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SOCIOECONOMIC ISSUES IN AGRICULTURAL SETTLEMENT AND PRODUCTION IN BOLIVIA'S CHAPARE REGION

by

Michael Painter
and
Eduardo Bedoya Garland

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TABLE OF CONTENTS

LIST OF TABLES iii

LIST OF FIGURES v

LIST OF ACRONYMS vii

1. INTRODUCTION 1
   1.1. Purpose of the Overview 1
   1.2. Discussion of Database 1
      1.2.1. The DIRECO Database 1
      1.2.2. The CERES Database 4

2. BACKGROUND TO MIGRATION 6
   2.1. Historical Mobility and the Control of Different Ecological Zones 6
   2.2. The Impact of the Coca Boom on Migration in Cochabamba 8
   2.3. Push versus Pull Factors in Migration 10
   2.4. Push Factors in Chapare Migration 13
   2.5. Pull Factors in Chapare Migration 15
   2.6. Implications for Development Policy 16

3. CHAPARE POPULATION ORIGIN AND COMPOSITION 17
   3.1. Origin 17
   3.2. Composition 22
      3.2.1. Family-based Production 22
      3.2.2. Age 23
      3.2.3. Gender 26

4. PRODUCTION SYSTEMS 30
   4.1. Limitations of the Existing Data on Production 30
   4.2. General Characteristics of Chapare Farming 33
   4.3. Land Distribution 44
   4.4. Coca Price and Coca Production Levels 64

5. CONCLUSIONS 67
   5.1. Migration and Development 68
   5.2. Chapare Cropping Systems 69
   5.3. Socioeconomic Research and Planning 70

6. REFERENCES CITED 71

LIST OF TABLES

Table 1. Reasons for Migration Cited by Chapare Farmers 15
Table 2. Department of Origin of Chapare Farmer Population 17
Table 3. Department of Origin of Farmers in Chapare, Yapacaní, and San Julián . . 19
Table 4. Provinces of Origin for Farmers in the Chapare, Yapacaní, and San Julián Originating in Cochabamba Department 20
Table 5. Localities of Origin - Farmers from Chapare and Carrasco Provinces Cochabamba Department 21
Table 6. Mean Ages of Chapare and Yapacaní Farmers 23
Table 7. Mean Ages of Chapare Farmers by Microregion 24
Table 8. Land Ownership in Areas of Origin by Chapare Farmers 25
Table 9. Size of Chapare Farmers' Landholdings in Home Areas 25
Table 10. Male and Female Children of Chapare Farmers, by Microregion 26
Table 11. Male and Female Children of Chapare Farmers, by Year of Arrival 27
Table 12. Chapare Cropping Systems by Farmers' Period of Arrival 31
Table 13. Yapacaní Cropping Systems by Farmers' Period of Arrival 32
Table 14. Total Areas in Hectares Dedicated to Crop Production Chapare Farmers Included in DIRECO Database 41
Table 15. Mean Areas in Hectares Per Farm Dedicated to Crop Production Chapare Farmers Included in DIRECO Database 41
Table 16. Percentages of Farmland in Each Microregion Dedicated to Different Uses 42
Table 17. Type of Labor Force Utilized According to Cultivated Hectares 43
Table 18. Frequency Distribution of Chapare Farms by Lot Size 45
Table 19. Concentration of Landholdings in the Chapare 53
Table 20. Soil Use in Chapare 62
Table 21. Principal Cropping System According to Plot Size 62
Table 22. Intensity of Soil Use According to Plot Size 63
Table 23. Modern Inputs Use According to Intensity of Soil Use 63
Table 24. Active Agricultural Area, Cleared and Fallow Hectares, According to Plot Size 64
Table 25. Importance of Hired Labor by Area Under Coca Cultivation 66

LIST OF FIGURES

Figure 1. Yapacaní Farmers by Year of Arrival 11
Figure 2. Chapare Farmers by Year of Arrival 12
Figure 3. Chapare Settlers by Department of Origin 18
Figure 4. Children of Chapare Settlers, % of Daughters and Sons Compared 28
Figure 5. Children of Yapacaní Settlers, % of Daughters and Sons Compared 29
Figure 6. Coca and Other Crops, Chapare 34
Figure 7. Coca and Other Crops, Yapacaní 35
Figure 8. Mean Lot Size by Year of Settlement, Chapare and Yapacaní Compared 37
Figure 9. Chapare Cropping Systems, Relationship of Coca to Other Crops 38
Figure 10. Yapacaní Cropping Systems, Relationship of Coca to Other Crops 39
Figure 11. Mean Lot Sizes of Chapare Farmers by Microregion 40
Figure 12. Land Distribution - Chapare, Microregion 1 46
Figure 13. Land Distribution - Chapare, Microregion 2 47
Figure 14. Land Distribution - Chapare, Microregion 3 48
Figure 15. Land Distribution - Chapare, Microregion 4 49
Figure 16. Land Distribution - Chapare, Microregion 5 50
Figure 17. Land Distribution - Chapare, Microregion 6 51
Figure 18. Land Distribution - Chapare, Microregion 7 52
Figure 19. Land Distribution - Chapare, Microregion 1 54
Figure 20. Land Distribution - Chapare, Microregion 2 55
Figure 21. Land Distribution - Chapare, Microregion 3 56
Figure 22. Land Distribution - Chapare, Microregion 4 57
Figure 23. Land Distribution - Chapare, Microregion 5 58
Figure 24. Land Distribution - Chapare, Microregion 6 59
Figure 25. Land Distribution - Chapare, Microregion 7 60

LIST OF ACRONYMS

CAE	Crédito Agropecuario de Emergencia
CERES	Centro de Estudios de la Realidad Económica y Social
COB	Central Obrera Boliviana
CRDP	Chapare Regional Development Project
DESFIL	Development Strategies for Fragile Lands
DIRECO	Dirección de Reconversión Agrícola
IBTA	Instituto Boliviano de Tecnología Agropecuaria
ICIs	Instituciones Crediticias Intermediarias
IDA	Institute for Development Anthropology
INC	Instituto Nacional de Colonización
PDAR	Programa de Desarrollo Alternativo Regional
SARSA	Systems Approach to Regional Income and Sustainable Resource Assistance
SDTB	Subsecretaría para el Desarrollo del Trópico Boliviano
UMOPAR	Unidad Móvil de Patrulla Rural
USAID	United States Agency for International Development (AID)

1. INTRODUCTION

1.1. Purpose of the Overview

This discussion summarizes information obtained from analysis of sets of data on farmers in the Chapare region. The data in the first set were collected by officials of the *Dirección de Reconversión Agrícola* (DIRECO), the Bolivian government agency responsible for monitoring levels of coca production and certifying farmers' participation in voluntary coca reduction efforts that qualify them to receive cash payments, credit and other development assistance. The discussion also draws on the data gathered in a socioeconomic study of Chapare farmers conducted by the *Centro de Estudios de la Realidad Económica y Social* (CERES). Rivera (1990) reports on this research; however, we have conducted a reanalysis of the material to take advantage of information obtained through farmer interviews that was not reported on in the original report. This report also summarizes other available information on migration to the Chapare to provide a context for interpreting the data presented.

The information presented here does not exhaust what we know about the organization of production in the Chapare, and the Chapare's relationship to upland areas from which most of its farmer and rural laborer population comes. Rather, it seeks to respond to specific questions that USAID/Bolivia and AID/Washington have indicated they would like answered in anticipation of the design of the follow-on activity to the Chapare Regional Development Project (CRDP). We hope that the answers to these questions will provide the basis for a more penetrating analysis of the economic policy and rural development issues surrounding coca production in the Chapare than has occurred to date, and facilitate a fruitful discussion about the nature and scope of a successor to the CRDP. As this discussion occurs continuing analysis of the information that has been collected on the Chapare and Associated High Valleys areas, with highly focused new research on specific topics, will offer important information and insights.

1.2. Discussion of Database

1.2.1. The DIRECO Database

The largest data set analyzed for this report consists of material collected from 10,703 Chapare farmers who discussed voluntarily reducing the amount of coca they are producing with DIRECO officials between November 1985 and the end of December 1989.[1] A second set of data reflects 1,143 interviews with farmers in the Yapacaní area of Santa Cruz who were obliged to cease growing coca because of the *Ley del Régimen de la Coca y Sustancias Controladas*, promulgated in June 1988. This report will draw on the Yapacaní material from time to time, when comparisons of the two areas will highlight issues relevant to the Chapare. As part of

[1] This is one of several areas in which there is some ambiguity in the database; 523 entries show no interview date, and an additional 16 indicate that interviews were collected between May 1973 (prior to the existence of DIRECO) and October 1985.

these discussions DIRECO officials routinely interview farmers to construct a profile of their farms. The information obtained includes:

1) Name;
2) Identity card number;
3) Department, province and locality of origin;
4) Marital status;
5) Age;
6) Number of sons and daughters;
7) Level of formal schooling attained;
8) Profession or trade practiced;
9) First- and second-most important economic activities;
10) Whether the producer resides on-farm or elsewhere;
11) Year of settlement;
12) Location of farm, including province, microregion, and union;
13) Lot number;
14) Type of title held;
15) Farm size;
16) Area under cultivation, in fallow, or forested;
17) Area in coca;
18) Area dedicated to other crops (cassava, rice, corn, taro, bananas, citrus, avocado, and two "other" categories);
19) Information on types of road linkages, distance to markets, etc.;
20) Animals raised;
21) Receipt or not of technical assistance and its provider;
22) Ownership or not of a motor vehicle; and
23) The date of the interview.

While the data are flawed in many respects, some of which will be discussed in this section, the information provides an excellent preliminary profile of Chapare farmers. The profile may be used for planning and analysis purposes, as a check on qualitative assessments by technical and professional personnel working in the area, and as a source of information on which to base hypotheses for the conduct of more in-depth research on specific topics.

Several factors need to be borne in mind by readers of this report as they evaluate the information presented here or information presented by Bolivian institutions working from the DIRECO database. First, the database does not represent a probabilistic sample of Chapare farmers; these are individuals who approached DIRECO with at least a potential interest in voluntarily reducing the area of coca they had under production. We do not have systematic information about the (larger) population of farmers that has not approached DIRECO. However, the problems that this presents are more academic than real. In the first place, the 10,703 interviews conducted by DIRECO represents between 20 and 40 percent of the farmer

population of the Chapare.[2] Because of its sheer size, the database approaches being a descriptive sample for the Chapare. While we do not know that there are not significant differences between the farmers who have talked with DIRECO and those who have not, the size of the database makes it appear doubtful that this factor is a source of significant bias, and studies and evaluations conducted in the region (e.g., Jones 1990; Rivera 1990) have not turned up information that would contradict such an assumption. In conducting the analysis of the database, we have defined the study population as those farmers interviewed by DIRECO, and the results presented are a description of that population. Lacking better information, we assume that the characteristics of population contained in the database are largely representative of the entire farmer population in the Chapare.[3]

Second, there are problems with the kind and quality of information collected. This results from several factors, the most basic of which is that the questionnaires were designed and farmer interviews have been conducted with little clear idea of precisely how the information obtained would be used. For example, the interviews follow a fairly standard practice of gathering information about the farmer, including name and identity card number, without noting whether the person is male or female. Perusal of farmers' names suggests that there is a significant minority of female farmers represented. However, as the database is presently structured, the only way to measure this would be to examine each record individually to determine whether the person interviewed had a man's or woman's name. Similarly, the interviews report on the number of male and female children residing with the interviewee, but not on the presence or absence of a spouse.

For several years following the initiation of farmer interviews, the forms were simply stored in the DIRECO office, and subjected to no formal analysis. The information was computerized at the instigation of SARSA, with funds from SARSA and the *Programa de*

[2] This assertion is based on an estimated mean household size of approximately 4.5 people, indicated by the present analysis of the DIRECO database, and two recent population estimates. The most recent, conducted by the *Centro de Estudios de la Realidad Económica y Social* (CERES) under contract to the *Programa de Desarrollo Alternativo Regional* (PDAR) (Rivera 1990), estimates the Chapare population at approximately 91,000, a third may consist of an internally "floating" population rural laborers, and not the coca farmers themselves. The other population estimate was conducted by the Development Strategies for Fragile Lands (DESFIL) project, in 1987, at the behest of USAID/Bolivia (Durana et al. 1987). This estimate was based on an analysis of dwelling units as depicted by satellite and aerial photographs. Three different numerical techniques were used, yielding estimates ranging from 196,000 to 234,000.

[3] This emphatically is not intended to imply a recommendation for another study of the Chapare population in order to define the characteristics of the population that has not talked to DIRECO. Overcoming logistical obstacles and insuring the personal security of researchers are sufficiently difficult that this would not be a cost-effective exercise unless there were specific and compelling information that the DIRECO database is biased along a crucial parameter.

Desarrollo Alternativo Regional (PDAR). Between the time that DIRECO began regularly interviewing farmers and when the material was computerized, the questionnaire format was changed at least three different times, in response to changes in interest and priorities and suggestions from interviewers about how the interviews could be improved. As a result, there is variation over time in the questions that were asked, or in the way they were asked. Inevitably, this resulted in some lost information when the interviews were coded for computer inputting, and numerous blank entries resulting from interviewers using different versions of the questionnaire. These problems compound the normal variations in the responsiveness of people interviewed, and the skills of interviewers in accurately recording responses. The most obvious manifestation of this in the analysis is that there is a large number of blank answers for many fields included in the data set. For example, the year of arrival in the Chapare is not included in 1,818 of the 10,703 records, and these were excluded from the analysis that divided the settlers into cohorts depending on when they arrived. As a result, while the database contains 10,703 records, rarely do all of these figure into the base of interviews on which specific queries are made. However, because of the large size of the database, such "holes" rarely present significant problems in conducting analysis. Close readers will simply notice that there is some variation in the sum of the "Ns" involved in comparisons of different groups within the database.

Finally, it is important to remember that this is a "working" database. Four institutions -- DIRECO, IBTA/Chapare, CERES, and IDA/SARSA are currently using it as a basis for analysis in their planning and monitoring and evaluation activities. As each institution works with the data set, it discovers and corrects errors such as duplicate records or nonsensical responses, or updates records based on more recent information.[4] While none of these changes are of a sort that will significantly alter the findings that one may derive from analysis, it is probable that if someone were to conduct identical queries on different versions of the data set that the answers will frequently be marginally different from one another.

1.2.2. The CERES Database

In this document we also present a reanalysis of data of agriculturalists, that was collected in the Chapare by CERES between November 1989 and January 1990. Preliminary findings are presented in Rivera (1990). However, while the information gathered by the CERES field team

One finds occasional examples such as a farmer's age being listed as 44, while the year of his arrival in the Chapare is recorded as 1934; or of farmers for whom the area of coca cultivation recorded exceeds the area recorded for the total lot size. For this analysis, we obtained a version of the dataset from IBTA/Chapare that we knew had been subjected to considerable cleaning, and had been most recently updated on 9 November 1990. Nonetheless, we did find occasional errors which we corrected, introducing minor changes to the results of tabulations. IBTA/Chapare regularly updates the information in its database when it is visited by producers interested in receiving technical assistance whose names appear in the database. It has undoubtedly made changes in its dataset since sharing a copy with us.

is very rich, time and other factors limited the original analysis. These data contain 194 interviews directed to members of several *sindicatos*, and which included three non-coca producers. Nevertheless, only 124 interviews include information on agricultural production. Rivera (1990) affirms that CERES database does not represent a probabilistic sample of Chapare's farmers; these are agriculturalists who voluntarily submitted to being interviewed by CERES. The main reason is that CERES encountered serious resistance to questions related to coca production. Therefore, CERES eventually needed to search for a different set of coca producers who were not originally in its sample.

The information collected by CERES includes:

1) Place of birth of each household member;
2) Marital status;
3) Age and sex of each household member;
4) Principal and secondary economic activity of each household member;
5) Migratory pattern of the family head;
6) Year of settlement in the tropical region;
7) Whether the producer owns properties in his or her place of origin or in a different location;
8) Plot size;
9) Labor relations such as non-remunerated work, hired work, off-farm work, sharecropping, ayni, etc.;
10) Wage rates;
11) The use of modern agricultural inputs (fertilizers, pesticides, and improved seeds);
12) Area in coca and area dedicated to other annual or permanent crops;
13) Economic orientation in each crop (market or family consumption);
14) Monetary income generated through agricultural production;
15) Animals raised (only few interviews included this information);
16) Area in fallow;
17) Principal problems among coca producers; and
18) Recommendations of farmers to increase agricultural production.

As is true of the DIRECO database, the problems presented by the non-probabilistic sample are more academic than real. In the first place, the group of 124 interviews that contain information on agricultural production do not differ from the global sample of 194 farmers. In the second place, as noted above, the general tendencies found in the CERES data complement and reinforce the information contained in the DIRECO database. Thus, the CERES database is a useful and reliable source of information. Also, while the sample is not probabilistic, CERES chose the research areas from which it is drawn by considering different ecological settings and migratory patterns (for instance, spontaneous or state sponsored settlements). Finally, in comparison to DIRECO's team research, the interviewers were more skilled in eliciting and recording information. As a result, in this report, we frequently rely on the information collected by CERES to provide the information needed to interpret tendencies in the DIRECO data.

2. BACKGROUND TO MIGRATION

Two common misconceptions are frequently voiced in discussions about migration to the Chapare. One is that Chapare migration is a continuation of the historically high geographic mobility of Andean peoples, frequently related to their need to maintain access to ecologically diverse production zones that are often defined in terms of elevation above sea level. The other is that Chapare migration is a result of the coca boom, the response of rural people to the opportunities offered by generally high international cocaine prices since the late 1970s. Both propositions have bases in fact. However, both also seriously distort one's understanding of Chapare migration unless accompanied by significant caveats.

2.1. Historical Mobility and the Control of Different Ecological Zones

Upland populations in the Andes have historically attempted to maintain access to different ecological zones, which have frequently been distant from one another, to provide themselves with the food, fiber, and other resources they required to survive and prosper. A principal function of pre-Hispanic states was the maintenance of such access, and they defined it as a question of national security. With the decapitation of these states at the time of the Spanish conquest, responsibility for maintaining access to diverse ecological zones devolved onto extended kin groups and, in some cases, other local or community-based institutions. These attempted to accomplish their task through a variety of mechanisms, including direct control of land, the establishment of fictive or affinal kin ties, the institutionalization of trade relationships and other mechanisms. The specific mechanisms for maintaining access to different areas have varied widely throughout the Andes, reflecting the diversity of physical settings that different populations have had to confront. They also varied considerably over time, varying according to changes in the relationships of different areas of the Andes to the world economy, land tenure arrangements, the legal status of peasant communities in the different Andean nations, and other factors.

Rural Andean populations have been tenacious in their defense of access to different ecological areas, and encroachment on that access has been a major impetus to peasant resistance movements and revolt over the centuries. Sometimes, rural populations have been able to defend this access to the present day. Aymara-speaking populations on the north side of Lake Titicaca, in Bolivia and Peru, for example, continue to maintain long-distance exchange relationships with lowland populations as far away as Apolobamba. In Cochabamba department, upland populations in Carrasco province maintained direct access to land in the tropical lowland areas of the province until the 1970s.

Also, the pressure on the lands of rural dwellers has been constant. Often they have been overcome by direct land encroachment; while sometimes changes in the broader economic context threatened their ability to continue producing. These included increased costs of rural production, making the maintenance of access to different ecological zones uneconomical, even if there was no direct effort to appropriate their land. Sometimes, the reorganization of

production to cut off access to lands necessary for families to sustain themselves occurred early in an area's colonial history. For example, many mine workers forcibly recruited to work in Potosí from throughout the Andes south of Cuzco did not return home when their periods of labor ended. Many remained in the mining center and assimilated into the local population, and others resettled in the relatively nearby valleys of Cochabamba, where land was available (Bakewell 1984:81-136; Toledo 1975:355-356). Combined with the massive population movements that were occurring in the region because of rural dwellers seeking to escape tribute obligations, migratory patterns across ecological zones, based on kinship and ethnic affinity, were disrupted. The landholdings of the indigenous communities established during the colonial period in Quillacollo and the Valle Alto of Cochabamba were inadequate to support the families living on them by the early 1700s. Families supplemented agricultural production in their home areas through participation in the skilled crafts that flourished there, including gunpowder making, textiles, breadmaking, and ceramics (Larson 1988:202-205).[5]

Agriculture in Cochabamba has, since the colonial period, been closely tied to the mining industry, and the living conditions of rural dwellers have historically been affected by two major factors: 1) periodic droughts, which often caused crop failures in all areas not under irrigation, and eliminated the possibility of earning cash income through the sale of agricultural products for most families; and 2) fluctuations in international ore prices, which affected the relative importance of food and labor exports from Cochabamba to the mining centers. Over time the terms of trade between the Cochabamba's agricultural economy and the mining centers tended to decline, so that the export of workers to the mining centers became increasingly important. Of course, this intensified the region's vulnerability to the ebb and flow of the international mining economy, as, during periods of expansion, Cochabamba supplied workers to the mines, while in periods of contraction, it reabsorbed people into the agricultural economy (Dandler 1984; Harris and Albó 1984:36-54).

In this context, two watershed events in the migratory history of Cochabamba were the completion of the railroad link between Cochabamba and Oruro, in 1917, and the implementation of the agrarian reform, in 1953. By connecting these cities with the Pacific Ocean ports (Mollendo and Arica), the rail network opened them as markets to a variety of imported goods, such as textiles and housewares, that had previously been provided by the regional craft industries. These were unable to compete effectively with imported manufactured goods, so large numbers of people could no longer supplement agricultural production through work at home, and entered the migratory wage labor force.

The implementation of the agrarian reform in the high valleys of Cochabamba and neighboring departments also contributed to the inability to support themselves through agriculture. In the first place, while the focus was on redistribution, this was carried out more systematically in dryland areas than in irrigated bottom land. Thus, the most productive land

[5] The *charango* and leather industries of Aiquile are probably also remnants of this, as are the fireworks and pottery industries in Tarata.

remained highly concentrated in the hands of few people. Second, with its focus on land redistribution, the agrarian reform did little to improve the productivity of agricultural labor in upland areas. While institutional mechanisms such as *sindicatos*, cooperatives, and producer associations have all attracted the interest of the national government and donor agencies, the investments in upland agriculture and associated improvements in market conditions, infrastructure and the like have been insignificant in relation to the investments made to support export production -- mining in the highlands and valleys and commercial agriculture in Santa Cruz (e.g., Gill 1987; Gordon 1977; Heath 1969). Thus, the development investment that accompanied the reform actually exacerbated the problems with unfavorable terms of trade that the agricultural valleys of Cochabamba and neighboring departments had been experiencing for some time with the export economy. Finally, as the formal barriers to access to schools, health services, and the like declined following the 1952 revolution, the subsistence requirements of rural dwellers rose as they were obliged to contribute a significant portion of the costs of these services. These factors tended to compel people to enter the growing flow of population seeking ways of earning income off the farm. By the late 1970s, 90 percent of the families in many parts of rural central and southern Bolivia earned more than half their income through off-farm sources (e.g., USAID/MACA 1981; Deere and Wasserstrom 1980).

