Land tenure and customary rights: Implications to forest conservation and the indigenous community of San Antonio (Cayo) Belize

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Land Tenure and Customary Rights:
Implications to Forest Conservation and the Indigenous Community
of San Antonio (Cayo), Belize

by

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This thesis focuses on the role of land tenure in the conflict between national forest resource conservation and agricultural expansion near the Masewal Maya community of San Antonio (Cayo) in Belize. The work explores the indigenous customary agrarian system used by the Masewal and details the gradual conversion of communal lands to state-owned lands under British colonial rule. In San Antonio, agricultural lands have been distributed to villagers through a set of state leasehold arrangements while forest reserve lands have been withheld as state property, allowing only minor resource extraction rights to local villagers. Recent attempts by villagers to develop agricultural clearings within the state forest reserves raise the question as to whether current land tenure relationships near San Antonio adequately encourage agricultural intensification on cleared farmland and whether they can continue to support the cultural autonomy of the Masewal people.

Using personal observations, ethnographic interviews and a social survey to document how British colonial practices mimicked traditional Mayan land customs, this study concludes that state leasehold arrangements under Belizean law have supported the retention of customary Masewal cultural traditions but have hindered agricultural intensification and encouraged continued deforestation.

Movement away from shifting cultivation towards agricultural intensification may require irrigation and tenure changes which will weaken the cultural practices of the Masewal in San Antonio by emphasizing increased national government participation in local land management and the development of a land market. Under current practices, prospects for forest conservation are not good. Successful forest conservation will require greater internal governmental cohesion and expanded coordination with the village. Co-management of natural resources and agroforestry are discussed as alternatives to expensive irrigation systems as a potential means of agricultural intensification.
Preface

I first heard of the conflict between property rights and environmental protection in buffer zones near protected areas one evening in 1991 in Libby, Montana. I was arguing before a hostile crowd of 500 loggers and their families for support of an agreement that had been reached between millworker representatives and environmentalists over wilderness area protection in northwestern Montana. A logger rose following one of my comments and told the crowd that wilderness protection was just the first step in a preservation program. What the embattled community should expect next was "buffer zone management" which would impose stringent environmental restrictions on adjacent lands, undermining private property rights and local rights to access federal forested lands.

In the spring of 1993 I visited an old friend, Paula Palmer, a sociologist, author and conservation activist in Costa Rica. She suggested I look into a course offered by the United Nations University for Peace, located at Colon, Costa Rica, in Buffer Zone Management. In June of 1994, prior to making the study in Belize on which this thesis is based, I enrolled in the course as the first non-aligned student (neither tied to a government nor to an NGO) in the course's five year history. The course began with a frank admission that forest degradation was an on-going historical fact in Central America and then suggested that, by designating buffer zone areas of varying intensities of human activity around core habitat areas of protected forests, policies for community
development programs could be designed that combine planned restoration activity with community-driven and environmentally sensitive economic development. We visited sites in Costa Rica where farmers and local groups had accepted the responsibility for environmental protection through small business development using agroforestry, intercropping, ecotourism, and forestry cooperatives.

From Costa Rica, I traveled overland to Guatemala where I observed several examples of agroforestry programs that had been initiated in the Petén region adjacent to Belize in recent years. I then moved on to the Masewal Mayan village of San Antonio in the Cayo District of Belize to work with the Ministry of Economic Development in researching and writing a community needs assessment for the village (Clark 1994). I found the work through the efforts of two of my advisors who were working in the University of Montana-University College of Belize forestry and ecotourism exchange and I worked in Belize under the able guidance of Dr. Marion Glaser.

My research was requested by the Social Planning Component of the Forest Planning and Management Project (FPMP) because satellite images and aerial photographs showed agricultural incursions into the hardwood forests of the Mountain Pine Ridge Forest Reserve (MPRFR).¹ In spite of previous evictions by the Forest Department in 1984,

¹ This study resulted when modern satellite photography indicated the possible need to limit expansion by the local indigenous population into a state forest reserve. An interesting contrary use of modern satellite technology is presented by Fox (1994) who used a Ground Positioning System to map customary lands of indigenous groups in Kalimantan, Indonesia, to protect customary lands from incursions from timber companies with forest concession contracts.
1987, and 1991\(^2\) (FPMP 1993), San Antonio residents were continuing to try to colonize new land for agriculture within the forest reserve. This was the fifth such community study by the Ministry of Economic Development under the FPMP\(^3\) and, like the others, it was aimed at seeking means to resolve local-state boundary disputes and to incorporate village conceptions of the community problems in development policies and programs. In San Antonio the Forest Department was specifically interested in identifying and diffusing social pressures that were pushing local cultivators into state-owned forest reserve lands.

I would like to thank the many Belizeans who helped me with my two month long project work in San Antonio. Marion Glaser provided me with timely critiques of my fieldwork and led me to many valuable documents and key pieces of literature. Ricardo Thompson of Central Farm responded promptly to all inquiries and his information was of great help in understanding how lease arrangements work in Belize. Manuel Balona, Eduvijes Tzib, and Remijio Tzib of the Peanut and Grain Cooperative took the time to explain how the cooperative worked in detail, let me sit in on their meetings, and took me to see their cultivated lands. I deeply appreciated the insights of all those San Antonio residents that shared their ideas with me. I am particularly indebted to my good friend don Felix Tzib and his family who provided lodging and indulged my presence while in their village. Thanks also to Abraham Balona whose assistance in my village survey was

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\(^2\) See Appendix 2, Map 1.

\(^3\) Other communities include San Antonio (Toledo), St. Margarets, San Vincente, and communities in the Columbia Forest Management Area.
instrumental in its success.

I would also like to thank my thesis committee for their assistance, guidance, and perseverance in this project as well. Dr. Paul Miller showed me that humility and concern for the impoverished need not be eliminated in the search for scientific truth. I thank Dr. Steve Siebert for making the connections in Belize that led to my study there. His work in non-timber forest products showed me that solutions to development problems may lie in unchartered paths if we are only willing to look beyond current practices for those solutions. Particularly, I wish to thank Dr. Jill Belsky for her inspiration and assistance in pursuing a career in international development. She has opened my mind to a world of current literature both domestically and internationally on the need to combine social development work with environmental science. I could never repay her for her efforts in helping me receive funding for my project and for my education.

I send my appreciation to the University of Montana for transportation assistance.

I extend my gratitude to Emily Parrot and Donetta Klein for their generosity and support which made it possible for me to attend the University of Montana. Good friends, after all, are required to make things possible. Finally, I wish to extend my heart-filled thanks to my wife, Michele Nuss, who supported me during my months of absence in school and in Belize and with whom I have shared the trials and tribulations of a "non-traditional" student trying to achieve a mid-life redirection of his life's course. I am grateful to you all.
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Land Tenure and Customary Rights: Implications to Forest Conservation
and the Indigenous Community of San Antonio (Cayo), Belize

by Charles Clark

Chapter 1  Introduction

The Historical Context

Deforestation and the shrinkage of tropical forest habitat in Central America has led to widespread fears that significant biodiversity losses may occur in coming years if the process of forest conversion to areas of concentrated human use is not arrested. Between 1974 and 1989, the forest coverage per capita in Central America, including the country of Belize, fell 48 percent (Aguirre 1993), highlighting both the area's nearly three percent per year population growth and its increasing demand for forested land for commercial products and for agricultural purposes. Six sources of deforestation have been identified as contributing to the decline of tropical forests in the region (de Camino V. 1993:8):

1) The demand for land for cattle pastures and subsistence farming and the migration of farmers to forested areas because of loss of soil productivity;

2) The lack of sustained yield management of commercial forests;

3) The construction of logging roads into previously unroaded forest habitat;

4) Agricultural production for export markets which more than doubled the land under cultivation between 1950 and 1970;
5) Firewood collection and loss of forested land to urbanization;

6) War, land reform, and international structural adjustment programs.

Central to the effort to conserve forested habitat are these two questions: (1) can deforestation be slowed by increasing the agricultural productivity of small landholders and (2) how can effective changes in production be encouraged by changes in social institutions such as land tenure, community cooperatives, and joint local and national participation in development programs?

In spite of a growing acknowledgment on the part of social agencies and NGOs that local community and cultural concerns need to be integrated into development and forest conservation programs along with national economic and environmental goals, few examples of successful local-national integration exist (Wells 1994). The need remains to create social programs that incorporate the judgment of national administrators such as the Belizean Forestry Department and the desires, both economic and cultural, of local communities, particularly indigenous ones. The foundation for resolving natural resource conflicts through a solid working relationship between a professional forestry staff and an generally undereducated but self-reliant indigenous agricultural community lies in understanding the roots of the indigenous culture itself and the historical development of its relationship to state authority. Land tenure provides an excellent means for judging the historical development of a conflict because its modern form often represents a series of compromises between indigenous customs and national authority and its current functioning is deeply tied to other social institutions which reflect the diversity of national
socio-economic goals. Land tenure institutions often provide a basis for community bonds, establish lines of interaction between small farmers and their government, and hold material significance both to small farm and national productivity.

Lack of long-term security of land tenure is widely believed to be at the heart of the forest conversion process. This axiom applies to state forest managers investing in inventories and planning mechanisms for sustainable harvest from state forest reserves, for timber concessionaires required to reforest harvested land, for agricultural workers investing in intensification technology, and for communities seeking ways to include firewood supplies and open-space in future plans. Without an enforceable and stable land ownership system, landowners and producers lack the security needed to undertake investment in conservation measures when costs can be recouped only slowly through time. Knowledge of, access to, and respect for the particular land tenure system in effect is essential if the various parties seeking to use land are to concur on appropriate conservation measures to protect forest habitat while increasing farmer productivity.

This thesis examines how the land tenure system and associated property rights assignments in Belize affect land use conflicts and decisions in the Masewal Mayan village of San Antonio (Cayo) in Belize. Land ownership patterns around this agricultural village are dominated by national lands which were appropriated as "Crown land" in 1872 by British colonial administrators (Moberg 1992). The diverse state landholdings near San Antonio include a sustained yield forest reserve, national lands of unprotected status still open for colonization, and state leasehold lands leased to village members for agricultural
purposes. Intermixed among the state leasehold lands are private holdings that have been converted by lessees from leasehold to privately-owned parcels.

Figure 1  LAND TENURE IN BELIZE

National (3.6%)
Leased (0.1%)
(23.5%)

Leased National Lands
(approx.)
600,400 acres

Forest Reserves
(approx.)
1,427,240 acres

Private Lands
1,912,900 acres

TOTAL AREA = 5,674,900 acres

Source: King et al. 1993
It is my contention that British colonial land policies and the post-colonial transitional government lease arrangements implemented in the 1960s upheld traditional Mayan cultivation rights and protected the village from outside land speculation. This permitted villagers to retain their traditional cultural patterns in spite of the gradual development of industrialized agriculture, the penetration of a cash economy and national social integration. However, acceptance by the village of the principles of privatization of land which underlies the national leasing policy contradicts customary Masewal practices of periodic village land redistributions. This has created the seeds of village differentiation which along with population growth lie at the root of the desire by some villagers to expand agricultural holdings into the nearby forest reserve. Past policies that promoted village unity now threaten it by introducing artificial land scarcities and community conflicts over differential access to increasingly scarce non-timber forest products such as firewood and posts. Village attempts to organize a modern farm cooperative as a means to acquire additional lands within the Mountain Pine Ridge Forest Reserve above San Antonio are not likely to provide solutions to land scarcity or distributional problems.

The Relevancy of San Antonio as a Case History

San Antonio is a relevant case study regarding of the role of land tenure in agricultural intensification and forest conservation for the following reasons. First, the village land holdings are predominantly leasehold arrangements of state-owned "Crown
lands" with virtually no penetration of a land market. Lease arrangements have not been widely discussed in the literature.\(^1\) How the leasehold tenure institution affects land use decisions and investment in intensification technology is important for policy makers. Second, San Antonio is an indigenous community with a history of shifting cultivation and low-level animal husbandry. However, some small farmers use mechanical cultivation, chemical inputs, and sell peanuts on the global market (Tzul 1993). As such, it provides an excellent place to study the evolution and co-existence of different agrarian systems and to analyze the agricultural intensification process as it relates to customary cultivation rights, indigenous agrarian systems, and induced potential social stratification. Third, because the village of San Antonio borders the Mountain Pine Ridge Forest Reserve established in 1944 for commercial timber management, an analysis of the consequence of the limiting access to forest resources on an indigenous community facing land scarcity and a growing population has particular relevance to other areas of Central America. Fourth, the level of non-agricultural employment, cash economy penetration, and stratification within the peasant\(^2\) economy of San Antonio have particular importance to both the degree and forms of agricultural intensification existing today and those which

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\(^2\) The word peasant is used in the literature to refer to small landowning farmers and landless members of the rural proletariat who spring from farming and indigenous cultures (Blaikie 1985; Chambers 1988). In many Latin American countries the work campesino refers to the same class of rural workers. The use of a small rural community in Belize as the case study for this paper complicates the terminology as the English word farmer is commonly used to describe rural workers and small farm owners in Belize. The three terms, peasant, campesino, and small farmer are used interchangeably in this paper with a distinction being made between propertied and landless farmers where necessary.
will be adopted in the future. Fifth, by studying the historical context of property rights, market penetration, and the relationships between the community and wider institutions, specific policy objectives and problems can be identified as they relate to agricultural intensification, customary rights, and access to and conservation of forest products and habitat.

From this study of conditions in San Antonio (Cayo), Belize, I conclude that the state leasehold tenurial system has provided the security needed for agricultural intensification investment and has served to protect the cultural integrity of San Antonio Masewal Maya community. The leasehold arrangement suffers from the contradictory nature of supporting integrative customary cultivation rights while promoting the privatization of natural resources which creates internal differentiation and increasing land scarcity. The leasehold security has not been sufficient to promote public investments needed to expand the profitability of agricultural production but has tended to encourage forest conversion to pasture land. Community acceptance of the privatization of land (including the de facto recognition of private property rights within leasehold arrangements) and the structure of usufruct rights in Belize promotes a situation where farmland is left idle even in the face of agricultural land scarcity, encouraging individuals and the San Antonio farm cooperative to seek new farmland within the Mountain Pine Ridge Forest Reserve. Prospects for protecting the hardwood forests in the MPRFR from colonization by the villagers are slim unless a means is found to either develop irrigation in support of dry season intensification projects or to introduce agroforestry and dryland intercropping.
Thesis Organization

This thesis concentrates on the ties between land tenure and agricultural intensification, the process of agricultural development whereby changes in the relations of cultivation (either in productive or social relations) or the adoption of new knowledge or methods of technology serve to increase product output per hectare per period of time. I have restricted the discussion of land tenure to agricultural intensification because both villagers and the Ministries of the Belizean national government see agricultural intensification as a means for local community development in San Antonio. In that spirit, after a discussion of methodology in Chapter 2, I introduce the case history through a review the evolution of land tenure near San Antonio in Chapter 3. Following that, I present the literature review of land tenure in Chapter 4, drawing analogies to the case history and my study when appropriate. Chapter 5 concentrates on agricultural intensification and the household, public, and governmental decisions that go into agricultural investments and risk-taking, also with analogies to San Antonio. I devote Chapter 6 to the specific tenure-related problems related to irrigation which would be needed for most of the proposals for agricultural intensification I heard discussed while in the village.

Finally, I conclude with an assessment of the potential for using agricultural intensification as a tool for forest conservation on lands near San Antonio. Here I raise the use of alternate forms of agricultural intensification such as agroforestry, intercropping, and cover crops. My musings end on the separation between the Ministry
of Agriculture and the Forest Department in the Ministry of Natural Resources and their historical inability to develop an integrated program for agricultural communities such as San Antonio. Perhaps this is the biggest obstacle facing development in the area. The responsibilities for deforestation pressure on the forests near San Antonio go well beyond the village itself. People on many levels will have to consult their mirrors when assessing blame for current problems in the village. What is so encouraging about Belize and San Antonio, however, is the spirit of national pride that ties the people together. This sense of common identity may serve as a basis for community and national government comanagement of natural resources in a way that can both enhance local economic conditions and preserve the valued forest resources in the Mountain Pine Ridge Forest Reserve.
Chapter 2 Study Methodology Used in San Antonio

The study\(^\text{3}\) for this thesis was accomplished by means of a multiplicity of methods to develop a description of the social processes in San Antonio. Methods employed included a review of the literature, interviews with government personnel, ethnographic interviews with village residents, a census and survey of village households, two months of direct personal observation, a review of governmental documents pertaining to the Forest Planning and Management Project, and the development of computerized maps of the area near San Antonio (see Appendix 2). This attempt to establish a broad view of social processes in San Antonio by synthesizing the divergent perspectives of the various parties involved in village life proved necessary because of the high degree of conflict and low level of communication over the issues involved. These conflicts divided the village residents themselves, divided government ministries, and divided the national government from the Village Council. Because this thesis has been restricted to the role that land tenure plays in village issues, I do not discuss in great detail the conflicts that embroil the village and national government in political turmoil. Rest assured, my methodology is very much a product of those divisions.

The Literature Review

The review of the literature required extensive readings not only in land tenure and

\(^{3}\) My study lasted from July 3 - August 15, 1994. The survey portion of the study was conducted August 10-14, 1994.
property rights, but in associated fields of agricultural intensification, agroforestry, Belizean forest management and conservation, sustainable development, extractive reserves, Mayan cultivation practices and history, and the colonization and agricultural activities in the nearby Latin American countries of Mexico and Central America. Because of the extensive nature of the background literature used in this study, I have chosen to weave the literature and the story of San Antonio together through the chapters rather than separate the literature review into a chapter of its own. This should enable the reader to grasp the relevancy of various points to the situation of San Antonio without the need to reiterate the cited literature.

The Ethnographic Interviews and Observation

While in Belize, I met with the acting Forest Supervisor of the Mountain Pine Ridge Forest Reserve and with the members of the Forest Planning and Management Project representing both the Forestry Department in the Ministry of Natural Resources and the Social Planning Component of the Ministry of Economic Development. From these discussions and the wealth of forestry and community documents that had been developed for the FPMP, I developed a perspective on forest management practices within the MPRFR, particularly concerning plans for hardwood forest management in the area within the MPRFR under dispute with San Antonio residents.4 I discovered a lack of official communication between the Forest Department and the village itself. The Forest Department

4 I met with Ian Gray, acting Forest Officer of the Mountain Pine Ridge Forest Reserve, on three occasions to discuss Forest Department perspectives on topics ranging from hardwood forest management, refugee pressures on the MPRFR, fire history, hunting regulations, and agricultural incursions into the reserve which he had mapped using a Ground Positioning System.
Department had never held any public meetings within the village to discuss either their management plans for the MPRFR or the agricultural incursions by San Antonio farmers into the MPRFR.

With Dr. Marion Glaser, I visited with the Minister of Agriculture who set up a field trip with the Chief Extension Officer of the Central Farm, Belize's central agricultural research institute. We met the local agricultural extension agent in charge of the San Antonio area and joined members of the San Antonio Peanut and Grain Cooperative and the Village Chairman in a field trip to examine two potential water sources for a village water supply. We discussed the farmers' desires for irrigation and the potential of the two sources for irrigation using ram pumps. We also toured one of the PGC's clearings within the MPRFR that had been planted to peanuts and discussed soil erosion and Belizean soil conservation regulations that prohibit both mechanical agriculture on slopes greater than 12.5% and forest clearing within sixty-six feet of open water (Dickson 1983; Thompson 1994, personal communication).

I spent two months living in the village with the family of the Village Chairman, now retired from a career of service as a Forest Officer at the Mountain Pine Ridge Forest Reserve and at the Forestry Office in Mango Creek in southern Belize. On the one hand, the close relationship I developed with the Village Chairman was extremely beneficial to me as he spoke English and had an extensive forestry history that included years as a chicle tapper, a mahogany hunter, and as a crew boss and Forest Officer managing firefighting and work crews. His stories about past activities were invaluable in
developing an historical perspective of the Mountain Pine Ridge Forest Reserve and its management and relationship with the village. Following his retirement, he had begun working his farm in earnest once again and cattle ranching, and by working with him planting corn and repairing fences I developed a practical sense of customary agricultural practices of the Masewal Mayan villagers.

Living with the Village Chairman, however, had a mixed if not negative side. Religion, party politics, attitudes towards the Forest Department, extended family relationships, and non-farm employment were all factors that created distrust in the village and which hampered village participation in local socio-political issues. The Chairman was distinguished from the general population in that he was a Roman Catholic in a village in which some 80% of the population had converted to the Pentecostal religion, was a relatively large landowner, had an historical association with the Forest Department, and was allegedly connected to the People's Unity Party (which he denied). His own Vice-Chairman warned me about living with the Chairman for fear of affecting my survey. I must conclude that my closeness to the Chairman (and my willingness to drink an occasional beer at the local tavern in this largely non-drinking village) may have prevented some people from opening up to me on certain issues, particularly political and religious ones. I doubt if it seriously biased my work in the village.

In fact a sign that I developed trust through my work in the village came when the leader of the San Antonio Peanut and Grain Cooperative told government officials at a meeting that the PGC considered me a friend. I attended regular meetings of this local
agricultural cooperative during which the group would discuss matters in Spanish rather than Yucatec Mayan so that I could understand. At the end of each meeting they allowed time for me to ask questions and present ideas. I helped plant peanuts with one of the member's families, observed herbicide applications and plowing procedures, and toured the roads and fields that the Cooperative was making within the boundaries of the Mountain Pine Ridge Forest Reserve with one of the members. During the meetings I heard discussions concerning bookkeeping and internal organizational issues, credit options and loan strategies, and agricultural education on fertilizer and herbicide applications, intercropping and soil conservation. I also discussed the history of the agricultural openings within the MPRFR with several of the farmers in the Cooperative.

During the afternoons, when the heat of the day slowed the pace of life in the village, I would walk around the village and hold spontaneous interviews with individuals and then record the heart of the discussion later. In all, I collected 36 ethnographic surveys from 28 people. Information from some of these surveys is included in the thesis but for the most part, the information has served as background material which helped me establish a better comprehension of current farming practices and general village attitudes.

When water scarcity proved to be a central village issue, I met with the district's Water and Sewer Authority supervisor and he asked me to make a map of village lots to assist in planning a potential water system for the town (see Appendix 2, Map 3). I also developed maps on agricultural landholdings, MPRFR openings, and potential water sources. These maps are derived from various sources and were digitized later using
AtlasGIS software at the University of Montana. The Social Planning Component furnished me with a general map of western Belize on which I overlaid boundaries of the MPRFR from the Forest Department's maps. The Ministry of Natural Resources Lands and Survey Department provided maps of the village and of agricultural holdings near the village which I adapted to accommodate local knowledge of landowners and boundaries. The openings from the agricultural incursions was digitized from an aerial photograph from NARMAP (and thus are somewhat distorted) while the Peanut and Grain Cooperative proposed boundaries inside of the MPRFR come from Forest Department documents (FPMP 1994).

Besides biking the loop from the village to the PGC openings in the MPRFR, I also hiked the area extensively, walking the San Antonio and Cristo Rey roads to the village rural land boundaries, hiking the trail to the Macal River, and walking the agricultural feeder roads. I visited many of the ecotourist facilities that employed local workers, including the Maya Lodge, Bull Run, the Blancaneau Lodge, Caracol, Mountain Equestrian Trails, and the Garcia sisters' museum of Mayan artifacts and stone carvings.

I also held interviews with people outside of the area about San Antonio. I discussed San Antonio with two Forest Conservation Officers, learning first hand about wildlife issues, conservation education, and refugee and development pressures on the area's wildlife habitat. This was particularly useful in assessing the social processes near San Antonio that reflected interactions between villagers and nearby Seven Miles, a rapidly growing refugee settlement.
The Village Sample Survey

I conducted a census/survey of the village and surrounding rural households. The results from that survey are summarized in Table 1 and detailed in Appendices 3-5. Because of unfortunate complications and particular village data needs, what was planned to be a random survey became a house to house sampling as 201 of 207 households were contacted during the survey. Many difficulties and irregularities (as described below) occurred during the survey which cast doubt on the validity of the data to be generalized to the whole population using statistics. Results are, therefore, at best descriptive and they are shown with valid N given for each question and percentages being the # of responses received divided by the valid N for that question.

Timing was the greatest problem with the survey. When I arrived in Belize, I agreed to wait to put together the survey until Dr. Glaser returned from Europe. However, personal reasons delayed her return until the my last ten days in the village. There was no time to pre-test the survey and I settled on adjusting it following each of the first two days of interviews. Because I delayed so late in writing the survey, I was unable to do the survey myself and had to hire three villagers to help with the interviews at the last moment. They were not properly trained and only one of them met regularly with me over the four days it took to complete the survey and tried consciously to adopt scientific procedures. Between he and I, we surveyed about 70% of the village households. The Village Chairman insisted on surveying a portion of the village, but he consistently failed to ask the open ended questions on village problems and fallow cycles, though he asked
most agricultural questions on landholdings and cultivation. The final person, who had done the village census for the government just four years before, failed to ask any agricultural questions and often skipped questions. His section of the village, about 15% of the village, has irregular and suspect results.

The house by house census, rather than the planned random survey, was conducted for two important reasons that arose during my research. First, the Water and Sewage Authority (WASA) had plans for a water system for the village based upon a population figure of 1000 people - well below the 1164 village residents of the 1990 Census figures (Belizean National Census 1991). WASA estimated the need for a holding capacity of twenty gallons per person per day (Andrews 1994). It seemed quite likely that the population was increasing and that the WASA estimate was too low for an adequate design of a village water system. Secondly, a major conflict within the village was occurring over the fact that village did not have adequate house lots for younger village members needing them. When the Village Chairman mentioned that nearly one hundred new house lots were needed, I was skeptical as only 207 households exist in the whole San Antonio area, including village-born residents living along the San Antonio and Cristo Rey Roads. My survey found a slowly declining population (down to 1126 by 1994) that was blamed by residents on out-migration due to the hardship from the lack of water, because educated younger people were leaving to seek better paying employment, on the lure of drugs and rock and roll, and on "too much religion" in the village itself. From the survey, we found the village might need as many as 209 house lots in the next ten years to
accommodate household growth and younger families, though this figure that would double the size of San Antonio seemed to be based on village desires that out-migration stop, an improbable factor. Some obvious over-reporting of lot needs was identified as some households apparently hoped that by reporting greater need they might access a greater number of lots in the future.

Figures from my study are interspersed in the following chapters to make certain points in the literature review clearer to the case history of San Antonio (Cayo). It is my honest belief that, in spite of study irregularities and lack of statistical correlation, the study results indicate clear trends concerning property relationships and agricultural practices in the area. These trends are the subject of this thesis.
Chapter 3 Land Tenure and Property Rights Development in San Antonio:

The Case for Customary Cultivation Rights

Masewal Settlement in San Antonio Village

The Masewal residents of San Antonio are descendants from a portion of some 5000 immigrants who moved south from the Yucatán in the latter half of the 1800s. They moved to escape the Caste Wars of Yucatán and its aftermath which reduced the indigenous population in the Yucatán by 75% due to war, sickness and impoverishment (Reed 1964). The San Antonio ancestors came by foot and established settlements along the creeks in the pine and hardwood forests above the what is now the village of San Antonio village in the western uplands of Belize in the late 1860s or early 1870s, about the time that British colonial administrators declared non-registered private lands in Belize as Crown lands. The Masewal farmed and pastured their cattle until the turn of the century when a strange disease forced the abandonment of the villages. The families moved to the current site of San Antonio located on the rolling flatlands below what is now the Mountain Pine Ridge Forest Reserve, Belize's oldest sustained yield forest timber reserve (Tzul 1993).

