

THE PROFITABILITY OF SMALL
FARMS IN BOLIVIA

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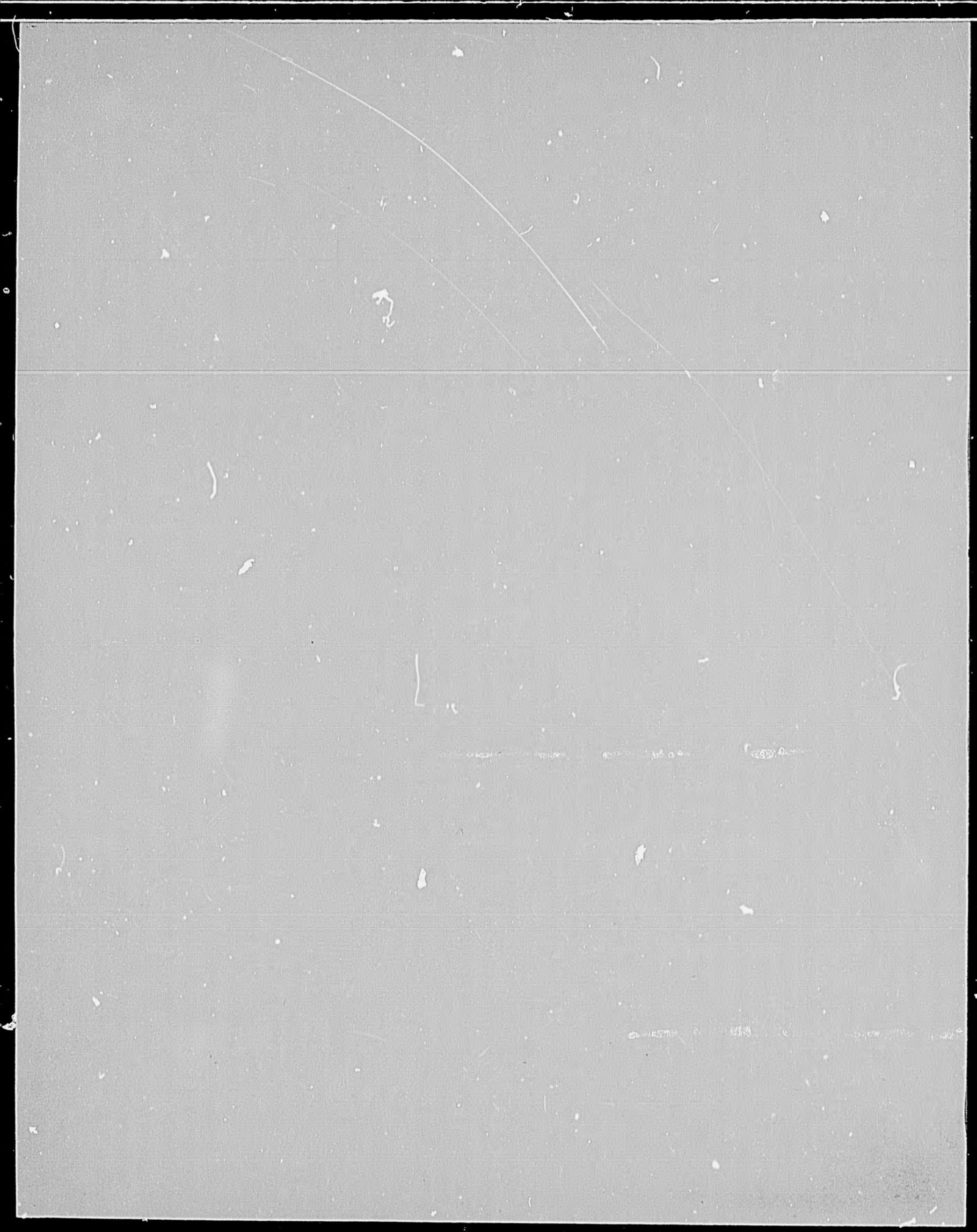
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INTRODUCTION

Many of Latin America's most pressing economic problems stem from rapid population growth and limited agricultural production. In Bolivia, other Andean countries, Central America, and Mexico, these problems have been compounded by the fact that most potential cropland is in underdeveloped, low-lying tropical areas and not available in the areas where the population is concentrated.

Bolivia was the second country in Latin America to initiate a comprehensive agrarian reform. The plan was designed to alter the social, economic, and political structure of the country. A primary objective of the agrarian reform was to remold the semi-feudalistic society into a modern agricultural system. The first step was a sweeping program of redistribution of land. Redistribution could only go so far -- a limited amount of tillable land in the Highlands^{1/} was being divided among a seemingly unlimited number of people. Consequently, a comprehensive program of resettlement of people in the eastern Lowlands was initiated.