In summary it is true that the Andean rural population has historically been highly mobile. But, only part of this mobility has been the result of rural adaptation to the environment through the establishment and maintenance of access to different ecological zones. Much more is attributable to the relationship between the agricultural and mining economies, and the role of the agricultural areas as suppliers of both food and people. More still is related to the progressive underdevelopment of the agricultural economy because of generally unfavorable terms of trade and specific but profound changes in the regional market linkages and land tenure. Migration has deep historical roots, and those who argue that an alternative development program cannot halt migration are correct. However, this has little to do with adaptation to the Andean environment by smallholding peasants, and a great deal to do with the scale of underdevelopment that the social and economic processes described here have wrought.

2.2. The Impact of the Coca Boom on Migration in Cochabamba

The boom in the demand for cocaine in the U.S. and Western Europe tremendously accelerated the process of agricultural settlement in the Chapare, and the exponential growth of coca leaf production in response to that demand has fundamentally altered the regional economy of Cochabamba in many respects. Thus, many observers have attributed the massive movements of people in rural Cochabamba and neighboring departments to the growth in coca production in the Chapare.

It is not difficult to see why coca production in the Chapare might be perceived as the cause of migration in central Bolivia, as associated changes in regional population distribution and economic dynamics have been dramatic. In 1967 there were 54 *colonias* in the Chapare, with a total population of 24,381 people. By 1981, there were 247 *colonias* in the Chapare,

with an estimated settler population of 83,525 (Flores and Blanes 1984:82, 88-89). This represented a 243 percent increase in the settler population and a 357 percent increase in the number of *colonias* in the Chapare (Jones 1990). By 1987, this population had more than doubled again, to between 196,000 and 234,000 people (Durana et al. 1987). Similarly, the 1976 census placed the population of the department of Cochabamba at 720,962 people. By 1987, the *Subsecretaría para el Desarrollo del Trópico Boliviano* (SDTB) estimated that the urban area of the city of Cochabamba alone contained nearly 800,000 people. The city of Cochabamba and the Chapare were the only two areas of the department experiencing unambiguously positive rates of population growth. Much of the city's growth was clearly related to its role as a jumping-off-point and commercial center for Chapare settlement, and as a place where "narco-dollars" were being conspicuously invested in the development of urban real estate. Thus, the regional economy did come to revolve around the cocaine boom.

We should also remember, however, that the importance of migration to secure off-farm employment was well established by the mid-1970s, before the take-off in cocaine production (Riordan 1979), and that the social and economic processes leading to this dependence on off-farm employment began decades before. Families from the high valleys of central and southern Bolivia had previously made their presence felt in many other areas, as construction workers and domestic servants in Buenos Aires (Balán and Dandler 1986), agricultural laborers in northern Argentina (Whiteford 1981), the Azapa valley of northern Chile, and in Santa Cruz department of Bolivia (Gill 1987; Riviere d'Arc 1980; Stearman 1976), and as settlers in the colonization areas of northern Santa Cruz (Hess 1980; Stearman 1985; Painter et al. 1984; Pérez 1987). In Santa Cruz, during 1976, for example, the pool of migrant workers from upland Bolivia ranged between nearly 19,000, in February, and 96,000, in August when agricultural labor demands are highest (Riviere d'Arc 1980:158-159). This figure does not include the people who were migrating to Santa Cruz during this time as agricultural settlers, and may be regarded in many respects as comparable to that portion of the Chapare population that "floats" between the Chapare and their areas of origin. As we can see, the scale of migration between the uplands and Santa Cruz in the mid-1970s was at least comparable to the scale of migration between the uplands and the Chapare in the mid-1980s. Furthermore, studies of migrant households based in the upland areas (e.g., Balán and Dandler 1986; Carafa et al. 1987) indicate that families maintain contacts in a variety of migratory destinations and respond rapidly to changing conditions of risk and opportunity in different areas.

The relationship between migration to the Chapare and other destinations also becomes clearer if we compare the periods of greatest population growth in the Chapare with those of settlement areas in Santa Cruz. Records of the *Instituto Nacional de Colonización* (INC) for the San Julián area of northern Santa Cruz show that the period in which most settlers arrived was between 1976 and 1979, and that, after 1979, arrivals declined steadily.[6] Nearly 60 percent of

The exception to this pattern is 1983, when there was a slight increase in the arrival of settlers to the area as a result of the beginnings of the drought in upland areas. The significance of the drought is discussed below.

the 1,977 settlers registered with the INC in the San Julián area arrived between 1976 and 1979 (Painter; personal files). These figures are consistent with figures gathered by DIRECO for Yapacaní, an older area of smallholder settlement in northern Santa Cruz, located at the eastern end of the Chapare region. As may be seen from Figure 1, Yapacaní experienced steady growth beginning in the early 1960s, with approximately 20 percent of its population arriving in each of the five-year periods between 1965 and 1984. Population growth for the Yapacaní area dropped off sharply for the 1985-89 period. In contrast, Figure 2 shows that the Chapare settler population began to grow rapidly in the period 1975-79, with the arrival of 19 percent of the population interviewed by DIRECO, and took off during the early 1980s, with 43 percent of the population interviewed by DIRECO arriving during that period. Thus, both areas of Santa Cruz were important destinations for settlers prior to the rapid expansion of settlement in the Chapare. Arrivals in San Julián declined just as the Chapare was beginning to expand rapidly, while Yapacaní maintained an already established pattern of growth. The Chapare is simply the latest chapter in a long history of migration and settlement by rural people from the uplands of central and southern Bolivia.

While the impacts of Chapare migration in response to the cocaine boom are undeniable and profound, it is clear that the boom is not the cause of migration in Cochabamba. Rather, because of the economic opportunities that coca leaf production has offered the poor rural population of central Bolivia because of the boom, the Chapare became the migratory destination of choice for a large portion of that population beginning in the late 1970s and particularly during the mid-1980s. The illegality of cocaine consumption in the U.S. and other wealthy nations and the social problems associated with the provision of an illegal product for which there is substantial demand have caused considerable attention to focus on the conditions of coca leaf and cocaine production in Bolivia. The rural population of central and southern Bolivia was suffering from acute problems related to impoverishment and environmental destruction and had been for decades before the rise in the demand for cocaine. However, it was the existence of a large, nearby, and poor rural population dependent on earning off-farm income for its survival that made the Chapare a center for coca leaf production, and the lack of alternatives that made it the migratory destination for so many rural Bolivians.

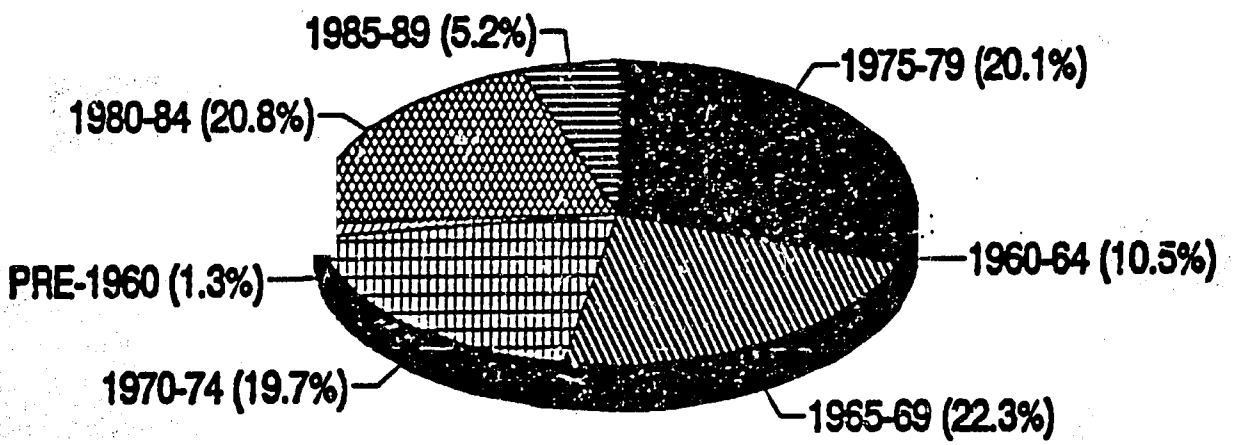
2.3. Push versus Pull Factors in Migration

The forces driving migration to the Chapare are well understood and have been discussed at length elsewhere (e.g., Blanes 1984; Jones 1990; Painter 1987; Rasnake and Painter 1989; Painter 1990), and these discussions will be summarized here. First, however, some concern has been expressed about the relative contribution to Chapare migration of so-called "push" and "pull" factors -- that is, pressures driving people to leave their homes because of difficult conditions there versus the attraction exerted by the Chapare due to the availability of land and the relatively high profits associated with coca production.

Students of migration have for some time avoided attempting to discuss the phenomenon in terms of "push" and "pull" factors because these discussions inevitably obscure the fact that

FIGURE 1

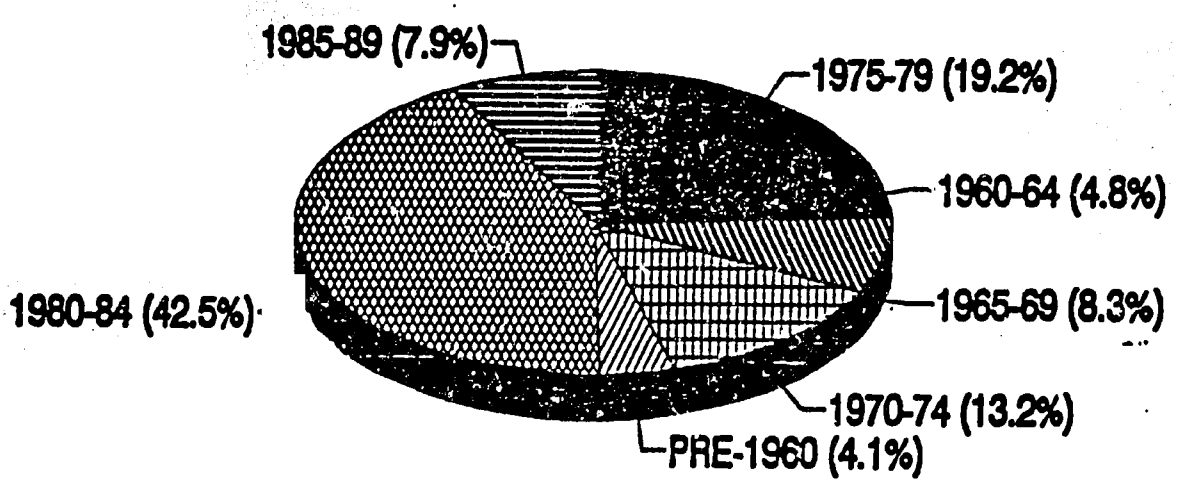
YAPACANI FARMERS BY YEAR OF ARRIVAL



Source: DIRECO database.

FIGURE 2

CHAPARE FARMERS BY YEAR OF ARRIVAL



Source: DIRECO database.

the pushes and pulls are inextricably related to one another. That is, the same sets of conditions and policies that make an area particularly attractive so that it pulls migrants usually affect other areas adversely, making them less attractive and causing them to push people away. In this sense, discussing migration in terms of push and pull factors is problematic in ways that are parallel to the problems inherent in analyzing Latin American societies in terms of so-called "traditional" and "modern" sectors. Returning to the example of Santa Cruz, for example, the rapid expansion of commercial agriculture that made the department such an important migratory destination depended on the prior existence of a poor unemployed or underemployed rural population that, nevertheless, could cover some of its own subsistence costs to serve as cheap work force responsive to the fluctuations in labor requirements.

Similarly, the decisions of successive national governments and international development agencies to make the large and continuing investments that permitted the Santa Cruz agriculture contributed to the continuing underdevelopment of central and southern Bolivia along the lines described above in at least two ways. First, these decisions meant that the development resources that would have been required to address issues such as promoting regional integration of markets for agricultural products, improving the productivity of rural labor, and seriously searching for the organizational models that would have permitted the agrarian reform to realize more of its promise to highland and valley peasants was not forthcoming. Second, by increasing the geographic and social inequities in the distribution of resources, these decisions heightened the dependency of rural people on migration outside of their home areas in search of the off-farm employment they needed to survive.

Thus, care needs to be exercised when discussing migration in terms of push and pull factors. If, however, this is to be our frame of reference and we understand push and pull factors as defined in the first paragraph of this section, it is clear that historically push factors are more responsible for migration to the Chapare than the pull exerted by the Chapare. As discussed above, the dependence of the rural population on migration in search of off-farm income was well established before the cocaine boom and had its roots in long-term deterioration in the terms of trade between agricultural and craft production for Bolivia's internal market and the export sector. Within this context, several events occurred in Bolivia's upland areas during the 1980s that coincided with the international boom in cocaine consumption that drove coca leaf prices up so dramatically. Discussed in the following section, these events administered a series of blows to a rural population that had been experiencing pushes to migrate for several decades.

2.4. Push Factors in Chapare Migration

Climatic adversity and changes in international commodity markets during the 1980s accelerated the processes of impoverishment and environmental destruction driving migration from upland areas. A severe drought that began in 1983 and has not, in fact, abated in some areas, made life in their home areas impossible for many rural Bolivians. Northern Potosí was particularly hard-hit, as may be seen by the numerous families from that area in the streets of cities such as Cochabamba and La Paz, begging, selling lemons, and seeking some way to

survive in the cities. The drought pushed large numbers of smallholders throughout central and southern Bolivia "over the edge" in terms of their ability to earn a living through agriculture; thousands of families have left their homes permanently as a result, and thousands more have either begun to migrate seasonally or increased the amount of time they spend away from home in search of employment.

Ironically, in some cases, drought relief efforts have themselves increased the pressures on people to migrate. In Mizque, for example, many farmers received agricultural credit under the *Crédito Agropecuario de Emergencia* (CAE) program, sponsored by USAID/Bolivia, with participation of P.L. 480 and some *Instituciones Crediticias Intermediarias* (ICIs). The credit program was intended to speed the recovery of rural families affected by the drought by easing access to seeds, inputs and improvements for their lands. Unfortunately, in many areas, such as Mizque, the drought lasted longer than the CAE program. As a result, farmers had to repay their loans even though the drought had not ended and they continued to realize subnormal harvests. In an effort to repay, many families sold livestock, farm implements, and even tried to sell or give their land to the financial institution, efforts that were generally inadequate. When USAID/Bolivia sought money for the CRDP credit program, it began to pressure the financial institutions involved in the CAE program to collect the outstanding loans and return the money to P.L. 480. Naturally, the financial institutions increased the pressure on farmers, who responded to the increased cash demand by migrating to the Chapare to earn money. Sometimes, the loan program was responsible for families who had not previously migrated beginning to seek employment in the Chapare (Cuba 1989).

In 1985, a second financial disaster struck the poorest sectors of Bolivian society, as international tin prices collapsed when the London Metal Exchange terminated trading. The result of an unfavorable shift in exchange rates and the accumulated debts of the International Tin Council, the event brought ruin to Bolivia's principal legal export industry. Between August 1985 and August 1986 some 27,000 mine workers lost their jobs. The *Banco Central de Bolivia* estimated the unemployment rate to be 20 percent by the end of 1985, largely because of the layoff of mineworkers, and, according to the *Central Obrera Boliviana* (COB), the figure approached 30 percent by the end of 1986 (Crabtree et al. 1987:20). The impact of the mining collapse on families not directly employed by the mining industry -- but dependent on it -- has never been measured. Many families migrated to urban areas, particularly Cochabamba and La Paz, and from Cochabamba, many went to the Chapare when they were unable to find work in the city. Others went directly to tropical lowland settlement areas in Pando and Beni departments, as well as to the Chapare region.[7] For many, the Chapare was the destination of choice because coca leaf production offered an immediate source of wage labor.

Finally, it is important to remember that these events took place in the context of general financial collapse. The collapse was closely related to Bolivia's inability to continue to make

[7] Not all of the lowland settlement areas are agricultural. For example, most of the ex-miners who went to Pando are involved in gold mining cooperatives.

payments on its substantial foreign debt, most of which was incurred during the 1970s, under the Banzer regime. In addition, in 1983, the Siles government embarked on an ill-conceived attempt to unlink the exchange rate of the Bolivian peso from the U.S. dollar. The effects of this *desdolarización* on the already weakened Bolivian economy were disastrous; the annual inflation rate exceeded 14,000 percent at its peak in 1984. Even middle-class salaries evaporated, and only those with access to dollars enjoyed any protection. Lacking alternatives, many people turned to participation in producing or processing coca leaf as a way to earn them.

Interviews with Chapare farmers also show that it is the inadequacies of their home areas more than attractions held by the Chapare that move most people to migrate. Through interviews conducted in six communities of Campero and Mizque departments, Jones (1990), for example, found that the major factor driving migration to the Chapare was a lack of water, and some respondents indicated outright that they would not go to the Chapare if they had irrigation at home. This finding echoes that of Carafa et al. (1987), who reported that families with even small amounts of irrigation tend not to migrate. Data from the socioeconomic study of Chapare farmers conducted by CERES also show that poor conditions at home are the determining factor in most people's decisions to migrate. Of the 176 farmers interviewed by CERES, 146, or 83 percent, indicated that they migrated for reasons related to a lack of economic opportunity at home (Table 1, below).

Table 1. Reasons for Migration Cited by Chapare Farmers

Reason Cited	No. of Respondents	% of Total
Lack of land	74	42
Increase income	33	19
Seek employment	39	22
Traveled with family	17	10
Other reasons	13	7
TOTAL	176	100

Source: CERES interviews. N=194, with 18 not responding.

2.5. Pull Factors in Chapare Migration

As Jones (1990) observes, the only significant pull exerted by the Chapare has been the income-earning potential associated with coca leaf and cocaine production. Even this attraction is under constant scrutiny and many people respond quickly to changes in coca prices. Rivera (1990) concluded that the laborer population of upland origin in the Chapare had declined dramatically in the closing months of 1989, in response to low coca leaf prices. Jones (1990) calculated that wage rates in the Chapare would have to be at least 1.67 to 1.88 times the going

daily wage rate at home -- four to five bs. -- in order to trigger migration. He also emphasizes, however, that the real determining factor in calculating the point at which Chapare wage rates (which are, in turn, determined by coca leaf prices) trigger migration is the extent to which people have opportunities to do other things. Carafa et al. (1987) found that many people would forego migration to the Chapare if they could earn enough to cover their subsistence requirements close to home, even if the local wage was substantially lower than the Chapare wage rate. For many people much of the time, however, there is no work at any price in their home areas, and, for them, a low wage in the Chapare may be the only choice.

In addition, interviews indicate that there are also factors that discourage migration to the Chapare. Principal among these is disease, particularly yellow fever, tuberculosis, and various unspecified lung infections. Respondents in all six upland communities in which Jones (1990) conducted interviews raised the issue of disease as making migration to the Chapare dangerous. In interviews conducted by Carafa et al. (1987) and Painter (1987), disease also figured prominently as reasons for why people would prefer not to go to the Chapare if there were other alternatives. Fear of violence from the police also figures prominently among the negative factors associated with Chapare migration in Jones' interviews as well as in the findings of the earlier studies.

2.6. Implications for Development Policy

Several implications may be drawn from this discussion of migration to the Chapare. First, the deep historical roots of migration from central and southern Bolivia mean that the participation of rural people in coca leaf and cocaine production will not be influenced to a great extent by development efforts in the Chapare. These may be effective in providing farmers who have established themselves in the Chapare with development alternatives, assuming that they address the marketing problems that farmers there face and consider the limitations on crop production in many areas of the Chapare imposed by the physical environment. However, development efforts in the Chapare will not address the needs of the rural labor force that moves between the Chapare and upland areas.

Second, development efforts in upland areas will not stop migration. The scale of economic stagnation and environmental destruction is so great that no amount of development investment will stimulate significant economic growth in many areas. Therefore, the goal of development in upland areas needs to be to identify areas with economic growth potential and focus resources on them to create migratory destinations that provide alternatives to the Chapare and are closer to people's homes. In this effort, the appropriate criterion for prioritizing areas in which to work needs to be economic growth potential. The relative contribution of a particular area to Chapare migration is of secondary importance.

Bolivia's rural population has proven to be highly responsive to changing opportunities to earn off-farm income in different areas. The objectives of alternative development efforts in areas outside the Chapare are, accordingly, twofold: 1) to promote economic growth that will

provide alternatives to migration to the Chapare, and 2) to promote the diversification and internal integration of Bolivia's rural economy so that the population is less susceptible to being rapidly drawn into participation in the production of a "boom" commodity in the future.

3. CHAPARE POPULATION ORIGIN AND COMPOSITION

3.1. Origin

According to the information contained in the DIRECO database, the Chapare population is predominantly from the upland areas of Cochabamba department, with the departments of Potosí, Oruro, and Chuquisaca ranking a distant second, third and fourth, respectively. The precise figures are displayed in Table 2, and the relative proportions are displayed in Figure 3.

Table 2. Department of Origin of Chapare Farmer Population

Department	No. of Farmers	% of Total
Cochabamba	6,867	65.2
Potosí	1,292	12.3
Oruro	431	4.1
Chuquisaca	303	2.9
La Paz	149	1.4
Other Departments	94	0.9
No response	1,395	13.2
TOTAL	10,531*	100.0

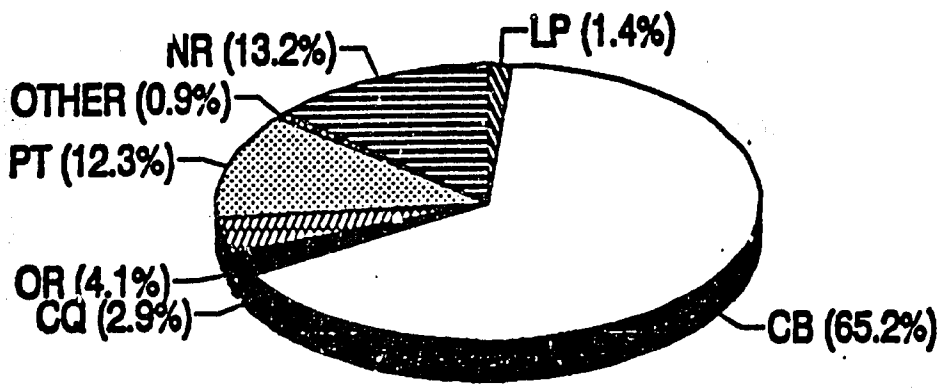
*The total does not equal 10,703, the number of records in the database, because there were 172 anomalous responses regarding department of origin.