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\[ An 1861 Census of Belize estimated that 38% of the Belizian population was Mayan Indians from Mexico, primarily the Yucatán. The British declared Belize a British colony in 1862 (Bolland 1986). In 1872 the colonial administration passed the Crown Lands Ordinance which declared forested land to be the property of the government (Moberg 1992) and which may have established the first Mayan reserves (Bolland 1986). This is contradicted by Glaser and Marcus (1994) who state that the Indigenous Reservation system began in the 1930s. \]
Figure 2 REGIONAL MAP

Belize Location Map

1 Mountain Pine Ridge
2 Maya Mountains

SAN ANTONIO VILLAGE
CAYO DISTRICT

Source: Bradt and Rachowiecki (1982)
I purposefully use the term *Masewal* for the people of San Antonio for several reasons. First and foremost is the fact that the people of the village call themselves Masewal (*Masehual* or *Masahual* in Spanish) and not Maya, though they are not adverse to the term Maya as a generic term for indigenous people in the wider international region. According to Masewal verbal tradition, the Masewal words *"ma yan"* which signify "There is none," was the response that Masewal chieftains gave to the first Spanish colonialists when they entered villages and demanded gold and silver (Tzul 1993). Through the process of social construction, the honest response to European greed was turned into the name now characteristically used to include native peoples between Honduras and Chiapas, Mexico. Today, San Antonio residents remain one of just two Belizean villages to retain Masewal (Yucatec Maya) as the common village language (F. Tzib, personal communication), though church services and meetings are often held in Spanish and the public schools are taught only in the national language of English. By emphasizing the self-identity of the Masewal in San Antonio, I am emphasizing the ties the community maintains to traditional customs and customary property rights relationships that existed until very recently among the villagers.

The Evolution of Customary Cultivation Rights in San Antonio

Land tenure and property rights in Belize may be understood in terms of the steadily evolving conception of tenure through years of modern international development programs. Early post-World War II Central American development projects defined *land*...
tenure along straightforward ownership terms as "the legal or customary system under which land is owned" (United Nations 1951:4). This simplistic definition of land tenure proved unworkable because land tenure is inextricably linked to other institutions (Plumwood and Routley 1982). The land ownership expectations of impoverished peasants facing inequitable systems of land ownership distribution encouraged confrontations between small farmers and state authorities throughout this century. This struggle has complicated land reform efforts and led to the notion that land ownership involves social relationships well beyond the simple titling of land (Barraclough 1973; de Janvry et al. 1989). The existence of customary rights among indigenous groups who viewed land as common property also led to conflicts between the colonial and developmental goal of improving small farmer household security through land titling and indigenous desires for the preservation of cultural traditions. In the poor agricultural indigenous community of San Antonio, an evolution of land tenure has occurred along with the gradual expansion of agricultural landholdings resulting in the slow growth of national government presence in property rights management.

Many Mayan groups retain ancient cultural traditions of collectively farming community-held village lands or they farm nearby lands using variations of village-regulated shifting or swidden cultivation. In the pre-Colonial absence of a money

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1 *Shifting cultivation* or *swidden cultivation* is the rotation of area plots from a base of a stable community, a base that moved from time to time as land productivity and forest products declined. This form of agriculture, common to tropical climates world-wide, is in contrast to *permanent or fixed-field cultivation*. For a description of shifting cultivation, see H.C. Conklin's 1957 "Hanunoo Agriculture," FAO. Conklin divided shifting cultivation into periods involving removal of old vegetation and control of new vegetation through the five general processes of site selection, cutting, burning, cropping and fallowing (from Carter 1969).
economy, neither practice recognized privatized ownership over cultivated lands. Instead, cultivation rights were obtained through birth and marriage into tribal membership and through *usufruct rights*, rights established through continued use of the land held by the village as common property. Among the Masewal Maya of the Yucatán Peninsula in Mexico, village elders redistributed land in and near the village periodically among village households while more distant lands were free to the open access of anyone willing to make a go of it in the wilds (Redfield 1941; Reed 1964; Culbert 1973). Village membership remained central in cultivation rights, for even if a family chose to leave the village for a period of time, they could be assured of obtaining land and a place to farm and settle upon their return. Young families were also guaranteed agricultural land to farm. As long as land was plentiful and indigenous populations low, conflicts over land and forest resources could be settled by the local administration of councils of elders. This *indigenous agrarian system* of cultivating commonly-held land in combination with and derived from cultural social traditions, I call *customary cultivation rights* which have appeared in aboriginal groups throughout the world and throughout Central America (cf. Reed 1964; Boserup 1965; Wolf 1966; Little and Brokensha 1987; Watts 1987; Clay 1988; Feeny et al. 1990; Bromley 1991).

The colonization of Central America, primarily by the Spaniards but inclusive of British occupation of Belize, introduced many European feudal and early capitalist social and productive relations into the customary farming livelihoods of native indigenous groups such as *fajina* (six days of conscription each year for public works infrastructure
development), taxation to support colonial administration, money, crop production for export markets, and the privatization of agricultural land. These changes had the effect of undermining village elder leadership and authority as colonial administrators dismissed traditional indigenous agricultural systems based on shifting cultivation in favor of plantation and annual cropping near areas of colonial population centers. Colonial emphasis on market crops, whether agricultural or forest products, neglected infrastructure investment for improved subsistence farming and domestic production and under Spanish rule concentrated the best lands in the hands of a few colonial owners (Baker 1984; Jones 1990; de Janvry et al. 1989). In contrast to this, the British colonial administration in Belize concentrated land ownership in the hands of the state through the establishment of "Crown" lands in 1872 as a means to monopolize rights on mahogany exports and logwood (for dies) extraction. As long as British exclusive rights to timber were respected, indigenous groups like the Masewal of San Antonio were permitted to make settlements and graze cattle at will. The San Antonio ancestors pursued an indigenous agrarian system that combined cattle husbandry on the wildfire-generated grasses growing beneath the pine forests of the Mayan Mountains with long-fallow

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8 Under Belizean law, the Crown Land Ordinance of 1872 was amended to recognize private land claims established prior to 1879 (Dickson 1983). While most land was reserved for the colonial administration, private lands where heavily concentrated in the hands of a few British corporate owners (Bolland 1986). The Masewal settled in areas very near the current sites of agricultural incursions in the Mountain Pine Ridge Forest Reserve in the late 1860s or early 1870s. I will leave it to others to judge who established primary rights to the land above San Antonio, the Masewal whose ancestors built the extensive raised cultivation beds in the Mayan Mountain uplands of Belize and in the Yucatán or the white British colonialists. The Forest Department was established in 1922 (Bolland 1986), while the Mountain Pine Ridge Forest Reserve, the first sustained-yield managed Forest Reserve in Belize, was not established until 1944 (Revista Forestal Centroamericana 1994).
shifting cultivation on more fertile lands cleared and burnt from hardwood forests along the Little Vaqueros and Privassion Creeks (Tzul 1993).

This indigenous agrarian system, still used by the Masewal in San Antonio, Belize, was a local adaptation to the system of shifting cultivation found in place in the Yucatán by early Spanish colonialists (Reed 1964). The system involved a cycle of clearing and burning followed by two or three years of cultivation of maize, beans, coco yams and squash and then a regenerative long-fallow period up to twenty years of length that permitted forest regeneration. During the cultivation period, the humid climate of Belize permitted the intensified method of double cropping during the eight or nine month wet season, followed by the dry months from February to May conducive to the slash and burning of new land.\(^9\) In addition to restoring soil fertility, long fallow periods allowed for post and pole regeneration which were used for home construction (lumbered homes were unknown until after hurricane Hattie destroyed San Antonio in 1961) and for fence posts. Cohune palms, used for roof thatch, are fire resistant and were left standing in agricultural fields.

Shifting cultivation as was practiced by early San Antonio residents was vilified as inefficient and wasteful by colonial administrators, as well as by development program administrators through the late 1970s. These administrators blamed the need to shift plots on rapid losses of soil fertility from soil erosion rather than recognizing the inherent limitations of tropical soils. A growing body of scientific evidence, however, indicates

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\(^9\) Carter (1969) found a similar cropping pattern among Kekchi migrants near Lake Isabel in the southern tropical lowlands of Guatemala, not far from the southern tip of Belize.
that shifting cultivation is a rational agricultural response to tropical conditions (Kellman and Adams 1970; Lambert and Arnason 1980; Arnason et. al. 1982; Clay 1988; Ong 1991). Arnason's research in nearby Succotz indicates that soil fertility can be maintained through short cultivation periods followed by fallow periods of 17 years duration, though longer periods of fallow are needed to restore lands that have been continuously cropped for many years. Ong reports that erosion from shifting cultivation is of short duration and not particularly damaging to soil nutrients on moderate slopes (Ong 1991). Permanent field cultivation which lacks fallow restoration periods, remains a scientific concern.

In his philosophical book on environmental degradation in Latin America, El Discurso de La Naturaleza, Fernando Mires (1990) presents the compelling argument that traditional indigenous cultivation systems are not just subsistence farming systems but highly evolved scientific socio-economic systems. He asserts that historical relationships to the natural environment represent a form of ecological economics based on an economy of scarcity in contrast to modern exploitative economics of growth based on limitless natural resource exploitation. Mires believes that acceptance of the growth economy is tantamount to sacrificing the livelihoods and cultural existence of those who depend on the environment for existence. He maintains that indigenous rationality and years of scientific practice have led native cultures to an economic system that preserves the environment, minimizes labor and resource use, and is carried forth from generation to

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10 Carter (1969) points out that Kekchi migrants in lowland Guatemala who had inhabited the area by Chichipate for less than twenty years had names for eight soil types, ten levels of soil texture, five soil drainage patterns, and a root-bound element that were used as a basis for site selection. They identified twenty stages of milpa agriculture, ten stages of vegetative growth, and recognized sixteen plants as important in site selection, some for wet season milpa and some for dry season sites.
generation - one which can serve a model for modern development. To Mires, the goal of resource conservation is not biological preservation but rather the cultural preservation of those social groups who depend on the survival of the natural environment around them.

Mires, though, fails to address the issue that as the fallow period of shifting cultivation is shortened with the growth of more sedentary communities, practices develop that may not be ecologically feasible. Mires' own romanticism states that the grand Mayan cultures of Central America altered ecosystems and created new ones in a reciprocal relationship to the environment that grew from an intensive use of resources based on ecological knowledge, not its destruction. Other authors take issue with this point. Abrams and Rue (1988) report that sampling indicates that soil and nutrient loss from deforestation during the Classic Maya Period in Petén, Guatemala, led to deficiencies in potassium, phosphorus, and magnesium associated with excessive run-off and sedimentation, possibly contributing to the causes of the civilization's downfall. Using pollen samples near Copan, Honduras, they found that overuse of hardwood firewood supplies was the most likely cause of deforestation. Turner (1974) also documents Mayan intensification in the Rio Bec region of the Yucatán and suggests that repeated burning turned large areas into grasslands that the Mayans were then unable to crop given their technological capabilities. In forming permanent settlements, the farming practices of the ancestors of San Antonio residents may not have been as ecologically sustainable as Mires might have us believe.
The Introduction of Private Property Rights through Leasehold Arrangements

When the Masewal Maya living in the hardwood forest areas of what is now the Mountain Pine Ridge Forest Reserve moved to the flatlands below at the turn of the 20th Century to escape disease, they began to populate the permanent settlement of San Antonio (Cayo). They brought with them the traditional governing system developed under centuries of Spanish rule in the Yucatán where local administration and dispute resolution was done by a single Alcalde chosen for the village by a Council of Elders (Reed 1964; Tzul 1993). They continued the long-fallow shifting cultivation system which mixed crops and cattle until market penetration led many to begin modernization and annual cropping with shorter fallow periods in the mid-20th Century. They also maintained customary cultivation rights of allowing all village members the right to cultivate surrounding arable commonly-held lands.

While the British ignored agricultural investment in local infrastructure, markets and production for small producers in favor of temporary road construction for timber extraction in the rural areas of Belize (Moberg 1992), they at least took administrative steps to secure rights and land for indigenous groups. The British colonial administration developed Indian settlements in the 1930s that allocated annually-renewed cultivation rights to block 'reservation' areas at the community level. The alcalde or village head

11 "Ridge" in Creole is a term used to describe a plant/land association rather than an upland geographic formation (Moberg 1992). The pine 'ridge' forests represent pine overstory over an oak understory, characteristic of poor granitic subsoil and frequent fire history. Some researchers believe the pine forest predominance to be a sign of past Mayan practices of over-harvesting of hardwood firewood and intentionally set fires for grassland formation to improve deer hunting. (See Abrams and Rue 1988) Hartshorn and Davidson (1984) define a "ridge" as a "strip of well-developed forest canopy" (p. 88).

12 Moberg states that investment in agricultural infrastructure did not begin in Belize until the 1950s.
allocated the land and individuals paid $5/year/household to the government (Glaser and Marcus 1994). This system was an adoption of traditional Masewal and Mayan customary cultivation rights with the addition of a yearly tax to support the colonial administration. San Antonio retained the right to distribute land among its residents but lost the right to freely colonize farm land outside of the reserve lands set aside for the village. A more significant long range change, however, came from the fee payment to an outside authority which established the first threads of privatization into the land tenure system used by the Masewal of San Antonio. The customary village right to redistribute unused land to needy individuals and young families was replaced by semi-permanent individual-state property relationship based on an annual fee payment (a precursor to the leasehold system). For the first time, land could be "locked up" by a non-internal community relationship. As long as the population remained small, the reserved lands near San Antonio were adequate for the village. In time, however, gradual population growth from births and immigration led to increasing land scarcity (Tzul 1993) and the need to either intensify cultivation practices on existing land or to expand to other Crown lands near San Antonio. Hurricane Hattie in 1961, which leveled the old forests of Central Belize and the town of San Antonio, along with prospects for national independence provided the impetus for a formal land tenure change to state leasehold lands and the extensive expansion of San Antonio landholdings.

Hurricane Hattie altered San Antonio's physical development and land settlement patterns. Hattie leveled many of the thatched roofed pole houses in the village and a great portion of the large trees in the tropical forests around the village. In the hurricane's
aftermath, the village rebuilt using lumber from sawmills that had been established in the Mountain Pine Ridge area in the 1950s and began the process of the transition to the tidy village of houses and yards found in San Antonio today. Forest Department log salvage of the blowdown and commercial trees in the area provided the impetus to improve the two main roads into San Antonio in the early sixties which opened the door to community expansion along the new roads.

The leasehold agreement that followed provided the means for this community expansion. It was a modernization of the reserve system of the 1930s but with the newly created local government Village Council left out of land distribution issues. In 1959 the British introduced the current Village Council system of community-wide elected representatives into indigenous villages replacing traditional rule by a council of elders and their chosen alcalde (Tzul 1993). In 1961 Belizeans elected the People's Unity Party (PUP) as an interim transitional government in the first step towards national independence. Shortly thereafter individual application for leasehold from the state was introduced at the request of young village members facing a land scarcity situation.

In [1963], a small group of young farmers began to press government to allow the leasing of the crown land. After several representations to the Lands Department, government decided to lease land to the young farmers under the following understanding: Since there were no lands surveyed in the area, the Lands Department would accept lease only on lands located on the newly opened Guacamallo Road [San Antonio Road]. Consequently, Mr. Carlos Harrison, Lands Inspector, went to San Antonio and demarcated several parcels of land along the Guacamallo Road. Thus, in 1964 applications were accepted by the Lands Department for the purchase of land under the Location Ticket System.

As soon as the applications were approved, the lessees began to develop lands. Today all those lands have been developed to pastures, fruit trees, row cropping and other forms of cultivation.

A few years after the first group applied for the lands, many more began to purchase their lands and finally all the lands along the Guacamallo Road and deep into the hinterland were taken over. At present most of the lands in the vicinity of the village
have been leased and much difficulty and quarrels have been experienced over the
distribution of land.

In the 1980's the road from San Ignacio to San Antonio via Cristo Rey was improved
to all weather road status. As a consequence of that development, all the suitable lands
on that road were also leased from government and developed. Today that is the most
developed area of San Antonio. (Tzul 1993: 78-79)

Within the current land ownership patterns in the San Antonio area private ownership
cO-exists with three state ownership forms: state leasehold, unleased national or Crown
lands, and the restricted access state-owned Mountain Pine Ridge Forest Reserve
(MPRFR). Common village agricultural property no longer exists. Following the
development of leasehold arrangements and the opening of roads, virtually all the arable
land near San Antonio was placed under local control through lease applications by what
is now the older generation of San Antonio residents. Leasing was not divided by need
but on a first come, first serve basis of distribution. Those applying later for land found
accessible and machine cultivable land unavailable. One farmer told me that he had to go
so far to lease even rocky land that members of the nearby community of Cristo Rey have
complained that his leases were within their jurisdiction.

The leasehold system established in Belize is a flexible ownership system whereby the
national government transfers virtual private property rights to the leaseholder as
usufructuary rights. Originally,

"[t]he Location Ticket System [was] a system whereby the government leases land for
five years. During the five years, the lessee must develop and pay the purchase price to
the government. After the five years, the lessee is granted title to the land." (Tzul 1993:
79)

19 In 1978 the government subdivided a section of the Maya Ranch obtained by the government for lease
to village members. Five members of the San Antonio Peanut and Grain Cooperative were among those
families leasing land from the Maya Ranch ("Report of a Meeting to Discuss Land Availability for the
San Antonio Peanut and Small Grain Cooperative, FPMP, 4/8/94).
Under the current system, leases run for seven years. Following a review during which proof of development must be shown, leases are renewable at the request of lessee and transferable to offspring. Longer leases can be obtained in special cases when collateral is needed. A $10 fee for title application is required, and land is sold at the discretion of and price set by the Minister of Natural Resources (usually about $25/acre) (Thompson 1994).

The inexpensive land leases, only BZ$2 per acre per year, allowed local residents to quickly lay claim to nearly all arable land around San Antonio. This monopoly over agricultural land by local residents, combined with the virtually complete harvest of valued timber around the village by the Forest Department, served to produce a situation where a land market (the sale of private land property to other private individuals) failed to develop in San Antonio. Two key results arose from the lack of a land market: the village maintained ties to traditional patterns of customary rights and agricultural intensification on cleared land did not reach its maximum productivity.

First, the lack of outside intrusion permitted the village to retain its isolation and cultural integration even as it modernized, developed schools, and participated in outside employment. This helps explain why the village maintains the Masewal language even though it is not taught in the schools. In spite of electoral politics, the Village Council functions in much the same way as the old Council of Elders and chosen Alcalde, as younger village members tend not to participate in village meetings and/or allow elder

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14 Masewal is commonly used in personal interactions in the village, but it is greatly diluted with Spanish which is the language of the churches and public meetings. Many newcomers and spouses are not fluent in the Masewal dialect. The situation is complicated by the fact that the schools are taught in the national language English which is commonly spoken among village children. A large portion of the village is tri-lingual, though many older residents are not comfortable speaking English even though they may understand it.
members to dominate discussions (personal observation). The current elected Village Chairman is still expected to direct village life in much the same manner as the old Alcalde (Clark, 1994). Additionally, birth in the village and village membership is still reason enough to return to vote and participate in community affairs (C. Mai 1994, pers. com.).

As will be illustrated in following chapters, this is a direct result of the leasehold operation. Thus, the customary cultivation system of San Antonio’s ancestors has been retained in many dimensions with the very important distinction that the village no longer possesses control over usufruct rights and there no longer are periodic redistributions of access to arable land and forest resources. This is a key point that impinges directly on local desires to maintain San Antonio’s cultural identity and the problems it faces maintaining internal cohesion in the face of growing land scarcity15 as well as on its conflicts with national land managers of the Mountain Pine Ridge Forest Reserve.

The second point concerning the lack of a market is that without the potential to recover investment costs through profitable commodity or land markets, agricultural landowners are not apt to invest in expensive technological intensification or in public

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15 The findings of Morhmann and Nelson (1993) in the village of San Antonio (Toledo) have striking similarities to the situation in San Antonio (Cayo). They write, "The change to other Christianity [than Catholicism] which is more based on the nuclear family rather than on the community as a whole might have brought about the first major move towards separating the village. Land parcelling and the dispossessioning the Maya People of communally held land is a further step in breaking up a culture. Once people live separated in that sense (loss of common religion, common land), they show little or no responsibility for the environment they live in, as they are no longer in tune with nature as a whole and the responsibility lays with the 'neighbors' or the 'village chairman' or the 'forestry department' or if even more removed, with the 'government.'" An estimated 80% of the residents of San Antonio (Cayo) have converted to the Pentecostal religion in the last 15 years, stressing relations with other community members. This has created significant internal difficulties in dealing with political issues which are avoided by Pentecostal followers (F. Tzib, per. com.) but the significance of this change seems to be in an increased respect for private property rights which often work against the poorer families, not on increased degradation of the environment.
works (Russell and Nicholson 1981; Pearce and Warford 1990). Moberg (1991) has documented how vacillating national policies between food price supports which raised the national debt and cheap food imports for urban areas has placed small Belizean producers at a disadvantage and encouraged them to shift away from subsistence production towards non-farm income.

"From this it is apparent that government policies have favored town residents at the expense of rural producers, despite the Marketing Board's stated goal of promoting staple crop production. This point is not lost upon rural staple crop producers, many of whom 'justifiably feel that they subsidize urban non-producers, while they are themselves forced to live at subsistence level with insufficient returns to encourage increased production' (MacInnes 1983:106).

"The Belizean government's attempt to deliver low-cost food to non-farming populations via price controls creates major disincentives for staple crop production in rural communities."

"Both neoclassical and populist analyses concur that agricultural self-sufficiency requires a rise in producer prices to competitive levels. Only then will farmers deliver crops to urban markets and invest in technological change." (Moberg 1991: 19,21)

A weak commodity market with low prices for locally produced food and cheap imported food has prevented capital accumulation in San Antonio as well as in other parts of the country. Moberg found evidence that rural farmers in Stann Creek were shifting to citrus in favor of staple crop production but I found little evidence of similar desires on the part of San Antonio farmers.

Because of the low-cost land lease system in Belize, San Antonio villagers have been able to retain possession of large tracts of land without fear of losing them or needing to sell them to outsiders. Even workers employed outside San Antonio have not been disposed to purchase and sell land near San Antonio because retention of these lands guarantees continued participation in community affairs (a form of customary cultivation...
rights). Lack of profitable commodity markets, customary unwillingness to sell land to outsiders, and the state operated leasehold arrangements increase village reluctance to invest in agriculture and encourage under-utilization of arable land. Few village members other than the San Antonio Peanut and Grain Cooperative (PGC) have invested heavily in agricultural intensification and even the PGC work has been financed largely by outside NGOs from Canada and the Netherlands (Carroo 1987). Whether the Peanut and Grain Cooperative, which is responsible for the agricultural incursions into the Mountain Pine Ridge Forest Reserve, should be considered a form of public or private investment is a critical issue in determining strategies for those wishing to improve the profitability of San Antonio agriculture through intensification and for those wanting to protect forest resources from continued colonization and its conversion to permanent agriculture.
Chapter 4 Land Tenure and Property Rights Conceptions: How They Relate to San Antonio

The Evolving Social Context of Land Tenure and Property Rights

Forty years of international development experience\textsuperscript{14} has shown that land ownership as a social institution carries with it a series of implications concerning its extensions into political and economic arenas. Land tenure, in a post-modernization sense, is defined as "the legal and traditional relations between persons, groups, and classes that regulate the rights to the use of land, transfer thereof, and enjoyment of its products, and the duties that go with those rights. In brief, land tenure can be considered as a reflection of the power relations between persons and groups in the use of land" (Barraclough 1973: xvii).

Land ownership, the right to use and dispose of land, which appeared as a title-possessing component of early development models, evolved into a relative concept in the neo-liberal programs of the 1970s, with land tenure systems being defined in terms of local social systems interrelated with particular patterns of land tenure relationships. These land tenure systems were tied to "the legal forms of tenancy, the type of agriculture, and the degree of security and bargaining power of landless workers and small farmers" (Barraclough 1973: 15) and to contracted and customary rights and duties, liberties, and exposures in land use applications (Poostchi 1986). Land tenure systems recognized the fact that tenure relationships seem to influence (and sometimes follow) changes in

\textsuperscript{14} For a thorough review of early development theory see Eicher and Staatz (1984). Moberg (1992) presents an adequate discussion of later developments and relates them directly to development issues in Belize.
agricultural patterns, labor availability, investment potential, and markets within the context of historical agricultural and cultural development. Conceptualization of land tenure systems built upon earlier attempts to construct theoretical models of agrarian systems (see Figure 2) for the purpose of devising land reform programs in Latin America.

Figure 3  TUMA'S AGRARIAN STRUCTURE

Tenure, defined as "the act, right, manner or term of holding something" (Webster's 1977), has been applied to social and ownership relationships to land, water, minerals, trees, animals, plants and air, (and in slavery systems to people), as well as products of
human labor in different social contexts. Tenure implies both the authority relations that permit and control the holding and disposition (sale, giving, or inheritance) and the rights of and abilities to use the property in question. Some authors such as Daniel Bromley choose to avoid the use of the word "tenure", preferring to discuss land ownership systems as property rights regimes with accompanying social authority systems. Others, such as John Bruce and Louise Fortmann (1992) who work with and write about tree tenure prefer "tenure and associated rights of use."

For the purpose of this paper, I recognize two levels of social institutions as they relate to landed property relationships. Tenure represents the holding of property within an associated social historical context, inclusive of cultural perspectives, market and labor availability, and political relationship. In this thesis property rights mean enforceable ownership and are therefore tied to authority-based institutional arrangements, ownership being the "right to possess, to use, to manage, to benefit, to be secure, and to alienate" property (Bromley 1991: 159). This implies a more immediate right to use than tenure. Authority related to property is situational and may be legally-based or result from any number of socially derived differentials between owners and non-owners such as experience, education, knowledge of political processes, and wealth. Property rights analysis serves for understanding the privatization of land and natural resources because it emphasizes the changes in authority restrictions as property undergoes a transition from one form of property to another. Tenure analysis, on the other hand, speaks more to cultural expectations and non-property relationships that affect decisions on how and for
what purposes one uses one's property, be it private or public property. The two are certainly inseparable on some level and my separation of land tenure from property rights may be more an effort to analyze different social constructions of property relationships than a real difference.

Bromley's (1991: 2) theoretical work on property rights has given us the following definitions of property and property rights:

*property* - "is a right to a benefit stream that is only as secure as the duty of all others to respect the conditions that protect that stream."