The country has been faced with two agricultural problems: 1) population pressure in the Highlands and 2) inadequate agricultural production for a rapidly increasing population. Increased production requires increased capital investment in agriculture. While private enterprise can supply some of the investment, a major effort must come from the government -- especially since much of Bolivia still lacks the necessary infrastructure to support an expanded agricultural base.

Colonization of Bolivia's tropical land has been seen as the answer to both the underproduction of agricultural products and the overpopulation of the Highland regions. It has been felt that by encouraging people to migrate to the Lowlands, the agricultural base could be expanded with total production increasing more quickly and economically than by increasing productivity in the Highlands.

In an effort to populate the eastern Lowlands, the government has encouraged several types of colonization and resettlement. Special concessions have been granted to groups from other nations who were interested in immigrating to Bolivia's virgin territory for social, political, economic, and religious reasons. Japanese, Okinawan, Italian, and Mennonite colonists have settled in the Santa Cruz region during the past two decades. It was anticipated by some that the progressive farming techniques and practices of these colonists would serve as an example for native farmers, thereby serving as a key factor in increasing the productivity and modernization of native farming.

To prompt internal migration, two schemes are utilized. The first involves sponsored colonization. Government sponsored colonization projects in three regions -- Alto Beni, Chapare, and Santa Cruz -- are carefully planned. Each new settler is provided with ten to 30 hectares of virgin land, tools (an ax, machete, hoe, etc.), seed for the first planting, weekly rations of food until after the first harvest, and technical

^{1/} Throughout this paper, Highlands is used to refer to the Altiplano and valley regions 8,000 feet or more above sea level, whereas Lowlands refers to tropical and semi-tropical areas lying east of the Andes Mountains.

assistance to acquaint him with the clearing, burning, planting, tilling, and harvesting of crops in the tropical environment. Other services often provided by the government are: suitable clothing for the climate, a makeshift house which will serve the colonist for two or three years until he can construct a more substantial and permanent structure, as much as a hectare of cleared land which is often seeded with rice, corn, bananas, or yuca (also known as mandioca, cassave, or manioc), low interest loans, schools, and medical care without charge.

The second has been the spontaneous migration of many peasants, miners, and laborers to the Lowlands during the past several decades. A noticeable increase in this movement has occurred since the 1952 Revolution. For most of the spontaneous settlements, the government has done little more than build access roads and make token contributions toward schools and medical attention.

This research project was designed to compare the economic success of the colonists in sponsored colonies with those in spontaneous colonies and to compare the Lowland colonists, in general, with peasant farmers on the Highlands. These comparisons should indicate whether the increasing demand for agricultural products in Bolivia can be best fulfilled by intensifying or expanding the agricultural base. And, if the latter, whether the expansion should come through sponsored or spontaneous colonization programs.

HISTORICAL FRAMEWORK

Bolivia is not the only country making a concentrated effort to resettle large numbers of people from densely to sparsely populated areas. However, Bolivia has many unique problems which few other countries have. Without a thorough understanding of these obstacles, it is difficult to put the colonization schemes in proper perspective.

Since the beginning of the 20th century, there have occurred three events which, more than anything else, have shaped the present economic, social, and political status of Bolivia. First, the tin crisis during the years following World War I reduced the country's economy to an incredibly low level. Second, the Chaco War (1932-35) -- which apart from the enormous cost to Bolivia in terms of human life, material expenditure, and loss of part of its territory -- led to an internal social-political crisis both deep-rooted and prolonged. During the war, the native Indians^{2/} fought alongside of their Mestizo and Spanish-blooded countrymen. This had a profound effect upon the Indian. Hitherto, he had accepted, as a fact, his second-rate citizenship. Because of the war, he gained stature which he was not willing to relinquish. Finally, the land reform following the 1952 Revolution completely cut the old bonds of the Indian population. The reform gave the Indian deeper roots in the soil he tilled in the form of ownership, it also gave him the freedom to seek his fortune without losing his source of livelihood. Thus, the most significant result of the agrarian reform has not been more land to the tiller, more food and fiber for the Indian, or more total

^{2/} After the 1952 Revolution, the word Campesino replaced the word Indian. The latter is used in this paper when it more clearly identifies the ethnic group referred to.

agricultural production, but an increased mobility of the Indian which has exposed him to new opportunities and experiences. The force of this mobile population will not be quelled until Bolivia reaches a new plane and stability of social, economic, and political equality.

Social-Economic

The Revolution of April, 1952 was characterized by the application of measures which radically transformed the country's traditional economic structure. These included the nationalization of the large mining companies, land reform, active participation in trade union policy, and programs for the diversification of the economy. The changes have had repercussions on all aspects of Bolivian life. The government assumed responsibility for its most important economic activity -- mining. Certainly, the nearly complete dependence of the economy upon the mining sector could have been one factor impeding the general development of the country. However, this could have been more a fault of governmental mismanagement of fiscal and monetary policy concerning the mining industry rather than of the industry itself.

