact of titling on credit use found in the earlier studies continued to hold during the period in which LTP2 operated. They also suggest that there is a lag before the full effects of land titling on credit use are felt. Because of the limitations noted previously, however, the available data do not allow a precise estimate of the extent of the impact on credit use.

Similar efforts were made to use data on input use and crop yields to attempt to examine the effects of titling on production, but the results were mostly inconclusive. The yield changes experienced in each province, for example, were very sensitive to the definition of initial and final years, even when moving averages were used. Because of this, efforts to correlate titling with yield increases were extremely sensitive to model specification. In some cases, the expected positive correlation was observed; in others there was little, or even a negative, correlation. With more disaggregated and more detailed data, it might have been possible to better control for the impact of the multitude of factors other than titling which affected yields. It should also be borne in mind that impact on yields is only one aspect of the possible benefits of titling. Titling might also encourage or allow diversification into other crops or into non-agricultural activities. There is anecdotal evidence, for example, of land titles being used as collateral to finance education, migration, or non-agricultural investments in commerce and transport activities.

No data were available on the impact of titling on land values. Anecdotal information from farmers interviewed at random in the Northern and Northeastern regions suggests that land with titles sells for more. Farmers also expressed, and in practice have demonstrated, a willingness to pay fees to obtain titles to their land; since fees for titling are set at a nominal level (currently B110; at the time of LTP2 the fee was B90 or US\$3.6), however, they only provide a lower-bound estimate for the perceived benefits of titling. Farmers interviewed at random generally expressed a willingness to pay higher fees. More concretely, farmers unwilling to wait for the systematic adjudication process to reach their area have been willing to pay fees of B500 or more for sporadic adjudication of their land; during the years of the LTP2 project, about 34,000 titles were issued under this process. Although this represents only about 2% of the total titles issued during that period, it demonstrates that some farmers were not only willing to pay for their titles, but were willing to pay a premium to obtain the title a few years sooner than they would otherwise have done.

Although the analysis based on available secondary data provided only limited results, it and the more qualitative analysis based on interviews with knowledgeable observers carried out during the audit mission suggest that the results of the earlier studies of the benefits of titling are still broadly applicable in Thailand.

### **Estimated Rate of Return**

Table A1-3 shows the rate of return calculations for LTP2.

- (a) Benefits are calculated separately for each region, since the results of the analyses of titling show that regional variations are important. The estimated increases in productivity and input use in each region are based on the results of the studies by Feder and others and by Onchan and Aungsumalin. They are then applied to region-specific production budgets for the major rice crop, which is the main agricultural product in all the regions (paddy accounted for 44% of farm land in Central region, 52% in Northern region, and 65% in Northeastern region).<sup>17</sup> The costs and yields of several years have been averaged to avoid year-specific variations.
- (b) The estimated benefits are assumed to take 10 years to be fully realized, and to increase linearly beginning with the year in which each plot is titled.
- (c) In some cases, titling may not have any effect on production. For example, in areas where water availability is a limiting constraint, increased access to credit may not increase investment since few investments are likely to be profitable. To allow for this, it is assumed that there will be no benefits on 25% of titled plots. In addition, it is assumed that the benefits of NS3K conversion are smaller than the benefits of replacing lesser documents.<sup>18</sup> The case studies document that NS3Ks already provide substantial benefits (in particular, the study by Feder and others includes NS3K holders in its definition of titled farmers) although the results of the Onchan and Aungsumalin study suggest that the benefits of NS4s are greater. To allow for this, the benefits of NS3K conversion are assumed to be only half as great as the benefits of conversion from lesser titles.<sup>19</sup> The magnitude of both these adjustments is admittedly arbitrary.
- (d) For each region, the flow of benefits is then projected, based on the actual area titled in each region in each year of the project (and adjusting for the proportion which represents NS3K conversions, as discussed above). The resulting benefit flows are then discounted at 10%.
- (e) The discounted costs of project implementation are then subtracted. The amount and scheduling of expenditures is extracted from the LTP2's Implementation Completion Report. As mentioned earlier, the cost estimates include all of the titling costs (except for urban titling) and 50% of the overhead costs. Neither the titling fee paid by farmers nor the subsequent taxes they pay on any land transactions are included, since these are transfers.

Under these assumptions, the Net Present Value of the net benefits of the project is estimated to be about **US\$280 million**, with an Economic Rate of Return of about **34%**.<sup>20</sup> Even assuming that titling has low or no benefits in some areas, the benefits of titling are sufficiently large in some areas, relative to the costs of titling, to make the overall project be quite beneficial.

Given the number of assumptions and *ad hoc* adjustments that had to be made, sensitivity analysis is very important.

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<sup>17</sup> The estimates of increased productivity are given as increments to the yield changes that would otherwise have happened; no separate adjustment for the without-project case is necessary, therefore.

<sup>18</sup> The NS3K is a 'Certificate of Utilization'. It defines the land parcel less precisely than a full title, but otherwise conveys similar rights. About 8 million such certificates were issued during 1972-82, when the Thai Department of Lands (DOL) was unable to cope with demand for full titles (World Bank, 1994).