*property right* - is a claim to a benefit stream that the state will agree to protect through the assignment of duty to others who may covet, or somehow interfere with, the benefit stream. Rights have no meaning without correlated duties and the management problem with open access regimes is that there are no duties on aspiring users to refrain from use. Property is not an object but rather something of value (the benefit stream) against all others. Property is a triadic social relation involving benefit streams, rights holders, and duty bearers (Hallowell 1943 in Bromley).

The Belizean leasehold arrangement that dominates agricultural landholdings around San Antonio illustrates the difference between tenure and property rights and demonstrates that mixed systems may have contradictory results. As a tenure system, the leasehold arrangement gives the individual household long-term property security due to its low rent and, as demonstrated earlier, it also provides an institutional structure that protects the Masewal culture from outside influences. This represents an integrating function for the community. On the other hand, leasing has given individuals sole rights to posts, poles and firewood which for a majority of households are becoming increasingly
scarce commodities (Clark 1994). Many respondents without land or who possess land without access easements complained that the right to exclude others from private and leased lands had exacerbated resource scarcity because they were no longer permitted to collect forest products from leased lands that had been considered customary common property resources. In spite of the fact that leasing granted effective private property rights to leaseholders as early as the mid-1960s, it was only in recent years as resources became scarcer near the village that individuals have chosen to break with traditional common property customs and to enforce their individual property rights under British/Belizean law, supported by the growth of Pentecostal respect for private property.

Property Rights Regimes

Bromley's work on property rights has greatly clarified the nature, if not the role, of property rights relationships in the market economy. Particularly, he has clarified the difference between open access and common property land and as such has opened the ground for a deeper understanding of customary rights and traditional indigenous land tenure systems. Bromley introduces four forms of natural resource ownership: open access regimes, common property regimes, state property regimes, and private property regimes (see Figure 3). Property regimes are systems of property rights which "acquire their special character by virtue of collective perceptions regarding what is scarce (and

15 The most commonly used forest product from the MPRFR is bay leaf, the preferred palm for thatched roofs (about 15% of the houses in San Antonio still have thatched roofs). Fence poles and firewood are generally collected closer to San Antonio or from wamil (short bush fallow) portions of farms. 38% of respondents to my survey felt that firewood was currently scarce near San Antonio and another 21% reported that all non-timber products were scarce, indicating that nearly two-thirds of the village recognized a problem with growing scarcity of non-timber forest products (Clark 1994).
hence *possibly* worth protecting with rights), and what is valuable (and hence *certainly* worth protecting with rights)." (Bromley 1991: 3)

**Figure 4 BROMLEY'S PROPERTY RIGHTS CLASSIFICATIONS**

<table>
<thead>
<tr>
<th>Type of property</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Individuals have a duty to observe the rules of use determined by the controlling agency. The agency has the right to determine those rules.</td>
</tr>
<tr>
<td>Private</td>
<td>Individuals have the right to undertake socially acceptable uses and a duty to refrain from unacceptable uses. Others have a duty to respect individual rights.</td>
</tr>
<tr>
<td>Common</td>
<td>A management group has the right to exclude nonmembers. Nonmembers have a duty to abide by that exclusion. Co-owners comprise the management group and have rights and duties related to the use of resources.</td>
</tr>
<tr>
<td>Open access</td>
<td>No users or owners are defined. Individuals have the privilege but not the right to use resources.</td>
</tr>
</tbody>
</table>

*Source: Adapted from Bromley (1989), p. 872.*

*Source: Pearce and Warford (1993)*

Open access, unlike the other three forms of property rights regimes, does not have an associated authority system to define limits of use and extent of rights and has been the subject of a never-ending debate over Hardin's 'Tragedy of the Commons' assertion that, due to free unregulated access to the resource, commonly-held land inevitably will face degradation or extinction, depending upon the type of resource. Rational choice advocates have used the Prisoners' Dilemma\(^6\) to illustrate that not only will open access land be over-used, but that public investment in infrastructure and methodology that might
protect the resource will not be implemented because each individual can be assured of
greater return by using the resource to his/her own advantage without contributing to the
public investment (Russell and Nicholson 1981). When the San Antonio ancestors settled
originally in what is now the Mountain Pine Ridge Forest Reserve, the surrounding forest
operated as an open access grazing area incapable of being overused because of the small
population and light grazing demands. When the village settled more permanently in San
Antonio and began to grow, the land tenure regime made the transition to common
property under the control of an alcalde in line with the customary rights of the Masewal.

The error made by Hardin and many early works on the overuse of open access
resources was that agricultural property, as represented by the Mayan cultivation rights
systems employed in the Yucatán and Belize prior to leasehold implementation in the
mid-1960s, did not operate as open access regimes but as common property regulated by
oversight from village elders or other traditional land controlling organizations. Rights
were established by village membership and by use, and redistributed periodically to
account for village needs, growing populations, and immigration and intermarriage from
other indigenous groups. Far from lacking authority, customary and traditional land
tenure systems characteristic of common property relationships maintained stable (if not
always equitable) social/land relationships that protected natural resources (Reed 1964;
Watts 1987; Bromley 1991). As European markets and export crop production
penetrated into traditional Central American indigenous systems, mixed systems that

16 "The 'prisoner's dilemma' is a situation in which it is optimal for any prospective participant in a
collective enterprise to opt out (to 'defect') regardless of the strategy followed by other would-be
participants. If all cooperate, all, in the aggregate, will be better off than if all defect; but every
individual is better off defecting." (Russell and Nicholson 1981: 9-10)
retained communal forests and pastures but accepted the privatization of cultivated land became common. In the Yucatán, these common indigenous property regimes were incorporated into collective peasant landholdings known as *ejidos* as early as 1573 (Herzog 1959), which permitted Spanish control over but not the elimination of, village common land (Tuma 1965; Tello 1968). In Belize, local indigenous systems were first restricted to indigenous reserves and then incorporated into the state-controlled leasehold system.

Under a state property regime, "rights to the resource are vested exclusively in government which in turn makes decisions concerning access to the resource and the level and nature of exploitation" (Feeny et al. 1990: 5). State property regimes characterized by state ownership were less common under Spanish rule which tended to designate vast land tracts to large landed estates while interest in dye wood and mahogany led Belizean British administrators to take steps for state domination of a particular resource, particularly timber. The British established exclusive rights to timber through both tenure and property rights regulations. They declared all forested land as state land reserved for state exploitation ("Crown land"); and then they reserved the property right for the state to all standing timber, even on private property. When the government decided to encourage infrastructure development and colonization of Crown land with a potential for agricultural development in the interior of the country in the 1940s and 1950s, the need arose to delineate forest lands that could be cleared for agriculture from those reserved for sustainable forestry production (Moberg 1992). In 1944, Belize established the Mountain
Pine Ridge as the first official forest reserve in the mountains above the village of San Antonio. The Belize Forestry Department planned to harvest primarily pine trees (*Pinus caribaea* and *Pinus patula*) (Revista Forestal Centroamericana 1994). The reserve also included 25% hardwoods located in the zone where San Antonio's ancestors originally settled in the late 1800s. Today, Belizean forest reserves cover one-quarter of Belize, established either for timber extraction or for soil and watershed protection (King et al. 1993).

Throughout the 20th Century, all Central American governments have established forested timber reserves, and more recently, parks and wildlife reserves, often excluding use by local citizens and disregarding traditional customs (Thrupp 1988; Gomez-Pompa and Kaus 1992). The creation of forest reserves highlights two features about tenure systems and property rights: (1) they are effective relative to the enforcement of the associated rights and duties, particularly on state property at the margins of agricultural expansion, and (2) they are ever changing, based on positions of those in power and on public values.

Another look at the Mountain Pine Ridge Forest Reserve illustrates both of the above enforcement and evolution issues. The Mountain Pine Ridge Forest Reserve reserved all rights for the state, but selective enforcement has allowed villagers to hunt and to collect medicinal herbs, firewood, and bay leaf palms for roof thatch while prohibiting timber harvest and agricultural expansion. When San Antonio Peanut and Grain Cooperative members began clearing land in the MPRFR in 1984, the Forest Department sent mixed
signals by evicting farmers whose plots were deep within the reserve while allowing those near the edge of the MPRFR to maintain their land without an official lease arrangement (Garcia 1994, pers. com.). These mixed signals continued during the ensuing years, with the Lands and Survey Department agreeing to dereserve 600-1000 acres of MPRFR lands and to grant a lease for those hardwood lands to the Cooperative in 1987, 1989, and 1994 (FPMP 1994) while the Forest Department has refused to concede title and has continued eviction for forest incursions by the PGC members (Carroo 1987; Harpold et. al. 1990; Tzul 1990). In 1994, under verbal agreements between the Peanut and Grain Cooperative and high ranking Ministry officials, the PGC cleared about 100 acres of rolling ground near Privassion Creek and planted commercial peanuts, still without Forest Department approval or a written lease agreement. The Forest Planning and Management Project commissioned my study, "Social Needs Assessment, San Antonio (Cayo), 'August 1994" (Clark 1994) to examine social pressures behind the persistent efforts by the Peanut and Grain Cooperative to colonize MPRFR land. Review of recent incursions into the MPRFR is on-going (see maps in Appendix 2 for locations of historical agricultural incursions into the Mountain Pine Ridge Forest Reserve).

The evolution of tenure in the MPRFR is instructive. First an open access forest, the British colonial administration declared the area to be state land, though it did nothing to evict Masewal settlers in the area. Later, as concern over protecting areas for forest production combined with the need for developing agricultural land, the forests of the MPRFR were protected as a state forest reserve. Recently, potential land scarcity near
San Antonio has been used as a reason to consider dereservation of 600-1000 acres of MPRFR hardwood forest land to enable villagers to farm irrigable land there. But even this dereservation proposal is currently being debated along two quite different lines of public opinion pressure. One is the conservation imperative (Brechin and West 1990) to protect forest cover and habitat by maximizing forest use efficiency, an imperative evident in most international development programs as a result of the overwhelming evidence of rapid tropical forest deforestation and habitat loss (see Collins 1986; Van Òrsdol 1987; Hedström 1990; Wood 1990; Singh 1993; Diagnostico Participativo Communitario 1993). The recognition of conservation imperatives to slow deforestation and its resulting ecological degradation pressured NGOs working in San Antonio to add conservation measures (no riparian harvest, no clearings on slopes, and no hunting) as conditions to their support for the PGC. The Agricultural Department has enforced Belizean law against agricultural clearings by the PGC on land greater than 12.5% by requiring pineapple intercropping across slopes in the middle of peanut fields to prevent erosion on MPRFR lands. A second perspective comes from the local Masewals themselves. Some local indigenous community members discussed relocating San Antonio to the MPRFR lands (a site with running water) and converting a larger forested area into an Masewal Indigenous Reserve for cultural preservation (personal communication17) as has been done in Talamanca, Costa Rica, with the Bribri and Cabecar Indians (Palmer 1992, personal

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17 Due to the sensitive nature of this topic, I choose not to list my sources. Both members of the PGC and non-members discussed this option. Settlement within the the MPRFR has been granted previously to private tourist concessions. MPRFR settlement (but not an Indigenous Reserve) have been discussed in NGO reports (Harpold et al. 1990) and in government surveys (Tzul 1990).
communication\(^{18}\)). The dereservation of MPRFR lands to either the PGC or an a Masewal Indigenous Reserve would necessitate a tenurial change from state to common property under the authority of a specific local group. Even before obtaining an official lease, the PGC has further subdivided its holdings among the members, giving ten acres to those lacking land near San Antonio for subsistence farming and subdividing the rest for peanut production among members. Whether this is a step towards privatization of landholdings as seen in Guatemalan cooperatives (Barraclough 1973) or in Mexican ejidos (Tello 1968) is not yet clear.

Characteristics of Property Rights

As Bromley points out, a right "denotes a set of actions and behaviors that the possessor may not be prevented from undertaking [and] a right - by definition - implies a duty on the part of all others to refrain from preventing those actions and behaviors." (1991: 3-4). In locations where the state is strong enough and has the will-power to stop colonial expansion into forest reserves, growing rural populations will be forced (i.e., have the duty) to live within the confines of previously allocated lands, and subdivision into smaller and smaller farms (such as minifundios) and agricultural intensification can be expected to occur (Prostermann and Reiding 1987). In areas where state tenure is weak, confused, and unstable, colonization of state land may occur that carries its own

particular tenure problems and associated rights. In Belize which recognizes usufruct rights as a basis for tenure establishment, immigration by possibly as many as 40,000 refugees, 75% who live in the Cayo District (King et al. 1993), from politically unstable countries in the region has been met by national government acceptance of residency and usufructuary (and technically illegal) leasehold rights for the immigrants. This accession to the needs of refugees has created ambivalent attitudes among the Masewal of San Antonio who, while professing concern of the refugees' plight, harbor resentment against the refugees and national government for the colonization of new land when locals are prevented from colonizing areas within the MPRFR currently not being actively managed for timber harvest. On the other hand, the PGC has allowed one refugee from a neighboring refugee settlement to become a member and to participate in its 'holdings' within the MPRFR, a considerate measure but one which complicates the PGC's relationship to the national government as it raises issues about just who the PGC represents and to whom and for whose benefit the state is considering dereserving MPRFR land.

19 See Jeffrey R. Jones Colonization and Environment: Land Settlement Projects in Central America for a full analysis of colonization history and prospects in Latin America.

20 The hardwood forests of the MPRFR are just now being mapped by the Forest Department into management compartments (Gray 1994, pers. com.). The current operating guideline for the MPRFR, the Management Plan for Mountain Pine Ridge Forest Reserve, 1st April 1992 to 31st March 1997, Draft fails to consider hardwood management in the next several years.

21 Refugees in Belize must live in the country for ten years prior to applying for lease land but they can join local cooperatives to get land and credit (Nelson 1992). King et al. (1993) estimates that 75% of the country's refugees live in the Cayo District whose 5300 registered refugees is estimated to be but one-fifth of the total in Cayo. Lack of land rights has created a quandry for the government as large settlements like Siete Millas (Seven Miles) near San Antonio have sprung up without any official recognition or rights. Efforts to deal with problems in refugee areas has opened the government to criticism from impoverished Belizean indigenous groups for unfair treatment of Belizean citizens.
Private property regimes represent the most alienated forms of property where use and disposition of the resource lies in the hands of individuals in the possession of legal title. Private property cannot exist without political institutions willing to enforce the individuals' exclusive rights and the duties of others to respect those rights. However, under private property, the state cedes ownership rights to titled individuals or corporations recognized as legal entities under the laws of the state. The Belizean state grants de facto private property rights (usufruct rights) to those showing active improvements while colonizing land under the leasehold arrangement. The state retains no or only limited rights of regulation over the use and disposition of private property or leasehold lands. The state-controlled leasehold of Belize, therefore, operates in contrast to other forms of leasing and tenancy involving tenants and private landlords in that full property rights are granted to the tenant following the clearing of the land, even the right not to use the land. Most tenancy leasing from private owners represents a transfer of limited property rights through a contract to "use another person's agricultural land for the purpose of cultivation by oneself by paying a rent therefore" (Cheung 1969: 12) and requires payment of a fixed rent or share of the crop produced.

The low lease rent of BZ$2 per acre per year, equivalent to a single ride in the back of a pick-up to the nearby urban hub of San Ignacio, provides little incentive to convert leaseholdings to private property. Lacking a land market to encourage land sales, leasing in San Antonio amounts to a perpetual leasehold arrangement, a specialized form of transferring private property rights to individuals without endangering the cultural

22 BZ$2 = US$1
solidarity of the village. San Antonio conversion rates from leasehold to private property lie are low. Belizean landholdings are divided into 37% private land and 10.6% leased land. San Antonio villagers reported that only 25.7% of agricultural holdings were privately owned and while fully three-quarters remain leased, with only a fourth of the households reporting any private land ownership (Clark 1994). This ratio is typical for areas of Belize characterized by lease arrangements averaging under 50 acres (King et al. 1993). Conversion of land to private property, accomplished through the Lands and Survey Department at a price set by the Minister of Natural Resources, usually at BZ$25 per acre (Thompson 1994), is not being pursued in San Antonio. Traditional Mayan tenure relationships tied to customary rights and common property in San Antonio and poverty which is endemic with small farmers throughout the country are tied to inexpensive leasing to explain the slow conversion rate.

Private property rights are not irrevocable in all cases. The right of repossession of private land for public infrastructure development (such as market road development), known as eminent domain in the United States, is retained by most national states. Recent environmental cases involving pollution control, habitat protection, and reserve set-asides have shown that property rights can be terminated or limited by a recognized authority regime at considerable cost to the private owner. Belizean law which recognizes assartment claims, defined by Bruce and Fortmann (1992) as the establishment of ownership through the clearing of land, also reserves the right to repossess titled land if improvements are left unattended for three years running at any time in the future at the
original purchase price of the land regardless whether the land is subsequently sold to another owner (Dickson 1983).\(^2\)

Limitations on land and natural resource use rights vary by systems. Easements are prior limitations incorporated into the title that reserve use of property to others or limit the use of the resource by the owner himself/herself, as in right of way and conservation easements. During official land surveys, the Belizean government surveys access right of ways to all lots and agricultural plots\(^4\). An implicit right of transfer is a process that enables an authority institution to modify the degree of control exercised by the owners of record over the land (Bromley 1991). Proprietary rights are conditional rights of use over a natural resource given by the state to particular user groups such as timber concessions, extractive reserves, or preserved areas.\(^5\) Usufruct rights are the right to use but not own land. Usufruct rights are commonly employed to encourage the colonization of new areas and/or are used as a transitional step in the formal titling process of colonized land.

In the case of Belize, usufruct rights are applied to state/cultivator relationships in lease arrangements for Crown land where lessees are required to prove continuing use of lease land. Failure to maintain improvements or the sub-leaseing of Crown lands to others without Ministerial permission are grounds for revoking the lease permit. The restriction

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\(^2\) According to King et. al. (1993) the Land Use Authority is currently reviewing legal requirements for improvements in an effort to reconsider areas of the law that tend to encourage poor conservation and overdevelopment of plots.

\(^4\) See Land and Survey Department Plan No. 1937 for surveyed village lots and easements and Plan No. 1704 for surveyed agricultural plots and easements near San Antonio (Appendix 2 of this paper).

\(^5\) Belize has given management authority over seven of its national parks to the Belize Audobon Society and offers long-term timber concessions to various large mills. The government has experimented with extractive rights near the Cockscomb Jaguar Preserve for the displaced Mopan Maya of the area.
against sub-leasing without prior official approval and the fact that the Belizean government will entertain transferring leases to sub-lessors making improvements on a given piece of land leads San Antonio residents to be leery about leasing arable land to others. The result is that arable land is left idle rather than to be rented to landless community members, as indicated by the fact that only 27.3% of the land in San Antonio is being farmed in spite of trends towards using multi-cropping, machine cultivation, and agrochemical inputs (Clark 1994).

Environmental property rights are another rights category that govern the use of resources, including waste assimilation into the environment and which bestow rights to conserve, consume, sell, lease, bequeath, and exclude others as related to the natural resource (Pearce and Warford 1993). A group of San Antonio residents are currently appealing to the government in a case over environmental rights. Methane gas from an improperly operated gas generator from pig manure has been seeping downhill and making neighboring residents ill. The case has been slow in developing because many of the victims are relatives of the generator's owners and have been unwilling to press the government for relief. Usufruct, proprietary, and environmental rights often vary by the status of the users, and will be modified based on whether the use is for subsistence or commercial uses, how scarce the resource is, whether the area has ulterior social meanings such as in sacred set-asides or even by the level of public environmental concern by those.

26 The weakness of my study in failing to do a random sampling that allows statistical correlations to be drawn between factors is here apparent. It would be useful to draw correlations between cultivation practices (mechanical, shifting, fallowing) and land tenure (leasehold and private).
who lack formally recognized rights such as NGOs, local and indigenous groups (Fortmann 1985).

Property rights, then, manifest themselves as tenurial relationships in social situations and include rights of access to resources; rights to ownership, disposition, and inheritance; rights to lend, lease, or permit others access and use; rights to exclude others from use; rights of traditional and customary use; and rights to buy, sell, and profit from the marketing of the resource.

When various rights become codified through law and custom, they come to be taken for granted in the public mind and then present constraints on the decisions and possibilities within those systems. Other options of choice, perhaps equally valid, are not as readily evident. Various customary tenure systems may protect the rights of certain individuals and groups more than those of others. Ranchers, mine, and timber companies have long enjoyed privileged profiteering on public lands in Belize (Bolland 1986), as have latifundistas in Mexico whose prime fertile bottom-lands have escaped land redistribution since the ejido law Article 27 went into effect (Tello 1968). Communal property and customary indigenous lands have suffered losses with increased land privatization, often against peasant wishes and legal constraints (Reed 1964; Tello 1968) and sometimes, as in the case of San Antonio, with their support (Tuma 1965; Tzul 1993).

Modern land leasing near San Antonio has not guaranteed fair or equal land distribution in the community. The loss of community redistribution practices maintained under ancient customary Mayan practices under the current lease system eliminated a local
means to guarantee maximum utilization of agricultural land around the village and produced a situation of local land scarcity for some in San Antonio. Within my study, 37% of responding San Antonio households reported neither owning nor leasing land while 16.5% of those with land own or lease ten acres (4 hectares) or less. The majority of non-landowners were young people with small families usually living with their parents. The Peanut and Grain Cooperative, representing about 11% of village households, is seeking expansion land in the MPRFR not so much for redistributional purposes as for access to irrigation and year-round farming. Many PGC members already have adequate acreage of land near San Antonio, though they, too, maintain the need for land to divide among their children.

Perhaps Daniel Bromley puts the relationship of property rights and distributive justice the best when he says that land reform should deal with four aspects: "(a) who controls land, (b) who may use land, (c) who reaps the benefit of land use, and (d) who bears the costs of land use" (Bromley in Eicher and Staatz 1984: 276). There is little to indicate that PGC incursions into the MPRFR should be considered a community-based land reform practice aimed at colonizing land for the benefit of the village's landless population.
Chapter 5 How Tenure Security and Household Differentiation Affect Decisions to Invest in Agricultural Intensification

Leasehold and Under-Utilization

The preceding chapters established that the Masewal have a tradition of customary cultivation rights that integrates community membership and community regulation with a system of shifting cultivation. Under British colonial rule, these customary practices were tolerated while the government first limited the area available for cultivation and then established a fixed rent leasehold that replaced local control over land distribution within the village. The low fixed rent leasehold tenure system had the curious effect of permitting the village to monopolize agricultural land around San Antonio and thus prevent the development of a land market. This process ensured San Antonio's isolation, giving it a rare opportunity to maintain Masewal cultural heritage while the village gradually modernized. This heritage is seen today in the use of the Masewal language within the village and in the village's adaptation of leasehold and village council arrangements to maintain elements of customary cultivation rights, including rule by an alcalde selected by elders, voting rights established by birth and maintained through land relationships, and responsibility of a council of elders for the distribution of land to younger families.27

27 While land distribution rights have been taken over by the national government, the right to distribute surveyed town lots is still practiced by the Village Councils. Belizean law requires that town lots be auctioned (Dickson 1983). However, the custom is to grant distribution rights to indigenous communities (F. Tzib, R. Thompson 1994, pers. com.).
The acceptance of the privatization of property rights embodied in leasehold arrangements, however, limits land redistribution to hereditary division and, because all arable land near the village is currently leased, San Antonio newcomers lack the means to obtain land. Consequently, large families are forced to subdivide parcels to heirs into units too small to be profitable under current farming techniques. Many follow the option to seek land and employment outside of the village. The San Antonio Peanut and Grain Cooperative has actively been pursuing land acquisition within the Mountain Pine Ridge Forest Reserve for a variety of reasons, additional land for younger family members and the landless being one.28

While leasehold serves to provide adequate land tenure security for community members to encourage investment, lease laws and the recognition of usufruct rights serve to discourage maximum land utilization while encouraging continued deforestation and conversion to pasture land and idle farmland. Under-utilization of land occurs because individuals refuse to lease idle land to others due to fears of losing the lease to the tenants. It is cheaper to pay the small yearly rent and keep the land. I was told of nearly 200 acres being held idle for this reason. Only a quarter of the land near San Antonio was reported to be cropped, partially indicative of degraded soils, rocky soils, and the village practice of wamil (a form of shortened bush fallow) and partially due to idle land and low productivity pasture. Other than rocky forested hills, the land near the village was generally treeless while more distant land was actively undergoing forest to pasture conversion. Belizean

28 The search for water for year-round irrigation as a means to eliminate the dry season unemployment that forces most San Antonio residents into debt is the main reason. Seeking a new village site with water to lessen the daily burden on families was another. (PGC, pers. com.).
law recognizes the clearing of land as "improvement" and therefore clearcutting is the basis of usufruct rights used to establish leasehold land. With 50% clearing, the land becomes available for purchase as private property (Moberg 1992) though few San Antonio residents feel the need to convert land as seen by the low percentage of private to lease land in the area. Poor farmers find the clearing of new land to be a less expensive way to show continued use for lease requirements than investing in agricultural intensification of land already cleared.

Finding ways to encourage better utilization of cleared land through increased productivity will ostensibly reduce pressures for forest conversion to permanent agriculture land. Agricultural intensification near San Antonio will need to deal with the issue of under-utilization if it is to be used as a means to stem forest conversion pressure.

Peasant Household Differentiation and Wider Security Issues

A digression from the issue of land tenure systems into the issue of household differentiation and risk strategies is useful to explore the root issues behind investment practices in agricultural intensification. For sure, secure land tenure, usually obtained

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29 Glaser and Marcus (1994) report that 38% of the residents in the Columbia Forest Management Area in Southern Belize believe that the "forest belongs to those who cut it" - another example of the continuation of Mayan customary cultivation rights but now the village lacks the local authority to control land use.

