PN-AB-522
70672

RURAL LAND TITLING AND REGISTRATION IN LATIN AMERICA AND THE CARIBBEAN: IMPLICATIONS FOR RURAL DEVELOPMENT PROGRAMS

by

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This paper was prepared as part of the Tenure Security and Land Markets project, funded by the Agency for International Development (LAC/DR/RD).

October 1990

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Acknowledgments

Many people contributed to the preparation of this paper, and only a few can be sufficiently thanked. The results of the research reported here emerged only because of the close collaboration offered by Mitchell Seligson, Ed Nesman, Alexander Coles, and Harry Lemel. Barney Barnes, Lynn Holstein, and Harry Lemel provided comments on earlier drafts of the paper, and Jane Dennis did the typing and editing. Gordon Straub, Jack Rosholt, and Bill Baucom from AID encouraged the research program in Honduras, Ecuador, and St. Lucia, respectively. The regional research effort coordinated by Randy Stringer permitted the comparison of research from several countries. Tom King's patience and continued support for making research relevant to development programs formed the underpinnings of our efforts.

Special thanks are due to the field support from Honduras's Instituto Nacional Agrario, particularly Roger Lopez and Camilo Ochoa, and St. Lucia's Land Registration and Titling Program, especially Lester Martyr, Ausbert D Auvergne, and Keith Syrett. These people took the time to guide our efforts and explain complicated events even when they had much more important matters to administer.

D R A F T
October 1990

Rural Land Titling and Registration in Latin America and the Caribbean: Implications for Rural Development Programs

by

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SUMMARY

1. Objectives of the Paper

Analysts of the rural areas of Latin America and the Caribbean have frequently concluded that the lack of an adequately secure title to ownership of land, especially for smallholders, is a major constraint to the development of agriculture in the region. The basic argument asserts that security of ownership as represented in a legal land title contributes to the development of society by encouraging landowners to invest in their properties and by liberating market forces to allocate land resources and capital more efficiently. This expectation is not generally applicable. However, where conflicts over land rights are relatively latent, where the rights to land have been settled and distributed fairly equitably, and where the land-poor are threatened with the loss of their land, improving the effectiveness of state institutions for the protection of property rights--in conjunction with the wider distribution of property titles--can have both productive and equitable results.

Numerous titling and registration programs have attempted to ameliorate a widespread insecurity of landownership due to the lack of legal title, including efforts supported by the Agency for International Development (AID) in various Latin American and Caribbean countries such as Honduras, St. Lucia, El Salvador, and, most recently, Ecuador. In this context, titling concerns the issuance, by a state agency, of valid private property titles to previously "untitled" holders of the land while registration involves improving the effectiveness of state institutions that record and display interests in land--especially titles of ownership--and thus provide the basis for the legal protection of these interests.

Based on analyses of the AID-sponsored programs, the objectives of this paper are: (1) to explore the rationales of AID-supported titling and registration programs carried out in the Caribbean, Honduras, and Ecuador; (2) to analyze the experiences and achievements of these efforts to see how they confirm or contradict their rationales and expectations; and (3) to develop suggestions for future programs of this sort.

2. The Institutional Problem of Insecurity of Ownership

The Cadastral Land Information System (CLIS) is the web of state institutions which displays and protects property rights in land. The Property Registry, operating in conjunction with associated laws and regulations, is the principal state agency that protects such property rights. Landowners who have their rights protected by the Registry--that is, those whose interests are recorded according to specific legal requirements--are "institutionally secure," for they possess "legal title" to their land.

The improvement of ownership security on a wide basis requires the modernization of the national CLIS, which typically was designed in colonial times to serve the interests of a very restricted landholding elite. The transformation of the CLIS to meet more democratic needs requires new legislation, reorganized property registries, and improved mapping facilities. Technologically, the modernization of the CLIS involves the introduction of new techniques for map-based property descriptions which are derived from modern geodetic measuring systems, the use of aerial photography for the production of cadastral maps, the modification of regulations to permit the use of photocopying of official deeds as well as microfilming of documents, and the introduction of decentralized and often computerized land information techniques into property registries and cadastral mapping agencies.

In contrast to land registration and titling, which can maximize the ownership security of landholders, important public programs and development strategies will diminish or modify this private security. The rationale of such programs is that private rights over property should be limited in order to achieve broader societal goals, such as:

- the generation of resources for needed social infrastructure,
- the preservation of agricultural land and watersheds,
- the control of environmental pollutants, and
- the equitable distribution of productive resources.

Some combination of such objectives has, in many countries, led to rules which induce many landholders to doubt the security of their access to land and the benefits produced thereon, since their control over land is subject to social regulation and their right to profits from farming is conditioned by broader social claims.

The enforcement of such social rules for limiting the private security of ownership often requires the creation of a special agency for land management, an agency that is charged with applying the established incentives and sanctions to the actions of landholders. A state institution which is commonly empowered with such restrictive functions in Latin America is the agrarian reform agency, which can expropriate private landowners and transfer the ownership of land to reform beneficiaries or other private owners. It can also prohibit the further transfer or alienation of land it distributes. The land tax office is another public agency that impinges on private ownership.

Also, a land management agency is assigned the function of restricting or conditioning access to the land in the case of public "protected areas," which have assumed increasing importance recently in the maintenance of biological diversity, controlled use of forests, and preservation of natural resources.

These public agencies form part of the CLIS and, as such, must be incorporated into efforts at CLIS modernization. Rather than maximizing the security of private property ownership, these institutions attempt to provide a balance between the security of private landowners and the requisites of social interest. The challenge is to implement rules and provide resources for protecting and securing the rights of private ownership while achieving the desired social and political goals.

3. Findings of the Research

The major findings of the research are as follows.

3.1. The effectiveness of customary means for protecting rights of ownership have been underestimated while the advantages of the formal CLIS have been overly praised.

The means for improving security of ownership are not limited to improving or extending the laws of property and the capacities of public agencies to define or defend ownership claims. Functioning customary systems exist in many parts of Latin America and the Caribbean for defining property rights, usually without a formal legal basis but with the support and respect of the local community. These customary systems are cheap to operate, are accessible to local people, and are socially and economically advantageous. Moreover, the holders of customary titles may prefer these systems. The modernized, formal CLIS must compete with the customary system in order to become more attractive and better known.

An important implication of these findings is the importance of assuring that the formal CLIS is close to the people it serves. The property registries and associated agencies must be located in major municipal centers. The advantages of the legal, bureaucratic system must be explained to the previously excluded public. Both CLIS operators and other facilitating agencies must adapt to the needs of the people.

3.2. The effects of increasing the negotiability of title so as to stimulate loss of land by the peasantry may be exaggerated.

Incorporating land into the national CLIS through titling will lead to social benefits, it is argued, because titled land offers more security to those interested either in buying land or in accepting land as collateral for loans. The land market which emanates should improve the efficiency of land use and investment by facilitating the exchange of land.

One counterargument is that increased incorporation of land into the market economy will expose peasant possessors of land to the imperfections of the market, that is, to the monopoly power of certain economic groups.

Although the improvement of the institutional security of ownership can mean greater security for future acquirers of land, the basic question is whether only the very rich will be interested in acquiring land.

The study in Honduras compared transactions in land in titled areas with transactions in land in untitled areas. In one titled area, the proportion of parcels which had been transferred during a four-year period was actually less than in the nontitled area. Therefore, the titling program--the issuance of legal titles to private owners in replacement of their customary titles--has not stimulated the dispossession of the peasantry through greater sales of land, at least not in the short term. What will occur over the longer term remains to be seen.

The experience in St. Lucia is unclear on this point. In other Caribbean countries, however, the land market appeared to be stimulated by the program, with both greater rates of transaction and greater governmental revenues from transfer taxes. A follow-up study of the operations of the land market in the years after the termination of the Land Registration and Titling Program in St. Lucia would be instructive.

In Honduras, the titled farmers perceived substantial increases in the market value of their land following the titling program. They estimated that the value of their titled land increased about 60 percent more than the value of untitled land during the four years following the program. But these reported increases in land values may be only perceptions and hopes.

Although this positive perception of the monetary value of titled land may not continue as people become more acquainted with the transaction costs of titled land, the short-term increase in perceived value appears to be substantial. If the market reflects such increases, particularly with its repercussions on bankers and their valuations of property, the titling program may greatly increase the capitalized value of land. Such an effect would benefit the titled landowners.

On the negative side, however, these increases in the market value of titled land could mean that small farmers will face even greater difficulties in acquiring land, and this may be a factor in the observed low rates of land sales among titled landholders. This phenomenon deserves further study.

3.3. The role of security of ownership in landholder investment behavior has been misinterpreted.

Past studies done on security of ownership have almost always derived from a comparison of titled and untitled holders of the land. Such studies have usually concluded that the titled owners had superior access to credit, made more productive investments, and had higher productivity than the untitled owners. These studies implied that providing landholders with legally valid titles could overcome many of the problems of agriculture.

The data reported by these studies are based on ahistorical comparisons of two groups, titled and untitled landholders. This research method, however, merely presents an analogy. The titled versus nontitled comparisons

assume that the nontitled holdings, when titled, will become "like" the titled ones in terms of credit access, investments, production, and other indicators.

If factors other than possession of title are causing or conditioning changes in credit access and investment, the ahistorical comparisons would be misleading. Determining the levels of these indicators prior to the issuance of title, then issuing the farmers title, and returning some time later to measure any change in the indicators would be methodologically cleaner.

This research design was used in Honduras, with a baseline study of a sample of landholders conducted prior to a titling program, followed by the issuance of titles, and concluded with a restudy of the baseline sample to determine changes that had occurred. The study also gathered information from a control group.

However, the data from Honduras indicate that the potentially positive impact of recorded title on the investment, productivity, and income levels of farmers did not occur during the five-year period covered by the study. There were no systematic differences between the titled and the control groups on the changes in these indicators. Multivariate analyses from Ecuador and Panama concur with these findings.

4. The Expansion and Modernization of the Formal CLIS and the Management of Natural Resources

The experience with the Honduran and St. Lucian land titling and registration programs indicates that there may be significant social benefits that titling and registration programs can provide by their improving the capabilities of government, public utilities, private developers, and conservers of land to administer resources more effectively. The following land administration benefits were observed in Honduras.

- complete inventory of publicly owned (national and ejidal) land;
- clarification of the boundaries of private lands;
- delineation of boundaries of administrative units (departments, municipios);
- boundaries identified of public lands not subject to titling;
- significant improvements in property tax collections.

5. Evaluation of the Effectiveness of the Formal and Customary CLIS

The decision to devote resources to the modernization of the formal CLIS requires an assessment of the existing system and a comparison with what that system could potentially be. In order to carry out these comparisons, we suggest certain critical performance indicators:

- quality of information (accuracy, precision, and completeness);
- maintenance of the information in the CLIS in an up-to-date fashion;
- efficiency of CLIS information processing;
- cost of producing information from the CLIS;
- utility of the CLIS for registration, tax, and other purposes;
- complexity of information management technology;
- coverage of the country's land parcels by the CLIS.

6. Recommendations for the Modernization of Cadastral Land Information Systems

For those who wish to explore the desirability of modernizing the formal CLIS, we suggest the following activities.

6.1. Assess present demands on the formal CLIS

The initiation of the modernization process is a critical step that depends on the concerned parties having achieved a consensus, first, that something is sufficiently wrong with their present CLIS to merit change and, second, on the distribution of benefits of the potential changes to the system. The first step in the consensus-building process is to assess the degree to which demands on the CLIS have grown in quantity and changed in nature, using the following indicators: (1) growth in the number of transactions in land, (2) increases in the value of land, (3) increases in demands of banking institutions for mortgageable properties, (4) increases in demands of public utilities and land use planning agencies for land information, and (5) heightened demands for the protection of land, forest, and water resources.

In other contexts there may be other clues, but these general indicators of the economic and social environment within which the CLIS operates show some of the quantitative and qualitative challenges facing the land information system. Consideration of such factors can contribute to building the necessary consensus for undertaking the modernization of the CLIS.

