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FROM THE UPLANDS TO THE LOWLANDS:
AN ECONOMIC ANALYSIS OF BOLIVIAN
RURAL-RURAL MIGRATION

BY

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COVER

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FROM THE UPLANDS TO THE LOWLANDS:
AN ECONOMIC ANALYSIS OF BOLIVIAN
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HERNAN ZEBALLOS-HURTADO

Under the supervision of Professor Peter Dorner.

As part of the socio-economic policies of the 1950's and 1960's, the government of Bolivia declared a land reform program and focused attention on the development of the agricultural sector. Road construction to penetrate new subtropical lands and colonization became important ingredients of the development effort. About 50,000 families migrated from the Altiplano and valleys to the Bolivian Oriente between 1952 and 1972. This thesis is an attempt to evaluate the economic performance of the settlers themselves and the role and efficiency of government investment in this process.

Two sets of data were utilized. Questionnaire interviews were conducted with 760 colonists in six colonization areas (or projects): Alto Beni I and II and Caranavi in the department of La Paz; Chapare and Chimore in the department of Cochabamba; and Yapacani and Chanepiray in the department of Santa Cruz. These data cover sociological and economic information for the 1972-73 agricultural year. The other sources of data about public investment in colonization, for the period 1961-72, was gathered from government offices and public reports.

Two main streams of colonizers have moved from the highlands to the subtropics of Bolivia. They were government sponsored and directed projects on the one hand, and large groups of spontaneous colonists on the other. Because of policy implications for future land development, the study compares the performance of both systems. Accordingly, it uses two basic hypotheses. The first is that spontaneous colonies achieve better economic results than oriented ones. The second is that public investment in spontaneous colonies produces higher economic returns than such investments in oriented projects.

The analysis has been conducted in a two stage approach. A cross sectional analysis, using simple and multiple regression models, makes up the first approach. A longitudinal study, applying current project evaluation techniques--benefit-cost ratios and the determination of internal rates of return--is the second approach.

The analysis of the sample data leads to the conclusion that the hypothesis that spontaneous colonies achieve better results than oriented ones cannot be rejected. The spontaneous colonists attained an average net farm income of \$Bs 7,200 in 1973, which was 82 percent higher than the average net income in the oriented groups. Statistically this difference was highly significant at a 1 percent probability level.

The explanatory variables used in the simple and

multiple regression models were a group of sociological variables, length of stay in the colony, and economic factors of production. The simple regression models provided valuable indications about the relationship between levels of income and regional and local differences, origin, education, age, and length of stay in the colony.

In the multiple regression model, the dominant variables were colonization systems and factors of production. Using a stepwise regression procedure, the sociological variables were excluded. The dominance of capital, land and labor variables is implicitly related to technology. The analysis of the capital composition showed a general situation of low investments per household.

Oriented and spontaneous colonies have common features. Both have developed as a subsistence type of agriculture, characterized by low productivity and low incomes, although in general they are better off than in the highlands.

The hypothesis that public investment in spontaneous colonies produces higher economic returns than that in oriented ones cannot be rejected either. This is the conclusion obtained from the estimation of benefit-cost ratios and internal rates of return for the period 1963-72 with projections to 1987. At discount rates of 10 and

15 percent, the benefit-cost ratios for the spontaneous colonies were above 1, taking into account total investment. The B/C ratios were below 1 for oriented colonies. The internal rates of return were above 28 for the spontaneous colonies and only 7 percent for the oriented group.

The most important policy implications suggested by the research are: a) the avoidance of costly oriented programs which simply subsidize the creation of subsistence agriculture; b) the need to design policies to facilitate change to a higher productivity technology in the already settled groups; and c) the importance of a sound knowledge of the resource base and the possible returns from investment before funding new land development schemes.

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Note: Abbreviated denominations in the tables stand for the following:

COUNT = Frequency of cases :

PROW = Percentage in the row .

PCOL = Percentage in the column (zone).

PPLANE = Percentage in the plane (over overall sample)

CHAPTER I

INTRODUCTION

The Bolivian colonization effort in the 1950's and 1960's is a process which can only be understood within the political and economic background of those two decades.

The Revolution of 1952 made land reform possible, which in turn gave rise to a substantial sociological change in the older feudalistic structure of rural Bolivia. The land reform not only gave land to the peasants of the highlands; it also gave them social and physical (geographical) mobility (2, 43, 71). This facilitated the massive shifts of people to which this research refers.

As part of that political environment, and responding to pressing economic needs, policies were designed to encourage the economic development of the country. The elaboration of the Ten Year Plan for 1962-1971 (1) was the most comprehensive view of the overall economy and an important precedent in policy planning. Within this plan, as complementary to the land reform measures, the agricultural sector received some attention. As part of the targets for the sector, colonization was supposed to: 1) help in putting under cultivation 271,000 Has. of new land (out of a total of 411,000) in the Oriente;

2) shift 100,000 families, or approximately 450,000 persons, from the uplands to the lowlands of Bolivia (see Table I.1). This was almost 16 percent of the rural population. While the goal proved to be highly unrealistic, the results of this colonization process have been important.

TABLE I.1. POPULATION GROWTH AND INTERNAL MIGRATION
TARGETS: 1962-1971

	Population Flow (thousands of people)			
	Altiplano	Valleys	Llanos	Total
Growth	216	353	96	665
Migration from Altiplano	- 50		50	
Migration from valleys		-400	400	
Increase or decrease	166	- 47	546	665
Total rural population	1,071	1,428	951	3,450

Source: adapted from Table 37, p. 164A, Plan Nacional de Desarrollo Economico y Social (2).

Bolivia's economy since 1952 has been a typical example of an underdeveloped economy. Agriculture has been and remains the most important source of employment and the largest contributor to Gross Domestic Product (GDP). In 1952, 69 percent of the population was devoted to

agriculture and 29.2 percent of the Gross Domestic Product came from this sector. In 1972, 65 percent of the economically active population was involved in agriculture and produced 21.4 percent of the GDP. While the relative contribution of the sector to GDP has been decreasing, this has been largely because of the more rapid expansion of other sectors of the economy.

Despite such a large participation of the labor force in agriculture, the country does not feed itself. It has had to import steadily in the last two decades. Agricultural imports in current dollars were US\$ 26,862,000 (36 percent of total imports) in 1952, US\$ 24,725,000 (29.7 percent) in 1962 and US\$ 43,050,000 in 1972 (28.7 percent). Agricultural exports, although increasing in the same period, did not offset these imports. Agricultural exports grew from US\$ 3,185,000 in 1952 to US\$ 4,425,000 in 1962. From 1970 to 1972, more rapid increases were recorded -- US\$ 9,986,000 in 1970, US\$ 17,929,000 in 1971 and US\$ 25,011,000 in 1973. The recent expansion in exports comes mainly from cotton and coffee, which are produced in the Oriente and Yungas areas of Bolivia (64, 65).

This overall agricultural situation is paradoxical, given the excellent land resource endowment of the country (see Table I.2). Almost 8 million hectares of prime land were available for agricultural production. In 1972,

TABLE I.2. LAND AVAILABLE AND LAND USE, BOLIVIA, 1972

	Number of Hectares (thousand)	Share of Total Land (Percent)
Total Area of Bolivia	109,858	100
Forests	29,526	27
Pastures and Ranges	69,391	63
Tropical	(43,073)	(39)
Range and Watershed	(26,318)	(24)
Waste Land ^a	3,094	3
Prime Land for Crop Production ^b	7,847	7
Potential (not used)	(4,271)	(4)
Fallow ^c	(2,502)	(2)
In current use ^d	(1,074)	(1)

^aIncludes lakes, rivers, cities and wasteland (such as the Salar de Uyuni).

^bThis is land thought to have potential for crop production. There is an estimated 6.5 million additional hectares of more marginal land that could be brought into production that is currently classified as pastures, ranges, and forests.

^cLand currently in the fallow stage of the traditional rotation system.

^dEstimate from MACAG, División de Comercialización, unpublished data.

Source: Agricultural Development in Bolivia, AID/Bolivia, 1974 (64).

only one-eighth of this land was under cultivation. Although reliable figures are not available, at least 200,000 Hectares have been added in the last twenty years, and four-fifths of these were in the Oriente (64).

Lack of roads between the most important regions of Bolivia and a badly skewed distribution of the population has not helped this picture. Two-thirds of the population are concentrated in the traditional Altiplano and valleys of the Andean section of the country. According to the latest figures (see Table I.3) for the rural area, density varies from 52.66 inhabitants per square km. in the Altiplano Norte to .38 inhabitants in the Brazilian Shield section (department of Pando) of Bolivia. Densities are the greatest in the most fertile valleys of Cochabamba and the Lake Titicaca region in the northern Altiplano. In these areas, land reform resulted in the subdivision of land to levels which are of serious concern for policy makers.

Thus, as one international agency points out: "despite the agrarian reform of the 1950's, most of the rural population is still living in poverty and is largely outside the money economy. As a consequence, income distribution is badly skewed, with 80 percent of the population earning only 20 percent of the income" (36, p. 128). Low productivity and a stagnant agriculture sector contribute to this result.

TABLE I.3. REGIONAL DISTRIBUTION OF THE TOTAL AND RURAL POPULATION OF BOLIVIA, 1972

Regions and Zones	Total Population	Rural Population	Land Area ^a (Square Kilometers)	Regional Share of Area (%)	Density (inhabitants per square kilometer)	
					Total	Rural
1. Altiplano	44.4	38.6	182,048	16.6		7.48
-North	17.9	9.3	6,221	.6	148.93	52.66
-Central	24.3	27.0	94,512	8.6	13.30	10.09
-South	2.2	2.3	91,315	7.4	1.37	1.00
2. Valles	35.0	39.3	143,411	13.1	12.65	9.66
3. Yungas	5.2	6.5	45,814	4.2	5.86	4.97
4. Oriente	15.5	15.7	723,560	66.1	1.11	.76
-Amazon Rain Forest	2.6	3.0	184,358	16.8	.72	.58
-Beni Plains	2.2	2.5	135,848	12.4	.85	.64
-Santa Cruz	4.5	2.6	30,828	2.8	7.54	2.97
-Brazilian Shield	2.1	2.6	243,295	22.2	.44	.38
-Bolivian Chaco	4.1	5.0	129,231	11.8	1.65	1.36
5. Bolivia	100	100	1,094,833 ^b	100	4.73	3.22

^aTotal land area is used to calculate density for both total and rural population since land in urban centers is such a small share of total land that its presence does not significantly reduce estimates of density of rural population.

^bNot including Lake Titicaca.

Source: AID, Agricultural Development in Bolivia, 1974 (64).

As stated above, internal migration was intended to help in the solution of these problems. Some accomplishments have been made within the policies established. If colonization is to be used--and this seems to be the case--as a policy instrument for Bolivian economic development, knowledge of past experience is needed. The underlying purpose of this research is to provide some of this knowledge.

The specific objective of the study is to assess the economic performance of the settlers and the efficiency of government investment in colonization activities.

A historical review of colonization in Bolivia and general information about the zones and the colonies is presented in Chapter II. Theory and methods are discussed in Chapter III. The colonists' performance and the farm economic analysis is examined in Chapter IV. The role and analysis of efficiency of public investment in colonization over time is the central issue in Chapter V. The last chapter derives the policy implications from the preceding chapters.

CHAPTER II

A BACKGROUND TO COLONIZATION IN BOLIVIA

II.1. Historical Review

a. The Inca Period

In the period of history which covers about 400 years before Francisco Pizarro ended the Inca Empire in 1531, evidence exists that the colonization effort to dominate the Bolivian tropics began during the Inca ruling. Starting from a nucleus surrounding today's Cuzco in Peru, the Incas tried to enlarge their territory and subjugate the jungle tribes through military expeditions and settlement adventures (the "mitimaes"). It would appear that Capac Yupanqui, the third in a succession of thirteen kings, was successful in establishing colonies in part of the "yunca" (warm land). Inca Roca (sixth Inca) ordered expeditions to conquer "antisuyu," the eastern portions of today's Bolivia and Peru where "coca is grown" (21, p. 260). And, in an ambitious effort to expand boundaries, Pachacuti Inca (ninth king) ordered his son Capac Yupanqui to vanquish the territory of Musu (Mojo-Bolivia). Yupanqui himself, after becoming an Inca (the tenth) and ruling the territory for some time, decided to subject the "Chirihuana" province in the east. Both the difficult physical environment, plagued with too many swamps, lakes and rough mountains, and the "fierce and inhumane

Chirihuanos proved to be too much to overcome and the Incas retreated (17, 21, 24).

b. The Colonial Period

This colossal effort on the part of the autochthonous population to conquer the subtropics seems to have been frustrated during the colonial period (1531 to 1825). The conqueror's motivation to become rich on the mineral wealth of the Andean part of Bolivia (then Alto Peru) created an economic system under which the quechua and aymara populations were forced to remain in the highlands in order to provide the labor force needed for the mines and agriculture.

However, during the colonial period, Spain needed a link between the Viceroyalty of Alto Peru and that of La Plata. That need, and the continuous drive in search of "El Gran Paititi" or "El Dorado," led to a further expansion of the frontier left by the Incas. The colonial system was integrated, despite the rustic forms of transportation available during this period, like the mule, the dilligence, the llama, the horse and the canoe. Small towns were founded, such as Santa Cruz and Tarija in 1574. The Moxos region and the eastern part of Santa Cruz were explored and the tribes dominated during the sixteenth and seventeenth centuries (26, 37). The most difficult area to subjugate was the territory of the chirihuanos, the southeastern portion of Bolivia. It is of interest

to note the role of the Jesuit missionaries in this conquest. Several times these tribes were reduced to "misiones" by Jesuits and then were disbanded and the priests and converts killed. While in general they did not subdue the chirihuanos, they succeeded in establishing missions in the rest of the Oriente. The missions were a kind of socialist colony where agricultural and handicraft work were organized and obligatory. The output obtained was fairly distributed, although neither private property nor free marketing were permitted. Chiquitano was adopted as the official language among the tribes and created a communication barrier that allowed a unique form of control by the "fathers" of the missions (37). Most of the eighteenth century was spent in this process of conversion of tribes and establishment of priestly dominance.

At the end of the eighteenth century, the Jesuits were expelled from America, as their socialist experiments with the isolated jungle tribes were disliked by the colonial authorities. Their departure was so sudden that the colonial regime was not prepared to substitute a better form of administration and two and one-half centuries of patient and painful work were destroyed. After the Jesuits left, the missions decayed and many tribes dispersed, causing serious decay of the provinces of Moxos and Santa Cruz. In addition, without the control of the Jesuits, the native population was killed in large numbers and

replaced by smaller groups of white and mestizo people. The colonial administration could not replace the efficient labor done by the Jesuits in the missions and the young republic was left with an unpopulated and poor Oriente. The Bolivian historian Finot concludes: "[Chiquitos'] land worthy of a better destiny by the efforts that it represented, and by the peaceful and industrious condition of its native population, will only be able to flourish again when their best lands are crisscrossed by roads and colonization enterprises are established" (26).

c. The First One Hundred Years of the Republic

During the first century of the Republic (1825-1925), colonization efforts were minimal. The eastern populations established during the colonial era evolved into groups of isolated towns poorly connected by trails and based on self-sufficient economies (41). Since 1925, however, communications have improved with air transportation.*

d. Recent History

During more recent periods, government has paid greater attention to colonization activities. The government's first colonization attempt involved Todos Santos del Chapare, which was founded in 1920. The colony's

* Lloyd Aereo Boliviano, the first Bolivian airline, was established. Information provided by the company.

initial population consisted of 50 yuracare Indian families and a small military division headed by General Federico Roman, a legendary figure in the settlement efforts of this area. Fifteen years later, this colony had a population of 1200, consisting of nationals and a few Italian families (45, 57, 66). Since then, the Chapare has become a natural attraction for the population of the upper lands, especially Cochabamba peasants, and the region has gradually developed with a continuous influx of population. The effort to develop the Chapare was accelerated by the construction of the Cochabamba Todos Santos road between 1937-42. In addition to the initial nucleus around Todos Santos, several other colonies were founded during this period, including Agrigento, General Busch, Central Busch and Victoria, and the small town of San Antonio (today Villa Tunari). Immigration was also promoted and a small group of Jews escaping from Nazi persecution settled in the Chapare, only to leave it after a short time because of a yellow fever epidemic. Additional road development permitted expansion toward Chipiriri in the northwest. Thus, in 1944 Chapare was extended from the San Antonio-Todos Santos road in the north toward the Coni River in the east and toward the northwest in the direction of the Chipiriri and Isiboro rivers. At that time, it had a population of about 3300 persons (60).

The poor characteristics of the 180 km. road, which

permitted access to the Chapare region only twice a week, slowed development. In addition, an air ferry used to transport trucks and other vehicles from Villa Tunari to the west side of the San Antonio River was interrupted many times, causing severe loss of products en route to markets. During 1960-65, a pontoon was used for the same purpose, but it was impossible to operate during floods. Using the experience of Santa Cruz, and attempting to link Cochabamba with the Beni region by river, the government contracted the study and later the construction of the Cochabamba-Puerto Villarroel and Villa Tunari-Puerto Patino roads, the so-called Projects I and IV.*

Because of the colonization tradition of the Chapare and the promise of the new road, the C.B.F. incorporated this region as part of its C.B.F.-I.D.B. project. The area started on the east side of the Ene River, and covered 60 km. east and north, following the trail left by the road feasibility studies, covering an extension of about 50,000 Has. The project was initiated in 1963 and settled 1100 of an expected total of 4000 families. The existence of large swamp areas inadequate for agricultural development was one of the reasons why the target was not achieved.

*The feasibility studies were conducted by Tippetts, Abbet, McCarthy and Stratton, a firm from New York.

The construction of the road, which was programmed to start in 1963, was initiated two years later and completed by 1972. The present road is paved for 190 km. from Cochabamba to Rio Chimore, and then a 60 km. gravel road leads into Puerto Villarroel, the river port which presently connects Cochabamba with Beni. Despite the road construction and because of ecological, economic and sociological reasons, the Chapare has not developed as dynamically as Santa Cruz, although there is hope for the future. Colonization by peasants and some urbanites from Cochabamba has increased beyond the limits created by road construction.

The history of the development of Santa Cruz is quite different. Santa Cruz, the capital of the department, had very poor connections with Cochabamba, its nearest neighbor in the uplands of Bolivia. Both regions had been traditionally linked through a dirt road, but the condition of this road seriously limited further exchange between them. Before 1950, it took more than two weeks to travel between Cochabamba and Santa Cruz, which are only 500 km. apart. This situation was drastically changed during 1950-53 with the construction of a paved road which linked both cities. This road permitted a great flow of population between the Bolivian Oriente and the eastern part of the country.

In 1954, scarcely twenty years ago, international

experts were suggesting immigration into the region because of its enormous agricultural potential (30, 50). The Bolivian government, conscious of this need, promoted colonization through the activity of the Bolivian Development Corporation (C.B.F.), which together with the Bolivian Army set up the so-called Division of Colonization. This Division was a civilian-military organization which used soldiers as the labor force for pre-colonization activities, under the direction of a small group of technicians. Colonies like Cuatro Ojitos, Caranda and Yapacani were established this way. The young recruits, part of the Division, were also encouraged to settle in the region (52).

Development took place following four directions. In the south, the terminal of the Cochabamba-Santa Cruz highway was surrounded by spontaneous colonies like San Luis (52). From Montero (50 km. north of Santa Cruz city) in the northern portion, latifundia lands were occupied by groups promoted by C.B.F. Toward the east, small groups of spontaneous settlers and Okinawans established themselves on the banks of the Rio Grande River. The farthest colony in the westward direction was Yapacani, on the west side of the Yapacani River.

The establishment of Yapacani is also a landmark in Bolivian colonization. After the Chaco war, the government encouraged veterans to colonize the fertile lands of the region between the Yapacani and Ichilo rivers. Under

the auspices of the Army, the colony was started in 1937 with 40 households. Headquarters were established in "El Comando," a flood-free location 3 km. west of the river bench. Each settler was granted 50 Has. of land. By 1940, the colony named after President Busch (then President of Bolivia) included a 200-family group with a few European Jews and Portuguese. The colony sold its products to the Bolivian Army, but the Army left the area in 1945, and the colony dispersed. In 1950, only 22 families remained under very poor living conditions. However, Yapacani was revived under the C.B.F. program in 1958 and by 1962 there were 170 colonizers. In 1964 this area was included as part of the C.B.F.-I.D.B. program and, as such, is covered in this research.

During the 1950's and 60's the government built paved roads, using its own funds and others provided through a loan by the U.S. Agency for International Development. These roads extended from Montero to Rio Grande, Montero-Chane and Montero-Yapacani. This last highway included the 800 m. wide bridge over the Yapacani River, which was not finished because a flood washed away the last portion before completion. The bridge had to be refinanced and is presently under construction. This infrastructure, and gas and oil discoveries in the area, led to one of the most dynamic regional development experiences of the country (18).

In the western part of Bolivia, ten years after the Cochabamba-Santa Cruz road opened for service, the construction of a road between La Paz and Caranavi spurred other waves of people from the altiplano toward the lowlands in the Yungas region. The Yungas is the subtropical portion of the department of La Paz. As the Yungas is close to the capital's large concentration of population, it has a good market for its products, including bananas, rice, coffee, fruits, and coca leaves. Before land reform, the region was in the hands of a few families (52).*

Two forms of penetration into the area were under construction in 1950: a truck road, initiated during the Chaco war and later extended to Choro Alto, a large hacienda 150 km. from La Paz; and the La Paz-Beni railroad. The railroad was never completed. It reached only Chuspipata, which is 60 km. from La Paz, and presently the rails are being removed from this completed portion. This has proved to be an inadequate kind of transportation for a rugged territory with slopes as high as 80° and high altitudes to cross (5000 m. above sea level). The road construction joined el Choro with Caranavi, in 1959 a tiny town with no more than a half dozen houses. During the 1960's, roads were completed from Caranavi to Alcoche

* A historical review of the Yungas provinces can be found in Agustin J. Morales' "Monografia de las Provincias del Norte y Sud Yungas."

20 km. west, and to Puerto Linares 75 km. northeast. Land reform and road construction, facilitating the mobility of the Altiplano people, led to a continuous flow of settlers into the newly opened Caranavi-Alto Beni areas. In 1962, 70 settlements were recorded, with about 1000 families (52, pp. 228-257).

Through C.B.F., the government encouraged two types of colonization in this area. The first type is the spontaneous group, which operates under permissions granted for land occupation. Colonies like Sabaya, Peregrinos, Bartos and others were established along the first 40 km. of the Caranavi-Alto Beni road and starting from this main road, following the Carrasco, San Lorenzo and Espiritu rivers. Other groups also settled in the area. The second type is the oriented group. In this area, planning and further execution of the Alto Beni I project took place. This project settled 550 families grouped in four units (the so-called nucleus 1, 2, 3, and 4), between the Bella Vista range and the Alto Beni valley. Later, in 1963, the C.B.F.-I.D.B. project was executed in the Alto Beni region itself. Under this program over 1500 households settled, with the assistance of large government investments. Several hundreds of spontaneous colonists surrounded the oriented groups, making a total of 8-10,000 settlers.

Finally, immigration deserves some attention in the

colonization process. Throughout Bolivian history attraction of immigrants has always had an important place in government policies (4, 5, 6). Despite this, immigration of farmers to Bolivia has never been significant. The reasons for this seem to be the lack of seaports and the poor internal integration of the country, which make marketing difficult. Rural immigrants have gone by the thousands to Brazil, Argentina or Chile, but few have settled in Bolivia. Only a few immigrants have settled in the three regions under study. A small number of Spanish families settled near Caranavi and two or three Italian families remain in Todos Santos in the Chapare. The largest groups of foreigners in rural areas of Bolivia are those in Santa Cruz. In addition to those Europeans who tried to colonize the Yapacani areas in the 1940's, during the 1950's the Okinawan groups came to Bolivia and during the 1960's the Japanese of San Juan. Three smaller groups of Mennonites from Paraguay and Mexico also settled in Santa Cruz. It is estimated that no more than 1100 families of foreign colonists are living in this Department.*

* Instituto Nacional de Colonizacion. Sociology Department provided the following figures: 321 Okinawan families; 335 families in the colony of San Juan; and about 360 Mennonite families distributed in three colonies, Rio Grande-Izozog, Riva Palacio and Sommerfeld.

II.2. General Background

In order to have a necessary framework for the problem, the following issues will now be discussed: lands for colonization, and location and physical environment of the zones and area projects.

II.2.1. Lands for colonization

The lands assigned for colonization in Bolivia have their common antecedent in the Law of April 5th, 1905, which reserved eight large tracts of land covering 195,000 km², nearly one-fifth of the overall country (6). Although this law has been superseded by the Land Reform Law of August 1953, the Instituto Nacional de Colonizacion claims its rights for land development in colonization areas under the Law of 1905.

More recently, the government assigned Alto Beni-Caranavi, Chimore and Yapacani to the Bolivian Development Corporation for colonization purposes. Decree No. 7559, of March 1966, created the Instituto Nacional de Colonizacion and transferred these lands to the jurisdiction of the Instituto (7). The decree established a reserve of 7230 km² for colonization purposes only.

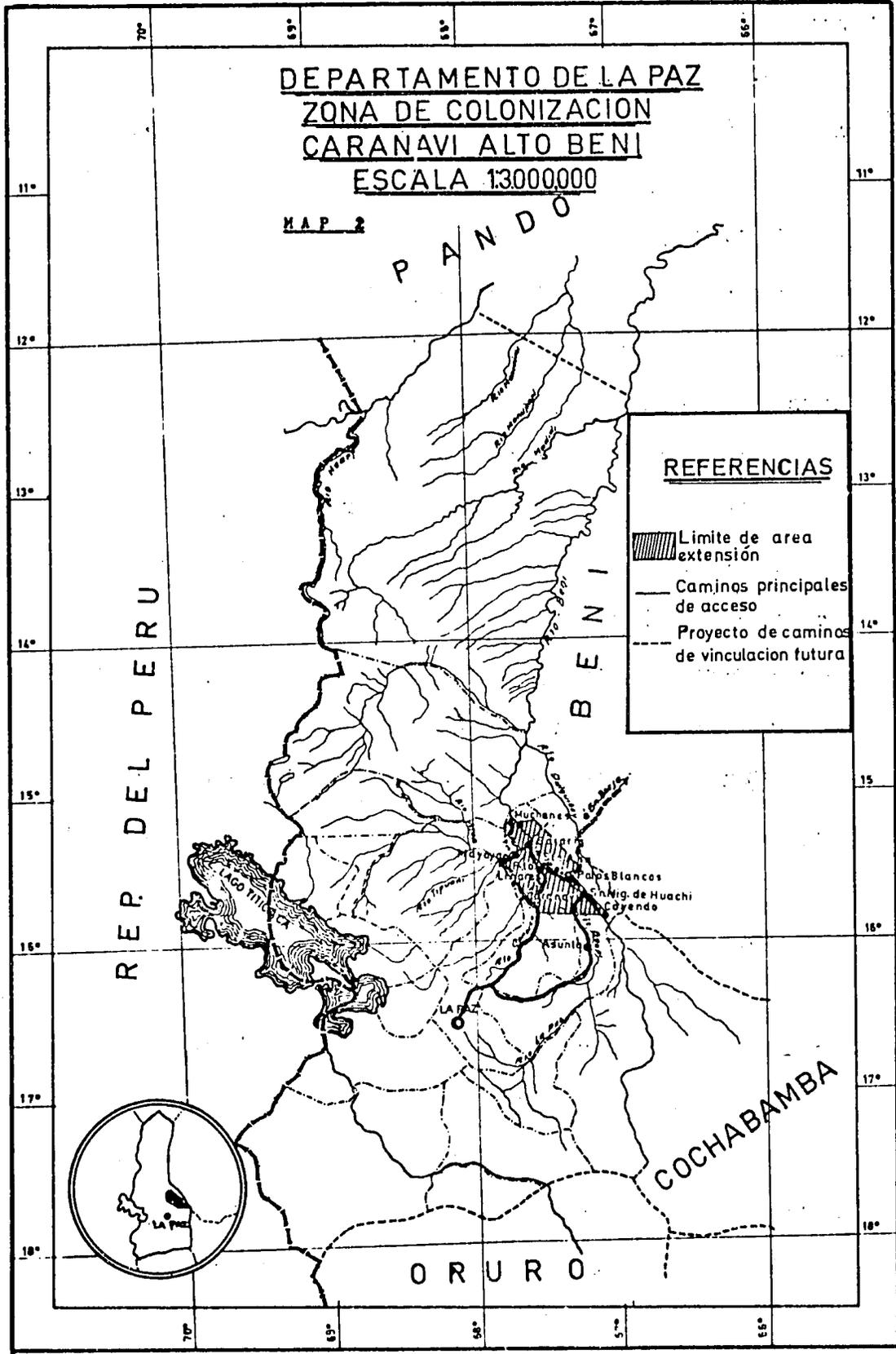
II.2.2. Location and physical environment of groups under study

The colonization areas are located in the Andes piedmont and subtropical portion of Bolivia (see Map 1). The physical environment of these regions, including soils,

climate, topography and natural vegetation, shows remarkable differences.

Caranavi-Alto Beni. This region is part of the department of La Paz, in its provinces Nor and Sud Yungas (see Map 2). The Caranavi zone can be defined as the entire region bordering the Coroico River in the southwest, the Kaka River in the northwest, the Bella Vista Range toward the northeast and an arbitrary border 30-40 km. southeast of the Caranavi-Alto Beni road, between the town of Caranavi and the Bella Vista Range. The area takes its name from Caranavi, located in the confluence of the Coroico and Yara rivers. As mentioned, in the late 1950's Caranavi was a very small town which evolved into a relatively important urban center with about 3000 dwellers by 1973. The Caranavi area covers a rugged territory with subtropical forests which, according to some technical reports, should not be colonized because of the danger of serious land erosion (53).

Alto Beni becomes a natural extension of Caranavi in the colonization process. This zone is a narrow valley, along the Santa Elena and the Alto Beni rivers, naturally limited by the Bella Vista Range in the west and the Marimonos Range in the east. It forms a band 90 km. long and 10-20 km. wide from Covendo, an old Catholic Mission, to Sararia down the Alto Beni River. About 13,000 of 50,000 Has. are flat land and first class soils,



distributed in several pockets in both bands of the river (8).

By 1960, the valley was populated by no more than 150 families of the Mosetenes and the Trinitario tribes. At present, it is more densely populated, with the 1500 rural families of the oriented project, a similar number of spontaneous settlers surrounding them, and others dedicated to commercial activities in small villages at Puerto Linares, Santa Ana, Palos Blancos and Sararia.

Both zones, Caranavi and Alto Beni, have markets for their products in the older towns of the Nor Yungas province, such as Coroico, Irupana and Chulumani, the city of La Paz and the northern Altiplano. An average of 80-100 six-ton trucks per day cross Unduavi, a checkpoint 46 km. from the city of La Paz.

Chapare-Chimore. Chapare is the popular name for the region geographically located between parallels 16 10' to 17 00' south, and 64 50' and 65 50' longitude west, covering approximately 4750 km². It is also the assigned name for an ecological classification within the country, covering the subtropical portion of the Chapare province of the department of Cochabamba (9). (See Map 3.) Physically the colonization area is circumscribed by the last ranges of the Andes toward the south, the Isiboro River to the west, the confluence of this river and the Ichilo

in the north, and the Ichilo River in the east.* Chimore is only a section or subzone within this large territory, between the Ene River in the west and the Ichilo River in the east. It forms a rectangle of 45 km. long and 35 km. wide.

The Chapare is a flat territory, sloping gently to the north. Alluvial soils, large swamps due to very high rainfall (an average of 3500 mm./year), and some poorly drained sectors make the region quite difficult for agricultural development.

The region provides Cochabamba and the southern Altiplano with coca leaves, tropical fruits (mostly citrus, bananas, and avocados), rice, and corn. The region now has good connections with the city of Cochabamba through the paved Cochabamba-Chimore road and gravel roads from Chimore to Puerto Villarroel and from Villa Tunari to Eteramasama in the west. The region is rapidly changing from an almost strictly jungle area, the "yuracare territory," to an important agricultural area due to colonization.

Yapacani. This zone is located in the Ichilo province of the department of Santa Cruz (see Map 4). Its natural boundaries are the Yapacani River in the east and

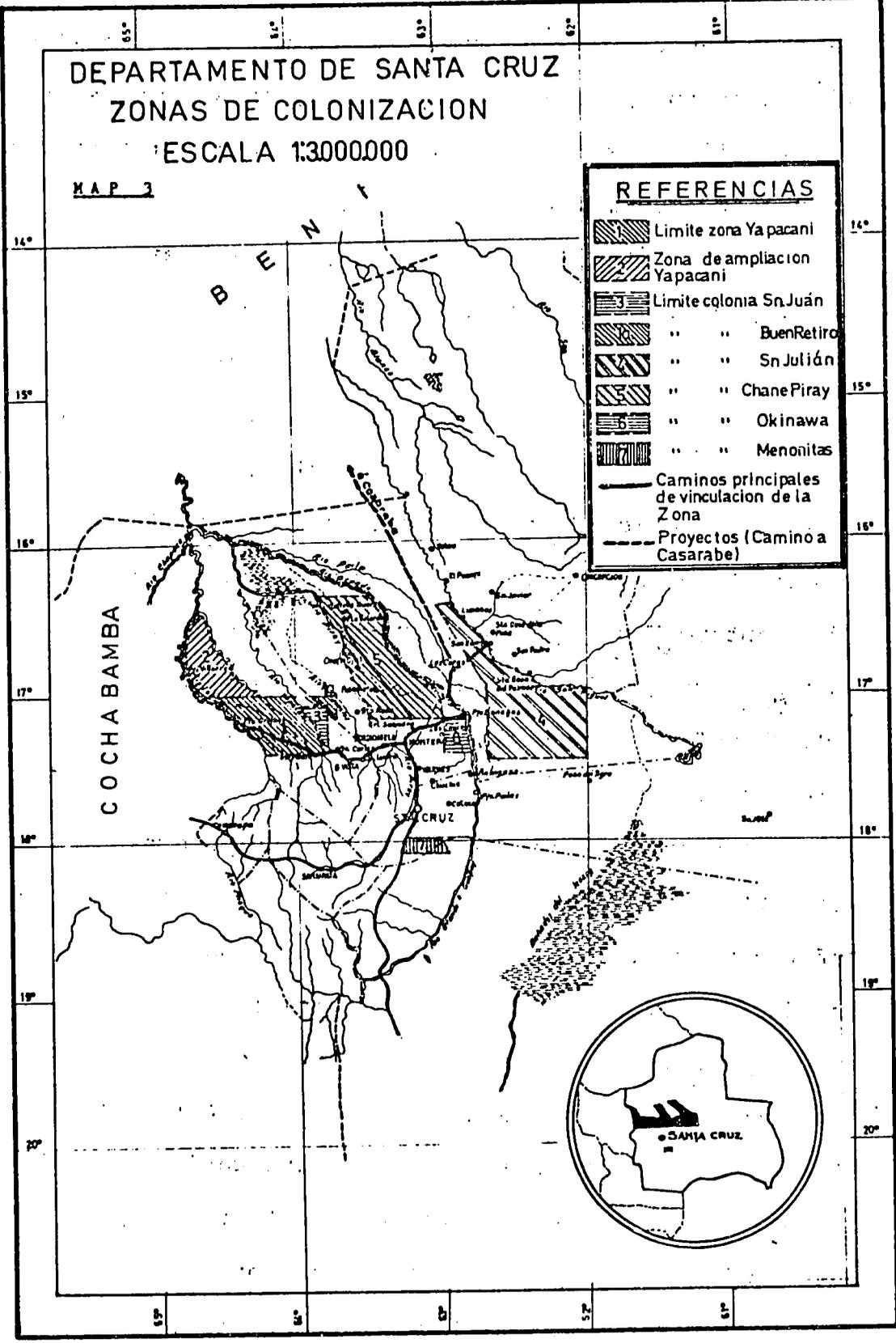
* By D.S. 10931, of September 1972, a territory of about 800,000 Has. was left aside to extend colonization activities.

DEPARTAMENTO DE SANTA CRUZ
 ZONAS DE COLONIZACION
 ESCALA 1:3000.000

M A P 3

REFERENCIAS

-  Limite zona Ya pacani
-  Zona de ampliacion Yapacani
-  Limite colonia Sn.Juán
-  " " BuenRetiro
-  " " Sn Juli6n
-  " " Chane Piray
-  " " Okinawa
-  " " Menonitas
-  Caminos principales de vinculacion de la Zona
-  Proyectos (Camino a Casarabe)



a belt about 20-30 km. wide to the Ichilo River, along the Yapacani-Puerto Grether road in the west. It is also a flat territory, with alluvial soils, large swamps and some sandy soil areas. The area has less rainfall than Chapare, averaging 1800 mm. per year (10).

In addition to this territory, in the eastern band of the Yapacani River, there is a small section called Buen Retiro, with about 18,000 Has. of land and populated by 730 families settled as part of the Yapacani project. Since it is generally included in the population and investment statistics of the Yapacani colony, Buen Retiro is implicit in this analysis. It is located 18 km. north of the Montero-Yapacani road, and bounded by the Japanese San Juan colony in the west, the National Forest Reserve "El Chore" in the north, and spontaneous groups in the east and south.

Both groups have become important producers of rice in Santa Cruz, their natural market. However, the efforts of the program have meant an important shift to cattle production of a part of the Yapacani colonies.

Chane-Piray. This zone is located in the Santieste-ban province of the department of Santa Cruz. The Chane-Piray does not immediately border Yapacani, but offers a good example of spontaneous colonization among the colonies in Santa Cruz. Its southern border begins 3 km. north of Mineros, a small colonization town, which in

turn is 40 km. north of Montero (see Map 4).

Chane-Piray is a 10-15 km. wide band of land, along a 90 km. road, stretching from Mineros to the confluence of the Rio Grande and Piray rivers. It is naturally bounded by the swamps of the Rio Grande in the east and those of the Piray toward the west. According to one expert, the area has some of the best soils in the subtropics of Bolivia (19). The dirt road which crosses the colony is a natural extension of the Montero-Cuatro Ojitos paved road.

In order of importance, and depending on the location of the settlers in relation to the end of this road, the most important crops are sugar cane, rice and bananas. These are marketed in Montero and the city of Santa Cruz. Private sawmills and spontaneous colonies are responsible for the development of this area.

CHAPTER III

THEORY AND METHODS

III.1. The Problem and Objectives

Colonization is a logical response to Bolivian economic conditions. Due to inadequate geographical distribution of manpower and other factors of production, some parts of the country with valuable land and natural resources are still undeveloped and underpopulated. At the same time, other parts have scarce and deteriorated land resources with excessive population pressure. Migration through the free movement of the labor force, or through policy-induced projects and programs, tends to correct this inefficient allocation of resources.

As mentioned in the historical review, two main streams of colonizers have moved from the uplands to the Bolivian lowlands. Government-sponsored and directed projects on the one hand, and large groups of spontaneous colonists on the other, have colonized the new agricultural frontier. The basic difference between both groups is the degree of government involvement. At one extreme, in the oriented projects, preliminary studies and careful, detailed planning takes place. Government projects tend to be centrally administered and relatively large assistance is provided to the colonists. However, at the same time, restrictions are imposed on the settlers' actions.

At the other extreme, spontaneous settlers only receive an authorization to occupy specific areas, and in some cases not even that. Squatters simply exceed the assigned or legal frontiers established by public authorities and start clearing and cultivating land. The assistance provided to oriented colonists takes the form of road construction, construction of public buildings to provide health and education services, and credit to settlers for food, clothing, and tools. These colonies are financed internally or through foreign loans. This suggests the issue of whether or not an underdeveloped country like Bolivia should use large loans to promote settlement of new areas at high per capita costs.

Besides internal migration, small groups of foreigners have settled in the subtropics of Bolivia. Since these colonies have succeeded, in general, their experience is valuable for policy decision. Although basic social differences exist between the national peasants and immigrants, they share some common problems that should be identified as elements for policy decision. Foreign colonies were initially intended as part of this study, but were eliminated because of budget and time limitations.

Colonization can be studied as a three-step process including pioneer, consolidation and growth stages (49, pp. 71-72). Each of these stages has its own features and demands different efforts from the colonists. Each

requires different courses of action from the government to guarantee faster development or to tie these programs to other economic policies, such as production objectives. What services should the government provide in each of these stages? At stake are such issues as the best possible use and defense of human and natural resources. These issues are also related to the importance of reducing the time required to reach each succeeding stage, or to reach the goal of achieving growth at a minimum cost in terms of both social and financial resources.