30 "Under the country's tenure laws, applications for land title are denied unless at least half the land applied for is 'developed' (i.e., cleared or under permanent cultivation). The planting of tree crops, such as citrus or coconuts, thus provides a means for small-scale farmers to formalize their claim to land. Citrus is also attractive to farmers as a source of old-age income because once established it requires much less strenuous labor than milpa farming." (Moberg 1992: 85) At this point, there is no evidence that San Antonio farmers see the planting of trees as a necessary means to achieve title, nor is investing in trees and agroforestry seen as a viable form of farm investment or retirement income.
through either a formal land title or a long-term fixed lease, lies at the heart of patterns of peasant investment in agricultural intensification. Without the assurance that they will possess the land in the future, few peasant households will make investments in the land beyond those needed to guarantee family subsistence. But given the penetration of the money economy to virtually all corners under global capitalism, peasants with the means will invest in capital improvement and public works as a capitalist unit as long as household subsistence is not threatened (Popkin 1979) and domestic and food import competition is not too strong (Moberg 1991). Thus, living a functionally dualistic role, peasants develop adaptive strategies to minimize risk and maximize profit. In a rational but non-capitalist manner, small farm households at times forego income generating work and allocate household labor instead to subsistence crop production (increase production), shift between market crops and subsistence crops, and work at unprofitable wages to preserve household subsistence (Moberg 1992). The curtailment of household consumption through reduced caloric intake, the reduction of outside purchases and agrochemical inputs accompanied by increased reliance on household food production, and the rejection of innovation for fear of upsetting the balance between the peasant household and outside markets are all conservative survival strategies aimed at reducing family subsistence risk (Wolf 1966). "Local people tend to be reluctant to enter into any situation which they perceive as exposing themselves to significant risks, and avoiding risk rather than maximizing yield is the basis for much subsistence agriculture" (Hough 1988: 133).
On the other hand, peasants live with climatic risk as a major determinant in their livelihood security\(^{31}\) and seek investment risk as an element of household *survival strategies* when there is an availability of agricultural surpluses (Russell and Nicholson 1981). Numerous elements play into a peasant's willingness to accept the risk of investment in agricultural intensification techniques: family food security, secure long-term land tenure relationships, population pressures and land scarcity, variations in asymmetrical market relationships, climatic patterns, credit and non-farm employment opportunities, and peasant/government relations. Customary practices of group public investment known as *fajina* are practiced in San Antonio - formerly six days of voluntary work each year required of all able bodied men of the village for community infrastructure maintenance that now designates collective work days called by the Village Chairman to accomplish specific community projects. The Peanut and Grain Cooperative with about 25 members is another form of collective investment using funds received from non-Belizean NGOs and from the Belizean Federation of Associated Cooperatives to purchase machinery and to provide loan capital for members (Carroo 1987; Harpold et. al. 1990; Re. Tzib 1994, pers. com.). Most agricultural investment, however, is left to individual households to make on their own leased land or to the national government for public works when funding and political will is available.\(^{32}\)

\(^{31}\) "Livelihood is defined as adequate stocks and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance of enhancement of resource productivity on a long-term basis. A household may be enabled to gain sustainable livelihood security in many ways - through ownership of land, livestock or trees, rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertoires of activities (Food 2000. 1987:3)." (from Chambers 1988: 9-10, emphasis added)
Peasants are generally risk-aversive in their investment patterns, tending to adopt new technology and methods of agricultural intensification only after community leaders have adopted them or by piecemeal adaptation of traditional practices to more modern ones. According to Village Chairman don Felix Tzib (personal communication), Mayan villagers of San Antonio (Cayo) have crossed imported short-season sweet corn with local indigenous varieties. Imported sweet corn, whose sweetness may sell for extremely high prices if sold in a timely manner, suffers the disadvantage of storing poorly in the Belizean heat if not sold as "green" (fresh) corn, a source of risk and loss in glut years for local farmers. The local indigenous variety is larger, slower growing, and susceptible to windthrow but stores without a fungus problem. Thus local farmers are improvising a new variety in an attempt to reduce risk yet take advantage the strengths and markets of each species. The introduction of agro-chemical inputs and of new African star grass varieties for cattle pastures have been pioneered by the area's largest landowners and the PGC are slowly being adopted by area farmers in San Antonio. The capital accumulation that accompanies successful risk gambles is found commonly as a goal of small peasant farmers.

The degree of acceptance of risk among peasant households is not the same for all households. Ample research of patterns of income distribution and land tenure has shown

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San Antonio residents tell the following story about public investment in the electrical system in the village. Twice in the years preceding the coming of electricity to town in 1992, the people of San Antonio went to the mountains, cut electrical poles, and erected them along the streets in anticipation of government fulfilling political promises to bring electricity to the village. Twice they were cut down for firewood when those promises proved to be hollow. One pole remains standing by the Catholic Church in symbolic memory to the collective investment on the part of residents. Residents who live along the San Antonio Road still await electricity with poles erected. Skepticism of government promises and politics runs deep in San Antonio for good reason.
that peasant communities are highly differentiated social structures (Chambers 1988; Belsky 1993). This differentiation is based on amount and quality of land farmed, the level of diversification of production (and hence market flexibility), the scale or production and use of technological inputs, availability of risk capital, the age and characterization of a household in terms of lifecycle, unequal food security, mobility and access to transportation, and household credit opportunities.

**Differentiation in San Antonio Landholdings**

My study suggests a differentiated land ownership pattern in San Antonio. The average reported ownership holding was above 48 acres while the average lease holding was around 35 acres. (Belize uses the acre rather than the hectare measure). Just four land owners held 55% of the reported private land holdings. If they are removed from the survey the average size of the private ownership holding falls to 27 acres. This is just below the 30 acre level that Belize has set as a goal for small farms (Hartshorn et. al. 1984) - a goal in accordance with local perceptions of a necessary farm size (R. Tzib, personal communication).33 Nearly 44% of those holding lease land rented more than 35 acres of land with an average of 52 acres per leasehold while the remaining 56% averaged leasehold sizes of 22 acres, suggesting that more than half of the leasehold farms may be below the size needed for farm self-sufficiency. About 54% of reporting households had

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33 Glaser (1992) recommends a minimum of 20 acres per family but suggests that where land scarcity or the need to protect forest habitat is especially acute, ten acres and supplemental non-farm income might be a better social goal. The idea of supplemental income is especially important for forest conservation interests as supplemental income activities such as nontimber forest product collection can serve both for household income and as a forest conservation practice (Belsky 1993).
less than ten acres of farmland or no land at all, certainly indicating the need for non-farm employment in the support of household sustainability. The overall average size of the 103 households reporting land ownership or leasing was 38 acres.

These figures, which illustrate San Antonio's farming dependency and relative farm size differential, clearly do not tell the whole tenure story. San Antonio's second largest landowning and cattle ranching family, with 500 acres, is not included in the statistics due to sampling problems. Including them here, only five families report controlling more than one hundred acres of land - two control 500 acres and 600 acres respectively, one 181 acres, and the other two just over one hundred. These large ranch/farms tend to be shared with extended families and may include joint control by several closely related families.

Intermittent heavy rains in July and throughout the fall and winter and the hard work of local farmers has made San Antonio well-known for its productivity (Thompson 1994, pers. com.). Peanuts are marketed both in Belize's largest cities by village merchants and through the Peanut and Grain Cooperative and its association with the Belizean Federation of Associated Cooperatives (BFAC) to Barbados and other Caribbean markets. Moberg (1992) states that peanuts are the one crop that has rivaled citrus in Belize for profitability per acre, but national peanut production has been inconsistent and affected by climatic conditions and his claim may be somewhat overstated. Farmers in San Antonio have not profited enough to own pick-up trucks and it is the merchants who seem to have reaped the benefits of the peanut's success. Low gross profit margins for peanuts (King et al.
1993) might be improved by recent plantings of larger Virginia peanuts imported from the states and planted in the area in May of 1994. Watermelon is a consistent producer in San Antonio (if cattle, horses, and tapir are successfully kept out) and brings consistent prices except during glut years. Corn is only rarely used domestically as a food source, though it is retained as subsistence security and as poultry feed. Most is sold locally to one of four pig farms or on the feed market in San Ignacio. For the most part, small farmers seem to believe that agriculture is still a healthy and profitable business, but blame the dry season and financial debts accruing to the penetration of the money economy as the reason for not advancing economically.

An interesting point can be made between the relationship of tenure and land productivity in San Antonio. Like most of Central America, cattle are perceived as an agricultural goal due the possibility of rapid conversion to large capital sums when mature (valued at almost BZ$1000 per animal). The disadvantages of high cattle production costs from herd purchase, veterinarian bills, fence construction and repair, water development, compensation payments to neighbors whose subsistence and commercial crops may be damaged by marauding cattle, and gradual range degradation common to the tropics (de Janvry et al. 1989) are often overlooked by eager local farmers. Success, however, appears to have a direct relationship to land ownership. The direct relationship between farm size and successful cattle ranching is readily evident in San Antonio.

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34 See Barraclough 1973, de Janvry et. al. 1989, and Prostermann and Reidinger 1990 for discussions on farm size and productivity. Essentially they concur that small, even marginal farms in Central America have outproduced large farms due to high labor investment and low input investment per acre and because of increased yields through intercropping.
Only nine households reported owning commercial animals in the San Antonio survey out of 65 reporting (13.8%) and two of these were commercial pig farms that bought rather than grew feed for their animals. Of the nine, five were associated with holdings of over 100 acres, one of 75 acres and one of 60 acres. Thus only two farms reported cattle on acreage of 30 acres or less, with one possessing only 4 head. Cattle provide a source of cash security for peasant farmers and represent a high level of capital accumulation. Local farmers told me that a herd of only 12-15 animals was barely self-sustaining and that a herd of nearly 30 animals was needed to make consistent money selling cattle (F. Tzib, personal communication). Using a figure taken from Costa Rica, 3 acres of fresh pasture land or 7 acres of old deteriorated pasture land is needed per head of cattle in the tropics (Forest Historical Society 1992). Local farmers reported the need to rotate cattle from area to area estimating the need from between two and five acres per head of cattle (F. Tzib; A. Tzul; E. Tzib, pers. com.) Since most pasture land in the San Antonio area is old, it can be assumed that it takes 60-85 acres to maintain a self-sustaining herd and around 150-200 acres for profitable cattle ranching. Only two farms fit this size in the area.

Based on land tenure relations, profitable cattle raising does not seem to be a sustainable or equitable method of agricultural intensification in the San Antonio area, though pasture improvement might increase herd size per area and permit smaller sized profitable ranches (at 3 acres/head, 70 acres might suffice for a sustainable and profitable

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35 In his 1987 report to HIVOS (the Humanistic Institute for Cooperation with Developing Countries) on the progress of the San Antonio Peanut and Grain Cooperative, Winston Carroo suggests for intensification possibilities for the cooperative: cattle, citrus, coffee, and cacao.
herd - eleven reporting farms meet that limitation). Many years ago the USAID and the government of Belize developed a pasture demonstration project to the northeast of San Antonio using five types of zacate grasses in efforts to encourage methods of enriching pasture land for cattle. "The Mayans don't like zacate," a local pig farmer told me, "because cattle and pigs won't eat it much. They prefer to use Guinea grass or faragua." Guinea grass is a two foot tall wetter site grass used to fatten cattle but not common in local pastures. A second type of grass introduction, this one being currently supported by a few local cattle ranchers and the cattle association, is a form of African star grass that can be transplanted by simply pulling up roots and shoving them underground in new locations. The largest cattle rancher in the area swears by the African star grass which is practically indestructible and soon dominates the vegetative landscape, providing even dry season forage. However, I witnessed African grass that had been planted on a hill above productive bottomland which had spread rapidly into the crop soil. The farmer complained that even following mechanical plowing, nothing would germinate or grow on the ground because of the grass. There should be a cautionary note added to its introduction not to plant African grass near cultivable areas.

A second restriction on the expansion of cattle ranching is the availability of water. Until 1968, San Antonio only had five cattle operations, all with less than 15 head of cattle. The establishment of artificial ponds (rainwater catchments) and the development of a few springs allowed the expansion of cattle to 22 ranchers and 350 total head by 1992

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36 This grass is being used only by a few area ranchers. Whether it will maintain its productivity with time has not been demonstrated.
(Tzul 1993) although my study indicates that these numbers have dwindled in the intervening years. The question of water availability returns time and time again as one of the major restrictions on agricultural expansion and intensification. Possibly the drilling of wells and the installation of gas pumps might permit greater land area to be converted to pasture.

If a small farm family has members capable of supporting intensification investment through outside income, a family may be encouraged to take intensification risks. Landless and tenant households often lack access to credit and therefore lack risk opportunity even if they would pursue investment. Low wages and real wage declines in the 1980s due to the international recession, estimated at 6%, and persistent rural poverty (62%) in rural Latin America (de Janvry et al. 1989) severely limits peasant household investment patterns (Moberg 1991). San Antonio residents have participated extensively in outside income generating activities, beginning with work in the woods and in the sawmills in the Mountain Pine Ridge area in the 1950s. Today, 92 households or 45% of all village households report having outside employment income, the majority being employment in marketing, with the Forest Department or with tourist resorts near the MPRFR. Of these, just under half report owning or leasing land in the surrounding area with an average holding of 41 acres, fairly close to the San Antonio average. Households with out-of-household income cultivate 29% of their land with annual crops as compared to a village average of 27.3% (Clark 1994). This would seem to indicate that outside employment is not a factor in land use productivity, although in many cases
out-of-household income permits investment in the hiring of seasonal agricultural laborers for clearing, planting, and harvesting.

Risk and National Government Policies

A peasant's relationship to the government agencies which control titling practices and entitlement policies is fundamental to security issues. The peasant is at a decided disadvantage in titling procedures. National governments, as in Belize, are responsible for granting formal fee-simple ownership titles to peasants who have demonstrated usufructuary rights through land clearing, fence and building construction, annual cropping or the planting of perennial crops. The centralized political authority in charge of granting and adjudicating titles (the Lands and Survey Department in Belize), is usually distant from rural crop lands, maintaining surveying and titling procedures that take years to negotiate. Often states grant titles or expedite land surveys as a means to support national economic development priorities rather than to assist the security and agricultural investments of small farmers. Faced with burdensome international debts and the need for export earnings, Third World governments commonly illustrate more sympathy to settling large corporate farms or to forest conversion to pasture than attending the rather expensive surveying and titling procedures for small household farmers (Bolland 1986; Moberg 1992). The possibility of political corruption in the granting of formal titles, or if not corruption then at least abrupt changes in national development policies during governmental party transitions, is a source of insecurity of real importance to peasants in remote areas of little political influence (Chambers 1988; Pearce and Warford 1993).
The granting of private title and ownership, however, is not always the same as gaining control of the land. Many resources, such as trees of commercial timber size, minerals, and precious metals Belize, are reserved by the state even during titling. Continual improvement maintenance is a prerequisite for holding land in Belize, even after purchase, and sixty-six foot wide riparian strips are expressly protected from development. On the other hand, without formal titles and the credit worthiness it bestows on a peasant, peasants needing to intensify agriculture to remain competitive may be forced to borrow heavily on extremely costly informal credit markets and thereby worsen their competitive position (Pearce and Warford 1993). In Belize, surveyed leasehold land (see map in Appendix 2) is available for use as collateral (FPMP 1993). Informal credit markets persist in San Antonio where farmers agree to exclusively sell peanuts to individuals granting loans to area farmers, often at a price actually higher than that offered by the Belize Federation of Associated Cooperatives and the PGC. The PGC maintains credit with the BFAC and offers loans for seed, fertilizer and tractor services to its own members and to the community at large. The last Belizean government under the People's Unity Party opened a series of Small Business and Farmers Banks capitalized by a combination of government funds and small farmer stock purchases which operated for a year and a half to the benefit of local San Antonio farmers. However, structural adjustment policies shut the bank down in 1992 in the middle of the growing season, catching local farmers with outstanding loans from greatly expanded purchases of seeds

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37 Easements to permit development within the 66 foot riparian zone have been given to ecotourism developments in the Mountain Pine Ridge Forest Reserve (personal observation) and in other areas of Belize such as the coastal village of Hopkins (Palacio 1995, pers. com.).
and tractor services but in need of additional funds for fertilizer, harvest and marketing. Many farmers lost a bundle and are now risk shy given the past uneven levels of government support. Furthermore, local investors in the bank have been unable to determine the location of their investment capital in the bank and may have lost that as well (A. Mai, pers. com.).

For tenants lacking secure formal titles or tenure security, investment that cannot be recouped within one year or sometimes even one growing season often is not pursued except under conditions of land pressure (Boserup 1965). Many agroforestry perennial crops and reforestation efforts are virtually impossible under systems of insecure land tenure (Bruce and Fortmann 1992) due to long rotation periods (15-50 years). However, short term leases do not necessarily discourage agricultural investment. Cheung (1969) believes that "insecurity, although undesirable for the tenant, may provide a stimulus to farming activity" (p. 80). He states that research in Asia indicates that production per hectare is nearly equal on lands with long or short term leases, with long term leases reducing the transaction costs involved in leasing while short term leases permit lower enforcement costs and renegotiation allows tenants with insufficient experience or knowledge to improve their position in later negotiations.

Colonization of Forest Land and the San Antonio Peanut and Grain Cooperative

Colonization of forested land presents a host or risks to peasants, government, and the environment due to the low level of existing governmental authority and services in remote settlement areas. Operation under usufruct tenure title security drives peasants to
give priority to activities (i.e., deforestation) that clearly increase one's usufruct claims to the land regardless of landform, soil type, or political policy governing forested lands. The possibility of public sector expropriation, particularly for forest reserves, parks, and biodiversity protection, combines with the remoteness of government institutions and general marginal soil fertility to produce extensive title conflicts and environmental degradation in areas of on-going forest conversion and colonization. Colonization is often driven by population growth, impoverishment, scarcity of land, fluctuating non-farm employment opportunities and the creation of national reserves.

"In such areas, as populations grow and common property resources are appropriated, agriculture becomes more intensive, and for time at least, less sustainable as fallows shorten and/or livestock become more numerous. Core invasions and pressures, appropriations and exclusions by government and by the urban and rural rich, declining biological productivity, and rising human populations drive many of the poorer people to migrate. This they do either seasonally or permanently, some to cities and towns, some to areas of green revolution agriculture, and some to forests, savannas, steep-slopes, flood-prone flatlands and other vulnerable or marginal areas. In these areas they may adopt sustainable forms of cultivation and pastoralism, but more often cannot, hindered and discouraged as they are by insecure tenure, lack of appropriate technology, and poverty." (Chambers 1988: 4)

Land titling in colonization areas usually follows the stages of the exploration and filing of initial claims, farm consolidation and the establishment of usufruct rights, the intensification and development of agriculture, and formal land titling (Jones 1990). Due to the lack of the presence of governmental authority in areas of colonization, titling presents specific problems in such areas. Many titles are never formalized due to costs and difficulties in reaching distant titling offices and titles are passed on through informal written titles that establish usufruct lineage. These informal transfer titles often lead to
competing claims that are difficult to resolve. In efforts to limit environmental
degradation and to encourage equitable land distribution, many settlement schemes are
designed with acreage limits to limit ownership and consolidation. The proposed PGC
leasehold in the MPRFR is 1000 acres with the provision that only 400 acres of flat land
can be farmed but lacks an impaired right provision against land consolidation.

Maintaining limitations on title rights is difficult due to the passage of many informal titles
to single persons and the lack of impaired right easements that limit the sale of property to
others. Even where regulations exist, wealthy owners are able to gain control of
additional land by titling it in the names of children and relatives, and cases of hiring
farmers to colonize land to be sold to a prospective rancher and of 'predatory' burning
have been documented in Central America (Collins 1986; Schwartzman 1987; Jones
1990). I did not document such cases in San Antonio.

Poor peasant management by non-native migrants has been a serious problem in areas
undergoing deforestation and conversion to agricultural land or pastures:

"Intensification of shifting cultivation, a frontier attitude toward new lands that leads to
an ongoing pattern of exploitation and abandonment of fields, and failure to consider the
long-term effects of cultivation practices are all problems that have been attributed to
small farm colonists in new settlement areas... Moran found that most of the problems
that colonists encountered were related not to their own poor resources or inability to
sustain yields, but to their own poor management practices and an inattentiveness on the
part of government agencies and other institutions to the local realities of the
colonization context." (Collins 1986: 2)

Collins found significant patterns of interaction between the social context of colonization
activity, small producer decisions, and environmental degradation. Tax incentives and
subsidies often support forest conversion to pasture which remains the greatest serious threat to forest habitat in the neotropics. Business-based development such as road construction for commercial timber extraction and mining is a major watershed and deforestation problem, and infrastructure road construction for business purposes opens areas to the advancing colonization frontier, threatening biodiversity that relies on secure forest habitat (Plumwood and Routley 1982; Noss 1987, 1989, and 1990). In some cases, the weakening of indigenous institutions at the edge of the agricultural/forest interface has resulted in power being handed to corrupt politicians and special interest minded forest officials and contractors who have protected the forests less than most indigenous communities might have (Chambers 1988; Pearce and Warford 1993). This has not been the case of the Mountain Pine Ridge Forest Reserve which has a reputation for being one of Central America's better managed reserves. Blame for the degradation of forests and the conversion of forest to cleared agricultural land, then, is highly site specific; most documented cases of rapid forest conversion in Belize and the rest of Central America have resulted from outside speculation (timber concessions, ranchers and tourism), from agribusiness plantation expansion, and from immigration of non-native colonos or refugees rather than from the practices of sedentary indigenous or peasant populations. Sedentary

38 "Inadequate forest policy and management are often abetted by misguided agricultural policy. Many countries actively encourage the conversion of tropical forests to other uses. Rules of land tenure in many states, such as Sabah, allow private parties to obtain title to forested land by showing evidence of 'improving' it - by clearing away the trees, for example. In the Philippines, Brazil and elsewhere, recognized rights of occupancy or possession are awarded on the basis of the area of land cleared. Such provisions often become a mechanism for privatizing land from the public forest estate. Those who obtain ownership soon sell out to larger capitalists, who consolidate the land to establish private ranches and accumulate speculative holdings." (Repetto 1990: 41) See also K.D. Singh's (1993) comparative analysis of ten-year FAO data for more information entitled "The 1990 tropical forest resources assessment," Unasylva, Vol.44, No. 174, pp. 10-19.
peasant cultures commonly respond to population pressures and land scarcity primarily through the intensification of agriculture (Boserup 1965; Cornista and Escueta 1990), but not always with the conservation of forest and forest resources.

In the case of San Antonio, continued land colonization since 1964 has not left government analysts confident that forest resources and agricultural land are being adequately protected. An early USAID document on deforestation in Belize reported that "[e]xtensively deforested areas are few in Belize: Mennonite farming communities in the northwest; sugar cane lands in the north; and traditional Indian areas of milpa farming in the west [near San Antonio and Succotz] and the south." (Hartshorn et. al., 1984:98) Preliminary investigation of land use intensification in the San Antonio area, performed by the NARMAP for the Forest Planning and Management Project, characterized the area like this:

Observations [of NARMAP reconnaissance flight]: Area north of San Antonio is being extensively farmed. Most of the lands are on hilly or rolling topography. Land pressure is relatively intense. Topography and land use dictate a need to introduce and promote conservation practices that will encourage sustainable framing of these lands. If action is not taken these lands will be degraded by intense cropping to the point that they will be abandoned. As a result more lands will be needed to support the farming community. This process has already been initiated as the San Antonio Small Grains and Peanut Cooperative has requested and received lands in the Pine Ridge Forest Reserve.

Farming activity has been initiated by the cooperative. Lands have been cleared in the lower regions. The amount of land cleared is in excess of 100 A. The total area leased to the cooperative is 1000 A and approximately 400A is valley bottom lands. Very little clearing can be observed on the hillsides. (Nolan, NARMAP, December 20, 1993)

For those concerned with forest protection, the colonization efforts by the San Antonio Peanut and Grain Cooperative of land within the Mountain Pine Ridge Forest Reserve (see map in Appendix 2) present two distributional issues related to land tenure.
The first is whether title transfer to the PGC will benefit land needs of the community, particularly those of landless young families needing leasehold land for their own, and thereby reduce local forest conversion pressures. The second concerns future tenure expectations for land in question and whether privatization and the loss of government control over development processes is probable.

The Intensification of Agriculture - Household Investment and Appropriate Technology

The modeling of agricultural development and the reasoning behind peasant adoption of increasingly intensified cultivation techniques has been pursued along a variety of paths. Conklin (1957), Boserup (1965), Wolf (1966) and other cultural analysts have taken an historical approach of attempting to follow cultivation patterns from extensive shifting cultivation with long fallow periods to highly intensified multi-cropping with little or no fallow. Economic theorists have preferred to view intensification as the inevitable product of linear technical advancement and of market driven adaptation to meet the needs of colonial, domestic, or international demand (see Eicher and Staatz 1984 for a summary of the ideas of Prebish, Singer, Johnston, Hirschman, and Schultz). Modernization theorists stressed modernity as the root to technological development - the change of attitude toward modern values of hard work, efficiency, individualism, and entrepreneurship.39 On the other hand, other analysts chose to study the history and livelihoods of peasants themselves and to base models on peasant practices. Popkin (1979) saw peasants

39 "With ... an understanding of traditional social structure, economy, and culture, one could anticipate the changes needed to bring about a shift to modern forms and chart a course." (Russell and Nicholson 1981: 17 on modernization) For more reading on modernization see the works of Henri Aujac, Alex Inkeles, and neo-liberal works by Milton Friedman.
adopting new technology as a rational household peasant survival strategy, while Boserup believed that intensification is rare without the prerequisite of population growth to supply additional labor for intensification.

The various models, while providing useful frameworks for analysis, break down on micro-inspection of conditions near San Antonio where the coexistence of agricultural systems represents a common modeling dilemma. Near the agricultural/forest interface, a differentiated peasantry farms with a variety of techniques under the constraints of mixed and sometimes unclear tenurial relations. Larger land owners and flat-land cultivators use machinery and agrochemical inputs on securely titled or leased land. More marginal farmers still practice shifting cultivation on hillsides and poor ground to the west and north of the village. Distant commercial farms and orchards hire local labor to irrigate and harvest plantations. Migrants and refugees may be found squatting on private and state land in large numbers not far from the village. The lack of consistent ownership patterns provide a cautionary note to the use of agricultural development models as descriptions of conditions near San Antonio without rejecting their conclusions outright.

Boserup (1965) describes intensification in terms of the five staged process of continual reduction of fallow periods - forest fallow, bush fallow, short fallow, annual cropping and multicropping. Both of the long fallow systems, forest and bush fallow, are forms of shifting cultivation which use slash and burn clearing techniques, one or two year cropping use, and then extended rotation back to natural vegetation. Gradual conversion to fire resistant grasses occurs when fallow periods decrease following increases in food
demand and land scarcity resulting from population growth and ecological degradation. Peasant communities face forced abandonment of cultivation areas for new ground or need the invention of cultivation tools to turn sod (the plow). Plowing in turn leads to the need to pasture work animals or to grow fodder crops in rotation with food crops and the eventual development of multi-cropping within the year or to permanent crops (Boserup 1965). Wolf (1966) divides the fallow cycle as a four staged process of long fallow, sectoral fallow, short fallow, and permanent crops, though essentially with the same almost linear historical development pattern.

Forest fallow rotations are characteristically 20-30 years long (Boserup 1965; Clay 1988) while in bush fallow (known in Belize as wamil or guamil) rotations persist 6-15 years in duration. Scientific evidence indicates that long fallow periods characteristic of tropical indigenous cultivation systems are substantially long enough to maintain soil fertility (Arnason et al. 1982; Baker 1984). Short cultivation periods are thought to result from weed invasion rather than to soil fertility losses (Kellman and Adams 1970). As fallow periods decline in length due to population pressures, soil fertility is maintained by the application of manure, crop rotations, and later agrochemical inputs. Tools, too, are associated with the various cultivation systems. Long fallow farmers use digging sticks and possibly hoes, the need to weed leads short fallow farmers to use hoes and

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40 Arnason et. al. 1982 report that on agricultural lands nearby the Masewal village of Succotz in Belize which have been farmed for nearly 100 years, the present cultivation system of ten year fallow periods following two years of harvest are not long enough to restore adequate soil phosphorus levels between cropping periods. They calculate that a 17.9 year fallow period would be required to maintain original fertility but that, with current levels of soil degradation, even longer fallow periods are currently needed for restoration of soil quality. They suggest that non-traditional intercropping with phosphorus mobilizing plants may assist a more rapid soil reconditioning.
plows, and annual cropping is associated with mechanical farming and irrigation. Thus intensification implies not only the shortening of fallow times, but changes in fertilizer type and application rates, tool use, input labor needs, and capital investment input per crop.