6.2. Evaluate the effectiveness of the formal and customary CLIS

Once the assessment of the society's demands on the formal and customary CLIS is accomplished, the next step is to evaluate how well the formal CLIS is presently functioning in comparison with the customary CLIS and with a model of the modernized formal CLIS.

6.3. Establish strategic goals of CLIS modernization

Strategic decisions must be made about the goals of CLIS modernization: (1) whether the deeds-based system will be transformed into a Torrens-style, parcel-based registration system, or whether the deeds-based system will be

modernized without changing its essential structure and philosophy; (2) whether the modernization will be "radical" or "incremental."

6.4. Decide on outreach strategy: government initiative or public use

The more successful and radical programs for the modernization of the formal CLIS in the short run have been those which have underwritten the costs of property description and adjudication of property rights (titling). The subsequent cooperation of the population with the government in these efforts has been mixed.

The alternative to "taking government to the people" is to improve the administrative and technological efficiencies of the property description and adjudication agencies and wait for the people who desire to upgrade their titles to approach these government bodies. This strategy minimizes cost in the short run but runs the risk of slow progress.

6.5. Choose among the technological options for CLIS modernization

The selection of technological options for a modernized CLIS is plagued by the lack of basic infrastructure in less developed countries. Such constraints condition the degree of technological complexity which different options for modernizing the CLIS imply. The challenge is to achieve progress toward a more acceptable system with the most appropriate technology. There are no magic formulas. The major decisions include: (1) the extent to which the property registry's information management will be "mechanized," (2) the degree of alteration of property description techniques, (3) the extent of use of foreign advisors, (4) the use of numeric parcel identifiers, (5) the use of general versus fixed boundaries, and (6) the problems of low salaries for technicians who are in high demand internationally and local technical training.

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October 1990

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1. Objectives of the Paper

Analysts of the rural areas of Latin America and the Caribbean have frequently concluded that the lack of an adequately secure ownership title to land, especially for smallholders, is a major constraint to the development of agriculture in the region (Salas Marrero and Barahona Israel 1973; Salas et al. 1970; Thome 1971; Seligson 1984; Barbosa and Strasma 1984; Villamizar 1984; Stanfield 1989). The problem has been identified in other regions as well (Feder et al. 1988).

Numerous titling and registration programs have attempted to deal with this insecurity of ownership, including efforts supported by the Agency for International Development (AID) in various Latin American and Caribbean countries such as Honduras, St. Lucia, El Salvador and, most recently, Ecuador. Titling is the issuance by a state agency of valid private property titles to previously "untitled" holders of the land. The registration component of these programs focuses on improving the effectiveness of title registration institutions which record and display interests in the land, especially ownership land titles, and which provide the basis for legally protecting these interests.

In the Honduran, St. Lucian, and Ecuadoran cases, the Land Tenure Center (LTC) (with support from AID and in collaboration with the University of South Florida and the University of Pittsburgh) conducted studies of the impact of titling and registration programs. The research assessed these programs' organizational and technical effectiveness as well as their influence on landholders who received titles to their lands.

Based on such studies, the objectives of this paper are: (1) to explore the rationales of these AID-supported programs; (2) to analyze the programs' experiences and achievements in order to see to what extent they confirm or contradict their rationales and expectations; and (3) to develop suggestions for future programs of this type. Since the studies reviewed here deal largely with agricultural land, extrapolation of the findings to urban contexts should be done with care.

2. The Problem of Insecurity of Ownership

2.1. Origins of Rural Land Holding without Legal Title

Throughout Latin America, the process of independence from Spain had been completed by the end of the nineteenth century, including the privatization of ownership of land previously controlled by the Spanish crown. In Central America, however, especially in Honduras, Nicaragua, Costa Rica, and Panama, privatization of landownership was not advanced as far as in other countries. Near the end of the twentieth century, the data for Honduras and Costa Rica indicate that at least half of the privately held land in agricultural use was without legal title (Stanfield et al. 1990; Salas Marrero and Barahona 1973). In Ecuador, at least 60 percent of the agricultural holdings did not have legal title as late as the 1980s (Seligson 1984, p. 70).

Possession of land without legal title, however, does not mean that the landholder lacks rights of ownership. Certain customary ownership regimes, such as family land in the Caribbean and indigenous peasant holdings in Honduras and Ecuador, have evolved instead of formal, legally defined ownership. In these instances, the holders of the land enjoy most of the benefits of private ownership, that is, they are recognized as the owners of the land by their neighbors and can transfer ownership through community-sanctioned private documents or witnessed transactions. However, due to the lack of a legally recognized title, such holdings lack a crucial aspect of private ownership, namely, the commitment by the state to protect the private rights in land. As Barlowe (1977, p. 4) has observed:

> It is hard to conceive of property without an owner, or an object that can be owned. But it is the presence of a protecting sovereign that makes the enjoyment of property possible. Rights in land exist because governments are willing to recognize and enforce them. In the absence of this protection, one would have to fight off trespassers and the rights of most owners would become meaningless.

Customary tenure forms are dictated by rules which a local community defines and changes "without help from the legislator" (Allott 1980, p. v). Although land held under a customary tenure regime, for which there is no state-sanctioned, title-identifying ownership, may be viewed as being less securely held than land for which a legally recognized title exists, there is no automatic equivalence of formal title and ownership security, especially when a customary regime of ownership has proved its usefulness and adequacy for the management of ownership matters over a period of years. In such systems the local community develops mechanisms of ownership protection and adjudication to replace those wielded by the state "sovereign" which Barlowe describes. However, the variable effectiveness of these mechanisms and their unacceptability to people and agencies (such as banks) from outside the local community limit their usefulness for protecting property rights.

2.2. Theoretical Implications of the Lack of Legal Title to Land

This paper focuses on the implications of certain limitations of private ownership, where ownership is conceived as a bundle of rights and responsibilities (Scott 1983; Barlowe 1977; Wunderlich 1979), which may vary across time, across jurisdictions, and between formal and customary systems of defining rights to land. The two dimensions or "bundles" of ownership rights that guide our discussions are: (1) the conditions under which those claiming to be owners may exclude others from the use and enjoyment of the land and what is produced thereon; and (2) the ability of owners to transfer rights to the land to other individuals through inheritance or sale as well as through mechanisms such as rentals or gifts or the like.

Factors that condition or weaken either or both of these two dimensions could contribute to the insecurity of ownership. The lack of a title as prescribed by law is one such factor. Without title, landholders do not have the legal means of protecting their rights to land from the competing claims of others. Nor do owners without legal title have the means for proving, as prescribed by law, that they are indeed the owners of the land and thereby the possessors of the right to transfer the property. Basically, legal titles provide the titleholders with access to the legal system which, to a greater or lesser degree, functions to protect these rights of ownership.

The use of public resources in the effort to improve the security of private ownership is based on the idea that landholders who do not enjoy security in their ownership of the land will not act in the public interest. One "public interest" argument which justifies the expenditure of public resources to improve ownership security through the clarification of rights to land pertains to the reduction of conflict over land boundaries and land owners. In some instances, especially where land values suddenly increase (perhaps due to the construction of a road or an irrigation system), smallholders who do not possess legal title may be summarily dislocated. Improving the legal bases of title for these people would provide state protection to their property claims, thereby serving a social justice function and avoiding serious social conflict.

Such potential for social conflict due to land not being legally titled arises in a number of situations and may be sufficiently serious to warrant public investment in the improvement of title legality. In frontier areas, for instance, where land is being incorporated into agriculture and is thereby changing its attractiveness to investors, the protection of insecure claims to ownership through legal title could contribute to a lessening of social conflict. The question of title also emerges when one social group attempts to dispossess another, as occurs frequently in the struggle between colonizers and indigenous communities. The issuance of titles based on the colonizers' legal system strengthens the colonists' claims but may in fact enhance social conflict with indigenous peoples, whose prior rights are at least formally extinguished by the act of legal titling.

In much of Latin America and the Caribbean, such conflicts have been serious and the issue of insecure ownership has been central to the debate over who gets the benefits of state protection of private use and enjoyment

of the land. In the Honduran case, for example, recent claims to land by indigenous groups have been countered by claims from colonizers, thereby raising problems with the policy of the Honduran government to grant legal titles to the occupiers and users of public lands, to which indigenous groups claim historic ownership. In this case, the legalization of private ownership for the colonists would imply extinguishing indigenous rights to the land, with implications for social justice on both sides of the conflict (Martínez 1990). In most settled areas of the region, conflicts deriving from the colonial era's nullification of indigenous land rights have retreated into latent difficulties, which emerge from time to time as holders of prior land rights attempt to recover their prerogatives (Ramón 1990).

The problem dealt with in this paper concerns the situation where present holders of the land do not possess legally recorded titles. In such instances there are "clouds" on their ownership claims, comprised more of a lurking set of doubts than open conflicts among neighboring claimants. However, such doubts about ownership titles can have negative implications for the overall development of society. There are two main justifications for public agencies to invest in improving private security of ownership under such conditions:

1) **Private, long-term investment, and thereby overall economic development, requires secure ownership of land.**

Agrarian development involves growth of productive forces as well as improvement of opportunities for those who work the land and who market and process its products. One requirement for sustainable increases in agricultural productivity is for farmers to make greater investments in technological and organizational arrangements. Making such investments in farming enterprises represents a decision to forgo other uses of resources, such as spending on consumer items, housing, education of children, commercial activities. Investing in the farming enterprise indicates the farm manager's calculated risk that today's investments in farming will improve future gratification from that enterprise.

An important influence on farmers' inclinations to make investments is their security of tenure. The hypothesis is that if farmers feel relatively secure in their possession of the land, they will be more inclined to make long-term capital investments and will devote more of their family labor to the farm enterprise. Raup (1967, p. 49) presents the basic idea: "Before you can risk your labor and your seed for a harvest that may be months away, you must have assurance that you will be able to reap where you have sown." In more formal terms, Villamizar (1984, p. 13) hypothesizes that farmers with relatively high levels of security of tenure "will invest with longer time horizons [given the] longer period foreseen to recoup investment, since [they are] freed of fear of being expelled from the land they are working."

Without a relatively secure conviction by landowners that they can exclude others from profiting from their property and thereby assure themselves of benefiting in the future from today's investments, farmers may not make such expenditures. Security of ownership may be a critical factor in landholder decision-making as to the use of land and technological resources. There are both environmental and production implications of insecure ownership:

a) Protection of the environment often requires the construction of water run-off control structures such as planting windbreaks and using fragile soils oriented to tree crops rather than annual production; such investments often require a long-term time horizon for the owner to realize benefits.

b) A consistent increase in crop yields often requires investments in capital improvements such as irrigation. Such improvements in yields also require constant experimentation with new technologies and organizational patterns, which frequently do not result in definitive results in any particular year. Year-to-year experimentation and commitment to consistent productivity improvement through capital investment presume a secure, long-term time horizon.

2) Secure ownership is necessary for a fluid market in land.

If farmers have insecure claims to land, they will have difficulty transferring their rights (particularly legally recognized ownership rights) to others, thereby inhibiting the operation of the credit market and the land market.

a) The credit market requires that borrowers promise to transfer their ownership rights of land to lenders if the borrowers do not repay their loans. Without marketable title, that is, without the borrower's secure possession of the right to transfer the land, institutional lenders are not inclined to accept the land as a mortgage guarantee.

b) The land sale market also requires security of ownership. A buyer wants to be certain that the seller has the right to sell, that is, that he is the true owner of the land. The ownership status of the seller is a basic condition for the security of the buyer that third parties will not contest the legality or legitimacy of the sale.

Legally valid ownership titles to the land give greater security to the persons wishing to acquire ownership (or some other interest such as a secured mortgage) that the sellers have the legal right to engage in transactions. Security of ownership in this case refers not only to the security of the present owner but also to the security of the potential owner that the transaction will result in the genuine transfer of ownership. This aspect of security of ownership permits the property to be treated as a marketable commodity and, as such, enters into the formation of a market economy, wherein the factors of production presumably flow freely from one owner to another.