Another important issue concerning the colonization problem refers to the creation of employment. Since generation of employment in other sectors of the Bolivian economy is insufficient to absorb the growth of the labor force, agriculture must do the job. However, agriculture in the traditional areas is facing serious constraints because of land scarcity and inadequate use. Is colonization the solution to this problem? If it is, which of the two systems is likely to create the most employment in the newly developed subtropical areas of Bolivia? The concepts of tapping new lands for employment creation or production purposes is also tied to the type of technology to be used in developing new lands and to the magnitude and quality of public investment over time.*

* Employment creation as one objective of agricultural

Still another issue in the settlement process is the different levels of achievement shown by different groups. Some colonies appear to be better off than others. Within the colonies themselves, some individuals undoubtedly appear to be in better economic conditions or enjoy higher standards of living. Leaving aside natural individual differences, there are certain common factors which contribute to the success of the migratory groups, and others which are associated with failure. It is felt that the identification of these factors will help in the design of more successful colonization projects.

Some of the factors which may explain success are easily accessible zones with adequate transportation and communication, nearby markets, and favorable natural factors such as soils and climate. The selection of the settlers, the transfer of institutions from their original communities, and, finally, the action of government with its varied regulations and services are other variables to be considered. In addition, the colonists' attitude, dictated by their background, experience, education, and motivation may also help to explain success or failure.

policies is suggested by Peter Dorner in "Policy Implications," Land Reform in Latin America--Problems and Cases; William Thiesenhusen in Latin American Employment Problem, LTC Reprint No. 70, pp. 1-12; and Michael Nelson, "Expanding the Tropical Land Frontier: An Avenue for Improving Income Distribution and Employment Creation in Latin American Agriculture." Paper presented at Purdue Workshop on Empirical Studies of Small Farms in Developing Nations. Mimeo, 50 pp., 1972.

Some negative factors include ecological conditions, such as poor soils, excessive rainfall, and a high degree of disease among the colonists. Poor and inadequate roads and lack of other infrastructure, and unskilled and weakly motivated human groups are other variables. Absence of government health and education services are circumstances that may also determine the failure of many colonization schemes or influence the low degree of development of some regions.

This thesis is primarily concerned with the differences between oriented and spontaneous settlements, particularly in terms of economic performance, measured by the income levels achieved by these groups and in relation to the rest of the rural sector. Because of their relevance to the problem, some sociological and institutional issues are also examined.

The specific objectives of the investigation are:

- 1) to determine the economic results achieved by spontaneous and oriented colonists in three different regions of the country;
- 2) to use these results as a yardstick by which to measure success or failure of the groups involved;
- 3) to assess the role and effects of public investment, especially among the oriented groups;
- 4) to analyze and evaluate the role of public institutions and those organized by the settlers in

the process of colonization.

Since Bolivia is presently trying to develop new land in its eastern part, in order to create the conditions to attract further massive migrations, this research is also intended to pinpoint the need for political decisions in the acceleration, retardation and/or improvement of the systems currently used.

III.2. Theoretical Framework and Hypothesis

The push and pull approach would appear to be a good model to explain the forces that impel peasant migration in Bolivia. Land scarcity, low incomes, lack of employment in urban communities, unskilled labor and increasing poverty due to population growth seem to be the push forces in the traditional agricultural areas. On the other hand, agricultural land available in larger units, likely higher incomes, off-season employment opportunities, government assistance (in sponsored projects) and almost free access to these possibilities in the lowlands constitute the pull factors which attract migrants (54, 16). Within this free movement of factors, government is a highly pervasive variable. Through policy measures or direct intervention, it influences opportunities, makes access to land, credit or services possible, and sets up constraints or makes further expansion possible.

Under this framework, two situations may be observed

in Bolivian rural-rural migration. In one case, a recipient area may reach a point of stable equilibrium. This may be a situation of saturation, or balance between outflow and influx. In the other case, a condition of unstable equilibrium or repulsion may be created where settled people start abandoning the area. This may originate because of a lack of new roads to penetrate into new areas, or a lack of services such as schools and health centers. Absence of roads and maintenance of those already built makes marketing of products difficult and compounds economic problems for the settlers.* Government intervention or help from outside sources is required, unless the colonies are so strong and well organized that they can provide all the necessary services by themselves.**

The purpose of this research, however, is not to

* This happened in the first colonization attempts of Yapacani. The army departure in 1945 from the area left the colonists without market for their products and consequently they started to withdraw from the region, except for a few families.

** Examples of this happening in real life are hard to find. Two cases in Latin America can be cited. Mennonites succeeded in the Paraguayan Chaco despite isolation and severe adverse conditions, and a group of American Quakers successfully migrated to Costa Rica. In the Mennonite case, strong self-cooperation and religious drive led to success. In the second case, strong religious belief and financial support from outside contributed to success. From Michael Nelson, "The Development of Tropical Lands," pp. 119-120, and Ulv Masing, "Foreign Agricultural Colonies in Costa Rica: An Analysis of Foreign Colonization in a Tropical Environment," Ph.D. Dissertation, University of Florida, 1964.

explain the reasons for internal migration in Bolivia, or emigration from Bolivia.* Rather, this study will assess the economic performance of the settlers and government investment. In other words, it will consider the private benefits and costs in the colonization areas, as well as public benefits and costs in settlement schemes. Within this context, colonization can be seen as the movement of factors of production to reach general equilibrium. More specifically, labor will be regarded as responding to the supply and demand forces that tend to locate resources where their marginal productivities are higher.

As part of a general equilibrium model, this research is based on the following assumptions:

- a) Colonizers are part of the competitive labor supply and demand market.
- b) Individuals moving from one place to another are mainly motivated by economic factors. They tend to migrate because economic gains result from settling in a new area.
- c) In the new regions where they settle, colonizers also try to maximize economic gains. If they do not, this is because there are market or

* This is another problem which deserves serious research and policy decisions due to the apparently heavy human losses that Bolivia is experiencing, in the form of young peasants emigrating to Argentina and Chile, and also with skilled professionals and technicians emigrating abroad.

institutional imperfections. Although this is a strong assumption, since not all the individuals will have the aptitude to act as profit maximizers, it helps to keep the problem within a more specific framework.

- d) Government is also a maximizer, as it tries to allocate its resources to maximize economic returns. Investment in colonization projects and related services are part of a set of possible choices where government invests to attain the highest possible economic returns. If this maximization is not achieved, the reasons must be investigated in order to readdress policy decisions. However, public policy actions may not be devised only to maximize economic returns. The desire could be to maximize a welfare function, where public investment and expenditure are used to affect future well-being instead of a present situation.* Among the social goals of colonization projects are

* Arrow and Mordecai argue that optimal investment policies need to specify a criterion function, by which optimality can be judged. They propose a social utility function -- a concave increasing function--which may help to measure the flow of consumption and services of got capital to each individual are assumed to yield a flow of what may be termed "felicity" to each individual. The flow of felicity to society is the sum over individuals at a given time; the total utility from a policy is taken to be the sum over all time of the felicities of each time, discounted back to the present at a constant rate (1, p. 11).

ication of frontiers, integration of the
 y and protection of human resources in the
 r as well as in further stages of the colon-
 n process. Viewed this way, colonization can
 ced within the Schultzian approach of govern-
 nvestment in its human resources (58). Still,
 y must know how much economic gain is being
 iced to attain certain social goals.*

s theoretical framework, both spontaneous and
 lists should achieve similar economic results--
 by the economic forces and their own maxi-
 :. This also assumes a given and constant
 spite these assumptions, the following gen-
 will be adopted for this thesis: "spontan-
 achieve better economic results than oriented
 ever, because of the political decision to
 ation with government resources, the prob-
 re accurately approached by means of the
 esis. That is, "public investment in spon-
 s produces higher economic returns, as com-
 ed groups."

d seem to be the concern of government and
 gencies when they finance public coloniza-
 ocially oriented projects, and economic eval-
 e. See, for instance: Price Gittinger,
 sis of Agricultural Projects," Johns Hop-
 Press, 1972, pp. 1-13; and E. J. Mishan,
 st-Benefit Analysis."

Research done in Latin America shows that, in general, oriented, directed or government programs in colonization have achieved poor results. In contrast, spontaneous colonies have shown extraordinary flexibility in land development and success in settlement (20, 31, 71, 59, 23).

Investigations conducted in Bolivia also indicate that spontaneous settlers are more successful in economic terms as compared to oriented groups. Both groups are better off than peasants who remained in traditional agricultural areas. For instance, Henkel (29) criticizes the administrative failures in the Chapare project, and attributes them to the low performance of oriented colonists. Wessel (68) affirms that colonists in general get incomes 2.7 times higher than peasants in Bolivian highland communities, due to regional differences in productivity and other related factors. He also points out another advantage that colonizers have over the peasants in the traditional highland communities. This is "a constant food supply throughout the year every year," while the possibility of starvation exists in the highlands. Rada and Marus (52) point out the adaptation of highland peasants in the lowland and their success, although they warn about some of the damage done to physically inadequate regions in terms of settlement. Royden and Wennergren (55) find that returns on public investment in a group of spontaneous colonies are very high. Similar conclusions

regarding low economic performance of oriented projects and high success of spontaneous colonists are provided by Nelson (49).

III.2.1. Qualification of the hypothesis

An analysis of the performance of both systems, though useful, represents an oversimplification. Some qualifications must be provided for a broader understanding of the problem.* The following qualifications will be used:

1. While differences in income are partly due to regional differences, even when the geographical factor is isolated spontaneous settlements get better results than oriented. The geographical factors, which involve specific ecological conditions like kind of soils, climate, topography, and natural resources, influence productivity and patterns of production. In other words, a colony located in a desert should not be compared to a colony in a fertile valley, although the differences due to investment and institutional arrangements of two groups working in a similar environment can be compared. Bolivia in this sense offers a unique opportunity, a kind of social laboratory, as the colonies of the two systems are side by

* Another way to put this: in addition to observing the effect of systems in the performance of colonists, other control variables will be added in successive stages of the analysis.

side. Since the sample takes into account both spontaneous and oriented groups in each region, it should be possible to isolate the geographical factor.

2. Differences in economic performance between oriented and spontaneous colonies are not due to education, age, origin or other sociological factors.

This qualification is based on the fact that the migrants in both types of colonies have similar backgrounds. There are differences between regions, but for each particular region people who become colonists speak the same language and emigrate from similar or neighboring locations.

3. Differences in income between the oriented and spontaneous colonies are not due to the use of different technologies.

Commonly, the peasant colonies use a low level of technology. This would support Taylor's hypothesis concerning the dualistic nature of the Nicaraguan economy. He says that "the agricultural economy developed through spontaneous land settlement tends to evolve so as to reproduce the economic dualistic structure characteristic of the rest of the country" (59, p. 4). This is not the case, however, of the commercial farms surrounding some of the colonies in Santa Cruz, or the case of the Japanese Okinawan or Mennonite farmers, who after some period of settlement start changing to new technologies.

4. Income differences are not due to farm size.

Among oriented groups, the farm size has been determined by the National Institute of Colonization. It differs for each region, but is fixed within regions. Among spontaneous groups sizes vary, but there are no extreme differences in size. If much larger farms were available, the pattern of land use would probably change, i.e., from grains to pasture and cattle, or to a new technology, as in the foreign colonies.

5. Differences in income are affected by the length of time lived in the colony.

Time is an important element in the analysis of colonization, because the new colonists must spend some time in clearing the land and building a hut. It also takes time to build roads and provide facilities to the settlers. To make a comparative study, it is necessary to select groups averaging the same length of time in the colony. The present study has such a sample, as the groups are in the consolidation stage and average 10-12 years. However, within the groups the time span varies among the component members due to a continuous influx and outflow of people.

III.3. The Data

Two main sources of data are used in this research. One source is data gathered from the colonists by means of

interviews and questionnaires. The other is secondary data on public investment in the colonies.

The procedure used to select the sample involved first dividing the maps of a particular zone into sectors. A full list of numbered plots per sector was obtained. From this list, 15 percent were picked at random. It was hoped that a 10 percent sample per sector would be obtained. In the Caranavi zone this percent was exceeded. In the others, several reasons prevented interviewers from reaching this goal. A total of 767 families were interviewed. Table III.3.1 describes the sample.

The questionnaires were designed to collect socio-economic data for the agricultural year 1972-73, which ran from June 30, 1972 to July 1, 1973. The sociological information provided answers on the origin of the colonists and their families, their composition, age, sex, marital status, occupation before becoming colonists, education, language, desertion intentions, reasons for these intentions, inputs and money brought to the colony.

On the economic side, data were gathered on land use, assets, use and availability of labor, production costs, use of agricultural and animal production, values, sales, home consumption and family income. Due to regional differences in patterns of production, the questionnaires were changed to make the information sufficiently detailed.

Secondary data was used to assess public investment

TABLE III.3.1. POPULATION AND SAMPLE DISTRIBUTION OF HOUSEHOLDS IN ORIENTED AND SPONTANEOUS COLONIES, BOLIVIA, 1973

Z O N E (1)	Department (2)	Type of Settlement (3)	Total Population (4)	Sample Population (5)	Frequency of Inter- view (6)	Perce- tage Sample (7)
Alto Beni I	La Paz	Oriented	800	550	46	8.4
Alto Beni II	La Paz	Oriented	1550	1500	133	8.9
Caranavi	La Paz	Spontaneous	2000	1160	159	13.7
Chimore	Cochabamba	Oriented	1100	1100	97	8.8
Chapare	Cochabamba	Spontaneous	2000	1100	97	8.8
Yapacani	Santa Cruz	Oriented	2500	1500	118	7.9
Chane-Piray	Santa Cruz	Spontaneous	3000	1500	117	7.8
TOTAL			12950	8410	767	9.1

Notes: (4) In the immediate area of influence covered by the study.

(5) Population from which the sample was extracted.

and costs. The data sources are past budgets and account reports from the National Institute of Colonization, National Road Service, Ministry of Agriculture and Peasant Affairs, and Ministry of Transportation and Public Works. Since a longitudinal analysis is needed, the sample data is used to estimate regional benefits and costs, which are added to public costs in 1972-73. To estimate other points of observation in previous years, some published data is used from other studies, which are specifically mentioned in each case.

III.4. Methods of Analysis

The problem will be treated within a resource allocation theoretical framework. Income levels, measuring success or failure of the colonies, are assumed to be affected by the use and availability of factors of production, colonization systems, regional differences and sociological variables.

The use of factors of production is implicitly influenced by management ability and the level of technology. Colonization systems are related to the level of public investment, regulations imposed on the colonies and credits. Government action toward oriented groups also results in certain behavior on the part of colonists. This relationship has been called paternalism and dependence. Likewise, its absence determines other behavioral patterns in the case of spontaneous groups. Regional variations

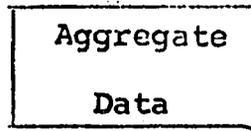
imply differences in geographical factors. The sociological variables are origin, religious affiliation, and the individual attitudes which emerge from individual and group backgrounds. Since technology in the colonization areas is basically labor-intensive, age can also be considered an important factor.

The two-stage analysis--cross section and longitudinal--outlined below will be followed. The way in which the cross section sample was examined by steps is shown schematically in Figure III.4.1.

a. Cross section analysis

The questionnaire data is subjected first to tabular analysis. This provides descriptive information about the economic and sociological characteristics of the colonies and their components. It also provides a simple but useful way to observe the association of variables. Some of the associations examined are those between levels of income and education, levels of income in relation to age and systems, and land use vs. capital investment. The primary statistical tool used at this stage is the Chi-square statistic. This statistic provides an indication of the independence between row and column variables. In other words, if there is no relation between two variables, such as income and origin of settlers, the proportion of medium income earners among the colonists of region A would appear to be the same as the proportion of medium

Step 1

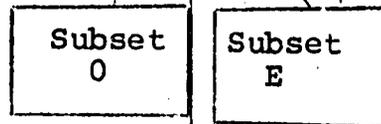


$$Y = f(\text{Systems})$$

$$Y = f(\text{Regions})$$

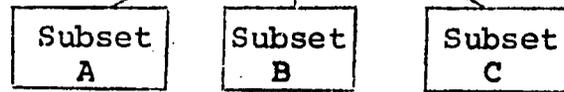
$$Y = f(D_k)$$

Step 2



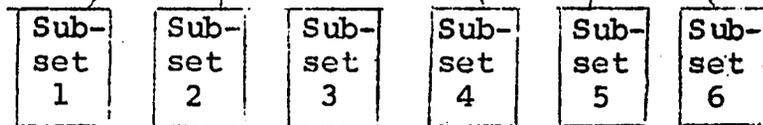
$$Y = f(X_i, S_j)$$

Step 3



$$Y = f(X_i, S_j, D_k)$$

Step 4



$$Y_2 = f(X_i, S_j)$$

Systems { O = oriented
E = spontaneous

Regions { A = Caranavi-Alto Beni
B = Chapare-Chimore
C = Santa Cruz

1,....6 = zones within regions

FIGURE III.4

Analytical Steps Followed in the
Cross-Sectional Data Analysis

income earners in the population as a whole. If this is not the case, one cannot accept the basic hypothesis that there is no relation between X and Y, origin and income.*

Multiple regression analysis is then used to deepen the analysis. The regression models will provide tests of the general and specific hypothesis stated above.**

In all cases, some form of measured income (cash, net or returns to management and labor) was used as the dependent variable. Factors of production, investment figures and sociological variables were the independent variables.

Dummy variables were used to test the differences in income levels due to the effects of the two colonization systems (oriented vs. spontaneous), and the differences between regions and zones. This is equivalent to the statement of the null hypothesis that "the difference

* For a theoretical explanation of the Chi-square estimator, the following references can be used: Jan Kmenta, "Elements of Econometrics," Chapter 11; Wonnacott and Wonnacott, "Introductory Statistics," Chapter 8.

** Within the vast literature related to Econometrics, some of the following references have been used in this chapter. When required, some specific sources will be indicated. Jan Kmenta, "Elements of Econometrics," The Macmillan Co., New York, 1971; N.R. Draper and H. Smith, "Applied Regression Analysis," John Wiley and Son, New York, 1966; Wonnacott and Wonnacott, "Introductory Statistics," John Wiley and Sons, New York, 1969; Wonnacott and Wonnacott, "Econometrics," John Wiley and Sons, New York, 1970; Arthur Goldberger, "Topics in Regression Analysis," The Macmillan Co., 1969; and Rao and Miller, "Applied Econometrics," Wadsworth Publishing Co., California, 1971.

in the mean income between the two systems, or different regions, is equal to zero." The coefficients of the dummy variables and their signs provide the magnitude and direction of the difference in relation to a chosen base system or region.

A dummy variable was also used to test for the existence of income differences due to "high" or "low" levels vs. no education. Education, age, and length of stay in the colony were also entered directly as numeric variables. A list of the variables used, and their units, is provided in each specific model.

A general hypothesized functional relationship then can be expressed as:

$$Y_p = F(X_1, X_2, \dots, X_n, S_1, S_2, \dots, S_n, D_k)$$

Where,

Y_p ($p = 1, 2, 3$) are net income, cash income, or returns to management and labor;

X_i ($i = 1, 2, \dots, m$) are factors of production, or investment figures;

S_j ($j = 1, 2, \dots, n$) are sociological variables, education, origin, religion;

D_k ($k = 1$ or 0) are dummies, for systems, regions, or sociological variables.

The choice of independent and dependent variables was based on economic theory, logic and empirical observation. Economic theory indicates that the availability

and use of factors of production, including management, within a given state of arts, determines the returns from these factors. Education is an explanatory variable widely used in economic studies as a proxy for management. It was thought that the inclusion of variables such as origin, language as a proxy for ethnic differences, and length of time in the colony could help to provide some additional insights into the problem. The interactions of the sociological variables with the economic and institutional factors will determine the level of success. Viewed in this context, income becomes a substitute for the overall level of success attained by the settlers.

In dealing with a multiple regression model, it is broadly recognized that stochastic and non-stochastic errors may be present. The first emerges from the implicit probability distributions of the values observed or random causes. The second originates in error of measurements of the observed independent values in relation to their deterministic relationship to the dependent variables (39, pp. 197-201). These problems were kept in mind, in the selection of the sample size and in the evaluation of the variables in the collection and computation processes.

Preliminary trials with linear models showed adequate fit and satisfactory explanatory power. These two reasons and the relative ease in interpreting the results argued for use of the simple linear form. To avoid what

Draper and Smith call "overfitting" of the equations, the explanatory variables were selected using a stepwise regression technique (22). Specifically, the criteria used to decide the remaining predictor variables in the equations were: 1) the overall level of significance of the equation; 2) the level of significance for each individual coefficient, at least a 90 percent probability level; and 3) the size of the coefficient of determination (R^2).

b. Longitudinal analysis

The public investment data is analyzed in order to observe the performance of colonization over time and the returns from this investment. Since investment by government diverts resources from private consumption and/or investment, efficiency is required in the use of resources over time. A way to measure efficiency is required to guide public investment decisions.

Certain problems must be taken into consideration when analyzing social investments, because of their special nature. Some of these are: 1) how to appropriate the benefits and costs of public investment; 2) how to distinguish between the social and private benefits; and 3) how to separate production and consumption benefits. These problems will be in evidence when discussing the empirical results.

To maintain consistency with the rest of the research, the estimates discussed below were obtained for both the

oriented and spontaneous categories, and for individual colonies. Each group was treated as an investment "project." The term "project" refers to an investment activity from which benefits are expected over an extended period of time. In this case, benefits involve economic gain for settlers and for the country investing in them.

Economic analysis of projects. There are several techniques by which to analyze efficiency in decision making and the use of public resources. Some of them are: 1) the present value, 2) annual net benefits; 3) benefit cost ratios; 4) least cost; and 5) internal rate of return.*

All of these techniques have some advantages as well as drawbacks. None of them can be considered the best technique. Generally, in project appraisal, they are indiscriminately used according to personal or institutional preference. For the sake of convenience, two have been chosen for this analysis: net benefit cost ratios and the internal rate of return.

Mishan suggests that a set of assumptions is common to public investment analysis, when using discounted values of the streams of returns. These assumptions are: "1) full employment of resources, implying that public

* These are usual techniques for project evaluation. Among the references used for this section, see 46, 27, 1, 32, 45.

expenditure of any kind can be increased only at the expense of private expenditure; 2) certain foreknowledge of the returns to any investment project; 3) the existence of a single rate of interest, r , to represent society's rate of time preference; 4) a certain rate in perpetuity, ρ , to all investment in the private sector of the economy; and 5) r less than ρ , which implies that the volume of investment for the economy is below the optimal value" (47, p. 778).

These assumptions form a useful frame of reference for the analysis. Nevertheless, in the case of Bolivia and any other underdeveloped economy, additional considerations are necessary. First, there is the problem of increasing unemployment in both urban and rural sectors. Thus, the opportunity cost of labor can be considered equal to zero. In addition, public investment which reduces private expenditure is restricted. In this case, foreign loans substitute for the lack of local savings. But foreign loans also create a burden for the borrowing country in terms of future investment and consumption levels.

Second, a single rate of interest cannot exist in a country where multiple direct or implicit rates prevail.*

* For instance, implicit rates exist when repayment of loans by small farmers is made in kind, at considerably undervalued product prices.

Third, a problem exists in determining the society's rate of time preference where low levels or subsistence incomes prevail. The rate must be very high, since famine may be imminent. Put another way, while market interest rates are 15 or 20 percent, the social rate of discount may be close to 100 percent because of the need to attain immediate consumption. Too high a rate is inadequate for project evaluation purposes. Fourth, assumption (5) would appear to be the closer approximation to reality.

The following is a brief discussion of the two techniques used in this research.*

Benefit cost ratio

Benefit cost ratio is measured as:

$$(1) \quad B/C = \sum_{t=1}^n \frac{B_t / (1+i)^t}{C_t + K_t / (1+i)^t}$$

where:

B_t = stream of benefits over time;

C_t = operation and maintenance costs over time;

K_t = capital investment;

i = an "appropriate" rate of interest;

t = time in years (or semester, or quarters).

Since in project economic analysis there is no need to distinguish between C_t and K_t , equation (1) can be

* Their current use and the abundant literature on the topic make it unnecessary to repeat some of their related concepts.

simply stated as formula (2).*

$$(2) \quad B/C = \sum_{t=1}^n \frac{B_t / (1+i)^t}{E_t / (1+i)^t}$$

where:

E_t = project expenditures over time.

The need to define the "appropriate" rate of interest is an obvious problem. As is always the case, there is no official social rate of discount to use as a common denominator for project evaluation. As a practical matter, two rates have been applied--10 and 15 percent. Ten percent has been the usual interest rate applied to agricultural loans by the Agricultural Bank of Bolivia. Fifteen percent has been the commercial rate for other types of loans in banking activities. Other, lower rates could be used. A 4 percent interest rate was charged by the Interamerican Development Bank for its loan 29 SF to be used in agricultural credits in the colonization projects. The same organization also used a 2 percent on the 51 TF loan.** But these are unusual rates in current international financial markets and do not reflect a real opportunity cost of

*As Hirsleifer, et al. (32, p. 158) point out, the distinction between operating costs and capital investment is a matter of degree rather than a fundamental dichotomy, since both expenditures have some continuing effects on the project life.

** A more detailed discussion on amounts of these loans can be found in Chapter V.

capital. Thus, their application would seem to be inadequate for discounting in this analysis.

Among the disadvantages of the B/C ratios as estimators of public investment efficiency are:

1) the fact that moving costs from the numerator to the denominator, or vice versa, may alter the ratio values, affecting conclusions;

2) the magnitudes do not always provide clear-cut answers in judging differences among projects. For example, which is a better project when two ratios such as 1.2 and 1.3 are compared? The volume and timing of investment will affect these results.

Internal rate of return

The internal rate of return is measured as:

$$(3) \quad \sum_{t=1}^N \frac{B_t - E_t}{(1+i)^t} = 0$$

where:

B_t , E_t , t and i are as previously defined.

In this equation, i becomes the unknown. It is the discount rate that makes the present value of a cash flow equal to zero. Cash flow is the stream generated as a difference between benefits from the project and expenditures on it (operating costs and capital investment).

The internal rate of return has been selected as a convenient indicator of public investment efficiency for

the following reasons:

1) It can be calculated without previous knowledge of the social discount rate, which, as discussed, is a vague and highly debatable concept and almost impossible to determine in practice;

2) It is presently a common technique in project evaluation, and its determination may help to compare the results achieved in colonization to others achieved in agricultural and non-agricultural activities.

Other non-economic criteria. A word of warning needs to be made about the exclusive use of economic indicators to assess the performance of Bolivian colonization. Given the many objectives of internal migration, emphasis on the economic side is to a certain extent a weakness. In addition, as Patch remarks, "the movements of people [in Bolivia] are not only geographically significant, but also socially meaningful" (51, p. 12).

Other criteria, such as the role of some sociological variables, have been used in the cross section analysis. The necessary specialization provides other constraints, forcing elimination of many other factors in the scope of this research.

CHAPTER IV

CROSS SECTIONAL ANALYSIS

As indicated in the theoretical framework, income, as a proxy to determine the success of colonists, depends upon factors of production, ecology, sociology, and institutional variables. The first section of this chapter will analyze the economy of the farm. It is expected that the study of factor-factor and factor-product relationships will provide the basic elements for the understanding of the economic performance of the settlers. In the second section, other variables will be added through multiple regression analysis, to implement the economic approach. This will allow the testing of the general hypothesis and its qualifications, and the assessment of the impact of sociological and institutional variables.

IV.1. Factors of Production

IV.1.1. Farm size and land use

The average farm size in the sample was 17.30 Has. Differences in size exist among the zones, as shown in Table IV.1.1.

The average farm size in the oriented groups is a matter of policy. In Alto Beni, settlers received a plot of 12 Has., in Chimore 20 Has., and in Yapacani plots of 20, 30, and 50 Has. The difference in plot size in this

TABLE IV.1.1. FARM SIZES IN COLONIZATION ZONES, 1973

Statistics	Spontaneous				Oriented				
	Chapare	Cara- navi	Chane- Piray	Mean S	Chi- more	Alto Beni I	Alto Beni II	Yapa- cani	Mean O
Mean Has.	10.97	8.82	27.85	15.38	20.0	12.67	12.33	28.64	19.12
Standard Deviation	5.65	2.33	9.78		0.0	5.36	3.66	13.76	

Note: Sample average 17.30 (10.75).

Source: Sample data.

last zone occurs because of decisions by project authorities to enlarge initial plots, from 20 or 30 to 50 Has., for cattle production.

The union leaders of the Chapare follow the tradition of assigning a 10 or 20 Ha. plot to their members, which is assumed to be of adequate size for earning a living.* Caranavi shows the smallest farm sizes, probably due to fragmentation of initial 10 Has. plots, and to increased population pressure on the already cleared lands. The problem of fragmentation is serious, given the rugged topography of the zone and the indiscriminate deforestation of unsuitable lands for cultivation. The Chane-Piray section has the largest average farm size, due to initial granting of 50 Has. plots. A closer examination of the data shows that Piray has three households with an average farm size of 15 Has., 42 units with 19.19 Has., 71 with 32.84 Has., and 1 settler with 75 Has. In contrast, Caranavi has 157 settlers with an average of 8.77 Has. and only one household with a 17 Ha. farm. This data would suggest that continuous fragmentation of plots in some areas may bring minifundia problems to the subtropical

*The Federacion de Campesinos del Chapare (Chapare Peasant Union) is a strong association, providing support to new smaller unions settling in new lands. They impose limits on the size of the individual farm units. Unluckily, they have not had the power in the last years to overcome the power of businessmen and "commercial" farmers who get land grants, as large as 1,000 or 2,000 Has.

region of Bolivia, and a serious deterioration of its land resource base.

Natural conditions and market forces determine different patterns of production and land use in the colonization areas. In the case of oriented groups, one additional factor contributes to other changes. Colonists in these areas were supposed to reach certain production targets, and the Institute established nurseries to provide citrus, coffee, cocoa and rubber plants to the settlers. This has influenced the development of more than 2,000 Has. of cocoa plantations in Alto Beni, nearly 40 Has. of rubber in Chimore, and plantation of a few thousands of citrus trees. In Yapacani, as mentioned, cattle production was encouraged. Spontaneous colonists developed their farms by trial and error as well as in response to product prices. These colonists did not receive any assistance, and either did not have a previous knowledge of the agriculture of the region, or had acquired some knowledge working as laborers on other farms. This has resulted in the patterns of land use shown in Table IV.1.2.

The present method of clearing land is slash and burn. Furthermore, colonists depend basically on their own labor force and some hired labor to attend their farms. Both facts provide an explanation for the data condensed in Table IV.1.2. The following describes the process in more detail.

TABLE IV.1.2. LAND USE IN COLONIZATION ZONES, 1973. Has.

Type of Use	Z O N E S							Total
	Oriented			Spontaneous				
	Chapare	Caranavi	Chane-Piray	Alto Beni I	Alto Beni II	Chimore	Yapacani	
1. Crops								
-Permanent (1)	1.85	2.87	2.53	2.43	2.84	3.38	1.10	2.45
-Annual (2)	1.49	.68	9.34	1.77	1.44	3.32	3.20	3.03
Sub-total	3.34	3.55	11.87	4.20	4.28	6.70	4.30	5.48
2. Pastures	2.61	.60	.34	.00	0.00	.03	1.60	.75
3. Land under Use	5.95	4.15	12.21	4.20	4.28	6.73	5.90	6.23
4. Forest	3.83	4.95	7.53	3.90	5.94	9.50	2.50	5.52
5. Uncultivated (3)	1.19	-.28 (4)	8.11	4.57	2.11	3.77	20.24	5.55

- Notes: (1) The sum of citruses, bananas, cocoa, coca, avocados, sugar cane, depending upon the region.
(2) The sum of rice, corn, other annual.
(3) The difference between farm size and land used and forest land.
(4) This is the result of double cropping, like maize and rice, for example.

a. Forest lands are cleared, then cultivated with rice and corn, as first crops, followed by rice, yuca or corn during a second and third year. After the third year, weeds and regrowth of the natural vegetation make it difficult and costly for the settler to cultivate those pieces and he will move to new forest areas within his lot. In a period of ten to fifteen years, depending on the speed of deforestation, the settler "finishes" his parcel and tends to move to new areas.

b. Because plots are hand cleared, many stumps are left in the ground. In addition, the absence of credit and technical assistance deters the transition from low productivity technology to the use of draft animals and/or agricultural machinery.

c. The result is a ceiling on the extension of cultivated land, which according to Table IV.1.2 seems to be between 4-6 Has., with the exception of Chanepiray (12 Has.). These figures are not very impressive, considering the ten years of hard work.

In other words, the small settler is condemned to an almost subsistence agriculture on a piece of land which deteriorates over a period of time because of inadequate techniques. This is the case in certain areas of Caranavi, Chimore and Santa Cruz. In older areas of Santa Cruz, because of the emergence of a large commercial

farming sector, vacated lands are acquired by larger farmers. Some other lands simply remain behind as "hollow" frontiers. In Chapare, Henkel distinguishes three stages in land use: pioneer fringe, commercial core, and zones of decay (29). The decay area would correspond to a hollow frontier or deteriorated region, due to lack of knowledge about tropical agriculture. Colonists in Alto Beni and parts of Caranavi and Chapare may attain a more stable situation with fruit tree plantations or other permanent crops such as coca.

If small farmers are displaced in this process, equity considerations must be made, because it would appear that in the long run those who sow are not those who reap the benefits. Furthermore, if misused areas are abandoned because of deterioration, land and natural resource conservation is at stake. Both problems deserve serious consideration in future land development plans.*

IV.1.2. Capital

The next factor of production to be considered is capital. This has been measured as the aggregation of

* Due to high rainfall in the subtropical areas, deterioration occurs in the rapid leaching of topsoil after deforestation. The problem is aggravated by serious erosion in steep lands. Loss of wild areas and forest resources occurs at the pioneer stage. Deforestation also accelerates the speed of river waters and causes serious floods and damage to the lower portions of subtropical Bolivia.

the value of house and improvements (fences, animal shelters, etc.), animals, tools and the value of plantations. Its composition and magnitude in absolute values are shown in Table IV.1.3, and its percentual composition in Table IV.1.4. A summary of the levels of significance as indicated by Chi square is given below.

	Oriented	Spontaneous	Zones
Physical Assets	.490	.999	
Animal Assets	.010	.005	
Physical and Animal Assets	.002	.216	
Plantations			.000

The Chi square statistics and Tables IV.1.3 and IV.1.4 provide the following conclusions:

- a) There are no statistically significant differences in the ownership of physical assets (house and improvements, other assets and tools), within each group.
- b) There are statistically significant differences in animal assets due to variations in patterns of production. For example, Alto Beni I has some dairy farms and Yapacani has increased cattle production.
- c) The addition of physical and animal assets shows statistically significant differences in oriented groups, but not in the spontaneous groups.

TABLE IV.1.3. AVERAGE INVESTMENT PER HOUSEHOLD IN THE COLONIZATION ZONES, 1973. \$Bs.

Type of Investment	Average								Average
	Chapare	Cara- navi	Piray	S (*)	Chi- more	Alto Beni I	Alto Beni II	Yapa- cani	O (*)
1) House and improvements	3206	2859	3319		1806	5552	1680	3035	
2) Other assets	7	41	96		24	243	626	18	
3) Tools**	790	781	986		792	494	495	498	
4) Physical assets	4004	3684	4402	3993	2622	6289	2801	3551	3388
5) Cattle value	1391	361	3537	1629	840	4388***	943	3347	2036
6) Poultry value	404	371	798		491	1000	504	586	
7) Hog value									
8) Animal assets	1944	895	5633	2660	1491	6271	1884	4446	3063
9) Physical and animal assets	5948	4579	10035	6654	4114	12560	4685	7997	6452
10) Plantations****	1597	3660	3961	3221	2951	2925	4309	959	2814
11) Total investment	7545	7239	13996	9875	7065	15485	8995	8956	9266

Notes: *Selected averages to highlight the differences.

**An average of 18 tools per household.

***Dairy cattle.

****Computed by Has. times average cost to establish the plantation: Citrus x \$Bs. 1000; Avocado x \$Bs. 1000; Banana x \$Bs. 600; Coca x \$Bs. 2000.

d) In the aggregate, an average of \$Bs. 9875 in the spontaneous sample as opposed to \$Bs. 9266 in the oriented group shows no significant difference in capital investment. How can these results be explained? The variations are due basically to types of production, and the homogeneity to the level of technology. In Chapare-Chimore and Caranavi-Alto Beni, plantations contribute around 45 percent to the composition of capital. This is an accretion effort on the part of the colonists in response to ecological conditions and market opportunities for fruit trees. In Yapacani, cattle make up a large share of the capital (37 percent). In Piray, both cattle and plantations (sugar cane) contribute a large proportion to the composition of capital (53 percent). The number of tools owned, an average of 18, valued between \$Bs. 500 and \$Bs. 1000 (equivalent to US\$ 25-50) also reveals uniformity. Other indicators that can be used to observe the capital intensity among the colonies are the ratio of investment to cultivated land and of cattle and animal value to pasture.

The ratio of investment (physical and animal assets) to cultivated land and the ratios of cattle and animal value to pasture, observed per region, are as follows:

Ratio	Chapare- Chimore	Caranavi- Alto Beni	Yapacani- Piray
Invest/Cultivated \$Bs./Ha.	1804.0	3879.0	3464.0
Cattle/pastures No. head/Ha.	.22	.08	.63
Animal value/pasture \$Bs./Ha.	567.0	317.0	1711.0

Lower levels of investment per Ha. of cultivated land in Chapare and Chimore as compared to Caranavi-Alto Beni and Yapacani-Piray are the result of the high value of cocoa plantations (Alto Beni) and cattle and sugar cane plantations (Yapacani-Piray). The absolute figures are low, less than \$200 per Ha. of cultivated land.

Low investments per farm reflect the situation of a labor-intensive agriculture with an absence of reproducible capital, or what Lewis has typified as the characteristics of a pure subsistence economy (42).

IV.1.3. Labor

In these small farms, labor comes from two main sources, family and hired labor. Family labor will depend on the age composition of the group and the presence of the family in the farm. Hired labor depends on the availability of cash for payments, and also on the attraction that the particular zones provide for additional influx of labor.

Family labor has been measured as the number of days

worked by the family members in the farm during the agricultural period July 1972 to June 1973. A cost has not been assigned to this labor. Hired labor has been measured both in number of days worked on the farm and in \$Bs. paid.

Some clarifications about the valuation process of hired labor are necessary. Labor contracts vary according to region and seasonal needs. In Alto Beni I and II, labor is very scarce. Periodical increases in demand for quinine bark or timber in this region also make it difficult to obtain hired labor for the small farms. Caranavi has similar difficulties. The result is that labor is hired for only a few days at a time, and payment must be made in cash. The opportunity to hire labor is thus limited to those who have higher cash incomes or resources.

In Chapare, and also in Chimore, seasonal labor moves from the Cochabamba valley, during coca picking or rice harvesting periods, and it becomes scarce the remaining periods. This pressures the colonists into paying in kind, as high as 1/3 or even 1/2 of the rice harvest, when the harvesting season comes, and rice cannot remain in the field once it is ripe. Higher returns to coca allow spontaneous settlers to hire larger numbers of people, as compared to Chimore (oriented). At the same time, severe losses of production occur because of this fact

among oriented colonists, and higher costs, in rice collection.* Absence of short term credits, during harvesting periods, does not help in this situation.

Another comparison is Yapacani, heavily dependent on rice, and Piray, dependent on rice and sugar cane. Because of these crops, both groups require as much as possible of hired labor. Piray, being closer to Montero, has a closer and larger source of labor and can afford to pay higher wages because of higher returns to sugar cane. In this particular case, cane-cutting is generally paid by the ton, and stiff competition with commercial farming provides a relatively high wage to hired labor. These aspects can be fully appreciated in Table IV.1.5, which shows a relatively small participation of family labor, in the farm business--less than 200 days worked during the year. This requires some explanation. First, colonists do not spend the full year in the colony. This will be observed in the discussion of the sociological review of the colonies. A large proportion of them work outside the colony during idle periods. Clearly, Chapare and Piray, with coca and sugar plantations, are the largest employers of outside labor.

IV.1.3.2. Sociological review on the colonies and the settlers. As part of the analysis of the labor force

*The sample data indicated losses of about 10 percent.