Boserup makes the claim that intensification technology is a result of growing populations and that without increasing the pressure on land caused by high population density, there is little incentive for peasants to adopt intensification techniques. This assumption arises from the finding that intensification generally raises, rather than lowers, labor demands per hectare and only if there is sufficient labor availability will peasants make the choice to invest in intensification (Boserup 1965; Raintree and Warner 1987). While many cases have been studied to support Boserup's population-push theory, it has been criticized as failing to recognize the role of ecological factors, market and price incentives and constraints, and political factors that also encourage or discourage agrarian investment (Padoch 1985; Collins 1986; Jones 1990). Padoch (1985) found that indigenous rice cultivators in Kalimantan, Indonesia, adopted irrigated rice cultivation in spite of heavier work loads due to climatic risk of dryland rice, accepting intensified agriculture in spite of low population density due to rational risk-reducing calculation. She also found that village households facing the same population pressures adopt intensification practices at different rates implying that other social institutions may be of more central character, especially in the short term. Jones points out that even after adequate knowledge is understood and available about intensification, peasants will persist in old ways if they use cheaper input requirements.
For Wolf (1966) adoption of agricultural intensification techniques represent a delicate balance between peasant needs to continue subsistence, replacement, and ceremonial funds around which customary life was centered and the intrusion of rational economic markets. With substantial surpluses to guarantee the needs of the various customary practices and self-sufficiency, the peasant would adapt technology to produce specialized commodity crops for market production.

Boserup raises some rather interesting points, particularly her theory that agricultural intensification brings a diminishing return on labor input (i.e., increases labor/hectare needs). Intensification is associated not only with changes in fallow but with changes of actual plant types cropped. This, in turn, changes seasonal work patterns and possibly leads to a loss of idle seasons, introduces weeding as a major labor requirement, and brings a gradual lengthening of the work day. Irrigation brings particularly large shifts in labor patterns with its requirements for off-season irrigation system maintenance, need for public investment (often a non-farm wage requirement), transplanting, and weeding. Barraclough reports that as farms increase in size, generally associated with mechanical intensification, labor needs per hectare also increase. Both growing complexity in the division of labor and increases in non-agricultural production are associated with population density increases and lend support to Boserup's diminishing labor return theory of intensification.

Intensification processes can be understood by a discussion of inputs, production, and outputs. Inputs include land, labor, finances, technology, and knowledge. Unless inputs
are priced low enough and unless households feel secure enough in their livelihoods, the likelihood of investing in intensification is low. Inputs can be either labor saving or land saving. Boserup maintains that labor saving development in times of rapid population growth and labor surpluses is inappropriate technology, a thought echoed by a host of development experts faced with the failure of the Green Revolution to substantially alleviate rural poverty and unemployment in Latin America (de Janvry et al. 1989; Pearce and Warford 1990). The rapid adoption of mechanical cultivation and herbicide applications in San Antonio aimed at increasing household profitability and agricultural productivity for a modern commodity market might be seen as an inappropriate technology that exacerbates population and land scarcity pressures and which reduces employment opportunities. Land saving inputs increase the output/area and total output of a region.

The application of appropriate production technology (based on labor availability, levels of financial and political support, and peasant knowledge and organizational skills, and what seems 'appropriate' to peasant beliefs) is designed to produce differential advantages in the sphere of production through diversification of production, improvement of the economies of scale (land consolidation, collective purchase of inputs), and optimum land utilization. Receptivity to appropriate technology is a function of farm characteristics and cultural context (Raintree and Warner 1986). Variation in productive units by size, off-farm income potential, farm earning capability, land tenure, herd size, accumulation capacity, and level of previous savings and investment (Watts 1987) affect
how individual productive units accept offered technology. Previous experience with the type of technology also may determine the ability to accept or speed of acceptance of a particular form of technology such as irrigation or leguminous intercropping.

Output intensification can be direct, such as covering market roads with all-season surfaces, or indirect such as policies that provide incentives for private construction of export facilities and the like. Three examples for the need of market roads were found in San Antonio. Individuals with land-locked unsurveyed plots complained that access to and from their lands were being limited by adjacent private owners. Leaseholders of the subdivided Maya Ranch lands complained that fall rains made the access roads impassable for crop removal and that this had resulted in much of last year's peanut harvest in the area spoiling. Finally, the PGC is demanding road and access improvement into the proposed lease lands within the Mountain Pine Ridge Forest Reserve along the Blancaneau Road, threatening to improve it themselves if need be.

San Antonio Farming Practices and Acceptance of Agricultural Intensification

San Antonio farmers have used multi-cropping (more than one crop per year) for years in the practice of milpa shifting cultivation. The climate is conducive to double cropping a primary crop in June and a secondary crop (*matahambre*) in December that must mature during the early stages of dry season. The farmers traditionally intercrop squash and yams with their com, raising beans as well during the matahambre cycle. The villagers deforested much of the flatter arable land around the village to create cattle
pasture grasslands and only the introduction of tractor plowing has made the conversion to multi-cropping commercial production possible in recent years. The soil requires heavy agrochemical input for fertility as the natural nutrient cycle of leaf litter incorporation was interrupted by thorough tree removal. No virgin forest exists in the San Antonio flatlands. Herbicides (particularly Gramazone sold as Paraquat in the U.S.) and machetes rather than hoes are used to clear weeds.

Only a few orchards exist in the area, one showing yellowing from chlorosis, possibly a nitrogen deficiency caused by large quantities of natural lime in the soil. (As with other tropical areas, many different combinations of nutrient deficiencies have been found in soils near San Antonio). Other than the planting of fruit trees, particularly lime and native fruits near homes (known as *huertas de casa*), the Masewal expressed little experience with tree planting and tree management in San Antonio was restricted to long-fallow for post and pole growth and the leaving of fire resistant cohune palms in fields for thatch. Several farmers remarked that the soil was inappropriate for citrus, but cooperative members who had experimented with orchard production since 1987 suggested that lack of water resources and costly fertilizer inputs were negative factors inhibiting citrus expansion. The principles behind tree crop production were not widely known and many residents expressed a belief that forestry and agriculture were antagonistic pursuits. This belief has been reinforced by conflicting and non-complementary programs stemming from the Agriculture Department and the

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41 King et al. (1993: 19) label San Antonio soils as AZ Hill Bank Plain soil with the characteristic of "Droughtiness and nutrient imbalance limitations." A thorough study of San Antonio agricultural soils was completed in 1975 (Olson 1975).
Forestry Department over the years

Cover crops are not grown between plantings to restore soil fertility and intercropping legumes was introduced Agriculture Department extension officers for the first time in the summer of 1994 (pers. obs.). Corn is grown both in milpas and in a few instances as a row crop. Crop diversity, whose associated investment risk is high due to high seed costs, the general unavailability of water, and the lack of access to credit, is practiced to a small scale with yams, coco yam, squash, and jicama being planted in small areas for supplemental income. A few growers have experimented with diversifying commercial crops with peppers, tomatoes, okra and bokchoi, but lack of water remains a critical problem for consistent results and production has been unreliable.

The population of San Antonio has more than tripled since 1960, increasing at 4.21% per annum between 1960 and 1990 (1991 Belizean National Census; Tzul 1993). I found a slight population decline between 1990 and 1994, explained locally by the out-migration of youths seeking employment and of families seeking livelihoods in areas with running water. Some signs that San Antonio may face Boserup's population pressures include this acknowledged out-migration, increasing land scarcity as seen by the professed land needs for extended families with land rights to plots just over the subsistence minimums, the fact that 52% of the village households have no land or landholdings significantly below subsistence levels, and the village estimate that 209 town lot sites will be needed in the next ten years to accommodate young families - a projected 100% increase in house structures (Clark 1994). Census statistics concur with

\[ 326,960 \times (1 + X)^{30} = 1126,990, \text{ therefore, } X = 0.0421831 \text{ or } 4.21\%/\text{year} \]
conclusions of increasing village land needs and possible surplus future labor as 23% of the 1126 villagers are between 10 and 19 years of age and 37.5% below ten years of age. The village and national government are at the junction of deciding whether this population will be met by agricultural intensification, outside employment, job diversification and creation, increased out-migration or forest colonization.

The Smallholder Household, Local Agency and Factors Beyond Community Control

In peasant communities, agricultural intensification is clearly linked to socio-economic institutions related to household survival strategies aimed at achieving a sense of security about land tenure, household food security, and community stability. However, these institutions may or may not be directly related to cultivation systems. A peasant's sense of security is rooted in land tenure security that determines investment risk acceptance and serves to underwrite financial credit opportunities, level of situated income in a differentiated community, life cycle level and livelihood survival strategies, and cultural traditions and cultivation experience. But peasant risk decisions are also affected by many non-household determinants. Among the outside influences on peasant investment are environmental and social constraints: the level of development of the farm production sphere, non-farm employment opportunities, intersectoral competition for finance capital, and unrecognized social costs of intensification transformation such as cultural disintegration. Governmental support for competing incentive structures, its willingness to invest in public goods (infrastructure development and the development of complementary government programs), and foreign investment patterns alter the
effectiveness of local agency. As long as the peasant family makes key investment
decisions at the household level, many of the above important factors remain outside of
the household's sphere of influence and consideration, leaving the peasant investor
alienated from the very factors that will determine the success of his/her investment.
Those who discuss land tenure as the basis for secure investment and those who provide
linear development models of cultivation practices clearly miss the point made by
political-economists: successful agricultural development is a multilayered social process.

Those factors that operate beyond the household farm's level of operation I call social
and ecological constraints. Social constraints include the willingness of others to
organize locally (local agency), governmental actions, and public choice and markets.
Ecological constraints include poor tropical soils, tropical storms, and rainfall patterns.

Local agency operates in the sphere of decision-making by involving customs,
actions, organizations, willful public agricultural decisions, and local participation43 in
development decisions. After all,

"[T]he final task of rural development work rests on the shoulders of millions of farmers,
rural households, rural jobless, rural poor many of whom are landless, disadvantaged,
hungry and starved, and a great number of rural artisans and rural shopkeepers, who,
with sweat and toil in the burning sun, blowing windstorms, shivering cold and
torrential tropical rain, bear the burden of the work." (Poostchi 1986: 11-12)

Local organizations such as agricultural cooperatives, conservation NGOs, village
councils, and credit unions serve to share knowledge, pool resources, distribute usufruct
rights, and petition government agencies for financial and political support to local

43 local participation - "empowering people to mobilize their own capacities, be social actors rather
than passive subjects, manage the resources, make decisions, and control the activities that
affect their lives" (Cerne 1985:10 in West 1994:11)
intensification efforts. "There is abundant evidence, contrary to Hardin, on the ability of social groups to design, utilize, and adapt often ingenious mechanisms to allocate use rights among members." (Feeny et al. 1990) Residents of San Antonio have shown the disposition to organize themselves for community betterment (the collection and raising of electrical poles), for religion (the construction of seven churches and a Pentecostal school), and for agricultural organization (the Peanut and Grain Cooperative and buyer and seller mechanisms).

Village and local agency faces both historical and present difficulties in asserting itself, however. Village cohesion in San Antonio has suffered from many of the difficulties recorded in other areas: the individualization of village life, the fostering of privatization of common property lands, the monetization of and growth of consumerism in village life, fluctuations in volatile market, dependency on outside moneylenders and political decision-makers and internal religious and power discrepancies (Blaikie 1985; Hough 1988; Bromley 1991; Wells 1994). The patronage political system of Belize which grants economic benefits to political supporters creates grave fluctuations of public sector support between changes of party regimes. A water system for San Antonio has flown on political winds for years with pipes appearing and disappearing with leadership changes. Factionalism is a stumbling block that stems from political favoritism. Villagers complained that jobs created during the road improvement projects were given to family members of the village chairman at the time. Two attempts at electing a village council in 1994 failed when Pentecostal members refused to participate in 'dirty politics.'
Advantageous access to resources through cooperative membership may prevent effective social organization from taking place on a village-wide level (Moberg 1992). The possibility that internal community dissension will surface if the PGC obtains irrigated land in the Mountain Pine Ridge Forest Reserve is a distinct possibility if the Forest Department decides to draw the line and permit only PGC operations there. The four hundred arable acres in the MPRFR under consideration for allocation can provide minimal subsistence acreage (ignoring commercial desires for the moment) for only 40 families based on Glaser's (1992) 10 acre minimum with supplemental income, no where near the projected household growth in the village (Clark 1994). Open-ended survey questions administered during my survey revealed that the Peanut and Grain Cooperative does not speak for the entire community as many respondents clearly stated their preference to remain independent (see Appendix 4 for summary of open-ended question responses). At a meeting I attended between government officials from the Agricultural and Economic Development Ministries and the PGC held at the Peanut and Grain Cooperative warehouse to discuss water issues, cooperative members, even when pressed about community needs, continued to push for permission to develop water on 'Cooperative' lands in the Mountain Pine Ridge Forest Reserve rather than to address overall community needs. Only the Village Chairman spoke out for the water needs of village residents not present. While not necessarily competing claims, limited investment capital might lead to a choice between either providing water for the village or providing water for the PGC land in the MPRFR.
Because the vast proportion of agricultural development funding passes through the hands of the national governments (Wells 1994), national resource management programs, production incentives, and market manipulations and regulations strongly affect the potential for local agency and investment. In most underdeveloped countries, public underwriting or direct subsidies may be necessary to achieve success in programs concerned with the provision of public goods. Forest conservation, especially when its achievement is tied to the need for agricultural investment in intensification techniques as argued in this thesis, is particularly sensitive to demands on national bodies from competing public projects. National investment falls into three areas: projects, complementary social programs and management.

Project support includes agricultural research and extension services, agroforestry, completion of baseline studies, and the encouragement of the development of local governmental structures such as cooperatives and irrigation boards. On this level, the Agricultural Department is pursuing extension services and trying to encourage village experimentation with the legume known as frijol abono for organic soil fertilization and with village gardens to lessen commodity dependence by individual households (E. Tzib, R. Thompson, pers. com.). Friction exists between extension agents and San Antonio farmers, however, because Agriculture Department officers have historically opposed PGC initiatives to expand landholdings into the Mountain Pine Ridge Forest Reserve without first initiating intensification practices in the San Antonio area. Farmers maintain that without adequate water supplies, intensification is largely a wasted effort.
Complementary programs such as education, health care, and the provision of modernized social services such as electricity and water greatly affect household security and investment practices. In the last five years, the government has provided funding for electricity, all-weather road improvement, and drilled four hand pump wells for the village. With outside NGO financing and Peace Corps volunteer services, village labor built a community health center in the summer of 1994, attesting to growing community security. The building of the health center, however, also produced a crisis that threatened to end the customary tradition of fajina or volunteer public work. For the first time, several community members paid others to represent them during fajina. This angered others who then refused to show up for fajina when it was called by the Village Chairman. Eventually the Chairman persevered and the residents helped pour the concrete floor for the health clinic, though laborers had to be hired to complete the structure. The grumbling was not resolved as the Chairman was unable to secure workers to clean the cemetery and it was eventually trimmed when a local political candidate hired people to clean the grounds (F. Tzib 1994, pers. com.).

Finally, national agencies can assist local agricultural investment by providing planning assistance to make sure projects are of an appropriate scale and direct projects with appropriate land use policies and enforcement procedures. Government can further insure the inclusion of diversified human and natural resources in a project, develop appropriate pricing and incentive supports, and participate in interactive planning and

4 Drinking water in San Antonio has been tested as just barely passing tests for dangerous levels of nitrogen (King et al. 1993) and high calcium levels are above standards limiting danger to kidney stones (Thompson 1994, personal communication).
management with local bodies as a means of empowering and encouraging traditional cultural methodologies (Wells 1994). Yet, water and agricultural development situations in San Antonio have revealed that the state (particularly partisan groups) often lacks the same motivations as local citizens and rarely discloses all of necessary information needed for local decision-making to the San Antonio village council (F. Tzib 1994, pers. com.). Often national governments pursue ex-sector policies and objectives that conflict directly with peasant investment wishes (Barraclough 1973; Blaikie 1985; Moberg 1991; Barry 1994; E. Tzib 1994, pers. com.).

In the planning and management of public investment projects such as large scale agricultural development projects such as irrigation and agroforestry that require changes in customary practices and a commitment to maintenance as well as to construction, public choice initiatives and rural development converge. Public decisions are collective decisions that directly require local input and design to be successful. Russell and Nicholson (1981) point out that local decision-makers are rational self-interested actors seeking labor efficiency and profitability in their participation in public projects. Designing public projects to focus on local goals with immediate pay-offs, maintaining a reasonable scope and size to the project based on local conditions, and timing local inputs to fit seasonal ability and agricultural labor requirements are keys to success (Hough 1988). It is essential, also, that areas of potential pit-falls for public projects be considered by both local and state agencies in project design:

- lack of savings and money;
• lack of trained leadership;
• costly and unrealizable enforcing mechanisms;
• organizational leadership and insurance;
• whether reforms are fixed or variable;
• operation of market mechanisms;
• risk of individuals absconding with public profits;
• how the distribution of benefits will affect a differentiated peasant community.

The view that agricultural intensification is very much a public decision needs to be reconciled with the functional dualism of the peasant household as a subsistence and privatized capitalist enterprise. Development projects that start small and incorporate local institutional building in long term development programs have a much better chance of resulting in higher productivity, better household livelihoods, and more ecologically minded development. For San Antonio, caught between customary Mayan practices and modernization and between rising individualism and the need for integrated collective decision-making, the future path of development is neither clear nor determined.
Chapter 6 Implications of Land Tenure on Farmers' Desires for Irrigation to
Assist Agricultural Intensification in San Antonio

A Village Without Water

In seeking solutions to the conflict between the continuing expansion of village agricultural lands and Forest Department desires to preserve the forests of the Mountain Pine Ridge Forest Reserve for sustained-yield forestry, the Ministry of Agriculture has devoted considerable extension efforts towards increasing productivity on lands currently cleared near the village. Farmers in San Antonio maintain, however, that it is the lack of dry season cropping, not low productivity,⁴⁵ that drives farming household broke as they must assume burdensome debts each spring. Many scoffed at the idea of investing in proposed agricultural programs because those programs, too, would need stable water supplies to guarantee their survival. Because San Antonio farmers feel so strongly that irrigation would be by far and away the best solution to dry season indebtedness, the issue of irrigation and its ties to land tenure institutions are discussed in depth in this chapter. Other agricultural options such as dryland crop rotations and drought tolerant tree crops with seasonal intercropping, and non-farm income generating possibilities such as the collection of non-timber forest products are reserved for the following and final chapter.

⁴⁵ In a personal interview with Dr. Glaser and I over agricultural issues in San Antonio in August of 1994, the Minister of Agriculture acknowledged San Antonio's reputation as a hardworking and highly productive farming community.
When asked during my survey, "What is the major problem facing San Antonio?" every single respondent replied, "Water." San Antonio is rare in that a village of over 1100 agriculturally-based residents has grown on a site with no adequate water supply. When village ancestors settled in San Antonio, two small creeks ran year-round from the dense semi-tropical forest. However, few residents can remember the creeks and San Antonio has survived through the years from two shallow ponds and a series of springs and wells in the surrounding countryside.

A few years ago, upon procuring funds for a community water system from USAID, the Water and Sewage Authority (WASA) attempted to drill a community well in the village, resulting in the development of four wells with handpumps. None had substantial enough flow to support a village system (estimated to need forty gallons per minute for the current population). From early morning until evening during the dry season, every three days, villagers line up at the well sites with as many as thirty plastic buckets waiting their turn to secure a few days' water supply. Households without trucks have to carry water from the wells or pay a driver to haul the water. Some residents prefer to go to the creeks in the Mountain Pine Ridge Forest Reserve where they can bathe, wash laundry, and return with a truck full of domestic water all in one trip. During the wet season life is

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46 When San Antonio residents who have relocated outside of the village to seek outside employment were asked about problems facing San Antonio, they often responded, "Too much religion." This was in reference to the seven Pentecostal churches in and near the village. The rift between Pentecostal and Catholic members is deep. One Pentecostal Peanut and Grain Cooperative member told me that village cooperation was impossible because the non-Christians (i.e. the Catholics called "mundanos" or earthly rather than heavenly people) would not convert and see the world like most of the villagers do. Only one of the Pentecostal churches was willing to work with the Catholic Village Chairman in accomplishing community projects.
easier for those with metal roofs, gutters, and holding tanks who collect and store enough water for a couple of weeks.

Water is the major ecological constraint on agricultural intensification in San Antonio, followed by rocky or degraded soil. Without water, many of the possible intensification schemes proposed to assist San Antonio farmers are unrealizable. The high intensity household and community gardens suggested by the Agricultural Department, aimed at decreasing household reliance on purchased commodities and increasing the labor contribution of women in the farming cycle, rely on dependable water supplies. Women are currently underemployed in the village as past employment opportunities, such as an oriental sewing shop in San Ignacio that employed thirty local women and a women's poultry, cooperative no longer exist. Women find wage-earning work near San Antonio only in the seasonal 'picking' and 'cleaning' of peanuts, a job for which they now have to compete with refugee families who will work for wages lower than those paid just a few years ago (Clark 1994). In some but not all families, women and children help with planting and weeding if the land is nearby the village. Theoretically, local gardens can be highly productive and serve as alternative sources of supplemental household income. However, local markets for diversified produce are small because the traditional Mayan diet is not widely varied and competition for fresh vegetables is already stiff in the nearby urban hub of San Ignacio. Marketing beyond San Ignacio requires access to a truck or the marketing through commercial sellers. It is interesting that in San Antonio almost all the
trucks are owned by store owners and commercial sellers and not by the poor farmers themselves.

Crop diversification is another form of intensification being tried in San Antonio. Tomatoes, bell peppers, okra and bokchoi need water-supported transplanting and labor-intensive care. During years when they have produced well, farmers earned large sums of money from them. However, fungal wilt is a growing problem that threatens to affect future crops (F. Tzib, pers. com.) unless wilt-resistant varieties are introduced. Successful expansion of nursery crops will require the input and expansion of agricultural extension services. Bokchoi, jicama, and exotic vegetables (to the Maya at least) such as broccoli need distant or specialized tourist markets.47

Additionally, without water, the village farmers face a dry spell (February-May) each year when agricultural cropping is impossible. Tied to the money and commodity markets, households must borrow money to cover family subsistence expenses and crop input expenses until the summer crop matures in September and October (M. Balona 1994, pers. com.). Loan repayment and high interest and commodity costs cut deeply into the farmers annual income.48 The 1993 Small Business and Farmers Bank closure

47 It has been said by Rigoberta Menchu, Guatemalan refugee leader who won the Nobel Peace Prize in recent years, that eating the same corn, rice and beans day and night, year after year, is a religious practice for the Maya. If they were to change their diet, their culture would die.

48 Per capita income in Belize is about three times that of other Central American countries. Virtually no farmers in San Antonio could estimate their yearly wages. The PGC continues to struggle with accounting as well. The 1987 objective to "implement bookkeeping sessions so that members can distinguish profit and/or loss being made within the cooperative" was finally achieved in 1994 when a member attended classes offered by the BFAC in accounting. He finished bringing the books of the PGC into order and up to date in the fall of 1994. The slowness in developing systematic bookkeeping in the PGC is an example of the difficulty in establishing new rural institutional frameworks for consistent long-term organizational decision-making.
caused many farmers in San Antonio to default on loans when they were unable to borrow funds to harvest and market expanded crops. The San Antonio farmers need to avoid the annual debt cycle, increasing to year-round production or improving the terms of trade they face in the marketplace. Aware of the price squeeze, several farmers expressed unwillingness to sell through the PGC because of poor prices and the inability to shop around for better terms in markets in Belize. The fact that the PGC could not extend enough loans to the whole community also led farmers to make informal loan arrangements and contracts with various village peanut buyers and sellers outside of the Peanut and Grain Cooperative structure.

Agroforestry, be it the development of citrus groves with intercropping, the planting of multi-purpose traditional use trees like *ramón*, the introduction of leguminous *Leucaena* in alley-cropping, or the planting of hardwoods and shade trees in pastures or as live fences (*cercas vivas*), relies on the use of water to guarantee survival of the trees over the long run. Without both secure land and secure water, poor peasant farmers will not invest in agroforestry programs (Fortmann 1985; Fortmann and Bruce 1992). The Belizean government sent agronomists to Costa Rica to study agroforestry but has not initiated a national program as has neighboring Guatemala (Palma 1993). In fact, the Forestry Department of Belize has no active reforestation program at this time to assist

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*49 In nearby Petén, Guatemala, CARE produced a valuable study on plants and trees traditionally used by area Mayan villages in home gardens ("Diagnostico Participativo Communitario 1993"). From this the program developed an analysis of how agroforestry could be used to increase forest productivity in the vicinity of deforested lands and hence improve community acceptance of reforestation efforts (Palma 1993). Many of these same plants and trees (such as Ramón, *Brosinum allicastrum*) were widely used by the Yucatec Maya of San Antonio (F. Tzib 1994, pers. com.).*
the Agriculture Department in developing an agroforestry program (Revista Forestal Centroamericana 1994, No. 7).

Peanut and Grain Cooperative members see the extension of the growing season through the dry season with irrigated crops as the way to improve the marginality of agricultural profit. This would entail either the intensification of the current two crop season to a three crop or persistent annual cropping pattern on semi-tropical soils of questionable fertility. Or they might increase the acreage under cultivation at a given time above the 25% level now found in the area. For intensification via irrigation to occur, water would have to be brought to the village from a dependable source or new land would have to be found closer to year-round creeks. Because the government has not committed funding to bring water to the village and the agricultural lands near San Antonio, the PGC has chosen to pursue the colonization of forested lands within the Mountain Pine Ridge Forest Reserve near Privassion and Little Vaqueros Creeks in an effort to obtain potentially irrigable land.

To date, the government has emphasized bringing drinking water to the village rather than developing water for irrigation. WASA plans for a tank on the hill in the center of San Antonio, for which funding has already been received, is based on providing water for the needs of 1000 people. As I have shown, the village estimates the need for the construction some 200 new buildings in the next ten years (probably exaggerated) while past population growth rates would project a population by the year 2000 of over 1700 people. Out-migration which is currently holding the population fairly stable would
decline if running water reduced the arduous nature of village life. It can be assumed under current plans that village water will have priority over agricultural water. This has significant bearing on how land tenure and agricultural expectations play into issue.