Source: DIRECO database.

The origins of Chapare settlers as reflected in the DIRECO data set are comparable in many respects to the origins of other settler populations in other areas. Table 3 compares the departments of origin of Chapare farmers with those in Yapacaní, also sampled by DIRECO, and with San Julián settlers in northern Santa Cruz who are registered with the INC. As may be appreciated, in all three cases, the central Bolivian departments, whose economies have been most affected by the social and economic processes described in Section 2, above, are the major sources of migration to the lowlands.

FIGURE 3

CHAPARE SETTLERS
BY DEPARTMENT OF ORIGIN



Source: DIRECO database.

Table 3. Department of Origin of Farmers in Chapare, Yapacaní, and San Julián

Department	Settlement Area					
	Chapare		Yapacaní		San Julián	
	Farmers	%	Farmers	%	Farmers	%
Cochabamba	6,867	65.2	363	33.6	303	15.3
Potosí	1,292	12.3	339	31.4	870	44.0
Oruro	431	4.1	24	2.2	196	9.9
Chuquisaca	303	2.9	205	19.0	395	20.0
La Paz	149	1.4	12	1.1	171	8.6
Santa Cruz	64	0.6	116	10.7	n.d.	--
Other Depts.	30	0.3	3	0.3	42	2.1
No response	1,395	13.2	19	1.7	0	0.0
TOTAL	10,531	100.0	1,081*	100.0	1,977**	99.9

* The total number of records in the DIRECO database for Yapacaní equals 1,143; the total shown in the table is 1,081 because of 62 anomalous responses.

San Julián settlers from highland departments registered with the INC as of July 1984.

Sources: DIRECO database; INC archives, San Julián (see Painter et al. 1984).

The department of Cochabamba figures prominently as an exporter of population in all three cases. But, it is singularly important in the case of migration to the Chapare. The factor most directly responsible for this appears to be the proximity of the Chapare for rural people from the upland areas of Cochabamba. This is confirmed when we examine the data in Table 4, which breaks the data for Cochabamba department down according to province of origin. As may be seen in Table 4, the two provinces that are the source of most of the migration to the Chapare are Chapare province itself and Quillacollo. In fact, all of the provinces that are most important as sources of migration to the Chapare share significant borders with Chapare province.

Given the high number of Chapare farmers who claim the Chapare as their place of origin, it is well that we also distinguish those who migrated from upland areas of Chapare province into the tropical region from farmers who are from the tropical area of the province originally. To accomplish this, we separated all records in the Chapare database in which respondents were from Cochabamba department and listed their home provinces as either Chapare or Carrasco. Carrasco was included because, like Chapare province, it contains significant upland and tropical areas within its borders. This operation yielded 2,195 records, which we then examined by locality of origin. This number was additionally reduced, as 475

Table 4. Provinces of Origin for Farmers in the Chapare, Yapacaní, and San Julián Originating in Cochabamba Department

Province	Settlement Area					
	Chapare		Yapacaní		San Julián	
	Farmers	%	Farmers	%	Farmers	%
Chapare	1,981	28.8	41	11.3	21	6.9
Quillacollo	1,031	15.0	57	15.7	40	13.2
Arani	484	7.0	10	2.8	19	6.3
Ayopaya	483	7.0	7	1.9	5	1.7
Capinota	406	5.9	27	7.4	32	10.6
Punata	355	5.2	10	2.8	21	6.9
Arque	290	4.2	42	11.6	11	3.6
Tapacari	274	4.0	4	1.1	6	2.0
Cercado	249	3.6	93	25.6	27	8.9
Carrasco	214	3.1	15	4.1	25	8.3
Esteban Arze	194	2.8	14	3.9	21	6.9
Mizque	131	1.9	7	1.9	17	5.6
Campero	53	0.8	12	3.3	34	11.2
Jordan	51	0.7	5	1.4	6	2.0
Bolivar	2	0.0	0	0.0	0	0.0
No response	669	9.7	19	5.2	18	5.9
TOTAL	6,867	99.7	363	100.0	303	100.0

Sources: DIRECO database; INC archives, San Julián (see Painter et al. 1984).

records contained no information about the farmers' localities of origin, and an additional 188 contained place names that we could not identify confidently as being in the upland or lowland areas of Chapare and Carrasco provinces. This left 1,532 cases for analysis, the results of which are summarized in Table 5. As may be seen, 1,287, or 84 percent of the farmers interviewed from Chapare and Carrasco were from three upland areas; Sacaba and Colomi, in the upland area of Chapare province, and Totora, in the upland area of Carrasco province. The Chapare and Carrasco records contained 134 cases, or 8.7 percent, in which farmers were from lowland areas.

In addition to simple proximity, historical factors may help explain the substantial presence of farmers from upland areas of Chapare and Carrasco provinces. As mentioned above, people from the Totora area maintained fields in the tropical areas of Carrasco for several

Table 5. Localities of Origin - Farmers from Chapare and Carrasco Provinces Cochabamba Department

Locality	Province	Farmers	%
Upland Localities			
Sacaba	Chapare	635	41.4
Colomi	Chapare	552	36.0
Totora	Carrasco	100	6.5
Ucuchi	Chapare	54	3.5
Palca	Chapare	18	1.2
Pojo	Carrasco	13	0.8
Pocona	Carrasco	10	0.7
Corani	Chapare	5	0.3
Candelaria	Chapare	4	0.3
Chillichi	Carrasco	4	0.3
Quehuiñapampa	Chapare	3	0.2
Subtotal		1,398	91.3
Lowland Localities			
Todos Santos	Chapare	44	2.9
Villa Tunari	Chapare	14	0.9
Espíritu Santo	Chapare	11	0.7
Chipiriri	Chapare	9	0.6
Paracti	Chapare	9	0.6
Chimore	Chapare	3	0.2
Ibirgarsama	Carrasco	1	0.1
Other	--	43	2.8
Subtotal		134	8.7
TOTAL		1,532	100.0

Source: DIRECO database.

centuries. Coca and other tropical products complemented upland crops for family consumption and for sale. Only in recent years, with the boom in coca prices and the continuing deterioration in terms of trade for upland agriculture, did these vertical production systems cease to function. Larson's (1988) account of Intendent Viedma's hopes, in the late 18th century, of promoting Chapare settlement in order to stimulate Cochabamba's economy through the production of coca leaf for the mining centers suggests that similar vertical linkages existed through much of the

region. Thus, the high incidence of migration from upland areas of the Chapare may result from preexisting vertical production linkages, and, perhaps, from their collapse because of a combination of continuing crisis in upland areas closely related to the rapid expansion of the lowland economy.

In summary, the data on the geographic origins show that migration to the Chapare is part of a broader pattern of migration to lowland areas by rural families from upland areas. Within this broader panorama, Chapare settlement has been accelerated by the boom in coca prices. Also, while, Cochabamba figures prominently as a source of migrants to lowland areas generally, it is particularly important in Chapare settlement. This is due to a combination of physical proximity and, possibly, to long-standing vertical production relations between parts of upland and lowland Cochabamba. However, apart from these two issues, migration to the Chapare is not particularly different from lowland settlement in other areas of Bolivia.

3.2. Composition

3.2.1. Family-based Production

As in other lowland settlement areas, and in rural Bolivia generally, the basic unit of production and consumption in the Chapare is the nuclear family unit, consisting of husband, wife, and offspring. As is discussed below, the family unit may be geographically separated for substantial periods of time, but is the institution around which agricultural production is organized in the Chapare and in upland areas. Unfortunately, the DIRECO database does not provide much information on farmer family composition.

The material collected by CERES, however, does help us construct a more detailed picture. Eighty-four percent of the 194 farmers interviewed by CERES were members of nuclear families. The principal productive activity for the people interviewed was agriculture in 94 percent of the cases. Seventy-nine percent of the persons interviewed were involved in only one productive activity, which was, without exception, agriculture.

The CERES data show the importance of unpaid labor in Chapare agricultural production, and we will return to the implications of this at several points in the discussion that follows. The most important productive activity for family members residing with the farmer interviewed was unremunerated labor on the farm, and only 13 percent of the farmers interviewed indicated that they work off the farm. Similarly, while 58 percent of the farmers interviewed by CERES stated that they do hire labor from time to time, 87 percent indicated that they regularly use unremunerated family labor, and 72 percent indicated that they regularly practice *ayni* labor exchanges on their farms. Farmers regularly stated that the availability of unpaid family labor and the costs of hired labor are major constraints on their ability to produce. Also, as shall be discussed below, the importance of unpaid labor generally and unpaid family labor in particular, plays an important role in shaping the responses of coca producers to fluctuations in the prices of coca leaf.

3.2.2. Age

Chapare and Yapacaní farmers represent a relatively old population in comparison to the rural Bolivian population overall. Age information for farmers in the two areas is summarized according to the period in which they arrived in the settlement area in Table 6. As may be seen, mean ages of Chapare farmers range from about 33 years old among the most recent arrivals to about 54 years of age among farmers who arrived in the area before 1960. Yapacaní farmers are very comparable to Chapare farmers in terms of age, with the only differences between the two populations that approach being significant occurring in the cohorts of the most recent arrivals and those who have been there the longest. As may be seen, the populations for these two cohorts in the Yapacaní data set are sufficiently small as to render the mean ages suspect.[8]

Table 6. Mean Ages of Chapare and Yapacaní Farmers

Years	Chapare			Yapacaní		
	Mean Age	Std. Dev.	N	Mean Age	Std. Dev.	N
Pre-1960	54.33	13.08	293	47.25	9.27	8
1960-64	48.70	12.32	350	48.07	13.22	42
1965-69	45.48	11.66	587	43.49	11.15	77
1970-74	42.86	11.66	985	40.00	10.32	52
1975-79	39.54	11.41	1,458	39.91	10.96	47
1980-84	35.46	10.99	3,039	35.76	8.85	50
1985-89	33.11	11.64	500	35.58	10.40	12

Source: DIRECO database.

The relative age of Chapare farmers is underscored in Table 7, which represents their mean ages broken down according to the Microregions in which they reside. As may be seen, the mean ages of farmers vary between 37 years old, in Microregion 6, and 44, in Microregion 5.

The data in the two age tables suggest that Chapare farmers have used lowland settlement as part of a production strategy intended to consolidate the economic security of their households. We know from many ethnographic studies of Andean populations that young men

Despite the fact that over 1,100 Yapacaní farmers were interviewed, DIRECO interviewers were much less punctilious in completing the information on age, year of arrival, and the like in Yapacaní than has been the case in the Chapare.

Table 7. Mean Ages of Chapare Farmers by Microregion

Microregion	Mean	Std. Dev.	N
Reg. 1	43.32	13.22	478
Reg. 2	39.15	11.00	1,066
Reg. 3	39.55	13.16	2,723
Reg. 4	38.09	12.19	2,157
Reg. 5	44.13	13.99	218
Reg. 6	37.15	10.39	382
Reg. 7	39.16	10.08	63

Source: DIRECO database.

tend to marry in their late 20s, after they have had some experience on their own in the world and begun to devise a strategy for how they will earn a living. Ethnographic accounts also show that rural households pass through several stages over time (e.g., Collins 1983; Deere and de Janvry 1979; Weil 1989). Research conducted in the provinces of Campero and Mizque (CEFOIN 1990), among rural populations involved in migration to the Chapare and elsewhere, show that this general pattern holds in the area affected by the CRDP. The CEFOIN study also highlights a well-established pattern of land scarcity that severely constrains the economic options of new families. Parents frequently do not have sufficient land to pass on to offspring upon their marriage, so that new families continue working for their parents for many years. In some cases, the *sindicato* must allocate new land to young families. Usually this land comes from areas belonging to the community or to the *sindicato* known as *monte*, which is often poorly suited for agriculture and managed as a corporately held grazing area.

In such a context, young families must rely heavily on sources of income earned away from home from the beginning of their existence. Some turn to seasonal wage labor in the Chapare and elsewhere to earn this income, and others become settlers, either abandoning their home areas altogether for a lowland settlement area, as is often true among settlers in northern Santa Cruz, or attempting to combine farming activities in lowland and highland areas, as frequently occurs in the Chapare.[9] Data collected by CERES in its socioeconomic study of Chapare farmers indicates that 40 percent of the landowners in the Chapare also own land in their home areas. Of the Chapare farmer who do have land in their home areas, 64 percent own less than a hectare. Land ownership in the Chapare is clearly associated with land scarcity at home. Furthermore, it is the Chapare farmers with the smallest landholdings who are most likely to maintain landholdings in their home areas. Of the Chapare farmers who do maintain

[9] See Jones' (1990) discussion of interviews with farmers in rural communities in Campero and Mizque regarding the factors that influence their decision to migrate.

land in both upland and lowland areas, CERES found that 66 percent had lots in the Chapare that were ten hectares or less in area. This information is summarized in Tables 8 and 9.

Table 8. Land Ownership in Areas of Origin by Chapare Farmers

	No. of Farmers	%
Chapare farmers who own land in home areas	76	40.6
Chapare farmers who do not own land in home areas	111	59.4
TOTAL	187	100.0

Source: CERES interviews.

Table 9. Size of Chapare Farmers' Landholdings in Home Areas

Plot Size (Has.)	No. of Farmers	%
0.1 to 1.00	48	64.0
1.01 to 3.00	21	28.0
Greater than 3.01	6	8.0
TOTAL	75*	100.0

*N=75, and not 76 as Table 8 would suggest, because one respondent provided no information on the size of his landholdings at home.

Source: CERES interviews.

In summary, the age data from the DIRECO survey confirms the information provided by various other sources. Chapare farmers, in large measure, arrive in the lowlands seeking to secure the livelihood of their newly established households. To the extent that they accomplish this by becoming full-time farmers in the Chapare or by maintaining a foothold in each area is closely related to their class position within the rural society. Farmers who own larger amounts of land in the Chapare are less likely to try to maintain production in their home areas as well. Also, their ability to acquire land in the Chapare is closely related to their economic at home; individuals who are relatively well off at home are more likely to have money to buy land, hire the labor to work it, and make the investments necessary to succeed economically in the Chapare. Thus, patterns of economic differentiation in the home areas are reproduced in the Chapare.

3.2.3. Gender

It is difficult to discuss gender issues in detail based on the DIRECO information, because the settler interviews were not designed with these in mind. Farmers are assumed to be male, although there is considerable evidence of a significant minority of women farmers. Jones (1990) found this to be the case, and a scanning of the DIRECO database reveals some farmers who have women's names. Unfortunately, the DIRECO database does not explicitly distinguish the gender of person interviewed, making comparisons of the characteristics of male and female farmers difficult.

The only gender-related information provided by the DIRECO database regards the sons and daughters of Chapare farmers. These are explicitly distinguished and the information permits some inferences about the number of women among the Chapare farmer population.[10] In this regard, the most singular characteristic of the Chapare population is the relative absence of daughters. As may be observed in Table 10, in all seven Chapare microregions, a decisive majority of the children residing with the farmer is sons. Only in Microregion 7 do the numbers of male and female offspring reach anything resembling comparable numbers.

Table 10. Male and Female Children of Chapare Farmers, by Microregion

Micro-region	Sons				Daughters			
	Total Sons	Mean per Household	Std. Dev.	% of Children	Total Daughters	Mean per Household	Std. Dev.	% of Children
Reg. 1	1,659	2.86	2.08	82.41	354	0.61	1.19	17.59
Reg. 2	3,505	2.85	2.15	84.81	628	0.51	1.09	15.19
Reg. 3	9,407	2.71	2.26	93.91	610	0.18	0.68	6.09
Reg. 4	6,296	2.61	2.29	97.48	163	0.07	0.45	2.52
Reg. 5	687	2.42	2.19	78,16	192	0.68	1.18	21.84
Reg. 6	1,229	2.49	2.19	88.35	162	0.33	0.92	11.65
Reg. 7	352	1.81	1.61	55.61	281	1.44	1.34	44.39

Source: DIRECO database.

If we compare the number of sons and daughters by year of settlement rather than by Microregion we see that little of the difference in numbers can be attributed to the stage of the

[10] It is important to remember that, in drawing on the DIRECO database, we are talking about women within the farmer population. One would expect significantly different results if the focus were on the merchant or laboring populations, for example.

life cycle of the household. As Table 11 shows, the mean number of daughters per household remains less than .5, regardless of whether we are referring to newly formed households, or households of an age at which we would expect children to have left to begin families of their own.

Table 11. Male and Female Children of Chapare Farmers, by Year of Arrival

Year of Arrival	Sons			Daughters			N per Cohort
	No. of Sons	Avg. per Household	Std. Dev.	No. of Daughters	Avg. per Household	Std. Dev.	
Pre-1960	1,145	3.15	2.18	157	0.43	1.01	363
1960-64	1,483	3.47	2.31	154	0.36	1.00	427
1965-69	2,500	3.39	2.24	237	0.32	0.87	737
1970-74	3,830	3.27	2.21	441	0.38	1.02	1,172
1975-79	5,080	2.15	2.15	477	0.28	0.85	1,710
1980-84	8,429	2.23	2.12	902	0.24	0.77	3,773
1985-89	1,211	1.72	2.04	152	0.22	0.68	703

Source: DIRECO database.

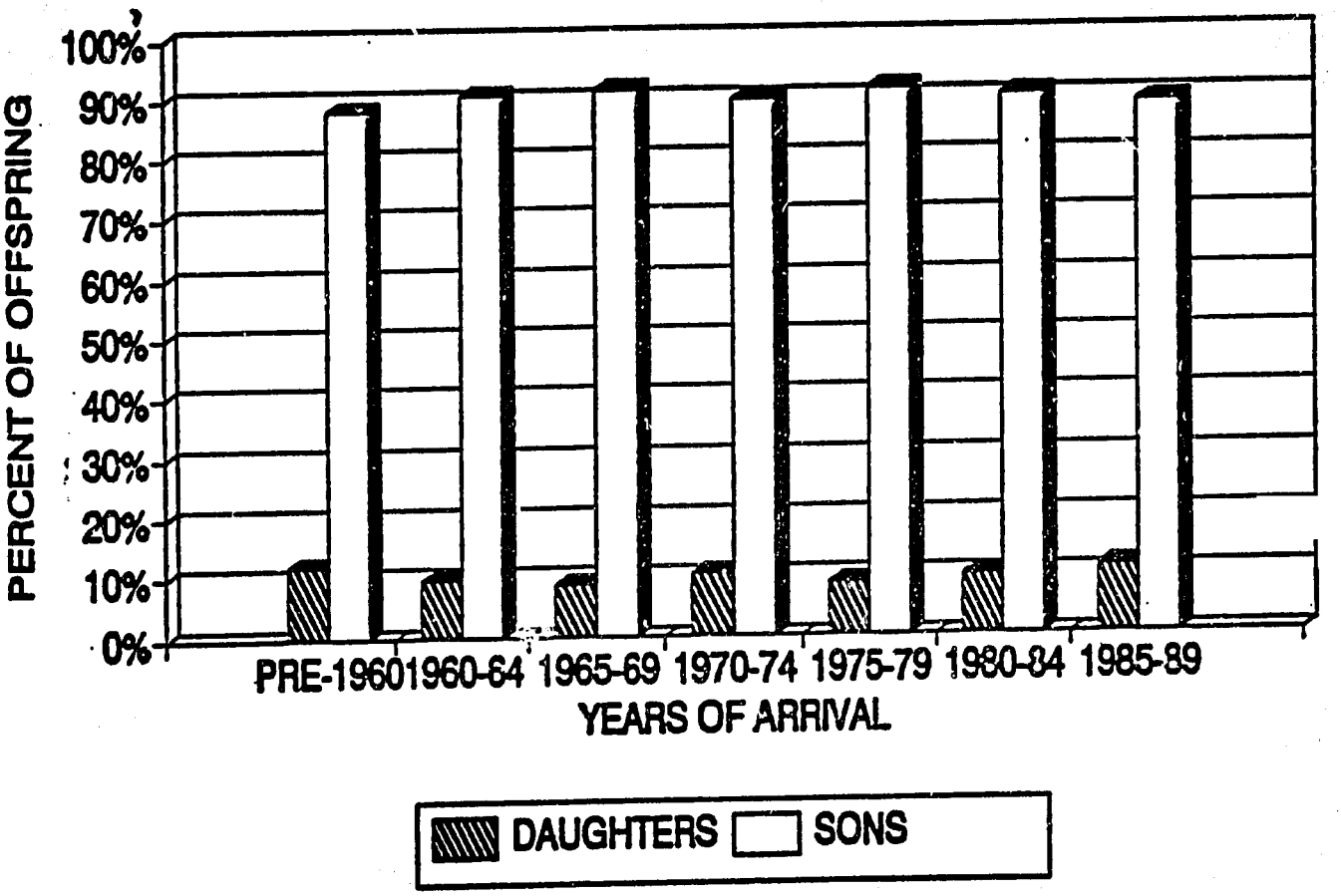
The singularity of the Chapare in this regard is particularly striking if we compare it to the Yapacaní settlement area. As may be seen by comparing Figures 4 and 5, Yapacaní households have a much more balanced distribution of male and female children residing there. Several factors are probably responsible for the difference. First, as discussed earlier, Yapacaní is an older settlement area than the Chapare. It was settled by people who first went to Santa Cruz, and then moved north to Yapacaní. Following this route, Yapacaní was not readily accessible from migrants' home areas, and moving back and forth between the two zones was not a practical option for most. Thus, Yapacaní tends to resemble other Santa Cruz settlement areas, to which entire families migrate permanently, rather than the Chapare, where as discussed above, many settlers attempt to maintain agricultural production in their home areas as well as in the lowlands. When the latter pattern is followed, husbands and older sons usually work the family lands in the Chapare, while wives and daughters remain in the upland areas, farming and caring for smaller children (Carafa et al. 1987; CEFOIN 1990; Jones 1990).