<sup>19</sup> NS3K conversions represented about 30-40% of total titles issued under LTP2, depending on the region.

<sup>20</sup> Omitting the costs financed by grants increases the NPV to US\$282 million and the ERR to 35%.

- (a) Reducing the assumed increases in input use and yields by as much as 50% reduces the NPV to \$109 million and the ERR to 21%. A reduction in the assumed increases in input use and productivity of more than 80% is needed before the project becomes unprofitable.
- (b) The assumption that the full benefits of titling would only be experienced after 10 years on any given plot is already quite conservative. For each additional year that full benefits are delayed, the NPV drops by about \$15 million.
- (c) Doubling the proportion of titled area on which it is assumed that no benefits are experienced (to 50% of the area titled) reduces the NPV to \$166 million and the ERR to 26%. The project is estimated as breaking even if as little as 15% of the area titled receives the assumed benefits. Assuming that there is *no* benefit to NS3K conversion reduces the NPV to \$260 million and the ERR to 32%.
- (d) If the entire overhead costs are charged to the titling activities, the NPV falls to \$272 million and the ERR to 31%.

These results show that the conclusion that the LTP2 project was profitable is quite robust to even dramatic changes in the assumptions.



**Table A1-3: Rates of Return Calculations for Thailand Second Land Titling Project**

Region	Year	Total area (ha M)	NS3K Conv	% of Titles	Total Titles	% of Total	Year From Project Start																	
							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14			
							<b>Total Benefits (B million)</b>																	
North	1991	70	13,018	0.02	198,486	0.37	0	7	14	22	29	36	43	50	57	65	72	718						
	1992	61	102,165	0.19	173,418	0.32		0	6	12	17	23	29	35	40	46	52	58	575					
	1993	38	50,472	0.09	107,752	0.20			0	4	8	11	15	19	23	26	30	34	38	376				
	1994	21	17,653	0.03	60,218	0.11				0	2	4	7	9	11	13	15	17	20	22	217			
	<b>Total</b>	<b>191</b>	<b>183,308</b>	<b>0.34</b>	<b>539,874</b>	<b>1.00</b>	<b>0</b>	<b>7</b>	<b>20</b>	<b>37</b>	<b>56</b>	<b>75</b>	<b>93</b>	<b>112</b>	<b>131</b>	<b>150</b>	<b>169</b>	<b>827</b>	<b>632</b>	<b>398</b>	<b>217</b>			
Northeast	1991	314	205,337	0.21	339,815	0.34	0	15	31	46	62	77	93	108	124	139	155	1,547						
	1992	256	0	0.00	277,537	0.28		0	14	28	42	56	70	85	99	113	127	141	1,410					
	1993	203	115,063	0.12	220,095	0.22			0	20	40	59	79	99	119	139	159	178	198	1,982				
	1994	142	74,169	0.07	154,215	0.16				0	14	28	43	57	71	85	99	114	128	142	1,419			
	<b>Total</b>	<b>916</b>	<b>394,569</b>	<b>0.40</b>	<b>991,662</b>	<b>1.84</b>	<b>0</b>	<b>15</b>	<b>45</b>	<b>94</b>	<b>158</b>	<b>222</b>	<b>285</b>	<b>349</b>	<b>412</b>	<b>476</b>	<b>539</b>	<b>1,980</b>	<b>1,735</b>	<b>2,124</b>	<b>1,419</b>			
Central	1991	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	1992	232	62,442	0.12	148,686	0.29			0	22	44	66	88	110	132	154	176	197	219	2,194				
	1993	208	3,065	0.01	133,363	0.26				0	21	42	63	84	104	125	146	167	188	209	2,090			
	1994	356	87,962	0.17	228,812	0.45					0	33	66	99	131	164	197	230	263	296	329	3,286		
	<b>Total</b>	<b>796</b>	<b>153,469</b>	<b>0.30</b>	<b>510,861</b>	<b>0.95</b>	<b>0</b>	<b>0</b>	<b>22</b>	<b>65</b>	<b>140</b>	<b>216</b>	<b>292</b>	<b>368</b>	<b>443</b>	<b>519</b>	<b>595</b>	<b>670</b>	<b>2,699</b>	<b>2,418</b>	<b>3,286</b>			
<b>Total</b>		<b>1,902</b>	<b>731,346</b>		<b>2,042,397</b>		<b>0</b>	<b>23</b>	<b>87</b>	<b>196</b>	<b>354</b>	<b>512</b>	<b>670</b>	<b>829</b>	<b>987</b>	<b>1,145</b>	<b>1,303</b>	<b>3,477</b>	<b>5,066</b>	<b>4,940</b>	<b>4,922</b>			
							<b>Discounted Total Benefits (B million)</b>																	
					North		0	7	17	28	38	46	53	58	61	64	65	290	201	115	57			
					Northeast		0	14	37	71	108	138	161	179	192	202	208	694	553	615	374			
					Central		0	0	18	49	96	134	165	189	207	220	229	235	860	700	865			
					<b>Total</b>		<b>0</b>	<b>21</b>	<b>72</b>	<b>147</b>	<b>242</b>	<b>318</b>	<b>378</b>	<b>425</b>	<b>460</b>	<b>486</b>	<b>502</b>	<b>1,219</b>	<b>1,614</b>	<b>1,431</b>	<b>1,296</b>			
							<b>Project Costs (B million)</b>																	
					Current Value				725	456	101													
					Discounted		7	518	599	343	69													
							<b>Net Benefits (B million)</b>																	
					Current Value				-638	-260	253	512	670	829	987	1,145	1,303	3,477	5,066	4,940	4,922			
					Discounted		-7	-498	-527	-196	173	318	378	425	460	486	502	1,219	1,614	1,431	1,296			
					NPV		7,076																	
							<b>Net Benefits (US\$ million)</b>																	
					Current Value				-25	-10	10	20	26	33	39	45	51	137	200	195	195			
					Discounted		0	-20	-21	-8	7	13	15	17	18	19	20	48	64	57	51			
					NPV		280																	
					ERR (%)		34																	