Social Institutions, Land Tenure and Irrigation

If water is developed and delivered to the village first, the first logical step in agricultural development would be high intensity community gardens, multistoried gardens, and nurseries located in town for transplanting crops to distant fields. These could be either household owned or operate under a form of cooperative membership. Households possessing extra plots or who own farmland very close to the village could be expected to run water lines to their land and to reap the benefits from a village water supply. Women, children, and the landless might obtain economic benefits from employment in the gardens, nurseries, and perhaps in expanding canning, drying, or marketing operations. Reliance on purchased food commodities might drop and household cash surpluses might rise. Individuals with land further from the village would not benefit directly, but might find increased profitability in the transplanting of vegetables started in nurseries if they have a spring on their land or if the transplanting was timed to coincide with the rainy season. Clearly, dry season benefits would accrue only to those with land in the immediate neighborhood of the village. It is doubtful whether cattle ranching would substantially change under a village water system.
A village water system underscores Bromley's points that a property system is a benefit stream and that it can operate only so long as an authority system operating along side of it. In the above case, the benefits flow directly to those who own land near the village. But what happens if a farmer or groups of farmers run water lines off the system and begin to siphon water off for agricultural uses from limited water resources that are needed for village use? Or what happens if there is plenty of water for village and adjacent plots for the first ten years, but village growth begins to demand water resources needed to sustain agricultural investments made in the meantime in expectation of non-diminishing water supplies? From the start, bringing water into an agricultural community such as San Antonio is to invite conflict over the distribution of access to water supplies, over processes for redistributitional practices as other users join the system, over the establishment of guaranteed rights to protect long-term investments, and over future development priorities. A water board to regulate, distribute, and enforce water rights is a necessity even under the most limited water project aimed at supplying only the village with water.

Russell and Nicholson (1981) suggest five considerations in the creation of a water regulatory body:

1) the distribution of water is manipulable and controllable by institutional means;
2) the larger social environment should be systematically connected to the local irrigation system;
3) the role of water management should be articulated in a political system;
4) the physical environment shapes organizational forms in irrigation;
5) success hinges on local control, a reasonable degree of equity, and the ability to exclude others.
The emphasis that success hinges on local control is mirrored in the works of E. Walter Coward, Jr. (1979, 1990) who studied land tenure and customary irrigation systems in India. According to Coward, irrigation systems are anything but static supply systems, requiring constantly changing labor needs by the season based on crop variance, maintenance needs, and policing necessities. Farmers do not need water at the same times, nor do they need constant volumes of water every day implying that water rights may need adjustment as crops rotate through the seasons. Despite this lack of symmetry in their needs, they do, however, share the need to know that a reliable source of water will be available at a given time. The connection between needed water security and village knowledge and understanding of local labor, soil and topographic conditions "are better understood by the relevant decision-makers" and make local control over the irrigation system a necessity (Coward 1990:83).

The organization of irrigation management revolves around three fundamental roles:

1) the organization of water allocation;

2) physical maintenance activities; and

3) conflict management (Coward 1979:29).

The form that that organization will take is derived in part, according to Coward, on the pattern of physical structures for conveying and distributing water which determines labor maintenance needs and on the patterns of land holding or tenure which may determine who will benefit most from the irrigation system. Clearly, if irrigation organization is introduced in a village with functioning customary social institutions such as San Antonio, its form will need to reflect practices as conflict resolution by a Council of Elders and
periodic redistribution of water rights to account for the needs of younger households. Coward warns that the concentration of authority over the distribution of water rights in the hands of national agencies may induce a system water use anarchy in indigenous cultures (Coward 1979).

Potential Irrigation Characteristics in San Antonio

Four water sources have been examined in the search for water for San Antonio: underground supplies with unproven volumes even for village use, the Macal River, Slate Creek, and Privassion Creek. None of the options are great. The latter three are state property resources and each is located between 4 1/2 - 6 miles from San Antonio. The Macal River was the choice of the previous PUP government which bulldozed a road from San Antonio to Macal River and when so far as to purchase pipe for the project. (The apparently was used elsewhere for a competing project when the United Democratic Party [UDP] assumed power in the last national election). This option would require electrical pumping of water from the river over a low pass and then gradually uphill to the village. Slate Creek is considerably smaller, but estimated to hold enough volume for village use. However, it provides water for some private land below where is disappears underground, and there may be water rights complications if large amounts are drawn off for agricultural irrigation. Slate Creek water will need to be ram pumped out of a canyon from where it may be able to be gravity fed to the village. It would have to be piped along the San

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50 I personally visited all three sites while in the village. One field trip was made to Slate Creek and Privassion Creek with cooperative members and representatives of the FPMP and Central Farm.
Antonio road where many villagers live and where the bulk of the agricultural land near San Antonio lies. This would reduce the length of water lines needed for major field irrigation and provide water services to a group of residents who will not receive water under current plans for the underground or Macal River water. No electrical lines exist along the San Antonio road so that in the case that electrical pumping is required to maintain water pressure for irrigation, additional costs will accrue for electrical line placement. Privassion Creek has plenty of water to support any agricultural opportunities with irrigation. Depending on investment capital availability, it could be developed with ram pumps lifting with compressed air, tunnel construction, or through an irrigation ditch. Appendix 2, Map 4 illustrates the various routes and relative distances for each.

Tenure relations remain important if plans are made to extend the irrigation system beyond the confines of the village and its immediate environs. Irrigation requires a significant investment on the part of individuals, communities, and the state in the application of finances, labor and technology to the project. The technologies used to supply, divert, and control water are different from those of applying water to fields, leveling, tilling, planting and harvesting (Freeman and Loudermilk 1981), and it is likely that successful planning will require knowledge from and the education and training of parties on all levels. Because the San Antonio irrigation project will not be one of simple diversion from a creek by trough or pipe to a nearby field, the expense of commencing a project may be well beyond the reach of the San Antonio community. State investment will be necessary to initiate an irrigation project of this size, and the national government
of Belize will likely need to develop a mechanism to recover costs of its investment through the imposition of taxes or rents to the irrigation users. Irrigation is a public investment, involving the creation new institutions such as an irrigation control board, joint operational planning committee, and tax boards and collectors. It is also a private one requiring individuals and households to assume the risk of investment in funding and labor for many years to come.

A few examples emphasize these points. Because Belize recognizes usufruct rights, local farmers need to know how distributional issues will be handled and if they will be designated on a first come, first serve basis. Farms located close to town and wealthier land owners will have a decided advantage if periodic redistribution of water rights is not included from the outset. Water demands and usage varies with time and investors need to know if water redistribution may occur at a later date before making investments. They need to know if the village or the national government will be making that decision. There is evidence that social groups can design, utilize, and adapt ingenious mechanisms for rights distributions (Feeny et al. 1990) and many authors (Bromley 1991) fear that concentrating arbitrary and institutional powers in the hands of national government may render local government powerless to fulfill its expected functions. This clearly happened in the case of land tenure where young families in San Antonio still expect the elders to provide cultivation land even though the authority to do so has passed on to the national government. Some form of co-management of water resources based on local preferences might be the best formation for a water board.
Should irrigation be extended to areas outside the immediate village, surveyed land will become collateral to raise money to pay for irrigation equipment. The Lands and Survey Department should complete the survey of agricultural lands controlled by San Antonio residents prior to initiating an irrigation system to minimize exclusion of particular landholders.

As pipes are laid, property values along the water system can be expected to rise rapidly. In a poor village like San Antonio, a land market can be expected to develop where modified customary rights now dominate. If the transition to an irrigated system is slow, perhaps with irrigation system extensions being paid for by local private investment, a land market might result in the consolidation of ownership by local but wealthier residents, piece by piece. Increasing village differentiation could be expected along with a rise of an extensive paid agricultural labor force. Tenant contracts between individuals and private owners, not currently found in San Antonio, might become necessarily common and would challenge the leasehold and usufruct system. However, if the public investment is made by the national government and the irrigation lines laid extensively over a relatively short period, it is doubtful that local land owners could amass the capital to prevent outside interests from speculating and buying land. Idle leasehold land may become too valuable to leave idle, and an innovative method for distributing this land within the village may be needed to prevent land appropriation by non-villagers.
Other Issues with Irrigation

The penetration of outside interests into San Antonio is clearly of central importance to the maintenance of the Masewal identity, however changed it may be in the modern world. If a goal of development is to solidify local welfare along with the cultural integrity of this Masewal village, special state and local institutions will have to be developed to regulate the land market with the coming higher land values. Perhaps a form of legalized sub-leasing that does not endanger the original leaseholder rights to repossess the land might permit better utilization of land in the irrigated areas.

For the most part, agricultural intensification through irrigation development implies an increase in labor per acre in the production process with the hope of expanding output per acre to a greater degree. Besides the direct investment in labor to construct the irrigation system, there remains the constant need for off-season maintenance and in-season repairs. If pumps are needed, a certain level of technological knowledge is needed and a fund for repairs and back-up facilities to protect planting investment during the dry season mechanical failures is required. Who is to shoulder the labor and financial costs of repairs and maintenance is of concern to the both the community and state seeking to make irrigation investments.

A community based on rainfed cultivation cannot expect to maintain its traditional agricultural patterns under irrigation (Tuma 1965). Under irrigation systems, the patterns of employment and cropping systems tend to change. Foremost is the loss of idle seasons for two reasons: major maintenance is usually done in the off-season and irrigation allows
cropping during periodic dry seasons when previously no work could be done. The question as to whether the San Antonio work force, accustomed to periods of slack time, will step forward to perform the additional labor is of concern to irrigation planners. The Peanut and Grain Cooperative's desire to initiate irrigation activity in the MPRFR indicates that village leaders, at least, are willing to promote year-round agricultural employment. Boserup (1965) maintains that irrigation brings a slowly lengthening work day as well. Crop patterns (and hence annual investment patterns as well) change as irrigation introduces new crops with different peak input needs. Transplanting and weeding become standard labor practices that are ignored under shifting cultivation. These offer the advantage of being seasonally and physically concentrated activities that often fall to women and children and which can, under proper pay scales and institutional arrangements, improve money transfers to segments of the population that are traditionally underemployed or landless.

Boserup maintains that tool development such as hoe use (then plowing) comes with the advent of short fallow cropping. Farmers in San Antonio seem to have skipped a step, going from long fallow shifting cultivation to plowing and the use of herbicides. I saw no sign of the use of hoes in San Antonio as farmers continue to use machetes to cut weeds close to the ground and chemicals to kill them. The indiscriminate and unsafe use of herbicides is common (Clark 1994) and in spite of extension efforts, chemical contamination of water supplies and human use areas remains a concern. Hoes are indispensable for intensive community gardens and nurseries and have been central to
managing irrigated crops throughout the world. Yet they would represent a return to more labor intensive practices to a community already committed to wide-spread herbicide applications.

Cattle ranching may become more profitable, especially if irrigation permits the growing of forage crops on more marginal soils now left idle. This may have negative implications for forest conservation since rockier lands to north and west may become improved pastures for cattle. This might allow another 20% of the local farmers to secure at least a substantial part of their income from the sale of cattle. As land values improve, leasing of pasture may become more profitable. Such a development might seriously quicken the pace of deforestation in the area and in the MPRFR and this development might need to be accompanied by a mandatory program of agroforestry to protect habitat and biological diversity in the area.

From these points one can draw the conclusion that agricultural intensification on the lands near San Antonio, as suggested by the farmers and agricultural extension agents in the area, will introduce significant change to the agricultural lives of San Antonio residents. The success of irrigation will be based on the ability to forge a local-national co-management that has willingness to tackle distributive issues. The establishment of water rights based on a first come, first serve basis will promote greater distributional inequality in the village as farmers near the town and large land owners will be able to take advantage of the water supplies due to proximity and access to credit resources. Without firm local control over operational decisions, internal conflicts similar to current political
divisions caused by village dependency on national political decisions will appear. Irrigation will likely make land too valuable to remain idle, leading to land sales and the sub-leasing of land to people from outside the village given the limited development capital available in the village.

Only a staged development of irrigated agricultural intensification under the tight control of a unified village will be able to maintain the customary traditional Masewal values and accomplish proposed programs of gardens, nurseries, and the increased crop diversity for water-dependent crops. Those customary rights and practices included periodic redistribution of land wealth and active voluntary participation in public works. These principles have not been lost in San Antonio, but they are very much repressed by the acceptance and growing strength of private property rights. Furthermore, political and religious disharmony brought political administration of the village to a standstill in 1994, leaving the village without representatives or a governing body with which the national government could communicate and negotiate. The PGC, the Pentecostal churches, and various political factions in the village participate in politics by developing self-interest-based relationships with the various Ministries in the Belizean government rather than working through their own Village Council. The national political parties have used political patronage in a manner that undermines village council authority and which has prevented the development of village institutions capable of resolving community problems and issues. Ministers have made promises and deals with certain village groups and factions without consulting other Ministers who likely might oppose the proposals.
All of these factors have disrupted village political life. The construction of a water system in San Antonio, with its vital need for social integration for resolution of regulation and distribution issues, is faced with turmoil and division which clearly puts prospects for its potential survival in doubt.
Chapter 7 Conclusion: The Prospects for Forest Protection near San Antonio

The assessment that irrigation possibilities in San Antonio face both organizational and financial roadblocks leads back to the question of colonization pressure on the Mountain Pine Ridge Forest Reserve. At present, lack of intensified and irrigated agriculture, increases in farm household differentiation and population, and the immigration of refugees into Belize are encouraging agricultural expansion into the reserve. What are the likely scenarios for land tenure and land use given past practice and desires of the various parties involved in deciding San Antonio's future? Are there ways to effect agricultural intensification in San Antonio that rely more on individual initiative rather than on collective decision-making and co-management, two organizational components needed for a large irrigation project but in short supply in San Antonio? Would a multilevel program for developing dryland crops, intercropping, and agroforestry for farmers combined with income generating businesses from ecotourism and non-timber forest product collection be a preferred alternative to irrigation?

51 Refugee pressure in the area is also creating pressure on private lands near the Mountain Pine Ridge Forest Reserve. See Bevis (1991) for a proposal on setting up a Private Slate Creek Reserve to protect habitat in an area adjacent to San Antonio and the MPRFR.

52 While beyond the scope of the immediate paper, agroforestry is being adapted throughout Central America as a key element of rural development processes in an effort to slow deforestation and improve campesino respect for forest protection. This is being done through buffer zone management. For further reading on agroforestry see Conway 1985, Raintree and Warner 1986, Van Orsdol 1987, Ong 1991, Palma 1993 and McLarney et al. 1994. For a discussion on buffer zone management see Noss 1990, Green 1993, or Palma 1993. For an analysis of food security and agroforestry acceptance see Belsky 1993.
The management of land tenure and related development issues near San Antonio involve an array of intermingled national authority that makes coordinated decision-making among the government's ministries difficult. The Lands and Survey Department controls the leasing of national land. Recent boundary changes between the MPRFR and the village have opened the steep and highly visible mountainside above San Antonio to colonization and conversion from forest to pastured slopes. Villagers are actively pursuing leasehold contracts with the Lands and Survey Department over land in this area. The dramatic effect of the first large-scale clearcutting of this area in the last couple of years (cut and burned in the last three years by a farmer lacking a formal land lease) indicates that Lands and Survey Department practices may have a large effect on vistas needed to promote ecotourism and may be encouraging losses in soil fertility and erosion on steep slopes. The Lands and Survey Department has been encouraging Peanut and Grain Cooperative initiatives within the MPRFR (Carroo 1987; Harpold et. al. 1990).

The Forest Department continues to oppose the colonization of land within the reserve, preferring its maintenance as as a productive sustained-yield forest to its conversion to agricultural land. On the other hand the Forest Department approved various lease and land use permits to foreign-owned ecotourist facilities. The Forest Department has not participated in discussions with the Agricultural Department on how it can help establish an agroforestry53 program near San Antonio nor has it developed a

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53 agroforestry - "refers to the techniques of either growing trees as a crop or of growing trees and agricultural crops together" (Hyde 1992: 433)

agroforestry - "the planting of useful tree species in conjunction with ground crops or livestock" (Browder 1992: 180)

agroforestry - "a complex system involving numerous interactions among species in relation to physical resources, pest levels and environmental modifications (Baker 1974)" (in Ong 1991: 107)
management program for the hardwood forests of the MPRFR which might include significant economic values for the community in terms of a harvest of non-timber forest products. Prior to my study under the FPMP, the Forest Department had never held any public meetings with the nearby San Antonio community to consider local needs.

The Agriculture Department, whose extension officers have opposed PGC colonization of MPRFR lands and therefore raised the ire of local farmers (E. Tzib 1994, pers. com.), has been slow to introduce non-irrigated forms of agricultural intensification such as dryland crops, cover crops, intercropping, and agroforestry. They confused their role even more in the summer of 1994 when the local extension officer appeared before a village meeting with a political officer who promised the people to bring water to the village and to secure even larger tracts of land within the MPRFR for the PGC and local farmers (E. Tzib, F. Tzib 1994, pers. com.).

Even the Ministry of Economic Development has been caught between political party changes and restructuring programs imposed by international banking institutions, allowing the Small Business and Farmers Bank to flounder in mid-course without protecting the investments of small farmers which were based on loan expectations from the bank. This breakdown of national governmental communication among its own ministries, communication necessary for the formation of broad developmental strategy, and the government’s lack of interest in encouraging direct participation of villagers in policy decisions produce a top-down imposed stagnation on the development of San Antonio.
Before discussing alternatives other than irrigation for reducing colonization pressure on the MPRFR, it is useful to analyze some of the potential scenarios for conservation of the MPRFR hardwood forests given current trends, ideas, and the tenure relationships operating in San Antonio. First, should the Ministries of the national government continue their muddled management of state property in the area, the PGC and other San Antonio residents who no doubt will follow will continue the assumption of MPRFR land under an unclear property rights regime. This will result in inter-ministerial conflict and national-village conflict. Second, the Ministries Agriculture and Natural Resources can draw together and define and enforce the limits of the Mountain Pine Ridge Forest Reserve, either rejecting PGC expansion into the reserve outright or by limiting expansion to the proposed PGC leasehold boundaries, effectively excluding others in the village who are not PGC members but setting established enforceable limits to state land. Third, the government can accept village desires to establish a settlement within the reserve by withdrawing the MPRFR boundary line to a point between the PGC proposed leasehold lands and the pine forest core in the Maya Mountains, thus permitting the colonization of intervening national lands under current lease arrangements. Fourth, the national government can withdraw from the area by establishing a Masewal Indigenous Reserve and leave management of the area as common property under specified group management rights. Or fifth, both the national government and Masewal people could accept the need for forest protection in the MPRFR and the work together to develop a multi-faceted development program that would include accession to agroforestry
management by farmers on lands near San Antonio and the institution of hardwood management within the MPRFR to include economic benefits from forest products for the villagers.

The easiest program for the government is to continue muddling along. Even though the failure to resolve property disputes causes persistent headaches and inter-ministerial problems, it requires little cost and few governmental changes other than acceptance of the gradual loss of the buffer zone\textsuperscript{54} of hardwood forest between San Antonio and the pine forest core of the MPRFR. Ample biological investigation throughout world\textsuperscript{55} would indicate that this area of hardwood forests is the most biologically diverse habitat in the area and the best source of economically valuable non-timber forest products. Habitat losses would ensue from forest fragmentation and increased biological edge effects from pushing the forest/farm frontier to the edge of the pine forests and much deeper up the Macal River. According to the Cayo Conservation Officer, fragmentation has already escalated under government programs to build forest roads through the area and by the government's on-going construction of a dam upriver on the Macal River, (Chen 1994, pers. com.).\textsuperscript{55} Habitat loss has been exacerbated by extensive hunting of wildlife by San

\textsuperscript{54} Gina C. Green, in her presentation workshop on "Working with Communities in Protected Areas" given April 27, 1993, in Belize defined a \textit{buffer zone} as an "area which is managed in such a way that negative influences to the integrity of the conservation area from the boundary inward is reduced to zero." (Green 1993: 4). Buffer zone management is further based on restoration needs from antecedent human-cause degradation from overharvest and the need to restore private as well as reserve lands (Budowski 1994).

\textsuperscript{55} Chen explained that when blasting for the Macal River Dam Project began, rural farmers around distant Succotz began seeing tapirs and rare tropical birds that had disappeared from the area from hunting pressure. He reported than local citizens killed them for food. By the summer of 1994, the project area had been made off-limits to outsiders, even residents of San Antonio, for fear of problems with environmentalists opposed to the project (F. Tzib, pers. com.).
Antonio residents and occasional attempts at shifting cultivation in the MPRFR. Gradual loss of state control to colonization would lead to the loss of the nearly mature hardwood forests of the area to shifting cultivation and probable forest-to-pasture conversion. Unclear property rights would leave the area as an open-access area where forest resources would be under-valued and wasted.

Rejecting PGC claims to reserve land outright seems to be either unenforceable or politically uninviting to the Belizean government. Three previous rejections have been reversed on later review by government Ministers.\(^5\) Limiting access to the MPRFR under secure leasehold rights given to Peanut and Grain Cooperative members only is a holding strategy, one not likely to prevent incursions from non-members in the long-run. The PGC does not represent the entire community (not even the entire farming community) and its twenty-five members are pushing the limits of consensus decision-making (M. Balona and Re. Tzib 1994, pers. com.). The PGC has already subdivided the land it is seeking to gain leasehold rights to in the MPRFR, giving some to subsistence farmers and one plot to a hardworking refugee from Siete Millas. Once successful irrigation is developed in the MPRFR by the cooperative, other farmers can be expected to want to join the effort. However, the cooperative will need to draw a line limiting membership for three reasons. First, the benefits from the opening of reserved land have been achieved through long years of personal work by PGC members. Whether they will extend those benefits to others by limiting their own benefits is doubtful.

\(^5\) In the winter of 1995, the current Belizean government once again reversed policies and evicted the PGC from MPRFR lands for the fourth time in eleven years, citing PGC clearings being made outside of the agreed upon boundaries and failure to adopt NARMAP conservation techniques as the reason behind the decision (Glaser 1995, pers. com.).
Second, the move into the reserve is intended to raise member's household profitability from the marginal subsistence levels achieved on land near San Antonio. This will mean excluding benefits to others simply because of the limited land resources (about 400 arable acres in the MPRFR). Third, organizational demands will limit the size that the cooperative structure can handle. Those excluded from the benefit stream derived from the irrigated PGC lands can be expected to attempt to legally and illegally to try to follow suit on other MPRFR lands.

The third option is to withdraw the MPRFR boundary back to a line close to the pine forest boundary and allow both a permanent settlement in the area and the active colonization of national land under typical lease arrangements. As seen with the land to the east of San Antonio along the San Antonio Road, this will produce relatively rapid leasing and clearing of arable land but will not ensure the efficient utilization of land nor the use of agricultural intensification of arable land. This option would provide secure tenure through leasehold but be tantamount to accepting forest conversion to pasture land. The geography of the MPRFR hardwood forest of gentle slopes and watered valleys is conducive to cattle ranching and might be combined with investment in African grass or faragua to improve pasture quality for increases in herd size.

Two types of semi-regulated development would probably occur under self-regulation and leasehold: large pastures for absentee land holders who live in San Ignacio or San Antonio where livelihood amenities already exist, and subsistence farms of San Antonio residents and foreign refugees, many of whom are approaching the ten year
residency requirement to lease public lands. The development of settlement lands in the reserve would introduce population and growth pressures on the environment, reduce habitat security to a minimum and push the agricultural frontier even deeper into the MPRFR. Leasehold land currently has the highest rate of deforestation in Belize (King et al. 1993), while farmers with leasehold parcels of less than 50 acres usually practice low levels of agricultural intensification. This option provides the least forest protection but deals more effectively with existing San Antonio land distribution problems than the proposal to limit access to MPRFR land to PGC holdings. With this option will come an influx of non-Masewal colonos who may disrupt traditional cultural patterns.

The establishment of Masewal Indigenous Reserve would give control over the hardwood zone between San Antonio and the MPRFR pine forest zone (under national environmental regulations, of course) to a specific interest group. This process would create common property in that it would exclude colonization by refugees and other Belizean citizens and give local control to the "Masewal people." If it could be enforced, this would surely produce a colonization rate much slower than that produced by a state leasehold regime open to everyone.

To work, however, common property regimes must be based on historical traditions and have a definite group of rights holders. They also must have national government support so as to be able to enforce those property rights and to exclude others. As a culture, the Masewal are not just located in San Antonio but throughout northern and

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57 Leased land is being cleared at a rate of 5.9% per year, private lands 3.8% per year, and national land at 0.5% per year, and forest reserves at 0.2% per year.
western Belize. San Antonio is unique in that the native language has not been lost in the village. But clearly, San Antonio residents intermarry with Masewal from other villages and promote cultural events in town and in San Ignacio that bring Masewal and other Maya from many areas. While not impossible, the development of a body to represent and act upon the authority of the Masewal people would require tenacious and sensitive negotiations on the part of the various groups of Masewal. The potential to obtain land potential in the area will likely draw the colonization interests of not only San Antonio citizens but those from out of the area itself. A proposal for a Masewal Indigenous Reserve might also raise vehement opposition voices among other Belizean sectors.

Even with the establishment of a body to regulate the reserve, the acceptance of private property rights as seen in San Antonio (Clark 1994) will erode common property conceptions with time. The fact that, near San Antonio, smallholder indigenous farmers have had historically the greatest deforestation effects (Nolan 1993) will likely produce an Indian Reserve of a fragmented forest at best and a deforested pasture land at worse. There is little reason to believe that indigenous management of the area would produce changes from what is seen near San Antonio, as the operating state leasehold system, already providing inexpensive land security for the farmers, has not produced agricultural intensification. Nor has it limited peasant household differentiation. It takes a leap of faith to believe that a community as divided as San Antonio and whose newly adopted Pentecostal ideas supporting privatization rights would, as Indigenous Reserve managers, do anything other than continue historical farming practices within the reserve.
A Masewal Indigenous Reserve would permit land distribution to young families and to landless village immigrants, resolving a land scarcity need for the immediate future for those willing to travel the long distance into the reserve to farm. Customary practices such as land distribution by the village elders, now only permitted in the distribution of town lots, could be enhanced. A village settlement within the reserve could be expected to develop rapidly as villagers move to be closer to water and to their land. The forest frontier would slowly move deeper into the MPRFR.

Additional village agricultural land may increase the area left idle for long fallow shifting cultivation. This would allow current land holders of tired ground near San Antonio to improve their soil by long fallowing their land through more mature forest stages, thereby improving soil quality as fallow length increases and improving habitat components near the village. Whether long fallow and soil fertility would occur without authoritative conservation mandates is debatable. The history of the tropics is that once developed, population pressures do not allow for the reforestation of land in most cases. Forest reclamation would need to be elevated to a community goal among the Masewal whose experience with reforestation and forestry is nowhere evident around San Antonio.

The final possibility is that state and local co-management of farm and forest resources might diffuse colonization pressures by combining agroforestry projects with irrigated agricultural intensification. Both the national government and the Village Council of San Antonio are fragmented by internal factions and unclear political alliances.
The investment in irrigation and the commitment needed for its maintenance and for long-term agroforestry projects are demands that require far more security than just land title security. Political and social stability, cooperation and dedication to debt repayment, willingness to adjust to new farming techniques and different labor demands, and hard work are the foundations to successful irrigation and agroforestry projects. In San Antonio, farmers have not been exposed to or involved in the practices of forestry and only a few have planted fruit trees on agricultural lands. To find local acceptance, agroforestry programs such as alley cropping, barrier hedges, live tree fences, planting hardwoods for pasture shade, and small home orchards must be fine tuned to the farmers' cultural experience (see Palma [1993] and the Diagnostico Participativo Comunitario [1993] for an enlightened approach). Selective management of wamil (forest fallow portions of agricultural fields) is a useful tool in establishing an understanding of forest practices among farmers and in improving forest utility reasonably rapidly. Successful agroforestry improves both soil structure and community welfare. Difficult to achieve due to site specific requirements, a program of agroforestry in San Antonio would require improved and closer working relationships between the farmers, the Agriculture Department and the Forest Department.