The often-heard argument that legal land titles are necessary for gaining access to bank credit is based on a number of assumptions. First, for access to credit to be improved for those without legal title to land, banks have to be willing to loan for agricultural purposes. Depending on economic circumstances, however, the risks in agriculture may be substantially higher and the profit rates substantially lower than in other sectors of the economy (see, for example, the report on Antigua and Barbuda, in LTC 1989). Moreover, bank managers must be willing to loan to small-scale farmers, who are typically

without legal titles. Many private banks have traditionally dealt only with a relatively few large-scale farmers and simply do not have the resources to handle the special needs of numerous small-scale, often illiterate farmers.

Finally, for the credit access argument to be valid for a region as a whole, the improvement in credit access should involve the incorporation of new borrowers and not merely the shift of loans from present clients to newly titled landowners (perhaps through pressures on banks to change their clientele). In this regard Feder et al. (1988) hypothesize that when the number of farmers with legal titles increases, bank owners and managers will respond by increasing the amount of capital available for loaning to landowners (and not simply divide a constant credit pool by a larger number of clients). They expect that with wider distribution of marketable titles, the total "credit pie" can actually increase in size due to an increased effective demand for credit.

This hypothesized increase in the effective demand for credit can come about for two reasons:

a) The market value of land which becomes legally titled usually increases. Land with title is more marketable than land without title, and people are willing to pay more for the land. Also, if titles influence the owners' perception of security, titleholders will make more longer-term investments, which also increase the value of the land. The increase in land values allows larger loans because of larger and more marketable equity for the owners.

b) Bankers can increase profits by expanding their loan portfolio to include people who are able to offer titled land as collateral. Without the constraint of possession of the untitled land, bankers should feel more secure in increasing agricultural loans, which in turn increases their interest-generated income and the profitability of banking operations.

The effective demand for capital generated by the wider dispersion of legal land titles, according to this hypothesis, is met in a reasonable amount of time by an expansion in the supply of capital available for lending. Thus, by increasing the number of farmers who hold titled land, the supply of credit increases. This increase in available capital linked to agricultural land would be an important stimulant to the long-term investment as well as the shorter-term production needs of farmers, thereby increasing land values and in turn the availability of more agricultural credit.

In summary, then, security of landownership should contribute to the development of society by encouraging landowners to invest in their properties and by freeing market forces to allocate land and capital resources efficiently.

The implication of these hypotheses is that society's rules governing landownership should be biased toward greater ownership security if the policy goal is increased long-term agricultural productivity and better husbandry of natural resources involved in agriculture (see Feder et al. 1988; Falloux

1987). Public investment in adjudicating legal land titles is one means for achieving more widespread security of ownership.

However, the possession of legal titles on a large scale does not mean that the other conditions for improving security of ownership exist. Highly skewed land distribution patterns in areas where employment opportunities are limited and where population growth rates are high can lead to constant conflicts over land, including land invasions, conflicts between the landless and the police and armed forces, and constant litigation. The landless threaten the property rights of the landed.

Such insecurity of ownership on the part of the holders of the larger farms derives not from their lack of ownership title but from the social problems deriving from land conflicts. Such fundamental social problems are not resolvable through a titling and registration program. However, where the conflicts are more latent, where the rights to land have been settled and distributed more equitably, and where the land-poor are those who are threatened with the loss of their land, improving the effectiveness of state institutions for the protection of property rights, in conjunction with the wider distribution of property titles, can have both productive and equitable results.

2.3. Institutional Bases of Ownership Security

Barnes (1988) defined a cadastral land information system (CLIS) as the means whereby a society officially delineates, records, and gives public notice of the nature and extent of rights to land. The wider distribution of legal land titles without the institutional means for recording and adjudicating these rights means little. The institutional strengthening of the CLIS in countries where insecurity of ownership has been defined as a social problem has typically accompanied adjudication and distribution of titles.

Of particular importance to the CLIS throughout the Americas is the property registry. Until recently, most registries have used a deed registration system, wherein transactions in land such as sales, mortgages, long-term leases, and inheritances are recorded. Any transactions not recorded in the property registry as specified by law are in principle superseded by those which are properly recorded when conflictive claims of ownership are presented in court. Also, the formal institutions of law enforcement are directly involved in protecting the interests in land which are recorded in the property registry.

Other institutions play important roles in providing ownership security, particularly those which describe the location and boundaries of land parcels. The registry records ownership information but relies on descriptions of one sort or another to locate the specific parcels owned. Traditionally, throughout Latin America and the Caribbean, such parcel descriptions have provided information about the adjoining owners and in some cases information about the physical location of the boundaries, as illustrated by the following description of a parcel of land in St. Vincent:

All that lot piece or parcel of land situated at Lower Lomas (Windward) in the State of Saint Vincent, being three and one half (3 1/2) lots more or less and being abutted and bounded on the North by lands of Hulda Small, on the South by lands of Always Boyea, on the East by a river and on the West by lands of Alwyn Boyea, or howsoever otherwise the same may be butted, bounded, known, distinguished or described.

With the advent of the Torrens system of property registration, the property registry has become associated with a cadastral mapping agency, so that recorded titles refer to a cadastral map of all parcels which describes their location and boundaries. The agency that maintains the cadastral map under such a system becomes of critical importance to the CLIS.

In most jurisdictions, however, the land survey profession is charged by law with describing parcels in a manner which is legally acceptable for recording and for providing evidence in cases of dispute. Land surveyors often become de facto property-rights adjudicators, locating boundaries which might be disputed or poorly marked.

Other mechanisms exist to protect property rights, including provisions of national constitutions that limit the conditions under which the state can expropriate private owners. Provisions of law also define the conditions under which people who occupy land in a continuous, peaceful, and uncontested way can become the titled owners of such land, superseding other claims of ownership. Typically the acquisition of ownership through this prescriptive mechanism, especially if overriding previous claims, is relatively difficult.

The principal agency by means of which property rights are protected, however, is the property registry and associated laws and regulations. The owners who have their land rights protected by the registry, that is, whose interests are recorded according to legal requirements, are "institutionally secure" in comparison with landholders whose ownership interests are not recorded. The former have "legal title" to their land.

The modernization of the CLIS typically involves the introduction of new techniques for map-based property descriptions, which are derived from modern geodetic measuring systems; the use of aerial photography for the production of cadastral maps; the modification of regulations to permit the use of photocopying of official deeds as well as microfilming of documents for facilitating storage; and the introduction of decentralized and often computerized land information system techniques into property registries and cadastral mapping agencies.

2.4. Socially Desirable Limitations on Private Security of Ownership

In contrast to these arguments for using public resources to maximize the landownership security of private landholders, important and desirable public programs and development strategies may diminish or modify this security. The basic hypothesis of such programs is that private rights over property should be limited in order to achieve broader social goals such as:

- the generation of resources for needed social infrastructure (such as a property tax for financing the school system or an accumulation of investable surpluses for spurring industrial growth through a "squeeze" on agriculture),

- the preservation of agricultural land to feed future generations and the long-term maintenance of watersheds which are instrumental for providing water to urban centers,

- the control of environmental pollutants which affect urban as well as rural populations, and

- the equitable distribution of productive resources as the foundation of economic and political democracy.

Some combination of such social objectives has, in many countries, led to rules which introduce doubts in the minds of some landholders about the security of their access to land and the benefits derived from that ownership, since their control of land is subject to social regulation and their possession of farming profits is conditioned by broader claims.

Numerous restrictions on the transfer of property rights have important social objectives. In Honduras, for example, transfers of land which has been assigned to agrarian reform beneficiaries must be approved by the agency that administers the reform. This restriction is based on a policy aim to avoid reconcentration of the land in the hands of hacienda owners.

Such a policy is of great importance in some instances. The Cereceda and Dahse (1980) study of the agrarian reform asentamientos established in Chile following the 1973 coup showed that individual titling of land under relatively adverse conditions for the titleholder can facilitate reconcentration. Burdened with the large debt assigned to the parcels and with little or no access to credit and other services, over 50 percent of the newly titled farmers were forced to sell their holdings in a relatively short period of time (three to six years) either to larger landowners or to those with capital to invest in land. For those who see peasant agriculture as undesirable, such transformations of landholdings on the basis of a land market facilitated by marketable titles in land would be positive. The political, economic, and social costs of the loss of land by the Chilean reform beneficiaries have yet to be calculated. They might have been avoided, in fact, by restricting private sales of the newly titled land in order to secure broader social goals. On the other hand, the parceling of large haciendas in Guatemala has not resulted in the large-scale loss of land by parcel recipients nor in the reconcentration of landholdings (see Schweigert 1989). The conditions under which the individual parcel titles are issued appear to be of fundamental importance in determining how the agrarian structure evolves. Rules to limit the reconcentration process have been of great priority in much of the Americas and have contributed to the "insecurity" of many large landowners.

The enforcement of such social rules for limiting private security of landownership often requires the creation of a special state agency for land

management, an agency which is charged with applying the legally established incentives and sanctions to the actions of landholders. In Latin America, the most common office entrusted with such functions is the agrarian reform agency, which is usually empowered to expropriate private landowners under certain conditions and has the legal facilities for transferring ownership of land so acquired from the state to reform beneficiaries or other private owners. Such agencies are also typically empowered to restrict the transfer or alienation of land from the original beneficiaries.

Another common public agency which impinges on private ownership is the land tax office, which develops procedures for determining who owns what land so that taxes can be assessed and collected.

In recent years the creation of "protected areas" has assumed more importance. In such cases a land management agency restricts or conditions access to the land and other resources within the boundaries of some protected area in order to protect biological diversity, control the use of forests, and/or protect natural resources.

The agencies charged with administering such programs limit the security of private ownership in order to achieve broader social goals. These agencies form part of the CLIS, using Barnes's definition, and, as such, may be incorporated into the efforts at modernization of the land information system. In Honduras, for example, the national cadaster produces parcel maps which eventually will serve as the legal description of landholdings for the property registry and as the basis of property tax collections for the municipal cadastral offices.

Rather than maximizing the security of private property ownership, these institutions which form the CLIS attempt to provide a balance between private landowner security and competing social interests. The challenge is to implement rules and provide resources for efforts to protect and secure rights of private ownership while achieving desired social and political goals which may imply increased ownership insecurity.

2.5. Relative Importance of Titling and Registration Improvement Programs

Throughout the Americas, public restrictions on private ownership security in order to achieve other social goals in a practical sense limit the scope of the arguments for putting top priority on programs to maximize ownership security. As Rendon Cano (1988) has pointed out in his review of Latin American property systems, private property in most Latin American countries must serve its social functions or else the state will expropriate the private interest. In principle, private landownership security as guaranteed by the state's CLIS and documented by legal title is never absolute in private property regimes (Barlowe 1977; Penn 1961).

In practice, the policy to maximize security of landownership in most Latin American countries is tempered by public interests in private property. There are, moreover, theoretical perspectives which provide bases for caution, and perhaps greater realism, in judging the priority of programs to improve ownership security.

Thome (1971) reviewed evidence on the importance of legal title and concluded that there is some basis for asserting that the lack of legal title can contribute to conflicts over land and the inhibition of investments and production. He (Thome 1971, p. 239) cautioned, however, that ownership security involves much more than legal ownership titles, for

> attaining tenure security, particularly in the more remote frontier areas, requires much more than the mere issuance of legally valid titles of ownership. Unless adequate credit facilities, access to markets and other forms of assistance are provided to the small holders, they may be forced after a few years to sell their holdings or even to abandon them, often to the benefit of the financially stronger landowners who can afford a long-term investment.