TABLE IV.1.5. LABOR USE IN COLONIZATION ZONES: MAN-DAYS PER FARM
AND AVERAGE WAGE PAID TO HIRED LABOR, YEAR 1972-73

Type and Use of Labor	Spontaneous			Oriented			
	Chapare	Caranavi	Chane Piray	Chimore	Alto Beni I	Alto Beni II	Yapacani
<u>Family Labor</u>							
-Annual crops	31.8	18.8	117.1	78.6	69.2	76.4	76.2
-Permanent crops	80.5	103.1	3.1	8.5	36.6	48.2	.6
-Animal raising	6.6	37.7	-	48.2	52.4	18.2	-
Subtotal	119.0	160.0	120.2	135.3	158.2	142.8	77.3
<u>Hired Labor</u>							
-Annual crops	29.7	13.7	161.8	65.9	61.0	22.6	52.0
-Permanent crops	286.3	54.5	106.1	2.3	24.6	6.8	.4
-Animal raising	-	-	-	-	-	-	-
Subtotal	316.0	68.2	267.9	68.2	85.6	29.4	52.4
Total	435.0	228.0	388.1	203.5	243.8	172.2	129.7
Average wage paid to hired labor, \$Bs.	10.2	10.0	32.1	16.0	11.5	15.4	16.2

Source: Sample data.

in the colonies, this section will discuss the sociological characteristics of the colonists themselves.

The overall migration process to the new agricultural frontiers of Bolivia, according to official figures, is estimated to comprise 543 colonies in 1973, totalling nearly 50,000 families in 12 different regions (see Table IV.1.6). This figure probably does not take into account some other 10-20,000 families, because new settlers generally take about five years before seriously filing legal application and the numbers of public officials in some areas are insufficient to cover their jurisdictions.

a. Origin of colonists and family composition

To avoid unnecessary repetition of references, the following discussion is based on data gathered in the interviews (Appendix I, Tables 1-40). Most of it will be based on the aggregate data, while the appendix provides specific information for each zone.

Sixty to seventy-five percent of the settlers colonizing Caranavi-Alto Beni are altiplano peasants, 10-25 are valley peasants, and a small percentage are former city-dwellers. In the cases of Chapare and Yapacani, colonists generally come from the temperate valleys of Cochabamba, Chuquisaca and Potosi. An exception seems to be the Chane-Piray zone, where quite a large proportion indicated that they came from the city, although this may simply be an intermediate step between the original rural community

TABLE IV.1.6. NATIONAL COLONIES, NUMBER OF SETTLERS AND THEIR LOCATION, BOLIVIA, 1973

Zone	Geographic Location	Department	No. of Colonies	No. of Families	Family Average	Estimated Population	Colonization System
Area I	Alto Beni	La Paz	4	550	3.91	2150	Oriented
Area II	Alto Beni	La Paz	2	1547	4.03	6241	Oriented
Area II	Alto Beni	La Paz	54	1486	3.10	4602	Spontaneous
Caranavi	Caranavi	La Paz	270	11778	3.13	36886	Spontaneous
Chimore	Chimore	Cochabamba	1	1308	3.99	5224	Oriented
Chapare	Chapare	Cochabamba	68	6462	3.95	23535	Spontaneous
Yapacani-							
Buen Retiro	Buen Retiro	Santa Cruz	2	2486	4.26	10588	Oriented
Yapacani	Yapacani	Santa Cruz	18	1786	4.03	7198	Spontaneous
San Julian	Rio Grande- Rio San Julian	Santa Cruz	1	2220	2.00	440	Oriented
Norte	Northern						
Montero	Santa Cruz	Santa Cruz	30	5213	3.68	19195	Spontaneous
Cotoca	Southern Santa Cruz	Santa Cruz	1	48	2.67	120	Oriented
Robore	Robore	Santa Cruz	33	1294	4.00	5176	Spontaneous
Bermejo	Arce Province	Tarija	4	225	3.03	682	Spontaneous
Uncon- trolled	Eastern Bolivia	Beni, Santa Cruz, Tarija	55	10000	3.87	38700	Spontaneous
Total			543	44403		160737	

Source: Adolfo Galleguillos, Department of Sociology, Instituto Nacional de Colonización, La Paz.

and the colony.

Nearly 80 percent of all colonists are married or live with a person of the opposite sex and have a family, as life in these areas is harder for single individuals. Wives also come from approximately the same places as the male settlers. Children were either born within the colony or they came from original communities. In fact, as part of the selection procedure in the oriented projects, preference was given to married individuals. In terms of previous occupation, as expected, 80 percent were occupied in agriculture, while 16 percent had some kind of urban occupation and only 3 percent were former mine workers.*

The average family size is 4.8 members, with 60 percent of the total having 2-6 members, and 18 percent having only one or two members in the family. Eighty-five percent are full families, having the father, mother, children, and some relatives living with them. The heads of the family averaged 37 years of age, with a distribution of 32 percent below 30, 33 percent between 31 and 40 years, 20 percent between 41 and 50 years, and only 14 percent above 50 years. In short, this is a relatively

*During 1961-64, as part of the policy designed to solve the excess labor problem in the nationalized mines, the government encouraged and facilitated migration to colonization areas and expropriated farms in Cochabamba. Both migrations could be considered to have had little impact on the solution of such employment problems.

young population. Wives were younger, with 22 percent in the range below 20 years, 28 percent between 30 and 40 years, 15 percent between 40 and 50 years, and only 6 percent above 50 years of age.

b. Education of settlers and their families

As is also shown in another study (55), the settlers are a selected group of peasants, as they have high literacy rates and educational levels. The sample indicated that 80 percent of the heads of the family know how to read and write, with a low of 67 percent for Chapare and a high of 87 percent for Alto Beni I. This is considerably better than the 70 percent illiteracy rate for the whole population of Bolivia. In terms of educational level, 6 percent of those having formal education attended the first grades of high school and 1 percent attended some technical school or university. The situation for wives is worse, which unfortunately is consistent with the tradition of rural Bolivia. Only 35.9 percent of them knew how to read and write, while only 2 percent had attended educational facilities above primary school.

The children of the colonists have better school opportunities than other children in rural areas. Practically all in the oriented projects and most in the spontaneous colonies have access to primary schools. Of the families in the sample, 85 percent reported sending their children to school and 43 percent of those in the

high school range were attending classes. This is quite a large figure and shows the increased interest on the part of the colonists to provide better opportunities to their children through education. Interest is also manifested when they help to build primary and high schools. Examples include the efforts of the settlers in Alto Beni I to build the Santa Rosa Nucleo Escolar which serves Alto Beni I and II. A large building for a high school is also under construction in Villa Busch, Yapacani, and smaller schools have been or are being built in most of the colonies. Although this effort helps meet educational needs, quality in teaching is poor and relevance is still linked to a humanistic concern instead of the more necessary agricultural or technical training.

c. Language and religion

Another important indicator that the colonists are a select group is the language spoken at home. On an average, 78 percent said they spoke Spanish with Piray and Yapacani higher than the rest (96 and 98 percent). It is widely recognized that one of the most important successes of Bolivian land reform has been the social integration of the peasants, but in some areas Quechua and Aymara are still the dominant languages. The need to participate actively in market activities, and to have access to the new opportunities in the colonization areas, undoubtedly is reflected in these high percentages

of Spanish-speaking people.

Most of the settlers--77 percent--are Roman Catholic, which is consistent with the official and traditional religion of the country. Nevertheless, new non-Catholic denominations are very active in these areas, which is reflected in the percentage of Protestant settlers (21%), with the highest participation in Caranavi and Alto Beni. A very low percentage declared no participation in any form of religious activity.

d. Health and health facilities

The colonists were young and generally healthy before coming to the colonies. In fact, one condition of selection for admission in the oriented group was a medical checkup. Nevertheless, an alarming 69 percent of those interviewed indicated that they experienced "lung" diseases, which supports medical reports indicating increased presence of T.B., due to difficult working conditions, malnutrition and adverse climate.* This of course suggests important implications in health programs for new area development.

Health facilities in the colonization areas are adequate in the oriented colonies, through arrangements

*This fact, however, is emphatically denied by the Medical Department of the Instituto, which insists that T.B. rates in the colonies are similar to those of the rest of the country.

between the Instituto Nacional de Colonizacion and different religious organizations, which provide medical care and even drugs to peasants below market prices.* The spontaneous colonies also had several facilities provided by the Ministry of Health or private organizations. The worst area was Chane-Piray, mostly due to poor road conditions, which did not permit ambulance functioning during the rainy seasons.

e. Previous situation and assets brought to the colony

When asked about their previous situation before becoming colonists, 57 percent considered it fair, only 15 percent good and 27 percent considered their previous situation bad. These answers can be related to their reasons for migration. Thirty percent were explicit in admitting that they migrated because they wanted to improve their economic situation. Thirty-five percent admitted economic reasons and information about colonization opportunities as the motives for migration. Other explanations were the desire to rejoin relatives (3 percent), the spirit of adventure, and suggestions by friends or relatives. Thirty percent did not provide any answer.

* Such as Catholic groups attending Km. 73, Santa Ana and Popoy on Alto Beni. The Committee of United Churches gives assistance to Piray and the Methodists work in Yapacani and in the new San Julian project.

It has been stated that the settlers leave their original communities because of push conditions. Asked about availability of assets in their places of origin, 256 out of 764 declared to have had a house, cattle, land, tools or a combination of "assets." Of those previously owning land, 27 percent retained it. No question was asked about the size of these plots, but the issue has relevance since the colonization schemes supposedly solve some problems of population pressure in traditional agricultural areas.*

Ownership of land by colonists in traditional areas may explain some of the lower net farm incomes and the minimal number of days worked in some colonization areas. In fact, it is known that a relatively large proportion work in both the traditional and colonization areas.

The colonists bring some of their assets to the new lands. From the total sample, 30 percent brought some money, most less than \$Bs. 500, the equivalent of US\$ 41.60. A small percentage brought some tools, and only two colonists said they took some animals to the colony. The presence of a large number of sheep in Alto

*This is at least a two faced problem. On the one hand, given the relatively good size of plots, colonists should be encouraged to give up the land they possess in the traditional areas. On the other, the Land Reform Law (Art. 94) allows the "minifundistas" to apply for land compensations in colonization areas when the lot granted to them in expropriated farms is insufficient to provide a decent income.

Beni and Yapacani shows some of the additional resources moved to the colony in following years.

f. Initial difficulties in the colonies

The initial difficulties that the colonists claim in order of importance are: 1) lack or poor quality of roads, 47 percent; 2) economic, marketing or lack of money problems, 42 percent; 3) health problems, 32 percent; 4) climate problems, 15 percent; 5) lack of potable water, 9 percent; 6) lack of knowledge about the agriculture of the region, 5 percent. Very few declared not to have some kind of problem or difficulty. Most current complaints of colonists to authorities involve roads, health facilities and schools. These needs obviously relate to improving their economic situation as well as assuring the well-being of their families.

Such problems forced the colonists to live alone during the pioneering stage of colonization. Only 34 percent of the families joined the settlers during the first year of colonization, while more than 50 percent joined the settler after his first year of permanence in the colony. Only Piray showed 83 percent of the families coming during the first year of settlement, probably because of its proximity to Montero and Santa Cruz.

g. Learning of agricultural techniques

Despite the fact that the colonists did not assign great importance to the learning of new agricultural

techniques in an unfamiliar environment, this seems to be a problem. The learning of techniques through the extension service, as expected, is higher in the oriented groups of Alto Beni and Chimore. Spontaneous colonists manifested their learning mostly by previous experience (52.9 percent). This is consistent with the fact that they generally work first as laborers in farms of older settlers before taking over a piece of land for themselves. Neighbors proved to be a good source of information in many cases (26.0 percent). One important example of knowledge acquired is the adoption of cocoa hybrid seeds and plants by most of Alto Beni settlers, although they declared not to have received much technical assistance (only 11.3 percent). Experience by local learning accounted for 10 percent of the knowledge gained.

h. Mobility in the colonies

At what could be considered the end of the pioneer stage, the reports on the oriented groups indicate a rate of desertion as high as 50 percent (11). There are no reliable estimates about desertion in spontaneous colonies. This is understandable, given the hardships of this stage. Yet, at the consolidation stage, the colonies are also quite mobile in population. With the exception of the Chapare group, around 20 percent of people stayed 1-5 years in the colony. Around 47 percent remained 6-10 years, 25 percent 11-15 years, and a very low

percentage more than 15 years. The older groups are also understandable, even in the oriented groups, since the projects absorbed some of the older truly pioneer settlers in practically all zones. The settlers with the longest residence were those of the Chapare group.

i. Adaptation in the colonies and desertion intentions

When asked if they had serious adaptation problems, 69 percent replied that it was not difficult, while the remainder said they had some difficulties adapting to the new climate and environment. Most of them thought that they liked the colonization area more at the time of the interview than at the beginning and only 6 percent said they actually liked the colony less than at the beginning. Another indicator that they felt better than in their original communities is that they thought they ate better than or the same as they had in their source communities. They do have a more regular and abundant supply of food throughout the year, as compared to the altiplano rural areas.*

On an average, 10 percent have intentions to desert the colony. The largest are the oriented groups of Alto Beni II (32.9 percent), and Chimore (16.5 percent).

*Wessel Kelso points out that the knowledge of this fact may attract additional thousands of peasants from the poorest areas of the altiplano communities (68, p.210).

Those who intend to abandon the colony offered economic reasons as explanation (16.4 percent), health problems (32.8 percent), a bad parcel of land (19.4 percent), and difficulties due to climate and lack of adaptation.

Three settlers in Alto Beni and one in Caranavi indicated the desire to change occupations. The colonies, as any other social community, are dynamic groups. Yet the reasons provided for leaving the colony reflect some of the common needs which must be overcome to improve the welfare of the community.

Of those who intended to desert, about 50 percent could be considered homesick, and would like to go back to their original communities. Nearly one-fourth would prefer to stay in the same zone or move to another colonization area. Only 17 percent manifested interest in moving to a city. Of those who wanted a change within a colonization zone, the main reason was the physical characteristics of the plots.

IV.1.3.3. Summary. From this background, a description may be compiled of the average colonist in any of the three regions under study. He was a poor peasant farmer when he moved from the altiplano or valleys, bringing only a few pesos or a few tools with him. A major reason for his migration was the scarcity of land, and a lack of job opportunities outside agriculture. He is now 37 years old, married, with 3.8 members in his family.

He has minimal reading and writing skills, although he now speaks Spanish instead of his native Quechua or Aymara. He is very conscious of the value of education and is sending his children to school either in or outside of the colony. Occasionally he participates in community development work, perhaps helping to build a high school in the colonization area. He is Catholic, although some of his neighbors are becoming Protestants. His initial, and in many cases current, difficulties were lack of roads, money and health facilities. He learned his agricultural techniques from previous work on neighboring farms, from observing older colonists, and sometimes from government technicians. He has been in the colony for ten years. An analysis of his accomplishments over these ten years is one of the general objectives of this study.

IV.2. Cash, Net Income and Returns to Management, Labor and Capital

Three forms of income were measured: cash income, net income, and returns to farm management, labor and capital. The following is a description of how these three indicators of performance were measured.

Cash income, measured as total sales minus total operating costs, excluding depreciation. In an equation form,

$$\text{Cash income} = \text{Agricultural} + \text{Forest} + \text{Animal} \\ \text{Sales} - \text{Total Cash Costs}$$

Cash income provides an important indicator of the market capability of the settlers. It also offers a good index of the capability to buy other factors of production besides land.

Net income, defined as total sales plus total home consumption, minus operating costs including depreciation. Consumption of farm products was valued using equivalent prices to those received by sales (opportunity cost). A straight line depreciation method was used by groups of capital items for four or five years of the life of the assets.

Returns to farm management, labor and capital, measured as total sales plus total home consumption, minus operating costs (or net income plus depreciation). The figures obtained for these forms of income are summarized in Table IV.2.1.

It may be observed that in all three measures of income the mean for spontaneous groups is about 80 percent above that of the oriented groups. Because of this, in the remaining analysis, only net income will be used as an estimator of income. The direction of the difference and the proportions are similar for the other two estimates.

A full description of sales, consumption and costs of production, per system and zone, is provided in Table IV.2.2. This table is illuminating in the following

TABLE IV.2.1. AVERAGE CASH INCOME, NET INCOME AND RETURNS TO MANAGEMENT, LABOR AND CAPITAL PER HOUSEHOLD IN COLONIZATION ZONES, 1973. \$Bs.

Zones	Cash Income \$Bs	Net Income \$Bs	Returns to Management, Labor, and Capital \$Bs
<u>Spontaneous</u>			
Chapare	6087.6	8114.0	8954.1
Caranavi	2454.1	3313.0	4031.4
Chane-Piray	<u>6932.9</u>	<u>12322.0</u>	<u>13264.6</u>
Mean Group	4730.6	7200.0	8016.1
<u>Oriented</u>			
Chimore	2873.2	4881.0	5446.4
Alto Beni	2009.0	3671.0	4425.9
Yapacani	<u>2926.0</u>	<u>3559.0</u>	<u>4327.3</u>
Mean Group	<u>2488.9</u>	<u>3954.0</u>	<u>4663.3</u>
Sample Mean	3581.5	5335.9	6297.4

a) Forest product sales are almost negligible. In fact, colonists make very little use of their forests, except for the sale of a few logs and firewood.

b) Crop sales and consumption account for a large proportion of gross value product (72.4 percent). It is particularly high for Chapare (91.3 percent) because of coca production, and for Caranavi (82.3 percent) because of coffee production. Chane-Piray is also high (86.7 percent) because of sugar cane and rice sales. Diversification is noticed with

TABLE IV.2.2. SALES, CONSUMPTION, COSTS AND AVERAGE FARM INCOME
BY ZONES AND SYSTEMS, 1973. \$Bs

Description	Spontaneous			Mean S	Oriented			Mean O
	Cha- pare	Cara- navi	Chane- Piray		Chi- more	Alto Beni	Yapa- cani	
<u>Sales & Consumption</u>								
1.Forest products	.0	15.03	0.0		23.4	5.9	44.6	21.3
2.Crops sales	9380.0	3788.0	11789.0	7607.0	4465.0	3011.1	2769.0	3321.0
3.Animal sales	221.8	230.8	1893.3	701.3	233.6	558.7	1554.6	751.9
4.Total sales	9602.0	4033.9	13682.4	8314.8	4722.0	3575.6	4369.0	4094.0
5.Agric. cons.*	2010.8	830.3	5580.6	2507.3	1951.7	1191.9	580.4	1218.4
6.Anim. cons.*	855.7	746.9	751.1	778.1	621.5	1224.8	820.9	955.7
7.Total cons.	2866.5	1577.3	6331.7	3285.5	2573.2	2416.8	1401.3	2174.4
8.Gross value	12468.6	5611.2	20014.1	11600.3	7295.3	5992.7	5770.0	6268.8
<u>Costs</u>								
9.Annual crops	395.9	148.5	4641.7	1495.0	1091.7	736.8	1220.2	963.6
10.Other crops	104.8	426.5	.0	216.4	104.8	141.1	.9	92.6
11.Perm. crops	2917.5	677.1	1773.5	1607.1	125.4	296.9	0.0	169.7
12.Animal raising	1.6	60.3	100.0	55.4	386.0	177.9	206.0	239.7
13.Financial	94.7	267.3	234.3	210.3	140.9	214.3	15.7	139.9
14.Depreciation	840.3	718.5	942.8	815.9	565.9	755.0	768.6	707.7
15.Total costs	4355.0	2298.0	7692.0	4400.0	2415.0	2321.9	2211.0	2315.0
16.Net income	8110.0	3313.0	12322.0	7200.0	4881.0	3671.0	3559.0	3954.0

Notes: (4) = (1 + 2 + 3); (7) = (5 + 6); (8) = (4 + 7); (15) = (9 + 10 + 11 + 12 + 13 + 14); (16) = (8 - 15).

* Home consumption of agricultural and animal products.

Source: Sample data.

larger sales of animal production in Yapacani (35.6 percent of total sales). In absolute value, Chane-Piray also has high animal sales.

c) On the cost side, animal raising costs on an average comprise a very small proportion of total costs, due to the home consumption orientation of animal production.

It is also of interest to observe the settlers' market participation as shown by the number of households selling a particular product (see Table IV.2.3). The Chapare group largely sold rice (55 percent), coca (97 percent), and bananas (48 percent). Caranavi clearly depends heavily on coffee (73 percent), bananas, and other plantation crops--citruses and avocados (71 percent). Chane-Piray markets mainly rice (94 percent) and a small group also markets sugar cane (21 percent). This is a very important crop for the colony, although transportation problems limit the crop to areas closer to the paved Montero-Mineros road.* Corn is another important crop in this colony. Chimore largely produces rice (96 percent) and bananas (56 percent). Alto Beni is mainly a cocoa producer (61 percent), with increasing numbers of settlers having young trees, which will increase cocoa production

* Royden and Wennergren discuss the intensity of land use and patterns of production in relation to distance to main road in Chane-Piray (55, p. 59 and Table 14).

TABLE IV.2.3. SETTLER'S MARKET PARTICIPATION IN CROPS AND ANIMAL PRODUCTION*

Type of Sales	Spontaneous			Total S	Oriented			Total O
	2 Cha- pare	2 Cara- navi	2 Chane- Piray		2 Chi- more	2 Alto Beni	2 Yapa- cani	
Forest products	0	2	0	2	7	5	10	22
<u>Annual crops</u>								
-Rice	53	17	93	163	91	146	60	297
-Corn	13	91	81	185	11	28	0	39
-Other	0	2	7	9	3	2	0	5
<u>Permanent crops</u>								
-Coca	93	-	-	93	-	-	-	-
-Cocoa	-	-	-	-	-	104	-	104
-Coffee	-	111	-	111	-	-	-	-
-Sugar cane	0	0	21	21	0	0	0	0
-Bananas	46	92	30	168	53	35	11	99
-Other	89	93	4	186	1	35	13	49
<u>Animal products</u>								
-Cattle	-	-	-	0	1	5	1	-
-Hogs	6	8	1	15	4	15	1	20
-Poultry	55	47	57	159	38	70	53	161
-Sheep	-	-	-	0	-	4	-	4
Number of settlers	96	153	99	348	95	169	102	366

* Measured as number of settlers reporting sales.

Source: Sample data.

in the future. Bananas and other permanent crops are also increasing in sales, although they presently have only a small share of the market (21 percent). Yapacani markets mostly rice (59 percent of producers). In terms of animal products, while herds are starting to build up in Alto Beni and Yapacani, sales are still low. Hogs and poultry sales are clearly by-products of mostly home oriented production.

Economic performance of spontaneous and oriented colonies

Two aspects deserve consideration in evaluating the performance of both groups. The first is income level, which is related to distribution; the second, how income levels compare with national averages.

1) Income levels. Considering 11 classes of income level, the findings were the following:

- a) 10 percent of the sample had negative net farm incomes (see Table IV.2.4, A and B). The worst off were Yapacani (23 percent) and Caranavi (16 percent). For the Yapacani group, these negative incomes may be attributed to market difficulties, because of poor road conditions in a large proportion of sectors within the colony. Caranavi had negative incomes, probably because of poor yields in some sectors and production losses because of lack of marketing. Alto Beni II also had a large proportion of

TABLE IV.2.4.A. RANGES OF NET FARM INCOMES IN \$Bs. PER ZONE, SPONTANEOUS COLONIES, 1973

Classes	Chapare		Caranavi		Chane-Piray		Mean Group	Part. Freq.	Acc. Freq.	% Acc. Freq.
	Mean \$Bs.	Freq.	Mean \$Bs.	Freq.	Mean \$Bs.	Freq.				
0 and less	-5.7	1	-692.8	25	-1431.0	4	-768.3	30	30	8.6
1-1000	336.0	4	462.4	29	464.5	2	448.1	35	65	18.7
1001-2000	1446.6	5	1417.6	19	1732.4	4	1471.3	28	93	26.7
1201-4000	2905.8	17	3072.8	23	2800.3	8	2968.2	48	141	40.5
4001-6000	5015.2	14	5008.1	27	4737.1	12	4948.6	53	194	55.7
6001-8000	7077.7	16	6846.0	16	7823.2	15	7000.6	47	241	69.2
8001-10,000	9081.1	12	8609.2	7	8913.3	9	8909.2	28	269	77.3
10,001-12,000	10531.0	6	10500.8	3	11036.1	8	10763.4	17	286	82.2
12,001-15,000	13596.3	9	13363.0	2	13962.1	16	13795.7	27	313	89.9
15,001-20,000	17047.8	7	0	0	17015.1	13	17026.5	20	333	95.7
More than 20,000	24707.3	5	24957.7	2	52391.8	8	39172.5	15	348	100.0
Mean zone	8114.0		3313.0		12322.0		7200			

Source: Sample data.

TABLE IV.2.4.B. RANGES OF NET FARM INCOMES IN \$Bs. PER ZONE, ORIENTED COLONIES, 1973

Classes	Chimore		Alto Beni I		Alto Beni II		Yapacani		Mean O	Part. Freq.	Acc. Freq.	% Acc. Freq.
	\$Bs.	Freq.	\$Bs.	Freq.	\$Bs.	Freq.	\$Bs.	Freq.				
0 and less	-1800.0	2	-2324.0	1	-960.2	16	-1077.9	24	-1054.8	43	43	11.7
1-1000	531.4	8	0	0	526.2	25	582.0	14	552.1	47	90	24.6
1001- 2000	1612.1	15	1341.6	5	1474.8	24	1426.6	13	1488.3	57	147	40.2
2001- 4000	2884.5	25	2706.1	10	2920.7	28	3016.8	15	2900.1	78	225	61.5
-6000	4979.1	15	4651.0	5	4950.5	20	4728.3	12	4878.7	52	277	75.7
-8000	7113.2	14	6721.3	9	6740.2	5	6726.8	9	5170.4	37	314	85.8
-10000	8543.5	4	8849.7	6	8775.1	3	8924.0	3	8773.1	16	330	90.2
-12000	10783.7	7	11360.0	1	10141.2	2	10866.7	2	10738.5	12	342	93.4
-15000	12934.6	2	13271.5	3	12207.0	1	13411.7	5	13177.3	11	353	96.4
-20000	16834.0	2	15583.4	3	16346.5	1	16811.9	5	16438.6	11	364	99.4
Greater than 20000	21047.5	1	31320.5	1	0	0	0	0	28683.5	2	366	100.0
Mean zone	4881.0		6762.0		2583.0		3559.0		3954.0		366	

Source: Sample data.

negative income (13 percent) which again may be attributed to difficulties in marketing because of lack of roads or high transportation costs. In fact, production losses in all regions are very high. Losses occur in the form of unharvested products, mainly fruits, and in storage, because of road transportation difficulties. In addition, storage of grains is very primitive and this adds to losses because of rat and insect damage.*

In Alto Beni, sectors like Sararia-Mayaya were isolated during most of the rainy season due to the lack of a bridge over the Suapi River (causing problems to about 400 households) and poor maintenance of feeder roads. Remolinos, San Antonio, and Nueva California depend basically on boat transportation by the Alto Beni River up to Puerto Linares. This implies high transportation costs (about \$Bs. 4.30 ton/km, compared to \$Bs. .99 ton/km for truck transportation between La Paz and Caranavi). In Chimore, most of the feeder roads were in poor condition, without bridges and with impassable roads during the rainy season. In Yapacani, most of the settlers in Faja Norte (North Belt) and those beyond 35 km of

* Losses of production because of lack of harvest may be as high as 50 percent in fruits. Incapability to harvest and storage losses are about 10 percent in rice.

Yapacani-Puerto Grether, Chorolque, Chore, and Buen Retiro also had very bad roads during the rainy season.

The surveyed Caranavi group had no serious road problems, but had few trucks going into the area. This situation was created by the truck union, which did not permit new truckers to work in the area. The Chapare group had no serious marketing problems except for considerable seasonal variations in coca prices (34, 35). Piray settlers had impassable main and feeder roads during the full rainy season and were collecting money to buy their own equipment to maintain their roads. In addition, heavy log transporting trucks and absence of gravel on the surface led to very poor road conditions. Thus, transportation costs were very high.*

Clearly, the very poor condition of roads in most of the oriented colonies is one of the basic problems that seriously affects the low levels of income. This also applies to the Piray colony, although in this case, high yields in rice and sugar cane help to provide higher returns and incomes.

* Royden and Wennergren report costs of transportation for sugar cane for Chane-Piray as percentage of price received in mill, as high as 38, 50 and 65 percent depending on farm location. For rice, from 6 up to 12 percent (55, pp. 38-40).

b) Eleven percent had incomes above 0 and below \$Bs 1000, 12 percent between \$Bs 1000 to 2000, 18 percent between \$Bs 2001 to 4000, and 15 percent between \$Bs 5001 and 6000 (US\$ 200 to 300). The five previous groups account for 66 percent of the sample. All of them may be considered strictly subsistence farmers.

In terms of total income participation, the spontaneous sub-group (194 out of 348) made 17.5 percent of the total income in the sample, and the oriented sub-group (277 of 366) made 37.7 percent of total income.

c) Of those in the upper classes, 12 percent made a net income between \$Bs 6001 and 8000, 6 percent between \$Bs 8001 and 10,000, 4 percent between \$Bs 10,001 and 12,000, 5 percent between \$Bs 12,001 and 15,000, 4 percent between \$Bs 15,001 and 20,000, and only 2 percent made an income above \$Bs 20,000, with a mean of \$Bs 37,938 (US\$ 1,897). It is interesting to note that in the spontaneous group, 35 settlers out of 348 in the classes with incomes above \$Bs 15,000 obtained 37.2 percent of the total income. In the oriented colonies, only 13 out of 366 obtained 16.1 percent of the total income in the sample.*

* Total income generated in the spontaneous group was \$Bs 2,505,650.0; in the oriented group, \$Bs 1,447,005.0

These results show that, depending upon certain conditions, settlers may attain incomes above mere subsistence. Higher incomes may allow these areas to develop faster and allow colonists to attain better standards of living.

2) Farm incomes compared to national rural incomes.

As stated, one of the objectives of this research has been the assessment of colonization in relation to income levels of the rest of the rural sector. This will be done in the following section.

The average national income per capita in the rural sector in 1972 was estimated at US\$ 44 (64). Assuming a 2 percent increase for 1973, it would be US\$ 45 or \$Bs 4320 for a 4.8 member family (the average family size found in the sample).^{*} Taking this figure as a break-even point, the results are the following (see table, p. 99).

In the spontaneous group, 57 percent of the households were above the national per capita income. This would indicate a good performance of settlers in the subtropical lands of Bolivia, confirming the findings of other researchers that peasants attain higher incomes in the lowlands (28, 68).

In the spontaneous group, 91.6 percent of the total

* The World Bank suggests that an annual p.c. income equivalent to US\$ 50 or less could be adjusted as an arbitrary standard to determine the absolute level of poverty (33, p. 4).

Income Class	<u>Spontaneous</u>		<u>Oriented</u>		<u>Total</u>	
	Average Net Farm Income \$Bs	Freq.	Average Net Farm Income \$Bs	Freq.	Average Net Farm Income \$Bs	Freq.
0 & less	-768.3	30	-1054.8	43	-937.1	73
0-4320	1957.6	119	1994.4	194	1980.4	313
Greater than 4320	11536.4	199	8569.4	129	10369.5	328
TOTAL	7200.0	348	3954.0	366	5536.0	714

income was obtained by the class above \$Bs 4320; in the oriented group, 76.3 percent of the total income was obtained by this class.

IV.3. Regression Analysis

IV.3.1. Economic differences between systems

A regression equation, with a 0-1 dummy variable, was used to test the general hypothesis of whether or not there are significant differences in the income levels of both groups. The average net farm income obtained in 1973 was used as the dependent variable.* In this type of equation, the constant is the mean of net farm income in an oriented or spontaneous group whenever the "1 dummy" is selected. The regression coefficient and sign of the

* Net farm income = sales + consumption - total operating costs

dummy variable is the amount by which the mean farm income for the base variable differs from the constant.

The results of the regression are the following:

$$(3.1.1) \quad Y_1 = 3954 + 3247 X_1 \\ \quad \quad \quad (448) \quad (642)$$

Where:

Y_1 = net farm income;

X_1 = 1 for spontaneous colonies and 0 otherwise.

As usual, the numbers between parentheses correspond to the standard error of the regression coefficients. This convention will be used throughout.

The equation expresses the fact that the average net farm income for the oriented colonists was \$Bs 3954 in 1973, while the average net farm income for spontaneous colonies was \$Bs 7200 in the same year. The coefficient showing this difference was significant at a 99.99 probability level for 1 and 712 degrees of freedom. The coefficient of determination (R^2) was equal to .0347.

This would appear to lead to the conclusion that spontaneous colonists are better off in economic terms than oriented ones. Another interpretation would be that the variable systems lead to statistically significant differences in income. These results support the conclusions found in the literature which compares both systems. This is that the oriented groups, because of the paternalistic behavior of the official institutions, experience a

weakening of initiative, and, in the long run, worse economic conditions. The value of R^2 , however, provides an important warning in this case. The type of colony explains only about 3 percent of the income variation. The unexplained portion is large because several other factors are assumed to be constant. The level of income attained would be better explained or predicted by the inclusion of other factors in the equation in order to decrease the unexplained variation. This will be done in the following sections.

IV.3.2. Regional differences in income

In the theoretical framework, the need to qualify the general hypothesis has been stated. One of these qualifications is to observe regional differences. As noted, regional differences determine varied patterns of production, and even different yields in the same crops, which help to explain variations in output and income. To measure the magnitude and direction of these differences, the following equation was estimated:

$$(3.1.2) \quad Y_1 = 7875 - 1369 X_1 - 4374 X_2$$

$$\quad \quad \quad (601) \quad (861) \quad (766)$$

Where:

Y_1 = net farm income;

X_1 = 1 for Chapare-Chimore and 0 otherwise;

X_2 = 1 for Caranavi-Alto Beni and 0 otherwise.

Yapacani-Chane-Piray was the excluded, or base, region.* The R^2 was equal to .0482. The equation indicates that the average net farm income for the Yapacani-Chane-Piray group was \$Bs 7875, \$Bs 6506 in Chapare-Chimore, and only \$Bs 3501 in the Caranavi-Alto Beni group. The coefficients were statistically different from zero at a 99.99 percent probability level for 2 and 711 degrees of freedom.

Using equation 3.1.2 as an indicator of the differences in income among regions, one would conclude that colonies in the Santa Cruz area are better off than those of Cochabamaa (21 percent higher average income), and that the Chapare colonists obtain higher incomes than their counterparts in Caranavi-Alto Beni (86 percent higher incomes). These differences are not unexpected, given the quick pace of development in the Santa Cruz area, the high value coca crops in the Chapare, the poorer yields in annual crops of Caranavi and the current market problems of Alto Beni. Still, regional differences are associated with only 4.8 percent of variance in the

* Taking Caranavi-Alto Beni as the excluded region provided the following equation:

$$Y_1 = 3501 + 3005 \text{ Chachire} + 4374 \text{ Yappire}$$

$$(975) \quad (778) \quad (766)$$

which is essentially the same result.

income levels of the groups. Thus, other variables must be inserted in the model to provide a better explanation of income variations.

IV.3.3. Differences among zones

Using dummies to identify the variations in net farm income between zones, the estimated equation was the following:

(3.1.3)

$$Y_1 = 12322 - 4208X_1 - 7441X_2 - 9009X_3 - 8763X_4 - 8651X_5$$

(828)	(1170)	(1173)	(1053)	(1152)	(1034)
--------	--------	--------	--------	--------	--------

Where:

Y_1 = net farm income;

X_1 = 1 for Chapare zone and 0 otherwise;

X_2 = 1 for Chimore zone and 0 otherwise;

X_3 = 1 for Caranavi zone and 0 otherwise;

X_4 = 1 for Yapacani zone and 0 otherwise;

X_5 = 1 for ABeni zone and 0 otherwise.

The excluded variable and base for comparison is Chane-Piray. The R^2 for the group was .129. The F ratio was 20.93 with 5 and 708 degrees of freedom, while the level of significance for this ratio is equal to .000. The five coefficients were significant at a 99.99 probability level. As in the previous case, this equation means that the average net farm income for Chane-Piray is equal to the constant value. The average income in Chimore is

thus given by:

$$12322 - 7441 = 4881$$

The average farm income for the other zones is calculated similarly.

IV.3.4. Summary

The previous analysis may be summarized in a table, showing the differences in average net farm income in relation to systems, regions and zones (see Table IV.3.1).

TABLE IV.3.1. AVERAGE NET FARM INCOME OF SETTLERS, BY SYSTEMS, REGIONS AND ZONES, 1973. \$Bs

System	Regions			Average System
	Chimore-Chapare	Alto Beni-Caranavi	Yapacani-Piray	
Oriented	4881	3671	3559	3954
Spontaneous	8114	3313	12322	7200
Average region	6506	3501	7875	$\bar{y}=5536$

Source: Equations 3.1.1, 3.1.2., and 3.1.3.

\bar{y} = sample average

In short, this table and its underlying equations indicate that differences between systems are statistically significant. In fact, an average spontaneous settler got 82 percent higher income than an oriented one. Differences between regions are also statistically significant, but at the zone level the differences in

average farm income between Caranavi and Alto Beni are not statistically significant. This apparent inconsistency will be discussed in Chapter VI.

IV.3.5. Sociological variables

IV.3.5.1. Origin. Since origin involves differences in background and experience, the inclusion of this variable in the analysis may shed light on the differences in the level of net farm income. Treating origin as a dummy variable, the following equation was estimated:

$$Y = 8633 - 4185 X_1 - 3362 X_2$$

$$(763) (904) \quad (924)$$

Where:

Y = net farm income;

X₁ = altiplano;

X₂ = valleys.

The excluded variable was origin in the city and origin in the same zone. The R² for the group was .029. The F ratio was 10.88 with 2 and 711 degrees of freedom. The group of variables was significant at a 99.9 probability level. This equation indicates that colonists who were former city dwellers or from the same zone attain significantly higher incomes than those coming from the altiplano and valleys.

These results will also be analyzed at the zone level.

IV.3.5.2. Education. As mentioned, settlers are a privileged group in terms of literacy rates, although there is no large group in the sample with a high educational level. At the same time, education is a good proxy for management ability. Using dummy variables to relate education and income levels, the following equation was obtained:

$$Y = 5072 - 2823 X_1 + 1514 X_2$$

Where:

Y = net farm income;

X₁ = high education (technical school or university level);

X₂ = low level (above the third grade of primary school and high school).

The base variable in this case is either no education at all, or third grade level. The R² was very low, equal to .008. The overall level of significance for the group of variables was .057, with X₁ not statistically significant and X₂ significant for a probability level of .03. These results can be better observed by tabular analysis (see Table IV.3.2).

Again, those with low or very low levels of education do not show statistically significant differences, and those with high education show the lowest average farm income. These results would appear to contradict

TABLE IV.3.2. AVERAGE NET FARM INCOME (\$Bs) IN RELATION TO SYSTEMS AND EDUCATIONAL LEVEL

System	Level of Education			Mean System
	High	Low	Very Low or No	
Spontaneous	706.5	9569.6	6396.3	7258
Oriented	2865.7	4441.9	3606.9	3909
Mean for Education	2248.8	6585.8	5073.5	5543
std. dev.	(3056.9)	(13142.2)	(5383.6)	

Chi square = 7.25 with 2 df. Prob (C^2 7.25) = .0266.

the vast literature indicating the importance of education in explaining differences in income (40). The answer, however, makes sense for the sample. First, there are only 7 observations for those with high education (232 for low and 466 for very low). This small group, because of their level of education, may be declaring lower incomes because of a fear of increased taxes. Another possible explanation is that the measured income corresponds to net farm income. Empirical observation of these colonists shows that the best educated tend to be involved in other activities, such as manager of local coops or union leaders. Income from other sources becomes more important and the parcel of land is neglected. For the remainder, the level is so

low that it makes little difference in technical knowledge. In addition, the extension service is so weak for both groups that again education is not a relevant factor in income differences.

IV.3.5.3. Language. Language may constitute a barrier and consequently a handicap for marketing operations. It is also related to differences in ethnic background and origin, which may help to explain differences in success.

Using dummy variables once more, the estimated equation was the following:

$$Y = 5839.5 - 3032.5 X_1 - 410.4 X_2$$

$$(370.7) (1209.6) \quad (918.5)$$

Where:

Y = net farm income;

X₁ = 1 for Aymara and 0 if otherwise;

X₂ = 1 for Quechua and 0 if otherwise.

The excluded language group was Spanish. The equation indicates that the Spanish speaking colonists got an average income of \$Bs 5839.5. Those speaking Quechua showed no statistically significant differences in income compared to this average, but the Aymara speaking group would appear to be worse off than the other two. This fact can be related to two aspects. First, the Aymara speaking group are altiplano people, most of them migrate to Caranavi-Alto Beni, and they are the least experienced group

in tropical agriculture. Second, the Caranavi-Alto Beni group is, on an average, attaining lower incomes than the other two regions.

The statistics provide an F ratio of 3.15 for 2 and 711 degrees of freedom with a significance level of .0434. The group of variables is statistically significant; however, the R^2 of .009 is very low, providing less than 1% of response in the dependent variable.