A second factor that may contribute to the low number of daughters represented in the DIRECO database is that many women may be involved in off-farm economic activities. As shall be discussed in detail in the following section, land is very unequally distributed in most areas of the Chapare and many families may find that they continue to need off-farm income, although the labor requirements of agriculture prevent most Chapare farmers from seeking work off the farm themselves. Of the 194 farmers interviewed by CERES, 66 percent stated that they

FIGURE 4

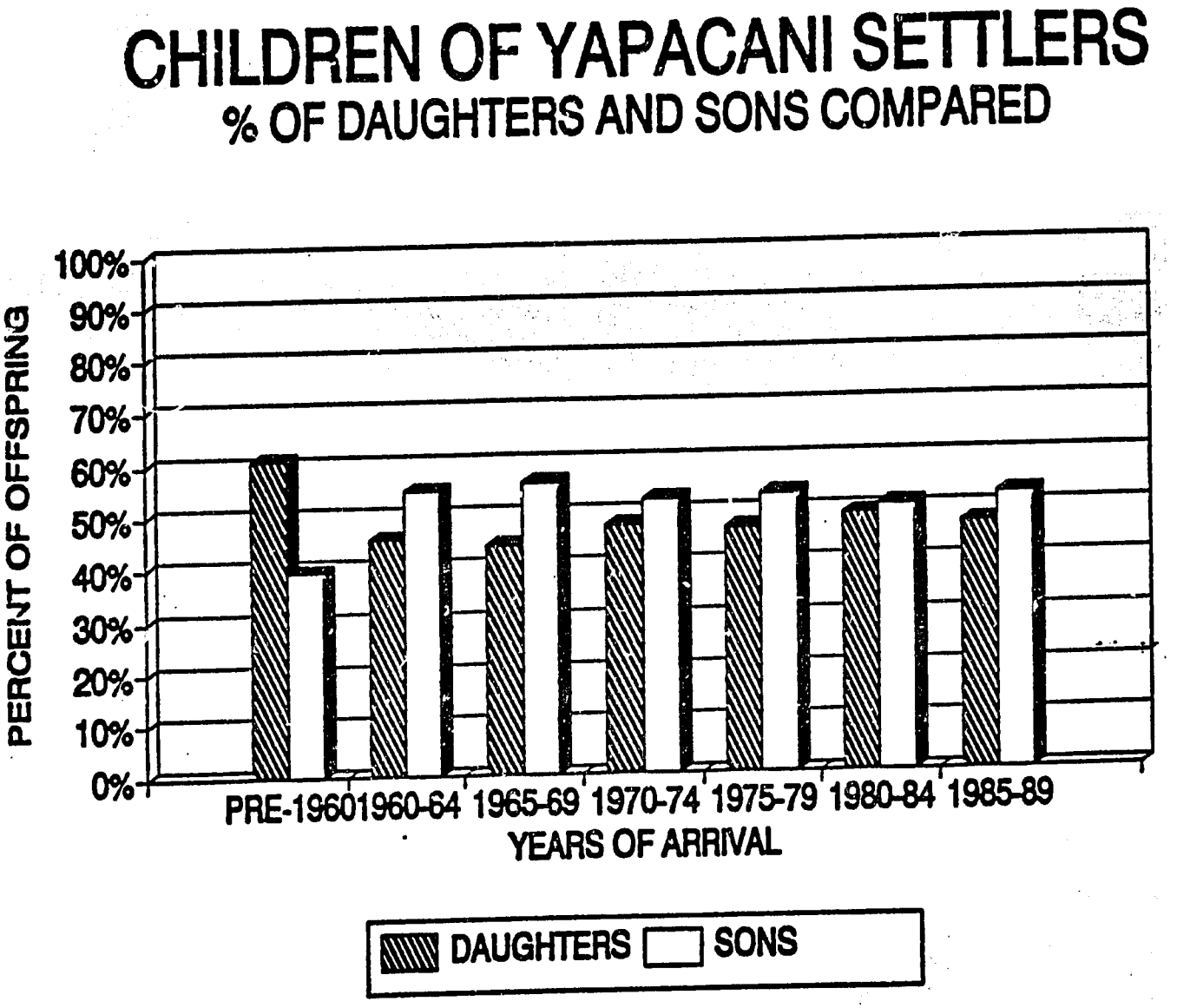
CHILDREN OF CHAPARE SETTLERS

% OF DAUGHTERS AND SONS COMPARED



*Source: DIRECO database.

FIGURE 5



Source: DIRECO database.

owned land and/or a house outside of the Chapare. Other research conducted by CERES reveals that large numbers of people in the migrant neighborhoods of Cochabamba have landholdings or other interests in the Chapare, even if they do not reside there most of the year (Alberto Rivera, personal communication). We also know that many migrant women in Cochabamba continue to be active in trade and transport, activities that form an important part of women's economic participation in many upland rural areas (e.g., CEFOIN 1990), and that this commercial activity involves many women in travel back and forth between Cochabamba and the Chapare. There appears to be an important number of Chapare families that do not maintain agricultural land in their home areas, but do maintain dual residences in the tropical lowlands and the city of Cochabamba, with the men responsible for farms in the Chapare and women managing commercial activities in the city.

Finally, a factor that is clearly responsible for the low number of women in the Chapare is the high level of risk associated with life there. As Jones (1990) discusses, the issues of disease and violence weigh particularly heavily in people's minds. As discussed in Section 2, Jones found that disease topped people's lists of things they don't like about the Chapare, with yellow fever, tuberculosis, and assorted lung diseases cited with particular frequency. In a poor population, where infant and child mortality rates are already frightfully high, one does not add to the risk by taking children to a place that is widely perceived as unhealthy. Similarly, people are very experienced with violence at the hands of the police (*Unidad Móvil de Patrulla Rural*, or UMOPAR), because of their official responsibilities to repress cocaine production, and unofficial activities involving corruption and physical abuse of the rural population (e.g., Isikoff 1989; Jones 1990; Kline 1987; Painter and Rasnake 1989). In short, the Chapare is not a healthy environment in the estimate of many to raise a family.

4. PRODUCTION SYSTEMS

4.1. Limitations of the Existing Data on Production

In theory, the DIRECO database offers considerable information on Chapare farming systems, and this section reports on some of the insights contained in the material. Unfortunately, it is in the area of specific information on crops and cropping systems that the weaknesses of the database are most apparent. Tables 12 and 13 summarize the agricultural data from the DIRECO for the Chapare and Yapacaní areas, breaking the information down according to the period in which the settlers arrived. As may be seen quickly, while the data offer a general picture of cropping systems, specific figures are often suspect. For example, the area dedicated to coca cultivation in the Chapare, according to the database consistently exceeds the figure given for the total area under cultivation. Similarly, if one adds the figures given for area dedicated to individual crops, the sum consistently exceeds the total area under cultivation in the Chapare. The discrepancies are less glaring in Yapacaní area; but, there too, one finds inconsistencies. Also, the significance of the distinction between "Other 1" and "Other 2" is unclear.

Table 12. Chapare Cropping Systems by Farmers' Period of Arrival

	Parcel Size	Coca Land	Cultivated Area	Fallow Area	Not Cultivated	Forested Area	Bananas	Cassava	Corn	Rice	Citrus	Taro	Avocado	Other 1	Other 2
							Pre-1960								
Total Has.	3261.20	551.60	329.85	306.80	97.63	167.80	150.31	82.48	22.11	102.07	251.95	2.54	22.04	57.26	2.51
Mean Area	8.98	1.52	0.91	0.85	0.27	0.46	0.41	0.23	0.06	0.28	0.69	0.01	0.06	0.16	0.01
Std. Dev.	6.51	1.18	2.67	3.33	1.12	2.13	1.32	0.34	0.22	0.46	1.11	0.03	0.50	1.51	0.06
N	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00	362.00	362.00
							1960-64								
Total Has.	4797.00	596.61	384.75	284.06	77.30	221.72	271.13	102.27	24.33	174.25	381.41	2.36	32.06	110.00	8.33
Mean Area	11.19	1.39	0.90	0.67	0.18	0.52	0.63	0.24	0.06	0.41	0.89	0.01	0.08	0.26	0.02
Std. Dev.	7.28	0.96	2.99	2.18	0.84	4.53	1.31	0.29	0.21	0.62	1.35	0.04	0.81	2.42	0.14
N	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00	427.00
							1965-69								
Total Has.	8614.80	1096.45	617.16	772.44	205.17	401.43	351.31	161.59	57.20	386.62	445.06	4.22	19.52	116.61	23.71
Mean Area	11.69	1.49	0.84	1.05	0.28	0.54	0.48	0.22	0.08	0.52	0.60	0.01	0.03	0.16	0.03
Std. Dev.	7.88	1.00	2.39	3.36	1.40	2.19	1.34	0.41	0.32	1.57	1.19	0.04	0.24	0.62	0.35
N	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00	737.00
							1970-74								
Total Has.	13821.60	1930.34	908.63	856.75	330.62	682.27	410.61	257.81	80.75	504.85	706.04	7.62	15.52	133.12	12.60
Mean Area	11.79	1.65	0.78	0.73	0.28	0.58	0.35	0.22	0.07	0.43	0.60	0.01	0.01	0.11	0.01
Std. Dev.	8.20	1.16	2.54	3.44	1.19	2.66	0.84	0.27	0.22	0.75	1.01	0.05	0.09	0.73	0.12
N	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1172.00	1171.00	1172.00	1171.00	1171.00
							1975-79								
Total Has.	19205.00	2449.48	1017.50	810.44	443.80	1135.60	504.81	391.13	114.77	773.26	804.84	7.14	21.46	135.48	8.88
Mean Area	11.23	1.43	0.60	0.47	0.26	0.66	0.30	0.23	0.07	0.45	0.47	0.00	0.01	0.08	0.01
Std. Dev.	7.50	0.95	1.98	1.76	1.19	2.82	0.81	0.29	0.26	0.74	1.42	0.03	0.10	0.78	0.12
N	1710.00	1710.00	1709.00	1709.00	1709.00	1709.00	1709.00	1709.00	1709.00	1709.00	1709.00	1707.00	1709.00	1707.00	1706.00
							1980-84								
Total Has.	38702.30	3500.14	1899.15	1339.11	1040.07	3517.12	708.21	713.54	265.77	1559.73	910.85	24.72	46.36	274.81	26.67
Mean Area	10.26	0.93	0.50	0.36	0.28	0.93	0.19	0.19	0.07	0.41	0.24	0.01	0.01	0.07	0.01
Std. Dev.	7.04	0.75	1.89	1.38	1.26	3.56	0.73	0.45	1.18	0.83	0.60	0.08	0.14	0.59	0.07
N	3773.00	3773.00	3769.00	3769.00	3769.00	3769.00	3771.00	3771.00	3771.00	3770.00	3771.00	3771.00	3771.00	3770.00	3767.00
							1985-89								
Total Has.	6928.40	415.71	284.44	301.76	150.02	730.08	77.43	70.33	31.66	223.16	77.56	2.16	3.57	29.50	0.99
Mean Area	9.86	0.59	0.40	0.43	0.21	1.04	0.11	0.10	0.05	0.32	0.11	0.00	0.01	0.04	0.00
Std. Dev.	6.89	0.65	1.35	1.67	1.09	3.69	0.48	0.17	0.21	0.81	0.26	0.02	0.07	0.41	0.02
N	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00	703.00

Source: DIRECO database.

Table 13. Yapacaní Cropping Systems by Farmers' Period of Arrival

	Parcel Size	Coca Land	Cultivated Area	Fallow Area	Not Cultivated	Forested Area	Bananas	Cassava	Corn	Rice	Citrus	Taro	Avocado	Other 1	Other 2
							Pre-1960								
Total Has.	369.80	4.34	130.50	149.95	44.50	66.00	0.47	4.40	1.50	24.50	4.47	0.00	0.00	108.05	5.00
Mean Area	28.45	0.33	10.04	11.53	3.42	5.08	0.04	0.34	0.12	1.88	0.34	0.00	0.00	8.31	0.38
Std. Dev.	13.54	0.25	10.21	9.24	3.28	9.20	0.07	0.56	0.29	1.82	0.79	0.00	0.00	9.14	1.08
N	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
							1960-64								
Total Has.	3227.70	36.71	1347.35	1236.30	238.50	352.50	90.02	19.71	34.02	255.45	22.09	0.20	1.62	774.70	68.70
Mean Area	31.96	0.36	13.34	12.24	2.36	3.49	0.89	0.20	0.34	2.53	0.22	0.00	0.02	7.67	0.68
Std. Dev.	15.45	0.46	13.12	13.42	5.54	8.86	2.32	0.42	0.76	3.06	0.31	0.02	0.10	10.43	4.10
N	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00	101.00
							1965-69								
Total Has.	6922.80	83.69	2581.61	2788.79	691.65	759.05	110.70	37.48	86.48	468.30	60.72	0.00	20.98	1443.05	142.85
Mean Area	32.20	0.39	12.01	12.97	3.22	3.53	0.51	0.17	0.40	2.18	0.28	0.00	0.10	6.71	0.66
Std. Dev.	14.81	0.41	11.40	12.75	5.32	7.76	2.12	0.73	0.81	2.83	0.82	0.00	0.73	9.28	3.44
N	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00	215.00
							1970-74								
Total Has.	5669.80	72.00	1693.37	2265.01	594.64	908.95	33.72	22.62	63.30	455.10	49.08	0.10	17.56	999.60	55.90
Mean Area	29.84	0.38	8.91	11.92	3.13	4.78	0.18	0.12	0.33	2.40	0.26	0.00	0.09	5.26	0.29
Std. Dev.	15.65	0.40	9.45	11.17	6.20	9.45	0.55	0.22	0.66	3.35	1.46	0.01	0.74	8.25	1.70
N	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
							1975-79								
Total Has.	5651.80	67.71	1469.58	2134.69	629.80	1039.90	88.74	18.89	58.69	449.13	24.72	6.00	0.92	696.35	23.91
Mean Area	29.13	0.35	7.58	11.00	3.25	5.36	0.46	0.10	0.30	2.32	0.13	0.03	0.00	3.59	0.12
Std. Dev.	17.78	0.38	8.18	11.30	5.67	10.27	2.06	0.17	0.60	4.06	0.24	0.43	0.04	6.42	1.44
N	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00	194.00
							1980-84								
Total Has.	5296.80	65.66	1246.20	1830.70	800.00	1561.08	59.04	24.58	65.25	410.10	48.19	0.01	2.81	426.32	26.12
Mean Area	26.48	0.33	6.23	9.15	4.00	7.81	0.30	0.12	0.33	2.05	0.24	0.00	0.01	2.13	0.13
Std. Dev.	17.14	0.49	6.56	10.55	6.82	12.30	0.82	0.25	0.67	2.22	1.11	0.00	0.07	4.30	0.92
N	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
							1985-89								
Total Has.	1337.30	10.82	251.89	431.50	188.04	394.70	18.53	10.28	11.47	79.75	6.61	0.00	3.00	80.21	4.46
Mean Area	26.75	0.22	5.04	8.63	3.76	7.89	0.37	0.21	0.23	1.60	0.13	0.00	0.06	1.60	0.09
Std. Dev.	18.61	0.27	5.78	8.69	6.95	12.40	1.18	0.48	0.47	1.84	0.35	0.00	0.42	3.29	0.39
N	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00

Source: DIRECO database.

We have inquired about these problems and DIRECO has attempted to be helpful in answering our questions. However, to date, we have not been able to explain or resolve the problems satisfactorily. Based on our conversations with DIRECO and other sources of information on Chapare production systems such as Jones (1990) and the information in the CERES interviews, we conducted our analysis along the following guidelines or assumptions. The most accurate figures are of coca cultivation, as DIRECO's major responsibility is to measure coca cultivation and certify reductions in cultivation in order for farmers to qualify for cash payments, agricultural credits, and technical assistance. Individual crop figures probably are also accurate, as DIRECO indicated that these are either actually measured or closely estimated by their personnel while they are in farmers' fields. Figures for total parcel size are probably fairly accurate as well, as lots have actually been surveyed in some cases, as part of the process of securing certificates of possession from the INC or other sorts of titles. Also, as the population of the Chapare has increased over the last decade, farmers have had to be very concerned about boundaries. Less reliable are the global estimates of total land under cultivation, uncultivated land, land in fallow, and forested land.

4.2. General Characteristics of Chapare Farming

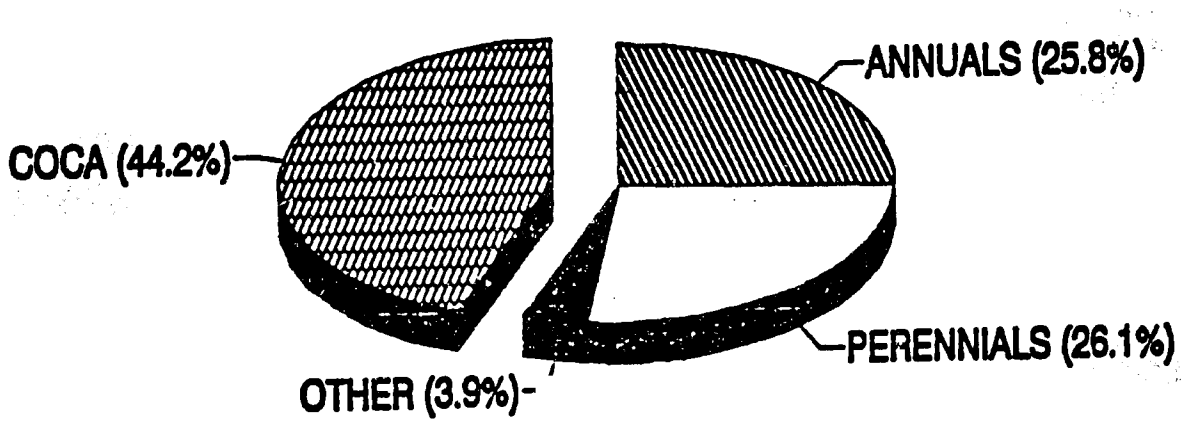
The general picture that emerges of Chapare farmers is that they are by and large smallholders with a diversified cropping system and few animals. Within this system, coca is the single most important crop, as one would expect, since it is the crop for which there has been the most reliable market over the last decade. However, coca is by no means the only crop cultivated by Chapare farmers. Chapare production systems include significant quantities of annual and perennial crops. In fact, in almost all cases, the amount of land dedicated to annual crops and other perennial crops exceeds the amount of land under coca cultivation. Coca amounts to approximately 40 percent of the area under cultivation in the Chapare.[11] In Yapacaní, coca production is a small part of the agricultural activity of farmers, accounting for about 4 percent of the cultivated area, based on the DIRECO database. The relationship of the areas under coca cultivation in the Chapare and Yapacaní is illustrated in Figures 6 and 7.

An important issue in understanding Chapare farming is the destination of non-coca production, particularly annual crops. Annual crops are consumed by farm families, forming the basic elements in their diet, and they are sold, although prices are normally low. Because of the high reliance on family and other forms of unwaged labor, the consumption role of annual crops is particularly important, as these workers usually reside on farm and must be fed and housed. Food is also provided workers as part of most hired labor arrangements. As is

[11] DIRECO figures place coca production at approximately 44 percent of a farmer's cultivated area, on average, while the data collected by CERES yield average figures that range between 37 and 39 percent of the area under cultivation. The difference in the results of the two studies are not significant.

FIGURE 6

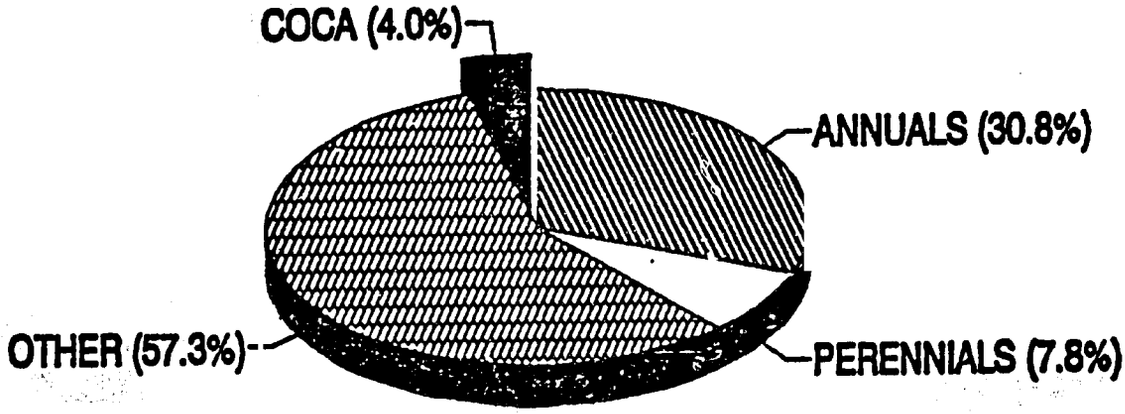
COCA AND OTHER CROPS
CHAPARE



Source: DIRECO database.

FIGURE 7

COCA AND OTHER CROPS
YAPACANI



Source: DIRECO database.

discussed below, coca is a labor-intensive crop to establish, the destination of annual crops are an indicator of the role that coca plays in the production system. When annual crops form an important part of the cropping system over the long term, and are primarily used for domestic consumption, it is probable that the family relies heavily on coca production for its income, and that annual crops are playing a role in their strategy for securing the necessary waged and unwaged labor.

Chapare farms are small compared to those in lowland settlement areas elsewhere in Bolivia, with the mean farm size between approximately nine and twelve hectares. Farm sizes in the San Julián area averaged approximately 40 hectares, with farmers who formalized their settlement through the INC receiving 50 hectare lots. In Yapacaní, the mean farm size is between 27 and 32 hectares (see Figure 8).

On the Chapare smallholdings the mean area under cultivation is between approximately 1.25 and 4 hectares, with coca cultivation occupying between about .5 and 1.25 hectares of this. The relationship of coca to other crops is fairly constant across cohorts of settlers defined by their year of arrival through the 1970s. For settlers who arrived during the 1980s, the total area under cultivation is significantly smaller and coca occupies a more important position (Figure 9). However, this is clearly related to the fact that not enough time has passed for them to establish an important perennial crop component in their production systems. In Yapacaní, coca is a minor part of farm production regardless of when a farm family arrived (Figure 10).