Neither the national government nor the local residents have shown the inclination to put aside past inconsistencies and current differences to work together on a project of the size needed for irrigation. Still, should the interested parties find a means to work together in a formal, organized manner that designates property rights authority and insures
equitable regulation of access to water rights, irrigation might provide the means to maintain a modernized version of the cultural independence that the Masewal seek. Water might buy time (and the food security) for this indigenous community to work out the differences that have come with modernization and to develop economically without needing to expand to other areas in the near future. This would allow the Forest Department, hopefully through co-management with the community, to develop harvest plans for the hardwood forests that would benefit the community's development in much the same way an extractive reserve⁵⁸ might do. Agroforestry programs could reduce forest product scarcity near the village and assist in developing a greater conservation ethic from which new working relations between the village and the government might grow. Setting collective sights on a multi-level development project that includes irrigation, agroforestry, conservation and ecotourism, and indigenous rights preservation is well within international banking and development standards (Wells 1994).

The commitment to that idea would have to come from the participants themselves. Without that commitment, the history of land tenure in Belize indicates that further deforestation and forest fragmentation is likely in the hardwood forests of the Mountain Pine Ridge Forest Reserve and that increased household differentiation and cultural weakening is the future for San Antonio. In such a young country as Belize, political inexperience with both small farmer and indigenous issues and a negative balance of

payments make development projects difficult to undertake even if the political will to do so exists.

Yet, the prospects for San Antonio remain bright. The tenacity and strength of indigenous cultures to survive in the wake of modernization is clearly a positive factor. San Antonio residents, in spite of religious and political differences, remain friendly and open to discussing new ideas and inventions. The Peanut and Grain Cooperative is raising farmer awareness of modern technological inputs and gaining valuable experience in large scale farming and internal cooperative organization. The villagers are law-abiding citizens with a strong desire to maintain community stability; they are inventive farmers who are acknowledged by the Agriculture Department for their productivity and intelligence. Each year, the village becomes more educated and the willingness to participate in scientific experiments is evident.

The government's role in agricultural development of San Antonio lags behind the expectations of the villagers. Belize is a youthful government slowly becoming more confident and capable of dealing with the complex issues of managing a national economy. The villagers need to learn not to expect so much from the government, and the government should learn how to provide key assistance to the village without making the vacant promises characterizing its past relationship with the village. More than anything else, the various ministries need to realize that single issue programs sponsored by independent and non-communicating ministries will not resolve forest conservation or agricultural development problems in San Antonio.
A multilevel development program that includes forestry conservation education, irrigated or dry-land agricultural intensification practices, and needed adjustments in social institutions to assist the retention of customary Masewal practices offers a means to provide for both community and forest needs. Such a program would need to be based on the direct participation of local people in the planning and regulation process and the willingness of the national Ministries to accept local input and direction. It will require a serious re-evaluation of the land tenure institutions so as to develop tenure relationships that promote both community well-being based on customary practices and forest conservation.
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Appendix 1  Computerized Maps of San Antonio (Cayo), Belize

Using Atlas GIS Software

Map 1  Agricultural Incursions in the MPRFR...  129
Map 2  Agricultural Land Holdings and Roads...  130
Map 3  San Antonio (Cayo) Belize: Lots and Survey Lines ...  131
Map 4  Water Potential Near San Antonio ...  132
SAN ANTONIO VILLAGE (CAYO) BELIZE
Lots and Survey Lines

Lot Categories
- Private Lots
- Church Lots
- Schools
- Cemetery
- Community Lots
- Pond and Creek
- Unknown Owners
- Peanut and Grain Coop
- Roads and Streets
- Proposed Subdivision

meters
0 50 100 150
WATER POTENTIAL NEAR SAN ANTONIO

1 = Slate Creek Proposal
2 = Macal River Proposal
3 = Privassion Creek Proposal

Mountain Pine Ridge Forest Reserve
Appendix 2 Survey Instrument (Clark 1994)

SURVEY OF SAN ANTONIO (CAYO) - AUGUST, 1994

I. DEMOGRAPHICS
1) Age of head of household _____ 2) Length in village _____
3) # family members in house _____ 4) # men >14 years _____
5) # women >15 years _____ 6) # People 15-25 in house -----
7) # People needing town lots in house in next ten years ___
8) # Buildings expect to build on lot in next 10 years _____
9) Estimated gross income ________
10) Are there months during the year when the family has no income? _______ When? ________
11) What are your family's staple foods?
12) How do you get it? milpa____ buy it____ hunting_____ from relatives____ other______

II. AGRICULTURE
13) Do you own____ or lease____ land for farming?
14) How many acres do you own____, lease from government____, lease from others in the community____, or farm with the Cooperative in the Mountain Pine Reserve_______?
15) How much of this do you farm each year? ______
16) Do you rotate areas of cultivation?_____
   Why?______________________________

PLEASE PROVIDE THE FOLLOWING INFORMATION ABOUT FARMING PRACTICES
Crops May-Nov. Crops Nov.-March $ Sold Where, to Whom
____________________________________________________________
____________________________________________________________
____________________________________________________________
17) Who helps with: clearing________________________
   planting________________________
   harvesting_______________________
   threshing_______________________
   marketing/transport______________

18) Do you raise animals? Domestic_______ Commercial_______

19) What are your biggest farm problems?
____________________________________________________________
20) Are you a cooperative member? Why?

III. FOREST USE
21) Which forest products do you collect and use?

22) Where do you get them?

23) Are forest products becoming scarce?

24) Do you maintain areas on your farm in high bush?

25) Do you ever purchase sand or gravel or wood from Augustine in the Mountain Pine Ridge?

26) How has the forest changed in your lifetime?

IV. OTHER TYPES OF BUSINESS
27) Please describe non-farm employment/business and problems you have with it.

V. WOMEN
28) Does San Antonio need more employment for women?

29) What can be done to assist women in the village?

VI. GENERAL QUESTIONS
30) What are the most important problems facing San Antonio?

31) What can the people of San Antonio do to raise incomes if they had outside assistance?

32) What needs to be done to bring the people of San Antonio together politically?
Appendix 3 Tabulation of Survey Results (Clark 1994)

Demographics

1) Age of head of household - mean 41.2 years (valid N = 188)
2) Length of residency in village - mean 32.02 years (valid N = 184)
3) # of family members in household - mean 5.63 (valid N = 203)
4) question dropped
5) question dropped
6) # people > 15-25 years old in household - mean 1.19 people (valid N = 175)
7) # household members needing town lots in next ten years - mean 1.26 (valid N = 180)
8) # buildings household expects to build on current lot in next ten years - mean .64 buildings (valid N = 176)
9) estimated gross income - range Bz$500/yr to Bz$26000/yr (valid N = 28)
10) Months without income?
11) Family's staple foods - question dropped as beans, rice, flour tortillas, and chicken universal
12) How do you get it? milpa only - 28.5%; buying only 48%; both 23.4% (valid N = 77)

Agriculture

13) How much land do you own? mean 11.36 acres (valid N = 89)
14) question dropped
15) How much of your land do you cultivate each year? mean 7 acres (valid N = 154)
16) Do you rotate areas of cultivation? yes - 37; no - 43 (valid N = 80)
17) Do you hire others? yes - 21; no - 34 (valid N = 55)
18) Do you raise commercial animals? yes - 6 (9.2%); no - 59 (90.8%) (valid N = 65)
19) see Appendix 5 Results of Open-ended Questions
20) Are you a cooperative member? yes - 17 (11.1%); no 136 (88.9%) (valid N = 153)
Household Forest Use

21) Which forest products do you collect and use? (valid N = 123)
   - firewood - 100
   - posts - 39
   - palmleaf - 19
   - lumber - 16
   - cohune palm - 14
   - vegetables - 1
   - charcoal - 1
   - herbs - 4
   - fruits - 2
   - palmetto - 4

22) question dropped

23) Are forest products becoming scarce? (valid N = 87)
   - firewood is scarce - 38 (43.7%)
   - all forest products are scarce - 21 (24.1%)
   - bayleaf is scarce - 1 (.5%)
   - posts are scarce - 1 (.5%)
   - firewood is not scarce - 26 (12.7%)

24) Do you maintain areas on your farm in high bush? yes - 80; no - 23 (valid N = 103)

25) Have you purchased products from Augustine in the Mountain Pine Ridge?
   - sand or gravel -
   - wood
   - no - 51 (valid N = 152)

26) see Appendix 5 Results of Open-ended Questions

27-32) open-ended questions
<table>
<thead>
<tr>
<th>SAN ANTONIO SURVEY QUESTION</th>
<th># OF RESPONSES</th>
<th>VALID N</th>
<th>MEAN</th>
<th>VALID PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do You Maintain Areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>80</td>
<td>103</td>
<td></td>
<td>77.67%</td>
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<tr>
<td>No</td>
<td>23</td>
<td>103</td>
<td></td>
<td>22.33%</td>
</tr>
<tr>
<td>Are Forest Products Becoming Scarce?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firewood Is Scarce</td>
<td>38</td>
<td>87</td>
<td></td>
<td>43.7%</td>
</tr>
<tr>
<td>All Forest Products Are Scarce</td>
<td>21</td>
<td>87</td>
<td></td>
<td>24.1%</td>
</tr>
<tr>
<td>Bayleaf Is Scarce</td>
<td>1</td>
<td>87</td>
<td></td>
<td>.5%</td>
</tr>
<tr>
<td>Posts Are Scarce</td>
<td>1</td>
<td>87</td>
<td></td>
<td>.5%</td>
</tr>
<tr>
<td>Firewood is Not Scarce</td>
<td>26</td>
<td>87</td>
<td></td>
<td>29.88%</td>
</tr>
<tr>
<td>Which Forest Products Do You Collect and Use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firewood</td>
<td>100</td>
<td>123</td>
<td></td>
<td>81.3%</td>
</tr>
<tr>
<td>Posts</td>
<td>39</td>
<td>123</td>
<td></td>
<td>31.7%</td>
</tr>
<tr>
<td>Palmleaf</td>
<td>19</td>
<td>123</td>
<td></td>
<td>15.4%</td>
</tr>
<tr>
<td>Lumber</td>
<td>16</td>
<td>123</td>
<td></td>
<td>13.0%</td>
</tr>
<tr>
<td>Cohune Palm</td>
<td>14</td>
<td>123</td>
<td></td>
<td>11.4%</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1</td>
<td>123</td>
<td></td>
<td>.813%</td>
</tr>
<tr>
<td>Charcoal</td>
<td>1</td>
<td>123</td>
<td></td>
<td>.813%</td>
</tr>
<tr>
<td>Herbs</td>
<td>4</td>
<td>123</td>
<td></td>
<td>3.25%</td>
</tr>
<tr>
<td>Fruits</td>
<td>2</td>
<td>123</td>
<td></td>
<td>1.62%</td>
</tr>
<tr>
<td>Palmetto</td>
<td>4</td>
<td>123</td>
<td></td>
<td>3.25%</td>
</tr>
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</table>
TABLE 1 Results of Survey (Clark 1994)

<table>
<thead>
<tr>
<th>SAN ANTONIO</th>
<th># OF RESPONSES</th>
<th>VALID N</th>
<th>MEAN</th>
<th>VALID PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Age of Household Head</td>
<td>188</td>
<td>188</td>
<td>41.2 years</td>
<td>100</td>
</tr>
<tr>
<td>Length of Residency</td>
<td>184</td>
<td>184</td>
<td>32.02</td>
<td>100</td>
</tr>
<tr>
<td># of Household Members</td>
<td>203</td>
<td>203</td>
<td>5.63</td>
<td>100</td>
</tr>
<tr>
<td># Members 15-25 Years</td>
<td>175</td>
<td>175</td>
<td>1.19</td>
<td>100</td>
</tr>
<tr>
<td># Members Needing Lots</td>
<td>180</td>
<td>180</td>
<td>1.26</td>
<td>100</td>
</tr>
<tr>
<td># Expected Buildings/10 Years</td>
<td>176</td>
<td>176</td>
<td>0.64</td>
<td>100</td>
</tr>
<tr>
<td>Land Owned</td>
<td>89</td>
<td>89</td>
<td>11.36 acres</td>
<td>100</td>
</tr>
<tr>
<td>Land Leased</td>
<td>151</td>
<td>151</td>
<td>19.38 acres</td>
<td>100</td>
</tr>
<tr>
<td>Land Cultivated</td>
<td>154</td>
<td>154</td>
<td>7 acres</td>
<td>100</td>
</tr>
<tr>
<td>Peanut and Grain</td>
<td>Yes</td>
<td>17</td>
<td>153</td>
<td>11.1%</td>
</tr>
<tr>
<td>Cooperative Member?</td>
<td>No</td>
<td>136</td>
<td>153</td>
<td>88.9%</td>
</tr>
<tr>
<td>Do You Raise</td>
<td>Yes</td>
<td>6</td>
<td>65</td>
<td>9.2%</td>
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<tr>
<td>Commercial Animals?</td>
<td>No</td>
<td>59</td>
<td>65</td>
<td>90.8%</td>
</tr>
<tr>
<td>Do You Rotate Areas of Cultivation</td>
<td>Yes</td>
<td>37</td>
<td>80</td>
<td>46.25%</td>
</tr>
<tr>
<td>of Cultivation?</td>
<td>No</td>
<td>43</td>
<td>80</td>
<td>53.75%</td>
</tr>
<tr>
<td>Do You Hire Others?</td>
<td>Yes</td>
<td>21</td>
<td>55</td>
<td>38.18%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>34</td>
<td>55</td>
<td>61.82%</td>
</tr>
</tbody>
</table>
Appendix 4 Results of Open-ended Questions (Clark 1994)

19) What are your biggest farm problems? (# of responses)
   - Not enough water (61)
   - Inaccessibility due to mud, no road, or neighbors (19)
   - Lack of land or land too small (13)
   - Poor soil (9)
   - While flies and disease (9)
   - Neighbor's cattle (3)
   - Oversupply of food, low prices (3)
   - Poor 1994 crop (3)
   - None (2)
   - Need more funding (1)

20) Are you a Cooperative member? Why or why not. (# of responses) (valid N = 150)
   - No. Prefer to work alone or independently. (14)
   - No. There is no land. (6)
   - Yes. Have access to machinery. (5)
   - No. I don't know how it works. (4)
   - No. they fail to provide loans or help. (3)
   - Yes. As a means to get land to work. (3)
   - No, but I am thinking of joining. (3)
   - No. I have other work. (2)
   - No. There is a lack of information and I don't feel comfortable at meetings. (2)
   - No. If I join it will be for nothing. (2)
   - No. It is too expensive. (2)
   - Yes. To have a market for my produce. (2)
   - I am a member but the head of the cooperative hasn't appeared for five years.
   - No Answer (101)

26) How has the forest changed in your lifetime?
   - Everything that belongs to the forest is for them and if we want to gain some
     money we cannot too because it belongs to the Reserve.
   - If we want posts we have to buy them, because if we go and hunt for them it is
     scarce around and we cannot enter the Reserve without permission.
   - Now everything is scarce.
   - We are charged a fine to get wood from the government-owned Mountain Pine
     Reserve.
   - The government sold everything and left the people with nothing.
   - We cannot get big mature woods for lumber now.
   - There are very few huge trees as those before.
   - Drastic. The high forest is disappearing very fast.
29) What can be done to assist women in the village?

- Bring water!
- There used to be 30 women who left each day to work in a Chinese sewing shop in Santa Elena. A sewing shop would help.
- Women can pick peanuts. Sometimes 75 go to the fields at once.
- A Women's Group needs better leadership and education from outside. Last time, the leader was greedy and it didn't work.
- There used to be a Women's Cooperative to raise chickens, but villagers complained about the smell. Now there isn't one.
- 85% of the girls go to high school now.
- Refugees take all the work the women used to do.
- Educated girls have to go to Belize to find work.
- The women should work on the farm, too.
- Provide training in light arts and crafts, poultry products, sewing, and confectionery.
- A cooperative needs start up money.
- A garment factory, a peanut brittle factory, jam, or a restaurant.
- Women's work on the farm is overlooked. The level of education of women is low. There is a need for technical training. Our culture gives trouble in today's world.

30) What are the most important problems facing San Antonio?

**Water**
- We need wells in each part of the village because the water trucks only deliver to the center of town.
- They should quit test drilling and just bring us water from the Reserve.
- Farmers without water in the dry season cannot produce crops needed for cash.

**Land**
- There is a general lack of agricultural land.
- Current land ownership is a form of colonization.
- There are no town lots so people must move away.
- There is a diminishing farm layout due to subdivision.

**Roads**
- Farmers need road to access their land, especially during the rainy season.
- The streets need improvement.
- The water trucks won't come here because the street is too narrow.
Finances
- Wages around San Antonio are too low.
- Prices of farm goods are too low and they fluctuate irregularly. Sometimes we can't sell our goods in Belize.
- The government should provide employment during the dry season.
- There is too much competition in Belize from products from outside the country.
- We have to go to sell in Belize as Indians, but the police go and chase us from there. So we have to see how we could live.

Other Ideas
- Ecotourism or a restaurant on the main road would help capture tourist dollars.
- We need jobs for the poor.
- San Antonio needs a high school because not everyone can afford to send their children to Cayo.
- There is no suitable area for garbage disposal.
- There is disunity in the village due to politics and religion.
- They don't clean the well often enough.
- It costs Bz$30 to get water from the MPR. The water truck won't come up our road.
- The Catholic School needs a blackboard and water tank. We ask the children to bring water. The poor can't afford $3.50 for their books and we have to buy them for them.
- The telephone closes at 5:00 PM and won't deliver important messages.

31) What can the people of San Antonio do to raise incomes if they had outside assistance?

- Work in groups to operate a revolving fund for projects.
- Small projects such as craft work, tourism, canning vegetables.
- Raise small animals.
- We should have technical people.
- Plant other crops like bayleaf, fruit palm, cedar, or mahogany.

32) What needs to be done to bring the people of San Antonio together politically?

- They will join together if they put a water system in San Antonio.
- Sincerity of government in finishing its projects begun by the last government.
- Choose a non-partisan, impartial political officer for the Cayo District.
- Political influences of both parties divide neighbors and friends.
- The government won't work with the Village Council.
- People brag and promise but nothing comes of it.
- Organize seminars in public relations with government officials to teach the people.
- There must be something of interest to bring the people out. Then use that meeting to encourage people to come out more.
- Talk with the Pastors directly.
- Non-church people (Catholics) won't unite with religious people.
- They need to be Christian. They need to join our religion.
- People shouldn't enter others' cleared land.
- Property lines need measuring because they cause conflicts.
- They need jobs and then the people will be happy.
- We need police at meetings to stop drunks from harassing people.
- People make too many excuses why they can't help with fagina.
- We need a person to lead the community. More cooperation.
- No one person can do it. We need cooperation and willingness to come together.
- Refugees work for too little and prices are too high in Belize to sell much. The government allows foreigners to have most of the land. Government thinks the refugees are better than we.
- People come to ask questions at meetings, but the government helps other people.
- I have applied for land for years but never got it. Local people won't rent small pieces of land.
Appendix 5 Definitions Relevant to Land Tenure Issues, International Development, Buffer Zone Management and Agroforestry

**actual right** - "have a correlated duty on the part of others to recognize those rights" (Bromley 1991:49)

**ad valorem royalties** - royalties based on the value of extracted logs (Repetto 1990:39)

**agrarian reform** - the combination of agricultural development, colonization, and land reform (Barraclough 1973:33)

**agrarian reform** - "a rapid improvement in one or more of the sectors of the agrarian structure" (Tuma 1965)

**agrarian structure** - land tenure (secure-insecure; collective - individual; owner-tenant; native-foreign; public-private) with private (title settled-unsettled; contract-subcontract; fee-simple - conditional); pattern or cultivation (extensive-intensive; dry-irrigated; supervised-unsupervised; mechanized-unmechanized; cooperative-individualistic; diversified-staple; market {domestic-export}-subsistence); terms of holding and scale of operation (holding-operation; large-small; consolidated-fragmented; rent {fixed-share; cash-kind [service-product]}-no rent {owner-squatter-national}); credit facilities (institutions{private banks, cooperatives, state} - moneylender/shopkeeper-landlord) (Tuma 1965)

**agricultural development** - "is the application of technology and capital to increase farm productivity" (Barraclough 1973:33)

**agricultural systems** - composition of landowning population (small owner-operators, large owner-operators, collective farmers), the non-landowning population (hired laborers on large plantations, hired laborers on small holdings, tenants), and squatters (Prostermann and Reideinger 1987:42)

**agroforestry** - "refers to the techniques of either growing trees as a crop or of growing trees and agricultural crops together" (Hyde 1992:433)

**agroforestry** - "the planting of useful tree species in conjunction with ground crops or livestock" (Browder 1993:180)

**agroforestry** - "a complex system involving numerous interactions among species in relation to physical resources, pest levels and environmental modifications (Baker 1974)" (Ong 1991:107)

**agrosilvicultura** - "Sistemas agroforestales que utilizan árboles en asociación y apoyo de una producióon (Van Orsdol 1987:11) (translation - agroforestry systems that use trees in association with and to support [agricultural] production)

**agrosilvopastoral** - "El uso integrado de sistemas forestales, agrícolas y de pastoreo en tecnologías sostenibles" (Van Orsdol 1987:11) (translation - the integrated use of systems of forestry, agriculture and grazing in sustainable technologies)

**assartment** - the establishment of land claims through the clearing of land (Bruce & Fortmann 1992:482)

**barrier hedges** - "is the name given to contour-aligned hedgerows established specifically for erosion control on slopes. These have also been called biological bounds." (Young 1989:68)

**biodiversity attributes** (Franklin) - composition, structure, function (Noss 1990)

**biotic impoverishment** - "As a landscape is fragmented or otherwise altered by human activity, some species thrive and other species decline. The cumulative loss of sensitive species from human-modified landscapes results in biotic impoverishment." (Noss 1989:12)

**buffer zone** - "a gradient of 'soft-boundary' zones enveloping core reserves and insulating reserves from intensive land-use activities on private lands. Inner buffer zones would be areas with low road density, primarily non-motorized recreational use, and very low-intensity silviculture
(e.g., selective logging). Outer buffer zones would allow more intensive uses, such as 'New Forestry' silvicultural practices (Franklin 1989) or some livestock grazing, but still be managed with biodiversity as the fundamental objective. Restoration activities would be conducted in all zones, as appropriate." (Noss 1989:26-27)

**buffer zone** - "Area which is managed in such a way that negative influences to the integrity of the conservation area from the boundary inward are reduced to zero" (Green 1990:4)

**ceremonial fund** - "All social relations are surrounded by such ceremonial, and ceremonial must be paid for in labor, in goods, or in money. If men are to participate in social relations, therefore, they must also work to establish a fund against which these expenditures may be charged. We shall call this the ceremonial fund." (Wolf 1966:7)

**class (Marx)** - "the relationship to the means of production" (Humphrey and Buttel 1986:16)

**class (Weber)** - the accumulation of different life chances (which resulted from) differential access to the machinery of state domination and the ability of social groups to use the legitimate power of the state to serve their own material ends. (Humphrey and Buttel 1986:16)

**class differentiation** - "unequal economic opportunities and wealth distribution if inequality seems to be of a permanent nature and tends to perpetuate class differences ... That is, economic class differentiation implies social and political class differentiation." (Tuma 1965:17)

**collective consumption** - "One attribute of a public good is that additional consumption of the good by one individual does not diminish the amount available to others." (Jackson in Russell and Nicholson 1991)

**colonization** - "the opening up on non-agricultural lands for agricultural use" (Barraclough 1973:33)

**common appendant** - "the right of the villagers who owned their own land within the manor to feed their animals used in agriculture upon the lord's 'waste'" (Cox 1986:54)

**common property** - a particular community owns the resource and this community frequently agrees to rules of behavior, including rules that regulate the rate at which the resource is used." (Pearce et al. 1989)

**common property** - rights conferred by a fairly defined community (rights may cover a specific resource - a tree, crop residues (Pearce and Warford 1990)

**common property** - represents *private property for the group of co-owners* (since all others are excluded from use and decision making). Second, individuals have rights (and duties) in a common property regime (Ciriacy-Wantrup and Bishop, 1975). In one important sense, then, common property has something very much in common with private property - exclusion of non-owners. In that sense we may think of common property as *corporate group property.*" (Bromley 1991:26)

**common property regime** (is defined) by group ownership in which the behaviors of all members of the group are subject to accepted rules and open for all to see...in a social setting in which individual conformity to group norms is the dominant ethic, common property regimes have a cultural context compatible with and indeed vital for effective performance." (Bromley 1991:27)

**common property resources** - such as rangelands, are defined as those to which access is open and free; individual ownership, by law or custom, is impossible, which accordingly generates a type of social trap. Resource depletion, economic inefficiency and environmental degradation...inevitably ensue." (Watts 1987:187)

**common-property resources** - "a class of resources for which exclusion is difficult and joint use involves subtractability" (Feeny et al. 1990:4)

**communal property** - is a property rights regime: "the resource is held by an identifiable community of independent users." (Feeny et al. 1990:4)

**community** - "comprises the populations of some or all species coexisting at a site" (Noss 1990:360)

**community forestry** - "refers to commonly owned or controlled forests" (Hyde 1992:433)

**composition (ecological)** - "has to do with the identity and variety in a collection, and includes species lists and measures of species diversity and genetic diversity" (Noss 1990:356-357)
conditional ownership - "ownership in a variety of forms existing side by side, limited in different ways, but meeting the general requirements of 'public interest'" (from Tannebaum) (Tuma 1965:125)

constant wealth inheritance - "This suggests that defining sustainable development as constant wealth inheritance is not sufficient. It requires modification to allow for the feasible avoidance of irreversible losses of natural assets, or compensation for their loss by other natural assets." (Pearce et al. 1989:36)

control - "is the right to disregard the interests of others in the exercise of the above dimensions (to possess, to use, to manage, to benefit, to be secure, to alienate) of ownership" (Bromley 1991:159)

core invasions and pressures - "extensions into rural areas of the power, ownership and exploitation of central, urban institutions and individuals which include the richer world of the North, governments of the South, commercial interests, and professionals who are variously wealthy, urban and powerful." (Chambers 1988.2)

core poverty - "where poor people are found in accessible areas of intensive agriculture and dense population" (SL - homestead gardening, rights to trees, access to common private property resources, labour-demanding farming systems to generate work and wages, irrigation for year-round work) (Chambers 1988)

core reserves: "roadless areas of various sizes managed primarily for their natural values, with no logging, mining, grazing, or other commodity production. Formerly degraded areas being restored to natural condition are included in this category... with recreational uses also strictly controlled." (Noss 1989:26)

corridors: "wide strips of land connecting core reserves into an interlinked network. Whenever possible, corridors would contain an inner, roadless core managed the same as core reserves. Otherwise, corridors would be managed in much the same way as inner buffer zones and surrounded by outer buffer zones." (Noss 1989:26-27)