IV.3.5.4. Age. The age of the operator of the farm may be an important element in explaining incomes attained. Younger people may endure a more hostile physical environment and longer hours of physical work. For both oriented and spontaneous groups, the answer seems to confirm these assumptions, as shown by Table IV.3.3

With 714 observations, the distribution of ages for both groups was the following: 32 percent less than 30, 34 percent between 30+ and 40, 20 percent between 40+ and 50, 12 percent between 50+ and 60, and two percent greater than 60 years of age. The results would appear to indicate that incomes attained are higher for those below fifty years, with peaks reached between 40 and 50 years of age. They start to decrease after an age of 50 years.*

* Kelso Wessel found the highest average farm earnings between 32-38 years for spontaneous and between 39-45 years of age for oriented. To a certain extent, these conclusions are similar (68, p. 165).

TABLE IV.3.3. AVERAGE NET FARM INCOMES PER HOUSEHOLD
IN RELATION TO AGE AND SYSTEMS. \$Bs.

System	Age Classes					Average System
	Less than 30	30+ to 40	40+ to 50	50+ to 60	Greater than 60	
Spontaneous	7703.5	6701.1	8880.0	5369.6	5225.3	7200.1
Oriented	3576.1	4031.1	5144.8	2894.7	375.1	3953.6
Average Age Class	5595.1	5110.2	6999.2	4554.3	3513.5	$\bar{y} = 5535.9$

Chi square = 19.86 with 4 d.f.
Prob (C2 6.7 19.86) = .0005.

IV.3.5.5. Length of time in the colony. Although this is not properly speaking a sociological variable, for the sake of convenience it will be discussed here.

The length of time in the colony has to do with agricultural knowhow, and gradual development of the farm. On the other hand, with the passing of years, as previously discussed, the plot of land may deteriorate due to the use of inadequate management and ecological conditions. Acquisition of knowhow may lead to higher incomes and deterioration of land to lower incomes. Both aspects are reflected in the variable length. The estimated equation was the following:

$$Y = 6991 - 2935 X_1 - 1101 X_2 - 1734 X_3$$

$$(960) \quad (1232) \quad (1073) \quad (1165)$$

Where:

Y = net farm income;

X_1 = 1 for first five years of residence in the colony and 0 otherwise;

X_2 = 1 for six to ten years of residence in the colony and 0 otherwise;

X_3 = 1 for eleven to fifteen years in the colony and 0 otherwise.

The analysis of variance for the group of variables provided an F ratio equal to 2.23 with 3 and 710 d.f. The significance level of the F ratio was .083; this is not highly significant. The base variable was a residence of more than 15 years in the colony. The equation states that this group obtained an average farm income of \$Bs 6991, which is higher than the rest of the groups. The individual coefficients indicate that the only group which is statistically significant below the average of the fifteen to twenty year group is the one which has less than 5 years of residence in the colony. The t value was -2.38 for 710 d.f. with a significance level equal to .0175. In general, it could be stated that incomes increase with longer residence in the colony. Further implications of this finding will be discussed in Chapter VI.

Similar results were obtained with the tabular analysis which will not be presented here to avoid unnecessary repetition.

IV.3.6. Multiple regression models

Several models were tested. The equations discussed in this section correspond to the whole sample (colonization problem) and to the zones (geographical and regional effects isolated). They were selected using the methodology discussed in Chapter III.

The variable names and units used were the following:

Y_1 = netinc = net farm income, \$Bs

Y_2 = retmgtlb = returns to farm, management, labor
and capital, \$Bs

Y_3 = cashinc = cash income, \$Bs

X_1 = district = 10 for Chapare
11 for Chimore
12 for Alto Beni I
13 for Alto Beni II
14 for Caranavi
15 for Yapacani
16 for Chane-Piray

X_2 = farmsize = farm size, Has.

X_3 = citrshas = citrus, cultivated Ha.

X_4 = avocahas = avocados, cultivated Ha.

X_5 = bananhas - bananas, cultivated Ha.

X_6 = cocoahas = cocoa, cultivated Ha.

- X_7 = ricehas = rice, cultivated Ha.
 X_8 = cornhas = corn, cultivated Ha.
 X_9 = otcrohas = other annual crops, cultivated Ha.
 X_{10} = pastuhas = pastures, cultivated Ha.
 X_{11} = houimpvm = expenditures in house and
improvements, \$Bs
 X_{12} = hogssvalu = hogs inventory value, \$Bs
 X_{13} = poultsval = poultry inventory value, \$Bs
 X_{14} = cattlval = cattle inventory value, \$Bs
 X_{15} = otassval = other assets, \$Bs
 X_{16} = toolsval = tools inventory value, \$Bs
 X_{17} = annolbr = annual crops family labor, man-days
 X_{18} = annhlbr = annual crops hired labor, man-days
 X_{19} = anpeslbr = annual crops hired labor, \$Bs
 X_{20} = transexp = annual crops marketing costs, \$Bs
 X_{21} = planhlbr = plantations hired labor, man-days
 X_{22} = plaolbr = plantations family labor, man-days
 X_{23} = plpeslbr = plantations hired labor, \$Bs
 X_{24} = tothlbrd = total hired labor, man-days
 X_{25} = totowlbr = total family labor, man-days
 X_{26} = totlabrd = total hired and family labor,
man-days
 X_{27} = plantpur = variable expenditures in planta-
tions, \$Bs
 X_{28} = anraicos = variable expenditures in animal
raising, \$Bs

- X_{29} = otinput = variable expenditures in other
crops, \$Bs
- X_{30} = credits = credit amortizations, \$Bs
- X_{31} = famsize = family size, number of family
members
- X_{32} = age = age of head of household, years
- X_{33} = education = education, coded in seven classes
- X_{34} = systemsd = systems, 1 = spontaneous group
and 0 if otherwise
- X_{35} = Chachire = 1 if Chapare-Chimore region, and
0 if otherwise
- X_{36} = Carabnre = 1 if Caranavi-Alto Beni region,
and 0 if otherwise
- X_{37} = Yappire = 1 if Piray-Yapacani region, and
0 if otherwise
- X_{38} = Chapare = 1 if Chapare zone and 0 if otherwise
- X_{39} = Chimore = 1 if Chimore zone and 0 if otherwise
- X_{40} = Caranavi = 1 if Caranavi zone and 0 if
otherwise
- X_{41} = Yapacani = 1 if Yapacani zone and 0 if
otherwise
- X_{42} = ABeni = 1 if Alto Beni zone and 0 if otherwise
- X_{43} = Piray = 1 if Chane-Piray zone and 0 if
otherwise
- X_{44} = Altiplan = 1 if Altiplano origin and 0 if
otherwise

- X₄₅ = Valleys = 1 if valleys origin and 0 if otherwise
- X₄₆ = City = 1 if city origin and 0 if otherwise
- X₄₇ = highed = 1 if high education (technical school or university level) and 0 if otherwise
- X₄₈ = lowed = 1 if low education (above third grade of primary and high school) and 0 if otherwise
- X₄₉ = Spanish = 1 if Spanish speaking group and 0 if otherwise
- X₅₀ = Aymara = 1 if Aymara speaking group and 0 if otherwise
- X₅₁ = Quechua = 1 if Quechua speaking group and 0 if otherwise
- X₅₂ = FRSFIVYS = 1 if less than five years of residence in the colony and 0 if otherwise
- X₅₃ = SIXTENYS = 1 if between 6 and 10 years of residence in the colony and 0 if otherwise
- X₅₄ = ELEFIFYS = 1 if 11 to 15 years of residence in the colony and 0 if otherwise

a. The aggregate model

The selected equation is the one presented in Table

IV.3.4. The coefficient of determination for the group of variables is .769, indicating that the variables in the model explain 76.9 percent of the total response in income. The only independent variable which is not an investment or production factor is the variable systems. Other variables such as age, length, education and origin were deleted as part of the selection procedure. Assigning a significance level of ten percent, the other variables did not offer statistically significant coefficients.* This will become obvious when discussing these variables at the zone level. A possible explanation for this result would seem to be the fact that some of these variables, when considered individually, show statistical significance for very specific areas, but their effect is diminished when other variables are added. Possibly, given the practical homogeneity of the social groups and the predominantly labor intensive, low level of technology, the dominant variables are precisely the amount of cultivated land, the availability of labor and the level of investment in the form of animals, and variable expenditures.

The coefficient for the variable systems is highly significant at less than 1 percent. The general

* All the sociological and some factors of production variables.

TABLE IV.3.4. REGRESSION MODEL FOR COLONIZATION, 1973
DEPENDENT VARIABLE = NET FARM INCOME IN \$Bs

Variable ¹	Regression Coefficient	Standard Error of Regression Coefficient	Partial Correlation Coefficient	T Value with 698 d.f.	Significance Level
Constant	-1369.6673	312.9736	-.163	-4.3763	.0000**
Bananhas	995.6451	156.5432	.234	6.3601	.0000**
Ricehas	1365.4000	113.8675	.413	11.9911	.0000**
Cornhas	558.4300	159.5171	.131	3.5007	.0005**
Otcrohas	2996.6302	383.5095	.284	7.8137	.0000**
Hogsvalu	.2747	.1346	.077	2.0404	.0417*
Poultval	2.6287	.2802	.335	9.3789	.0000**
Cattlval	.0621	.0236	.099	2.6238	.0089**
Otassval	-.1575	.0621	-.087	-2.3117	.0211*
Annpeslb	-1.2642	.1875	-.247	-6.7425	.0000**
Planhlbr	29.3414	2.8203	.366	10.4036	.0000**
Planpeslb	-1.5243	.2433	-.231	-6.2643	.0000**
Plantpur	.8791	.3044	.109	2.8876	.0040**
Anraicos	-.5339	.2006	-.100	-2.6606	.0080**
Otinput	3.8616	.5996	.237	6.4393	.0000**
Systemsd	1128.8596	406.7133	.104	2.7755	.0057**

F ratio = 155.60 with 15 and 698 d.f.
Significance level of F ratio = .0000
Standard error of estimate = 4228.3108
Coefficient of determination R² = .7698

Notes:

- ¹ Full names of variables are given on pp. 112-115.
*Level of significance $0 < p < .05$.
**Level of significance $0 < p < .01$.

hypothesis that spontaneous colonists achieve better economic results than the oriented ones should not be rejected.

The expected signs for the other regression coefficients are positive. The regression coefficients, in a linear model, show the amount of change that should be expected in the value of the dependent variable, when a one-unit change is introduced in a particular variable, and keeping other factors constant. Thus, putting under cultivation one additional Ha. with rice, *ceteris paribus*, should create an increase in income of \$Bs 1365.40. The magnitude of the cultivated land coefficients make sense with empirical observation.*

The sign and magnitude of the coefficient of the variable hired labor for plantations also make sense. The marginal value product is \$Bs 29.34 for one additional labor day. It has been shown (Table IV.1.5) that the average wage paid fluctuated between \$Bs 10 and 32. Settlers have been paying wages according to marginal

*Example: taking rice cultivation in Alto Beni, the following estimate could be given:

$$\begin{array}{rcl}
 1 \text{ Ha.} & = & 35 \text{ qq rice} \times \$\text{Bs } 51/\text{qq} = 1785 \\
 \text{Minus average cost 40\%} & & = \underline{714} \\
 \text{Expected earnings } \$\text{Bs} & & = 1071/\text{Ha.}
 \end{array}$$

Of course, variations in yield and prices among the zones explain the difference with the coefficient.

TABLE IV.3.5. CORRELATION MATRIX FOR VARIABLES USED IN COLONIZATION AGGREGATE MODEL

Variable Name*	5	7	8	9	12	13	14	15	19	21	23	25	27	28	29	34	42
Banarhas	1.000																
Ricehas	.268	1.000															
Cornhas	.234	.698	1.000														
Cterohas	.441	.418	.415	1.000													
Hogsvalu	.274	.401	.309	.221	1.000												
Poultval	.189	.191	.200	.206	.175	1.000											
Cattlval	.000	.050	.028	.070	.029	.163	1.000										
Ctassval	.033	.006	.065	.011	.028	.069	.077	1.000									
Anrhibr	.123	.760	.502	.261	.326	.180	.050	.035	1.000								
Anpsalb	.108	.804	.546	.277	.347	.168	.024	.027	.930	1.000							
Planhbr	.275	.016	.085	.279	.063	.079	.009	-.012	.067	.035	1.000						
Planpsalb	.365	.076	.135	.345	.155	.119	.016	.000	.146	.127	.922	1.000					
Plantpur	.261	.205	.190	.417	.176	.122	.017	.037	.147	.178	.257	.323	1.000				
Anraicos	.102	.081	-.002	.053	.204	.038	.114	.034	.105	.098	-.049	-.045	.032	1.000			
Ctinput	.341	.322	.418	.297	.254	.150	-.005	-.007	-.014	-.010	.015	.013	.016	.026	1.000		
Systemsd	-.047	.001	.264	.157	.020	-.060	-.047	-.046	.083	.138	.374	.355	.292	-.111	.159	1.000	
Metinc	.499	.608	.585	.607	.336	.367	.104	-.029	.310	.323	.380	.365	.320	-.000	.538	.186	1.000

* See pp. 112-115 for full variable names.

productivity value. The sign and probably the magnitude of the coefficient for variables hogsvalu, poulval, cattlval, the investment in animals, would appear to be in the right direction. The size of the coefficient is largely diminished, since in the sample there are only a few cattle producers. Variable expenditures show a satisfactory positive sign for plantations and variable expenditures.

Variables taking into account other assets, expenditures in labor for annual crops, and expenditures in animal raising have coefficients which seem to be unacceptable. The expenditure of \$Bs 1 in hiring labor to till annual crops or permanent crops would decrease net farm income \$Bs 1.20 and 1.52 respectively. Yet the coefficient for hired labor in man-days as discussed shows a positive marginal value product. This is probably due to the logical high correlation between wage payments for annual crops (anpeslbr) and hired labor for annual crops in man-days (annhlbr), and between man-days of hired labor for plantations (planhlbr) and payments for this labor (planpeslb), respectively (see Table IV.3.5 for correlation matrix). There is no clear reason for the sign of anraicos.

b. Zonal equations

The results are presented here for the regression models at the zone or area project level. The estimated

equations using dummy variables to test the importance of origin, education, age and language are summarized in Tables IV.3.6, A and B. As expected, all the constants are highly significant, implying that the average net farm incomes for the base variables differ from zero.

Observing the variable origin first, with the exception of Chapare, where peasants coming from the Altiplano (18 out of 96) would appear to be better off than those of city or valley origins, the coefficients are not statistically significant for all the other groups. This would lead to the conclusion that the variable origin does not lead to differences in income which are statistically significant.

Age of the head of household, when used numerically, gave no statistically significant coefficients in any of the groups. This result differs a little from the previous findings, when the variable was treated as discrete (using dummies for age brackets). However, it is consistent, since the population of the colonization areas is mostly formed by people below 50 years (86 percent) and this group becomes dominant in the determination of the magnitude of the coefficient.

Two groups (Chane-Piray and Alto Beni) have coefficients in which a low level of education is highly significant. In both cases, colonists with a low level of education would appear to attain higher incomes than

TABLE IV.3.6.A. SUMMARY OF EQUATIONS WITH SOCIOLOGICAL VARIABLES FOR SPONTANEOUS COLONIES, 1973

Variable Name	Chapare			Caranavi			Chane-Piray		
	Reg. Coeff. (s.e. reg. coeff.)	t value 93 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 150 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 96 d.f.	S. Level
<u>ORIGIN</u>									
Constant (1)	6867.2 (1939.0)	3.541	.000**	2933.4 (871.6)	3.365	.001**	14445.0 (2452)	5.890	.000**
Altiplan	5069.8 (2374.8)	2.134	.035*	4436.1 (951.3)	.458	.647	-3970.0 (4843)	-.819	.414
Valleys	411.9 (2061.6)	.199	.842	494.0 (1343.3)	.367	.713	-6230.0 (4757)	-1.309	.193
<u>EDUCATION</u>									
Constant (2)	7879.1 (723.5)	10.899	.000**	3248.4 (392.3)	8.280	.000**	9510.5 (2191.9)	4.339	.000**
Highed	0.0 (0.0)	.000	1.000	-2541.9 (2909.5)	-.873	.383	0.0 (0.0)	.000	1.000
Lowed	901.3 (1417.9)	.635	.526	347.3 (735.2)	.472	.637	9597.3 (4049.8)	2.369	.019**
<u>AGE (3)</u>									
Constant	7754.61 (2127.94)	3.644	.000**	2991.67 (1021.95)	2.927	.003**	11299.64 (7383.46)	1.770	.079**
Age	8.88 (50.37)	.176	.860	8.01 (24.13)	.331	.740	29.44 (175.66)	.167	.867
<u>LANGUAGE</u>									
Constant (4)	9004.2 (740.25)	12.163	.000**	3538.6 (364.96)	9.695	.000**	12330.0 (1935.7)	6.369	.000**
Aymara	0.0 (0.0)	.000	1.000	-1191.1 (838.29)	-1.429	.157	0.0 (0.0)	.000	1.000
Quechua	-2757.3 (1302.7)	-2.116	.037*	0.0 (0.0)			-209.83 (9630.1)	-.021	.982

TABLE IV.3.6.B. SUMMARY OF EQUATIONS WITH SOCIOLOGICAL VARIABLES FOR ORIENTED COLONIES, 1973

Variable Name	Chimore			Alto Beni			Yapacani		
	Reg. Coeff. (s.e. reg. coeff.)	t value 92 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 166 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 99 d.f.	S. Level
<u>ORIGIN</u>									
Constant (1)	5348.8 (2366.8)	5.107	.026*	3373.7 (874.07)	3.859	.000**	3545.50 (1493.31)	2.374	.019**
Altiplan	-322.4 (2482.4)	.016	.896	5.6 (966.33)	.005	.995	-85.53 (1803.35)	-.047	.962
Valleys	-561.6 (2423.4)	.053	.817	1340.4 (1122.31)	1.194	.234	50.63 (1611.24)	.031	.975
<u>EDUCATION</u>									
Constant (2)	5002.7 (504.4)	98.377	.000**	3025.0 (424)	7.141	.000**	3334.4 (631.3)	5.281	.000
Highed	-355.2 (4128.5)	.007	.931	-2349.0 (2470)	-.951	.343	4318.1 (4970.7)	.868	.387
Lowed	-401.9 (924.2)	.189	.189	1735.0 (667)	2.602	.010**	463.9 (1003.1)	.462	.644
<u>AGE</u>									
Constant (3)	3936.93 (1640.76)	2.399	.018**	3328.69 (1231.21)	2.703	.007**	4552.18 (1350.52)	3.370	.001**
Age	26.22 (44.09)	.594	.553	9.27 (32.13)	.288	.773	-29.43 (37.32)	-.788	.432
<u>LANGUAGE</u>									
Constant (4)	4911.75 (820.36)	5.987	.000**	3778.5 (363.0)	10.407	.000**	3607.3 (494.07)	7.301	.000**
Aymara	-156.50 (3014.21)	-.051	.958	-608.8 (920.1)	-.661	.509	0.0 (0.0)	.000	1.000
Quechua	-39.03 (959.39)	-.040	.967	-1183.0 (3069.8)	-.385	.700	-2483.6 (3528.4)	-.703	.483

TABLES IV.3.6, A and B

- Notes:
- (1) Excluded variable: city and other places.
 - (2) Excluded variable: very low or no education.
 - (3) Treated as numeric variable.
 - (4) Excluded variable: Spanish speaking group.

*Level of significance $0 < p < .05$.

**Level of significance $0 < p < .01$.

those with no education. The coefficients for high and low are not statistically significant for the other groups, implying that education does not lead to significant differences in income. The implications of this finding have already been discussed in the aggregate equations.

Language has a significant coefficient only for the Quechua speaking group in Chapare. Those speaking Quechua would appear to be less successful than those with knowledge of Spanish. Aymara shows a zero coefficient since the language was not reported in this area. In the other zones, the coefficients for Aymara and Quechua were not statistically significant, indicating that language would not appear to be an important variable in explaining differences in income.

The estimated equations testing the importance of years of residence in the colony are shown in Table IV.3.7. The constants were highly significant, with the exception of Chane-Piray and Alto Beni. The explanation is simple enough; only 2 out of 171 settlers had a residence of more than 15 years in Alto Beni, and only 5 out of 117 were in similar situations in Chane-Piray. As expected, the net farm incomes for the base variable -- 16 to 20 years of residence -- differs from zero. The coefficients for first five, six to ten, and eleven to fifteen years were not statistically significant in any

TABLE IV.3.7. SUMMAYY OF EQUATIONS FOR LENGTH OF RESIDENCY IN THE COLONY, 1973

Period of Residence	Chapare			Caranavi			Chane-Piray		
	Reg. Coeff. (s.e. reg. coeff.)	t value 92 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 149 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 95 d.f.	S. Level
Constant (1)	8143.6 (803.1)	10.140	.000**	3250.6 (1334.1)	2.436	.016**	9626 (9338)	1.030	.305
Frstfivys	0 (0)	.000	1.000	-1192.2 (1667.6)	-.714	.475	-1275 (10230)	-.124	.901
Sixtenys	-1243.1 (1821.3)	-.682	.466	-711.1 (1432.2)	-.496	.620	4929 (9617)	.512	.609
Elefifys	606.1 (1484.5)	.408	.166	1022.6 (1418.4)	.720	.472	-3651 (11223)	-.325	.745
	Chimore			Alto Beni			Yapacani		
Constant (1)	7000 (2891)	2.420	.017**	2130.9 (1361.0)	1.565	.119	3197.7 (1134.6)	2.818	.005**
Frstfivys	-2622 (2958)	-.886	.377	150.7 (1557.9)	.096	.923	0 (0)	.000	1.000
Sixtenys	-1809 (2955)	-.612	.541	1143.3 (1422.7)	.803	.422	628.7 (1332.8)	.471	.638
Elefifys	-1435 (3421)	-.418	.676	4264.1 (1530.5)	2.786	.006**	163.0 (1424.3)	.114	.909

Notes: (1) Excluded variable 16-20 years of residence.
 *Level of significance $0 < p < .05$.
 **Level of significance $0 < p < .01$.

group. The coefficient is zero for first five years of residence in Chapare, since there are no newcomers in this group. The same is true of Yapacani. These results would suggest that, at the consolidation stage, and with most of the settlers beyond the fifth year of residence in the colony, there are no substantial differences in income attributable to length of stay.

IV.3.7. Full models in zonal analysis

Taking both economic and sociological variables, and entering into the model those variables within a probability level below 10 percent and larger than zero, the estimated equations are those presented in Tables IV.3.8., A and B. The tables also show the variables that were left out in the selection procedure.

These equations simply confirm the partial analysis when using models that include only origin, education, language and length of stay. They also reinforce the findings of the model for the whole sample (Table IV.3.4). The dominant variables that appear to explain the response in income are land under cultivation, specific capital items (cattle, poultry or improvements of the farm) and labor. Two exceptions are present in these results. One is Chapare, where statistically significant differences in income would seem to exist in relation to the origin of the group. Another is Alto Beni, where the variable frstfivys (length) shows a statistically significant

TABLE IV.3.B.A. REGRESSION MODELS FOR SPONTANEOUS COLONIES, 1974
DEPENDENT VARIABLE: NET FARM INCOME IN SP-

	Chapala			Caranavi			Chano-Piray		
	Reg. Coeff. (s.e. reg. coeff.)	t value 87 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 145 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 89 d.f.	S. Level
	$S_y = 3643.2101$ $R^2 = .6299$			$S_y = 3125.5112$ $R^2 = .4359$			$S_y = 5727.7682$ $R^2 = .9146$		
Constant	-1031.6649 (1555.6621)	-0.6631	.5090	-1460.682 (684.712)	-2.1712	.0315	-1848.7973 (1077.6113)	-1.7153	.0895
Citrohas	1682.5859	4.4424	.0000						
Avocahas									
Banarhas				562.697 (289.471)	1.9438	.0530	2695.6810 (539.1430)	4.9980	.0070
Cocoahas									
Ricehas	1594.3930 (585.1660)	2.7246	.0078	1117.339 (246.149)	4.5393	.0000			
Cornhas	2384.7580 (957.0799)	2.4917	.0146	-1872.205 (662.955)	-2.8240	.0054			
Otcrohas							4530.6019 (705.0564)	6.4258	.0000
Hcuimpvm							-2969 (1741)	-1.7056	.0918
Hogsvalu									
Poultval				2.656 (.647)	4.1061	.0001			
Cattlval	.4118 (.0929)	4.4328	.0000						
Toolsvalu									
Annolbr									
Annhlbr									
Annpeslbr									
Planhlbr									
Planolbr							100.4118 (48.1963)	2.0833	.0401
Planpeslbr	1.0063	5.7513	.0000				-1.0759 (.3460)	-3.1096	.0025
Plantpur							1.6109 (.4829)	3.3360	.0010
Otinput									
Anlowbr									
Credits									
Varexp							9.40 (1.35)	6.954	.0000
Famsize				253.18 (113.60)	2.227	.0275			
Tohlbrd									
Totolbd				9.51 (2.73)	3.478	.0007			
Altiplan	5297.40 (1628.73)	3.252	.0016						
Valleys	2184.01 (1429.17)	2.227	.0285						
Highed									
Lowed									
Aymara									
Quechua									
Trafiaya									
Sixtenya									
blcf.112									

F ratio = 18.5 with 8 and
87 d.f.
Sig. level of F ratio = .0000

F ratio = 16.0 with 7 and
145 d.f.
Sig. level of F ratio = .0000

F ratio = 105.85 with 9 and
89 d.f.
Sig. level of F ratio = .0000

TABLE IV.3.8.B. REGRESSION MODELS FOR ORIENTED COLONIES, 1973
DEPENDENT VARIABLE: NET FARM INCOME IN \$Ba.

	Chimore			Alto Beni			Yapeyani		
	Reg. Coeff. (s.e. reg. coeff.)	t value 86 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 160 d.f.	S. Level	Reg. Coeff. (s.e. reg. coeff.)	t value 96 d.f.	S. Level
	S _y = 2751.9652 R ² = .5792			S _y = 3084.3860 R ² = .5083			S _y = 3382.9640 R ² = .5476		
Constant	1041.3554 (594.4901)	1.7516	.0834	204.5214 (463.1679)	-.4415	.6594	-2026.1414 (637.8681)	-3.1764	.0020
Citrusas									
Avocahas									
Banahas	1118.8809 (235.4743)	4.7516	.0000						
Cocoahas	-2139.5950 (1165.6266)	-1.8355	.0699	850.1048 (370.3946)	3.2951	.0230	693		
Ricehas	720.8795 (189.4565)	3.8049	.0003	1521.3350 (711.3509)	2.1386	.0340	693.7088 (208.6084)	3.3254	.0013
Cornhas	3903.0158 (1234.0263)	3.1628	.0022				-583.5493 (321.3663)	-1.8158	.0725
Otcrohas	2607.5719	2.8473	.0055	1812.9059 (1049.0218)	1.7281	.0859			
Houimpvm									
Hogvalu									
Poultval				1.4035 (.3711)	3.7821	.0002	4.8402 (.6826)	7.0908	.0000
Cattlval	-.8462 (.1618)	-5.2302	.0000						
Toolsval	-.4361 (.2428)	-1.7959	.0760	-.1620 (.0429)					
Otassval									
Annolbr				-.2015 (.0593)	-3.3994	.0009			
Ricmilcos				8.5723 (2.1269)	4.0303	.0001			
Annlhbr									
Annpeslb							-.7081 (.3169)	-2.2345	.0278
Planhbr									
Planolbr									
Planpeslb									
Plantpur									
Otinput									
Anlowlb									
Credits	1.5306 (.6157)	2.4859	.0149						
Varexp									
Famsize									
Tohhld									
Totolbd							16.1986 (3.8083)	4.2535	.0000
Altiplan									
Valleys									
Highed									
Lowed									
Aymara									
Quechua									
Prasivya				-1420.1459 (664.0070)	-2.2051	.0289			
Sixtenya									
Elefivya									

F ratio = 14.00 with 8/86 d.f. Sig. level of F ratio = .0000
 F ratio = 20.76 with 8/160 d.f. Sig. level of F ratio = .0000
 F ratio = 24.14 with 5/96 d.f. Sig. level of F ratio = .0000

coefficient.

In short, these results do not lead to the rejection of Qualification #2 of the main hypothesis, which stated that "differences in economic performance between oriented and spontaneous colonies are not due to education, age, origin or other sociological factors." They also give support to qualification #3, that differences in income are not due to the use of different technologies.

If sociological variables appear not to influence levels of income, or at least show a minor importance,* and if colonists are constrained in their development by a low level of technology, then higher incomes will come up from clearing of new land and additional labor. The policy implications of these findings will be more thoroughly discussed in the public investment analysis.

* Yet, colonization plays an important role as a "change agent of the Bolivian peasant culture--and this should be carefully evaluated " (38, p. 49).

CHAPTER V

LONGITUDINAL ANALYSIS

This chapter examines how the performance of the oriented and spontaneous colonies has been influenced by public investment during the period 1963-74. The first part will provide information on amounts and sources of funds. The second part will derive and discuss the benefit cost ratios and internal rates of return estimates. The third part will debate the role of the private and public institutions in both systems. The chapter as a whole will serve the purpose of testing the hypothesis that public investment in spontaneous colonies produces higher economic returns than in oriented groups.

V.1. Financial Resources Used in Colonization

In an unparalleled effort to develop new lands and expand agricultural frontiers, the government of Bolivia spent US\$ 32,900,000 in the period 1963-74.* In addition, US\$ 2,200,000 was provided as credit to the cooperatives of the Alto Beni, Chimore and Yapacani projects. The investment made by the settlers themselves can be estimated at US\$ 1,500,000. The total expenditure was

* This is a close approximation. Some governmental expenditures may have been omitted because of lack of information. All expenditures and revenues were converted into US\$ to facilitate the analysis.

US\$ 36,600,000 (see Table V.1.1).

These figures are only part of a larger investment. For example, the total cost of the construction of the Cochabamba-Villa Tunari-Puerto Patino road (see Map 3) was US\$ 52,000,000. For the purpose of this work, only one-fifth of this amount has been applied to the section Villa Tunari-Puerto Villarroel. This section serves the Chapare-Chimore settlers covered in the research. A similar case occurs in Santa Cruz. As mentioned earlier, access roads have been built from Montero to Yapacani and from Montero to Chane. The expenditures on the Yapacani-Puerto Grether section and the construction of the Yapacani bridge are the only ones included here (see Tables V.1.2 and V.1.7).

A more subtle problem is present in the investment made in the oriented projects. While the total investments were meant to serve these groups, it is obvious that the number of beneficiaries has increased over the years. Using the feeder roads built by the projects, new settlers have surrounded the initial oriented groups. Health and school facilities now largely serve both oriented and spontaneous.

Another problem appears in the determination of the nature and extent of private investment. In the oriented group, the credits provided with the 29 SF IDB loan are included as such (see Table V.1.6). This credit was

TABLE V.1.1. INVESTMENT FOR ROAD CONSTRUCTION AND COLONIZATION ACTIVITIES IN CARANAVI-ALTO BENI, CHAPARE-CHIMORE, YAPACANI, CHANE-PIRAY, BOLIVIA. PERIOD 1963-74 (IN THOUSANDS OF U.S. DOLLARS)

Year ¹	Road Construction	Road Maintenance	Projects of Colonization	Support to Spontaneous Colonies	Total Public Investment	Private Investment	Total
1963	1572	0	1707	452	3731	389	4120
1974	79	4	1455	22	1560	81	1641
1965	42	32	1354	36	1464	209	1673
1966	2160	32	679	39	2910	182	3092
1967	5406	32	1101	59	6598	327	6925
1968	1300	72	1176	84	2632	336	2968
1969	1683	101	1973	114	3871	1761	5632
1970	1400	52	134	97	1683	99	1782
1971	3355	59	148	100	3662	98	3760
1972	3300	54	92	102	3548	105	3653
1973	480	110	0	173	763	102	865
1974	214	110	0	166	490	12	502
Total	20,991	658	9819	1444	32,912	3701	36,613

¹1963-72, expenditures incurred; 1973-74, budgeted.

Source: Tables V.1.2, V.1.3, V.1.4, V.1.5, V.1.6.

TABLE V.1.2. INVESTMENT IN PENETRATION ROADS TO NEW SUBTROPICAL AREAS OF BOLIVIA, 1963-74. (IN THOUSANDS OF U.S. DOLLARS.)

Year	La Paz		Cochabamba	Santa Cruz	Total
	Caranavi- Pto Linares	Santa Ana Covendo	Villa Tunari- Pto Villarroel	Yapacani- Pto Grether	
1963	1527	45	0	0	1572
1964	0	79	0	0	79
1965	0	42	0	0	42
1966	0	160	0	2000	2160
1967	0	0	900	4506	5406
1968	0	0	900	400	1300
1969	0	0	1400	283	1683
1970	0	0	1400	0	1400
1971	0	100	2800	455	3355
1972	0	100	3000	200	3300
1973	0	80	0	400	480
1974	0	0	0	214	214
	1527	606	10400	8458	20991

Source: Ministry of Economy
Ministry of Public Works
National Road Service

TABLE V.1.3. GOVERNMENT EXPENDITURE IN ROAD MAINTENANCE RELATED TO COLONIZATION ZONES, 1963-74 (IN THOUSANDS OF U.S. DOLLARS)

Total	La Paz	Cochabamba	Yapacani Chane-Piray	Total
1963	0	0	0	0
1964	4	0	0	4
1965	32	0	0	32
1966	32	0	0	32
1967	32	0	0	32
1968	72	0	0	72
1969	101	0	0	101
1970	52	0	0	52
1971	56	0	3	59
1972	51	0	3	54
1973	60	45	5	110
1974	60	45	5	110
	552	90	16	658

Source: National Road Service
Ministry of Public Works, Accounting Department.

TABLE V.1.4. PUBLIC INVESTMENT ON BOLIVIAN COLONIZATION PROGRAM, 1961-72.
ORIENTED COLONIES. (IN THOUSANDS OF U.S. DOLLARS.)

Year	Source of Funding						Total
	IDB ¹		AID ²	WFP	Central Bank ³	INC	
	A	B					
1961	-	-	390	-	-	0	390
1962	-	-	941	-	-	0	941
1963	-	300	76	0	0	0	376
1964	94	1156	0	-	175	30	1455
1965	203	966	0	146	9	30	1354
1966	178	154	90	110	97	50	679
1967	84	597	167	77	26	150	1101
1968	211	686	7	105	14	153	1176
1969	338	1370	36	40	0	189	1973
1970	5	8	0	1	0	120	134
1971	16	44	0	1	0	87	148
1972	0	38	0	2	0	52	92
	1129	5319	1707	482	321	861	9819

Source: adapted from INC-BID Final Report, June 1970. Proyecto Alto Beni reports.

¹A) Funds used for direct assistance to settlers; B) Other expenditures in the project execution.

²Period 1961-63, Alto Beni Development Project; 1966-69, support to INC-IDB project.

³Loan to the INC to attend the INC-IDB project.

TABLE V.1.5. GOVERNMENT SUPPORT TO SPONTANEOUS COLONIES, 1963-74.
(IN THOUSANDS OF U.S. DOLLARS.)

Year	Caranavi	Chapare	Chane-Piray	Total
1963	0	0	452	452
1964	2	5	15	22
1965	16	5	15	36
1966	16	8	15	39
1967	21	23	15	59
1968	40	24	20	84
1969	59	30	25	114
1970	53	19	25	97
1971	56	14	30	100
1972	59	8	35	102
1973	52	81	40	173
1974	45	81	40	166
	419	298	727	1444

Source: National Institute of Colonization (INC).

TABLE V.1.6. PRIVATE INVESTMENT ON BOLIVIAN COLONIZATION, 1961-72
ORIENTED-SPONTANEOUS COLONIES. (IN THOUSANDS OF U.S. DOLLARS)

	Oriented						Spontaneous				Total	
	ABeni		Chimore		Yapacani		Sub-	Car.	Chap.	Pir.		Sub-
	29SF ¹		29SF ¹		29=F ¹		total				total	
1961	-	-	-	0	-	-	0	-	-	-	-	0
1962	-	-	-	0	-	-	0	-	-	-	-	0
1963	-	57	-	0	-	26	83	155	104	47	306	389
1964	-	16	-	9	-	21	46	21	6	8	35	81
1965	29	48	23	0	33	42	175	22	7	5	34	209
1966	34	29	27	16	39	1	146	21	7	8	36	182
1967	69	38	55	3	81	41	287	22	9	9	40	327
1968	72	11	56	7	84	82	312	1	2	21	24	336
1969	565	33	442	13	653	29	1735	16	3	7	26	1761
1970	-	33	-	13	-	21	67	18	4	10	32	99
1971	-	26	-	6	-	37	69	22	3	4	29	98
1972	-	41	-	13	-	22	76	16	2	11	29	105
1973	-	26	-	27	-	21	74	23	3	2	28	102
1974	-	2	-	3	-	2	7	1	-	4	5	12
Total	769	360	603	110	890	345	3077	339	150	136	624	3701

Source: Sample survey, 1973, and INC-IDB Final Report.

¹IDB loan for agricultural credit in colonization.

granted to the cooperatives and settlers and has to be repaid. Additional credit was supplied with the 51 TF loan, but it is not likely that this will be recovered. The current low levels of income and the settlers' reluctance to pay these debts will probably force the government to write them off.* Thus, in essence, these loans become public investment. For both groups, the assets brought to the colony were used to estimate private investment (see Table V.1.6). This may be on the low side, but no other reliable information was available.

A discussion of the use of the funds seems to be worthwhile. A large proportion of the investment has been applied to road construction (63.8 percent, Table V.1.1). In addition, a substantial portion of the Interamerican Development Bank 51 TF loan was spent for the survey and construction of feeder roads (36.4 percent). This raises the road construction share to 70.6 percent of the total expenditure.

Direct provision of credit to settlers in the oriented projects amounts to \$1,612,000. This constitutes 16.4 percent of the total cost of these projects and 4.9 percent of total investment. A maximum of \$140 per family

* This is not pure speculation. The government has already reduced the debt on two occasions. The first, from about \$Bs 6500 per family to \$Bs 3,000; the second, to \$Bs 1,800.

was fixed. This was to cover purchases of tools, additional food to that provided by the World Food Program (WFP), medicines and moving expenses. The food provided from the WFP consisted of a rationed supply of wheat flour, dry fish, edible oil, powdered milk, and cheese (see Table V.1.4).*

The funds provided to support spontaneous colonies included: 1) expenditures made by the Bolivian Development Corporation (CBF) to settle the initial group of families in Cuatro Ojitos; 2) expenditures by other government agencies on various facilities for San Pedro and Sangrado/Corazon in the same area; and 3) partial allocation of Instituto Nacional de Colonizacion expenditures to serve Chapare, Caranavi and Piray colonies. Government expenditures were also used for road maintenance (see Tables V.1.3 and V.1.5).

The source of funding is also of interest. The internal and international financing sources for

* At the end of the program, the foods distributed in five years were the following:

<u>Item</u>	<u>Kg.</u>	<u>Nr. of Families</u>	<u>Average Kg/fam.</u>
Wheat flour	1,688,996	8717	193.8
Dried fish	177,233	8717	20.3
Oil	116,292	8717	13.3
Milk	227,419	8717	26.1
Cheese	95,433	8717	10.9

Source: Modified from INC-IDB Project Final Report, 1970.

colonization are shown in Table V.1.7.

TABLE V.1.7. SOURCE AND AMOUNT OF FUNDS FOR NEW LAND DEVELOPMENT IN BOLIVIA, 1963-74.
(IN THOUSANDS OF U.S. DOLLARS)¹

Source		Total Investment	% of Total
US/AID	Main roads construction	20,711	56.5
IDB	Alto Beni Development Project	1,407	3.8
	INC-IDB project, budget support	300	.8
IDB	Loan 51 TF, for colonization	6,448	17.8
	Loan 29 SF, for agricultural credit in colonization	2,262	6.2
WFP	Value of food supplied to settlers	482	1.3
GOB	Support to oriented and spontaneous colonies	3,564	9.7
Private	Settlers' contribution	1,439	3.9
Total		36,613	100.0

¹1963-72, disbursed; 1972-74, budgeted.

Source: Tables V.1.1 to V.1.6.

By far the most important sources have been foreign loans or grants (86.2 percent). It would appear that the acceleration in the penetration of new lands would not have been possible without these resources. In addition, foreign loans were used to buy equipment (for highway construction, vehicles, office supplies and medicines) which were imported. With its chronic balance of payments deficit, the country would not have been able to finance

these activities without outside resources.

Considering the proportion of money spent in direct assistance to the oriented colonists, this is low (US\$ 322 per family). Most of the expenditure has been used for infrastructure. This infrastructure is presently serving both oriented and spontaneous colonies, and it represents a foothold for further penetration into new lands.* Taking the total investment incurred until the end of 1974 and an estimated 18,400 beneficiaries, the average investment per household reaches US\$ 1,993. But main roads are multi-purpose investments and are not exclusively for colonization. This criterion may permit exclusion of this type of expenditure in colonization. In this case the cost per settler goes down to US\$ 852.