Notes: Values shown in 10th year since titling are present value of all future benefit flows; 10% discount rate used; Exchange rate 25.3 B/US\$

## Annex 2: Guatemala Land Administration Project

The Land Administration Project being undertaken in Guatemala's Petén region comprises two main groups of activities:

- (a) **Land titling.** The project is financing land titling on 11,344 square kilometers, or the entire area of the Petén not already scheduled for titling under other projects. It is worth noting that titling activities are not restricted to individual landholders; the project will also issue titles to land held communally, by municipalities or cooperatives.
- (b) **Creation and operation of a land registry and cadastre.** The project is financing the establishment of a land registry for Petén and for the continued maintenance and updating of the cadastre created through the titling activities. This will ensure that records remain updated (thus preserving the benefits of project into the future) and provide information for other purposes, such as land use planning.

The bulk of project expenditures is devoted to rural land titling.<sup>21</sup> Direct expenditures on urban land titling activities are expected to be about \$0.92 million, or \$0.8 million in present value terms, plus part of general project expenditures. About 25% of project expenditures on activities such as conflict resolution, quality control, and maintenance and updating are assumed to be used for urban titling.<sup>22</sup> Because of their importance in total project expenditures, the economic analysis will focus on rural land titling activities. In the case of activities expected to generate national benefits outside the project area, such as capacity-building within the registry, half the cost is included as a cost to titling in Petén. With these adjustments, the cost of rural land titling activities is expected to be about \$15.8 million in present value terms. An additional \$2.5 million (in present value terms) will be spent on registry and cadastre maintenance activities (including the future costs that will be borne by various Guatemalan agencies following the end of the project itself). These activities will benefit not only the land titled under the project, but all land in Petén, including land already titled or being titled under other projects. The Project Preparation Facility (PPF) and Project Management expenses add another \$1.5 million and \$2.3 million, respectively. The project expenditures included in the analysis are summarized in Table A2-1.

### Costs

There have been a number of pilot rural land titling projects undertaken recently by several private firms that specialize in such work, either under contract to the Guatemalan National Institute for Agrarian Transformation (INTA) or in collaboration with NGOs such as CARE and financed by USAID. The cost of field activities related to rural land regularization in these pilot projects was about \$12.5 per hectare. By taking advantage of lessons learned under these pilot projects and incorporating improvements such as greater use of aerial photography, the cost of field activities related to regularization will be reduced to about \$9 per hectare. Additional costs, including the initial aerial photography and orthophotomap preparation, social communication, conflict resolution, supervision, quality control, and project management bring the average cost of rural land titling to about \$16.9 per hectare. The cost of registry and cadastre maintenance activities comes to about \$1.4 per hectare. Taking into account the different areas to which these costs apply, the average costs of titling and then maintaining that title up to date come to about \$17.8 per hectare. As an order of magnitude, therefore, it can be estimated that returns to land need to increase by about \$1.8 per hectare per annum to justify titling, given a discount rate of 10%. This figure is an

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<sup>21</sup> All values are given in real 1998 US dollars (US\$) unless otherwise stated. An exchange rate of Guatemalan Quetzals (Q) 6.3 = US\$1 was used to convert local currency costs and benefits to US dollars.

<sup>22</sup> Although the number of urban land titles expected to be issued (about 19,000) is only slightly less than the number of rural land titles expected to be issued (about 25,000), unit costs will be higher in rural areas.

underestimate since (i) benefits will be felt later than costs; and (ii) some areas will have no benefits for a variety of reasons, thus requiring higher returns in other areas to justify the project as a whole. Conversely, since some of the land that is currently not used will now be placed to more productive use (such as tree crops), the area that will generate benefits is probably larger than the area currently under cultivation, and the benefits per hectare required to justify conservation will be correspondingly lower.