Crisis - "implies the development of tension between tenure groups such that the stability or equilibrium of the social system is disturbed." (Tuma 1965:17)

culture (Weber) - legitimating ideologies and myths

culture (Durkheim) - shared values among members of society, the source of social cohesion (Humphrey and Buttel 1986:16)

customary common property - characterized by group/corporate ownership and management vested in the respective group or its leaders (Bromley 1991)

customary - control by community or tribe, individuals have only usufructuary rights (Poostchi 1986)

deforestation - "is not simply tree removal per se; the process of deforestation necessitates a greater rate of tree removal than that of tree regrowth, or reforestation. The simple felling of forest cover is not a priori deforestation unless there is a long-term and permanent reduction of the forest ecozone. The definition of deforestation generally implies, however, only a reduction in size if the forest and not in quality of trees." (Abrams and Rue 1988:380)

development - "implies change leading to improvement or progress. Consequently, what constitutes 'real' development is a normative or 'value-laden' issue." (Pearce et al. 1989:29)

development - "is regarded as an historical process which links the exploitation of resources in the more industrialized countries with those of the South." (Redclift 1987:3)

development - social change where new ideas are introduced into a social system in order to produce higher standards of living, through higher per capita incomes and higher levels of living through the use of more modern production techniques and improved social organizations (Poostchi 1986:273)

disarticulation - low cost labor combined with modern technological industrial base (wages do not rise with productivity because consumption is externally oriented) (Moberg 1992)
discount rate = rate of capital appreciation (possibility of collecting capital gains by leaving resource for later (Pearce and Warford 1990)
**distributive objective** - 1) Do we care if benefits reach all the poor or only a group of the poor? 2) Do we care if benefits help the non-so-poor as long as they also help the poor? (Hyde 1993:434)

**diversity** (ecological) - "takes into consideration the relative frequency or abundance of each species or other entity, in addition to the number of entities in the collection. Several different indices, initially derived from information theory, combine richness with a measure of evenness of relative abundances." (Noss 1990:356)

**diversity levels** - ecosystem diversity, species diversity, genetic diversity (Noss 1990)

**domain** - the ultimate ownership or control of over the use of a given area (Wolf 1966:50)

**ecological organization** - regional landscape, community-ecosystem, population-species, and genetic (Noss 1990:355)

**ecological sustainability** - whether the resource in question has been used without compromising the ability of future generations to meet their own needs" (WCED 1987) (Feeny et. al. 1990)

**economic growth** - "an increase over time in the level of real GNP per capita (or sometimes, the real level of consumption per capita)." (Pearce et al. 1989:30)

**economic growth** - means real GNP per capita is increasing over time. But observation of such a trend does not mean that growth is 'sustainable.' (Pearce et al. 1989:33)

**economic importance** - "if it has a significant impact on human welfare" (Pearce and Warnfod 1990:12)

**enabling incentives** - "if in place assist sustainable resource management, i.e. land tenure, if secure enables the persons owning or using the land to respond to price incentives and even planning objectives. The absence of secure tenure is, then, an example of a property rights failures or an institutional failure." (Pearce and Warnfod 1990:235)

**ecosystem** - "includes abiotic aspects of the environment with which the biotic community is interdependent" (Noss 1990:360)

**eco-tourism** - "low-impact, guided, walking or equestrian tours on pre-determined, maintained trails" (Harpold et al. 1990:9)

**efficiency** - "All resources will be used to the point where no person can increase his utility from the consumption of private goods without diminishing the satisfaction secured by another." (Bates in Russell and Nicholson 1981)

**efficiency** -concern with economic growth with social forestry as the means (social marginal benefits exceed social marginal costs); net benefits from social forestry must exceed net benefits from investment in agriculture, water or other alternative investments; (Hyde 1992:434)

**entitlements** - "entail a socially recognized structure of institutional arrangements that both constrain and liberate individuals in their behaviors with respect to other individuals" (Bromley 1991:142)

**environmental property** - involves sets of rights that govern the use of resources including waste assimilation into the environment; rights: to conserve, consume, sell, lease, bequeath, and exclude others (Pearce and Warnfod 1990)

**environmental sociology** - is generally defined as the study of the interrelationships between society and the environment (Schnaiberg, 1972; Dunlap and Catton, 1979a). The environmental sociologist is interested in specifying the mechanisms by which society and the environment interrelate, the cultural values and beliefs that cause people to use the environment in particular ways, an their eventual implications for social consensus and conflict." (Humphrey & Buttel 1986:4)

**environmentally sustainable agricultural generation** - "a process through which income is generated while preserving the long-term productive capacity of soil and water resources" (Harpold et al. 1990:9)

**environmentally sustainable agricultural production** - "the use of agricultural techniques that minimize soil depletion, chemical inputs and build soil structure. This promotes the intensive, long-term agricultural use of land, discouraging its short-term depletion which necessitates expansion to new land. " (Harpold et al. 1990:9)

**equitability (agroecosystem)** - how evenly the products of an agroecosystem are distributed among its human beneficiaries (Conway 1985:35)
erosion control - the use of trees to reduce soil erosion by supplementary use - "The trees and shrubs are not the primary means of checking runoff and erosion, but fulfill the functions of stabilizing conservation structures and making productive use of the land which these occupy" and direct use - "the trees, shrubs or hedgerows are in themselves a major method of reducing erosion" (Young 1989:59)

exposure - "the putting of a party in a new legally binding situation" (Bromley 1991:146)

externality - "is said to exist whenever the costs of change exceed the anticipated gains" (Bromley 1991:42)

externality has two aspects. First, there is the fact that a decision unit's utility of production function contains real variables whose values are chosen by others. Second, the decision unit responsible for choosing the value of those real variables does not compensate the recipients by an amount equal to the marginal cost of its actions." (Bromley 1991:63)

externalities - "increased intersectoral and final demand linkage effects, ecological effects, and social effects" (de Janvry et al. 1989:13)

extractive reserves - "natural tropical forest areas reserved for the extraction of potentially renewable commercial forest products (e.g., latex, fruits, nuts fibers, and timber) by traditional resident populations" (Hyde 1993:174)

extractive reserves - 'forest areas inhabited by extractive populations granted long-term usufruct rights to forest resources which they collectively manage' - Brazilian Ministry of Agrarian Reform and Development (Hyde 1993)

faction - "incorporate groups organized around leaders that promote the interests of their members" (Moberg 1992:12)

fertile soil - "is well structured, has good moisture-holding capacity, is resistant to erosion and possesses a store of fertility in the nutrients bound up in organic molecules." (Young 1989:93)

'first' thinking ... "goes with it has a structure, traits, and values generated by and serving the richer nations, and in all nations the urban industrial and elite cores." (Chambers 1988)

food security for the poor; as well as short-term asset stripping for quick profit by those who make, or are beyond the control of, the laws." (Baker 1984:55)

forest timber enrichment - "the planting of commercially valuable tropical hardwoods in secondary forests" (Hyde 1993:180)

function (ecological) - "involves ecological and evolutionary processes, including gene flow, disturbances, and nutrient cycling" (Noss 1990:357)

functional dualism - between commercial sector and minifundistas - subsistence covered by minifundo which allows depressed wages (de Janvry et al. 1989)

group - a number of people in a geographical location in interaction or communication together who share common interests and goals (Poostchi 1986)

hierarchy theory - "higher levels of organization incorporate and constrain the behavior or lower levels" (Noss 1989:357)

household, peasant - "has the potential to become capitalists, owning sufficient resources to compete with commercial farmers." (de Janvry et al. 1989:12)

household, subfamily peasant - "is semiproletarianized and relies heavily on wage labor; they act as a buffer between the urban and rural labor markets and fluctuate between these markets according to the prevailing economic conditions." (de Janvry et. al. 1989:12)

implicit rights of transfer - "this process of modifying the degree of control to be exercised by 'owners of record' over land" (Bromley 1991:161)

implicit transfer - one in which the legal entitlements that attach to a parcel of land are modified in some way (Bromley 1991)

implicit transfer - "refers to some form of collective action that alters existing entitlements, such a collective action being implemented through the offices of the state" (Bromley 1991:162)
improved tree fallow - "is intended to simulate the effects of shifting cultivation but with the tree fallow consisting of planted species, selected for their soil-enrichment capacity or useful products." (Young 1989:60)

infrastructure "is important because it suggests the ordered properties of the environment, no matter what scale one has in mind." (Humphrey and Buttel 1986)

institution - an abstraction referring to an aspect of a culture that satisfies some fundamental function of society (Poostchi 1986)

intensification - "the gradual change towards patterns of land use which make it possible to crop a given area of land more frequently than before" (Boserup 1965:43)

interaction - the process of exchanging messages with other persons through personal contact or other means of communication (Poostchi 1986)

interdependence is the ability, and the presumed right, of Alpha to impose unwanted costs on Beta. (Bromley 1991)

intergenerational equity - secures welfare of current generation without decreasing welfare of future generations (Pearce and Warford 1990)

intergenerational equity in the quality of life:
1) the next generation should inherit a stock of wealth, comprising man-made assets and environmental assets, no less than the stock inherited by the previous generation
2) that the next generation would inherit a stock of environmental assets no less than the stock inherited by the previous generation (Pearce et al. 1989)

international linkages which provide the transformation momentum behind environmental change. These international linkages involve the transfer of capital, labour, and natural resources." (Redclift 1987:2)

irreversibilities - once they occur, it is suffered by the next generation and all generations to come (Pearce et al. 1989)

land and income concentration - "deviation from the line of equality, or inequality according to a Lorenz curve." (Tuma 1965)

land/labor ratio - "the relationship between the arable land and the rural labor dependent on it for a living. Effective land/labor ratio refers to the currently accessible land area, given the population, while the potential ratio describes the relationship that may arise from a change in the magnitude of either or both in the future." (Tuma 1965:18)

large-scale versus small-scale operation - is relative and depends on the availability of land, economic efficiency, and the techniques in use" (Tuma 1965:17)

land ownership - "the right to dispose of land" (Tuma 1965:17)

land reform - "involves intervention in the prevailing system, levels and patterns of agricultural land ownership, control and usage, in order to change the structure of land holdings, improve land productivity and widen the distribution spectrum of benefits coming from such reforms." (Poostchi 1986:114)

land reform - "the large-scale redistribution of property in land for the benefit of small farmers and agricultural laborers. ... If land tenure is basically power with respect to land (and water), then land tenure reform must be the redistribution of this power." (Barraclough 1973:33)

land reform - "an institutional innovation promoted by the ruling order in an attempt to overcome economic or political contradictions without changing the dominant social relations." (de Janvry et al. 1989)

landscape - "refers to a mosaic of heterogeneous land forms, vegetation types, and land uses' (Urban et al. 1987)." (Noss 1990:358)

land settlement - "the planned, organized or spontaneous movement of people to areas of under-utilized agricultural potential" (Poostchi 1986:125)

land tenure - "the legal and traditional relations between persons, groups, and classes that regulate the rights to the use of land, transfer thereof, and enjoyment of its products, and the duties
that go with those rights. In brief, land tenure can be considered as a reflection of the power relations between persons and groups in the use of land." (Barraclough 1973:xvii)

**land tenure system** - "a local social system closely interrelated with a particular pattern of land tenure relationships. Other indicators of distinctive tenure systems include the legal forms of tenancy, the type of agriculture, and the degree of security and bargaining power enjoyed by landless workers and small farmers. The essential nature of all these relationships changes as methods of production become more advanced technologically, and other job alternatives become available. The degree of modernity and capitalization must also be considered in classifying tenure systems. It is necessary to distinguish between the ownership unit and the managerial unit; one land owner often controls several farms or "operating units" from the farm management point of view." (Barraclough 1973:15)

**land tenure systems** - include legal, contracted or customary, rights duties, liberties, and exposures (Poostchi 1986)

**legal system** - the ways in which institutions (that create social order that allows it to function and to survive) are promulgated and enforced (Bromley 1991)

**livelihood** - "adequate stocks and flows of food and cash to meet basic needs." (Chambers 1988:4)

**local participation** - "empowering people to mobilize their own capacities, be social actors rather than passive subjects, manage the resources, make decisions, and control the activities that affect their lives" (Cernea 1985:10 in West 1994:11)

**local social system** - "predictable patterns of interaction by members of a community" (Barraclough 1973:40)

**marginal production of resources** = rate of growth (Pearce and Warford 1990)

**markets** - are highly articulated institutional arrangements to channel individual initiative and avarice into putatively benign - but, if lucky, useful - directions. (Bromley 1991)

**metapopulation** - populations of a species connected by dispersal (Noss 1990:360)

**normal professionalism** - "means the thinking, values, methods, and behavior dominant in a profession or discipline." (Chambers 1988:4)

**norms** - are the established repetitive behavioral patterns with certain limits for the members of a given social system (Poostchi 1986)

**open access regime** - no property rights are defined for named individuals or communities, risks extinction of the resource. (Pearce and Warford 1990)

**optimal growth** - growth that maximizes the present value of future streams of consumption (the discounted value of future flows of per capita consumption) - unsustainable if future generations are undervalued (Pearce and Warford 1990)

**ownership** - "is the right to possess, to use, to manage, to benefit, to be secure, and to alienate" (Bromley 1991:159)

**paradigm** "is a set of definable and logically interrelated concepts for examining phenomena such as human society or its institutional parts (Humphrey and Buttel 1986:14)

**participation** is of little meaning if the people concerned have no power to participate in their own national economy or are powerless to seek access to the basic resources for a decent livelihood." (Baker 1984:60)

**peripheral poverty** - where poor people are found in areas which are remote and marginal (marginal farming, crops and livestock, water harvesting, soil retention and fertility enhancement (Chambers 1988)

**periphery** - "is that portion of economic space which is characterized by backward technology with little capacity to absorb the mass of the population into the modern sector. These excess human masses created by the very process of economic growth are the 'marginals.'" (de Janvry et al. 1989)

**personality** - the sum total of values, attitudes, thoughts, ideas and habits of a person (Poostchi 1986)

**perturbation (agroecosystem)** - an irregular, infrequent, relatively large and unpredictable disturbance (Conway 1985:35)
**policy instruments** - "methods to alter property rights among individuals and groups to accomplish certain ends." (Bromley 1991:35)

**political economy** is the perspective "in which the outcome of economic forces is clearly related to the behaviour of social classes and the role of the state accumulation." (Redclift 1987:3)

**power** (Weber) - "domination of the society by a stratum of elites who are able to control the machinery of the state" (Humphrey and Buttel 1986:16)

**power** (Durkheim) - leadership and representation of social groups in political sphere (Humphrey and Buttel 1986:16)

**power** - "when an individual or a group has the legal ability to alter the status quo structure of legal entitlements" (Bromley 1991:146)

**presumptive right** - "support no correlated duty but simply reflect the ability of a party to act as if there were an actual right present." (Bromley 1991:49)

**prisoner's dilemma** - is a situation in which it is optimal for any prospective participant in a collective enterprise to opt out (to 'defect') regardless of the strategy followed by other would-be participants. If all cooperate, all, in the aggregate, will be better off than if all defect; but every individual is better off defecting." (Russell and Nicholson 1981:9-10)

**production spheres** - household sphere of production and exchange (addresses management and organization of resources), domestic labor, prices of inputs and outputs, extent of commodity production, intersection of market with use-value production (Watts 1987)

**productivity** - in terms of numbers/biomass of individual species (Pearce et al. 1989:40)

**productivity (agro-ecosystem)** - the output of valued product per unit or resource input (Pearce et al. 1989:41)

**productivity (agroecosystem)** - the yield or net income per unit f resource (Conway 1985:35)

**property** - is a benefit (or income) stream, and a property right is a claim to a benefit stream that the state will agree to protect through the assignment of duty to others who may covet, or somehow interfere with, the benefit stream. Rights have no meaning without correlated duties and the management problem with open access regimes is that there are no duties on aspiring users to refrain from use. Property is not an object but rather something of value (the benefit stream) against all others. Property is a triadic social relation involving benefit streams, rights holders, and duty bearers (Hallowell 1943 quoted in Bromley 1991:2)

**property** - "is a right to a benefit stream that is only as secure as the duty of all others to respect the conditions that protect that stream." (Bromley 1991:22)

**property regimes** - "acquire their special character by virtue of collective perceptions regarding what is scarce (and hence possibly worth protecting with rights), and what is valuable (and hence certainly worth protecting with rights)." (Bromley 1991:3)

"property rights indicate which costs must be considered by the various decision-making units in a society." (Bromley 1991:51)

**proprietary interests** - "rights to limited use of forests" (Bruce and Fortmann 1992:490)

**public choice** is "used here to indicate a field of analysis and experiment involving the consequences of assuming that individuals act in a rational and self-interested (or self-serving) way, not only when the context is market transactions (deciding what crops to grow or what consumer goods to buy), but also when it is a collective decision (what person to elect as village head and, indeed, whether to vote at all). In particular, each individual is assumed to be able to rank the outcomes he or she foresees resulting from his own actions, and further is assumed to act to obtain the best possible one of the outcomes." (Russell and Nicholson 1981:3)

**public domain** - all land not held in private ownership (freehold or fee simple) by someone (Bromley 1991:108)

**public good** is a good for which consumption is nonexcludable and nonrivalrous. If the good is consumed by one person, then it can be consumed by another, and the quantity available to others is not diminished by that person's consumption of it." (Bates in Russell and Nicholson 1981:85)
public or collective good - "is a good, the significant benefit of which cannot be denied to those who do not help bear the costs." (Freeman et al. in Russell and Nicholson 1981:161)

rational individual - in the absence of a disciplining organization, will choose to do nothing either way - even assuming he has information about potential benefits, the know how and resources to make improvements." (Freeman et al. in Russell and Nicholson 1981:161)

relative deprivation - deprivation relative to one's own expectations for oneself; the precondition for major rebellion is that large numbers of people must see their actual situation as substantially less desirable than the situation that they perceive ought to be theirs. (Prostermann and Reideinger 1987:7-8)

renewable - "capable of regeneration" and depends on management regime; sustainable management allows a resource to renew itself (Pearce and Warford 1990)

replacement fund - "The amount needed to replace his minimum equipment for both production and consumption" (Wolf 1966:6)

resilience - the ability of the system to maintain its structure and patterns of behaviour in the face of external disturbance (Pearce et al. 1989:40)

resource management regime - a structure of rights and duties characterizing the relationship of individuals to one another with respect to that particular environmental resource. Institutional arrangements are continually established (and refined) in order to determine (and to modify) the scope and nature of the property regime over natural resources." (Bromley 1991:22)

right - "denotes a set of actions and behaviors that the possessor may not be prevented from undertaking."
- "a right - by definition - implies a duty on the part of all others to refrain from preventing those actions and behaviors" (Bromley 1991:3-4)

"Rights are not relationships between me and other with respect to that object. Rights can only exist when there is a social mechanism that gives duties and binds individuals to those duties.
"A right is the capacity to call upon the collective to stand behind one's claim to a benefit stream." (Bromley 1991:15)

risk capital - discretionary land, labor, financial capital (Hyde 1992)

roles - the patterns of behavior associated with a distinctive social position CH10 (Poostchi 1986)

"SD means 'environmentally-sound' development, or integration of conservation and development."
(Thrupp 1988:2)

Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. (Chambers 1988)

sedentation - "intensification of land use through establishment of permanent villages" (Arnason et. al. 1982:27)

shock (agro-ecosystem) - an irregular, infrequent, relatively large and unpredictable disturbance to the agricultural system (Pearce et al. 1989:41)

silvopastoril - "El uso de áreas forestales para sostener el patoreo y pastos en producción animal" (Van Orsdol 1987:11) (translation - the use of forested areas to support grazing and pastures in animal production)

social approach - "seeing the environmental stress as symptomatic of a social and political crisis usually based on: unequal control over access to, and use of, the natural environmental resource base; the 'developmental' conflict between export-based cash crops, foreign exchange and basically socially constructed" - "The environment ...is not merely located in different places; it means different things to those who use it." (Redclifi 1987)

social change - the process by which alterations and change occur in the structure, as well as the function, of a rural social system (invention, diffusion, and adaptation) CH10 (Poostchi 1986)

social costs - "are those falling beyond the boundary of the decision-making unit that is responsible for the costs" (i.e. externality) (Bromley 1991:59)
social forestry - "any forestry (except large scale commercial plantation and industrial forestry) so long as it emphasizes the responses of local consumers to forest-produced goods and services: usually fuelwood, fodder, forage, sometimes water, soil protection, and other tree and inter-planted non-wood crops." (Hyde 1992:432)

social or economic system - a complex structure whose social and economic components are interdependent; disturbing any of these components would reflect on the other components and on the system as a whole." (Tuma 1965:18)

social relations of each sphere - different economic status, and interaction in course of social reproduction, how labor is mobilized, how surpluses are extracted in context of intra-household and extra-household relations (Watts 1987)

social structure "social practices that are reproduced through time" (Giddens 1981 in Watts 1987:188)

social system - a collection or a group of individuals who are oriented to common goals (Poostchi 1986:273)

stability - the ability of the system to maintain a relatively constant condition (its 'equilibrium') in terms of its species composition, biomass and productivity, in response to normal fluctuations and cycles in the surrounding environment (Pearce et al. 1989:40)

stability (agroecosystem) - the degree to which productivity is constant in the face of small disturbances caused by the normal fluctuations of climate and other environmental variables (Conway 1985:35)

stakeholders - "the various parties and groups who have any sort of vested interest in the matters underlying a conflict" (Hough 1988)

state property - "the evolved administrative structure to manage the benefit stream from land and its related natural resources" (Bromley 1991:144)

state property - "rights to the resource are vested exclusively in government which in turn makes decisions concerning access to the resource and the level and nature of exploitation" (Feeny et al. 1990:7)

state property regime, ownership and control over use rest in the hands of the state. Individuals and groups may be able to make use of the natural resource, but only at the forbearance of the state." (Bromley 1991:23)

stress (agro-ecosystem) - a regular, sometimes continuous, relatively small and predictable disturbance on agricultural productivity over time (Pearce et al. 1989:41)

stress (agroecosystem) - a regular, sometimes continuous, relatively small and predictable disturbance (Conway 1985:35)

structure (ecological) - "is the physical organization or pattern of a system, from habitat complexity as measured within communities to the pattern of patches and other elements at a landscape scale" (Noss 1989:357)

surplus labor - "in agriculture refers to the amount of labor that may be removed from the land without reducing total production, given the state of technology." (Tuma 1965:19)

sustainable - refers to the maintenance of enhancement of resource productivity on a long-term basis. (Chambers 1988)

sustainable development - "development activities that favor a long-term perspective; development activities that are sensitive to and integrated with the environment and natural processes. It is, essentially, a sustained-yield management approach to development. ... It assumes that development cannot be sustained unless local people, communities, and organizations are actively involved and committed to the development activity. ... It is our argument that if conservation is to be sustainable, it will need to be pursued from the bottom up as well." (Brechin and West 1994:77-78)

"Sustainable development describes a process in which the natural resource base is not allowed to deteriorate." (Pearce and Warford 1990:8)
sustainable development - "involves maximizing the net benefits of economic development, subject to maintaining the services and quality of the stock of natural resources over time"
(Pearce et al. 1989:42)
sustainable development - means that per capita utility or well-being is increasing over time
(Pearce et al. 1989:33)
sustainable development - means that a set of 'development indicators' is increasing over time
(Pearce et al. 1989:33)
sustainable economic growth - means that the real GNP per capita is increasing over time and the increase is not threatened by 'feedback' from either biophysical impacts (pollution, resource problems) or from social impacts (social disruption) (Pearce et al. 1989:33)
sustainability - per capita levels of welfare remain constant or improve over time (Pearce et al. 1989)
sustainability (agro-ecosystem) - the ability of an agro-ecosystem to maintain productivity when subject to stress or shock (Pearce et al. 1989:41)
sustainability (agroecosystem) - the ability of a system to maintain productivity in spite of a major disturbance (Conway 1985:35)
sylvopastoral practices - "include scattered trees on pastures (e.g. systems with Acacia albida or other Acacia species), combinations of plantation crops with pastures (e.g. cattle under coconuts, sheep under rubber), live fences, fodder banks, windbreaks and shelterbelts, and hedgerow intercropping of pastures." (Young 1989:74)
system - "an assemblage of elements contained within a boundary such that the elements within the boundary have strong functional relationships with each other, but limited, weak or non-existent relationships with elements in other assemblages; the combined outcome of the strong functional relationships within the boundary is to produce a distinctive behaviour of the assemblage such that it tends to respond to stimuli as a whole, even if the stimulus is only applied to one part." (Conway 1985:34)
technocratic approach - physical problem with energy imbalance amenable to technological solution (Baker 1984:53)
technological paradigm characteristics:
"1 it is a-historical
2 it elevates 'symptoms' to the status of cause
3 it places environment over people in a cynical way
4 it increases the polarization of power relationships
5 it maintains a facade of concern, neutrality, and objectivity
6 it reinforces the status quo and the prevailing model of development
7 it uses the international scientific community and some of the major multi-lateral organisations to lend legitimacy to the existing political order by their very 'non-interference'." (Baker 1984:53)
terms of trade - "calculated as the prices a country receives for its exports relative to the price it pays for imports" (Mohr 1992:31)
'tradition' is being used here as an independent variable indicative of mindless acceptance of old practices wrapped up in ritual. These 'traditions' were often perfectly rational adjustments to the natural environment and were followed because they had proved their worth in the past, i.e. they were a dependent variable." (Baker 1984:55) (on common belief about tradition)
traditional agriculture - "is a state of economic equilibrium reached by agriculture over a long period of time and characterized by constant traditional technology and unchanging farmer preferences and motives" (Schultz 1964 in de Janvry et al. 1989:82)
transaction costs: 1) information costs; 2) bargaining costs (contracting costs); 3) enforcement costs (Bromley 1991)
transhumance - rainfed agriculture and animals herds in distance until harvest when returned to village (Watts 1987:177)
tree tenure - "consists of a bundle of rights which may be held by different people at different times. Four major categories of rights make up the bundle which comprises tree tenure: the right to own or inherit, the right to plant, the right to use, and the right of disposal." (Fortmann 1985:231)

underdevelopment - high rate of economic growth coupled to deepening impoverishment of rural majority (Moberg 1992:5)

underemployment - "in agriculture refers to the situation in which the accessible arable land is inadequate to keep the rural population dependent on it for a living fully occupied, given the techniques and the institutional arrangements regarding the number of hours and length of the work season. Underemployment may be disguised or revealed. The rural workers are disguisedly unemployed when they are apparently occupied full time but in fact less intensively than what is regarded as optimal, such that some of them may be removed from the land without reducing total production, or they may be able to operate a larger farm with the same techniques during the same work time. Underemployment would be revealed if the rural workers are partially unemployed; that is, they are working less than the number of hours or weeks customarily regarded as full employment." (Tuma 1965:18)

usufructuary rights - rights to use but not own land (no need to sell when in great supply) (Pearce et al. 1989)

utility - "satisfaction or well-being" (Pearce et al. 1989)

well-being - "of a defined population should be at least constant over time and, preferably, increasing for there to be sustainable development." (Pearce et al. 1989:32)

withholding power - the ability not to have to sell produce immediately (Wolf 1966)

References not found under 'Cited References':