What do these costs indicate? If colonization is going to be used as a policy instrument for employment creation, how does it rank compared to other activities?

* A summary of what has been accomplished in the three areas is presented in the INC-IDB Final Report. This consists of the following:

Construction of feeder roads	558 km.
Construction of adminis. bldgs.	54 units with 6,660 m ²
Construction of schools and health centers	62 units with 9,440 m ²
Supply of water wells	176 units
Number of families settled	5,000

To this effect, investment figures in other sectors may be illustrative. From 1965 to 1969, a total of US\$ 73 million for financing industrial projects was recorded by the National Institute for Investments. It was estimated that this investment created 9,830 jobs--an average of about US\$ 7,500 per new job (3, p. 56). Colonization activities provide more employment per dollar invested, but accordingly they are less productive than non-agricultural activities.

V.2. Economic Analysis of Colonization

As stated in Chapter III, the colonies will be treated as investment projects. The use of the project concept is more evident in the oriented group, but it also provides a practical way to examine the problem in general. Discounted benefit-cost (B/C) ratios and internal rates of return (IRR) will be the measures employed to judge the success of each "project" over time.

In order to compute the discounted B/C ratios and the IRR's, the stream of benefits and expenditures over the life span of the investment must be determined. Although the lives of the projects in this case are indefinite, the data are restricted to a convenient 25-year period. This affects the results very little, since the discounted flow beyond that limit approaches zero. The analysis will be preceded by an explanation of how returns,

costs, and flows are measured, and what these measures mean.

V.2.1. Benefit stream

The benefit stream measures the net value added which is generated in each project.* Specifically, the benefit stream is net value added per farm times the number of producing units per year (see Table V.2.1, number of farms). To obtain net value added per household, previous studies and published data for the years before 1972 have been used. (Sources are indicated in Tables V.2.1 and V.2.2.) For 1972, the survey data was used. Missing years were interpolated, using a growth rate of 5% for the period 1963-67, and averages between observed points for the period 1968-72.

Beyond 1972, the extrapolations used have been based on two assumptions. First, the number of households will reach an equilibrium level. Second, the average net value added per farm will also reach a limit. It is reasonable to assume that the number of households in the next fifteen years will not exceed certain limits. The colonies involved are within a specific geographical area which imposes a constraint. With constant

*The benefits from forest use are partly implicit. The sample and tax data include income from sale of forest products. In any case, forest source utilization has been minimal in most of the areas. It may be assumed that benefits and costs from forest resources cancel each other.

TABLE V.2.1. NUMBER OF FAMILIES SETTLED IN SIX COLONIZATION ZONES
BOLIVIA, 1963=72. PROJECTIONS, 1973-87.

Year	Oriented				Spontaneous				Total
	ABeni	Chimore	Yapa- cani	Sub- total	Cara- navi ²	Chapare ³	Piray ⁴	Sub- total	
1963	570	0	330	900	1550	2080	670	4300	5200
1964	730	150	589	1469	1760	2210	780	4750	6219
1965	1210	150	1116	2476	1980	2350	850	5180	7656
1966	1500	420	1129	4396	2190	2490	970	5650	10046
1967	1880	460	1644	3984	2410	2580	1100	6090	10074
1968	1990	580	2665	5235	2480	2630	1400	6510	11745
1969	2320	790	3027	5417	2640	2700	1500	6840	12257
1970	2650	1000	3290	6940	2820	2780	1650	7250	14190
1971	2910	1100	3750	7760	3040	2840	1700	7580	15340
1972	3320	1320	4020	8660	3200	2900	1860	7960	16620
1973	3580	1950	4280	9810	3430	3000	1900	8330	18140
1974	3600	2000	4300	9900	3500	3000	2000	8500	18400
1975	3600	2000	4300	9900	3500	3000	2000	8500	18400
1976-87 ⁵	3600	2000	4300	9900	3500	3000	2000	8500	18400

Sources: ¹INC-IDB final report on oriented colonies, June 1970; and additional estimates of spontaneous settlers surrounding original area project.

²1961 Monje Rada (52), 1963 Murillo (48), 1972 survey.

³1961 Monje Rada (52), 1967 Henkel (29), 1967 Zeballos (69), 1972 survey.

⁴1961 Monje Rada (52), 1961 Ferragut (25), 1967 Wessel (68), 1972 survey.

⁵per year.

TABLE V.2.2. ESTIMATED NET VALUE ADDED GENERATED BY "PROJECT" AREA
 PERIOD: 1963-72; PROJECTIONS: 1963-87 (IN THOUSANDS OF U.S. DOLLARS)

	Oriented				Spontaneous				Total
	ABeni	Chimore	Yapa- cani	Sub- total	Cara- navi	Chapare	Chane- Piray	Sub- total	
1963	68	0	60	128	232	802	229	1263	1391
1964	91	15	110	216	277	895	279	1451	1667
1965	156	17	214	387	327	999	320	1646	2033
1966	204	54	223	481	380	1112	384	1876	2357
1967	268	70	334	672	440	1210	457	2107	2779
1968	297	125	613	1035	475	1295	642	2412	3447
1969	410	219	774	1403	583	1395	755	2733	4136
1970	541	340	929	1810	705	1559	902	3166	4976
1971	679	445	1159	2283	849	1654	1081	3584	5867
1972	858	615	1343	2816	987	1841	1570	4398	7214
1973	648	595	929	2172	688	1251	1282	3221	5393
1974	745	700	1023	2468	763	1357	1400	3520	5988
1975	835	700	1118	2653	910	1560	1500	3970	6623
1976	900	700	1182	2782	1050	1650	1500	4200	6982
1977	990	700	1182	2782	1050	1800	1500	4350	7132
1978-87 ¹	1080	700	1182	2782	1050	1800	1500	4350	7132

¹Per year.

Sources: Alto Beni: 1962, Monje Rada (52); 1963, Murillo (48); 1967, Zeballos et al.; 1967-70, INC-BID quarterly reports; 1967, Nelson (49).
 Chimore: 1967, Henkel (29); 1967, Zeballos et al.; 1967-70, INC-BID quarterly reports; 1967, Nelson (49).
 Yapacani: 1962, Monje Rada (52); 1967, Wessel (68); 1967, Nelson (10); 1967-70, INC-BID quarterly reports.
 Caranavi: 1962, Monje Rada (52); 1963, Murillo (48); 1967, Nelson (49).
 Chapare: 1962, Monje Rada (52); 1966, Henkel (29); 1967, Nelson (49).
 Ch-Piray: 1961, Ferragut (25); 1962, Monje Rada (52); 1972, Royden and Wennergren (55); 1972, Graber (28).
 All zones: 1973, sample survey; 1974-87, projections.

technology, it is possible that the average net value added per farm may also reach a ceiling, but many more variations could be expected. Policies to develop new lands or to help the established settlers to increase their productivity may affect income levels in opposite directions. Increased demand for food may also raise the prices and affect incomes.

Net value added on the farm is equal to total value of production minus operating costs, excluding depreciation, taxes and interest costs.* These last items are considered internal transfers in economic analysis.

In the case of Caranavi-Alto Beni, the use of tax data has made it possible to check the estimation of the region's net value added. All the agricultural and forest production from this region must pass a tax check-point in Unduavi. The market value for the production of the whole region has been estimated, based on series data from the Aduana Agropecuaria Departamental de La Paz for the years 1963-72, and calculations of a weighted coefficient as a percentage of market value. The computed coefficient for the period was .09724. In other words, if the amount of taxes paid in Unduavi was \$100, the market value of production was \$1,028. A 10 percent

*This was also the criterion used in the cross-section study (see Chapter IV, p. 86).

adjustment was made for "intraregional" marketing of production which does not cross Unduavi and an additional adjustment for local consumption, using the estimates of the sample data.

In the case of Chapare-Chimore, the same type of estimation was possible, since taxes are paid over all the production that crosses in El Palmar. A series was available for the period 1965-72 from the National Road Service, which is in charge of collecting these taxes. In this case the computed coefficient for the period was .06752; that is, production pays an average 6.75 percent of "customs" tax, taking Cochabamba market prices as the base. The intraregional marketing for this region is smaller than in the case of La Paz, only 5%. This adjustment was also taken into consideration, as well as the local consumption.

There is no similar checkpoint for Yapacani and Chane-Piray, and in these cases only cross-section data over points in time were used to estimate benefits.

The impact of these projects, as implied by the benefit estimates presented here, is important (see Table V.2.2). The cross-section data indicates that the net value added in the oriented group grew, in current US\$, from about US\$ 128,000 in 1963 to US\$ 2,800,000 in 1972. The spontaneous groups increased net value added from an initial US\$ 1,260,000 in 1963 to US\$ 4,400,000 in

1972. Although the oriented colonies would appear to have had a larger impact, this is not the case. The difference simply shows two situations of growth from two different departure points. The number of spontaneous colonists in 1963 was already important (4300 families), as compared to the initial oriented groups (900 families).

However, to answer the questions of success of the projects and efficiency of the public sector, benefits and costs must be compared. As a first approximation, the total net value added for the six colonies in the period 1963-72 (US\$ 35,867,000) barely exceeds the total public investment made in that time span (US\$ 35,246,000). But, as mentioned previously, these are current expenditures and the net benefit and cost stream refer to the period 1963-72. Discounting provides a common yardstick for flows and makes the comparison of benefits and costs more meaningful, because money has different values over time. Consumption or expenditure today is not the same as consumption or expenditure in the future.

V.2.2. Cost stream

The public and private investments have been detailed in Section V.1. These investments must be apportioned among the different beneficiaries. Some of the resources have been used for specific purposes, such as credit to settlers, for example. Other expenditures, i.e., investment in infrastructure or general

administration, are not so specific. What follows will describe the criteria used to allocate these outlays among the different projects.

Investment in roads is directly proportional to the number of families in each colony. For example, the Caranavi-Puerto Linares road serves about 3,500 families in the spontaneous section and 3,600 families in the oriented section. The investment, accordingly, has been apportioned 49.3 percent in the first case and 50.7 percent in the second. Other infrastructure provides a larger proportion of service to neighboring groups than to distant groups. For instance, health centers and schools serve mostly neighboring settlers. They serve the more distant spontaneous colonies very little or not at all. Empirical knowledge of the regions involved suggested the apportioning of these other investment figures with 20 percent for spontaneous Caranavi and 80 percent for oriented colonies. For Chapare-Chimore, the proportion used was 40 and 60 percent, respectively.

The investments in the case of Yapacani are specific for that zone and unrelated to the Chane-Piray colony. Both groups have their own investment figures. In the case of Yapacani, however, the number of beneficiaries has increased over the years because of the presence of spontaneous groups surrounding the oriented ones. This fact has been taken into consideration in the evaluation

of benefits and costs.

Another issue involved in the apportioning of expenditures is the fact that these colonies are basically social projects. Some government expenditures are normal services which would be provided in any case (such as education and health), but were recorded as investment figures in the oriented groups because of their character as specific projects. It is recognized that these groups of people would have had to receive some of these services in their original communities. Thus, investment figures relative to the oriented groups may be inflated in comparison to the spontaneous groups.

Policy makers have an intrinsic interest in knowing the returns on total investment in these schemes, and in knowing whether the returns from the projects will cover the loan obligations.

To arrive at an answer on these issues, the costs have been classified in five categories. The assumption behind this classification is that, for the purpose of the analysis, each of these categories is a "relevant" cost. The case of grants is a good example. They are included in total investments, since they are a real cost. From the point of view of the national economy, they are not relevant. These grants have a specific purpose; in most cases they do not have a possible alternative use and do not imply future obligations.

Consequently, for practical purposes, they can be excluded. Government expenditures are another case, because most were used for services. These services must be provided to the population regardless of whether they are in the original communities or in the new colonization zones. To apply them to colonization expenditures is not entirely correct. Put another way, colonization can be treated as an external economy to certain government services, and some costs become irrelevant for the analysis. The same criterion may be used for road construction. As observed, in the new land development program road construction constitutes the largest share in expenditures. They are not only made for colonization purposes, but also serve other economic activities and generate economies of transportation. For instance, road construction is helping oil exploration in Chapare and Yapacani. It is also contributing to mining activities in Chapare and Caranavi. Again, agricultural colonization can be treated as an external economy to road construction, and roads may be excluded, or partially excluded, from total investment.

These categories of cost allow the computation of a range of benefit-cost ratios and internal rates of return, thus providing more information by which the investment in colonization can be judged.

The five categories of cost are the following:

- 1) Loans and grants only, with government expenditures excluded;
- 2) Foreign loans only, with government expenditures and grants excluded;
- 3) Total investment, comprising governmental investment, loans and grants;
- 4) Total investment, excluding main roads;
- 5) Government expenditures and loans only.

In all cases, private investment has been included in the computations.

V.2.3. Cash flow stream

The final step in deriving the benefit-cost ratios and the internal rates of return is the determination of the cash flow. This has been measured as follows:

$$\text{Cash flow} = \text{Project net value added} - \text{private investment} - \text{public expenditures}$$

To allow for uncertainty, project benefits were increased 10 percent over basic estimates. In addition, agricultural and forest production values appear to be underestimated by cross section data, by contrast to that derived from tax data, and need to be adjusted. Since costs were more accurate they were left unchanged. The five cost classifications discussed in the previous section were used. This implies an estimation of 10 cash flows for each colony. To be consistent with the rest of the research, two additional sets of flows were estimated

for the six projects as a whole and for the oriented and spontaneous colonies. The basic computations for the six colonies are shown in Tables V.2.3 to V.2.8. Additional estimations using the increase of 10 percent in net value added were used to compute the B/C ratios and IRR's, but are not shown here.

V.3. Benefit-Cost Estimates

The benefit-cost ratios were estimated using 10 and 15 percent as discounting rates because of the theoretical considerations explained in section III.3. The results are shown in Tables V.3.1 and V.3.2.

Five groups of estimates were obtained according to the flows used. They show the relation between:

- 1) Total benefits and total loans and donations;
- 2) Total benefits and foreign loans;
- 3) Total benefits and total expenditures in a project or group;
- 4) Total benefits and total expenditures excluding main roads;
- 5) Total benefits and government expenditures and loans.

A discussion of the results for oriented and spontaneous colonies follows.

a) Oriented colonies

The ratios for total expenditures in the oriented

TABLE V.2.3. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR ALTO BENI, 1963-1987
(IN THOUSANDS OF U.S. DOLLARS)

Year	NVA	Cost	Cost	Cost	Cost	Cost	Flow	Flow	Flow	Flow	Flow
		1	2	3	4	5	1	2	3	4	5
1963	10.92	1943.19	953.198	1943.19	1169.00	762.55	-1932.27	-942.27	-1932.27	-1158.08	-751.63
1964	75.25	883.00	542.000	895.03	895.03	445.63	-807.75	-466.75	-819.78	-819.78	-370.38
1965	108.29	682.00	432.000	768.22	768.22	431.82	-573.71	-323.71	-659.93	-659.93	-323.53
1966	174.75	398.00	241.000	434.22	434.22	229.02	-223.25	-66.25	-259.47	-259.47	-54.27
1967	229.90	369.00	275.000	469.22	469.22	320.22	-139.10	-45.10	-239.32	-239.32	-90.32
1968	256.84	377.00	349.000	474.50	474.50	376.70	-120.16	-92.16	-217.66	-217.66	-119.87
1969	342.87	517.00	469.000	637.21	637.21	495.41	-174.13	126.13	-294.34	-294.34	-152.54
1970	439.04	22.00	8.000	89.36	89.36	73.76	417.04	431.04	349.68	349.68	365.28
1971	581.00	115.00	115.000	173.39	173.39	150.39	466.00	466.00	407.61	407.61	430.61
1972	251.67	113.00	113.000	156.86	156.86	134.26	138.67	138.67	94.81	94.81	117.41
1973	621.98	81.00	80.000	168.42	168.42	151.42	541.98	541.98	453.56	453.56	470.56
1974	743.20	.00	.000	67.65	67.65	67.65	743.20	743.20	675.55	675.55	675.55
1975	835.20	.00	.000	67.65	67.65	67.65	835.20	835.20	767.55	767.55	767.55
1976	900.00	.00	.000	67.65	67.65	67.65	900.00	900.00	832.35	832.35	832.35
1977	990.00	.00	.000	67.65	67.65	67.65	990.00	990.00	922.35	922.35	922.35
1978	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1979	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1980	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1981	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1982	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1983	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1984	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1985	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1986	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35
1987	1080.00	.00	.000	67.65	67.65	67.65	1080.00	1080.00	1012.35	1012.35	1012.35

Note: $Flow_i = NVA - Cost_i$

TABLE V.2.4. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR CHIMORE, 1963-1987
(IN THOUSANDS OF U.S. DOLLARS)

Year	NVA	Cost 1	Cost 2	Cost 3	Cost 4	Cost 5	Flow 1	Flow 2	Flow 3	Flow 4	Flow 5
1963	.000	119.00	80.00	119.00	119.00	32.00	-119.00	-80.00	-119.00	-119.00	-32.00
1964	6.000	362.00	333.00	417.00	417.00	188.20	-356.00	-327.00	-411.00	-411.00	-182.20
1965	-6.125	333.00	312.00	343.00	343.00	134.80	-339.13	-318.13	-349.13	-349.13	-140.93
1966	11.083	140.00	88.00	179.00	179.00	74.20	-128.92	-76.92	-167.92	-167.92	-63.12
1967	12.733	448.77	392.77	495.77	284.00	204.11	-436.04	-380.04	-483.04	-271.27	-191.38
1968	61.533	452.77	450.77	497.77	286.00	225.31	-391.24	-389.24	-436.24	-224.47	-163.78
1969	-235.358	794.42	784.42	844.42	515.00	363.77	-1029.78	-1019.78	-1079.78	-750.36	-599.13
1970	327.417	339.42	338.42	371.42	42.00	167.37	-12.00	-11.00	-44.00	285.42	160.05
1971	438.583	681.84	681.84	704.84	46.00	295.74	-243.26	-243.26	-266.26	392.58	142.84
1972	601.733	725.90	725.90	748.90	43.00	313.36	-124.17	-124.17	-147.17	558.73	288.37
1973	567.500	10.00	10.00	51.59	51.59	45.59	557.50	557.50	515.91	515.91	521.91
1974	697.000	10.00	10.00	52.59	52.59	46.49	687.00	687.00	644.41	644.41	650.41
1975	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41
1976	700.000	10.00	10.00	52.59	52.59	46.49	690.00	690.00	647.41	647.41	653.41
1977	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41
1978	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	647.41	647.41	653.41
1979	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41
1980	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	647.41	647.41	653.41
1981	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	648.41	648.41	654.41
1982	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	647.41	647.41	653.41
1983	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41
1984	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	647.41	647.41	653.41
1985	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41
1986	700.000	10.00	10.00	52.59	52.59	46.59	690.00	690.00	647.41	647.41	653.41
1987	700.000	10.00	10.00	51.59	51.59	45.59	690.00	690.00	648.41	648.41	654.41

Note: Flow_i = NVA - Cost_i

TABLE V.2.5. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR YAPACANI, 1963=1987
(IN THOUSANDS OF U.S. DOLLARS)

Year	NVA	Cost 1	Cost 2	Cost 3	Cost 4	Cost 5	Flow 1	Flow 2	Flow 3	Flow 4	Flow 5
1963	33.26	118	118	130	130	80.56	-84.74	-84.74	-96.74	-96.74	-47.30
1964	89.20	491	491	572	572	366.27	-401.80	-401.80	-482.80	-482.80	-277.07
1965	138.73	517	460	541	541	291.26	-378.27	-321.27	-402.27	-402.27	-152.53
1966	182.98	2208	2130	2305	305	1334.53	-2025.02	-1947.02	-2122.02	-122.07	-1151.55
1967	212.11	4870	4774	4940	434	2843.69	-4657.89	-4561.89	-4727.89	-221.89	-2631.58
1968	447.28	796	752	875	475	515.91	-348.72	-304.72	-427.72	-27.72	-68.63
1969	92.49	984	954	1031	748	601.27	-891.51	-861.51	-938.51	-655.51	-508.78
1970	908.09	5	5	39	39	36.90	903.09	903.09	869.09	869.09	871.19
1971	1122.54	479	478	502	47	300.72	643.54	644.54	620.54	1075.54	821.82
1972	1321.77	216	215	297	97	205.91	1105.77	1106.77	1024.77	1224.77	1115.86
1973	907.96	400	400	484	84	316.40	507.96	507.96	423.96	823.96	591.56
1974	1021.80	214	214	297	83	207.33	807.80	807.80	724.80	938.80	814.47
1975	1118.00	0	0	84	84	84.00	1118.00	1118.00	1034.00	1034.00	1034.00
1976	1182.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1977	1182.50	0	0	144	144	144.00	1182.50	1182.50	1038.50	1038.50	1034.00
1978	1182.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1979	1182.50	0	0	144	144	144.00	1182.50	1182.50	1038.50	1038.50	1034.00
1980	1182.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1981	1182.50	0	0	144	144	144.00	1182.50	1182.50	1038.50	1038.50	1034.00
1982	1182.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1983	1182.50	0	0	143	143	143.00	1182.50	1182.50	1038.50	1038.50	1034.00
1984	1182.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1985	1182.50	0	0	144	144	144.00	1182.50	1182.50	1038.50	1038.50	1034.00
1986	1132.50	0	0	143	143	143.00	1182.50	1182.50	1039.50	1039.50	1034.00
1987	1182.50	0	0	144	144	144.00	1182.50	1182.50	1038.50	1038.50	1034.00

Notes: $Flow_i = NVA - Cost_i$

TABLE V.2.6. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR CARANAVI, 1963-1987
(IN THOUSANDS OF U.S. DOLLARS)

Year	NVA	Cost					Flow				
		1	2	3	4	5	1	2	3	4	5
1963	77.50	854.811	854.811	854.81	102.00	170.96	-777.31	-777.31	-777.31	-24.50	-93.46
1964	256.20	394.000	394.000	395.97	395.97	80.77	-137.80	-137.80	-139.77	-139.77	175.43
1965	304.70	329.000	329.000	344.78	344.78	81.58	-24.30	-24.30	-40.08	-40.08	223.12
1966	358.60	83.000	52.000	98.78	98.78	26.18	275.60	306.60	259.82	259.82	332.42
1967	417.82	260.000	203.000	280.78	280.78	61.38	157.82	214.82	137.04	137.04	356.44
1968	468.33	236.000	234.000	276.50	276.50	87.30	232.33	234.33	191.83	191.83	381.03
1969	567.00	479.000	467.000	537.79	537.79	152.19	88.00	100.00	29.21	29.21	414.81
1970	687.00	3.000	3.000	55.64	55.64	53.24	684.00	684.00	631.36	631.36	633.76
1971	826.67	15.000	15.000	70.61	70.61	58.61	811.67	811.67	756.06	756.06	768.06
1972	970.67	13.000	13.000	72.14	72.14	61.74	957.67	957.67	898.53	898.53	908.93
1973	664.71	.000	.000	51.58	51.58	51.58	664.71	664.71	613.13	613.13	613.13
1974	756.00	.000	.000	44.58	44.58	44.58	746.00	746.00	711.42	711.42	711.42
1975	910.00	.000	.000	38.58	38.58	38.58	910.00	910.00	871.42	871.42	871.42
1976	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1977	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1978	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1979	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1980	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1981	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1982	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1983	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1984	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1985	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1986	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42
1987	1050.00	.000	.000	84.58	84.58	84.58	1050.00	1050.00	965.42	965.42	965.42

Note:-- Flow_i = NVA -- Cost_i

TABLE V.2.7. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR CHAPARE, 1963-1987
(IN THOUSANDS OF U.S. DOLLARS)

Year	NVA	Cost 1	Cost 2	Cost 3	Cost 4	Cost 5	Flow 1	Flow 2	Flow 3	Flow 4	Flow 5
1963	698.53	80.00	80.00	80.00	80.00	48.00	618.53	618.53	618.53	618.53	650.53
1964	888.55	308.00	308.00	313.00	313.00	189.80	580.55	580.55	575.55	580.55	698.75
1965	991.75	258.00	258.00	263.00	263.00	159.80	733.75	733.75	728.75	728.75	831.95
1966	1105.20	65.00	41.00	73.00	73.00	32.60	1040.20	1064.20	1032.20	1032.20	1072.60
1967	1200.95	892.23	847.23	915.23	227.00	531.34	308.72	353.72	285.72	973.95	669.61
1968	1292.77	873.23	871.23	897.23	209.00	546.74	419.54	421.54	395.54	1534.12	892.57
1969	1391.50	1445.58	1435.58	1475.58	405.00	891.35	-54.08	-44.08	-84.08	986.50	500.15
1970	1555.12	1072.58	1072.58	1091.58	21.00	662.55	482.54	482.54	463.54	1534.12	892.57
1971	1651.30	2153.16	2153.16	2167.16	26.00	1305.90	-501.86	-501.86	-515.86	1625.30	345.40
1972	1838.50	2304.10	2304.10	2312.10	18.00	1390.46	-465.60	-465.60	-473.60	1820.50	448.04
1973	1238.00	.00	.00	81.41	81.41	81.41	1248.00	1248.00	1166.59	1166.59	1166.59
1974	1357.50	.00	.00	81.41	81.41	81.41	1357.50	1357.50	1276.09	1276.09	1276.09
1975	1560.00	.00	.00	81.41	81.41	81.41	1560.00	1560.00	1478.59	1478.59	1478.59
1976	1650.00	.00	.00	81.41	81.41	81.41	1650.00	1650.00	1568.59	1568.59	1568.59
1977	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1978	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1979	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1980	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1981	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1982	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1983	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1984	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1985	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1986	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59
1987	1800.00	.00	.00	81.41	81.41	81.41	1800.00	1800.00	1718.59	1718.59	1718.59

Note: $Flow_i = NVA - Cost_i$

TABLE V.2.8. NET VALUE ADDED, COST AND FLOW ESTIMATES FOR CHANE-PIRAY, 1963-1987
(IN THOUSANDS OF U.S. COLLARS)

Year	NVA	Cost 1	Cost 2	Cost 3	Cost 4	Cost 5	Flow 1	Flow 2	Flow 3	Flow 4	Flow 5
1963	182.0	0	0	452	452	452	182.00	182.00	-270.00	-270.00	-270.00
1964	271.8	0	0	15	15	15	271.83	271.83	256.83	256.83	256.83
1965	315.2	0	0	15	15	15	315.25	315.25	300.25	300.25	300.25
1966	375.5	0	0	15	15	15	375.54	375.54	360.54	360.54	360.54
1967	448.2	0	0	15	15	15	448.25	448.25	433.25	433.25	433.25
1968	620.7	0	0	20	20	20	620.67	620.67	600.67	600.67	600.67
1969	748.0	0	0	25	25	25	748.00	748.00	723.00	723.00	723.00
1970	891.5	0	0	25	25	25	891.50	891.50	866.50	866.50	866.50
1971	1077.4	0	0	30	30	30	1077.42	1077.42	1047.42	1047.42	1047.42
1972	1559.0	0	0	35	35	35	1558.98	1558.98	1523.98	1523.98	1523.98
1973	1280.8	0	0	40	40	40	1280.80	1280.80	1240.80	1240.80	1240.80
1974	1395.8	0	0	40	40	40	1395.80	1395.80	1355.80	1355.80	1355.80
1975	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1976	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1977	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1978	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1979	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1980	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1981	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1982	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1983	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1984	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1985	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1986	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00
1987	1500.0	0	0	47	47	47	1500.00	1500.00	1453.00	1453.00	1453.00

Note Flow_i = NVA - Cost_i

TABLE V.3.1. BENEFIT-COST RATIOS AT 10 AND 15 PERCENT DISCOUNTING RATES (D.R.)
ORIENTED AND SPONTANEOUS COLONIES IN BOLIVIA, 1963-1987.

Criteria	Oriented			Ori- ented	Spontaneous			Spon- tane- ous	Total
	Alto Beni	Chimore	Yapa- cani		Cara- navi	Chane- Piray			
I. BASIC NVA 10% D.R.									
1. Loans & grants	.98	1.02	.79	.89	2.77	2.58	-	-	1.85
2. Loans only	1.59	1.12	.82	1.04	2.86	2.61	-	-	2.06
3. Total public investment	.86	.90	.72	.80	2.33	2.42	12.97	3.16	1.62
4. Total public inv.-main roads	1.02	1.52	2.13	1.47	3.29	9.17	12.97	6.96	3.15
5. Govt. inv. plus loans	1.55	2.03	1.19	1.43	7.23	3.91	12.97	5.61	2.88
II. BASIC NVA 15% D.R.									
1. Loans & grants	.62	.69	.57	.61	1.94	2.35	-	-	1.41
2. Loans only	1.04	.75	.59	.73	2.00	2.38	-	-	1.59
3. Total public investment	.57	.62	.53	.56	1.72	2.24	8.62	2.64	1.26
4. Total public inv.-main roads	.68	1.00	1.59	1.01	2.60	7.91	8.62	5.63	2.39
5. Govt. inv. plus loans	1.07	1.43	.89	1.02	6.05	3.65	8.62	4.87	2.30

Source: based on Tables V.2.3 to V.2.8.

TABLE V.3.2. BENEFIT-COST RATIOS AT 10 AND 15 PERCENT DISCOUNTING RATES (D.R.)
ORIENTED AND SPONTANEOUS COLONIES IN BOLIVIA, 1963-1987

Criteria	Alto Beni	Chimore	Yapacani	Ori- ented	Cara- navi	Chapare	Chane- Piray	Spon- tane- ous	Total
I. NVA Increased 10%. 10% D.R.									
1. Loans & grants	1.08	1.12	.87	.98	3.05	2.84	-	-	2.04
2. Loans only	1.75	1.23	.90	1.14	3.15	2.87	-	-	2.27
3. Total public investment	.95	.99	.79	.88	2.56	2.66	14.27	3.47	1.78
4. Total public inv.-main roads	1.12	1.67	2.34	1.62	3.62	10.09	14.27	7.66	3.47
5. Govt. inv. and loans	1.72	2.23	1.31	1.57	7.95	4.30	14.27	6.17	3.17
II. NVA Increased 10%. 15% D.F.									
1. Loans & grants	.68	.76	.63	.67	2.13	2.58	-	-	1.55
2. Loans only	1.14	.82	.65	.80	2.20	2.62	-	-	1.75
3. Total public investment	.63	.68	.58	.62	1.89	2.46	9.48	2.90	1.38
4. Total public inv.-main roads	.75	1.10	1.75	1.11	2.86	8.70	9.48	6.19	2.63
5. Govt. inv. and loans	1.18	1.57	.98	1.12	6.65	4.01	9.48	5.36	2.53

Source: based on Tables V.2.3 to V.2.8.

groups at both 10 and 15 percent rates are less than 1. This result implies that the returns from investment in oriented colonies do not even cover total investment over a 25-year period. What is true for the groups as a whole is also true for the individual colonies. Yapacani shows the lowest ratio (.72), reinforcing the conclusion stated in the cross-section analysis that this colony gets the lowest average income. Considering loans and grants only, the ratio for the group is still below 1.0 at both 10 and 15 percent discounting rates. It is only slightly above 1.0 for Chimore and below 1.0 in the cases of Alto Beni and Yapacani. If main roads are excluded from total investment (colonization is treated as an external economy to highway construction programs), the ratio for the group is above 1.0. This shows the fact that road expenditures account for a large proportion of the new land development program, particularly in the Yapacani case. The construction of the Yapacani bridge and the river control works all represent heavy expenditures. Nevertheless, as seen in Chapter IV, average income per household in this area project is considerably lower than in the other five zones.

Considering loans as the only relevant investment, the ratio for the whole oriented group is above 1, below 1.0 for Yapacani and above 1.0 for Alto Beni and Chimore. It must be remembered that loans primarily used for road

construction constitute an important share of total expenditure. Finally, the ratio for the group is above 1.0 at a 10 percent discount rate when only loans are considered. The ratio is still below 1.0 for Yapacani, implying a very poor return in this area, and consequently a very poor investment decision.

These results are not significantly altered when the adjustment of 10 percent is applied to project net value added (see Table V.3.2).

b) Spontaneous colonies

The case of the spontaneous colonies is quite different. At a 15 percent discount rate the three projects show benefit-cost ratios larger than 1.0, and as high as 8.6 in Chane-Piray (see Tables V.3.1 and V.3.2). Caranavi and Chapare were assumed to have received 20 and 40 percent of the loan investments, respectively. The results thus imply that spontaneous colonies produce higher returns even when they absorb part of the investment in the oriented schemes.

An explanation of this contrast lies in the fact that spontaneous settlers consistently have attained higher income levels and the number of families is larger and expenditures on direct assistance to them have been minimal, as compared to oriented colonies.

Therefore, the benefit-cost ratios give strong support to the hypothesis concerning the performance of

oriented vs. spontaneous colonies over time. The hypothesis that public investment in spontaneous colonies produces higher economic returns than in oriented groups should not be rejected. The intertemporal comparisons show very favorable results for the spontaneous groups.

V.4. Internal Rates of Return

As in the benefit-cost ratios, the internal rates of return were computed from five basic cash flows. The benefit stream obtained is explained in section V.2.1, and the five groups of cost stream in section V.2.2. Accordingly, they show the following:

- 1) The net rate of return on loans and grants;
- 2) The net rate of return on foreign loans;
- 3) The net rate of return on total private and public investment;
- 4) The net rate of return on total expenditures excluding main roads;
- 5) The net rate of return on government expenditures and loans.

Computations with the adjustment of 10% in net value added were also performed. Thus, a total of 10 internal rates of return for each colony and groups of colonies is presented in Table V.4.1. These results are discussed by groups of projects in the following sections.

TABLE V.4.1. INTERNAL RATES OF RETURN FOR ORIENTED AND SPONTANEOUS COLONIES
IN BOLIVIA, 1963-1987

Criteria	Oriented			Ori- ented	Spontaneous			Spon- tane- ous	Total
	Alto Beni	Chimore	Yapa- cani		Cara- navi	Chapare	Chane- Piray		
I. BASIC NVA COSTS INCLUDED									
1. Loans & grants	10	10	6	9	29	*	-	*	24
2. Loans only	15	11	7	11	30	*	-	*	30
3. Total public investment	8	9	6	7	28	*	*	*	21
4. Total public inv.-main roads	10	15	24	15	*	*	*	*	26
5. Govt. inv. plus loans	16	21	13	15	*	*	-	*	*
II. NVA INCREASED BY 10%									
1. Loans & grants	11	11	7	10	32	*	-	*	27
2. Loans only	17	12	8	12	33	*	-	*	33
3. Total public investment	9	10	9	9	30	*	*	*	34
4. Total public inv.-main roads	11	16	26	17	*	*	*	*	29
5. Govt. inv. plus loans	18	22	14	17	*	*	-	*	*

Source: based on Tables V.2.3 to V.2.8.

Notes: -not applicable
*larger than 50%

a) Oriented colonies

The internal rate of return on total expenditure is 7 percent for the group. This rate goes up to 9 percent if benefits are adjusted by 10 percent. The rate of return on total investment for each individual project is very close to the groups rate: 8 percent for Alto Beni, 9 percent for Chimore, and 6 percent for Yapacani. Higher average income per household in Chimore than in Alto Beni helps to explain this difference, despite the fact that road investment in Chimore has been higher.

The rate of return on loans and donations is 9 percent for the group, but 10 percent for Alto Beni and Chimore, and only 6 percent for Yapacani. When main road investments are excluded, the rate of return goes up to 16 percent for the group, with 15 percent for Chimore and 24 percent for Yapacani. As explained, both zones have had considerably higher investments in access roads.

Considering loans only as relevant cost figures, the internal rate of return for the group remains at a low percent. The Alto Beni rate goes up to 15 percent, implying a larger government fund participation in this area. If government investment and loans proportionally applied to spontaneous colonies are considered the relevant cost, the net rate of return for the group is 15 percent. This rate of return is equivalent to the benefit-cost ratio of 1.0 at the same discounting rate.

Over a period of 25 years, the oriented colonies hardly broke even with this group of expenditures. This is clearly a very poor performance. If benefits are increased 10 percent, the overall rate for investment on loans goes up to 12 percent, still a not very impressive rate. The case of Yapacani is especially critical, as the net rate of return on loans only is 7 percent. This shows the critical importance of ecological conditions in the selection of an area project. On the one hand, poor soils and heavy rainfall help to explain low incomes. In addition, such conditions also led to high public investments.

b) Spontaneous colonies

The internal rates of return for the group are above 50 percent. In the case of Caranavi they are 28 percent for total investment, which is much better than any of the oriented colonies. Yet Caranavi shows comparatively lower incomes as compared to Chapare, because of adverse topographical conditions and soils. The other rates are above 50 percent, showing a considerably better return on public investment.

Thus the internal rate of return technique confirms the conclusion of the benefit-cost ratio estimates that spontaneous colonies perform better than oriented ones.

V.5. The Institutional Framework

It is evident from the investment figures, the number of families settled, and the utilization of about 100,000 Has. that the development of colonization has been important from 1960 to 1973. It is a remarkable accomplishment; compared to the previous thirty years. On the other hand, the economic analysis shows unfavorable results in terms of efficiency in the use of public funds, for the oriented groups as compared to the spontaneous colonies. Technology was suggested as an important explanatory variable in the cross section study. The levels of investment between the two groups appear as significant in the longitudinal analysis. The contrasting outcome between oriented and spontaneous colonies offered by the numerical computations deserve a new angle of observation: the institutional framework.

The variable systems discussed in Chapter III are a proxy for the institutional arrangement which marks the difference between the oriented and spontaneous colonies. How this institutional arrangement was set up will be discussed in this section. Since the topic is broad in itself, the focus will be placed on the relations created between settlers and public institutions, the fulfillment of contractual obligations on both parts and the apparent effect on the performance of the colonists.

a) Oriented colonization

The oriented colonies emerged as a policy decision of the Bolivian government to accelerate new land development and internal migration. The decision was based on the need to increase food production, to substitute imports and create agricultural exports. It also was designed in order to move 100,000 families from the highlands to the lowlands from 1961 to 1972. As explained in Chapter II, in the 1950's the Bolivian Development Corporation (CBF) promoted several colonies in the northern portion of Santa Cruz. The CBF, through its "Internal Migrations Project Bureau," established Cuatro Ojitos, Caranda and Yapacani in Santa Cruz. It also opened a trail connecting Chapare and Yapacani in order to attract new migrants. This experience and an aggressive management, joined to international conditions which favored new land development all over Latin America (49), moved CBF to enlarge its operations in colonization.

With the cooperation of US/AID in Bolivia, CBF started the "Alto Beni Project" in 1961 (15, 62, 70). This was the first heavily funded colonization project. It was also a new approach to the problem. Because of the relative success of the Alto Beni Project, and the recent presence of the Interamerican Development Bank to finance settlement activities in Latin America at a later date, the CBF-IDB projects were started in 1963. These

projects covered Alto Beni II, Chimore and Yapacani. As a consequence of this package, the Instituto Nacional de Colonizacion was founded in 1966, as the only institution in charge of colonization activities in Bolivia. Since that year, the Instituto was responsible for the management of specific fiscal lands and internal migration for agricultural colonization.

As an example of the management of the oriented groups, the Alto Beni I group will be discussed in some detail. A specific administrative arrangement was set up, within CBF, under the title Proyecto de Desarrollo Alto Beni. The head office in La Paz had Engineering, Sociology, Agricultural and Administrative Departments to deal with these specific activities. It focused its work in two stages, the so-called pre-colonization and settlement activities. The pre-colonization tasks included agrological, climatological and sociological studies previous to the settlement. They were intended to provide basic knowledge for area development. The next step was surveying works for physical planning, road construction and land parcelation. Rustic community centers and temporary palm houses were built and contractors cleared and planted two hectares of staple crops for each settler, before their arrival in the colony.

A careful selection of the colonists was implemented. The implicit assumption was that the system would not work

properly if the prospective settlers were not carefully screened. Promoters were sent to rural areas of the Altiplano offering information and incentives. Unemployed urban workers in La Paz were also encouraged to migrate. The selection of colonists was based on a theoretical point system, with education, health, age and previous farm experiences as variables. The selection form, according to its creators, was intended to "individualize the applicants, gathering information which would allow to know the food, health and education needs, avoiding that the settlers be left to chance and to their weak (sic) abilities" (48).

Once selected, the applicant signed a colonization contract with CBF. This document shows the philosophy behind the program. Because of its interest, a summary of this contract is provided:*

1. It was CBF's responsibility to:
 - a. finance the selection, including the medical checkup and transportation expenditures for the settler and his family; food up to \$Bs 270 a month, during 8 months; basic tools, generally including a machete, an ax, and a hoe; and limited medical assistance.