### Anticipated Benefits

**Improved security.** In Petén, improved security appears to be a major benefit of titling. Although the extent of tenure insecurity is difficult to measure (no data exist on evictions, for example), farmers consider tenure security to be extremely important. Farmers cite the need to guarantee their household's source of livelihood, which they see as threatened by the potential for loss of land, as a major reason for wanting titles. As discussed below, farmers are willing to pay what for them are substantial amounts to obtain titles and the increased security they represent. Additional evidence of the importance farmers attach to titles is provided by reports from several NGOs that work on protected areas that farmers who have encroached in core or multiple-use areas are usually very willing to relocate outside these areas—even on less land—provided they are able to obtain title in the destination areas (by law, titles cannot be issued to land inside protected areas).

**Farmer investments.** One of the concrete benefits of titling is that it may encourage farmers to undertake profitable long-term investments that they had previously shied away from. Although the extent of possible improvements to land in Petén is limited by agro-ecological conditions and by the weakness of marketing infrastructure, farmers with title do appear to undertake a range of improvements.

- (a) **Tree crops.** A number of tree crops can be grown in Petén, including timber trees such as cedar and mahogany and fruit trees such as oranges, mango, banana, and cashew. Tree crops do not begin producing until several years after their establishment, and may not reach full production for several years beyond that. Cashew trees, for example, only produce about 50 kg/ha in the second year after planting, and do not achieve their full production potential of 1,500 kg/ha until 8 years after planting (PMS, 1993). Farmers without secure tenure are generally reluctant to undertake such investments. Once they receive titles, farmers often have much more confidence in undertaking such longer-term production. Farmers in the Tayazal pilot area, for example, have begun planting a range of tree crops since receiving titles. Such tree crops had by no means been unknown prior to titling, but their extent had been very limited. Similarly, farmers in the Sayaxché area that have received titles under PMS are eager to plant more citrus, but are limited by the availability of seedlings.
- (b) **Improved pasture.** Investments in livestock itself are unlikely to be affected much by titling. Since livestock is mobile capital that would not be lost even if farmers were to lose their land, absence of titles is unlikely to have discouraged livestock investments. Pasture improvements, on the other hand, represent a long-term investment that farmers may be unwilling to make without secure tenure. Indeed, several farmers in Tayazal report having sown grazing areas with improved pasture. Aside from the increased livestock production possible from improved pasture areas, the sustainability of the system is also increased.
- (c) **Increased intensity of agricultural production.** At present, cultivation in Petén is based on frequent fallows (*guamil*). Individual parcels are cultivated for one to three years and then left fallow for up to five years before being cleared and cultivated again. Some measures exist which can allow longer-term cultivation of the same parcel. For example, use of *frijol abono*, a nitrogen-fixing ivy, allows continuous cultivation of the same parcel for extended periods of time. The benefits of its use, however, are only felt beginning two

or three years after establishment (Fion, 1997). Again, such efforts to increase the long-term productivity of land may be discouraged by insecure tenure.

**Access to credit.** Increased access to credit is likely to play only a limited role in the benefits of rural land titling in Petén.<sup>23</sup>

- (a) Commercial banks have been reluctant to offer credit to small farmers, due partly to the risks involved and partly to the high costs of handling numerous small transactions. Availability of titles to serve as collateral will help alleviate the former problem but not the latter. Historically, the availability of cheap credit from state-run financial institutions, which generally placed very little importance to repayment, has also acted as a disincentive to commercial bank participation in the rural financial sectors.<sup>24</sup>
- (b) On the demand side, applying for formal credit loans can impose high transaction costs on small farmers, especially since bank branches tend to be limited to larger population centers. This problem will also not be alleviated by titling.
- (c) Perhaps more important, many farmers are reluctant to borrow against land even if credit were available, from fear of losing their land should adverse agricultural conditions prevent them from repaying their loans.
- (d) Many of the investments that farmers can make, as described in the previous paragraph, have relatively limited need for credit. While access to credit would no doubt aid farmers in undertaking them, the main input required is typically labor from the farm household so lack of credit is generally not an important constraint. The major exception to this pattern is that of potential export crops<sup>25</sup>, most of which require substantial inputs. Without financing for working capital, production of these crops is unlikely to be feasible for small farmers. Some tree crops, such as oranges, also require substantial initial investments and are unlikely to be undertaken on a wide scale if financing is not available.

**Land market improvements.** Despite legal restrictions, land sales already appear to be quite common in Petén. Farmers sell the rights to “improvements” (*mejoras*) they have made to the land, such as clearing it for cultivation. Since this practice is officially frowned upon and since farmers place a high premium on tenure security (which unofficial transactions do not guarantee), it may be expected that the functioning of land markets will improve. Already there is anecdotal evidence that titling eases the operation of land rental markets, since farmers no longer fear tenants will be able to lay claim to rented land. Restrictions on land sales in the 10-year period following issuance of the title, however, mean that it may take some time for this effect to be felt.

Farmers require assistance for the potential benefits of new crops and production techniques to be fully realized, due to scarcity of resources and lack of familiarity with the agro-ecological environment of Petén. Communities supported by NGOs such as CARE seem better off than those that are not. Improvements to transport and communications infrastructure and to rural financial markets would also help.

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<sup>23</sup> Increased access to credit is likely to be an important benefit from titling in urban areas, however. Commercial banks such as Banco Industrial are working on new lines of credit for small residential and commercial loans in urban areas.