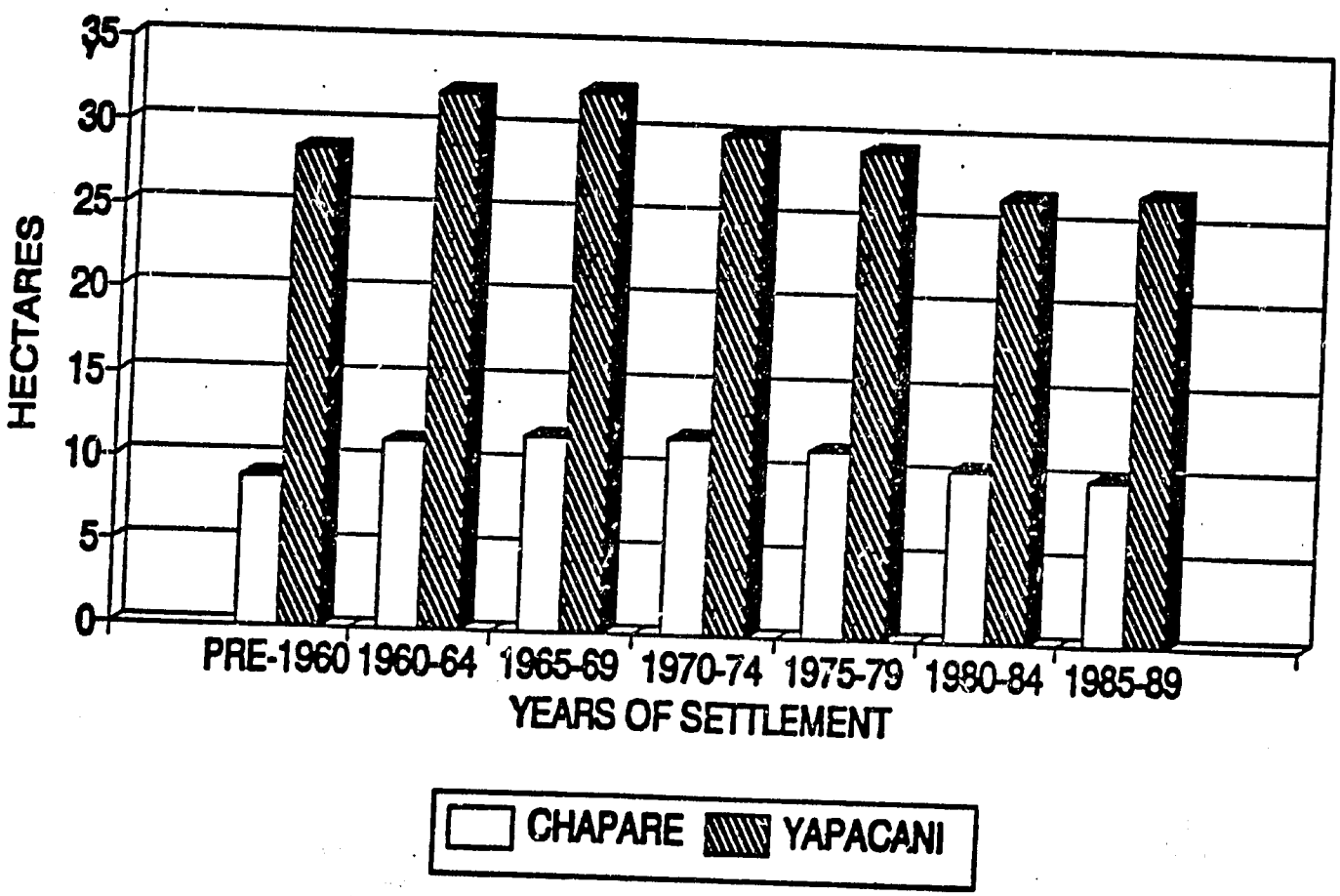
Variations in cropping systems become more apparent when one compares Chapare settlers according to the Microregions in which they reside. This suggests that over the medium to long term the physical conditions of a particular area play a critical role in shaping the production practices of farmers. As may be seen in Figure 11, mean farm lot sizes vary considerably from one Microregion to another, ranging from approximately seven to 27 hectares. Also, the mean area per farm dedicated to coca production remains fairly constant across microregions, ranging from approximately .9 hectares to approximately 1.6 hectares. At the same time, the percentage of the farm lot dedicated to coca varies considerably, from 3.36 percent to 14.49 percent of the total farm area (See Tables 14, 15, and 16).

To assess the significance of the relationship of farm size to the amount of coca under cultivation we calculated two Spearman's rank-order coefficients. In both cases the independent variable was the mean lot size in each Microregion. In one comparison we assigned the mean amount of coca in hectares in each Microregion as the dependent variable, and in the other, we assigned the percentage of the farm's area dedicated to coca as the dependent variable. The value of r_s when the ranks of the Microregions were compared with respect to the relationship between mean farm size and the mean area under coca cultivation was .393, indicating no significant correlation. However, when we compare the ranks of the Microregions with respect to mean farm size and the mean percentage of the total farm area under coca cultivation the resulting Spearman's rank order coefficient is -.857, which is significant at the .05 level.

FIGURE 8

MEAN LOT SIZE BY YEAR OF SETTLEMENT

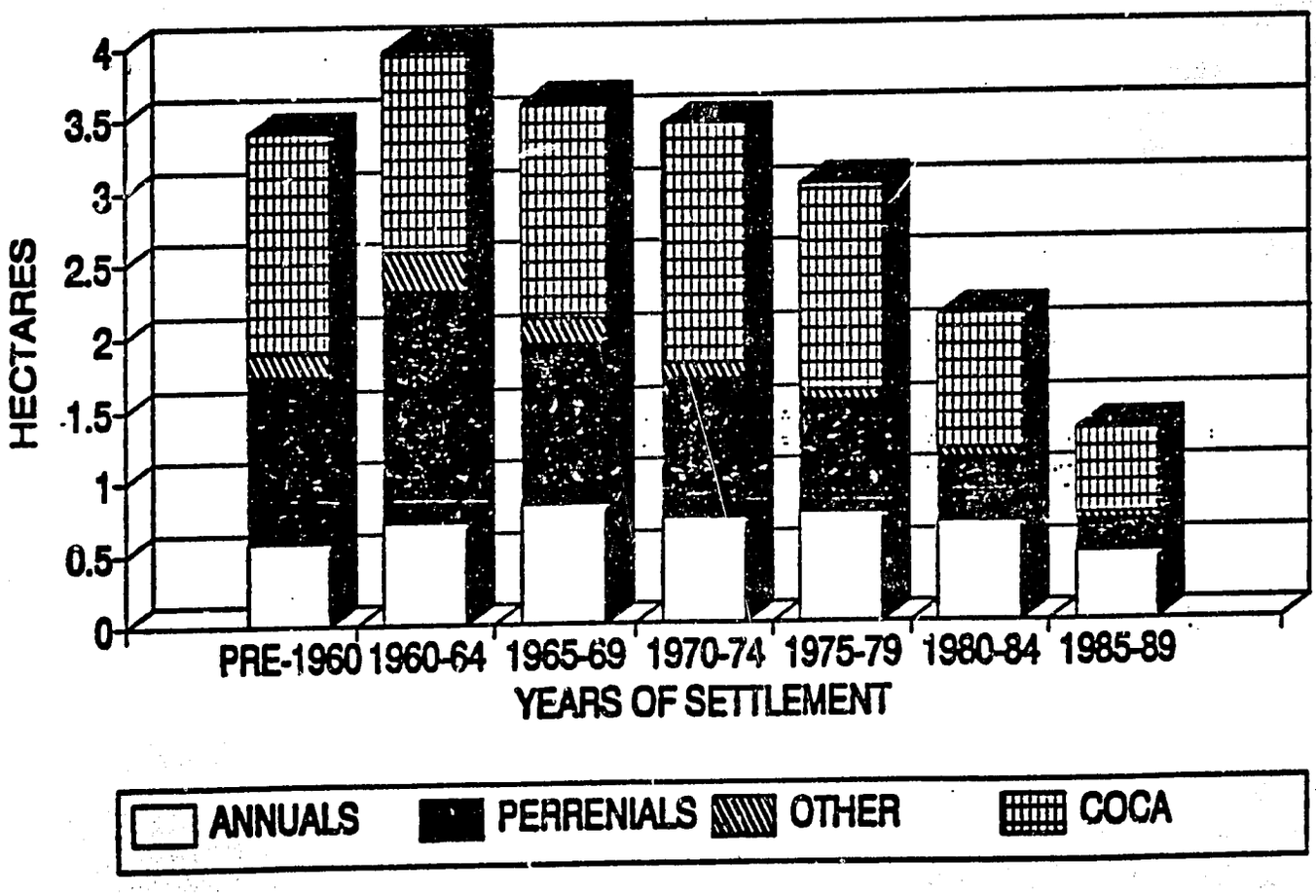
CHAPARE AND YAPACANI COMPARED



Source: DIRECO database.

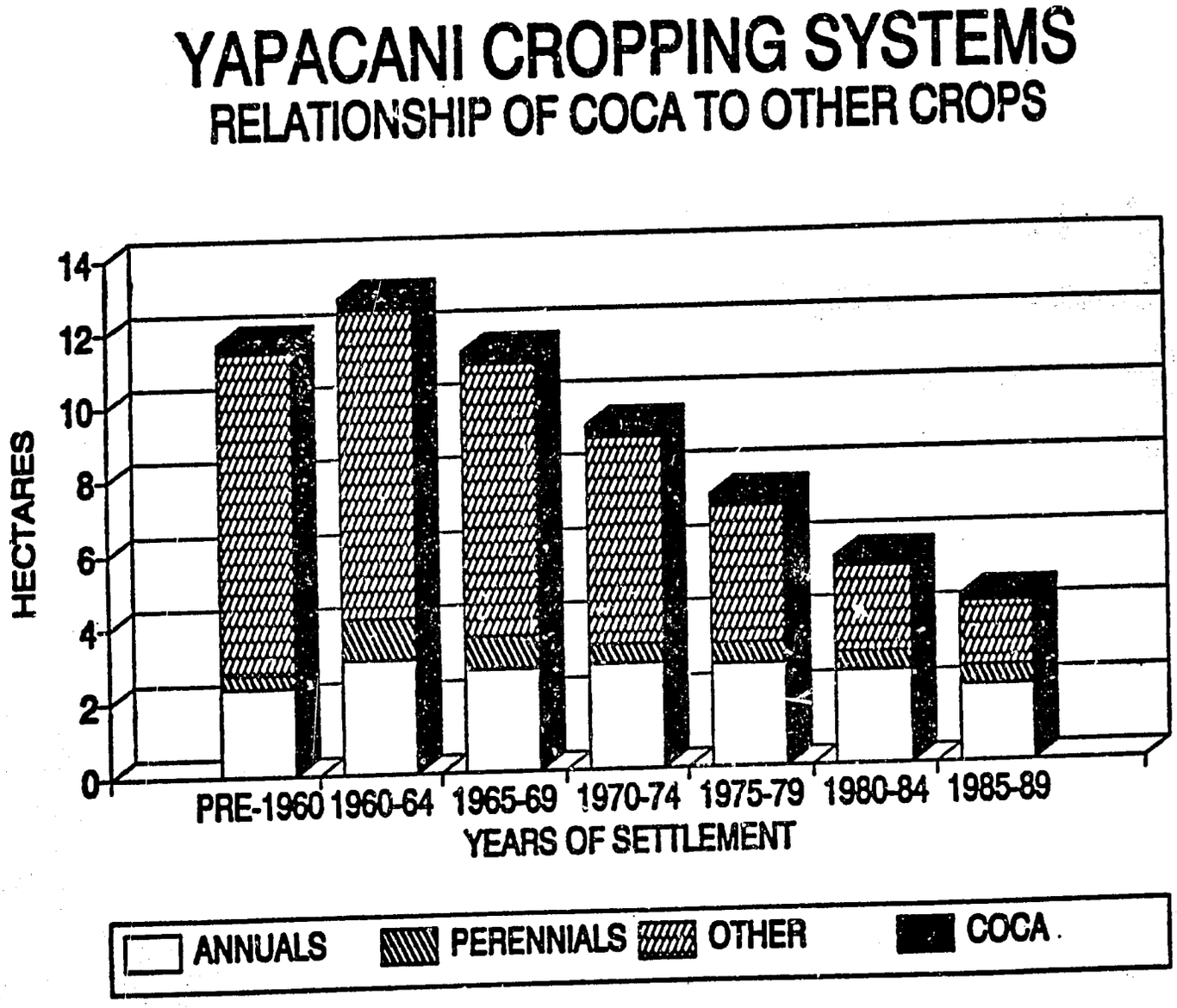
FIGURE 9

CHAPARE CROPPING SYSTEMS
RELATIONSHIP OF COCA TO OTHER CROPS



Source: DIRECO database.

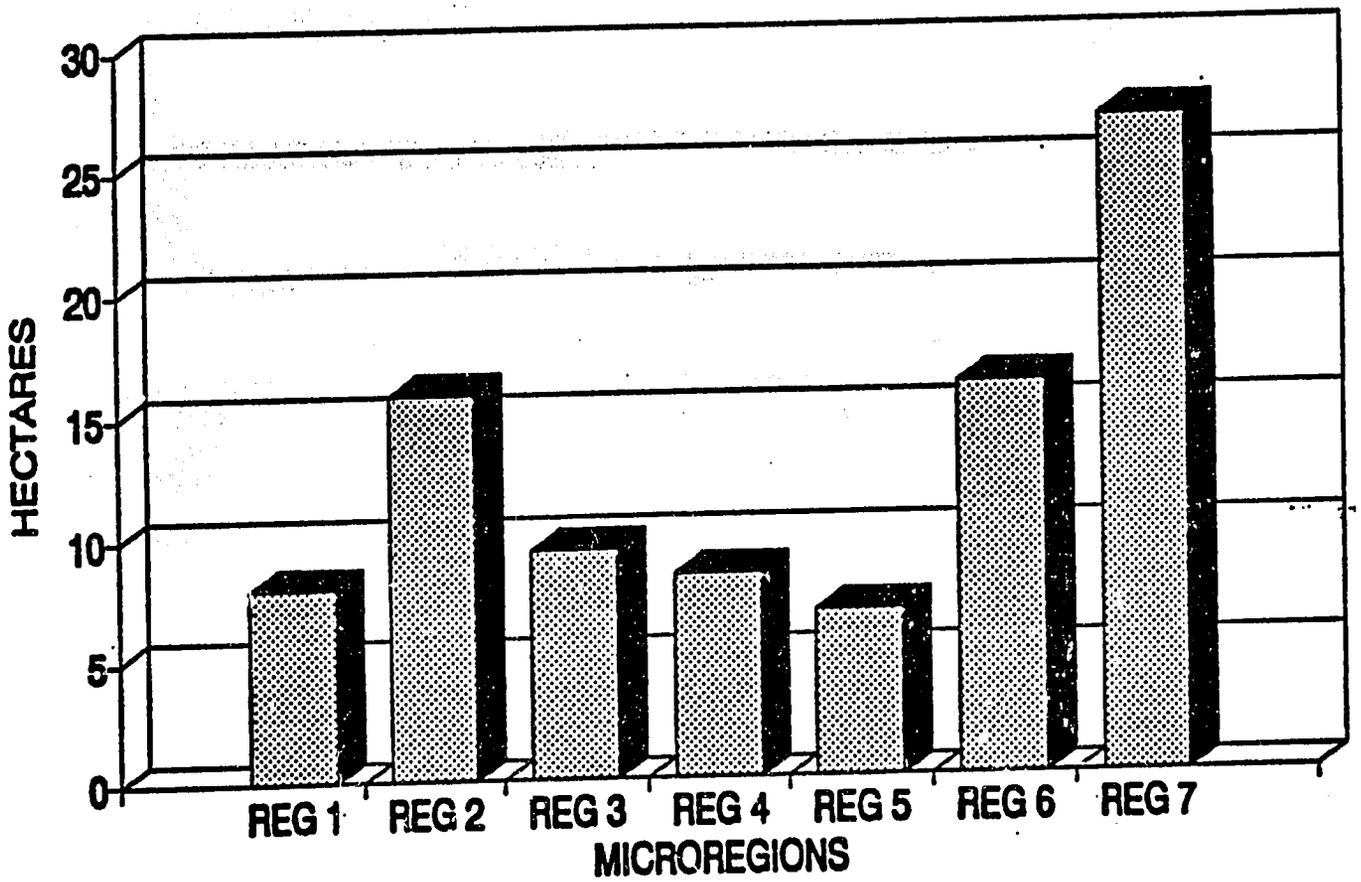
FIGURE 10



Source: DIRECO database.

FIGURE 11

MEAN LOT SIZES OF CHAPARE FARMERS
BY MICROREGION



Source: DIRECO database.

Table 14. Total Areas in Hectares Dedicated to Crop Production Chapare Farmers Included in DIRECO Database

Crop	MICROREGIONS						
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7
Coca	605.87	1,937.44	3,758.44	2,936.97	249.68	632.61	176.62
Bananas	454.53	399.56	885.05	257.44	63.49	121.43	174.46
Cassava	107.11	308.47	609.06	527.91	36.61	97.90	55.95
Corn	52.42	202.76	171.68	75.43	11.02	34.88	32.08
Rice	140.90	724.73	1,121.81	1,063.72	37.22	159.93	345.52
Citrus	597.37	755.40	1,026.15	751.99	60.60	224.16	42.08
Taro	3.84	3.28	18.42	15.10	4.10	1.38	4.00
Avocado	59.96	6.63	54.24	21.53	2.49	1.78	2.13
Other 1	45.10	128.92	254.69	74.12	24.14	38.87	240.76
Other 2	6.60	21.85	26.26	12.78	6.01	4.98	2.94

Source: DIRECO database.

Table 15. Mean Areas in Hectares Per Farm Dedicated to Crop Production Chapare Farmers Included in DIRECO Database

Crop	MICROREGIONS						
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7
Coca	1.04	1.57	1.08	1.22	0.88	1.28	0.91
Bananas	0.78	0.32	0.25	0.11	0.22	0.25	0.89
Cassava	0.18	0.25	0.18	0.22	0.13	0.20	0.29
Corn	0.09	0.16	0.05	0.03	0.04	0.07	0.16
Rice	0.24	0.59	0.32	0.44	0.13	0.32	1.77
Citrus	1.03	0.61	0.30	0.31	0.21	0.45	0.22
Taro	0.01	0.00	0.01	0.01	0.01	0.00	0.02
Avocado	0.10	0.01	0.02	0.01	0.01	0.00	0.01
Other 1	0.08	0.10	0.07	0.03	0.09	0.08	1.23
Other 2	0.01	0.02	0.01	0.01	0.02	0.01	0.02

Source: DIRECO database.

Table 16. Percentages of Farmland in Each Microregion Dedicated to Different Uses

Microregion	Annual Crops (%)	Perennial Crops (%)	Other Crops (%)	Coca (%)	No Crops* (%)
Reg. 1	6.61	24.17	1.12	13.17	54.92
Reg. 2	6.35	5.95	0.77	9.92	77.01
Reg. 3	5.83	5.97	0.85	11.41	75.93
Reg. 4	8.30	5.09	0.43	14.49	71.70
Reg. 5	4.60	6.54	1.56	12.90	74.40
Reg. 6	3.70	4.37	0.55	7.95	83.43
Reg. 7	8.33	4.16	4.64	3.36	79.52

Includes land in fallow, forested land.

Source: DIRECO database.

This suggests several points about Chapare coca production. First, coca producers are not seeking to maximize coca production. Social science research on small farmers suggests two explanations for this. One is that, since coca is the only cash crop that offers farmers good possibilities of turning a profit, there is a system of quotas on production to exercise some control over price and ensure that coca revenues are broadly distributed among farmers. Such systems exist in many areas of the world. Peanut quotas enforced by the federal government in the southeastern U.S. and quotas on high value cash crops such as tea enforced by contract farming schemes in different areas of the world are examples that come to mind. In the Chapare, one can imagine that the *sindicatos* might be interested in a quota system in order to distribute the revenues from coca production among their members, while drug traffickers would be interested if they could dispense coca leaf production quotas as a means of exercising influence over the producer population. In fact, the existence of an explicit quota system appears extremely unlikely in the Chapare, although an informal quota system could be enforced by coca leaf buyers. Considering whose interests might be served and why by the existence of a quota on coca production is suggestive about the dynamics of coca cultivation there.

A second, more likely, explanation of the statistics presented above is that the actual amount of coca under production is dependent on the interaction of three factors: 1) farmer calculations regarding the minimum amount of coca required to yield a cash income that covers basic consumption requirements; 2) the limitations on the availability of family labor to harvest, dry and transport coca leaves; and 3) the limitations on the capacity of farmers to hire additional laborers. Interviews conducted by CERES suggest that most Chapare farmers use a combination of unremunerated family labor and hired labor to harvest coca. The relative importance of family labor is greatest with those farmers whose area under cultivation is smallest, and decreases as the area under cultivation increases (see Table 17).

Table 17. Type of Labor Force Utilized According to Cultivated Hectares

Number of Cultivated Hectares	Only Family Labor Force		Family Labor Plus Hired Labor		Total	
	#	%	#	%	#	%
0.1 to 2.99	28	67.0	14	33.0	42	100.0
3 to 4.99	16	36.0	29	64.0	45	100.0
5 to 6.99	4	25.0	12	75.0	16	100.0
7 +	1	7.0	13	93.0	14	100.0
	49	42.0	68	58.0	117	100.0
					7	No Answer
					124	

Source: CERES interviews.

Larger land owners tend to be wealthier, and they can hire more workers. However, if this were the only factor at work, we would expect there to be a positive correlation between farm size and the amount of land in coca production, which there is not. In fact, very few farmers exceed 1.5 hectares in coca cultivation, regardless of how much land they have. This suggests that farmers are striking a balance in their minds between the value of coca as the only crop they can be reasonably sure of selling (which means that they want to have a minimum amount in order to insure they can meet basic needs), and the risks associated with coca (price instability [Jones 1990], violence, and repression).

The relatively greater importance of coca for farmers who own less land also emphasizes the importance of coca as the major economic option for those farmers who have few other choices. The farmers who are most dependent on coca are those with the least land, and alternatives to coca production need packages of crops, inputs, and, most importantly, marketing strategies that insure that these really do represent practical alternatives given constraints on farmer resources and the need to mitigate risk. It also means that, whether they are the direct objects of police violence or not, the poorest farmers are the ones who are most hard hit by efforts to repress and disrupt coca production. To the extent that such repression efforts are successful, they leave some of the poorest members of Bolivian society with few economic alternatives. The potential social and economic costs of robbing these people of their livelihood without providing genuine alternatives are at least as high as those currently associated with illicit coca production.