* Corporacion Boliviana de Fomento, Proyecto Alto Beni. "Contrato de Colonizacion," 4 pp.

- b. provide a 12 ha. plot of land, surveyed and delimited, and titles to this land, within a maximum period of three years after settlement.
- c. offer technical agricultural extension and social advice, "within the limitations provided by the Statute of Colonization."

2. The settler's obligations were to:

- a. contribute personal labor for communal activities, under the direction of the chief of the colony, and to work his parcel of land "according to instructions to be provided by the technical staff of the program."
- b. observe the regulations of the "Statute of Colonization," subject to the regime of licenses and permits to leave the colony.
- c. reimburse CBF for all expenditures made in his favor. Included were several administrative expenditures. The credit had a 5-year grace period and a 10-year repayment period.

In addition, the contract established the loss of all rights to farm property in cases where the colonist did not fulfill his obligations or refused to obey the Statute of Colonization.

In short, the spirit of this agreement tended to overestimate the capacity of the "project" authorities and underestimate the settlers' abilities to work to

their own benefit, and to overcome problems.

As Nelson points out, most of the colonization projects in Latin America "typically appear to be in the hands of weak agencies," which leads to poor administration and inefficiency (49, p. 256). Lack of trained personnel at all levels, which affects the development of agriculture, has also been recognized by a recent assessment of the Bolivian Agricultural Sector (64, p. 245). The colonization schemes and their bureaucratic arrangements have not been exceptions in this case.

Agricultural extension was very weak during the whole program. With the exception of hybrid cocoa introduction on a very limited scale, no major achievements were attained, despite the fact that during the first three years of administration there was an average of one agronomist for each 120 settlers. Feeder roads were not completed. Those already built were not adequately maintained after the project was completed. The four community centers built in each of the colonies were abandoned after four or five years of use. They were almost entirely deteriorated in 1973. Land titles had not been issued until the end of this same year.

This pattern of administration was followed in the CBF-IDB projects, with some improvements. Later on the Instituto was created from Project personnel. It also added a group of people who worked with spontaneous

colonization in the Ministry of Agriculture. This was a single institution for a specific clientele--the colonists, in general, and the settlers of the projects in Chimore, Alto Beni and Yapacani, specifically. Again, contracts were signed between institution and settlers, with mutual responsibilities. Selection was the normal procedure for admission as a settler. Despite these niceties, at the end of the program the rate of abandonment was about 50 percent.

The projects were executed from 1963 to 1970. They were initially intended to be completed in 30 months. As mentioned, the accomplishments are important, but the transition of the colonies to be served by the normal agencies of government was inadequate. The Instituto had a relatively large bureaucracy at the end of the international funding but it did not have the means to provide the service to its clientele. Other agencies refused to incorporate these areas under their jurisdiction to provide the services needed. For example, the Ministry of Health in 1973 did not recognize the oriented colonization areas within its competence. As a result, the Instituto provided minimal services, and in many cases arrangements had to be made with religious organizations to improve these services. In 1966-73, the National Road Service ignored the 550 km. of feeder roads built by the Colonization Program and did not provide the

maintenance required. The Instituto inherited some heavy equipment from the projects for this work, but a limited budget to operate them. In addition, the quality of personnel deteriorated. Without outside pressure from a lender, new designations responded to political recommendations and not to qualifications. Services suffered under these conditions.

There is an additional important issue in oriented schemes. Settlers' organizations (unions or "sindicatos") have been weakened all over. Both the Alto Beni Project authorities and those of the INC-IDB projects discouraged peasant unions. At the beginning of the process, large coops were imposed and membership in them became a requirement for credit access.* Poor, imposed coop administrators left their organizations bankrupt. Large liabilities accumulated for the individual settlers. Colonists' complaints were simply ignored and their representation in Administrative and Surveillance Councils was primarily symbolic, providing no effective means of action. Later on, when public officials decreased their pressure on the colonists' organization, smaller coops started to develop.** These smaller groups are successful

* Despite all this effort, at the end of the projects, less than 50 percent were coop members (11, p. 13).

** Some groups were reluctant from the very beginning to become members of the official coops. An example is

in marketing, credit and consumption supply activities. Occasionally, union leaders have been beaten, discouraged, and sent to jail when making claims for the colonies on the grounds of "political stability." The result in general for the ex-oriented groups was weak organization. In addition, dependency has been built into the behavior of these colonists, diminishing considerably their own initiative to solve problems. This dependency has been the result of two attitudes. On one hand, authorities believed that the colonizers might be guided, and their futures planned--like production targets, as reflected by the contract. On the other hand, authorities felt colonizers' representation was perilous, and only economic organizations deserve consideration. Coops must be encouraged, unions discouraged.

In a frank analysis of the end result of these attitudes, the last administrator of the INC-BID project concluded:

the system based in excessive State paternalism decreases the working habits of the peasant, it kills its initiative, and his interest for community work decays trusting that everything must be given to him. It destroys all the values of the man, subjecting him to a situation of complete dependence, when everybody's will should be strengthened to overcome the work difficulties and adapt to the new environment (11, p. 46).

the Nueva Canaan cooperative in Chimore. It started its activities in 1964 and has been successful in many respects. This group eventually rejected the project credits.

b. Spontaneous colonies

The development of the internal institutions in spontaneous colonies is quite different from that in oriented colonies. The relations with official institutions are also different. In order to obtain a picture about how they work, and to have a parallel with the Alto Beni I, the history of the San Lorenzo colony will be briefly related.

San Lorenzo is one of twelve colonies within the sample of the Caranavi group. Its history reflects some of the common trends followed by the spontaneous group in all the Caranavi region. San Lorenzo derives its name from the river which flows into the Carrasco River. It had 207 members in 1973. The group is composed mainly of Altiplano peasants coming from the province of Pacajes, in the department of La Paz. The first groups heard about Caranavi in 1959, from truckers who brought rice and bananas from the Yungas to their local fair. They were informed about the availability of new lands, and the opening of a new road from Caranavi to the Alto Beni. Stimulated by this information, some neighbors decided to send a commission to Caranavi to obtain additional news and investigate the possibility of obtaining the land. A group of three members traveled to Caranavi, and a week later returned home with good news. Evidently, they could apply for land, about 10 Ha. per family. The

jungle was frightening--very hot, many mosquitoes--but the region was exciting, and they saw some new settlers carving their way into the jungle.

The next year--1960--about 90 families decided that migration was a good possibility, and asked permission to occupy land along the river from CBF. They were granted a memorandum with a map, showing the location of the plot assigned, and authorizing the occupation of about 1,000 Has. They started clearing the land between September and November of that year. They organized the San Lorenzo sindicato, which represented them and imposed some obligations on their members.

The first year, as a collective action, they opened a trail along the river. They marked a front of 100 m. and assumed to have a depth of 1,000 m. At the end of the year, each family had an average of .5 Has. cleared and sown with rice. A very precarious house was built. Around the house, a few bananas, some citruses and papaye were planted. The rice harvest was made using the "ayni" system.* After the harvest, taking out the product was a hard task; it had to be carried on their backs for four, five, or more kilometers--about one quintal**

* A day-by-day exchange of labor services among the peasants of the same group.

** 100 lbs.

every time. A communal palm house was built over the Caranavi road in order to temporarily store the products before loading the trucks. The Caranavi road was still under construction; the first three years they lost much of their product. The fourth year, they negotiated the opening of a tractor trail with a local logger; in exchange, they would cut the logs and give them free to the sawmill. A few kilometers were opened the first year. The following year some additional kilometers were built. The whole colony helped in opening the trail for the work of the tractor.

Throughout the years, the union has been their main organization. It belongs to the Carrasco central, which is comprised of a total of 15 colonies. The central is a member of the Confederacion de Campesinos de Bolivia. In future years, when they needed cooperation from any governmental agency, the confederation opened the doors to them. In this way, they succeeded in improving their road with pipes provided by the National Road Service and a few hours of tractor work per year. In the last few years they have been able to build two schools, with the help of the Community Development Service. They provided the labor, and the Service part of the construction materials. A social building has been built for the union meetings.

During the first years, they spent half of their

time in Pacajes, and the other half in the colony. At present, most of them have already moved entirely to the colony, and just a few keep their original lands. The colony has expanded; it has almost doubled in size, and additional land was obtained from the same CBF in 1964.

The access road is now in good condition most of the time. The demand for coffee has increased in the last three years, providing a good source of cash income. The members of the colony have improved their economic situation and feel that they have no serious problems.

It is clear from this brief history that the spontaneous colonists have had to survive in a new environment on their own initiative. Because of that, they have developed better and stronger syndical and coop organizations. Ironically, spontaneous colonists have been politically accepted by government political bureaus as have other peasant unions.* Oriented colonists' representation has been recently admitted by both the Confederacion Nacional de Campesinos and the Ministry of Peasant Affairs.

*This is, of course, the trend after the revolution of 1952 and the land reform measures.

CHAPTER VI

SUMMARY AND POLICY IMPLICATIONS

The main objective of this study was to assess the economic performance of spontaneous and oriented colonies in Bolivia. This has been done by determining the economic results achieved by both groups and by evaluating the role and effects of public investment in this process.

The oriented colonies studied were Alto Beni I and II, Chimore and Yapacani. The spontaneous ones were Caranavi, Chapare and Chane-Piray. Geographically, they correspond to three different regions in the country. The Caranavi-Alto Beni region is in the department of La Paz, the Chapare-Chimore region is in the department of Cochabamba, and Yapacani and Chane-Piray are in the northern section of the department of Santa Cruz.

Particular emphasis has been placed on the oriented colonies because of the magnitude of the investment in them. However, because of current interest by the Bolivian government in the development of new areas, knowledge of the economic performance of settlers and public investment analysis have important policy implications.

VI.1. Economic Performance of Spontaneous and Oriented Colonies in 1972-73.

The general hypothesis posed in the study--that

spontaneous colonies achieve better results than oriented ones--cannot be rejected. This is the conclusion provided by analysis of the sample data. The spontaneous colonists attained an average net farm income of \$Bs 7,200 in 1973, which was 82 percent higher than the average net income in the oriented group. Statistically, this difference was highly significant at a one percent probability level.

Regional and local differences contributed to a partial explanation of the basic difference between the two groups. The colonies in the Santa Cruz areas achieved higher incomes than Chapare-Chimore and Caranavi-Alto Beni, while Caranavi-Alto Beni had the lowest average income. Again, regional differences were statistically significant at a one percent probability level. Differences between individual colonies (or zones) showed that Chapare and Chane-Piray were better off than Chimore and Yapacani, respectively. However, there was no statistically significant difference between Caranavi and Alto Beni. In at least two regions, the spontaneous colonies were consistently better off than the oriented ones.

The differences between Caranavi and Alto Beni are important because Alto Beni I had twice the average income of Caranavi, but Alto Beni II had only 78 percent of the income of Caranavi (see Tables IV.2.A and B). Alto Beni I is clearly affecting the regional average. It also shows the importance of the ecological differences between the

three colonies. Caranavi is characterized by shallow soils and slopes of 20 to 50 percent or more. Alto Beni I and II, on the other hand, have deep clayish soils and most of the colonists live in areas with gentle slopes of 1 to 30 percent gradients. In addition, Alto Beni II has faced marketing difficulties due to a lack of feeder road maintenance. Once these problems are overcome, Alto Beni II will probably reach the income levels of Alto Beni I.

Sociological variables were investigated as explanations of the differences in achievement between oriented and spontaneous colonies. Origin of settlers was one of these variables. Urban origin and origin in the same zone were shown to be positively related to higher incomes. Origin in the altiplano or valleys did not significantly explain differences in income levels. An urban experience may imply that an individual is more alert to new inputs and/or marketing opportunities and connections. At the same time, agricultural experience in the altiplano or valleys does not help in the subtropics. When the colonists are poor, uneducated peasants, the result is merely a shift of primitive techniques from the uplands to the lowlands.

Education did not appear to lead to significant differences in income, although the settlers have high literacy rates, compared to national averages. Two factors would seem to explain this paradoxical result. First,

those with higher education tend to neglect their farms in favor of other sources of income, and since net farm income was the economic performance yardstick used, the underutilization of the farm resources will obscure any positive relationship between education and income. Second, for the majority, the education level is no more than the third grade of primary school, which implies knowledge of little more than rudimentary reading and writing skills.

Language, used as proxy for ethnic differences, did not indicate any difference between Spanish and Quechua speaking groups. But those whose primary language was Aymara seemed to obtain lower levels of income. A geographical circumstance may help to explain this outcome. Because of its proximity to Caranavi-Alto Beni, 96.5 percent of the Aymara colonists (Altiplano people) have settled in this region, which shows the lowest average net income. The remaining 3.5 percent settled in Chimore, another low income colony. However, particular ecological conditions affect the income levels in both cases. Thus, it becomes hard to discern the direction of causality. Do ecological conditions outweigh ethnic and cultural differences and lead to lower levels of income, or are ethnic and cultural differences more important factors in explaining levels of income?

The age of the head of the household provided some

additional explanation for the variations in income. Those colonists below fifty years of age attained higher incomes than those above fifty. Younger people may endure a more hostile physical environment and longer hours of physical work; thus, the answer appears logical.

The length of stay in the colony provided an additional explanation. The highest incomes were attained by those with more than 15 years of residence in the colony, while the lowest incomes were earned by those with less than five years of residence. This is a very important finding. It implies the change from a previous shifting to a permanent agriculture, at least for the researched groups. If incomes decrease with the length of permanence in the colony, this would suggest a deterioration of the land base. Higher incomes at later stages imply acquisition of knowhow in building up capital in the form of plantations and animals. Larger capital and higher incomes are necessary conditions for a viable agriculture in the subtropics of Bolivia.

The analysis here was based on an individual examination of each variable. A multiple regression model was then specified to further examine the relationships.

A stepwise regression procedure was applied to the whole sample and the subsets of data from the individual colonies. After the initial inclusion of sociological, systems, and factors of production variables, the only

variables which remained in the model were systems and factors of production. Specifically, the amount of cultivated land, the availability of labor and the level of investment in the form of animals and variable expenditures and systems remained as the dominant variables in the final equation.

The same procedure was applied to obtain the equations for individual colonies and produced similar results, with one exception. In the case of Chapare, the origin variable was significant, as settlers coming from the altiplano had higher incomes. Another significant variable was length of stay. In the case of Alto Beni, this variable remained in the equation for the first five years of residence. The coefficient was negative, indicating that the new colonists in the zone were attaining lower incomes. This result makes sense for a colony where plantations have been encouraged and commercial sales start after four or five years of the tree planting.

The permanence of the variable "systems" in the multiple regression model, with a highly significant coefficient, tends to support the general hypothesis concerning the better performance of the spontaneous colonies. The exclusion of the sociological variables from these models would appear as a mathematical translation of the relative social homogeneity of both oriented and spontaneous groups.

The dominance of the capital, land and labor variables is implicitly related to technology. The analysis of the capital composition showed a general situation of low investments per household, with absence of reproducible capital, such as equipment or machinery. There were no significant differences in capital investment between oriented and spontaneous colonies. Variations in the composition of capital were simply due to types of production. This confirmed Qualification #3 of the main hypothesis concerning the use of similar technology in both groups. Higher incomes were associated with the amount of cultivated land and labor availability, a clear situation of labor-intensive technology.

Another relevant result concerns income distribution and income levels. Fifty-seven percent of the spontaneous colonists attained net incomes above the national average for the rural sector. Among oriented colonists only 35 percent were above the average. Policies which tend to overcome the current difficulties faced by oriented groups could help to raise their income levels, hopefully to levels similar to those of spontaneous groups.

The examination of the distribution of income showed that a relatively small percentage of settlers attained a substantial share of the total income generated in each colony. Ten percent of the spontaneous colonists had net

incomes above \$Bs 15,000 (US\$ 750), obtaining 37.2 percent of the total income generated in the group. This is an impressive average compared to the national per capita of US\$ 45 in the rural sector. In the oriented colonies, only 3.6 percent had incomes above \$Bs 15,000, which amounted to 16.1 percent of the total income generated in the group. Case studies of these successful examples could provide valuable answers for policy decisions.

In short, oriented and spontaneous colonies have common features. Both have developed a subsistence type of agriculture, characterized by low productivity and low incomes, although in general they are better off than in the highlands. Spontaneous colonies have attained higher incomes than oriented ones and, in this sense, they are more successful. The analysis of public investment provides some of the reasons for this outcome. Both groups still maintain low standards of living, as a result of their economic status and their sociological background.

With the same human capital for future land development, the course of that development can be predicted as an expansion path along a production function with constant returns to scale. The magnitude of the expansion will be influenced by the opening of new roads and the demand for products of the subtropics of Bolivia.

VI.2. Public Investment and Economic Analysis of
Colonization over Time, 1963-1972 and Projections
to 1987

The hypothesis that public investment in spontaneous colonies produces higher economic returns than oriented colonies cannot be rejected. This is the conclusion obtained from the analysis of public and private investment between 1963 and 1972, and from projections up to 1987. The methodology used in this case has been the computation of benefit-cost ratios and internal rates of return as measures for investment efficiency. The institutional framework in which oriented and spontaneous colonization developed was also considered relevant.

At discounting rates of 10 and 15 percent, the benefit-cost (B/C) ratios for the spontaneous colonies were above 1, taking into account total investment. The B/C ratios were below 1 for oriented colonies. The internal rates of return on total investment were above 28 percent for Caranavi and above 50 percent for the spontaneous Chapare and Chane-Piray. The internal rate of return on total investment was only 7 percent for the oriented group. This shows a considerably lower performance than the spontaneous colonies.

In general, however, the results in terms of efficiency over time are favorable to investment in new land development and colonization. The B/C ratios are above

l at 10 and 15 percent discounting rates, and internal rates of return above 20 percent. Despite the fact that only direct money impacts emerging from agricultural production were taken into account, this favorable result basically is due to spontaneous colonization. In addition, it is evident that part of the national targets have been achieved. Colonization has helped in terms of increasing and diversifying agricultural output. It has also contributed to the creation of employment, although not in the desired magnitude. The physical and social integration of the country has been largely enhanced. The new roads are connecting regions previously disconnected and the "colla" and "camba" cultures have become closer than ever.*

Still, the low performance of oriented colonization must be critically analyzed. Pre-colonization studies of soils and natural resources were conducted. Sophisticated procedures were used to select candidates. Projects designed with such relative care could be expected to generate more than subsistence agriculture. Clearly this has not happened. The reasons are that a rigidity on the part of the Alto Beni Project authorities, the Corporacion Boliviana de Fomento, and finally

* "Colla" is the generic term for the highlanders, and "camba" for the people of the lowlands.

the Instituto Nacional de Colonizacion led to a waste of forest and other natural resources. Also, settlers were assigned swampy plots or parcels with very poor soils, leading to failure and desertion. Rates of desertion were very high despite the laborious selection procedure.

This research would lead to the conclusion that somehow public investment in the oriented colonies did not create regions with progressive settlers. There has been an apparent waste of financial resources in the oriented projects. There were two main forms of waste: one in direct assistance to settlers at the wrong time, and with negative effects; and another, in a large unnecessary bureaucracy.

One of the thorny aspects in explaining such an outcome is the institutional framework in which oriented and spontaneous colonies developed. It is evident that the Corporacion Boliviana de Fomento first, and the Instituto Nacional de Colonizacion at a later stage, have successfully completed the construction of roads and public buildings and the establishment of other facilities, for example, an excellent nursery for cocoa and citrus production in Alto Beni. The main failures affecting the performance of oriented colonists appear to have occurred in: 1) absence of land titling; 2) direct assistance to settlers; 3) the paternalism and dependence created between the "project" authorities (CBF, Program

or INC) and the settlers; and 4) the transition from project management to the supply of normal services by the government.

These four aspects deserve some additional discussion. At the end of 1973 (twelve years after the Alto Beni I project started), not a single colonist had been granted title to land, despite all the survey expenditures for land delineation and the presence of a Law Department in the Instituto. Lack of title constitutes a serious impediment for credit application. In addition, it creates a lack of confidence on the part of the settlers about their property rights. Absence of credits makes practically unfeasible any further expansion of the farms, condemning settlers to subsistence farming.

Although direct assistance to settlers has not been high (a total of US\$ 3,874,000, or an average of US\$ 704 per household in the form of the 51 TF credit, food from the WFP and 29 SF agricultural credit), this seems to have been used at the wrong time--in the pioneer stage. These resources have apparently served to weaken the will of the settlers to struggle in the colonization areas. The receipt of food, clothing, tools and transportation facilities created a cycle of dependence, which the colonists tried to maintain as long as possible. Once the loan sources dried up, many of them simply abandoned the areas, leaving uncultivated plots and pending

debts.* The experience of the spontaneous settlers, in contrast, shows that they overcame this stage by themselves, and after four or five years of settlement (at the consolidation stage), started demanding government services. The cost for the government in this case is minimal.

The third institutional failure stems from the desire on the part of the colonization authorities to exercise control over the colonists. They thus established a rigorous system of issuing permits to oriented colonists which allowed them to leave the project area. While the spontaneous colonists moved freely in and out of the colonies, the oriented colonists for many years had to obtain a permit to move. This probably restricted off-season work and additional income. The settler was forced to cut off, perhaps with unnecessary rush, his links with his previous world. In addition, Chimore colonists were not permitted to cultivate cocoa, the best cash crop for the region.

However, what has apparently handicapped oriented colonies most has been the transition from project management to the supply of normal services by the government. This, of course, cannot be imputed to the INC, but to the lack of coordination among the different government

* These debts over the plot had to be accepted by the newcomers, in order to be granted the land.

services, and the chronic lack of financial resources of the public budget. The budget was mostly designed to cover salaries and administrative expenditures. The National Road Service was reluctant to maintain the 550 km. of feeder roads, and the Ministry of Health refused to take under its jurisdiction the health facilities built by the program. The complete failure to maintain feeder roads has been the most important cause of production losses for oriented colonists in the last years.

The results of Alto Beni I, however, suggest that these are temporary problems. Once roads improve and the administration becomes less rigid, the situation will improve and incomes will increase.

VI.3. Policy Implications

The findings of this research would appear to have relevance for future policy decisions in three directions:

- 1) On the nature of colonization programs;
- 2) On policies for the already established colonies;
- 3) On new land development schemes.

VI.3.1. On the nature of colonization programs

One of the lessons seems to be that it does not pay to heavily fund production schemes which will evolve into subsistence agriculture. In other words, the subsistence-type generates itself, at least in the pioneer stage.

Given the population growth and the need for employment creation in the rural sector, internal migration is still needed in the Bolivian economic development process. The approach, however, must be one that avoids the subsidization of subsistence agriculture. The provision of good, permanent access roads at low costs seems to be the answer.

Another experience seems to be that the less the government intervenes in the pioneer stage, the better off the colonies will be in terms of economic and social gains. At this stage, the settlers' own organizations should be strengthened. While government activity is strongly needed to facilitate the access to new lands by road construction, additional services should be provided only at a later stage, in the consolidation process.

VI.3.2. On policies for the already established colonies

Improvement and maintenance of feeder roads and technological changes seem to be the major issues for immediate policy action. (There are many other specific problems in each colony that will be left aside for the sake of clarity.) The marginal investment in road improvement (mostly drainage and/or gravelling, according to local circumstances) will certainly provide the highest returns in the immediate future. The colonizers will certainly benefit, but this investment would also help

provide a larger and probably cheaper supply of food to the urban centers. This research showed that by 1972 the six colonization areas were adding an agricultural output valued at US\$ 6,500,000. With presently available resources, and better feeder roads, these same colonies could market at least 20 or 30 percent more, or about US\$ one-and-a-half to two million dollars.

Technological change which increases production seems to be the only way to improve the living conditions of the thousands of settlers in the future. In the case of Chapare-Chimore, Yapacani and Chane-Piray and the other colonies in these two major regions, the transition needs to be made from purely labor-intensive techniques to animal or mechanical power. The present resource combination of abundant land and small population suggests this solution. The fast development of commercial agriculture and the experience of foreign colonies, both using mechanization and modern inputs, also leads to this conclusion.

The case of Caranavi-Alto Beni is different. Since most of the land is mountainous, only limited mechanization is possible. In this case the emphasis should be on land-intensive techniques. The introduction and diffusion of high yielding varieties of cocoa is a good example. This needs to be maintained and if possible expanded to new crops, which in turn requires the establishment of a

sound research and extension service for the region.

Two other more specific issues need to be faced in order to facilitate such change. One is land titling. Without titles, the colonists do not have access to the regular sources of credit, at least under current legal regulations. Another is a more flexible policy on farm size. As observed in the income distribution, there is an important group of aggressive settlers who are attaining higher incomes than the average and are constrained by farm size. Given the social consequences of permitting too much concentration of land in the hands of a few settlers, a ceiling of 80 or 100 Ha. could be established in areas like Yapacani or Chane-Piray but, within those limits, aggregation of smaller plots should be permitted.

VI.3.3. On new land development schemes

As an immediate target, Bolivia is facing the challenge of developing over 2,000,000 Hectares of virgin and almost immediately accessible lands.* The Government is also undertaking an ambitious road construction plan for

* They are distributed as follows:

Mosetenes (La Paz-Beni)	70,000
Chapare (northern portion of currently colonized area)	500,000
San Julian (eastern Santa Cruz)	650,000
Abapo-Izozog-Parapeti (southern Santa Cruz)	700,000
Yapacani-Puerto Villarroel (Santa Cruz-Cochabamba)	<u>180,000</u>
Total	2,100,000

the decade ahead.* Both activities are closely inter-related and will require a substantial investment, in addition to funds already invested in basic and feasibility studies.

The push forces in the highlands and the need for absorbing the population growth of the traditional agricultural areas suggests that the human resources associated with these programs will be peasants from the highlands. To avoid developing extensive regions with merely subsistence agriculture, a policy designed to encourage the creation of a commercial farm sector would seem to be highly advisable. In addition to economic considerations, social and political reasons are involved.

In terms of investment in infrastructure, a low investment per square kilometer to be developed seems advisable in the first stage. To be more specific, the situation of Caranavi versus Yapacani seems to be a good example. Caranavi shows relatively low levels of income, but the rates of return are satisfactory for total investment. On the other hand, Yapacani settlers had similar incomes to those of Caranavi, but the "project" has a low return of 6 percent. The obvious difference is that

*The outstanding examples are: the projected road highway La Paz-Beni, the connection between Cochabamba and Santa Cruz via Chapare, and the plan to build 3,000 km. of new roads in the eastern and northern portions of Bolivia.

investment in basic infrastructure is minimal in the case of Caranavi. Because of the nature of oriented projects and adverse ecological conditions, public investment has been very high in Yapacani. In addition, the feeder roads in Caranavi were built with resources generated within that region.

A similar argument can be made for Chapare. So far, the highly expensive road connecting Cochabamba and Chapare has not produced the expected dramatic changes in the agriculture and economy of the region. The weight of this investment is naturally affecting the low rate of return for Chimore.

Knowledge of the resource base is also important, but use of this knowledge seems even more important. The experience with the oriented colonies shows that basic studies were not utilized during project execution. For future development the magnitude of investment seems critical in relation to the resource base in the two cases. The planned La Paz-Beni highway will cross the barrier of the Andes, and the full axis of the road will be surrounded by mountainous land partly developed with the Caranavi-Alto Beni settlers. Future agricultural development under these conditions will only be at the subsistence level and will not be highly profitable. While the interconnection between La Paz and the Beni plains is geopolitically important, low returns may be

expected because of the resource base.

A similar contrast between needs of investment and low returns can be forecasted in the planned interconnection between Cochabamba-Santa Cruz via Yapacani and Puerto Villarroel or Puerto Grether-Ivirgarsama. The road will facilitate interchange between the two regions, but the intermediate areas for development have large swamps and in general soils of poor fertility. The advisability of high expenditures is highly questionable.

Thus, the basic implication is that although these investments are highly desirable and needed to accelerate Bolivian development, a cautious policy in public expenditure must be observed, with special attention to the magnitude of the investment in relation to the resource base and the human capital complementary to those resources.

To conclude, the most important policy implications suggested by this research are:

a) The avoidance of costly oriented programs of colonization which simply subsidize the creation of subsistence agriculture.

b) The improvement and maintenance of feeder roads in order to help in the consolidation of already established colonies. Investment of this nature seems to offer high pay-offs.

c) The design of policies to facilitate long run

changes to higher productivity technology. Land extensive technologies, for Santa Cruz and Chapare, and land intensive technology in the case of Caranavi-Alto Beni are suggested.

d) The acceleration of land titling along with a policy which allows farm size increases. These are complementary measures to (c). However, increases in farm size should be held within reasonable limits in order to avoid the consequences of future land and income concentration in a few hands.

e) The construction of all-weather roads must be given top priority in future lands development, yet the unit costs per square kilometer of land to be developed must be weighed with a sound knowledge of the resource base and the possible returns from investment before beginning a project.

TABLE A.1

ORIGIN OF SETTLERS

ROWS.....CATEGORIES OF ORIGIN

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMPE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
ALTIPLAN	18	30	27	84	118	27	25	329	COUNT
	5.47	9.12	8.21	25.53	35.87	8.21	7.60	100.00	PROW
	18.75	30.93	58.70	63.16	74.68	23.08	21.37	43.06	PCOL
	2.36	3.93	3.53	10.99	15.45	3.53	3.27	43.06	PPLANE
VALLEYS	69	64	12	27	16	79	32	299	COUNT
	23.08	21.40	4.01	9.03	5.35	26.42	10.70	100.00	PROW
	71.88	65.98	26.09	20.30	10.13	67.52	27.35	39.14	PCOL
	9.03	8.38	1.57	3.53	2.09	10.34	4.19	39.14	PPLANE
YUNGAS	3	1	5	15	8	0	0	32	COUNT
	9.38	3.13	15.63	46.86	25.00	.00	.00	100.00	PROW
	3.13	1.03	10.87	11.28	5.06	.00	.00	4.19	PCOL
	.39	.13	.65	1.96	1.05	.00	.00	4.19	PPLANE
CITY	1	1	2	2	13	4	31	54	COUNT
	1.85	1.85	3.70	3.70	24.07	7.41	57.41	100.00	PROW
	1.04	1.03	4.35	1.50	8.23	3.42	26.50	7.07	PCOL
	.13	.13	.26	.26	1.70	.52	4.06	7.07	PPLANE
ZONE	5	0	0	1	0	0	2	8	COUNT
	62.50	.00	.00	12.50	.00	.00	25.00	100.00	PROW
	5.21	.00	.00	.75	.00	.00	1.71	1.05	PCOL
	.65	.00	.00	.13	.00	.00	.26	1.05	PPLANE
OTHER	0	1	0	4	3	7	27	42	COUNT
	.00	2.38	.00	9.52	7.14	16.67	64.29	100.00	PROW
	.00	1.03	.00	3.01	1.90	5.98	23.08	5.50	PCOL
	.00	.13	.00	.52	.39	.92	3.53	5.50	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PPLANE

TABLE A.2

ORIGIN OF WIFE OF SETTLER

ROWS.....CATEGORIES OF WIFE(ORIG)

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMOPE	A BENE I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
	15	24	28	63	106	23	13	272	COUNT
ALTIPLAN	5.51	8.82	10.29	23.16	38.97	8.46	4.78	100.00	PROW
	15.53	24.74	60.87	47.37	67.09	19.66	11.11	35.60	PCOL
	1.96	3.14	3.66	8.25	13.87	3.01	1.70	35.60	PPLANE
VALLEYS	72	57	6	19	14	73	28	269	COUNT
	26.77	21.19	2.23	7.06	5.20	27.14	10.41	100.00	PROW
	75.00	58.76	13.04	14.29	8.86	62.39	23.93	35.21	PCOL
	9.42	7.46	.79	2.49	1.83	9.55	3.66	35.21	PPLANE
YUNGAS	1	1	4	19	11	1	1	38	COUNT
	2.63	2.63	10.53	50.00	28.95	2.63	2.63	100.00	PROW
	1.04	1.03	5.70	14.29	6.96	.85	.85	4.97	PCOL
	.13	.13	.52	2.49	1.44	.13	.13	4.97	PPLANE
CITY	0	0	1	1	8	4	29	43	COUNT
	.00	.00	2.33	2.33	18.60	9.30	67.44	100.00	PROW
	.00	.00	2.17	.75	5.06	3.42	24.79	5.63	PCOL
	.00	.00	.13	.13	1.05	.52	3.80	5.63	PPLANE
ZONE	3	0	0	4	0	0	0	7	COUNT
	42.86	.00	.00	57.14	.00	.00	.00	100.00	PROW
	3.13	.00	.00	3.01	.00	.00	.00	.92	PCOL
	.39	.00	.00	.52	.00	.00	.00	.92	PPLANE
OTHER	5	15	7	27	19	16	46	135	COUNT
	3.70	11.11	5.19	20.00	14.07	11.85	34.07	100.00	PROW
	5.21	15.46	15.22	20.30	12.03	13.68	39.32	17.67	PCOL
	.65	1.96	.92	3.53	2.49	2.09	6.02	17.67	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	5.02	17.41	20.68	15.31	15.31	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	5.02	17.41	20.68	15.31	15.31	100.00	PPLANE

TABLE A.3

ORIGIN OF CHILDREN OF SETTLER
 ROWS.....CATEGORIES OF CHILDREN
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A HENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
ALTIPLAN	2	12	14	32	65	6	7	138	COUNT
	1.45	8.70	10.14	23.19	47.10	4.35	5.07	100.00	PROW
	2.08	12.37	30.43	24.06	41.14	5.13	5.98	18.06	PCOL
	.26	1.57	1.83	4.19	8.51	.79	.92	18.06	PPLANE
VALLEYS	27	41	5	7	4	31	10	125	COUNT
	21.60	32.80	4.00	5.60	3.20	24.80	8.00	100.00	PROW
	28.13	42.27	10.87	5.26	2.53	26.50	8.55	16.36	PCOL
	3.53	5.37	.65	.92	.52	4.06	1.31	16.36	PPLANE
YUNGAS	6	0	3	19	14	0	1	43	COUNT
	13.95	.00	6.98	44.19	32.56	.00	2.33	100.00	PROW
	6.25	.00	6.52	14.29	8.86	.00	.85	5.63	PCOL
	.79	.00	.30	2.49	1.83	.00	.13	5.63	PPLANE
CITY	0	0	5	6	21	2	24	58	COUNT
	.00	.00	8.62	10.34	36.21	3.45	41.38	100.00	PROW
	.00	.00	10.87	4.51	13.29	1.71	20.51	7.59	PCOL
	.00	.00	.65	.79	2.75	.26	3.14	7.59	PPLANE
ZONE	50	22	13	35	32	52	44	248	COUNT
	20.16	8.87	5.24	14.11	12.90	20.97	17.74	100.00	PROW
	52.08	22.68	28.26	26.32	20.25	44.44	37.61	32.46	PCOL
	5.54	2.88	1.70	4.52	4.19	6.81	5.76	32.46	PPLANE
OTHER	11	22	6	34	22	26	31	152	COUNT
	7.24	14.47	3.95	22.37	14.47	17.11	20.39	100.00	PROW
	11.46	22.68	13.04	25.56	13.92	22.22	26.50	19.90	PCOL
	1.44	2.88	.79	4.45	2.88	3.40	4.06	19.90	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PPLANE

TABLE A.4

OCCUPATION OF SETTLER BEFORE BEING IN THE COLONY

ROWS.....CATEGORIES OF OCCUPATION

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORF	A BEMI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
	81	82	29	86	111	101	108	598	COUNT
FARMER	13.55	13.71	4.85	14.38	18.56	16.89	18.06	100.00	PROW
	84.38	86.32	64.44	69.35	73.51	87.07	93.10	60.48	PCOL
	10.90	11.04	3.90	11.57	14.94	13.59	14.54	80.48	PPLANE
	11	10	14	24	29	10	5	103	COUNT
WORKER	10.68	9.71	13.59	23.30	28.16	9.71	4.85	100.00	PROW
	11.46	10.53	31.11	19.35	19.21	8.62	4.31	13.86	PCOL
	1.48	1.35	1.88	3.23	3.90	1.35	.67	13.86	PPLANE
	3	0	1	6	4	4	2	20	COUNT
TRADER	15.00	.00	5.00	30.00	20.00	20.00	10.00	100.00	PROW
	3.13	.00	2.22	4.84	2.65	3.45	1.72	2.69	PCOL
	.40	.00	.13	.81	.54	.54	.27	2.69	PPLANE
	1	3	1	8	7	1	1	22	COUNT
MINER	4.55	13.64	4.55	36.36	31.82	4.55	4.55	100.00	PROW
	1.04	3.16	2.22	6.45	4.64	.86	.86	2.96	PCOL
	.13	.40	.13	1.08	.94	.13	.13	2.96	PPLANE
	96	95	35	124	151	116	116	743	COUNT
TOTAL	12.92	12.79	6.06	16.69	20.32	15.61	15.61	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.92	12.79	6.06	16.69	20.32	15.61	15.61	100.00	PPLANE

TABLE A.5

FAMILY SIZE IN THE COLONIES
 ROWS.....CATEGORIES OF FAMSIZE
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
2 AND LESS	10	27	6	32	37	18	8	138	COUNT
	7.25	19.57	4.35	23.19	26.81	13.04	5.80	100.00	PROW
	10.42	27.84	13.04	24.06	23.42	15.38	6.84	18.06	PCOL
	1.31	3.53	.79	4.19	4.84	2.36	1.05	18.06	PPLANE
2+ TO 4	43	33	12	35	47	28	33	231	COUNT
	18.61	14.29	5.19	15.15	20.35	12.12	14.29	100.00	PROW
	44.79	34.02	26.09	26.32	29.75	23.93	28.21	30.24	PCOL
	5.63	4.32	1.57	4.58	6.15	3.66	4.32	30.24	PPLANE
4+ TO 6	30	27	18	36	35	43	37	226	COUNT
	13.27	11.95	7.96	15.93	15.49	19.03	16.37	100.00	PROW
	31.25	27.84	39.13	27.07	22.15	36.75	31.62	29.58	PCOL
	3.93	3.53	2.36	4.71	4.58	5.63	4.84	29.58	PPLANE
GREATER THAN 6	13	10	10	30	39	28	39	169	COUNT
	7.69	5.92	5.92	17.75	23.08	16.57	23.08	100.00	PROW
	13.54	10.31	21.74	22.56	24.68	23.93	33.33	22.12	PCOL
	1.70	1.31	1.31	3.93	5.10	3.66	5.10	22.12	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PPLANE
Average family size	4.5	3.8	5.0	4.6	4.6	4.6	5.1	4.8	

TABLE A.6

FAMILY COMPOSITION IN THE COLONIES									
ROWS.....	CATEGORIES OF FAMCOMP								
COLUMNS....	CATEGORIES OF DISTRICT								
	ICHAPARE	ICHIMORE	IA BENI	IA HENI	ICARANAUI	IYAMACANI	ICH=PIRAY	TOTAL	
FATHER	4	15	7	10	13	1	2	52	COUNT
	7.59	28.85	13.46	14.23	25.00	1.92	3.65	100.00	PROW
	4.17	15.96	18.42	8.00	6.33	.90	1.71	7.06	PCCL
	.54	2.04	.95	1.35	1.76	.14	.27	7.06	PPLANE
MOTHER	0	0	0	4	0	4	1	9	COUNT
	.00	.00	.00	44.44	.00	44.44	11.11	100.00	PROW
	.00	.00	.00	3.20	.00	3.60	.85	1.22	PCCL
	.00	.00	.00	.54	.00	.54	.14	1.22	PPLANE
CHILD	3	0	1	2	9	2	2	19	COUNT
	15.79	.00	5.26	10.53	47.37	10.53	10.53	100.00	PROW
	3.13	.00	2.63	1.00	5.77	1.86	1.71	2.58	PCCL
	.41	.00	.14	.27	1.22	.27	.27	2.58	PPLANE
RELATIVES	0	1	1	6	4	3	5	20	COUNT
	.00	5.00	5.00	30.00	20.00	15.00	25.00	100.00	PROW
	.00	1.06	2.63	4.80	2.56	2.70	4.27	2.71	PCCL
	.00	.14	.14	.81	.54	.41	.68	2.71	PPLANE
WORKERS	0	0	0	1	4	0	3	8	COUNT
	.00	.00	.00	12.50	50.00	.00	37.50	100.00	PROW
	.00	.00	.00	.80	2.56	.00	2.56	1.09	PCCL
	.00	.00	.00	.12	.54	.00	.41	1.09	PPLANE
FAT-MOTH	4	5	1	6	8	5	0	29	COUNT
	13.79	17.24	3.45	20.69	27.59	17.24	.00	100.00	PROW
	4.17	5.32	2.63	4.80	5.13	4.50	.00	3.93	PCCL
	.54	.68	.14	.81	1.09	.88	.00	3.93	PPLANE
ALLFAM	59	53	28	47	69	39	36	331	COUNT
	17.82	16.01	5.46	14.20	20.65	11.78	10.88	100.00	PROW
	61.44	56.38	73.68	37.60	44.23	35.14	30.77	44.91	PCCL
	8.01	7.19	3.80	6.36	9.36	5.29	4.88	44.91	PPLANE
COMBATS	26	20	0	49	49	57	68	269	COUNT
	9.67	7.43	.00	18.22	18.22	21.19	25.28	100.00	PROW
	27.05	21.28	.00	39.20	31.41	51.35	56.12	36.50	PCCL
	3.53	2.71	.00	6.65	6.65	7.73	9.23	36.50	PPLANE
TOTAL	96	94	33	125	156	111	117	737	COUNT
	13.03	12.75	5.15	16.96	21.17	15.06	15.88	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCCL
	13.03	12.75	5.16	16.96	21.17	15.06	15.88	100.00	PPLANE