This observation signals two weaknesses in studies which imply that security of ownership is a critical condition for agrarian development:

a) The factors that influence the investment and production processes are multiple and interrelated. Moreover, the functioning of input and product markets, credit availability, technical assistance, and basic infrastructure, such as roads, health facilities, and schools, are of critical importance to farmers' inclinations to make investments and improve long-term productivity. The provision of such services and institutions is not automatic but rather requires substantial public and private investments.

b) Embarking on programs that attempt to modify tenure security through the issuance of legal titles may not have their intended effects because of a bimodal social structure, which often implies a lack of land and labor markets in many regions of the less developed countries. Under conditions where patronage arrangements are strong, it is not likely that the issuance of land titles will alter the incentive structure of a highly dependent and weak segment of the peasantry. "Land tenure . . . is not simply an instrumental variable easily manipulated by governments for economic reasons alone" (Kanel 1971, p. 23). Broader structural reforms and the replacement of landlord patronage systems by a democratically balanced political economy and a system of contracts enforced by a relatively impartial state may well be necessary conditions for titling and registration programs to have their desired effects.

Another difficulty with an unbalanced focusing of public resources on strengthening the security of private landownership stems from an assumption of the inferiority of the customary system for regulating ownership claims. Titling and registration programs have typically dealt exclusively with the formal CLIS, that is, titling land for the jurisdiction of the formal CLIS and institutionally strengthening the CLIS for handling subsequent transactions. Little consideration has been given to strengthening the customary system of defining and defending ownership, and the advantages of the customary ownership regime have not been systematically compared with those of the formal CLIS.

These cautions concern programs that aim at resolving at least some of the problems of agriculture through improving the security of landownership. They suggest that we not expect too much from such programs, at least from programs limited to delivering titles and formalizing the property registries.

Given these theoretical debates, an assessment is needed of what has happened when actual programs have attempted to extend and modernize the formal CLIS. Using AID-supported LTC research as the focus of analysis, section 3 of this paper deals with the following questions: (1) What empirical evidence pertains to the impact of titling and CLIS modernization on the security of landownership? (2) What are the development impacts of programs to improve ownership security as a land tenure reform, particularly regarding access to credit, farmer investments, and the marketability of property in land? Section 4 explores the broader question of how AID-supported programs to modernize the formal cadastral land-information system may have affected the society's capacity to manage land and other natural resources. Section 5 provides suggestions for the design of CLIS modernization programs in the future.

3. Tenure Reform and Security of Ownership: Research Conclusions

Titling and associated institutional modernization programs rest on two essential assumptions: (1) the improvement of the security of landownership is a critical condition of development; and (2) incorporating landholders into a modernized and strengthened CLIS is a sufficient means for improving the security of ownership.

These arguments about the desirability of institutionalized security of landownership have guided research on the impact of titling programs and the modernization of the national CLIS. The major conclusions of the research support some of the hypothesized benefits of titling and registration programs but also question some of the expectations of these efforts. Research indicates that while the struggle for agrarian development and national resolution of deep conflicts may involve the modernization of the CLIS, more far-reaching policies will be required as well.

The major conclusions of recent research on these questions are as follows.

3.1. The Effectiveness of Customary Means for Protecting Rights of Ownership Have Been Underestimated While the Advantages of the Formal CLIS Have Been Overly Praised

The means for improving security of ownership are not limited to extending the laws of property and improving the public agencies established by the state to define ownership, such as the property registry, or to defend landownership claims, such as the courts and the police. Rather, in many parts of Latin America and the Caribbean there are functioning, customary systems for defining property rights, usually without a formal, legal basis but with the support and the respect of local communities. These customary systems are relatively inexpensive to operate, are easily accessible to local people, and may be socially and economically advantageous by permitting tenure forms not protected by the formal CLIS. As such, the customary parts of the CLIS may be quite resilient and the holders of customary titles may prefer that system to the formal, legal one.

Coles's (1989) study in Honduras showed that once the state issued legal titles to holders of public lands, some of the newly titled owners, as would be expected, sold their lands or willed them to heirs. However, the new owners, usually neighbors, did not record these sales or inheritances in the property registry but rather relied on traditional forms of transferring landownership (private documents or verbal contracts) and used local mechanisms to record rights to land, including neighbors' acceptance of boundaries, notables' witnessing transactions, the lawyers' drawing up "legal-like" deeds. If the trend of avoidance of the property registry for recording transactions continues after the titling and registration exercise is completed, the land will again be held under nonrecorded titles within a generation, much like the situation that existed prior to the program.

The major difference between the previous situation of insecurity of landownership in Honduras and the evolving legal system appears to be the removal of state claims of ownership to the land through the titling process, although the state does retain a direct interest in the land until the debt has been paid. In practice, this requirement for review of each transaction is seldom followed, that is, land transfers are effected without state approval.

Since it is theoretically and legally possible for a state agency to review transactions, the titling program may have actually decreased ownership security. The state has indeed delivered private titles to landholders, but those titles carry certain obligations with them. Prior to the titling program, the landholders employed customary means for transferring and protecting rights to land, and the state was not involved. People effected transactions without state approval. Now, once the titles have been issued, the state assumes a legally defined role in approving transactions. If rules governing transactions are not followed, the state can nullify those transactions--certainly an insecure situation for those who buy titled properties under the customary system. Thus the positive aspects of the state's having yielded its legal claim to the ownership of public lands, which were held in usufruct by private landholders, may be negated by the state's retention of an interest in land transactions and the new owners' uncertainties regarding parcels acquired without official approval.

In the St. Lucian case, the customary tenure form, family land, was little affected by the titling and registration program, which relied on voluntary requests for parcel subdivision (Stanfield 1989). Most of the holdings of family land were not subdivided nor was the number of people holding interests in undivided parcels of such land reduced. The advantages of these holdings, particularly the ability of family landholders to have access to more land than would be the case if such holdings were subdivided, apparently encouraged the maintenance of that customary tenure form (Bruce 1983; Stanfield 1989). It remains to be seen whether the robustness of family land tenure will resist other pressures.

The study of the land tenure system in Panama (LTC 1986) also found evidence that, in principle, most people did not prefer the customary means for defining and defending property rights over the formal registration system, but that in practice, the formal processes of land titling and registration were extremely slow, costly, and difficult to complete, particularly for the smallholder. While formal title may be desirable for many people, the costs of getting and maintaining that title are a significant barrier to the transformation of customary into legally titled holding.

The finding of relatively robust customary systems of property definition and defense in the recent studies confirms the findings of previous inquiries (see, for example, Thome 1971; Barraclough 1973; Salas Marrero and Barahona Israel 1973). Titling programs and registration modernization have frequently assumed a desire on the part of most customary titleholders for incorporation into the formal CLIS. That desire may be present for some landholders and absent or ambiguous for others, with good reasons for both preferences.

Part of the problem of landholder skepticism concerning the formal CLIS is that the extension and strengthening of that system requires the establishment and exercise of state bureaucratic power, which, in countries like Honduras, is often weak. There are two shortcomings in particular: (1) the institutional capacity of public agencies to administer laws regulating rights to land is sporadic and frequently ineffective, especially in rural areas; and (2) agencies of the state are viewed with suspicion and outright hostility by portions of highly polarized societies.

The lack of functioning public agencies and, where they do function with some effectiveness, the latent and often expressed conflict between the state and segments of the population combine to undermine the operation of a formal, legally based property system and lead some groups to prefer a customary, local, community-managed system.

Under such conditions, modernization of property registration systems which is oriented only toward titling and strengthening the information management of state agencies (for example, computerized cadastral mapping, computerization of registries) will be difficult to maintain. At the same time, if modernization of the property registration system manages to deal directly with the CLIS inaccessibility and the feelings of hostility experienced by significant portions of the population to the institutions comprising the CLIS, resistance to being part of the formal system should decline.

It should be noted that there appears to be a strong sentiment in certain segments of the population which favors being incorporated into the formal CLIS. People see advantages in holding legally titled land. In the Honduran study, survey data indicated that on average, landholders estimate that parcels of land with legal title are more valuable than parcels without such titles (Stanfield et al. 1990). Moreover, the titling effort in Honduras was undertaken at least in part because of pressures brought on government by coffee farmers, who demanded titles to their lands (Stanfield et al. 1986). Thousands of farmers have applied for legal title and have assumed the often substantial costs involved in providing the titling agency with the necessary documentation for securing title.

But there also appears to be some farmer ambivalence about the desirability of legal titles. In St. Lucia, despite subsidization of legal and survey services by the registration and titling program, most of the holders of family land retained a family-land title (Stanfield 1989). In Honduras, where there are no sanctions for not participating in the titling program and where survey and adjudication costs are borne by the government, only about a third of the eligible landholders has applied and received title (Stanfield et al. 1990). The cost of the land which the government is charging the beneficiaries of the titling program has constituted a barrier in a significant number of cases. People are waiting to see what develops around the issues of land taxation, the availability of credit (which might require marketable title for collateral), and the actions of the state in enforcing its rights to authorize land transactions that involve land which has been titled before making further moves to obtain legal title.

One implication of these findings is that for the incorporation of the bulk of the property owners into an institutionally stronger CLIS to occur, the CLIS must be assuredly close to the people it is to serve. This means that the property registries or some designated agency must be located in the major municipal centers, not just in the departmental capital. Agencies that participate in or review transactions should have local administration facilities. It also means that efforts must be undertaken to educate the previously excluded public about the advantages of the legal, bureaucratic system. Perhaps most important, efforts are needed to change the behaviors and perceptions of the people who operate the CLIS (lawyers, judges, police, land surveyors, notaries) and other agencies, such as private and public sector banks, to adapt to the needs of those parts of the population which have not significantly or positively participated in the formal, legal, land information system.

Under the changing conditions which give rise to the need to modernize and extend the formal CLIS, titling and registration programs must undertake substantially more educational and institutional restructuring than has been the case to date. The underlying principle is that for the CLIS to replace the customary system of defining and defending rights in land, it must be brought closer to the people it hopes to serve.

3.2. The Effects of Increasing the Negotiability of Title so as to Stimulate the Loss of Land by the Peasantry May Be Exaggerated

One argument outlined above concerning the advantages of titling is that incorporating land into the national CLIS through titling will lead to social benefits because such titled land offers more security to those interested in buying land or accepting land as collateral for loans. With the buying, selling, and mortgaging of land easier to accomplish, the land market should operate to improve the efficiency of land use and investments in the land.

One frequently heard counterargument is that such increased incorporation of land in the market economy will expose the peasant possessors of land to the imperfections of the market, namely, the monopoly power of certain economic groups. The improvement of the institutional security of ownership can mean greater security for the future acquirers of the land, but who will be interested in acquiring land?

Assuming the economic predominance of a small but coherent class whose strength is directly related to control over land, a standing concern is that some members of such a class will find ways to purchase the newly titled land. Alternatively, certain elements of this oligarchy, through their control of the banking system, could acquire these newly titled land through mortgage foreclosures. Thus, without active state interventions in the economy--such as a systematic program for the development of peasant agriculture, the reorientation of the commercial sector, especially the banking system, and the weakening of traditional power over land--the exposure of peasant landholdings to the imperfections of land market may lead to their systematic loss of land.

The study in Honduras compared the transactions in land in titled areas with transactions in untitled areas. There was no difference in the rate of transactions in one titled area. In another, the proportion of parcels which had been transferred during a four-year period was actually less among the titled landholdings than in the untitled area (Stanfield et al. 1990). Perhaps that reduction in the rate of transactions was due to the involvement of the title-issuing agency, the National Agrarian Institute (INA), in the process or perhaps it was due to the greater ties of the newly titled owners to their lands. What is undeniable, however, is that the titling program--the issuance of legal land titles to private owners in replacement of their customary titles--did not stimulate the dispossession of the peasantry through greater sales of land, at least in the short term. What will occur over the longer term remains to be seen.

The experience in St. Lucia is unclear on this point of possible dispossession. In the other Caribbean countries that undertook a similar titling and registration program, the land market appeared to be stimulated, with greater rates of transaction and greater governmental revenues from transfer taxes (Lewis 1980). A follow-up study of the operations of the land market in the years after the termination of the Land Registration and Titling Program (LRTP) in St. Lucia would be instructive.