<sup>24</sup> The Bank is assisting in the preparation of a Rural Financial Markets Project to address the current weakness of rural financial markets, based on a Rural Financial Market sector study which included extensive surveys in Petén and other departments.

<sup>25</sup> Petén has begun exporting products such as chilis. The recent certification of Petén as medfly-free is likely to increase the scope for such activities, once it is recognized by the major potential export markets.

**Benefits of Maintaining a Land Registry and Cadastre.** Maintaining a land registry and cadastre is likely to lead to three basic groups of benefits:

- (a) First, it will ensure that benefits of titling are maintained. Without a functioning land registry, the reliability of titles would gradually degrade over time.
- (b) Second, it will provide a database for land use planning. The benefits of this database will depend on the use to which it is put—its benefits are not in itself, but in what it allows. For example, the database will be useful in developing an effective system of protected areas, which is likely to require, for example, the creation of corridors joining the various protected areas so as to reduce their isolation.
- (c) Third, it will result in substantially reduced transaction costs to users, in terms of actual expenditures and of reduced opportunity cost of time required to carry out land transactions (in terms of person-days necessary and in terms of delays to activities). Currently, land-owners must go to Guatemala City to register their land. In many countries, increasing the accessibility and lowering the access costs of land ownership information has stimulated increased use of this information, especially by mortgage lenders (Jeffress, 1991).

### **Environmental Benefits**

**On-farm environmental benefits.** On-farm, regularization is likely to result in more sustainable resource use by:

- (a) Removing the incentive to clear forest from farmers' own land so as to establish ownership, increasing the extent to which farmers retain forest cover on their land rather than clearing it for agriculture. More intensive agricultural production techniques will also reduce pressure to expand the cultivated area, and may even reduce it (Reyes and Ammour, 1997).
- (b) Increasing planting of tree crops, which will have both a direct benefit by providing a more biodiversity-friendly and more sustainable agricultural system, and an indirect benefit by reducing pressures on remaining forest areas for fuelwood and other products.
- (c) Improving pasture, which will improve the sustainability of the livestock system.

**Off-farm environmental benefits.** Off-farm, the main potential benefits of registration arise from its impact on protected areas, which are currently under severe pressure from in-migration.<sup>26</sup> The project is likely to help alleviate the environmental impact of existing migration flows by discouraging settlement in the core and multiple-use zones of protected areas and by helping to channel migration into less sensitive areas. Regularization will only be carried out outside protected areas. Since settlers place considerable importance on the ability to regularize their claims, an incentive will be created for in-migrants to settle outside protected areas. For example, both CARE and the Nature Conservancy report that settlers in protected areas have been very willing to relocate provided they are given access to land with the potential for titling.<sup>27</sup> NGOs such as CARE are seeking to tie their regularization efforts in the buffer zones to agreements with local communities to help defend nearby protected areas.

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<sup>26</sup> In-migration into the region has historically been encouraged. FYDEP, the state organization responsible for Petén, undertook a number of formal settlement schemes until it was disbanded in the late 1980s. More recently, in-migration has accelerated as a result of the end of the civil war, with the return of combatants and refugees and the promise of land availability contained in the Peace Accords. The appropriate counterfactual for the project, therefore, is not a situation in which no migration into ecologically fragile areas is occurring, but a situation in which such migration is already substantial.

<sup>27</sup> As part of this effort, it was hoped that registration would help identify areas where land is still available to be settled so as to channel migrants away from protected areas and resettle farmers who have already encroached

## Data Sources

Although the likely benefits of the project's activities are clear qualitatively, quantitative analysis is constrained by an extreme scarcity of data. Not only are quantitative data on the effects of titling almost non-existent, but even basic data on the costs and benefits of existing agricultural production systems is scarce.

**Land prices.** In many cases, the benefits of land titling can be estimated by analyzing the changes in land prices that occur as a result of titling and registration. Unfortunately, such an approach is not feasible in Petén, where there are very few data on land prices. Moreover, any price data that might exist or might be collected are unlikely to give a reliable indication of the impact of department-wide regularization. Until recently, only a very small proportion of all land in Petén had been registered, making the market for such land an extremely thin one, subject to substantial fluctuation. Moreover, until recently much of the land that had been registered tended to belong to better-off farmers, to be in more favorable areas, and to be used for different purposes than those of the majority of Petén's farmer, such as extensive livestock grazing. As such, its price is unlikely to be representative of the bulk of land in Petén.<sup>28</sup>

**Farmer willingness to pay.** A different measure based on behavioral evidence is provided by farmers' willingness to pay for obtaining land titles. This provides a *lower-bound* estimate of the value farmers place on land titles—farmers anticipate receiving benefits at least equal to the amount they pay for the title. These anticipated benefits might take the form of improved returns thanks to the investments that farmers anticipate undertaking or the credit they anticipate receiving, or it may take the form of avoided losses in income as a result of eviction. The cost to farmers of obtaining title includes the sales price of the land itself, and titling and measurement fees. For a farm of less than 2 caballerías (90 hectares), the sale price of land is Q5,000, or \$800, to which must be added an INTA administrative fee. Almost all farmers take advantage of the 10-year payment option, which means they also bear additional interest costs and administrative fees.<sup>29</sup> Taking all these costs and fees into consideration, and adjusting for the effect of future inflation, the present value of the cost of a 1 caballería farm to farmers is about Q5,460, or \$870, implying a cost per hectare of about Q120, or \$19. If farmers should be unable to make a payment on time—a not unlikely occurrence, given the variability of agriculture in Petén—the total cost would climb further due to late payment fees.<sup>30</sup> The number of farmers with farms larger than 2 caballerías is smaller, but their demonstrated willingness-to-pay is much higher: \$67 per hectare for farmers with up to 3 caballerías, and as