TABLE A.7

AGE OF SETTLERS										
ROWS.....	CATEGORIES OF AGES/ETL									
COLUMNS.....	CATEGORIES OF DISTRICT									
	CHAPARE	CHIMORE	JA BENI	II	CARANAVI	YAPACANI	TCH-PLANE	YI	TOTAL	
20 AND LESS	9.09	9.09	.00	18.18	36.36	22.73	4.55	100.00	22	COUNT
	2.08	2.08	.00	3.01	5.06	4.27	.85	2.88		PROW
	.26	.26	.00	.52	1.05	.65	.13	2.88		PCOL
										PPLANE
20+ TO 30	9.69	11.01	2.54	18.50	16.30	20.26	21.59	100.00	227	COUNT
	22.92	25.77	13.04	31.58	23.42	39.32	41.88	29.71		PROW
	2.98	3.27	.79	5.50	4.84	6.02	6.41	29.71		PCOL
										PPLANE
30+ TO 40	11.16	19.12	7.97	16.33	17.93	16.33	11.16	100.00	251	COUNT
	29.17	49.08	43.48	30.83	28.48	35.04	23.93	32.85		PROW
	3.66	6.28	2.02	5.37	5.89	5.37	3.66	32.85		PCOL
										PPLANE
40+ TO 50	14.01	10.19	7.64	22.29	21.02	7.64	17.20	100.00	157	COUNT
	22.92	16.49	26.09	26.32	20.89	10.26	23.08	20.55		PROW
	2.88	2.09	1.57	4.58	4.32	1.57	3.53	20.55		PCOL
										PPLANE
50+ TO 60	22.22	5.55	7.78	11.11	31.11	11.11	11.11	100.00	90	COUNT
	20.83	5.15	15.22	7.52	17.72	8.55	8.55	11.78		PROW
	2.62	.65	.92	1.31	3.66	1.31	1.31	11.78		PCOL
										PPLANE
GREATER THAN 60	11.76	5.88	5.88	5.88	41.15	17.65	11.76	100.00	17	COUNT
	2.08	1.03	2.17	.75	4.43	2.56	1.71	2.23		PROW
	.25	.13	.13	.13	.92	.39	.26	2.23		PCOL
										PPLANE
TOTAL	12.57	12.70	6.92	17.41	20.68	15.31	15.31	100.00	764	COUNT
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		PROW
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00		PCOL
										PPLANE
Average age	40.4	36.0	39.0	36.2	40.0	33.7	34.7	37.2		
s.d.v.	(12.37)	(9.53)	(9.45)	(10.56)	(13.70)	(13.10)	(10.79)	(11.99)		

TABLE 2.8

AGE OF WIVES OF SETTLERS
 ROWS.....CATEGORIES OF AGEWIFE
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMDRE	A HEMI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
	10	26	5	37	40	20	28	169	COUNT
20 AND LESS	5.92	15.38	4.73	21.89	23.67	11.83	16.57	100.00	PROW
	10.42	26.80	17.39	27.82	25.32	17.09	23.93	22.12	PCOL
	1.31	3.40	1.05	4.84	5.24	2.62	3.66	22.12	PPLANE
20+ TO 30	32	13	15	30	37	45	44	216	COUNT
	14.81	6.02	6.94	13.69	17.13	20.83	20.37	100.00	PROW
	33.33	13.40	32.61	22.56	23.42	38.46	37.61	28.27	PCOL
	4.19	1.70	1.96	3.93	4.84	5.89	5.76	28.27	PPLANE
30+ TO 40	26	46	13	38	40	27	25	215	COUNT
	12.09	21.40	6.05	17.67	18.60	12.56	11.63	100.00	PROW
	27.08	47.42	28.24	28.57	25.32	23.08	21.37	28.14	PCOL
	3.40	6.02	1.70	4.97	5.24	3.53	3.27	28.14	PPLANE
40+ TO 50	18	10	9	24	22	18	16	117	COUNT
	15.38	8.55	7.69	20.51	18.80	15.38	13.68	100.00	PROW
	18.75	10.31	19.57	18.05	13.92	15.38	13.68	15.31	PCOL
	2.36	1.31	1.18	3.14	2.88	2.36	2.09	15.31	PPLANE
50+ TO 60	10	2	1	4	15	7	3	42	COUNT
	23.81	4.76	2.38	9.52	35.71	16.67	7.14	100.00	PROW
	10.42	2.04	2.17	3.01	9.49	5.98	2.56	5.50	PCOL
	1.31	.26	.13	.52	1.96	.92	.39	5.50	PPLANE
GREATER THAN 60	0	0	0	0	4	0	1	5	COUNT
	.00	.00	.00	.00	80.00	.00	20.00	100.00	PROW
	.00	.00	.00	.00	2.53	.00	.85	.65	PCOL
	.00	.00	.00	.00	.52	.00	.13	.65	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PPLANE

TABLE A.9
 CIVIL STATUS OF SETTLERS
 ROWS.....CATEGORIES OF STATSET
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CAWANAVI	YAPACANI	CH-PIRAY	TOTAL	
MARRIED	79	73	36	90	125	79	92	574	COUNT
	13.74	12.72	6.27	15.68	21.78	13.76	16.03	100.00	PROW
	82.20	76.04	78.26	69.23	82.24	69.91	78.63	76.53	PCOL
	10.53	9.73	4.80	12.00	16.67	10.53	12.27	76.53	PPLANE
SINGLE	2	14	5	19	8	8	12	68	COUNT
	2.94	20.59	7.35	27.94	11.76	11.76	17.65	100.00	PROW
	2.08	14.58	10.87	14.62	5.26	7.08	10.26	9.07	PCOL
	.27	1.87	.67	2.53	1.07	1.07	1.60	9.07	PPLANE
DIVORCED	1	0	0	0	1	1	0	3	COUNT
	33.33	.00	.00	.00	33.33	33.33	.00	100.00	PROW
	1.04	.00	.00	.00	.66	.88	.00	.40	PCOL
	.13	.00	.00	.00	.13	.13	.00	.40	PPLANE
WIDOW	4	2	2	5	12	4	4	33	COUNT
	12.12	6.06	6.06	15.15	36.36	12.12	12.12	100.00	PROW
	4.17	2.08	4.35	3.85	7.89	3.54	3.42	4.40	PCOL
	.53	.27	.27	.67	1.60	.53	.53	4.40	PPLANE
LIVINGW	10	7	3	16	5	21	9	71	COUNT
	14.08	9.86	4.23	22.54	7.04	29.58	12.68	100.00	PROW
	10.42	7.29	6.52	12.31	3.29	18.58	7.69	9.47	PCOL
	1.33	.93	.40	2.13	.67	2.80	1.20	9.47	PPLANE
NO ANSWR	0	0	0	0	1	0	0	1	COUNT
	.00	.00	.00	.00	100.00	.00	.00	100.00	PROW
	.00	.00	.00	.00	.66	.00	.00	.13	PCOL
	.00	.00	.00	.00	.13	.00	.00	.13	PPLANE
TOTAL	96	96	46	130	152	113	117	750	COUNT
	12.80	12.80	6.13	17.33	20.27	15.07	15.60	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.80	12.80	6.13	17.33	20.27	15.07	15.60	100.00	PPLANE

TABLE A.10

DOES THE SETTLER READ OR WRITE
 ROWS.....CATEGORIES OF FLDNRWRSE
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
READWRIT	64	80	40	107	114	98	96	599	COUNT
	10.68	13.36	6.68	17.86	19.03	16.36	16.03	100.00	PROW
	66.67	83.33	86.96	82.31	75.50	85.96	82.05	79.87	PCOL
	8.53	10.67	5.33	14.27	15.20	13.07	12.80	79.87	PPLANE
DONTRWR	32	16	6	23	37	16	21	151	COUNT
	21.19	10.60	3.97	15.23	24.50	10.60	13.91	100.00	PROW
	33.33	16.67	13.04	17.69	24.50	14.04	17.95	20.13	PCOL
	4.27	2.13	.80	3.07	4.93	2.13	2.80	20.13	PPLANE
TOTAL	96	96	46	130	151	114	117	750	COUNT
	12.80	12.80	6.13	17.33	20.13	15.20	15.60	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.80	12.80	6.13	17.33	20.13	15.20	15.60	100.00	PPLANE

TABLE A.11

SETTLERS' LEVEL OF EDUCATION
 ROWS.....CATEGORIES OF EDUCATN
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	ABENI	TAHANI	ICARANAVI	YAPACANI	CHPIRAY	TOTAL	
	0	0	0	2	1	1	0	4	COUNT
	-	-	-	2	1	1	-	4	SUM, EDUCATN
	-	-	-	1,000	1,000	1,000	-	1,000	MEAN, EDUCATN
PROFESS	-	-	-	0,000	-	-	-	0,000	SDV, EDUCATN
	.00	.00	.00	50.00	25.00	25.00	.00	100.00	PRON
	.00	.00	.00	1.61	.67	1.01	.00	.57	PCOL
	.00	.00	.00	.28	.14	.14	.00	.57	PPLANE
	0	1	0	1	1	0	0	3	COUNT
	-	3	-	3	3	-	-	9	SUM, EDUCATN
	-	3,000	-	3,000	3,000	-	-	3,000	MEAN, EDUCATN
TECHSCH	-	-	-	-	-	-	-	0,000	SDV, EDUCATN
	.00	33.33	.00	33.33	33.33	.00	.00	100.00	PRON
	.00	1.06	.00	.81	.67	.00	.00	.43	PCOL
	.00	.14	.00	.14	.14	.00	.00	.43	PPLANE
	25	28	22	45	43	40	29	232	COUNT
	124	137	106	217	204	191	137	1116	SUM, EDUCATN
	4,960	4,893	4,818	4,822	4,744	4,775	4,724	4,810	MEAN, EDUCATN
HIGHSC	2,000	3,150	3,948	3,866	4,415	4,229	4,549	3,929	SDV, EDUCATN
	10.78	12.07	9.48	19.40	18.53	17.24	12.50	100.00	PRON
	26.04	29.79	50.00	36.29	28.86	40.40	29.29	32.91	PCOL
	3.55	3.97	3.12	6.38	6.10	5.67	4.11	32.91	PPLANE
	38	48	16	52	66	44	52	316	COUNT
	228	288	96	312	396	264	312	1,896	SUM, EDUCATN
	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	MEAN, EDUCATN
PRIMARY	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	SDV, EDUCATN
	12.03	15.19	5.06	16.46	20.89	13.92	16.46	100.00	PRON
	39.58	51.06	36.36	41.94	44.30	44.04	52.53	44.82	PCOL
	5.39	6.61	2.27	7.38	9.36	6.24	7.38	44.82	PPLANE
	33	17	6	24	38	14	18	150	COUNT
	231	119	42	168	266	98	126	1,050	SUM, EDUCATN
	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	MEAN, EDUCATN
NO EDUC	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	SDV, EDUCATN
	22.00	11.33	4.00	16.00	25.33	9.33	12.00	100.00	PRON
	34.38	18.09	13.64	19.35	25.50	14.14	18.18	21.28	PCOL
	4.68	2.41	.85	3.40	5.39	1.99	2.55	21.28	PPLANE
	96	94	44	124	149	99	99	705	COUNT
	583	547	244	702	870	554	575	4,075	SUM, EDUCATN
	6,073	5,819	5,545	5,661	5,839	5,596	5,808	5,780	MEAN, EDUCATN
TOTAL	7,960	8,027	8,478	1,0584	9,869	9,575	8,290	9,285	SDV, EDUCATN
	13.62	13.33	6.24	17.59	21.13	14.04	14.04	100.00	PRON
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.62	13.33	6.24	17.59	21.13	14.04	14.04	100.00	PPLANE

TABLE A.12

DOES THE WIFE READ OR WRITE

ROWS.....CATEGORIES OF REGION

COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENI I	A RENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
FEARWRIT	23	30	23	47	56	39	49	273	COUNT
	8.42	13.19	8.42	17.22	20.51	14.29	17.95	100.00	PROW
	25.84	45.00	52.97	44.34	42.42	37.50	49.49	42.06	PCOL
	3.54	5.55	3.54	7.24	8.63	6.01	7.55	42.06	PPLANE
DONTRWR	66	44	16	59	76	65	50	376	COUNT
	17.55	11.70	4.26	15.69	20.21	17.29	13.30	100.00	PROW
	74.16	55.00	41.03	55.66	57.52	62.50	50.51	57.94	PCOL
	10.17	6.78	2.47	9.09	11.71	10.02	7.70	57.94	PPLANE
TOTAL	89	80	39	106	132	104	99	649	COUNT
	13.71	12.33	6.01	16.33	20.34	16.02	15.25	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.71	12.33	6.01	16.33	20.34	16.02	15.25	100.00	PPLANE

TABLE A.13

LEVEL OF EDUCATION OF WIVES

ROWS.....CATEGORIES OF EDUWIFE

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BEMI I	A BEMI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
PROFESSN L	0	0	0	1	1	0	1	3	COUNT
	.00	.00	.00	33.33	33.33	.00	33.33	100.00	PROW
	.00	.00	.00	.95	.76	.00	1.01	.46	PCOL
	.00	.00	.00	.15	.15	.00	.15	.46	PPLANE
COLLEGE	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
TECHSCH	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
HIGHSCH	0	2	2	0	3	0	6	13	COUNT
	.00	15.38	15.38	.00	23.08	.00	46.15	100.00	PROW
	.00	2.50	5.13	.00	2.27	.00	6.06	2.01	PCOL
	.00	.31	.31	.00	.46	.00	.93	2.01	PPLANE
PRIMARY	24	35	21	51	52	38	41	262	COUNT
	9.16	13.36	8.02	19.47	19.85	14.50	15.65	100.00	PROW
	26.97	43.75	53.85	48.57	39.39	37.25	41.41	40.56	PCOL
	3.72	5.42	3.25	7.89	8.05	5.88	6.35	40.56	PPLANE
NO EDUC	65	43	16	53	76	64	51	368	COUNT
	17.66	11.68	4.35	14.40	20.65	17.39	13.86	100.00	PROW
	73.03	53.75	41.03	50.48	57.58	62.75	51.52	56.97	PCOL
	10.06	6.66	2.48	8.20	11.76	9.91	7.89	56.97	PPLANE
TOTAL	89	80	39	105	132	102	99	646	COUNT
	13.78	12.38	6.04	16.25	20.43	15.79	15.33	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.78	12.38	6.04	16.25	20.43	15.79	15.33	100.00	PPLANE

TABLE A.14

DO THE CHILDREN GO TO SCHOOL
 ROWS.....CATEGORIES OF SCHLCHIL
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENDI	A RENDI	ICARANAVI	YAPACANI	CH-PIRAYI	TOTAL	
GO	55	37	27	53	75	54	54	355	COUNT
SCHCOL	15.49	10.42	7.01	14.93	21.13	15.21	15.21	100.00	PROW
	84.62	92.50	100.00	69.74	87.21	77.14	98.18	84.73	PCOL
	13.13	8.63	6.44	12.65	17.90	12.89	12.89	84.73	PPLANE
DONT GO	10	3	0	23	11	16	1	64	COUNT
	15.63	4.69	.00	35.94	17.19	25.00	1.56	100.00	PROW
	15.38	7.50	.00	30.26	12.79	22.66	1.82	15.27	PCOL
	2.39	.72	.00	5.49	2.63	3.82	.24	15.27	PPLANE
TOTAL	65	40	27	76	86	70	55	419	COUNT
	15.51	9.55	6.44	18.14	20.53	16.71	13.13	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	15.51	9.55	6.44	18.14	20.53	16.71	13.13	100.00	PPLANE

TABLE 15
 DO THE CHILDREN GO TO HIGH SCHOOL
 ROWS.....CATEGORIES OF HSCSCHIL
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENDI	A RENDI	ICARANAVI	YAPACANI	CH-PIRAYI	TOTAL	
GO	44	33	18	37	61	48	49	290	COUNT
SCHOOL	15.17	11.38	6.21	12.76	21.03	16.55	16.90	100.00	PROW
	80.00	89.19	64.67	63.79	82.43	88.89	90.74	80.78	PCOL
	12.20	9.19	5.01	10.31	16.99	13.37	13.65	80.78	PPLANE
DONT GO	11	4	9	21	13	6	5	69	COUNT
	15.94	5.80	13.04	30.43	18.84	8.76	7.25	100.00	PROW
	20.00	10.81	33.33	36.21	17.57	11.11	9.26	19.22	PCOL
	3.06	1.11	2.51	5.85	3.62	1.67	1.39	19.22	PPLANE
TOTAL	55	37	27	58	74	54	54	359	COUNT
	15.32	10.31	7.52	16.16	20.61	15.04	15.04	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	15.32	10.31	7.52	16.16	20.61	15.04	15.04	100.00	PPLANE

TABLE 7.15
 LEVEL OF EDUCATION OF CHILDREN
 ROWS.....CATEGORIES OF EDUCCHI
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
1-3 PRIM:	12	23	5	51	21	3	8	123	COUNT
	9.76	18.70	1.07	41.46	17.07	2.44	6.50	100.00	PROW
	32.43	46.00	62.50	57.30	25.61	60.00	66.67	43.46	PCOL
	4.24	8.13	1.77	18.02	7.42	1.16	2.83	43.46	PPLANE
4-6 PRIM:	4	8	1	9	13	1	1	37	COUNT
	10.81	21.62	2.70	24.32	35.14	2.70	2.70	100.00	PROW
	10.61	16.00	12.50	10.11	15.85	20.00	8.33	13.07	PCOL
	1.41	2.83	.35	3.18	4.59	.35	.35	13.07	PPLANE
1-3 HIGH:	5	13	0	18	13	1	1	51	COUNT
	9.80	25.49	.00	35.29	25.49	1.96	1.96	100.00	PROW
	13.51	26.00	.00	20.22	15.85	20.00	8.33	18.02	PCOL
	1.77	4.59	.00	6.36	4.59	.35	.35	18.02	PPLANE
4-6 HIGH:	16	6	2	11	35	0	2	72	COUNT
	22.22	8.33	2.78	15.28	48.61	.00	2.78	100.00	PROW
	43.24	12.00	25.00	12.36	42.68	.00	16.67	25.44	PCOL
	5.65	2.12	.71	3.89	12.37	.00	.71	25.44	PPLANE
TOTAL	37	50	8	89	82	5	12	283	COUNT
	13.07	17.67	2.83	31.45	28.98	1.77	4.24	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.07	17.67	2.83	31.45	28.98	1.77	4.24	100.00	PPLANE

TABLE A.16

DISEASES SUFFERED BY COLONISTS BEFORE COMING TO THE ZONE

ROWS.....CATEGORIES OF DISEASES

COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
STOMACH	65	47	32	45	103	72	97	501	COUNT
	12.97	9.38	6.39	16.97	20.56	14.37	19.36	100.00	PROW
	71.43	66.20	71.11	73.28	78.03	65.45	87.39	74.11	PCOL
	9.62	6.95	4.73	12.57	15.24	10.65	14.35	74.11	PPLANE
LUNGS	21	19	11	25	15	20	12	123	COUNT
	17.07	15.45	8.94	20.33	12.20	16.26	9.76	100.00	PROW
	23.08	26.76	24.44	21.55	11.36	18.18	10.81	18.20	PCOL
	3.11	2.81	1.63	3.70	2.22	2.96	1.70	18.20	PPLANE
OTHER	4	1	0	6	11	17	2	41	COUNT
	9.76	2.44	.00	14.63	26.83	41.46	4.88	100.00	PROW
	4.40	1.41	.00	5.17	8.33	15.45	1.80	6.07	PCOL
	.59	.15	.00	.89	1.63	2.51	.30	6.07	PPLANE
DONTKNW	1	4	2	0	3	1	0	11	COUNT
	9.09	36.36	18.18	.00	27.27	9.09	.00	100.00	PROW
	1.10	5.63	4.44	.00	2.27	.91	.00	1.63	PCOL
	.15	.59	.30	.00	.44	.15	.00	1.63	PPLANE
TOTAL	91	71	45	116	132	110	111	676	COUNT
	13.46	10.50	6.66	17.16	19.53	16.27	16.42	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.46	10.50	6.66	17.16	19.53	16.27	16.42	100.00	PPLANE

TABLE A.17

DISEASES SUFFERED IN THE COLONY
 ROWS.....CATEGORIES OF DISCOLOR
 COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENO I	A RENO II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
STOMACH	20.00	20.00	.00	20.00	20.00	.00	20.00	100.00	COUNT
	1.37	5.26	.00	1.12	1.12	.00	.96	1.02	PROW
	.20	.20	.00	.20	.20	.00	.20	1.02	PCOL
									PPLANE
LUNGS	41	12	27	66	56	49	90	341	COUNT
	12.02	3.52	7.92	19.35	16.42	14.37	26.39	100.00	PROW
	56.15	63.16	47.10	74.16	62.92	56.98	86.54	69.45	PCOL
	8.35	2.44	5.50	13.44	11.41	9.98	18.33	69.45	PPLANE
OTHER	25	3	3	21	23	28	8	112	COUNT
	23.21	2.68	2.68	18.75	20.54	25.00	7.14	100.00	PROW
	35.62	15.79	9.66	23.60	25.84	32.56	7.69	22.81	PCOL
	5.30	.61	.61	4.28	4.68	5.70	1.63	22.81	PPLANE
DONTKNW	5	3	1	1	9	9	5	33	COUNT
	15.15	9.09	3.03	3.03	27.27	27.27	15.15	100.00	PROW
	6.85	15.79	3.23	1.12	10.11	10.47	4.81	6.72	PCOL
	1.02	.61	.20	.20	1.83	1.83	1.02	6.72	PPLANE
TOTAL	73	19	31	89	89	86	104	491	COUNT
	14.67	3.87	6.31	18.13	18.13	17.52	21.18	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	14.67	3.87	6.31	18.13	18.13	17.52	21.18	100.00	PPLANE

TABLE A.18

LANGUAGE SPOKEN IN THE SEYTLER'S HOME

ROWS.....CATEGORIES OF LANGUAGE

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A FENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
SPANISH	65	25	40	108	127	115	111	591	COUNT
	11.00	4.23	6.77	18.27	21.49	19.46	18.78	100.00	PROW
	67.71	26.04	86.96	81.82	81.41	98.29	96.52	77.97	PCOL
	8.58	3.30	5.28	14.25	16.75	15.17	14.64	77.97	PPLANE
AYMARA	0	2	6	21	29	0	0	58	COUNT
	.00	3.45	10.34	36.21	50.00	.00	.00	100.00	PROW
	.00	2.08	13.04	15.91	18.59	.00	.00	7.65	PCOL
	.00	.26	.79	2.77	3.83	.00	.00	7.65	PPLANE
QUECHUA	31	69	0	3	0	2	4	109	COUNT
	28.44	63.30	.00	2.75	.00	1.83	3.67	100.00	PROW
	32.29	71.88	.00	2.27	.00	1.71	3.48	14.38	PCOL
	4.09	9.10	.00	.40	.00	.26	.53	14.38	PPLANE
OTHER	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
NO ANSWR	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
TOTAL	96	96	46	132	156	117	115	758	COUNT
	12.66	12.66	6.07	17.41	20.58	15.44	15.17	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.66	12.66	6.07	17.41	20.58	15.44	15.17	100.00	PPLANE

TABLE 2.19

RELIGION OF SETTLERS

ROWS.....CATEGORIES OF RELIGION

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENT I	A BENT II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
R CATMO	15.34	12.59	5.00	14.48	17.76	17.07	17.76	100.00	COUNT
	92.71	76.84	63.04	64.12	66.03	86.09	92.79	77.33	PROW
	11.87	9.73	3.87	11.20	13.73	13.20	13.73	77.33	PCOL
									PPLANE
PROTEST	3.73	12.42	9.32	27.33	32.30	9.94	4.97	100.00	COUNT
	6.25	21.05	32.61	33.59	33.33	13.91	7.21	21.47	PROW
	.80	2.67	2.00	5.87	6.93	2.13	1.07	21.47	PCOL
									PPLANE
SEVER	.00	.00	.00	.00	100.00	.00	.00	100.00	COUNT
	.00	.00	.00	.00	.64	.00	.00	.13	PROW
	.00	.00	.00	.00	.13	.00	.00	.13	PCOL
									PPLANE
NO ANSWR	12.50	25.00	25.00	37.50	.00	.00	.00	100.00	COUNT
	1.04	2.11	4.35	2.29	.00	.00	.00	1.07	PROW
	.13	.27	.27	.40	.00	.00	.00	1.07	PCOL
									PPLANE
TOTAL	12.50	12.67	6.13	17.47	20.80	15.33	14.80	100.00	COUNT
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PROW
	12.50	12.67	6.13	17.47	20.80	15.33	14.80	100.00	PCOL
									PPLANE

TABLE A.20

ASSETS AVAILABILITY IN PLACE OF ORIGIN
 ROWS.....CATEGORIES OF ASSETS
 COLUMNS.....CATEGORIES OF DISTRICT

	ICAPARE	ICIMOSE	IAHENA	IAHENA	ICAPANAVI	ITAPACANI	ICOMINAYI	TOTAL	
	11	11	0	10	5	3	5	49	COUNT
HOUSE	22.45	22.45	8.18	20.41	10.20	6.12	10.20	100.00	PROG
	11.43	11.34	8.70	7.52	3.16	2.56	4.27	6.41	PCOL
	1.44	1.44	.52	1.31	.65	.39	.65	6.41	PPLANE
CATTLE	0	1	0	0	3	0	0	8	COUNT
	.00	12.50	.00	50.00	37.50	.00	.00	100.00	PROG
	.00	1.03	.00	3.01	1.90	.00	.00	1.05	PCOL
	.00	.13	.40	.52	.39	.00	.00	1.05	PPLANE
LAND	18	8	0	7	1	2	4	40	COUNT
	45.00	20.00	.00	17.50	2.50	5.00	10.00	100.00	PROG
	19.75	8.25	.00	5.24	.63	1.71	3.42	5.24	PCOL
	2.36	1.05	.00	.92	.13	.26	.52	5.24	PPLANE
TOOLS	0	0	0	2	0	1	0	3	COUNT
	.00	.00	.00	64.67	.00	33.33	.00	100.00	PROG
	.00	.00	.00	1.50	.00	.85	.00	.39	PCOL
	.00	.00	.00	.26	.00	.13	.00	.39	PPLANE
OTHER	0	0	0	1	0	0	0	1	COUNT
	.00	.00	.00	100.00	.00	.00	.00	100.00	PROG
	.00	.00	.00	.75	.00	.00	.00	.13	PCOL
	.00	.00	.00	.13	.00	.00	.00	.13	PPLANE
HOU-CATL	0	2	3	3	2	1	0	11	COUNT
	.00	18.18	27.27	27.27	18.18	9.09	.00	100.00	PROG
	.30	2.26	6.52	2.26	1.27	.85	.00	1.44	PCOL
	.00	.25	.39	.39	.26	.13	.00	1.44	PPLANE
HOU-CATL	2	4	10	18	21	2	3	60	COUNT
	3.33	6.67	14.07	30.00	35.00	3.33	5.00	100.00	PROG
	2.08	4.12	21.74	13.53	13.29	1.71	2.56	7.85	PCOL
	.26	.52	1.31	2.36	2.75	.26	.39	7.85	PPLANE
COMBINT	65	71	29	82	126	108	105	592	COUNT
	10.98	11.99	4.90	14.86	21.20	18.24	17.74	100.00	PROG
(*)	67.71	73.20	63.04	66.17	74.75	42.31	84.74	77.49	PCOL
	8.51	9.29	3.80	11.52	16.49	14.14	13.74	77.49	PPLANE
TOTAL	96	97	46	133	158	117	117	764	COUNT
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PROG
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00	PPLANE

(*)

Disaggregate
 as follows:

No data	50	33	18	32	53	86	92	364
Other comb.	15	38	11	56	73	22	13	228

TABLE 7.21

DID THE SETTLERS KEPT OR SOLD THEIR LAND

ROWS.....CATEGORIES OF LANDORS

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENI I	A RENI II	CARANAUI	YAPACANI	CH-PIRAY	TOTAL	
KEPTLAND:	35	48	20	71	86	25	20	305	COUNT
	11.48	15.74	6.56	23.28	28.20	8.20	6.56	100.00	PROW
	85.37	84.21	83.33	83.53	86.87	96.15	90.91	86.16	PCOL
	9.89	13.56	5.65	20.06	24.29	7.06	5.65	86.16	PPLANE
SOLDLAND:	5	7	3	11	8	1	2	37	COUNT
	13.51	18.92	8.11	29.73	21.62	2.70	5.41	100.00	PROW
	12.20	12.28	12.50	12.94	8.08	3.85	9.09	10.45	PCOL
	1.41	1.98	.85	3.11	2.76	.28	.56	10.45	PPLANE
EXCHLAND:	0	2	1	3	4	0	0	10	COUNT
	.00	20.00	10.00	30.00	40.00	.00	.00	100.00	PROW
	.00	3.51	4.17	3.53	4.04	.00	.00	2.82	PCOL
	.00	.56	.28	.85	1.13	.00	.00	2.82	PPLANE
NO ANSWER:	1	0	0	0	1	0	0	2	COUNT
	50.00	.00	.00	.00	50.00	.00	.00	100.00	PROW
	2.44	.00	.00	.00	1.01	.00	.00	.56	PCOL
	.28	.00	.00	.00	.28	.00	.00	.56	PPLANE
TOTAL	41	57	24	85	99	26	22	354	COUNT
	11.58	16.10	6.78	24.01	27.97	7.34	6.21	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	11.58	16.10	6.78	24.01	27.97	7.34	6.21	100.00	PPLANE

TABLE A.22

PREVIOUS SITUATION BEFORE BECOMING COLONISTS

ROWS.....CATEGORIES OF PREVISIT

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
GOOD	5	16	17	39	25	8	4	114	COUNT
	4.39	14.04	14.91	34.21	21.93	7.02	3.51	100.00	PROW
	5.43	16.67	37.78	30.23	16.03	6.96	3.48	15.24	PCOL
	.67	2.14	2.27	5.21	3.34	1.07	.53	15.24	PPLANE
FAIR	42	35	12	67	86	101	107	430	COUNT
	9.77	8.14	2.79	15.58	15.35	23.49	24.88	100.00	PROW
	45.65	36.40	26.67	51.94	42.31	87.83	93.04	57.49	PCOL
	5.61	4.68	1.60	8.96	8.82	13.50	14.30	57.49	PPLANE
RAD	45	45	16	23	65	6	4	204	COUNT
	22.06	22.06	7.84	11.27	31.86	2.94	1.96	100.00	PROW
	48.91	46.88	35.56	17.83	41.67	5.22	3.48	27.27	PCOL
	6.02	6.02	2.14	3.07	8.69	.80	.53	27.27	PPLANE
TOTAL	92	96	45	129	156	115	115	748	COUNT
	12.30	12.83	6.02	17.25	20.86	15.37	15.37	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.30	12.83	6.02	17.25	20.86	15.37	15.37	100.00	PPLANE

TABLE A.23

REASONS THAT INDUCED THE SETTLER TO COLONIZE
 ROWS.....CATEGORIES OF COLONISM
 COLUMNS.....CATEGORIES OF DISTRICT

	ICHAPARE	ICHIMORE	IA BENI I	II	ICARANAVI	IYAPI	ICANI	ITCH-PIRAYI	TOTAL	
ECONOM	29	0	15	44	55	17	0	160	COUNT	
	18.12	.00	4.38	27.50	34.38	10.62	.00	100.00	PROW	
	31.52	.00	32.61	33.59	35.48	14.78	.00	29.68	PCOL	
	5.38	.00	2.78	8.16	10.20	3.15	.00	29.68	PPLANE	
HEALTH	0	0	0	1	1	0	0	2	COUNT	
	.00	.00	.00	50.00	50.00	.00	.00	100.00	PROW	
	.00	.00	.00	.76	.65	.00	.00	.37	PCOL	
	.00	.00	.00	.19	.19	.00	.00	.37	PPLANE	
PROPAGN	2	0	5	16	5	49	0	77	COUNT	
	2.60	.00	6.49	20.78	6.49	63.64	.00	100.00	PROW	
	2.17	.00	10.87	12.21	3.23	42.61	.00	14.29	PCOL	
	.37	.00	.93	2.97	.93	9.09	.00	14.29	PPLANE	
RELATVS	2	0	3	4	8	1	0	23	COUNT	
	8.70	.00	13.04	39.13	34.78	4.35	.00	100.00	PROW	
	2.17	.00	6.52	6.87	5.16	.87	.00	4.27	PCOL	
	.37	.00	.56	1.67	1.48	.19	.00	4.27	PPLANE	
ADVENTRE	2	0	0	3	3	0	0	8	COUNT	
	25.00	.00	.00	37.50	37.50	.00	.00	100.00	PROW	
	2.17	.00	.00	2.29	1.94	.00	.00	1.48	PCOL	
	.37	.00	.00	.56	.56	.00	.00	1.48	PPLANE	
SUGGESTS	3	0	2	1	2	0	0	8	COUNT	
	37.50	.00	25.00	12.50	25.00	.00	.00	100.00	PROW	
	3.26	.00	4.35	.76	1.29	.00	.00	1.48	PCOL	
	.56	.00	.37	.19	.37	.00	.00	1.48	PPLANE	
OTHER RS	5	0	0	5	6	2	0	18	COUNT	
	27.78	.00	.00	27.78	33.33	11.11	.00	100.00	PROW	
	5.43	.00	.00	3.82	3.87	1.74	.00	3.34	PCOL	
	.93	.00	.00	.93	1.11	.37	.00	3.34	PPLANE	
COMBINT	49	0	21	52	75	46	0	243	COUNT	
	20.16	.00	8.64	21.40	30.86	18.93	.00	100.00	PROW	
	53.26	.00	45.65	39.69	48.39	40.00	.00	45.08	PCOL	
	9.09	.00	3.90	9.65	13.91	8.53	.00	45.08	PPLANE	
TOTAL	92	0	46	131	155	115	0	539	COUNT	
	17.07	.00	8.53	24.30	28.76	21.34	.00	100.00	PROW	
	100.00	.00	100.00	100.00	100.00	100.00	.00	100.00	PCOL	
	17.07	.00	8.53	24.30	28.76	21.34	.00	100.00	PPLANE	

TABLE A.24

DID THE COLONISTS ARRIVE WITH OR WITHOUT THEIR FAMILIES

ROWS.....CATEGORIES OF ARRIVAL

COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
ALONE	43	34	20	57	71	64	38	332	COUNT
	12.95	11.75	6.02	17.17	21.39	19.28	11.45	100.00	PROW
	45.26	41.05	43.48	43.51	45.81	55.65	38.78	45.17	PCOL
	5.85	5.31	2.72	7.76	4.66	8.71	5.17	45.17	PPLANE
WITHFAM	22	19	7	36	43	51	57	235	COUNT
	9.36	8.09	2.98	15.32	18.30	21.70	24.26	100.00	PROW
	23.16	20.00	15.22	27.48	27.74	44.35	58.16	31.97	PCOL
	2.99	2.59	.95	4.90	5.85	6.94	7.76	31.97	PPLANE
WITHGRUP	1	15	11	11	5	0	0	43	COUNT
	2.33	34.88	25.58	25.58	11.63	.00	.00	100.00	PROW
	1.05	15.79	23.91	8.40	3.23	.00	.00	5.85	PCOL
	.14	2.04	1.50	1.50	.68	.00	.00	5.85	PPLANE
WITHFRDS	17	15	4	18	18	0	3	75	COUNT
	22.67	20.00	5.33	24.00	24.00	.00	4.00	100.00	PROW
	17.69	15.79	8.70	13.74	11.61	.00	3.96	10.20	PCOL
	2.31	2.04	.54	2.45	2.45	.00	.41	10.20	PPLANE
FAMFRDS	12	7	4	9	18	0	0	50	COUNT
	24.00	14.00	8.00	18.00	36.00	.00	.00	100.00	PROW
	12.63	7.37	8.70	6.87	11.61	.00	.00	6.80	PCOL
	1.63	.95	.54	1.22	2.45	.00	.00	6.80	PPLANE
TOTAL	65	45	46	131	155	115	98	735	COUNT
	12.93	12.93	6.26	17.82	21.09	15.65	13.33	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.93	12.93	6.26	17.82	21.09	15.65	13.33	100.00	PPLANE

TABLE A.25

THE COLONISTS LIKE OR DISLIKE ACTUALLY THE ZONES

ROWS.....CATEGORIES OF LIKEDISL

COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
LIKEMORE	44	82	28	106	138	113	112	623	COUNT
	7.06	13.16	4.49	17.01	22.15	18.14	17.98	100.00	PROW
	49.44	94.25	66.67	83.46	90.20	97.41	96.55	85.34	PCOL
	6.03	11.23	3.84	14.52	18.90	15.48	15.34	85.34	PPLANE
LIKELESS	1	1	9	17	9	2	1	42	COUNT
	2.38	2.38	21.43	45.24	21.43	4.76	2.38	100.00	PROW
	1.12	1.15	21.43	14.95	5.88	1.72	.86	5.75	PCOL
	.14	.14	1.23	2.60	1.23	.27	.14	5.75	PPLANE
MORETHAN	44	4	5	2	6	1	3	65	COUNT
	67.69	6.15	7.59	3.08	9.23	1.54	4.62	100.00	PROW
	49.44	4.60	11.90	1.57	3.92	.86	2.59	8.90	PCOL
	6.03	.55	.68	.27	.82	.14	.41	6.90	PPLANE
INDIFF	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
UNSUR	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
TOTAL	89	87	42	127	153	116	116	730	COUNT
	12.19	11.92	5.75	17.40	20.96	15.89	15.89	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.19	11.92	5.75	17.40	20.96	15.89	15.89	100.00	PPLANE

TABLE A.26

LEARNING OF AGRICULTURAL TECHNIQUES BY SETTLERS
 ROWS.....CATEGORIES OF TECHLER
 COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
PREVEEXP	13	54	23	44	71	107	85	397	COUNT
	3.27	13.60	5.79	11.06	17.88	26.95	21.41	100.00	PROW
	13.54	56.25	50.00	33.33	45.81	92.24	77.98	52.93	PCOL
	1.73	7.20	3.07	5.87	9.47	14.27	11.33	52.93	PPLANE
EXTEN3N	1	29	4	48	2	0	1	85	COUNT
	1.18	34.12	4.71	56.47	2.35	.00	1.18	100.00	PROW
	1.04	30.21	8.70	36.36	1.29	.00	.92	11.33	PCOL
	.13	3.87	.53	6.40	.27	.00	.13	11.33	PPLANE
NEIGHBOR	72	10	13	28	53	8	11	195	COUNT
	36.92	5.13	6.67	14.36	27.18	4.10	5.64	100.00	PROW
	75.00	10.42	28.26	21.21	34.19	6.90	10.09	26.00	PCOL
	9.60	1.33	1.73	3.73	7.07	1.07	1.47	26.00	PPLANE
LOCALLER	10	3	6	12	29	1	12	73	COUNT
	13.70	4.11	8.22	16.44	39.73	1.37	16.44	100.00	PROW
	10.42	3.13	13.04	9.09	18.71	.86	11.01	9.73	PCOL
	1.33	.40	.80	1.60	3.87	.13	1.60	9.73	PPLANE
TOTAL	96	96	46	132	155	116	109	750	COUNT
	12.80	12.80	6.13	17.60	20.67	15.47	14.53	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.80	12.80	6.13	17.60	20.67	15.47	14.53	100.00	PPLANE