A related finding from research in Honduras is that titled farmers perceive there to be a substantial increase in the market value of their land following a titling program (Stanfield et al. 1990). During the four years after the titling program, farmers estimated that the value of the titled lands had increased about 60 percent more than the value of untitled land. This perception of value increase may not continue as people become more acquainted with the transaction costs of titled land, but the short-term increase in perceived value does appear to be substantial. If the market reflects such increases, particularly as seen by bankers in their valuations of properties for mortgage purposes, the titling program may have greatly increased the capitalized value of land. Such an effect would benefit titled landowners.

On the negative side, substantial increases in the market value of titled land could mean greater difficulties for the small farmers in acquiring land through the market, which may be a factor in the observed low rates of land sales among the titled landholders. This phenomenon deserves further study.

3.3. The Role of Security of Ownership in Landholder Investment Behavior Has Been Misinterpreted

In the past, studies done on the security of landownership almost always derived from a comparison of holders of titled and untitled land. Such studies usually concluded that the owners of titled land had superior access to credit, made more productive investments, and had higher productivity. These studies implied that many of the problems of agriculture would be overcome simply by providing landholders with legally valid titles (Feder et al. 1988; Salas Marrero et al. 1970; Seligson 1984; Barbosa and Strasma 1984; Villamizar 1984).

The data reported by such studies are undoubtedly well gathered and well analyzed but are based on ahistorical comparisons of the two groups, titled and untitled landholders. The problem with this research method, especially when used for policy recommendations, is that it is based on an analogy. The titled versus nontitled comparisons assume that the untitled holdings, when titled, will become "like" the titled ones in terms of credit access, investments, production, and other economic indicators.

If factors other than possession or acquisition of title are causing or conditioning changes in credit access, investments, and so forth, the ahistorical comparisons would be misleading (Roth et al., 1989). Methodologically, it would be cleaner to determine the levels of these indicators prior to the issuance of title, issue the title to the farmers, and at some later time evaluate any changes in the measurements of impact.

Such a design was in fact used in Honduras, with a baseline study conducted prior to a titling program, followed by the formal issuance of titles, and culminating with a restudy of the baseline sample to determine changes which may have occurred among the sample of landholders (Seligson and Nesman 1989). The study also gathered two measurements on these indicators from a sample of "control group" farmers in an area not subject to the titling program.

The data from Honduras show that the potentially positive impact of recorded title on investment, productivity, and income levels of farmers did not occur during the five-year period covered by the study. There were no systematic differences between the titled and control groups on the changes in the indicators of these variables (Stanfield et al. 1990).

Even when cross-sectional data are analyzed using a multivariate model, there appears to be little impact of possession of legal title on such phenomena in the Latin American context. In the LTC study in Panama, there was a statistical correlation between land title and more use of credit, greater farm productivity, and interest of most farmers in legalizing their informal or irregular land tenure arrangements. But the study could not establish a causal link between land titling and agricultural development indicators such as increased credit use or productivity. Rather, it was difficult to separate the impact of title on agricultural development from the impact of other factors, such as the size of the parcels, soil capabilities, the producers' prior contacts with credit sources, and the comparative effectiveness of the customary system of property titling (LTC 1986).

In the Boldt study in Ecuador (Boldt 1989), once farm size and other factors were controlled in a cross-sectional study of titled and untitled farmers, there were no differences in terms of investments and production. Similar results were obtained in the Boster et al. (1989) study in Ecuador.

This is not to say that institutional insecurity of ownership, that is, the lack of a legal title to the land, is irrelevant to the process of agrarian development. Many farmers are convinced of the value of legal titles, as shown in the data indicating that the Honduran landholders themselves see economic benefits from the possession of a title (Stanfield

et al. 1990). There is very probably a long-term connection between the development of a more egalitarian and effective state with the gradual extension of the protection of property rights by that state and the development of the agricultural sector. A legal land title is both a means and a symbol of access to opportunities within agriculture, but title is just one piece of a very complicated puzzle.

The misconception about the importance of legal title to land lies in treating tenure status as a variable which is subject to manipulation in a simple programmatic manner without dealing with the complex web of factors which influence economic and social democratization of society, particularly the improvements in access to opportunities by small-scale family farmers. The farmers' decisions to invest capital and labor time as well as the linkages between investments and production and income are influenced by weather, by other employment and income opportunities, by general market possibilities, as well as by the relations among social classes. Legal title is but one thread of this web.

The data on the role of legal title for improving access to credit provide a case in point. In initial analyses, data gathered in Honduras showed that more widely distributed legal titles appeared to have an impact on access to credit, even in the relatively short time period of the study. There was a net increase in the number of people with loans in the titled areas, a significantly higher increase than in the control areas; private banks which require collateral for loans accounted for all of the additional loans, and the amount of money loaned rose dramatically in the titled areas as compared with the control areas (see Stanfield et al. 1990).

Aside from methodological problems deriving from the very small number of credit recipients among the samples of small-scale farmers, the main problem with this particular survey data set for attributing systematic credit-access benefits to the titling program is that most of the new credit recipients in the sample were from just <u>two</u> communities in one of the titled departments. As determined through case studies of credit access and use, the bank manager in one of these communities (the municipality of Colinas in the department of Santa Barbara) decided to accept INA land titles as guarantees for making loans to people who had not been bank clients before <u>and</u> for increasing the amount of money loaned to already established clients. The bank manager did not record mortgages on the titled properties but simply put the INA titles in his vault until the loans were repaid. A similar situation occurred in the other community where credit access dramatically increased following the titling program.

These particular community experiences were not replicated in the other areas studied. There were no significant changes in the other communities either in the number of clients or in the amount of money loaned. The experience of the Colinas bank manager, however, is very instructive and could be explored further for demonstrating the value of using the INA titles as he did. The case-study local conversation about the new titles seem to have encouraged the Colinas bank manager to experiment with using the new INA titles for issuing loans. If the policies of other banks could be the focus of special efforts for making them more responsive to the needs of the newly

titled peasant producers, the increased importance that many farmers attach to their land titles could be leveraged into greater access to credit and, perhaps over the long term, begin to affect the more difficult processes of on-farm investments, increased productivity, and farmer income enhancement. Titling alone, without local educational efforts and institutional changes, will not bring about these effects. And even longitudinal surveys of landholders will be insufficient to detect such relationships if they are not accompanied by in-depth, historical case studies of the communities and farmers being touched by the titling and registration programs as well as movements toward or away from broader democracy of opportunity.

4. Expansion and Modernization of the Formal CLIS and the Management of Natural Resources

The theoretical basis of much of the land titling programs has been the expected private benefits which should accrue from greater security of landownership via the adjudication of titles as state patents of private ownership. These private benefits, according to the advocates of land titling programs, should accumulate sufficiently to be of benefit to the wider society.

The data have indicated, however, that the expected private benefits of titling have been few and difficult to realize, at least in the short run. However, the experience with the Honduran and St. Lucian titling and registration programs has suggested that there may be significant social benefits which titling and registration programs can provide by improving the capabilities of the government, public utilities, private developers, and conservers of the land and attendant resources to administer these resources more effectively and closer to the people. The following potential land administration benefits from titling and registration have been observed in Honduras.

4.1. Inventory of Publicly Owned (national and ejidal) Land

The Honduran titling and registration program (Programa de la Titulación de la Tierra, or PTT) for the first time has provided detailed information concerning the distribution of landholdings located in national and ejidal land. The PTT also has provided data concerning the nature of land use for each parcel of land and information concerning the means by which the lands were acquired by the present holders as well as the names of those holders. This information can be extremely useful for planning development projects which affect the land, such as soil and water conservation initiatives, watershed management programs, technological transfer oriented toward particular crops, and programs seeking solutions to the problem of extreme poverty due to land fragmentation.

4.2. Clarification of the Boundaries of Private Lands

The boundaries of the private lands have in many cases been chronically difficult to determine for a variety of reasons. In some cases boundaries are unclear because of the vague metes-and-bounds descriptions used in the older deeds, the lack of accurate land surveys, or subdivisions made subsequent to the original deeds but carried out without being recorded. Other boundary vagueness has resulted from the unauthorized expansion of finca boundaries into ejidal and national lands.

The cadastral mapping exercise, which involved walking the boundaries of each parcel with the claimants, resulted in comprehensive cadastral maps with parcel boundaries agreed upon by adjoining owners and marked on maps at least to the precision of the scale used in the aerial photographs. While the precision of this mapping and marking of boundaries is not as high as would

be obtained through traditional survey techniques, the property descriptions contained in the cadastral maps are undoubtedly more precise and useful than the metes-and-bounds descriptions or the verbal agreements which in most cases existed prior to the PTT.

4.3. Delineation of Boundaries of Administrative Units (departments, municipios)

The delineation of administrative boundaries between departments and municipalities has been ambiguous and often undefined. The PTT ran into this confusion when carrying out the cadastral mapping of parcels, which required the identification of parcels according to their location by department. In many instances the existing maps of boundaries did not correspond with geographical features on the ground, or there was a longstanding dispute as to which department or municipality had jurisdiction over a particular area. Areas which have been in dispute between administrative units have been submitted to arbitration by the Ministry of Justice.

This confusion has meant that in these administratively ambiguous areas, the public has difficulty knowing where to go to secure such documents as birth and death certificates and even to record land transactions. But perhaps more important for the future institutional development of Honduras, the development of the Folio Real (a new, parcel-based registration system which is to be launched with the help of the cadastral information) requires that departments be surveyed completely before the system can be initiated. The location of departmental boundaries is of fundamental importance. Moreover, municipal boundaries must be clear before the local cadastral offices can collect land taxes.

The PTT contributed substantially to the clarification of such administrative boundaries, thereby providing the basis for the future development of the Folio Real as well as municipal land-tax administration.

4.4. Boundaries Identified of Public Lands not Subject to Titling

The PTT also contributed significantly to the clarification of boundaries of land that cannot be titled, such as forest reserves, certain critical watersheds (for instance, the land around the Yojoa Lake), areas along public roads, and lands assigned to municipal administration, which are subject to different rules for occupation and titling.

4.5. Significant Improvements in Property Tax Collections Are Possible

One of the most important products of the cadastral mapping being done presently in Honduras is the improvement of property tax collections. To provide for necessary infrastructure investments, such alternative sources of public income are needed as revenues from export and import taxes are reduced following trade liberalization.

Property taxes are collected at the municipal level by the municipal cadastral offices. This local office has no structural relation with the national cadaster, or at least did not have prior to recent efforts at establishing these important linkages. The collection of taxes is based on local knowledge of who owns what land and on the propitious appearance of a property owner who wants to carry out some transaction which requires certification from the municipal cadastral office. Both the valuation procedures and the rate of tax collection are inadequate; the people administering the program are often poorly trained and have little information to guide them in assessing and collecting taxes.

The national cadaster has carried out two pilot projects involving the provision of complete cadastral maps to two municipios, Villa San Antonio and Puerto Cortés. In Villa San Antonio, tax collections were increased 258 percent following the introduction of the completed cadastral maps and the training of cadastral administrators, and the increase in Puerto Cortés was 163 percent.

Discounting the cost of maintaining the municipal cadaster, it is estimated that the cost of producing the cadastral maps and property owner lists can be recovered from increased revenues in four to five years. The collection of other taxes, such as impuesto vecinal, commercial establishment, and municipal service, is also improved after the provision of cadastral information.

Added to this benefit of improved property tax revenues is the possibility of an efficiently and fairly administered land tax providing an incentive for landholders to use their land more effectively in order to meet their tax obligations or else sell it to someone who will. The result could be a greater supply of land in the land market as well as improved efficiency of land use.

These benefits, however, are conditioned on the efficient functioning and maintenance of the cadastral mapping system. The cadastral maps are to provide property descriptions which will be used in property deeds as well as other land transactions when the Folio Real system is functional. Until this linkage is made, however, and until the general population begins to use the new system for all land transactions, the danger is that the maps will soon become out-of-date.

An effective system for taxing the present holders of the land could be an important instrument for keeping the system up-to-date. When a transaction occurs, the old owner will not want to continue paying taxes and will be motivated to inform the cadastral office of the change in ownership, thereby changing the tax rolls and the information in the cadastral land information system, particularly the information in the property registry.