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into protected areas—efforts that are currently being stymied by the difficulty of finding suitable alternative land. In practice, however, it appears that whatever idle land is being identified during the titling process is promptly claimed by local residents.

<sup>28</sup> Anecdotal evidence indicates un-titled land sells for about Q10,000-20,000 per hectare, while titled land sells for more than Q50,000 per hectare, depending on differences in land quality, accessibility, and other factors.

<sup>29</sup> For a 1 caballería (45ha) farm, an initial payment of 10% of the Q5,000 sale price must be made (Q500), together with an administrative fee of 5% of the sale price (Q250). Measurement and lawyer's fees are also due at this time, unless they are covered by a project. In the case of Tayazal, a measurement fee of about Q800 was charged. The rest of the sale price is then paid over 10 years, with a 5% interest rate on the outstanding balance. Capital and interest payments are used to calculate an annuity value, so that each of the ten annual payments is identical (Q576). In addition, an administrative fee of 5% of the sale price (Q250) is due with each payment; for a total annual payment of Q826.

<sup>30</sup> A 5% annual interest rate is charged on late payments, pro-rated for the number of days the payment is late.

much as \$113 per hectare for farmers with up to 4 caballerías.<sup>31</sup> Bearing in mind that the fees farmers pay are a lower-bound estimate of the benefits they foresee from titling, evidence that farmers pay these fees provides strong evidence of the likely existence of substantial benefits. All evidence to date indicates that farmers have a strong willingness to pay these fees. In the pilot areas where titling has already been undertaken, uptake of the titles by farmers has been almost universal. In the earlier pilot areas, such as Tayazal, many farmers have now made their second payment.<sup>32</sup> That farmers are willing to pay these fees also demonstrates that they expect titling to be financially profitable from their perspective.

**Production benefits.** The likely production benefits resulting from titling are difficult to estimate directly for two reasons. First, data on the magnitude of costs and benefits of current and potential production activities are scarce. Second, even with such data, the extent to which current production activities will be modified and/or new activities adopted is difficult to predict *ex ante*. Available evidence from pilot titling areas such as Tayazal indicates that both are occurring to some extent, but even in these areas the full extent of changes that will be induced cannot yet be observed since titling is very recent. Available data do provide some indications of potential returns, however. One manzana (0.7ha) of cashew, for example, is estimated to have a rate of return of 35% and a net present value of Q9,720; once full production is reached after 8 years, it will generate a net income of about Q2,000 (calculated from data in Gaitan Flores, 1993). Thus, planting a single manzana of cashew would be sufficient for farmers to break even financially on buying titles, especially since such planting does not usually displace the farmers' traditional maize cultivation. Similarly, a manzana of oranges is estimated to have a rate of return of 25%, a net present value of about Q16,000, and to generate a net income of about Q5,500 once full production is reached after about 7 years (the much higher initial investment required, will, however, limit many farmers' ability to undertake orange production; availability of planting material is also a problem).

### Estimated Rate of Return

Table A2-2 shows the rate of return calculations for the Land Administration Project:

- (a) The magnitude of the estimated benefits of titling is based primarily on the farmers' observed minimum willingness to pay for titles, which ranges from \$19 per hectare for farmers with up to 2 caballerías, to as much as \$113 per hectare, for farmers with 3 to 4 caballerías. A figure of \$35 per hectare is used in the base case calculations, roughly midway between the demonstrated willingness-to-pay for titles of farmers with less than 2 and less than 3 caballerías (the bulk of farmers expected to be affected). Since the willingness to pay is a *lower bound* of the benefits farmers expect to receive from titling, this figure is a reasonable but conservative estimate of benefits. This figure is also consistent with the available data on possible production benefits, such as the returns to cashew or orange production cited above.

<sup>31</sup> Under the price schedule which became effective on 3 July 1997, land prices are:

Farm size (caballerías)	Price (Q/caballería)	Payable over (years)
0 - 2	5,000	10
2 - 3	20,000	10
3 - 4	35,000	10
4 - 5	50,000	10
> 5	70,000	5

<sup>32</sup> Because of drought during 1997, and then extensive forest fires in May 1998, many farmers in the Tayazal area have had production and income shortfalls which have affected their *ability* to make payments. Despite these problems, INTA estimates that about 50% of Tayazal farmers have made their second payment; of the rest, most have visited the INTA office to explain the problems which prevented them from paying and to express their intention of making the payment as soon as possible.