TABLE A.27

ADAPTATION TO THE ZONE

ROWS.....CATEGORIES OF ADAPTATION

COLUMNS.....CATEGORIES OF DISTRICT

	: CHAPARE :	: CHIFORE :	: A BENI I :	: A BENI II :	: CARANAVI :	: YAPACANI :	: CH-PIRAY :	: TOTAL :	
YES	: 25 :	: 12 :	: 34 :	: 63 :	: 96 :	: 42 :	: 17 :	: 289 :	COUNT
	: 8.65 :	: 4.15 :	: 11.76 :	: 21.80 :	: 33.22 :	: 14.53 :	: 5.88 :	: 100.00 :	PROW
	: 26.60 :	: 12.90 :	: 75.56 :	: 48.84 :	: 61.94 :	: 36.84 :	: 15.60 :	: 39.11 :	PCOL
	: 3.38 :	: 1.62 :	: 4.60 :	: 8.53 :	: 12.99 :	: 5.68 :	: 2.30 :	: 39.11 :	PPLANE
NO	: 69 :	: 81 :	: 11 :	: 66 :	: 59 :	: 72 :	: 92 :	: 450 :	COUNT
	: 15.33 :	: 18.00 :	: 2.44 :	: 14.67 :	: 13.11 :	: 16.00 :	: 20.44 :	: 100.00 :	PROW
	: 73.40 :	: 87.10 :	: 24.44 :	: 51.16 :	: 38.06 :	: 63.16 :	: 84.40 :	: 60.89 :	PCOL
	: 9.34 :	: 10.96 :	: 1.49 :	: 8.93 :	: 7.98 :	: 9.74 :	: 12.45 :	: 60.89 :	PPLANE
TOTAL	: 94 :	: 93 :	: 45 :	: 129 :	: 155 :	: 114 :	: 109 :	: 739 :	COUNT
	: 12.72 :	: 12.58 :	: 6.09 :	: 17.46 :	: 20.97 :	: 15.43 :	: 14.75 :	: 100.00 :	PROW
	: 100.00 :	: 100.00 :	: 100.00 :	: 100.00 :	: 100.00 :	: 100.00 :	: 100.00 :	: 100.00 :	PCOL
	: 12.72 :	: 12.58 :	: 6.09 :	: 17.46 :	: 20.97 :	: 15.43 :	: 14.75 :	: 100.00 :	PPLANE

TABLE A.28

EATING HABITS IN THE COLONY
 ROWS.....CATEGORIES OF FEEDING
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
BETTER	30	60	21	51	74	16	76	328	COUNT
	9.15	18.29	6.40	15.55	22.54	4.88	23.17	100.00	PROW
	31.91	63.16	46.67	38.93	47.74	13.79	69.09	43.97	PCOL
	4.02	8.04	2.82	6.84	9.92	2.14	10.19	43.97	PPLANE
EQUAL	52	27	15	55	64	94	32	339	COUNT
	15.34	7.96	4.42	16.22	18.88	27.73	9.44	100.00	PROW
	55.32	28.42	33.33	41.98	41.26	81.03	29.09	45.44	PCOL
	6.97	3.62	2.01	7.37	8.58	12.60	4.29	45.44	PPLANE
WORSE	12	8	9	25	17	6	2	79	COUNT
	15.19	10.13	11.39	31.65	21.52	7.59	2.53	100.00	PROW
	12.77	8.42	20.00	19.08	10.97	5.17	1.82	10.59	PCOL
	1.61	1.07	1.21	3.35	2.28	.80	.27	10.59	PPLANE
TOTAL	94	95	45	131	155	116	110	746	COUNT
	12.60	12.73	6.03	17.56	20.78	15.55	14.75	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.60	12.73	6.03	17.56	20.78	15.55	14.75	100.00	PPLANE

TABLE A.29

PERIOD OF ARRIVAL TO THE COUNTRIES									
ROADS.....CATEGORIES OF REPAIR									
COLUMNS....CATEGORIES OF DISTRICT									
	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
LAST 6 MOS	0	0	0	4	1	0	0	5	COUNT
	.00	.00	.00	80.00	20.00	.00	.00	100.00	PROW
	.00	.00	.00	3.08	.64	.00	.00	.66	PCOL
	.00	.00	.00	.53	.13	.00	.00	.66	PPLANE
1971-72	0	10	2	5	10	3	7	37	COUNT
	.00	27.03	5.41	13.51	27.03	8.11	18.92	100.00	PROW
	.00	10.42	4.35	3.85	6.41	2.56	5.98	4.89	PCOL
	.00	1.32	.26	.66	1.32	.40	.93	4.89	PPLANE
1969-70	0	33	2	16	7	15	19	92	COUNT
	.00	35.87	2.17	17.39	7.61	16.30	20.65	100.00	PROW
	.00	34.38	4.35	12.31	4.49	12.82	16.24	12.17	PCOL
	.00	4.37	.26	2.12	.93	1.98	2.51	12.17	PPLANE
1967-68	0	22	3	38	15	20	52	150	COUNT
	.00	14.67	2.00	25.33	10.00	13.33	34.67	100.00	PROW
	.00	22.92	6.52	29.23	9.62	17.09	44.44	19.84	PCOL
	.00	2.91	.40	5.03	1.98	2.65	6.88	19.84	PPLANE
1965-66	12	12	7	37	24	23	13	128	COUNT
	9.38	9.38	5.47	28.91	18.75	17.97	10.16	100.00	PROW
	12.77	12.50	15.22	28.46	15.38	19.66	11.11	16.93	PCOL
	1.59	1.59	.93	4.89	3.17	3.04	1.72	16.93	PPLANE
BEF 65	82	19	32	30	99	56	26	344	COUNT
	23.84	5.52	9.30	8.72	28.78	16.28	7.56	100.00	PROW
	87.23	19.79	69.57	23.08	63.46	47.86	22.22	45.50	PCOL
	10.85	2.51	4.23	3.97	13.10	7.41	3.44	45.50	PPLANE
TOTAL	94	96	46	130	156	117	117	756	COUNT
	12.43	12.70	6.08	17.20	20.63	15.48	15.48	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.43	12.70	6.08	17.20	20.63	15.48	15.48	100.00	PPLANE

TABLE A.30

LENGTH OF STAY IN THE COLONIES
 ROWS.....CATEGORIES OF LENGTH
 COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A BANI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
1-5 YS	0	43	4	26	18	25	25	141	COUNT
	.00	30.50	2.84	18.42	12.77	17.73	17.73	100.00	PROW
	.00	44.79	8.70	20.80	11.61	21.37	21.37	18.77	PCOL
	.00	5.73	.53	3.46	2.40	3.33	3.33	18.77	PPLANE
6-10 YS	14	47	14	89	59	57	70	350	COUNT
	4.00	13.43	4.00	25.43	16.86	16.29	20.00	100.00	PROW
	14.74	48.96	30.43	71.20	38.06	48.72	59.63	46.60	PCOL
	1.86	6.26	1.86	11.85	7.86	7.59	9.32	46.60	PPLANE
11-15 YS	24	5	28	9	70	35	17	187	COUNT
	12.83	2.67	14.97	4.28	37.43	18.72	9.09	100.00	PROW
	25.26	5.21	60.87	6.40	45.16	29.91	14.53	24.90	PCOL
	3.20	.67	3.73	1.07	9.32	4.66	2.26	24.90	PPLANE
16-20 YS	57	1	0	2	8	0	5	73	COUNT
	78.08	1.37	.00	2.74	10.96	.00	6.85	100.00	PROW
	60.00	1.04	.00	1.60	5.16	.00	4.27	9.72	PCOL
	7.59	.13	.00	.27	1.07	.00	.67	9.72	PPLANE
TOTAL	95	95	46	125	155	117	117	751	COUNT
	12.65	12.78	6.13	16.64	20.64	15.58	15.58	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.65	12.78	6.13	16.64	20.64	15.58	15.58	100.00	PPLANE

TABLE A.31

PERIOD WHEN THE FAMILY JOINED THE COLONIST									
ROWS.....	CATEGORIES OF JOINFAM								
COLUMNS....	CATEGORIES OF DISTRICT								
	CHAPARE	CHIMORE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
WITH HIM	14	15	5	33	40	46	71	225	COUNT
	6.22	7.11	2.22	14.67	17.78	20.44	31.56	100.00	PROW
	21.54	19.51	11.03	27.50	26.14	45.54	70.30	33.83	PCOL
	2.11	2.41	.75	4.96	6.02	6.92	10.68	33.83	PPLANE
FST YR	6	20	11	23	11	7	11	89	COUNT
	6.74	22.47	12.36	25.84	12.36	7.87	12.36	100.00	PROW
	9.23	24.39	25.58	19.17	7.19	6.93	10.89	13.38	PCOL
	.90	3.01	1.05	3.46	1.65	1.05	1.65	13.38	PPLANE
AFT YR1	43	44	26	61	98	48	19	339	COUNT
	12.68	12.98	7.67	17.99	28.91	14.16	5.60	100.00	PROW
	66.15	53.65	60.47	50.63	64.05	47.52	18.81	50.98	PCOL
	6.47	6.62	3.91	9.17	14.74	7.22	2.86	50.98	PPLANE
NOT YET	2	2	1	3	4	0	0	12	COUNT
	16.67	16.67	8.33	25.00	33.33	.00	.00	100.00	PROW
	3.08	2.44	2.33	2.50	2.61	.00	.00	1.80	PCOL
	.30	.30	.15	.45	.60	.00	.00	1.80	PPLANE
TOTAL	65	82	43	120	153	101	101	665	COUNT
	9.77	12.33	6.47	18.05	23.01	15.19	15.19	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	9.77	12.33	6.47	18.05	23.01	15.19	15.19	100.00	PPLANE

TABLE A.32

DO THE COLONISTS LEAVE THE ZONE PERIODICALLY
 ROWS.....CATEGORIES OF SETOUT
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A HENI I	A HENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
YES	94	88	41	116	141	104	113	697	COUNT
	13.49	12.63	5.88	16.64	20.23	14.92	16.21	100.00	PROW
	98.95	91.67	89.13	88.55	90.97	90.43	97.41	92.44	PCOL
	12.47	11.67	5.44	15.38	18.70	13.79	14.99	92.44	PPLANE
NO	1	8	5	15	14	11	3	57	COUNT
	1.75	14.04	8.77	26.32	24.56	19.30	5.26	100.00	PROW
	1.05	8.33	10.87	11.45	9.03	9.57	2.59	7.56	PCOL
	.13	1.06	.66	1.99	1.86	1.46	.40	7.56	PPLANE
TOTAL	95	96	46	131	155	115	116	754	COUNT
	12.60	12.73	6.10	17.37	20.56	15.25	15.38	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.60	12.73	6.10	17.37	20.56	15.25	15.38	100.00	PPLANE

TABLE A.33

FREQUENCY WITH WHICH THE COLUMNISTS LEAVE THE ZONE

ROWS.....CATEGORIES OF FRESCUT

COLUMNS....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A RENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
VERY FRE	21	7	4	12	9	1	21	75	COUNT
	26.00	9.33	5.33	16.00	12.00	1.33	28.00	100.00	PROW
	22.34	7.95	9.76	10.17	6.34	.95	18.58	10.70	PCOL
	3.00	1.00	.57	1.71	1.28	.14	3.00	10.70	PPLANE
NOT FRE	38	20	10	39	27	3	11	154	COUNT
	24.68	16.80	6.49	25.32	17.53	1.95	7.14	100.00	PROW
	40.43	29.55	24.39	33.05	19.01	2.86	9.73	21.97	PCOL
	5.42	3.71	1.43	5.56	3.85	.43	1.57	21.97	PPLANE
RARELY	35	55	27	67	106	101	81	472	COUNT
	7.42	11.65	5.72	14.19	22.46	21.40	17.16	100.00	PROW
	37.23	62.50	65.85	56.78	74.65	96.19	71.68	67.33	PCOL
	4.99	7.45	3.85	9.56	15.12	14.41	11.55	67.33	PPLANE
TOTAL	94	88	41	118	142	105	113	701	COUNT
	13.41	12.55	5.85	16.83	20.26	14.98	16.12	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	13.41	12.55	5.85	16.83	20.26	14.98	16.12	100.00	PPLANE

TABLE A.34

DO THE COLONISTS FEEL THEY LIVE HAPPIER OR UNHAPPIER
 ROWS.....CATEGORIES OF HAPPINESS
 COLUMNS....CATEGORIES OF DISTRICT

	CHAFARE	CHIMORE	A BENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
HAPPIER	73	83	30	83	128	55	93	545	COUNT
	13.39	15.23	5.50	15.23	23.49	10.09	17.06	100.00	PROW
	77.66	88.30	68.18	69.17	82.58	47.83	83.02	74.25	PCOL
	9.95	11.31	4.09	11.31	17.44	7.49	12.67	74.25	PPLANE
SAME	16	8	3	22	17	57	17	140	COUNT
	11.43	5.71	2.14	15.71	12.14	40.71	12.14	100.00	PROW
	17.02	8.51	6.82	18.33	10.97	49.57	15.18	19.07	PCOL
	2.18	1.09	.41	3.00	2.32	7.77	2.32	19.07	PPLANE
LESS HAP	5	2	9	15	6	3	2	42	COUNT
	11.90	4.76	21.43	35.71	14.29	7.14	4.76	100.00	PROW
	5.32	2.13	20.45	12.50	3.87	2.61	1.79	5.72	PCOL
	.68	.27	1.23	2.04	.82	.41	.27	5.72	PPLANE
UNSURE	0	1	2	0	4	0	0	7	COUNT
	.00	14.29	28.57	.00	57.14	.00	.00	100.00	PROW
	.00	1.06	4.55	.00	2.58	.00	.00	.95	PCOL
	.00	.14	.27	.00	.54	.00	.00	.95	PPLANE
TOTAL	94	94	44	120	155	115	112	734	COUNT
	12.61	12.81	5.99	16.35	21.12	15.67	15.26	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.81	12.81	5.99	16.35	21.12	15.67	15.26	100.00	PPLANE

TABLE A.35

DO THE COLONISTS INTEND TO ABANDON THE COLONY

ROWS.....CATEGORIES OF DESERTION

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A HENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
YES	10	13	8	26	15	3	4	79	COUNT
	12.66	16.46	10.13	32.91	18.99	3.80	5.06	100.00	PROW
	10.75	13.54	17.39	20.47	9.68	2.56	3.60	10.60	PCOL
	1.34	1.74	1.07	3.49	2.01	.40	.54	10.60	PPLANE
NO	83	83	38	101	140	114	107	666	COUNT
	12.46	12.46	5.71	15.17	21.02	17.12	16.07	100.00	PROW
	89.25	86.46	82.61	79.53	90.32	97.44	96.40	89.40	PCOL
	11.14	11.14	5.10	13.56	18.79	15.30	14.36	89.40	PPLANE
TOTAL	93	96	46	127	155	117	111	745	COUNT
	12.48	12.89	6.17	17.05	20.81	15.70	14.90	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.48	12.89	6.17	17.05	20.81	15.70	14.90	100.00	PPLANE

TABLE A.36

REASONS FOR PROBABLE DESERTION OF THE COLONIES

ROWS.....CATEGORIES OF REASONS

COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMORE	A HENI I	II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
ECONOM	9.09	18.18	18.18	9.09	36.36	9.09	.00	100.00	COUNT
	10.00	20.00	25.00	5.56	28.57	33.33	.00	16.42	PROW
	1.49	2.99	2.99	1.49	5.97	1.49	.00	16.42	PCOL
									PPLANE
CLIMATE	22.22	22.22	.00	44.44	.00	.00	11.11	100.00	COUNT
	20.00	20.00	.00	22.22	.00	.00	25.00	13.43	PROW
	2.99	2.99	.00	5.97	.00	.00	1.49	13.43	PCOL
									PPLANE
CH OCCUP	.00	.00	.00	66.67	33.33	.00	.00	100.00	COUNT
	.00	.00	.00	11.11	7.14	.00	.00	4.48	PROW
	.00	.00	.00	2.99	1.49	.00	.00	4.48	PCOL
									PPLANE
BAD PLOT	7.69	7.69	15.38	30.77	23.08	7.69	7.69	100.00	COUNT
	10.00	10.00	25.00	22.22	21.43	33.33	25.00	19.40	PROW
	1.49	1.49	2.99	5.97	4.48	1.49	1.49	19.40	PCOL
									PPLANE
HEALTH	22.73	9.09	18.18	22.73	18.18	.00	9.09	100.00	COUNT
	50.00	20.00	50.00	27.78	28.57	.00	50.00	32.84	PROW
	7.46	2.99	5.97	7.46	5.97	.00	2.99	32.84	PCOL
									PPLANE
OTHER UN	11.11	33.33	.00	22.22	22.22	11.11	.00	100.00	COUNT
	10.00	30.00	.00	11.11	14.29	33.33	.00	13.43	PROW
	1.49	4.48	.00	2.99	2.99	1.49	.00	13.43	PCOL
									PPLANE
TOTAL	14.93	14.93	11.94	26.87	20.90	4.48	5.97	100.00	COUNT
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PROW
	14.93	14.93	11.94	26.87	20.90	4.48	5.97	100.00	PCOL
									PPLANE

TABLE A.37

PLACES WHERE THEY WOULD GO IN CASE OF DESERTION
 ROWS.....CATEGORIES OF PLACE GO
 COLUMNS.....CATEGORIES OF DISTRICT

	CHAPARE	CHIMPE	A BENI I	A BENI II	CARANAVI	YAPACANI	CH-PIRAY	TOTAL	
	0	0	1	3	1	0	0	5	COUNT
SAMEZONE:	.00	.00	20.00	60.00	20.00	.00	.00	100.00	PROW
	.00	.00	12.50	8.57	7.14	.00	.00	5.95	PCOL
	.00	.00	1.19	3.57	1.19	.00	.00	5.95	PPLANE
	2	2	1	4	4	1	1	15	COUNT
OTH ZONE:	13.33	13.33	6.67	26.67	26.67	6.67	6.67	100.00	PROW
	20.00	20.00	12.50	11.43	28.57	33.33	25.00	17.86	PCOL
	2.38	2.38	1.19	4.76	4.76	1.19	1.19	17.86	PPLANE
	2	5	4	22	7	0	1	41	COUNT
PLAC OPI:	4.68	12.20	9.76	53.66	17.07	.00	2.44	100.00	PROW
	20.00	50.00	50.00	62.86	50.00	.00	25.00	48.81	PCOL
	2.38	5.95	4.76	26.19	8.33	.00	1.19	48.81	PPLANE
	6	0	0	5	1	1	1	14	COUNT
TO CITY:	42.86	.00	.00	35.71	7.14	7.14	7.14	100.00	PROW
	60.00	.00	.00	14.29	7.14	33.33	25.00	16.67	PCOL
	7.14	.00	.00	5.95	1.19	1.19	1.19	16.67	PPLANE
	0	3	2	1	1	1	1	9	COUNT
OTHR:	.00	33.33	22.22	11.11	11.11	11.11	11.11	100.00	PROW
	.00	30.00	25.00	3.86	7.14	33.33	25.00	10.71	PCOL
	.00	3.57	2.38	1.19	1.19	1.19	1.19	10.71	PPLANE
	10	10	6	35	14	3	4	84	COUNT
TOTAL:	11.90	11.90	9.52	41.67	16.67	3.57	4.76	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	11.90	11.90	9.52	41.67	16.67	3.57	4.76	100.00	PPLANE

TABLE A.38

RESOURCES THE SETTLER BROUGHT TO THE COLONY
 ROWS.....CATEGORIES OF RESOURCE
 COLUMNS.....CATEGORIES OF DISTRICT

	ICHAPARE	ICHIMORE	IA BENI	II	ICARANAVI	IYAPACANI	ITCH-PIRAYI	TOYAL	
MONEY	23	37	17	39	50	37	30	233	COUNT
	9.87	15.88	7.30	16.74	21.46	15.88	12.88	100.00	PROW
	63.89	94.87	70.83	73.58	76.42	94.87	85.71	80.07	PCOL
	7.90	12.71	5.84	13.40	17.18	12.71	10.31	80.07	PPLANE
SEEDS	0	0	0	0	0	0	0	0	COUNT
	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
TOOLS	3	1	7	6	7	2	4	32	COUNT
	9.38	3.13	21.58	25.00	21.88	6.25	12.50	100.00	PROW
	8.33	2.56	29.17	15.09	10.77	5.13	11.43	11.00	PCOL
	1.03	.34	2.41	2.75	2.41	.69	1.37	11.00	PPLANE
ANIMALS	1	0	0	0	0	0	1	2	COUNT
	50.00	.00	.00	.00	.00	.00	50.00	100.00	PROW
	2.78	.00	.00	.00	.00	.00	2.86	.69	PCOL
	.34	.00	.00	.00	.00	.00	.74	.69	PPLANE
OTHER	0	0	0	2	4	0	0	6	COUNT
	.00	.00	.00	33.33	66.67	.00	.00	100.00	PROW
	.00	.00	.00	3.77	6.15	.00	.00	2.06	PCOL
	.00	.00	.00	.69	1.37	.00	.00	2.06	PPLANE
DONTREM	9	1	0	4	4	0	0	18	COUNT
	50.00	5.56	.00	22.22	22.22	.00	.00	100.00	PROW
	25.00	2.56	.00	7.55	6.15	.00	.00	6.19	PCOL
	3.04	.34	.00	1.37	1.37	.00	.00	6.19	PPLANE
TOTAL	36	39	24	53	65	39	35	291	COUNT
	12.37	13.40	8.25	18.21	22.34	13.40	12.03	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	12.37	13.40	8.25	18.21	22.34	13.40	12.03	100.00	PPLANE

TABLE A.39

ESTIMATED AMOUNT OF PESOS HE BROUGHT AT THE BEGGING
 ROWS.....CATEGORIES OF PESUOT
 COLUMNS....CATEGORIES OF DISTRICT

	ICHAPARE	ICHIMORE	IA BENI	IA RENI	II	ICARANAVI	IYAPACANI	ICH-PIRAYI	TOTAL	
	85	81	27	81	94	86	97	551		COUNT
500 AND	15.43	14.70	4.90	14.70	17.06	15.81	17.60	100.00		PROW
LESS	88.54	83.51	58.70	60.90	59.49	73.50	82.91	72.12		PCOL
	11.13	10.60	3.53	10.60	12.30	11.26	12.70	72.12		PPLANE
	5	8	3	15	19	7	3	60		COUNT
500+ TO	8.33	13.33	5.00	25.00	31.67	11.67	5.00	100.00		PROW
1000	5.21	8.25	6.52	11.28	12.03	5.98	2.56	7.85		PCOL
	.65	1.05	.39	1.96	2.49	.92	.39	7.85		PPLANE
	6	8	16	31	43	23	14	141		COUNT
1000+ TO	4.26	5.67	11.35	21.99	30.50	16.31	9.93	100.00		PROW
5000	6.25	8.25	34.78	23.31	27.22	19.66	11.97	18.06		PCOL
	.79	1.65	2.09	4.06	5.63	3.01	1.63	18.46		PPLANE
	0	0	0	6	2	1	3	12		COUNT
5000+ TO	.00	.00	.00	50.00	16.67	8.33	25.00	100.00		PROW
10000	.00	.00	.00	4.51	1.27	.85	2.56	1.57		PCOL
	.00	.00	.00	.79	.26	.13	.39	1.57		PPLANE
GREATER	0	0	0	0	0	0	0	0		COUNT
THAN	.00	.00	.00	.00	.00	.00	.00	.00		PROW
10000	.00	.00	.00	.00	.00	.00	.00	.00		PCOL
	.00	.00	.00	.00	.00	.00	.00	.00		PPLANE
	96	97	46	133	158	117	117	764		COUNT
TOTAL	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00		PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		PCOL
	12.57	12.70	6.02	17.41	20.68	15.31	15.31	100.00		PPLANE

TABLE A.40 (a)

INITIAL PROBLEMS FOUND IN THE COLONY
 ROWS.....CATEGORIES OF INITPROB
 COLUMNS....CATEGORIES OF DISTRICT

	CHAPANE	ICHIMORE	IAHANI	IAHANI	IAHANI	IAHANI	IAHANI	IAHANI	TOTAL	
ECONOM	24.68	6.96	4.11	11.08	37.03	7.28	8.86	100.00	118	COUNT
	82.98	23.40	28.89	27.56	75.00	31.94	32.18	46.81		PROB
	11.56	3.26	1.93	5.19	17.33	3.41	4.15	46.81		PCOL
										PPLANE
HEALTH	2	2	6	41	13	18	36	118		COUNT
	1.69	1.69	5.06	34.75	11.02	15.25	30.51	100.00		PROB
	2.13	2.13	13.33	32.28	8.33	25.00	41.38	17.48		PCOL
	.30	.30	.89	6.07	1.43	2.67	5.33	17.48		PPLANE
CLIMATE	0	6	2	15	4	11	15	53		COUNT
	.00	11.32	3.77	28.30	7.55	20.75	28.30	100.00		PROB
	.00	6.38	4.44	11.81	2.56	15.28	17.24	7.85		PCOL
	.00	.89	.30	2.22	.59	1.63	2.22	7.85		PPLANE
ROADS	11	53	17	23	15	12	8	139		COUNT
	7.91	38.13	12.23	16.55	10.79	8.63	5.76	100.00		PROB
	11.70	56.38	37.78	18.11	9.62	16.67	9.20	20.59		PCOL
	1.63	7.85	2.52	3.41	2.22	1.78	1.19	20.59		PPLANE
WATER	0	0	2	4	0	7	0	13		COUNT
	.00	.00	15.38	30.77	.00	53.65	.00	100.00		PROB
	.00	.00	4.44	3.15	.00	9.72	.00	1.93		PCOL
	.00	.00	.30	.59	.00	1.04	.00	1.93		PPLANE
KNOWLEDG	0	1	3	3	3	1	0	11		COUNT
	.00	9.09	27.27	27.27	27.27	9.09	.00	100.00		PROB
	.00	1.06	6.67	2.36	1.92	1.39	.00	1.63		PCOL
	.00	.15	.44	.44	.44	.15	.00	1.63		PPLANE
OTHER	0	6	0	0	0	0	0	6		COUNT
	.00	100.00	.00	.00	.00	.00	.00	100.00		PROB
	.00	6.38	.00	.00	.00	.00	.00	.89		PCOL
	.00	.89	.00	.00	.00	.00	.00	.89		PPLANE
NONE	3	4	2	6	4	0	0	19		COUNT
	15.79	21.05	10.53	31.58	21.05	.00	.00	100.00		PROB
	3.19	4.26	4.44	4.72	2.56	.00	.00	2.81		PCOL
	.44	.59	.30	.89	.59	.00	.00	2.81		PPLANE
TOTAL	94	94	45	127	156	72	87	675		COUNT
	13.93	13.93	6.67	18.81	23.11	10.67	12.89	100.00		PROB
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		PCOL
	13.93	13.93	6.67	18.81	23.11	10.67	12.89	100.00		PPLANE

TABLE A.40 (b)

INITIAL PROBLEMS FOUND IN THE COLONY(2)
 ROWS.....CATEGORIES OF INITPRO2
 COLUMNS.....CATEGORIES OF DISTRICT

	ICHAPANE	ICHIMORE	IA BENT	IA REMI	IAHANA	VIYAPACANI	ICH-PIRAY	TOTAL	
	0	0	0	0	0	0	0	0	COUNT
ECONOM	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
	16	0	6	19	58	13	17	129	COUNT
HEALTH	12.40	.00	4.65	14.73	44.96	10.08	13.18	100.00	PROW
	21.92	.00	18.67	19.19	43.58	28.69	19.77	26.33	PCOL
	3.27	.00	1.22	3.88	11.84	2.65	3.47	26.33	PPLANE
	9	0	1	7	26	4	12	59	COUNT
CLIMATE	15.25	.00	1.09	11.86	44.07	6.78	20.34	100.00	PROW
	12.33	.00	2.78	7.07	19.40	8.89	13.95	12.04	PCOL
	1.84	.00	.20	1.43	5.31	.82	2.45	12.04	PPLANE
	46	14	14	32	42	25	49	222	COUNT
ROADS	20.72	6.31	6.31	14.41	18.92	11.26	22.07	100.00	PROW
	63.01	82.35	38.89	32.32	31.34	55.56	56.98	45.31	PCOL
	9.39	2.86	2.86	6.53	8.57	5.10	10.00	45.31	PPLANE
	1	3	8	25	5	3	8	53	COUNT
WATER	1.89	5.66	15.09	47.17	9.43	5.66	15.09	100.00	PROW
	1.37	17.65	22.22	25.25	3.73	6.67	9.30	10.82	PCOL
	.20	.61	1.63	5.10	1.02	.61	1.63	10.82	PPLANE
	1	6	7	16	3	0	0	27	COUNT
KNOWLEDG	3.70	.00	25.93	59.26	11.11	.00	.00	100.00	PROW
	1.37	.00	19.44	16.16	2.24	.00	.00	5.51	PCOL
	.20	.00	1.43	5.27	.61	.00	.00	5.51	PPLANE
	0	0	0	0	0	0	0	0	COUNT
OTHER	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.04	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
	4	8	0	0	0	0	0	0	COUNT
NONE	.00	.00	.00	.00	.00	.00	.00	.00	PROW
	.00	.00	.00	.00	.00	.00	.00	.00	PCOL
	.00	.00	.00	.00	.00	.00	.00	.00	PPLANE
	73	17	36	49	134	45	86	490	COUNT
TOTAL	14.90	3.67	7.35	20.20	27.35	9.18	17.55	100.00	PROW
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	PCOL
	14.90	3.67	7.35	20.20	27.35	9.18	17.55	100.00	PPLANE

BIBLIOGRAPHY

1. Arrow, J. Kenneth, and Mordecai Kurz, Public Investment, the Rate of Return and Optimal Fiscal Policy, The Johns Hopkins Press, Baltimore, 1970, 218 pp.
2. BOLIVIA, Junta Nacional de Planeamiento. "Plan Nacional de Desarrollo Economico y Social, 1962-1971," Resumen, La Paz, 1961, 328 pp.
3. BOLIVIA, Ministerio de Planificacion y Coordinacion, "Estrategia Socio-Economica del Desarrollo Nacional 1971-1991," 2 vols., La Paz, 656 pp.
4. BOLIVIA, Ministerio de Inmigracion, Informaciones relativas a la modalidad de las zonas agropecuarias del territorio de la Republica de Bolivia, destinadas a la receptibilidad de elementos colonizadores, 1945, 20 pp.
5. BOLIVIA, Ministerio de Agricultura, I.N.C. Informacion general sobre colonizacion para inmigrantes. La Paz, 1968, 18 pp.
6. BOLIVIA, Ministerio de Agricultura. "La colonizacion en Bolivia." Leyes, Decretos Supremos y Otras Disposiciones Legales," 1965.
7. BOLIVIA, Instituto Nacional de Colonizacion. "Proyectos de Colonizacion Puerto Villarroel-Km. 21, Chane-Piray, Ampliacion San Julian," vol. I, mimeo, p. 23, 1974.
8. BOLIVIA, Servicio Agricola Interamericano. "Proyecto Alto Beni--Informe detallado de los suelos existentes en las margenes de los rios Cotacajes y Alto Beni," La Paz, mimeo, 89 pp., 1965.
9. BOLIVIA, Ministerio de Agricultura. Departamento de Suelos. "El Chapare. Capacidad Agrologica y Recursos Naturales." Mimeo, 253 pp., 1964.
10. BOLIVIA, Ministerio de Agricultura. Departamento de Suelos. "Proyecto Yapacani-Puerto Grether," mimeo, 99 pp., 1964.
11. BOLIVIA, INC Programa de Colonizacion INC-BID. Informe Final, mimeo, 67 pp., June 1970.

12. BOLIVIA, Instituto Nacional de Colonizacion. "Programa de Colonizacion INC-BID." Quarterly reports 1-21, 1964-70.
13. BOLIVIA, Instituto Nacional de Colonizacion. "Sintesis del Plan General de Desarrollo del INC," La Paz, 1972, 37 pp.
14. BOLIVIA, Ministerio de Economia Nacional, Caminos Yapacani-Puerto Grether y Guabira-Yapacani, Guabira-Chama y Guabira-Puerto Banegas. In "Diagrama," Sept. 1963, pp. 12-21.
15. BOLIVIA, Ministerio de Economia--USAID/Bolivia. "Informe de Labores por la Gestion 1963." pp. 39-43 (on PAB).
16. Blevins, A.L. "Migration Rates in Twelve Southern Metropolitan Areas: A Push-Pull Analysis," in Social Science Quarterly, 50(2):37-53, 9, 69.
17. Cieza de Leon, Pedro. El Senorio de los Incas. Ed. Instituto de Estudios Peruanos, Lima, 1967, 271 pp.
18. Crossley, J. Colin. Santa Cruz at the Crossroads: A Study of Development in Eastern Bolivia. Rotterdam, 1961, 20 pp., photocopy.
19. Cochrane, Thomas T. "A Land System of Central Tropical Bolivia," Santa Cruz, Ministry of Agriculture, 1967, 80 pp.
20. Crist, Raymond E. and Ernesto Guhl. "Pioneer Settlement in Eastern Colombia." A report of the Smithsonian Institution, Washington, 1957, pp. 391-414.
21. De la Vega, Garcilaso (El Inca). Comentarios Reales o el Origen de los Incas. Ed. Bruguera, S.A. Espana, 1968, 783 pp.
22. Draper and Smith, Applied Regression Analysis. John Wiley and Sons, New York, 1966, 407 pp.
23. ECUADOR, Instituto Nacional de Colonizacion, "Informe de Labores 1963-64."
24. Favre C., Leon. "Bolivia, Colonizacion, Agricultura." Sucre, Imprenta Lopez, 1857, 110 pp.

25. Ferragut, Casto. "Principales Caracteristicas de las Colonias agricolas y referencias para una politica de colonizacion." La Paz, Bolivia. Direccion de Instituciones y Servicios Rurales, 1961. 58 pp., tables.
26. Finot, Enrique. Historia de la conquista del Oriente Boliviano. Ed. Libreria Cervantes, Buenos Aires, 1938. 401 pp.
27. Gittinger, Price. "Economic Analysis of Agricultural Projects." The Johns Hopkins University Press, Baltimore, 1972, 221 pp.
28. Graber, Kenneth. La Vida Agricola en las Colonias. Comite de Obra Rural-Distrito Oriental Iglesia Evangelica Metodista en Bolivia, 1972, 91 pp.
29. Henkel, Ray. "The Chapare of Bolivia: A Study of Tropical Agriculture in Transition." Ph.D. Dissertation, Dept. of Geography, Univ. of Wisconsin, 1971.
30. Henney, Homer, et al. Report of Santa Cruz Area Development Group. An AID report to the government of Bolivia, 1954.
31. Hill, George, et al. "Frontier Rural Development in Costa Rica." A Land Tenure Center Study, Univ. of Wisconsin, typed, Costa Rica, 1964.
32. Hirshleifer, Jack, C. James DeHaven, and W. Jerome Milliman. "Water Supply--Economics, Technology and Policy." The University of Chicago Press, 1960, 378 pp.
33. IBRD, Agricultural and Rural Development Department. Rural Development and Bank Policies: A Progress Report. Dec. 2, 1974. Report no. 588, 58 pp.
34. Instituto de Estudios Sociales y Economicos (IESE), U.M.S.S. "Produccion y Comercializacion de la Coca--Informe Preliminar," Cochabamba, 1972, mimeo, 75 pp., 1 map.
35. Instituto de Estudios Sociales y Economicos (IESE), U.M.S.S. "Cuadro Estadistico de Produccion Agricola Tropical--Chapare-Yungas," Cochabamba, 1973, mimeo, 43 pp.
36. Interamerican Development Bank, Annual Report 1971, "Socio-Economic Progress in Latin America."

37. Jofre, O. Manuel (hijo). Colonias y Misiones. In Diccionario Geográfico de la Republica de Tarija, 1895.
38. Keller, N. Gordon and Percy Aitken, Socio-Cultural Factors in Colonization in Bolivia--An Integrated Model for New Lands Development, "Utah State university, mimeo. U.S.U. Series 14/74, 51 pp.
39. Kmenta, Jan. Elements of Econometrics. The Macmillan Co., New York, 1971, 655 pp.
40. Kiker, B.F. (ed.), "Investment in Human Capital," University of South Carolina Press, 1971, pp. 125-375.
41. Lavadenz, J. La colonizacion de Bolivia durante la primera centuria de su independencia. Bolivia, Ministerio de Guerra y Colonizacion, 1925. 108 pp.
42. Lewis, W.A. Economic Development with Unlimited Supplies of Labor, reprinted in A.N. Agarwale and S.P. Singh (eds.). The Economics of Underdevelopment, Oxford University Press, 1963.
43. Malloy and Thorn, eds. "Beyond the Revolution--Bolivia Since 1952," University of Pittsburgh Press, 1971, 402 pp.
44. Mather, Kirtley F. Exploration in the Land of the Yuracares, Eastern Bolivia, Denison University, 1920.
45. Mears, A. Leon and J.B. Djarot Siwijatmo. "Project Evaluation--Indonesian Cases and Exercises." Mimeo, 293 pp., July, 1974.
46. Mishan, E.J. "Elements of Cost-Benefit Analysis." New York, Praeger, 1971, 364 pp.
47. Mishan, E.J. "A Proposed Normalization Procedure for Public Investment Criteria." The Economic Journal, Dec. 1967, pp. 777-796.
48. Murillo, Ch. Antonio. "Colonizacion de la Zona Caranavi-Santa Ana de Huachi"--Estudio tecnico socio-economico. Unpublished B.S. thesis. Universidad de San Simon, Cochabamba, 83 pp., 1964.
49. Nelson, Michael. The Development of Tropical Lands. Unpublished for Resources for the Future, Inc., Johns Hopkins University Press, Baltimore, 1973.

50. Papadakis, J. Copia del Informe sobre el Desarrollo Agrícola y Colonización de la Región Santa Cruz-Montero. 1954, Report from an ILO expert to the government of Bolivia.
51. Patch, W. Richard. "Bolivia's Developing Interior." American Universities Field Staff. West Coast Series, vol. IX, No. 3, 1962.
52. Rada, Monje and John Marus. Estudios de colonización en Bolivia. Vol. II, Análisis de las características socio-económicas de las colonias. Mimeo, 345 pp., La Paz, 1962.
53. Rabaj, C. Serafin et al. "Colonización espontánea en Caranavi. Estudio Socio-económico," La Paz, 1967, typed, 152 pp.
54. Ravenstein, E.G. "The Laws of Migration," Journal of the Royal Statistical Society, vol. XLVIII, June 1885, pp. 166-227.
55. Royden, C. Thomas and F. Boyd Wennergren. El Impacto de las Carreteras de Acceso en la Colonización Espontánea: Área Chane-Piray. Utah State University, Logan, Utah, 1973. 89 pp.
56. Sariola, Sakari. "A Colonization Experiment in Bolivia," Rural Sociology, vol. 25, no. 1, March, 1960, pp. 76-90.
57. Silva, V. Juan. Todos Santos del Chapare, Colonia Fiscal en el Departamento de Cochabamba. Bolivia, Ministerio de Agricultura, Colonización e Inmigración, 1936, 8 pp.
58. Schultz, Theodore W. "Reflections of Investment in Man," in JPE, Supl. October 1962, vol. LXX, Part 2:80-93.
59. Taylor, R. James Jr. "Agricultural Settlement and Development in Eastern Nicaragua," Ph.D. Dissertation, Agricultural Economics, Univ. of Wisconsin, 1968, 195 pp.
60. Thibodeaux, Ben H. An Economic Study of Agriculture in Bolivia. Typed report, 1944.
61. Tinnermeier, L. Ronald. "New Land Settlement in the Eastern Lowlands of Colombia," LTC Research paper No. 13, 1964.

62. Torrico, A. Armando. "Antecedents Caranavi, Carrasco y Alto Beni INC-BID," La Paz, Bolivia, INC, 36 pp.
63. United Nations, Economic Commission for Latin America, "Economic Survey of Latin America: 1973," Bolivia, pp. 268-302.
64. United States AID Mission to Bolivia, "Agricultural Development in Bolivia--A Sector Assessment," La Paz, 1974, mimeo, 324 pp.
65. _____, "Estadísticas Economicas," Serial, 9, 10, 11, 12, 1968-71.
66. Urquidi, Guillermo. Tierras del Secure, 1938.
67. Valencia, Monzon, Maldonado. "La Situacion Agropecuaria Nacional, Estudios Socio-Economicos y Planes de Produccion Agropecuaria de las Zonas de colonizacion CBF-BID," mimeo, 165 pp., 1 map.
68. Wessel, Kelso L. "An Economic Assessment of Pioneer Settlement in the Bolivian Lowlands," Ph.D. Dissertation, Dept. of Ag. Econ., Cornell University Press, 1968.
69. Zeballos, H. Hernan. "Estudio Socio-economico de la Zona de Colonizacion Antigua del Chapare," mimeo, 29 pp., 1965.
70. _____, "Sintesis Informativa sobre el Proyecto de Desarrollo del Alto Beni," CBF, 1962, 15 pp.
71. Zondag, Cornelius, "La Economia Boliviana--1952-1965," ed. Los Amigos del Libro, La Paz, Bolivia, 1968, 316 pp.