5. Planning for the Modernization and Extension of the Formal CLIS

The decision to devote resources to the modernization of the formal CLIS requires an assessment of the existing system and its comparison with alternatives, especially with CLIS in other nations as well as with the customary CLIS in-country, which, as we have seen, functions alongside the formal land-information system. Performance indicators would facilitate carrying out these comparisons.

Different models have been developed to guide this evaluation process. In the early part of this century, Fortescue-Brickdale (1913, p. 2) argued for the modernization of the English title-registration system by observing that a new system could have higher degrees of security, greater simplicity, higher accuracy of information, greater efficiency of operation, and lower cost.

Dowson and Sheppard (1956), West, (1971) and Dale (1986) echoed these views and added completeness of record and suitability to local conditions to a list of desirable properties of any CLIS. Holstein (1987) emphasized the importance of completeness of coverage, the continual updating of both mapping and registration information, and the flexibility of the system for incorporating technological improvements (such as computerization). Rosholt (1986) stressed the ability of a CLIS to satisfy the needs of multiple users and the degree to which agencies can cooperate in the maintenance of the system.

Cost-benefit approaches to evaluation (Epstein and Duchesneau 1984; Luzar 1987; Wunderlich and Moyer 1984; WLRC 1986) have made substantial contributions to the techniques of cost estimation but have had less success with quantifying the overall benefits of the CLIS. Nor have these approaches been very helpful in conceptualizing the essential features of the system for which costs and benefits can be calculated.

Barnes (1988) reviewed these various approaches and synthesized CLIS evaluative indicators into six criteria for comparing different efforts at modernizing CLIS. Generalizing his analytical model for application to the functioning of all CLIS, not just those in the process of updating, we propose using his six criteria plus the criterion of coverage.

5.1. Quality of Information

The quality of information in the CLIS can be measured in terms of its accuracy, precision, and completeness. One component of CLIS quality is the accuracy of parcel descriptions. The recent trend has been to replace descriptions which supply information on the ownership of adjoining parcels and/or distances from certain landmarks, or "metes and bounds" descriptions, with cadastral maps which delineate all parcels and show important geographic features (roads, streams, buildings, and the like). The development of photogrammetric techniques can secure substantial cost savings without a significant degeneration in the quality of spatial data. Yet the legal requirements for parcel descriptions often do not permit use of such techniques. A reliance on traditional survey techniques often produces the

appearance of high spatial data quality but does not necessarily provide useful, low-cost information on a wide geographic area.

Modifying land survey procedures can also have important cost and information management implications. The "general boundaries" method of boundary demarcation, such as has been used in Honduras, Ecuador, and St. Lucia, plots parcel boundaries on base maps to the precision permitted by the maps. The traditional "fixed boundary" approach to parcel boundary description requires complex ground measurements which are costly to achieve. Probably the more important advantage of the "general boundaries" approach is that it lends itself to the graphical delineation methods based on photogrammetry. Yet the fixed boundary tradition remains the customarily preferred method of demarcation, is still enshrined in law in Honduras and elsewhere, and is defended as being more desirable because of its alleged higher precision.

The Gonzalez study (1975, p. 377) of the CLIS in El Salvador describes a common situation in the Americas:

> a characteristic of our properties in many instances is that property boundaries are natural features producing an irregularly shaped parcel, and therefore it is difficult to justify a costly numerical method or conventional survey methods when some accuracy can be obtained using the simpler and more practical graphical methods.

As a general guideline, the precision of a cadastral survey should not be more than is necessary for the fulfillment of practical requirements. The system, the method of production, and the legal basis will have be adapted to local circumstances, both social and physical (Barnes 1988, p. 141), and that adaptation is necessarily difficult.

5.2. Maintenance of the Information in the CLIS

This feature refers to the effectiveness of the CLIS in reflecting the constantly changing nature of parcel boundaries and land rights on the ground. Many CLIS are not well maintained, that is, do not adjust parcel information to changes in the shape of properties or alterations in the rights to land and other resources as required by law and custom. As Barnes (1988, p. 139) has observed:

> Issues and demands relating to maintainability do not appear to be fully appreciated in the design of many CLIS. Creating an information base for the first time is vastly different--in software, hardware, procedures and data structure requirements--from maintaining an information base. This is particularly true for the spatial components of an information base where certain spatial or topological relationships need to be retained. For example, changing the coordinates of a parcel corner will affect the definition of adjoining parcels sharing that corner, as well as the boundary line(s) that either terminate at the point or run tangentially through the point.

The maintenance of accurate information in the CLIS is facilitated by linking the surveying and mapping information of the cadaster with that of the property registry. In Honduras and Ecuador, this linking is only just beginning, with the danger of information becoming out-of-date before the merger is complete. Another mechanism for improving the maintenance of accurate information is incorporation of an effective property tax into the system. Owners who transfer their rights will be motivated to inform the CLIS of any transfer which they carry out in order to avoid tax liability.

5.3. Efficiency of Information Processing

The efficiency criterion refers to the ability of a CLIS to process information, as measured by the number and area of delineated, mapped, and registered parcels processed in a particular period of time. Barnes (1988) calculated efficiency indicators for three CLIS modernization projects which were attempting to delineate and title large geographically contiguous areas (in Honduras, Ecuador, and St. Lucia). In each case, delineation and titling were done by specially organized teams, using aerial photography for building cadastral maps. The mapping techniques were different, however. In Honduras,

TABLE 1

Comparison of Delineation and Titling Efficiencies in Honduras, Ecuador, and St. Lucia

EFFICIENCY INDICATORS	HONDURAS	ECUADOR	ST. LUCIA
Delineation and mapping:			
Parcels per team month	52	98[a]	99[b]
Area per team month	536	1,071	188[b]
Average parcel size	9.1	10.9	1.9
Parcels per 100 hectares	11	9	53
Titling:			
Titles per team month	97	68	99
Hectares per team month	550	n.a.	188

Source: Grenville Barnes, "A Comparative Evaluation Framework for Cadaster-based Land Information Systems (CLIS) in Developing Countries," Ph.D. thesis, University of Wisconsin-Madison, 1988, p. 135.

a. Does not include any cadastral mapping.

b. Includes demarcation, whereas in the other countries the marking of parcel boundaries through clearing was not required.

the cadastral base maps were digitized while in St. Lucia, the cadastral maps were produced manually. The adjudication of title procedures also differed, owing to different legal and organizational conditions. In Honduras and Ecuador, the delineation and titling were done by government agencies while in St. Lucia, those functions were carried out by a privately contracted company. One major difference among the three countries is the much smaller average parcel size in St. Lucia, in part because the delineation and titling included urban house plots as well as agricultural parcels while in the other two countries most delineated parcels were agricultural. Despite these differences, the efficiency indicators which Barnes developed can prove useful for future planning for CLIS modernization. Further research is needed to generate comparative efficiency figures for existing CLIS, formal and customary.

5.4. Cost of Modernizing the Formal CLIS

The cost of producing a single information unit from the CLIS, such as a cadastral map sheet or title, is an important indicator of how well the system is functioning as well as the likelihood of its being maintained. The modernization of a CLIS requires investments different from those involved in daily operations, and, in different contexts, costs will differ even when using similar methodologies.

TABLE 2

Comparisons of Unit Costs of Delineation and Titling in Honduras, Ecuador, and St. Lucia

	HONDURAS	ECUADOR	ST. LUCIA
Delineation and mapping:			
US$ per parcel	41.00	66.00	96.00
US$ per hectare	4.50	4.60	49.00
Titling:			
US$ per title	116[a]	174[a]	118
US$ per hectare	19	n.a.	59
US$ per parcel	89	n.a.	118

Source: Grenville Barnes, "A Comparative Evaluation Framework for Cadaster-based Land Information Systems (CLIS) in Developing Countries," Ph.D. thesis, University of Wisconsin-Madison, 1988, p. 140.

a. In Honduras, a single title could include more than one parcel of land.

The work by Barnes (1986) produced useful data on the comparable costs of delineation and mapping in projects which were involved in major modernization of their respective CLIS, as shown in Table 2.

The relatively high costs per parcel and per hectare for delineation and titling activities in St. Lucia are due to a number of factors, including the higher parcel densities, the higher wage scales, and the different management organization. The management form most commonly used for AID projects has been governmental, but in St. Lucia, a private firm was contracted. That firm was composed largely of expatriate personnel who carried out the delineation and titling. St. Lucia also did a more complete adjudication of rights to land, not simply the adjudication of ownership for those requesting that right, as occurred in Honduras. Costs for the same activities using the same management methodologies may well vary among countries, but these data show exactly which costs are involved in an effort to renovate a formal CLIS, including production of cadastral maps and adjudication of titles.

5.5. Utility of the CLIS

The relative utility of a CLIS is its ability to satisfy the needs of actual and potential users of the land information which it manages. One indicator is the number of different information users and the frequency of their interactions with the CLIS. One problem with the CLIS in Honduras is the centralization of numerous parcel sales--and the approval of subdivisions--in a single agency in the capital city, which dramatically decreases the accessibility and use of that component of the CLIS, particularly by smaller-scale landowners. In a relatively small country such as St. Lucia, centralization of the CLIS in a single office presents fewer difficulties, though making the land information available to property registry nonusers is still a long and difficult process.

On the other hand, a CLIS which has many different types of users may become overly complex as it attempts to produce information for many different purposes. The historical function of most CLIS (see West 1971) has been either as a property registry for protecting the land rights of a certain segment of the population or as a revenue-producing information base for administering land taxes. There are advantages where both functions have been combined, but there are also significant problems in maintaining both sufficient quality to satisfy the property registry and sufficient currentness to satisfy the land tax agency. Extending the CLIS to serve yet other needs usually proves to be a difficult task. It seems prudent to limit user demands on the CLIS until both property and tax functions are efficiently served.

Of fundamental importance to the utility of the CLIS is its proximity to the population of landholders. Highly centralized property registries, such as in Guatemala and Jamaica, contrast with the decentralized systems used in Haiti and Ecuador in terms of the cost of making contact with the CLIS. The decentralized systems tend to be "closer" to the people who may use the CLIS to record and defend their rights to land.

Costs of dealing with the CLIS, not just geographical location, must also be taken into account when judging relative proximity. Costs may be socially

high for the lower classes, where the CLIS has historically served the interests of a landholding elite. Data from a study of land markets in Ecuador are instructive in this regard (see Ramón 1990).

Prior to the agrarian reform in Ecuador, there was a strong pattern of both class and ethnic segmentation of landholdings, particularly in the Sierra. The agrarian reform era resulted in significant shifts of land across these segments and restructured the property system in some areas of Ecuador. The transformation of the agrarian structure in the region studied by Ramón (1990) resulted from the breakup of hacienda lands through expropriation, or the threat of expropriation, and through subsequent land market activity. This transformation changed the demands on the formal CLIS. Previously, the CLIS served a very limited class of landowners. At present, the number of landholders is dramatically higher and composed of different social classes, as shown in Table 3.

TABLE 3

Control of Agricultural Land, Cantón Cayambe

	1954		1989	
	(ha)	(%)	(ha)	(%)
White elites (> 20 hectares)	32,909	(83)	13,180	(31)
Mestizos and poor whites (< 20 hectares)	4,979	(13)	3,515	(8)
Indigenous (< 20 hectares)	1,762	(4)	26,000	(61)
Total	39,650	(100)	42,695	(100)

Source: Galo Ramón, "Indios, tierra y modernización: Cayambe 1950-1988," typescript (Madison: Land Tenure Center, University of Wisconsin, and the Centro Andino de Acción Popular, Quito, Ecuador, 1990), p. 38.

5.6. Complexity of Information Management Technology

The complexity criterion refers to the technical difficulty of the land information technology used, the nature and extent of education and training required to maintain the system, the expertise used to create the system, and the procedures and techniques employed for demarcation, delineation, mapping, and titling of land rights.