Finally, when we examine coca production as part of a diversified farm production strategy in which farmers have invested significantly in other crops, we see that getting them to adopt new cropping systems and technologies is not a problematic issue to the extent that they perceive these as addressing the limitations on economic opportunities that make coca attractive.

Just as rural populations have historically been very responsive to changing patterns of costs and opportunities in making their migratory decisions, farmers in the Chapare are responsive to changing opportunities and costs associated with different crops. The focus for alternative development efforts in the Chapare needs to be on overcoming the constraints on the profitable marketing of agricultural products.

4.3. Land Distribution

While land distribution is in the Chapare is not as skewed as it is in some areas, there is considerable inequality in the size of individual landholdings. Furthermore, land distribution patterns vary considerably from one Microregion to another. This variation by Microregion underscores the importance of the variability in the physical capacity of the Chapare to sustain different types of agricultural production regimens, and the need for alternative development efforts to take this variability into account. Furthermore, the unequal distribution of land within each Microregion indicates that technical packages of inputs and cultivars need to reflect the variability in the resources of farmers and how this will influence their capacity to take advantage of the production assistance offered. While it is not practical to think of tailoring technical assistance packages to the needs of all strata of Chapare farmers, it would be useful to base technical assistance on an economic analysis that departs from an explicit notion on the physical limitations on sustainable production in each Microregion, and an explicit consideration of the economic potential of the bulk of the farms there, given the size of landholdings and what we know about the profitability and production costs associated with each alternative.

Table 18 summarizes the frequency distribution of the Chapare farms included in the DIRECO database according to the size of landholdings. As may be seen more clearly in Figures 12 - 18, which are based on the table, in all Microregions most farmers hold relatively small amounts of land, although there is considerable variation both in the modal landholding size and in the pattern of distribution. In Microregions 1 and 3, which are regarded as having the greatest agricultural potential, the modal landholding size is approximately ten hectares. This is also the case in Microregions 4 and 5. In Microregions 2 and 6, the modal landholding size is approximately 20 hectares. Microregion 7 has a bimodal distribution, with landholdings concentrated around 20 and 30 hectares.

Table 19 presents the concentration of landholdings in the hands of farmers of different sizes in the Chapare. As may be seen, the 10 percent of farmers who own the largest lots control between approximately 13 percent of the total farm area, in Microregion 6, and 30 percent of the total farm area, in Microregion 5. More significantly, the bottom 10 percent of farmers in terms of the size of their holdings control only between 0.47 percent of the farm area, in the case of Microregion 5, and 2.35 percent of the farm area, in Microregion 7. Figures 19 - 25 graphically represent the concentration of landholdings in each Microregion. As may be seen, when the farmers are divided into 20 percent cohorts, rather than the 10 percent cohorts shown in Table 19, the pattern of concentration becomes even more dramatic.

One important issue that the large number of farmers with small extensions of land raises is the extent to which farm size is a constraint to profitably adopting the packages of inputs and crops being offered as alternatives to coca cultivation. Additional economic research needs to be conducted to show whether or not, given the distribution of land, particular technical assistance packages offer practical options for farmers.

Table 18. Frequency Distribution of Chapare Farms by Lot Size

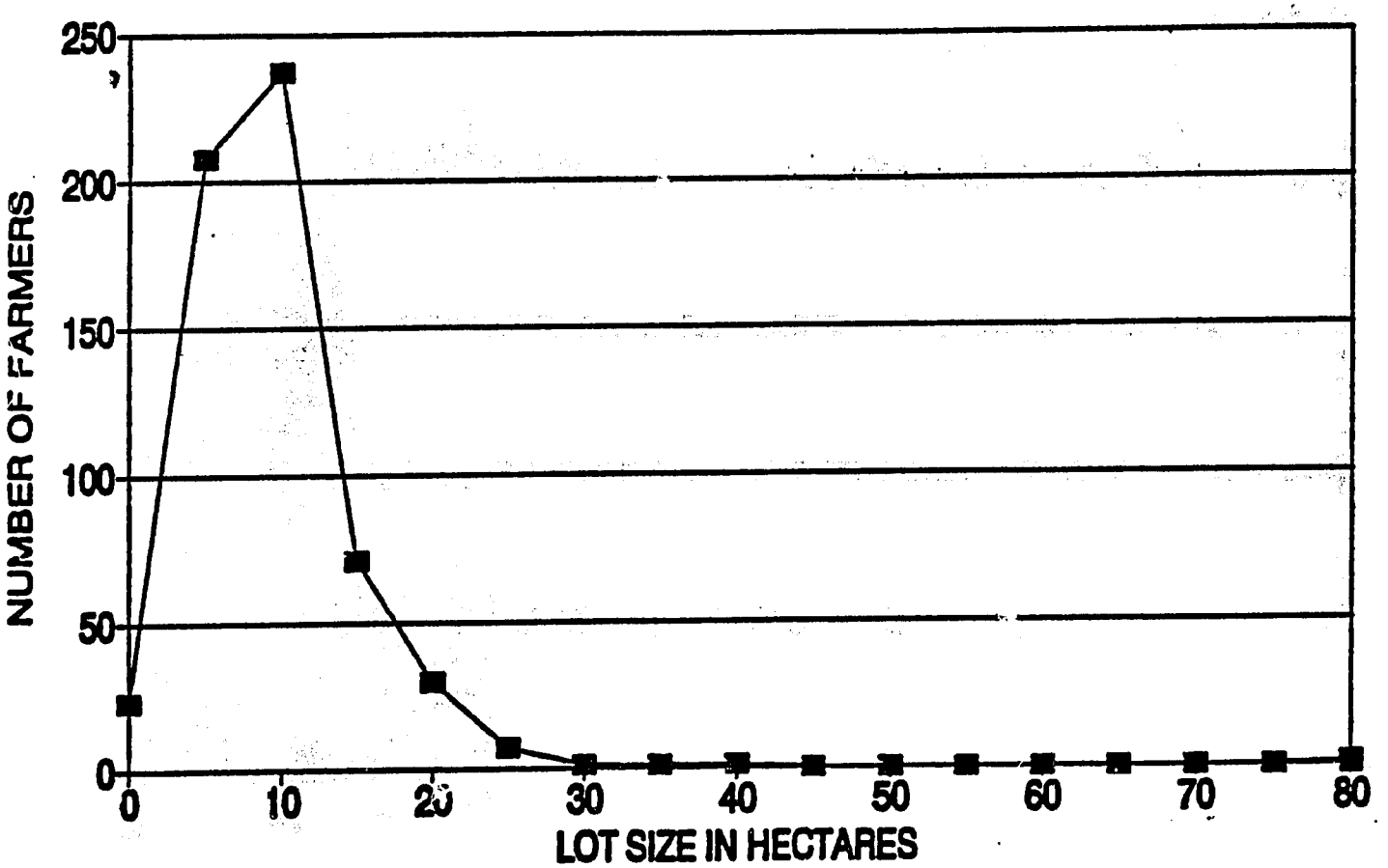
Hectares	MICROREGIONS						
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7
0	23	37	178	79	14	7	2
0<N≤5	208	65	847	660	128	21	2
5<N≤10	237	211	1,597	1,385	112	93	14
10<N≤15	71	178	291	179	19	57	24
15<N≤20	30	688	513	93	4	294	49
20<N≤25	7	27	27	7	2	20	1
25<N≤30	1	2	7	3	1	0	43
30<N≤35	1	6	0	0	0	0	20
35<N≤40	1	3	6	2	0	1	9
40<N≤45	0	0	1	1	3	0	2
45<N≤50	0	8	0	0	0		19
50<N≤55	0	0	0	1	0		1
55<N≤60	0	4	1	0	0		9
60<N≤65	0	0	0		0		0
65<N≤70	0	0	1		1		
70<N≤75	0	1	0		0		
75<N≤80	1	0	2				
80<N≤85	0	1	0				
No. of Farms	580	1,231	3,471	2,410	284	493	195
Max. Farm Size	78	82	80	54	70	36	60

Source: DIRECO database.

FIGURE 12

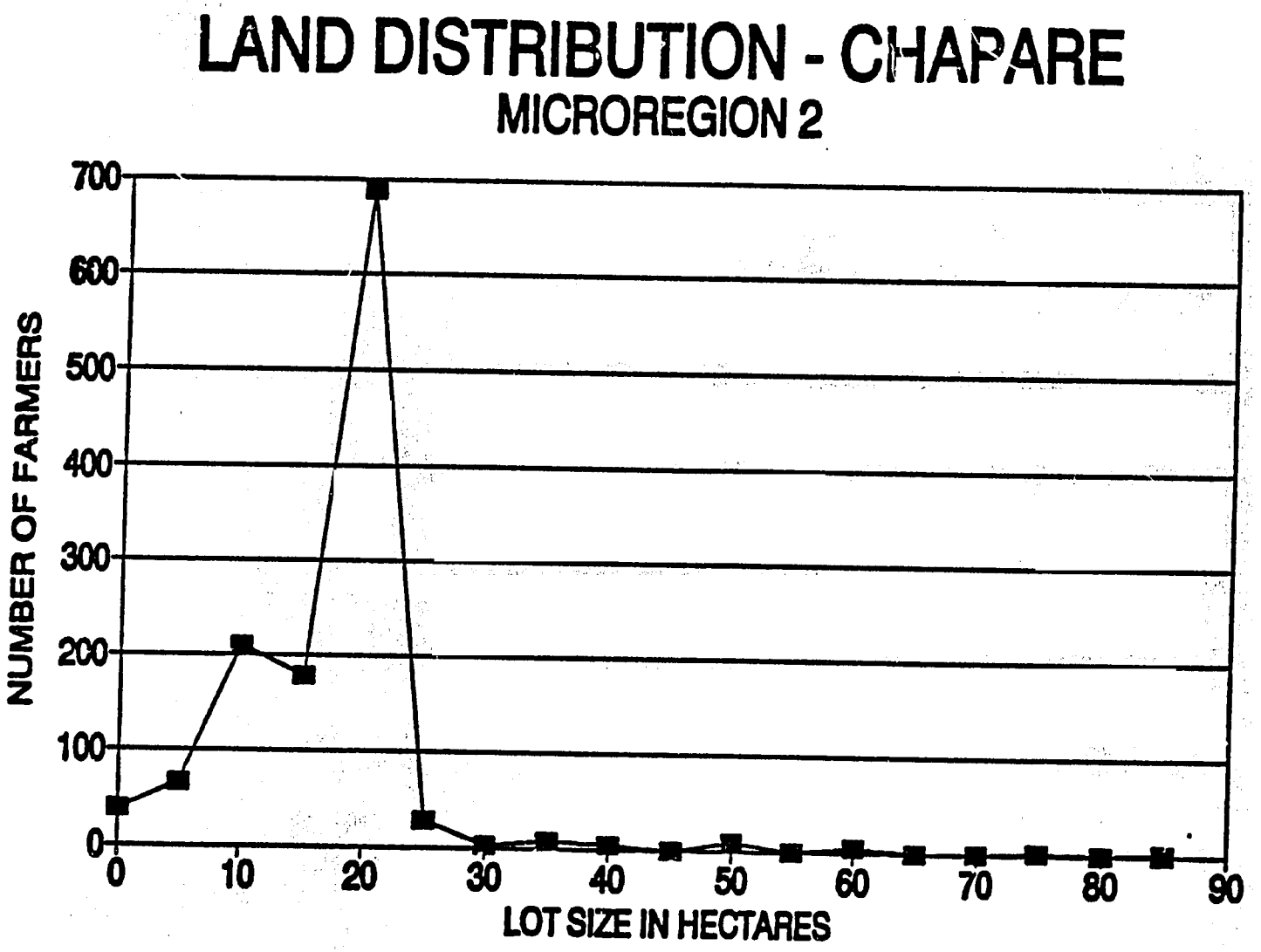
LAND DISTRIBUTION - CHAPARE

MICROREGION 1



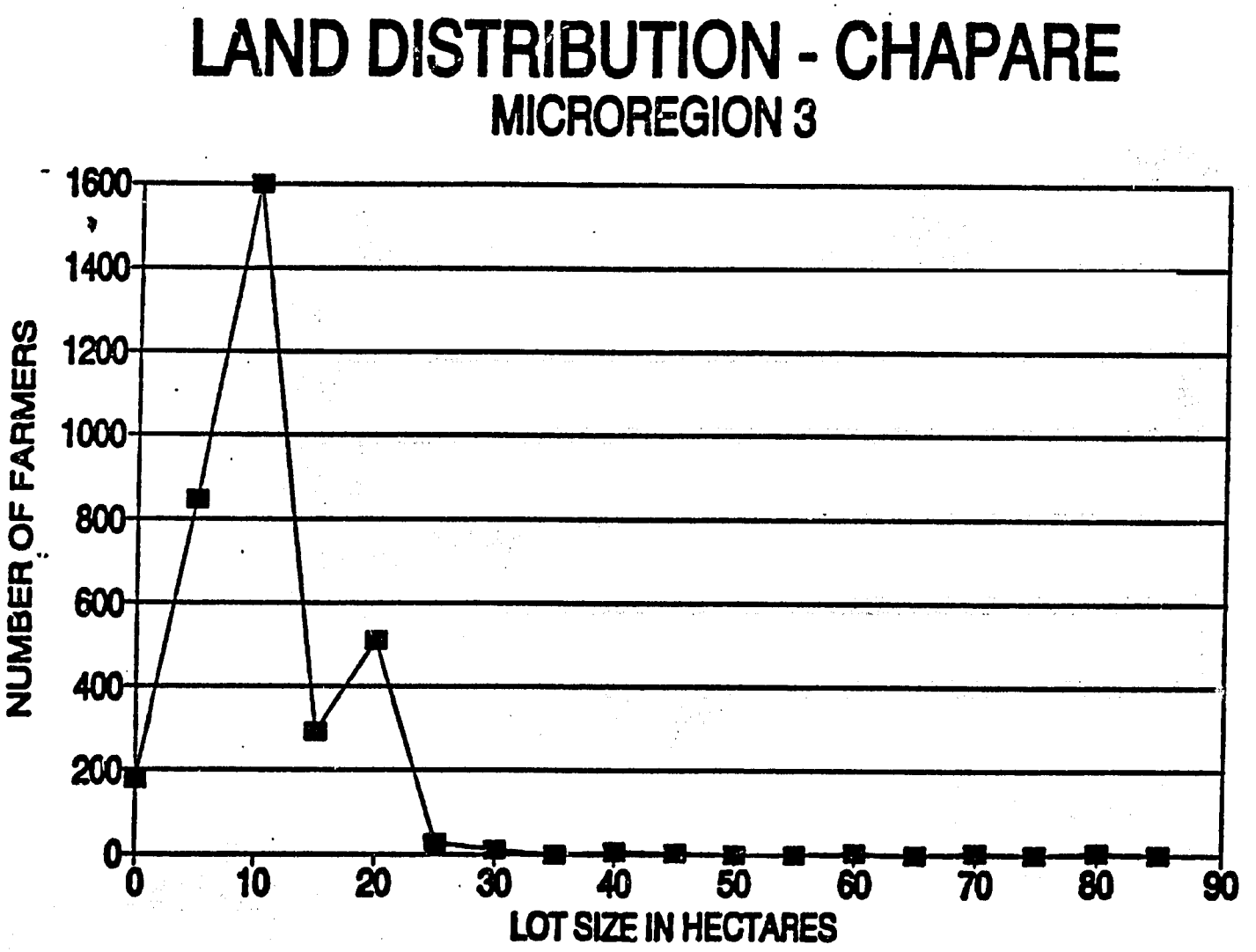
Source: DIRECO database.

FIGURE 13



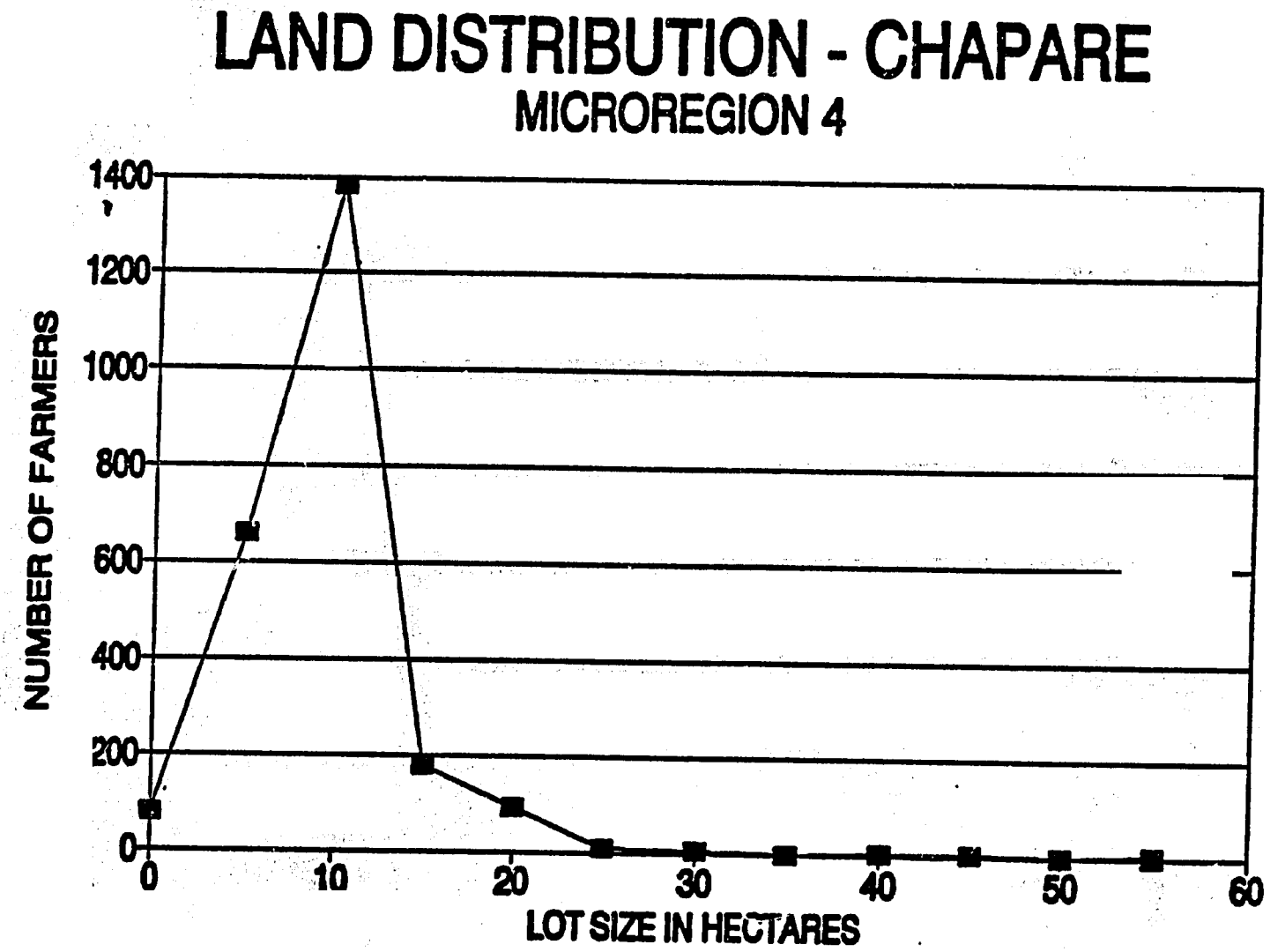
Source: DIRECO database.

FIGURE 14



Source: DIRECO database.

FIGURE 15

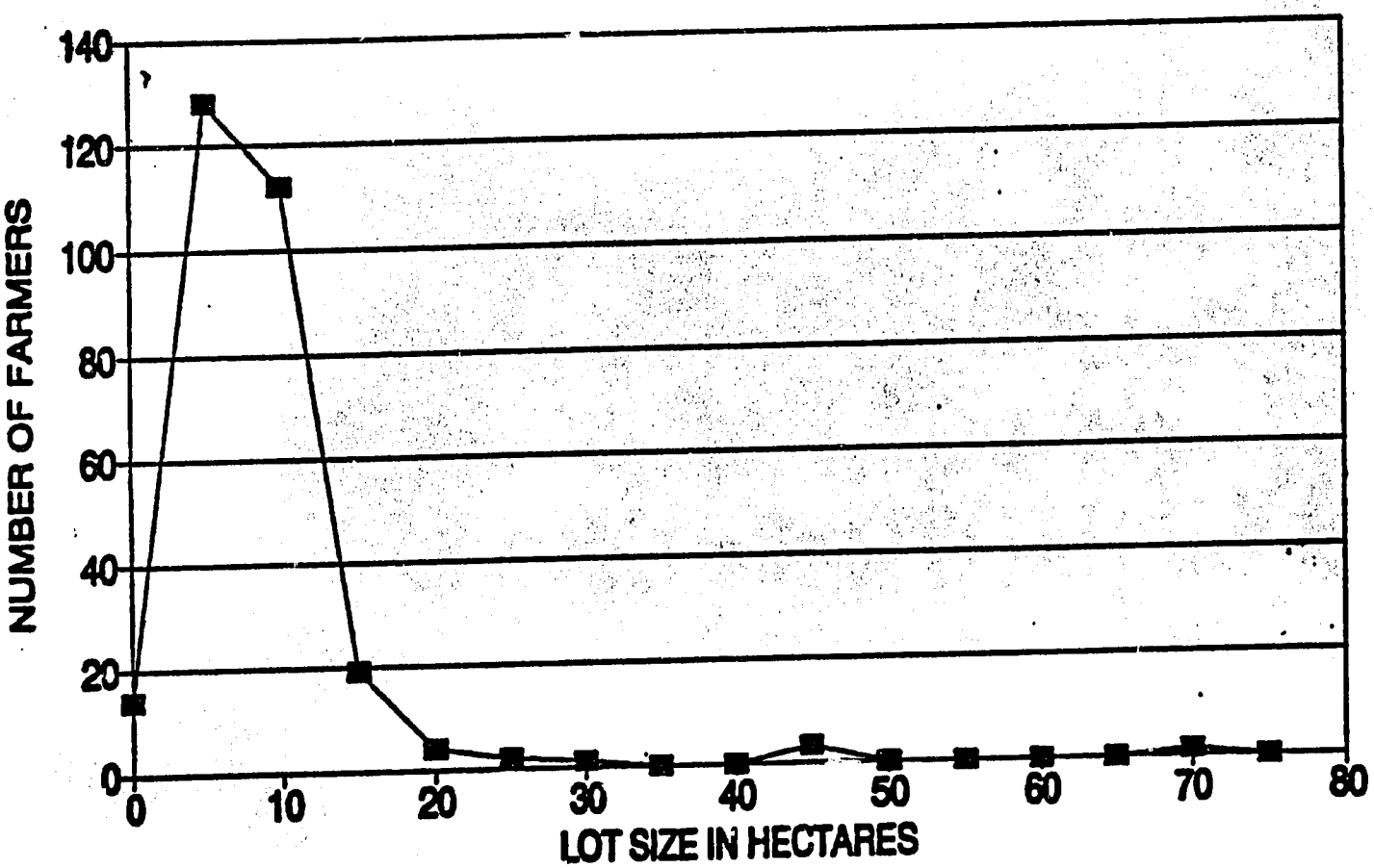


Source: DIRECO database.