- (b) The farmer's willingness to pay provides an estimate of the net present value of benefits. This estimate is converted to an estimate of annual benefits assuming that it takes 10 years for benefits to be fully realized, and that benefits increase linearly beginning with the year in which each plot is titled.<sup>33</sup> This results in an estimated annual benefit of titling of \$5.3 per hectare, reached 10 years after titling, with proportionally lower benefits in preceding years.
- (c) The flow of benefits is then projected, based on the area titled in each year of the project. About 11,300 square kilometers are expected to be titled, while registry and cadastre activities will benefit all 18,000 square kilometers of land outside the protected areas. The resulting benefit flows are then discounted at 10%.
- (d) The discounted costs of project implementation are then subtracted. As mentioned earlier, the cost estimates include all of the project costs, except for urban titling and for 50% of the costs of activities expected to have nationwide benefits.
- (e) Since both the estimated project costs and the estimated project benefits are incremental to what would happen in the absence of the project, computing a without-project case is not necessary.

Under these assumptions, the Net Present Value of the net benefits of the project is estimated to be about **US\$7.1 million**, with an Economic Rate of Return of about **12.3%**. It should be borne in mind that these are conservative estimates, since the estimated benefits are based on lower-bound estimates, and since many environmental benefits remain unquantified.

Given the number of assumptions and the weakness of much of the data, sensitivity analysis is very important.

- (a) Reducing the assumed annual benefits per hectare by 20%, to \$4.2 per hectare, reduces the NPV to \$1.5 million and the ERR to 10.5%. The project breaks even as long as annual benefits per hectare are \$4.0 or more.
- (b) The assumption that the full benefits of titling would only be experienced after 10 years on any given plot does not affect results, since the underlying estimate of the total benefit from titling is unchanged.
- (c) If the area titled proves to be smaller than expected (for example, if areas ineligible for regularization prove to be larger than expected) or if *no* benefits are received from titling in some areas (perhaps due to other constraints preventing farmers from investing or because poor agro-ecological or socio-economic conditions preclude profitable investments), project benefits will decrease since overhead costs will be spread over a smaller area. If benefits are generated on only 10,000 square kilometers, instead of the expected 11,300 square kilometers, the NPV falls to \$3.9 million and the ERR to 11.3%.
- (d) A cost increase of 10% would reduce the NPV to \$5.0 million and the ERR to 11.5%. A cost increase of 20% would reduce the NPV to \$2.9 million and the ERR to 10.4%.

These results show that the conclusion that the Land Administration Project is profitable is fairly robust to changes in the assumptions. The key assumption is that of the estimated benefits from titling. The base-case estimate of annual benefits of \$5.3 per hectare is reasonable in light of farmers' demonstrated willingness to pay for titles and is consistent with available data on possible returns from a variety of agricultural production improvements that are likely to be induced by titling. The project will break even as

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<sup>33</sup> The magnitude of project benefits is unaffected by this assumption, since the present value of total benefits is unchanged. However, making this assumption provides a more realistic impression of the likely flow of benefits over time than assuming full benefits are achieved instantly.



long as annual benefits are at least \$4.0 or more. Since this is only 35% more than the lowest demonstrated farmer willingness-to-pay for titles, and since this willingness-to-pay is a lower bound on expected benefits, it appears likely that this threshold will be reached. The project can withstand some escalation in project costs. However, attention needs to be placed on avoiding excessive cost escalations, since costs are front-loaded compared to the likely flow of benefits.