Research done by Dueker and Kjerne (1987) has demonstrated that the most advanced technological approach is not necessarily "better." From a number of perspectives, their investigation concluded that less effort, lower cadastral base-layer accuracy, and lower levels of spatial knowledge are advantageous. However, embarking on a lower-level technological path can also mean an inability to adjust to new options, resulting in subsequent cadastral system redesign and data reconversion, that is, essentially throwing away much of the earlier work.

Complexity also refers to the institutional context within which the CLIS functions. This environment is often poorly understood by the designers of land-information modernization efforts. Many cadastral modernization efforts have been inadequate or have failed because of the extreme complexity of the undertaking. As developed in Jamaica, the more appropriate CLIS modernization strategy was to begin with a relatively simple approach but allow for gradual upgrading as skills, technology, and institutions evolved and increased the country's abilities to manage more advanced technological packages (Stanfield et al. 1987).

5.7. Coverage

"Coverage" refers to the degree to which the formal CLIS extends over the land of the country, public and private, that is, the proportion of the land parcels and area which are recorded and delineated in the CLIS. As noted elsewhere (Stanfield et al. 1990), a major problem developing in Honduras is the likelihood that its CLIS modernization, undertaken to incorporate holdings into the formal system, may decay relatively rapidly. That is, coverage of the formal CLIS may revert in a few years to what it was before the initiation of the modernization process.

The degree to which formal CLIS information covers the land area of a country is a measure of the system's success but is also a measure of the integration of social classes and state institutions. Improving coverage over the long term requires more than a "project" to extend that reportage, but such an effort can contribute to the democratization of social institutions.

6. Recommendations for the Modernization of Cadastral Land Information Systems

The experiences with CLIS modernization in recent years can provide some guidance for future efforts. Modernizing a CLIS involves: (1) an assessment of demands on the present system; (2) an evaluation of how the present system is meeting those demands and will likely meet them in the future; (3) decisions concerning the strategic goals of the modernization process; (4) a determination of the outreach strategy for dealing with CLIS problems; and (5) the selection of an appropriate technological package.

6.1. Assess Present Demands on the Formal CLIS

The initiation of the modernization process is a critical step; it depends on having achieved a consensus that something is sufficiently wrong with the present CLIS to merit change as well as an agreement on what the distribution of benefits of the potential changes will be. The LTC applied a modified version of Barnes's analytical framework to an assessment of the CLIS in St. Vincent (LTC 1989), with special attention to the social context and demands on the CLIS as part of the process of building a consensus for the modernization of the system.

The first step in the consensus-building process is to assess the degree to which demands on the CLIS have grown in quantity and changed in nature by using the following indicators:

1) growth in the number of transactions in land;

2) increases in the value of land;

3) increases in demands of banking institutions for mortgageable properties as the basis for long-term investment financing;

4) increases in the demands of public utilities (housing, water, telephone, transportation, electricity) and land-use planning agencies for information to facilitate and guide development investments in infrastructure; and

5) heightened demands, which require information about the present and desired distribution of private and public property rights, for the protection of land, forest, and water resources.

In other contexts there may be other gauges, but these general indicators of the economic and social context within which the CLIS operates show some of the quantitative and qualitative challenges facing the CLIS. Consideration of such factors in debates about the priorities of public investments can contribute to building the necessary consensus for undertaking a modernization of the CLIS.

6.2. Evaluate the Effectiveness of the Formal and Customary CLIS

Once the assessment of society's demands on the formal and customary CLIS is at least partially accomplished, then evaluate how well the formal CLIS is presently functioning in comparison with the customary CLIS and a model of the modernized CLIS. The criteria for carrying out this evaluation are discussed in section 5.

6.3. Establish Strategic Goals of CLIS Modernization

Strategic decisions must be made about the goals of the CLIS modernization:

1) Will the deeds-based system be transformed into a Torrens-style, parcel-based registration system, or will it be modernized without changing its essential structure and philosophy?

The trend toward a parcel-map-based property-registration CLIS in the region, with the state's guaranteeing the information, is inconsistent in application and requires constant assessment. The strategy for this type of transformation in Costa Rica contrasts with that in Honduras. In Costa Rica, the creation of a modernized CLIS proceeded relatively smoothly while in Honduras, though the initial steps were promising, there appears to be little commitment to extending the modernization process into the registry procedures and structures.

2) Will the modernization be "radical," that is, a massive transformation of the entire system within a short period of time, such as in St. Lucia, or "incremental," that is, modest steps taken toward the goal of modernization which will permit future improvements, such as proposed for St. Vincent (LTC 1989)?

The costs of undertaking a radical transformation of the CLIS are often daunting. In St. Lucia, the CLIS modernization was underwritten by a grant from AID. In other countries of the Caribbean, with similar resources and problems, this financial support has not been forthcoming. Although the cost of CLIS modernization can be stretched out over a period of decades through the adoption of an incremental strategy, the political commitment for such an effort is difficult to maintain. The program in Jamaica (supported by the Inter-American Development Bank) is an example of a more modest effort which has been very slow in developing.

6.4. Determine Outreach Strategy: Government Initiative or Public Use

In the short run, the more successful and radical programs for modernization of the formal CLIS have underwritten the costs of property description and adjudication of property rights (titling) and have taken these services to the people. The subsequent cooperation of the population with the government in these efforts has been mixed, from very high in St. Lucia to modest in Honduras.

The alternative to "taking government to the people" is to improve the administrative and technological efficiencies of the property description and adjudication agencies and to wait for the people desiring to upgrade their titles to approach these agencies. This strategy, which is being considered in St. Vincent and which has been customarily used in Great Britain, minimizes costs in the short run but slows the process of making progress. The seriousness of the problems of an outmoded and poorly organized CLIS along with the overall political and economic conditions will influence which option is chosen.

6.5. Select the Technological Option for CLIS Modernization

The selection of technological options for a modernized CLIS is plagued in less developed countries by the lack of basic infrastructure. Problems typically include an unreliable electrical grid and a poorly paid staff to manage important parts of the CLIS. These constraints condition the degree of technological complexity of the modernized CLIS. The challenge is to achieve progress toward a more acceptable system with the most appropriate technology. As Angus-Leppan (1989, p. 65) observes, "Sometimes the most appropriate technology is advanced technology, while in other instances much less advanced techniques are most appropriate." There are no magic formulas. The major decisions include:

1) The extent to which the property registry's information management is "mechanized," which can involve electronic information storage and retrieval in combination with miniaturization, storage, and indexing of paper documents

One option being developed presently in Guatemala is the creation of a microfilm data base of all deeds in the property registry. Such an option is also being considered in St. Vincent. Another option is to create a computerized data base containing information on rights to land, such as a name index, which is being used in St. Lucia. Still another option is the creation of an integrated information system of parcel mapping and land information management, such as is being done in Jamaica and Honduras, based on the Intergraph technology.

2) The degree of alteration of property description techniques

The description of property rights must refer to a specific piece of land which is located geographically. The colonial systems for locating properties most commonly depended on physical landmarks and referenced one owner's rights in terms of the adjoining owners, that is, the "metes and bounds" approach, modified by the use of surveyors' measurements of angles and distances.

Recent technological developments permit much more accurate descriptions of property boundaries, obtained at lower costs than the traditional methods. The options include:

- satellite position fixing, the use of analytical photogrammetric instruments and aerial triangulation to speed the field work for the preparation of cadastral maps;

use of lower-level technology, such as field adjudication, manual compilation of cadastral maps, use of rectified photomaps rather than orthophotos or line maps, and combination of theodolite and electronic distance-measuring devises with traverses for survey control.

One technique used in Honduras for the survey of parcels is the identification of parcel corners on aerial photo maps by sticking a pin through the points where the property owners indicate a property corner to be located. The pinholes are then used to prepare parcel maps, which are subsequently computerized.

3) The extent of use of foreign advisors

In most instances a major strategic decision for the modernization of the formal CLIS will be the proper mix of foreign and local technicians to implement the program. The process of training--building on existing or upgraded local capacity--can be slow or, as in the case of many small countries, extremely difficult. The efficiency of operations may be maximized in a short amount of time by importing the technological expertise--the familiar "rush in--rush out" of foreigners.

The more lengthy, institution-building approach will, in most countries, involve some technical assistance. In these instances of limited involvement of foreign expertise, pilot studies and programs are useful in order to build on, yet still change, familiar procedures and organizational structures and in order to use local knowledge to avoid institutional and cultural errors. The problem of changing bureaucratic procedures will be laborious, however, and will necessitate substantial public relations efforts and institution-strengthening.

4) The use of numeric parcel identifiers

In most CLIS modernization programs, some attempt is made to introduce numeric parcel-identification numbers to replace or supplement the more familiar parcel identification forms (names of adjoining owners, description in reference to landmarks, and the like). The numeric identifiers (cadastral map sheet plus parcel number within each sheet, or a geodetic reference number derived from some point in each parcel) are useful for linking the graphic and alphanumeric information in the CLIS.

However, the numeric identification systems may be poorly understood by the population in general and may produce some resistance from legal and survey practitioners, who are more accustomed to the traditional, verbal identification system. Again, education and public relations programs must accompany the CLIS modernization efforts in order to improve chances of success.

5) The choice between general versus fixed boundaries

The debate over the appropriate level of precision of parcel descriptions to be used in the modernized CLIS is almost always contentious. In Honduras and St. Lucia, the general boundaries approach was used in order to produce

cadastral parcel maps quickly and at a relatively low cost (see Furmston 1986, for a discussion of the general boundaries approach). However, the techniques of graphic mapping were resisted in both countries as being too imprecise for adequate description of parcel boundaries for titling purposes.

In St. Lucia, there is an established procedure for property owners to carry out a traditional, fixed-boundary survey--at their own expense--should they so desire. However, from the legal perspective, the boundary information contained on the registry map is sufficient for documenting property transactions. In Honduras, there is presently much confusion on this point, largely because the linking between cadastral mapping and titling, which is now under way, has had little institutional impact on property registry procedures and lawyer and surveyor practices.

6) The problem of low salaries of technicians in high demand internationally and local technical training

In many CLIS modernization efforts, the delineation and computerization techniques developed are in substantial worldwide demand. In many instances, technicians trained for a particular program will work with that program only long enough to perfect their skills and then resign to seek employment in the private sector or abroad.

This problem of staff instability is enhanced by the thin level of technical personnel which is protected by civil service regulations. This means that in practice, following each election, each new government replaces many technical people with people from its own particular party or perspective.

Staff instability is typically underestimated in CLIS modernization efforts. Perhaps the only long-term response is simple recognition that many government programs function mostly as training facilities for the private sector and for external corporations and governments. Resources must programmed for continual education and training efforts.

References

Angus-Leppan, Peter. 1989. "The Thailand Land Titling Project." International Journal of Geographical Information Systems 3: 59-68.

Arévalo-Salazar, Luis. 1970. "The Legal Insecurity of Rural Property in Colombia: A Case Study of the Notarial and Registry Systems." Ph.D. thesis, University of Wisconsin-Madison.

Allott, A. 1980. The Limits of Law. London: Butterworth.

Barbosa, Tulio, and John Strasma. 1984. "The Relationship between Productivity and Title in Maranhao, Brazil". Mimeograph. Paper presented to the International Conference on Land Programs, sponsored by the National Institute for Land Settlement and Agrarian Reform (INCRA), in Salvador, Bahia, Brazil.

Barlowe, Raleigh. 1977. Who Owns Your Land? Extension Bulletin, no. E-1101. East Lansing: Cooperative Extension Service, Michigan State University.

Barnes, Grenville. 1988. "A Comparative Evaluation Framework for Cadastre-based Land Information Systems (CLIS) in Developing Countries." Ph.D. thesis, Civil and Environmental Engineering, University of Wisconsin-Madison.

Barraclough, Solon L. 1973. Agrarian Structure in Latin America. Toronto: Lexington Books.

Betances, E.R. 1983. "Agrarian Transformation and Class Formation in the Dominican Republic, 1844-1930." Latin American Perspectives 15:

Boldt, Rebecca A. 1989. "The Effects of Land Title on Small Farm Production in the Highlands of Ecuador." Mimeograph. Madison: Land Tenure Center, University of Wisconsin.