FIGURE 16

LAND DISTRIBUTION - CHAPARE

MICROREGION 5

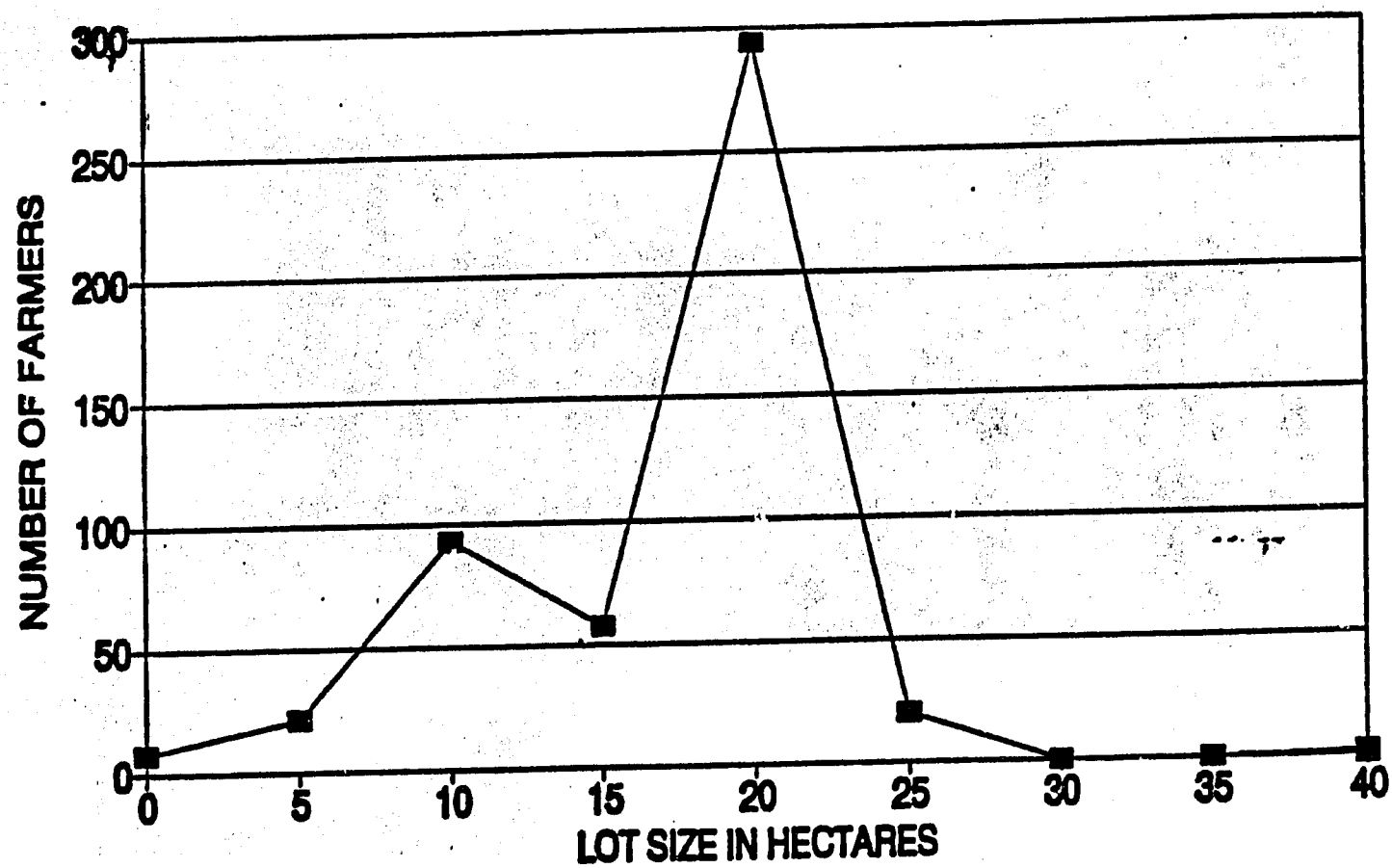


Source: DIRECO database.

FIGURE 17

LAND DISTRIBUTION - CHAPARE

MICROREGION 6

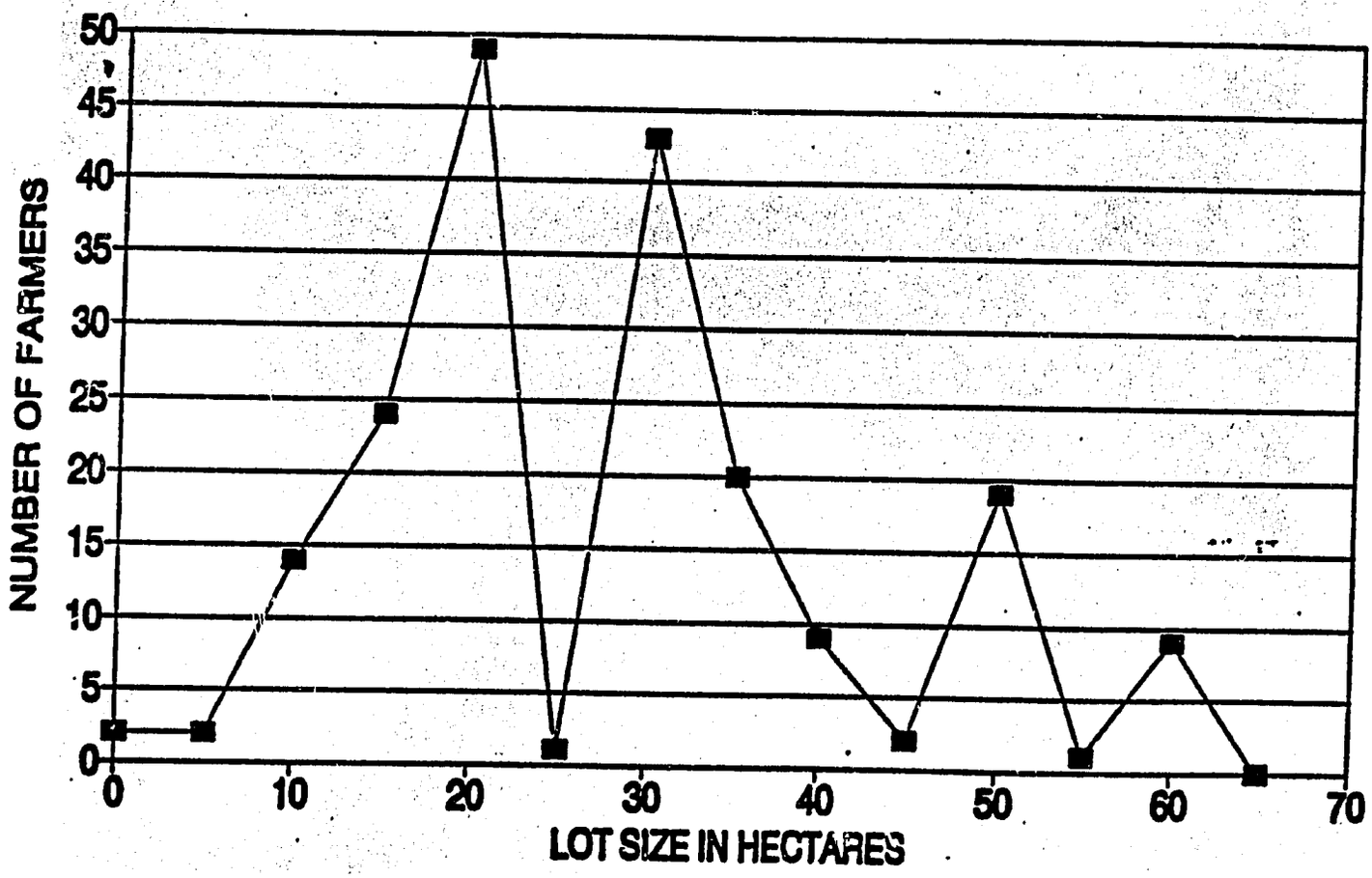


Source: DIRECO database.

FIGURE 18

LAND DISTRIBUTION - CHAPARE

MICROREGION 7



Source: DIRECO database.

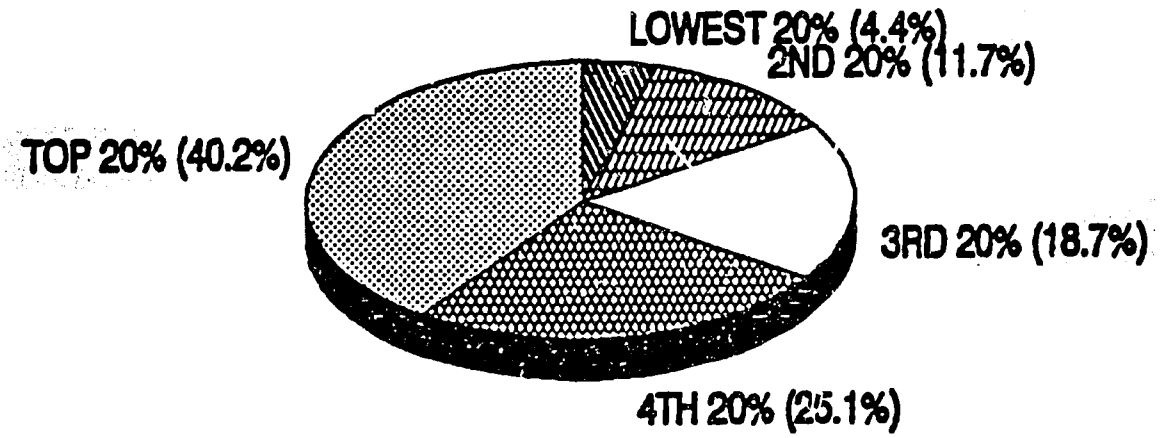
Table 19. Concentration of Landholdings in the Chapare

Strata	MICROREGIONS													
	Reg. 1		Reg. 2		Reg. 3		Reg. 4		Reg. 5		Reg. 6		Reg. 7	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Bottom 10%	41.5	0.90	352.0	1.80	289.3	0.88	341.5	1.68	9.0	0.47	202.7	2.55	123.50	2.35
9th 10%	159.1	3.46	1,092.1	5.59	1,275.1	3.87	1,065.2	5.26	57.0	2.95	491.4	6.18	245.00	4.66
8th 10%	249.0	5.41	1,361.2	6.97	1,741.0	5.29	1,205.0	5.94	96.1	4.97	565.4	7.11	338.00	6.43
7th 10%	290.0	6.30	1,780.0	9.11	2,357.6	7.16	1,616.6	7.98	120.8	6.24	755.0	9.49	384.00	7.31
6th 10%	372.3	8.09	2,077.3	10.64	3,177.5	9.65	2,284.4	11.27	145.0	7.49	938.4	11.80	429.00	8.16
5th 10%	486.3	10.57	2,300.5	11.78	3,470.0	10.54	2,410.0	11.89	178.0	9.20	1,000.0	12.57	550.70	10.48
4th 10%	574.0	12.48	2,460.0	12.60	3,470.0	10.54	2,410.0	11.89	215.4	11.13	1,000.0	12.57	599.00	11.40
3rd 10%	580.0	12.61	2,460.0	12.60	3,734.0	11.34	2,410.0	11.89	256.7	13.27	980.0	12.32	681.20	12.96
2nd 10%	686.8	14.93	2,460.0	12.60	5,999.2	18.22	2,473.6	12.20	290.5	15.01	980.0	12.32	888.00	16.90
Top 10%	1,161.1	25.24	3,185.4	16.31	7,417.9	22.53	4,053.8	20.00	574.4	29.69	1,039.7	13.07	1,017.30	19.36

Source: DIRECO database.

FIGURE 19

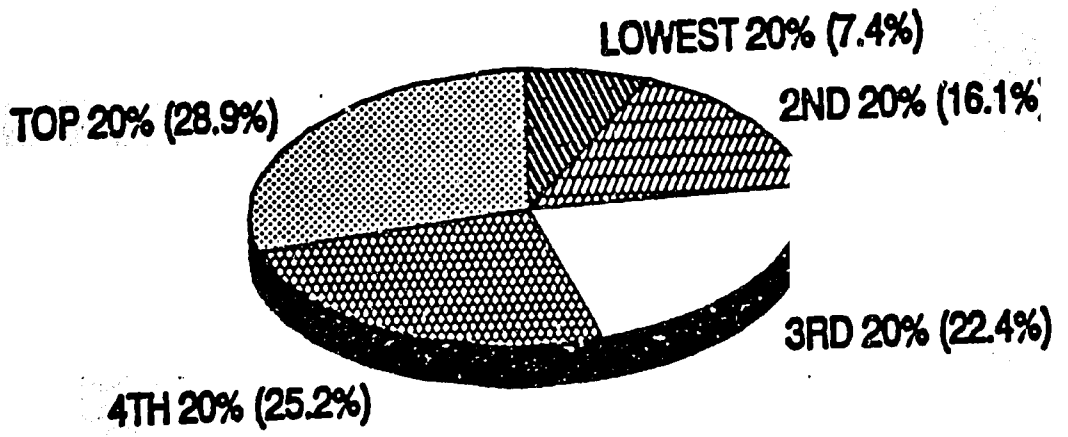
LAND DISTRIBUTION - CHAPARE
MICROREGION 1



Source: DIRECO database.

FIGURE 20

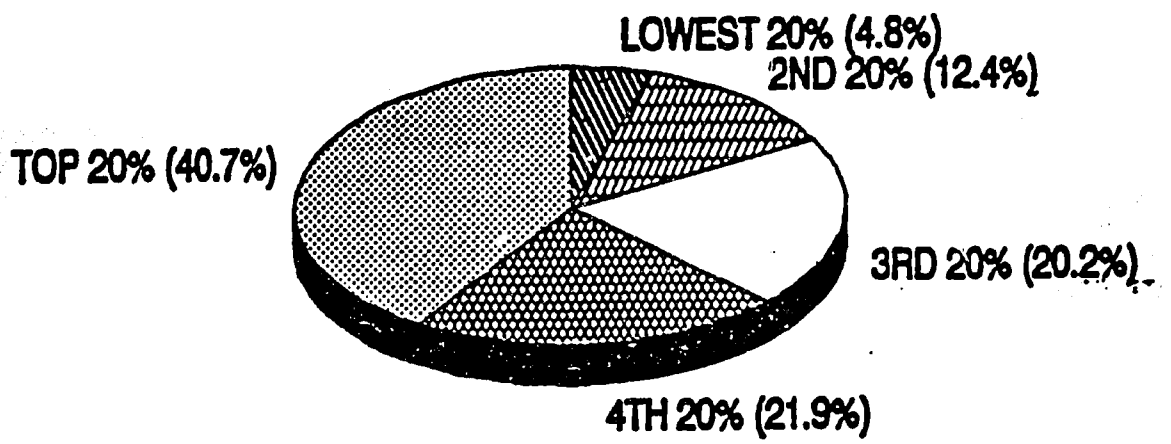
LAND DISTRIBUTION - CHAPARE
MICROREGION 2



Source: DIRECO database.

FIGURE 21

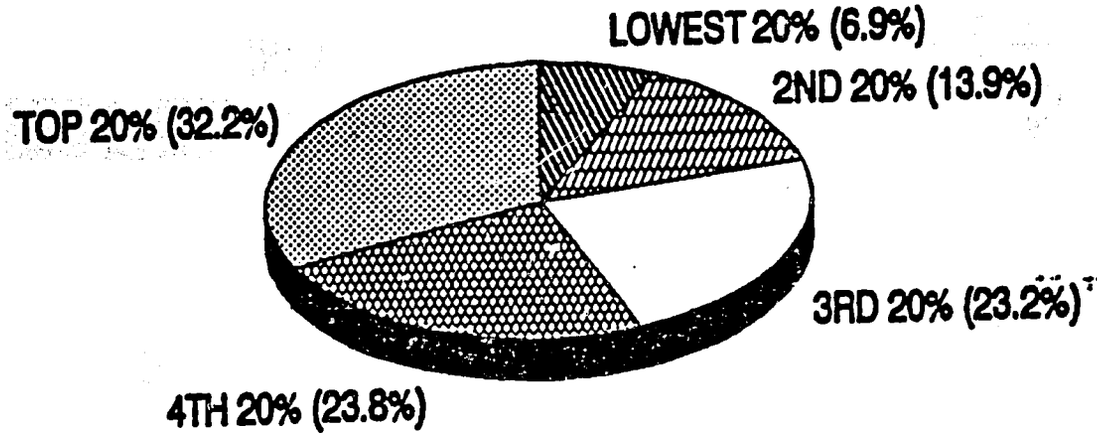
LAND DISTRIBUTION - CHAPARE
MICROREGION 3



Source: DIRECO database.

FIGURE 22

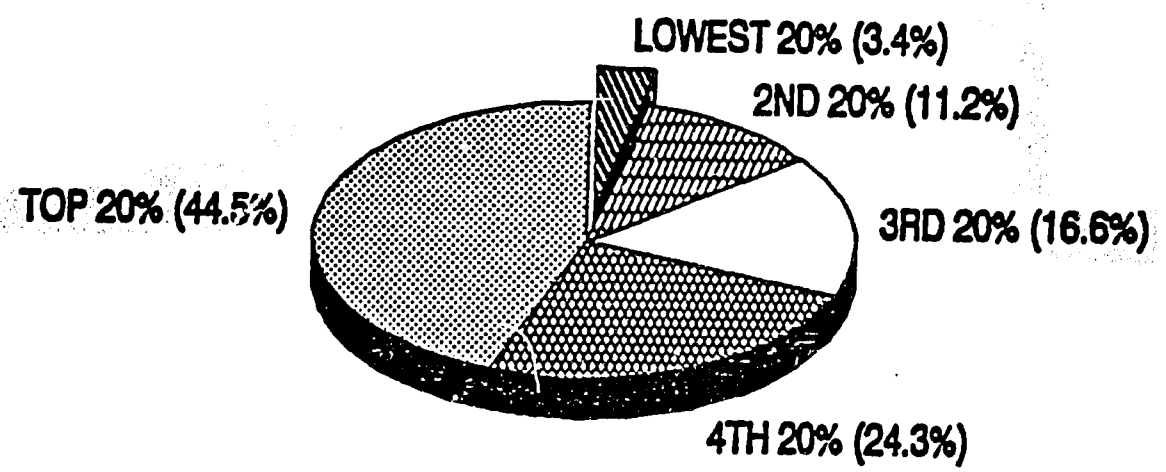
LAND DISTRIBUTION - CHAPARE
MICROREGION 4



Source: DIRECO database.

FIGURE 23

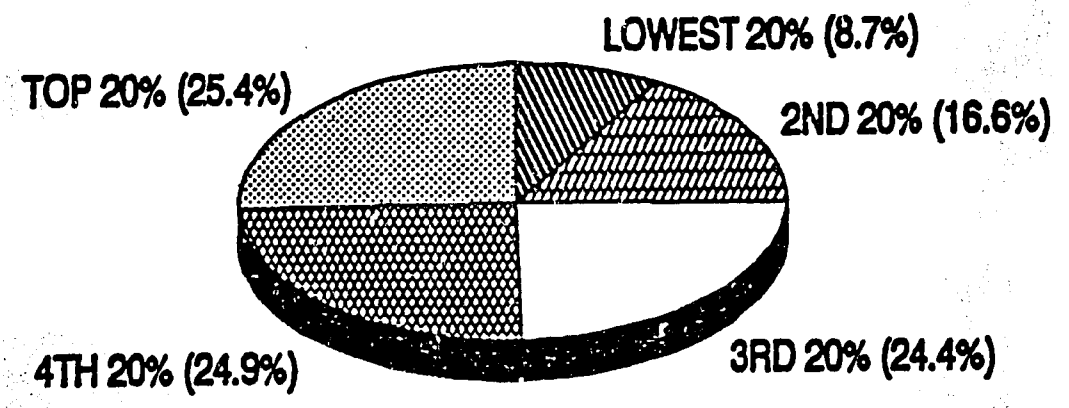
LAND DISTRIBUTION - CHAPARE
MICROREGION 5



Source: DIRECO database.

FIGURE 24

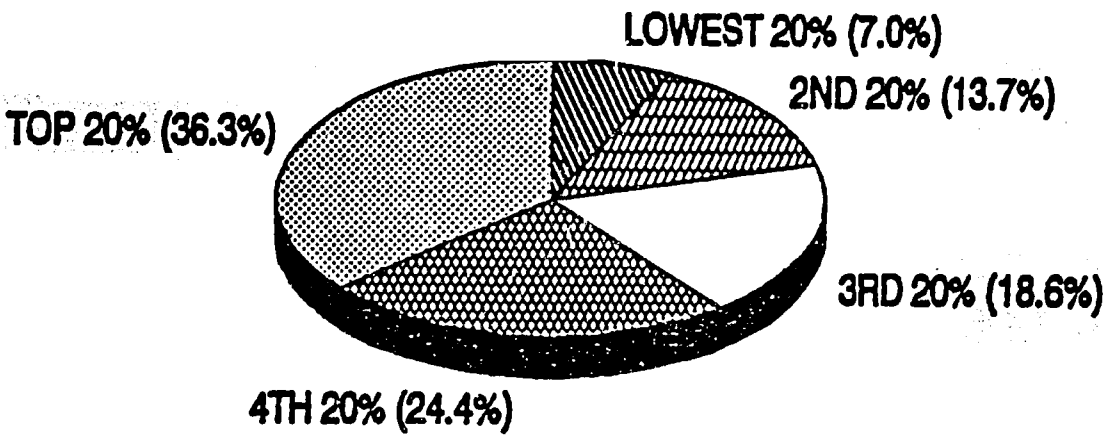
LAND DISTRIBUTION - CHAPARE
MICROREGION 6



Source: DIRECO database

FIGURE 25

LAND DISTRIBUTION - CHAPARE
MICROREGION 7



Source: DIRECO database.