**Table A2-1: Costs of Rural Land Titling in Petén under the Land Administration Project**  
(\*000 US\$)

	Year													PV
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010+	Total
<b>Project Preparation Facility</b>	<b>1,167</b>	<b>407</b>												<b>1,537</b>
<b>Titling and Cadastre Activities</b>														
1 Mapping														
Investment		73	621											
Recurrent		14	14	14	14	14	14	14	14	14	14	14	14	
<b>Total Mapping</b>		<b>87</b>	<b>634</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>710</b>
2 Field-Level Data Acquisition														
Investment		771	3,179	2,913	2,854	2,819								
Recurrent		54	54	54	54	30								
<b>Total Field-Level Data Acquisition</b>		<b>826</b>	<b>3,234</b>	<b>2,968</b>	<b>2,908</b>	<b>2,849</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9,408</b>
3 Conflict Resolution														
<b>Total Conflict Resolution</b>		<b>822</b>	<b>520</b>	<b>412</b>	<b>356</b>	<b>289</b>	<b>231</b>	<b>173</b>	<b>116</b>	<b>58</b>	<b>29</b>	<b>14</b>	<b>14</b>	<b>2,269</b>
4 Supervision and Quality Control														
Investment		236	677	144	144	32								
Recurrent		274	554	554	554	284								
<b>Total Supervision</b>	<b>0</b>	<b>510</b>	<b>1,231</b>	<b>698</b>	<b>698</b>	<b>316</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2,679</b>
5 Maintenance and Updating														
Investment			223											
Recurrent		88	155	155	155	155								
<b>Total Supervision</b>		<b>88</b>	<b>378</b>	<b>155</b>	<b>155</b>	<b>155</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>711</b>
<b>Total Titling</b>	<b>0</b>	<b>2,332</b>	<b>5,998</b>	<b>4,246</b>	<b>4,131</b>	<b>3,622</b>	<b>245</b>	<b>187</b>	<b>129</b>	<b>71</b>	<b>42</b>	<b>28</b>	<b>28</b>	<b>15,777</b>
Land Registry														
1 Establishment														
Investment		100	62	101	45									
Recurrent		48	117	111	168	136	128	128	128	128	128	128	128	
<b>Total Establishment</b>		<b>148</b>	<b>179</b>	<b>211</b>	<b>214</b>	<b>136</b>	<b>128</b>	<b>128</b>	<b>128</b>	<b>128</b>	<b>128</b>	<b>128</b>	<b>128</b>	<b>1,425</b>
2 Modernization														
Investment RIC		53	53	128	103									
Recurrent RIC		12	24	27	42	42	42	42	72	72	72	72	72	
<b>Total Modernization</b>		<b>65</b>	<b>77</b>	<b>155</b>	<b>145</b>	<b>42</b>	<b>42</b>	<b>42</b>	<b>72</b>	<b>72</b>	<b>72</b>	<b>72</b>	<b>72</b>	<b>755</b>
<b>Total Registry</b>	<b>0</b>	<b>212</b>	<b>255</b>	<b>366</b>	<b>358</b>	<b>178</b>	<b>170</b>	<b>170</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>2,180</b>
<b>Project Management</b>	<b>0</b>	<b>499</b>	<b>737</b>	<b>698</b>	<b>698</b>	<b>451</b>								<b>2,344</b>
<b>Total</b>	<b>1,167</b>	<b>3,450</b>	<b>6,990</b>	<b>5,310</b>	<b>5,187</b>	<b>4,250</b>	<b>415</b>	<b>357</b>	<b>329</b>	<b>271</b>	<b>242</b>	<b>228</b>	<b>228</b>	<b>20,301</b>

Notes: 50% of costs of activities with national benefits included; 20% of costs of geodesic network included; costs of urban activities omitted; discount rate 10%; exchange rate Q6.3/US\$

**Table A2-2: Rate of Return to Rural Land Titling in Petén**  
(‘000 US\$)

	Year																
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014+
<b>Costs</b>																	
Land titling	1,167	3,238	6,734	4,945	4,829	4,073											
Cadastral and Registry	0	134	161	231	226	112	261	225	207	171	153	144	144	144	144	144	1,437
<b>Total Costs</b>	<b>1,167</b>	<b>3,372</b>	<b>6,895</b>	<b>5,175</b>	<b>5,055</b>	<b>4,184</b>	<b>261</b>	<b>225</b>	<b>207</b>	<b>171</b>	<b>153</b>	<b>144</b>	<b>144</b>	<b>144</b>	<b>144</b>	<b>144</b>	<b>1,437</b>
Discounted Costs	1,167	3,065	5,699	3,888	3,453	2,598	147	115	97	73	59	50	46	42	38	34	313
<b>Benefits of Titling</b>	<b>Km<sup>2</sup></b>																
Area Titled in Year 2	2,836		0	150	300	451	601	751	901	1,051	1,201	1,352	1,502	1,502	1,502	1,502	15,017
Area Titled in Year 3	2,836			0	150	300	451	601	751	901	1,051	1,201	1,352	1,502	1,502	1,502	15,017
Area Titled in Year 4	2,836				0	150	300	451	601	751	901	1,051	1,201	1,352	1,502	1,502	15,017
Area Titled in Year 5	2,836					0	150	300	451	601	751	901	1,051	1,201	1,352	1,502	15,017
<b>Total Benefits</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>150</b>	<b>451</b>	<b>901</b>	<b>1,502</b>	<b>2,102</b>	<b>2,703</b>	<b>3,304</b>	<b>3,904</b>	<b>4,505</b>	<b>5,106</b>	<b>5,556</b>	<b>5,857</b>	<b>6,007</b>	<b>60,067</b>
Discounted Total Benefits	0	0	0	113	308	559	848	1,079	1,261	1,401	1,505	1,579	1,627	1,609	1,542	1,438	13,072
<b>Net Benefits</b>	<b>-1,167</b>	<b>-3,372</b>	<b>-6,895</b>	<b>-5,025</b>	<b>-4,604</b>	<b>-3,283</b>	<b>1,240</b>	<b>1,877</b>	<b>2,496</b>	<b>3,133</b>	<b>3,752</b>	<b>4,361</b>	<b>4,962</b>	<b>5,412</b>	<b>5,713</b>	<b>5,863</b>	<b>58,630</b>
Discounted Net Benefits	-1,167	-3,065	-5,699	-3,775	-3,145	-2,039	700	963	1,164	1,329	1,446	1,529	1,581	1,568	1,504	1,404	12,760
NPV	7,058																
ERR (%)	12.3																

*Notes:* All costs and benefits shown are incremental to the without-project case; costs and benefits shown for 2014 represent the present value of all future costs and benefits; discount rate 10%; exchange rate Q6.3/US\$

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