Boster, James S., Mitchell A. Seligson, Katherine Terrell, José V. Zevallos. 1989. "Land Tenure Security in Ecuador: A Preliminary Study of Cayambe and Pedro Moncayo." Mimeograph. Pittsburgh: Center of Latin American Studies, University of Pittsburgh.

Bruce, John W. 1983. "Family Land Tenure and Agricultural Development in St. Lucia." LTC Research Paper, no. 79. Madison: Land Tenure Center, University of Wisconsin.

CAHDEA (Consejo Asesor Hondureño para el Desarrollo de las Etnias Autóctonas). 1989. "Terratenientes ladinos invaden tierras Tawahkas." Presencia Etnica, no. 1.

Carter, Michael R., Keith D. Wiebe, and Benoit Blarel. 1989. "Tenure Security for Whom? An Econometric Analysis of the Differential Impacts of Land

Policy in Kenya." Mimeograph. Madison: Land Tenure Center, University of Wisconsin.

Cereceda, L.E., and Fernando Dahse. 1980. Dos décadas de cambios en el agro chilena. Santiago: Pontificia Universidad Católica de Chile, Instituto de Sociología.

Clapp, James, J.D. Mclaughlin, J. Sullivan, and Alan P. Vonderohe. 1985. "Toward a Method for the Evaluation of Multipurpose Land Information Systems." Proceedings of URISA Conference, Ottawa, pp. 1-10.

Coles, Alexander. 1989. "Land Transactions and the Land Titling Project in Honduras." Mimeograph. Madison: Land Tenure Center, University of Wisconsin.

Dale, Peter. 1986. "Cadastral Surveying in Kenya: The Experience of a Developing Country." Unpublished manuscript.

Demsetz, Harold. 1967. "Toward a Theory of Property Rights." American Economic Review 57.

Dueker, Ken, and D. Kjerne. 1987. "An Evaluation of Utility of Different Implementation Paths for the Cadastral Layer in a Multipurpose LIS Context." Unpublished manuscript.

Dowson, E., and V.L.O. Sheppard. 1956. Land Registration. London: Her Majesty's Stationery Office.

Epstein, Earl, and T. Duchesneau. 1984. "The Use and Value of a Geodetic Reference Framework." FGCC Report. Washington, D.C.

Falloux, François. 1987. "Land Management, Titling and Tenancy." Paper presented at the World Bank Agricultural Sector Symposium, January 8-9, 1987.

Feder, Gershon, Tongroj Onchan, Yongyuth Chalamwong, and Cira Hongladarom. 1988. Land Policies and Farm Productivity in Thailand. Baltimore: Johns Hopkins University Press.

Fortescue-Brickdale, C. 1913. Methods of Land Transfer. London: Stevens and Sons.

Fortmann, Louise. 1990. "Locality and Custom: Non-aboriginal Claims to Customary Usufructuary Rights as a Source of Rural Protest." Journal of Rural Studies 6: 195-208.

Furmston, B.E. 1986. "Land Registration in Developing Countries: Technical Issues and Options." Proceedings of a Symposium on Land Registration, Tenure Reform and Land Information Systems, St. Lucia, pp. 12-21.

Furmston, B.E., and I.T. Logan. 1987. "Land Information Systems in Developing Countries." Survey Review, vol. 29, no. 225, pp. 131-141.

Goldstein, Bernice. 1974. "Intercountry Evaluation of Cadastral Programs: Costa Rica, Guatemala, Nicaragua, Panama." Program Evaluation Studies. Washington, D.C.: Bureau for Latin America, Agency for International Development.

Gonzalez G., J.S. 1975. "Modern Cadastre in a Developing Country." Proceedings of a Conference on Modernization of Land Data Systems (MOLDS), pp. 371-390.

Holstein, Lynn. 1985. "Land Registration for Less Developed Countries--A Checklist." Paper presented at a Symposium on the Management and Development of Natural Resources, Kuala Lumpur, Malasia.

_____. 1987. "Considerations for Land Registration Improvement for Less Developed Countries." Survey Review, vol. 29, no. 223, pp. 19-27.

Inter-American Development Bank. 1986. "Jamaica Land Titling Project Feasibility Report." Washington, D.C.

Kanel, Don. 1971. "Land Tenure Reform as a Policy Issue in the Modernization of Traditional Societies." In Land Reform in Latin America: Issues and Cases, edited by Peter Dorner, pp. 23-35. Land Economics Monograph Series, no. 3. Madison: Published by Land Economics for the Land Tenure Center at the University of Wisconsin.

_____. 1974. "Property and Economic Power as Issues in Institutional Economics." Journal of Economic Issues 8: 827-840.

King, Russel. 1977. Land Reform: A World Survey. Boulder, Colo.: Westview Press.

LTC (Land Tenure Center). 1986 "Republic of Panama: Agrarian Land Titling." Report for USAID/Panama and the Ministry of Agrarian Development. Edited by Joseph R. Thome. Panama City.

_____. 1988. "Land Registration, Tenure Security, and Agricultural Development in St. Lucia: A Research Report." 5 vols. Typescript. Madison: Land Tenure Center, University of Wisconsin.

_____. 1989. "A Study of the Land Tenure System in St. Vincent and the Grenadines." Typescript. Madison: University of Wisconsin.

Larsson, G. 1971. "Land Registration in Developing Countries." World Cartography.

Lemel, Harold W. 1985. "Land Titling: Conceptual, Empirical and Policy Issues." Madison: Land Tenure Center, University of Wisconsin.

_____. 1989. "Land Use Intensity and Investment as Related to Title Security: Evidence from the LRTP Baseline Survey". Typescript. Madison, Wis. Paper prepared for presentation to Latin American Studies Association Congress, San Juan, Puerto Rico, 21-23 September 1989.

Lewis, J. 1980. "Evaluation of Land Registration in Antigua." Report to BDD/DOS. Mimeographed.

Luzar, J. 1987. "The Economics of Precision: A Learning Theory Approach." Proceedings of an ILI Symposium on the Economics of Land Information, ACSM-ASPRS Convention, Baltimore, Maryland, pp. 71-78.

Martínez, Juan Ramón. 1990. "Justícia a los indígenas." La Tribuna, 19 March, p. 5.

Nesman, Edgar G., and Seligson, Mitchell A. 1988. "Land Titling in Honduras: An Impact Study in the Santa Bárbara Region." Typescript. Madison: Land Tenure Center, University of Wisconsin.

Penn, R.J. 1961. "Public Interest in Private Property (Land)." Land Economics 37.

Ramón, Galo. 1990. "Indios, tierra y modernización: Cayambe 1950-1988." Typescript. Madison: Land Tenure Center, University of Wisconsin, and the Centro Andino de Acción Popular, Quito, Ecuador.

Raup, Philip M. 1967. "Land Reform and Agricultural Development." In Agricultural Development and Economic Growth, edited by Herman M. Southworth and Bruce F. Johnston. Ithaca, N.Y.: Cornell University Press.

Rendon Cano, Julio. 1988. "Propiedad, tenencia y redistribución de tierras en la legislación de América Central y México." Estudio Legislativo (FAO/Rome), no. 39.

Rosnolt, J. 1986. "Cadastres in Latin America." Unpublished manuscript.

Roth, Michael, Richard Barrows, Michael Carter, and Don Kanel. 1989. "Land Ownership and Farm Investment:Comment." American Journal of Agricultural Economics 71: 211-214.

Salas Marrero, Oscar A. n.d. "Los registros jurídicos de bienes en el derecho nacional de Costa Rica y en el derecho internacional." In Principios y Desarrollo Legislativo de los Registros Jurídicos de Bienes, by Ilustre Colegio Nacional de Registradores de la Propiedad y Mercantiles. Madrid, Spain.

_____. 1984. "The Land Registry of Mexico: A Functional Evaluation." Arizona Journal of International and Comparative Law. 57-89.

Salas Marrero, Oscar A., F. Knight, and C. Saenz. 1970. "Land Titling in Costa Rica: A Legal and Economic Survey." Mimeograph. San José: USAIS, with the Law School, University of Costa Rica.

Salas Marrero, Oscar A., and Rodrigo Barahona Israel. 1973. Derecho Agrario. San José: Publicaciones de la Universidad de Costa Rica.

Sazama, G.W., and Davis, H. 1973. "Land Taxation and Land Reform." Economic Development and Cultural Change 27.

Schweigert, Thomas. 1989. "Land Tenure Issues in Agricultural Development Projects in Latin America." LTC Paper, no. 132. Madison: Land Tenure Center, University of Wisconsin.

Scott, Anthony. 1983. "Property Rights and Property Wrongs." Canadian Journal of Economics 16: 555-573.

Seligson, Mitchell A. 1982. "Agrarian Reform in Costa Rica: The Impact of the Title Security Program." Inter-American Economic Affairs 35: 31-56.

_____. 1984. "Land Tenure Security, Minifundization and Agrarian Development in Ecuador: A Preliminary Assessment." Mimeograph. Tuscon: Department of Political Science, University of Arizona. Report to AID/Ecuador.

Seligson, Mitchell A., and Nesman, Edgar G. 1989. "Land Titling in Honduras: An Impact Study in the Comayagua Region." Mimeograph. Madison: Land Tenure Center, University of Wisconsin.

Simpson, S.R. 1976. Land Law and Registration. Cambridge: Cambridge University Press.

Stanfield, David. 1989. "Land Registration and Security of Land Ownership in St. Lucia." Typescript. Madison, Wis. Prepared for presentation to Latin American Studies Association Congress, San Juan, Puerto Rico, 21-23 September 1989.

Stanfield, David, Ricardo Zeledón, Santiago Moquete, Alex Coles, Mario Fandiño, Lily Caballero, and Randy Stringer. 1986. "Land Titling in Honduras: A Midpoint Evaluation of the Small Farmer Titling Project in Honduras, Project no. 522-0173." Typescript. Madison: Land Tenure Center, University of Wisconsin.

Stanfield, David, Norman Singer, and Huntley Manhurtz. 1987. "Government of Jamaica Land Titling Project." Draft. Report prepared for the Ministry of Agriculture, Kingston, Jamaica.

Stanfield, David, Mitchell Seligson, Edgar Nesman, and Alexander Coles. 1990. "The Honduras Land Titling and Registration Experience." Madison: Land Tenure Center, University of Wisconsin. Research reported in this paper funded by AID Mission in Honduras and by AID's LAC/DR/RD office in Washington.

Thome, Joseph R. 1971. "Improving Land Tenure Security." In Land Reform in Latin America: Issues and Cases, edited by Peter Dorner, pp. 229-240. Land Economics Monograph Series, no. 3. Madison: Published by Land Economics for the Land Tenure Center at the University of Wisconsin.

United Nations. Economic and Social Council. 1973. Report of the Meeting of the Ad Hoc Group of Experts on Cadastral Surveying and Mapping.

Seventh U.N. Regional Cartographic Conference for Asia and the Far East, Tokyo.

Villamizar, Fernando. 1984. "Inter-American Financing of Rural Land Titling Programs." In Proceedings of the International Workshop on Land Tenure Administration, Salvador, Brazil, August 20-24, 1984, vol. 1, pp. 253-270. Brazilia: National Institute for Land Settlement and Agrarian Reform (INCRA).

West, H.W. 1971. "Land Registration: Some Current Policies and Problems." Land and Water Economic Policies, no. 1. New York: Agricultural Development Council.

WLRC (Wisconsin Land Records Committee). 1986. Final Report of the Wisconsin Land Records Subcommittee on Benefits and Standards. Vol. 2. Madison: WLRC.

World Commission on Environment and Development. 1987. Our Common Future. Oxford: Oxford University Press.

Wunderlich, G. 1979. "Landownership: A Status of Facts". Natural Resources Journal 19: 97-118.

Wunderlich, G., and D.D. Moyer. 1984. "Economic Features of LIS." In Seminar on the Multipurpose Cadastre: Modernization of Land Records in North America, pp. 183-202. Madison: Institute for Environmental Studies, University of Wisconsin.