A second issue that the distribution of landholdings raises relates to the extent to which Chapare farming may be environmentally destructive, and suggests where efforts need to be directed to address this issue. Information obtained from the CERES interviews with Chapare farmers shows that the average fallow area -- 6.39 hectares -- is larger than the average total cultivated area of 3.2 hectares (Table 20).[12] In other words, overall, an average of two hectares is left fallow or abandoned for every one hectare cultivated. The CERES data also indicate that 71 percent of the farmers in Chapare manage plots that are predominantly fallow areas and cultivated with annual crops. The practice of shifting cultivation inside these plots is the principal agricultural system. In the remaining 29 percent of the plots, the permanent crops occupy most of the cleared land (Table 21). These figures paint a picture of agriculture in the tropical areas of the Chapare as characterized by a very extensive land use regimen.

Nevertheless, this data must be analyzed further and with great care. Figures from fallow areas were obtained from the CERES questionnaire, which explicitly asked the coca farmers the number of hectares left fallow on their plots. Responses from farmers included the word chume, which is used to denote land abandoned after having been cultivated for a given period of time. There is every indication that farmers responded in a precise manner to this question. Notwithstanding this, we are interested in understanding whether Chapare farmers manage chume land. Do they sow, plant and harvest; do they leave the land fallow for a certain pre-determined period; or do they simply abandon the land definitively? Recent studies carried out in other regions of the Amazon reveal that certain non-indigenous traditional communities -- for example, the ribereños in Perú -- manage fallow areas (Denevan and Padoch 1990). Their use of natural resources is similar to that of the indigenous groups living in the same area. It is likely that farmers born in the tropical provinces in the Chapare zone and whose families have resided there for generations, utilize their resource base in a like manner. Nevertheless, there is as yet no indication that the Andean farmers in the tropical zones manage their resources in a sustainable fashion. The fact that some colonists eventually return to fallow or abandoned areas to harvest some products is not evidence of sustainable use of resources. In any case, it is essential that this question be studied in more depth.

Moreover, the CERES interviews show that large farmers are more extensive in their use of land than are small farmers, in that they have a larger proportion of their land in fallow than do small farmers. This results in a lower index of intensity of soil use. In that sense, greater soil use intensity is inversely related to plot size. Table 22 illustrates this relationship. While the smaller plots are concentrated on the higher indexes -- 0.7 to 1.0 -- the larger farms are on the lower indexes -- 0.1 and 0.2. Thus, large farmers are more likely than small ones simply to allow land to fall into disuse when productivity declines, relying on a fallow period to restore

[12] In this analysis we rely on the CERES material because we feel the figures on area of land in fallow are more reliable than those contained in the DIRECO database. The DIRECO materials appear to reflect accurately the areas dedicated to individual crops. But, the global figures on land under cultivation, land in fallow, and land in forest are inconsistent with the figures on individual crops, and appear to consistently underestimate these areas.

fertility at some unspecified future time. Likewise, it should be noted that although the incidence of fertilizer use lightly increases with the intensity of soil use, the overall use of this modern input is very low among all Chapare farmers (Table 23). Expressed differently, smaller fallow areas are not accompanied by significant increases in fertilizers. Finally, although 89 percent of the agriculturalists interviewed by CERES utilize insecticides, these are basically used for coca plantations.

Table 20. Soil Use in Chapare

Plot Size Hectares	Cases	(1) Average Plot Size Hectares	(2) Coca (Average) Hectares	(3) Permanent Crops (Average) (Including Coca) Hectares	(4) Annual Crops (Average) Hectares	(5) Fallow Area Hectares	(6) Total Agricultural Area (3+4+5) Hectares	(7) Intensity of Soil Use $\frac{3+4}{6}$
0.1 to 5	29	4.43	0.91	1.60	0.78	1.53	3.91	0.61
5.1 to 10	57	8.57	1.21	2.15	1.13	3.32	6.6	0.49
10.1 to 20	31	17.16	1.91	3.64	1.33	9.98	14.95	0.33
20.1 +	7	59.28	1.62	2.41	1.79	40.0	44.2	0.09
Global Average	124	12.61	1.34	2.06 (64.0)	1.14 (36.0)	6.39	9.59	0.33
				(100.0)				

Source: CERES interviews.

Table 21. Principal Cropping System According to Plot Size

Plot Size (Hectares)	Agricultural System with Fallow (Annual Crops + Fallow Area)		Agricultural System without Fallow (Permanent Crops)		Total	
	#	%	#	%	#	%
0.1 to 5	20	53.0	18	47.0	38	100.0
5.1 to 10	46	68.0	22	32.0	68	100.0
10.1 to 20	32	94.0	2	6.0	34	100.0
20.1 +	7	100.0	--	--	7	100.0
	105	71.0	42	29.0	147	100.0
					47	No Data
					194	

Source: CERES interviews.

Table 22. Intensity of Soil Use According to Plot Size

Plot Size (Hectares)	Intensity of Soil Use									
	0.1 to 0.2		0.3 to 0.4		0.5 to 0.6		0.7 to 1.0		Total	
	#	%	#	%	#	%	#	%	#	%
0.1 to 5	3	11.0	5	17.0	9	31.0	12	41.0	29	100.0
5.1 to 10	3	14.0	17	30.0	21	37.0	11	19.0	57	100.0
10.1 to 20	13	42.0	10	32.0	7	23.0	1	3.0	31	100.0
20.1 +	6	86.0	1	14.0	--	--	--	--	7	100.0
	30	24.0	33	27.0	37	30.0	24	19.0	124	100.0

Source: CERES interviews.

Table 23. Modern Inputs Use According to Intensity of Soil Use

Intensity of Soil Use	Number of Cases	Improved Seeds		Fertilizers		Insecticides	
		Yes %	No %	Yes %	No %	Yes %	No %
0.1 to 0.2	30	8.0	92.0	4.0	96.0	88.0	12.0
0.3 to 0.4	33	--	100.0	16.0	84.0	100.0	--
0.5 to 0.6	37	6.0	94.0	16.0	84.0	87.0	13.0
0.7 to 1.0	24	7.0	93.0	25.0	75.0	80.0	20.0
	124	5.0	95.0	15.0	85.0	89.0	11.0

Source: CERES interviews.

The CERES interviews permit us to determine how this extensive type of cultivation causes significant damage to the forest. As we see in Table 24, farmers must clear 17.27 hectares of land in order to manage 2.77 cultivated hectares at a level of intensity of 0.1 to 0.2. At levels of 0.3 and 0.4, a total of 10.30 hectares must be cleared in order to cultivate 3.96 hectares. In the former case, the proportion of the effective area to be cultivated to the total area deforested (fallow + cultivated areas) is 6.23; whereas in the latter the proportion is 2.6. In other words, those following a pattern of extensive soil management must clear between six and two hectares of land for every one in production. Large areas of forest are being consumed to maintain relatively small areas of agricultural production under the present system. Among these plots, land rotation rather than crop rotation is the main pattern of cultivation. Nevertheless, still be investigated is the question of whether or not there exists a certain group of farmers who manage fallow or chume lands. In any case, the vast deforested areas relative to those farmed, or which receive at least some kind of input on the part of farmers, is reason for reflection and concern. Finally, at levels of 0.7 and 1.0, the reduced fallow area seems to

indicate that crop rotation is the primary agricultural system. However, the relatively low use of fertilizers is another reason for concern. A pattern of soil use intensification or crop rotation without fertilizers would suggest the development of a process of soil exhaustion. Again, this is another important issue that needs to be studied in more depth.

Table 24. Active Agricultural Area, Cleared and Fallow Hectares, According to Plot Size

Intensity of Soil Use *	# of Cases	(1) Average Plot Size		(2) Active Agricultural Area Annual & Permanent Crops		(3) Fallow Area		(4) Total Cleared Area	
		Has	%	Has	%	Has	%	Has	%
0.1 to 0.2	30	22.13	100.0	2.77	12.51	14.5	65.6	17.27	78.0
0.3 to 0.4	33	12.54	100.0	3.96	31.57	6.34	50.55	10.30	82.0
0.5 to 0.6	37	9.10	100.0	4.66	51.20	3.30	36.26	7.96	87.0
0.7 to 1.0	24	6.7	100.0	3.76	56.11	0.92	13.73	4.96	70.0
	124								

$$\text{* Intensity of Soil Use} = \frac{\text{Permanent Crops + Annual Crops}}{\text{Permanent Crops + Annual Crops + Fallow Area}}$$

Source: CERES interviews.

4.4. Coca Price and Coca Production Levels

This paper has repeatedly referred to the importance of coca as the most secure opportunity that Chapare farmers have to realize a profit through their agricultural production. This is in part due to the generally high coca leaf prices resulting from the international boom in cocaine consumption, and in part due to the poor marketing opportunities that other crops offer. Relatively high prices for coca leaf have been a major factor in driving the accelerated pattern of agricultural settlement experienced by the Chapare during the late 1970s and 1980s. Coca prices are also decisive in determining wage rates paid to agricultural laborers by Chapare farmers, and, as a result, they are decisive in setting the level of wage labor migration that occurs between the Chapare and upland areas (Jones 1990). The price of coca leaf is also the primary target of police repression efforts. The decline in coca prices for the month of August 1986 has been the most frequently cited piece of evidence of the success of Operation Blast Furnace, which began in the Chapare in June of that year. Current efforts to repress coca production focus on forcing fluctuations in coca prices from area to area of the Chapare and from one day to the next, to increase the risk and uncertainty that producers associate with coca production (Jones 1990).

Finally, the issue of coca prices weighs heavily in discussions of alternative development. Some argue that alternative development is futile since nothing can compete with coca in price, and conclude from that argument one portion or another of the activities carried out by the CRDP should not be supported. In this section we shall attempt to summarize what we know about producer responses to changes in coca prices in the Chapare. In Section 2 we discussed the impacts of coca prices on migration, and concluded that, while the price of coca certainly influences whether or not people go to the Chapare at a particular time, they are not a cause of migration. Furthermore, there are many negatives associated with Chapare migration that act as a counterweight to the incentives provided by high coca prices. Therefore, one does not have to provide economic opportunities that compete with Chapare wage rates to provide alternatives to wage labor migration to the region.

Similarly, based on the information that the DIRECO and CERES materials provide, we conclude that it is not necessary for alternative crops to compete directly with coca leaf with regard to the price paid to the farmer, if the alternative crops are potentially profitable for that farmer in their own right, given constraints on land and labor. In Section 4.2, we pointed out that there is no relationship between the size of landholdings and the area of coca under cultivation, while an inverse relationship exists between the size of landholdings and the percentage of the land dedicated to coca. This was related to a combination of factors, related to producers' need to secure a minimum cash income on the one hand, and limits on their ability to hire wage laborers and the availability of family workers, as well as the risks associated with coca production on the other. In the same section, we also noted that the importance of unremunerated family labor is greater for families with smaller areas under cultivation. As the area under cultivation increases, so does the relative importance of hired labor.

The CERES interviews also suggest, however, that, within this overall picture, the dynamics associated with coca production are somewhat different. As may be seen in Table 25 the cohorts of farmers with the smallest areas of coca under cultivation (0.1 - 1.0 hectares) rely more heavily on hired labor than do their counterparts with holdings between 1.01 and 2.0 hectares. Farmers with 2.01 hectares or more of coca rely heavily on hired labor.

On the one hand, the smaller farmers make a larger financial sacrifice than do larger farmers, because a minimum level of coca cultivation acts as a quasi-guarantee of a minimum level of cash income from farming. Thus, as noted previously, coca is relatively more important for smaller producers than for larger ones. Also, the labor requirements for establishing new coca fields are considerable. Henkel (1971:190, 210), for example, found that the labor requirements to establish coca are very high compared to other crops grown in the Chapare. He stated that this was particularly the case with respect to the heavy amount of weeding required to protect young coca plants until they can shade the ground. According to his figures, a hectare of coca required approximately 120 person/days of labor in weeding, compared to 36 person/days for coffee, 32 for citrus, and 24 for bananas. Henkel reported that this heavy labor input associated with weeding limited the expansion of coca cultivation to 1,600 to 3,200 square meters of new area per year. For smaller farmers, a large investment in the labor necessary to

establish a minimum level of coca production as quickly as possible is an investment in their financial security.

Table 25. Importance of Hired Labor by Area Under Coca Cultivation

Number of Coca Hectares	Number of Agriculturalists That Hire Labor		Number of Agriculturalists That Do Not Hire Labor		Total	
	#	%	#	%	#	%
0.1 to 0.5	19	53.0	17	47.0	36	100.0
0.51 to 1.0	16	62.0	10	38.0	26	100.0
1.01 to 2.0	15	44.0	19	56.0	34	100.0
2.01 +	16	94.0	1	6.0	17	100.0
	66	58.0	47	42.0	113	100.0
					11	No Answer
					124	

Source: CERES interviews.

Once coca has been established, farmers are not necessarily responsive to short-term fluctuations in price. This is because most farmers rely primarily on unpaid family labor or on labor exchanges such as *ayni*. Weil (1989) found this to be the case when she conducted field research in the Chapare in the early 1970s, and the interviews conducted by CERES confirm that this is still the case today. Furthermore, the major impact of the low and fluctuating prices experienced during the latter part of 1989, according to farmers interviewed by CERES was to increase their reliance on these forms of unpaid labor. As a result, low and fluctuating coca prices have had a dramatic impact on wage labor migration to the Chapare, and, when the CERES team was in the field in late 1989, had triggered an exodus of workers from the region. However, the impact of price on production is less clear, as the immediate response of farmers is to rely more heavily on forms of unwaged labor. Thus, coca can continue to make important contributions to a family's cash income, even when the price is below its theoretical cost of production.

The implication of this for alternative development efforts is that, while price clearly has an important influence on coca producers' decision-making, the relationship is not as direct as one might suppose. Because of the high labor costs associated with establishing coca, an alternative crop that provided similar security in guaranteeing some cash income, with a lower labor investment, would be attractive, even if a producer's net profit were lower. This is because the alternative crop could be managed with greater reliance on family and other forms of unpaid labor, if the labor inputs were lower and less concentrated around a single activity.

At the same time, once coca cultivation is established, the use of unwaged labor makes farmers much more resistant to short-term price fluctuations promoted by repressive police action.

5. CONCLUSIONS

The migrations of farmers and laborers to the Chapare is part of a larger migratory pattern resulting from the underdevelopment of their home areas in relation to export enclaves associated with the mining industry and commercial agriculture in Santa Cruz. The major manifestations of this underdevelopment are stagnation of central Bolivia's agricultural economy and widespread environmental destruction in the forms of erosion, deforestation, overgrazing, and the practice of agriculture in areas poorly suited to this activity.

The response of the rural poor to this situation has for decades been wage labor migration to a number of destinations, and the agricultural settlement of Bolivia's tropical and subtropical lowlands. Migration to the Chapare has been part of this general pattern since the 1930s, and enjoyed official sponsorship as a regional development strategy beginning in the 1960s (Rasnake and Painter 1989). The rise in coca prices resulting from the increased international demand for cocaine made the Chapare more attractive in comparison to other destinations for people seeking wage labor or agricultural settlement opportunities, and accelerated the movement of people to that area in the late 1970s and 1980s. However, coca prices are not a cause of migration.

Chapare farmers are like small farmers elsewhere in that they practice a diversified production system that seeks to balance risk mitigation with income generation. The major differences in the characteristics of the Chapare population from other populations of agricultural settlers are related to the relative proximity of the Chapare to the home areas of many migrants or to the city of Cochabamba, and to fears about the risks associated with life in the Chapare because of disease and being subjected to police violence.

While coca is the most important crop of Chapare farmers, it does not dominate agricultural production there. Farmers grow a variety of annual and perennial crops and all indications are that they would be receptive to production alternatives that provided a relatively secure cash income and/or reduced their need to hire workers and permitted them to rely more on forms of unwaged labor. Because of the organization of production in the Chapare, such alternatives do not necessarily have to compete on a dollar-for-dollar basis with the price of coca.

Because coca is the most profitable crop, capital and human resources have been reoriented to support coca production, at the expense of other crops. Crops such as corn, rice, bananas and other fruits are cultivated extensively, with very low use of modern inputs. To the extent that modern inputs are used, they are preferentially allocated to coca production. However, coca production is also extensive, with unpaid labor substituted for hired labor and modern inputs whenever possible.

The diversity of the production systems in the Chapare suggests that, while it may be necessary to introduce new crops to provide producers with alternatives, that this should not be the area of major concern. Rather, agricultural research should focus on how to overcome the economic factors that have severely limited the economic opportunities associated with crops other than coca. Agronomic research needs to focus on improving the quality of existing production through better production techniques in areas such as maintaining soil fertility and pest control. This will also mitigate the environmental damage associated with Chapare agriculture by encouraging producers to become less extensive in their use of land.

Packages of improved crop varieties, inputs, and economic incentives need to be tailored to the ecological variability of the Chapare's Microregions, and to the major differences in the sizes of producers' landholdings and their capacity to secure labor for agricultural tasks either by hiring workers or drawing upon means of providing themselves with unwaged labor.

5.1. Migration and Development

Migration to the Chapare has its origins in social and economic conditions outside of the Chapare. While the boom in the international demand for cocaine accelerated Chapare settlement, it did not cause it. To the degree that the social and economic conditions driving migration from upland areas to the Chapare and elsewhere are not addressed, the social and environmental costs of the efforts by people from these areas to earn a living will continue to be high, regardless of what happens with regard to international cocaine demand and coca leaf production in Bolivia.[13] Therefore, a critical element of development assistance is to address the social and economic processes that have led to the economic stagnation and environmental destruction in the upland regions.

In prioritizing areas for focusing development assistance, a principal criterion has to be an upland area's potential for economic growth. Focusing on the areas that expel the largest numbers of people will not be a productive approach. As discussed in Section 2, migration from central Bolivia has deep historical roots. On the one hand, it is related to the high level of geographical mobility that has characterized Andean populations, and on the other, it is the product of numerous decades of systematic underdevelopment as a result of the region's relations with the export sectors of the Bolivian economy. In many areas the social, economic, and environmental problems are of a magnitude that no amount of investment will significantly improve conditions in the short or medium term. Development assistance cannot stop migration.

At the same time, because the migrant population is very responsive to changing opportunities, upland development efforts that focus on halting and reversing environmental

[13] Indeed, the costs have been high since well before the cocaine boom. However, they were largely unperceived until the particular problems associated with illicit narcotics production and consumption focused attention on them.

destruction and providing income-earning opportunities in areas that have economic growth potential can have a significant impact on altering the migratory patterns of people who have been going to the Chapare in search of wage labor. Also, to the extent that these upland efforts promote a higher level of regional integration, by removing obstacles to the marketing of agricultural produce, increasing competition among merchants, providing farmers with opportunities to become more involved in bulking and processing of their goods, and strengthening the local consumer market through increased incomes, such efforts may have a long-term impact on the conditions that promote wage-labor migration to the Chapare and elsewhere.

5.2. Chapare Cropping Systems

In working with Chapare farmers to find alternatives to coca production, the critical issues to be addressed are opening marketing opportunities for produce and promoting crops and cropping systems that are less demanding on family labor resources than is coca. Chapare agriculture is diversified despite the importance of the region as a producer of coca leaf, and farmers are clearly responsive to changing economic opportunities. Emphasizing the introduction of new cultivars or improved genetic material in the absence of a specific marketing strategy, and without considering their impacts on family labor resources will not provide farmers with alternatives to coca cultivation.

Coca occupies an important position because it is the only crop for which there is a fairly consistent market. However, it is a risky crop because of the repression associated with cultivation, and it is expensive to produce because of the high labor requirements. Chapare farmers rely very heavily on family and other forms of unwaged labor to produce coca. It is not clear that coca would be a profitable crop under present conditions if a cost were attached to this unpaid labor. Under these conditions, crops for which there were relatively secure markets and which were less demanding on family labor resources would be attractive alternatives to coca production. It is not necessary that crops be comparable to coca with respect to their selling price in order to be attractive to farmers. In fact, insisting on stating the problem in these terms distorts the constraints with which Chapare farmers are working, and promotes the false idea that, since no crop can compete with coca in terms of price, there really are no alternatives to offer farmers.

The Chapare is not a homogenous physical environment, but is characterized by wide variations in the agricultural development potential it offers. The division of the area into Microregions begins to address this diversity. The physical differences in the Microregions is accompanied by socioeconomic differences related to land distribution and the mean size of land holdings. In addition to offering farmers packages of crops and inputs that reflect the physical differences in the Microregions, it is important to consider the socioeconomic diversity. Packages of crops and inputs need to be evaluated in terms of how economical they are for farmers at different sizes of landholdings and whose capacity to draw on waged and unwaged labor also varies widely.

The constraints imposed by poor marketing conditions for their products and labor scarcity, combined with inefficient distribution of modern agricultural inputs cause Chapare farmers to be extensive soil users. Extensive land use is the way farmers deal with the low productivity associated with these problems, and it is a major source of environmental destruction in the Chapare. The problem appears to be particularly acute among farmers working larger areas of land. Improving marketing conditions and promoting cropping systems that are less demanding on family labor resources, together with improving the availability of agricultural inputs will make important contributions to reducing the environmental destruction presently associated with Chapare agriculture.

5.3. Socioeconomic Research and Planning

All of the institutions involved in the CRDP could benefit tremendously from greater support in the area of socioeconomic research and planning. DIRECO could greatly improve the quality and utility of the information it is gathering if changes were made in the questions it is asking. It could also use assistance in analyzing the data it already has. IBTA/Chapare could use assistance in gathering and analyzing socioeconomic data so that its work is less driven by simple production concerns and places greater emphasis on the issues of markets and labor availability. Therefore, USAID's socioeconomic technical assistance would be more effective if there were a social science unit that worked with all institutions across the breadth of the project, rather than within the PDAR. This would facilitate integration of different CRDP components, and it would help overcome bottlenecks in offering alternatives to coca production.

There are currently two areas in which additional socioeconomic research is needed in support of alternative development in the Chapare. The first is in identifying markets and developing marketing strategies for Chapare farmers' produce. The second is in better understanding patterns of use of waged and unwaged labor and how these vary among farmers with different resource endowments. Development efforts in the Chapare that do not depart from a firm understanding of these two issues are not likely to be successful. However, the information available to date shows that addressing the problems faced by farmers in these two areas will do more than anything else to reducing the attractiveness of coca in relation to other crops.

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