Even during a period when the resources of the state and the economy were at a low ebb, ambitious projects for the integration of the eastern tropical plains were undertaken. Heavy population in a small, unproductive area has been Bolivia's plight, yet industrialized countries have strived to concentrate their populations. The lack of industry appears to be as much a result of not developing as a cause.

Two factors can be cited as definite curtailments of development: 1) an inadequate educational base and 2) an inadequate internal transport system. The agrarian reform following the 1952 Revolution paved the way for an expansion of both the educational and transport systems. During the decade of 1955-65, more schools and roads were built than in any other decade. The result has been new hope for the poverty-stricken three-fourths of the population who are illiterate peasants. Only three countries in Latin America have a higher illiteracy rate than Bolivia and no other country has a lesser per capita income (1, pages 164-165; 2, page 32).

There are few parts of the world where the development of a transportation system encounters so many problems as in Bolivia, partly because of its terrain and configuration, but mainly because of the distribution of its population which is concentrated in the Altiplano region, but produces for and is supplied by distant internal and external markets. All exports must be transported over hundreds of miles of mountainous terrain to ports along the Pacific Coast. Many consumer goods must be imported over the same treacherous routes.

The road and rail networks were originally built to service the needs of the mining industry. Even the two most recently completed railroads from Santa Cruz to Brazil and Argentina lead outward rather than tying the country together. This leaves the task of internal service to trucks and the road system.

Roads have been an important factor in the development of Bolivia and will continue to play an increasing role in the future. Spontaneous settlement has never really branched out along the railroads, but people are following the roads and opening up new areas of production. Roadside pickup stations are a common sight along the roads

leading through the colonized areas of Santa Cruz, the Chapare, and the Alto Beni. Indeed, if Bolivia is to become self-sustaining in foodstuff and improve the diet of its population, it must move most of the produce by vehicular transport.

Agricultural

The terrain of the country is so heterogeneous that it is nearly impossible to define any two physiographic areas of any size which have uniform characteristics. However, when evaluating the agricultural production of the country, it is convenient to speak about the Highlands (the Altiplano and the valleys) and the Lowlands (the Yungas, the semi-tropics, and the tropics).

A properly planned and executed agricultural program in a developing country should be designed to accomplish the following.

1. Increase rural per capita production and income with a resulting increase in food availability for the urban population.
2. Decrease, or at least arrest the growth of, the population in heavily populated rural areas and contribute to the settlement and development of new regions.
3. Increase or develop agricultural exports.
4. Decrease or eliminate traditional imports of foodstuff.
5. Increase the commercialization and industrialization of agricultural production.
6. Improve marketing conditions.

Approximately 80 percent of the Bolivian population has traditionally been engaged in agriculture -- mostly in the Altiplano -- and have tilled the soil in essentially the same manner as their Inca forefathers. The only change in agriculture for centuries was the imposition of the Spanish-colonial latifundio system upon the natives. Farming involved dense population, cheap labor, low labor productivity, and depleted soils. The absentee landowner assured himself of a supply of food for his family with little incentive to become involved in commercial agriculture.

Two things are immediately obvious about Bolivian agriculture: 1) the country's climatic and soil conditions permit production of a wide variety of crops including all the necessary foodstuff and 2) the natural resources permit sufficient production for the entire population. In fact, the land and water resources of the country are adequate to support a level of agricultural production well beyond the capacity of the population to consume.

The agrarian reform, following the 1952 Revolution, greatly contributed to the change in agricultural patterns. Official data indicate that production of some foodstuff declined by more than 50 percent immediately following the revolution and did not regain pre-revolution levels until after 1957 (3, page 50). Some decline in production could be expected during the chaos which followed the agrarian reform decree

and the general political situation after the 1952 Revolution. However, it is doubtful that agricultural production declined as much as officially indicated.

One of the more acceptable checks on the reliability of production and consumption data is a food balance sheet.^{3/} If the given amounts of production and consumption -- adjusted for imports, exports, non-food use, and changes in stock -- do not provide sufficient calorie intake to maintain the population, then one or the other, or both, must be in error.

A rough food balance for Bolivia can be obtained by using only the major food items -- wheat, barley, corn, rice, sugar, potatoes, and yuca. Both the USDA's Economic Research Service (ERS) and the Interdepartmental Committee on Nutrition for National Defense (ICNND) have found, in recent studies, that the above seven items provide about 74 percent of the Bolivian calorie intake (4, page 37; 5, page 8).

The ERS calculated that during the 1959-61 period, the average Bolivian consumed 2,010 calories daily (5, page 8). The ICNND reported the daily per capita consumption of food in 1962 supplied 2,108 calories (4, page 28). Using the food balance formula and the assumption that the seven major food items accounted for most of the nutrition, the daily per capita calorie intake for the same two periods is estimated to have been 1,915 and 2,104, respectively.

During the period from 1950 to 1962, there was no exportation of the seven major food items. Changes in stock were nil and industrial use of the seven items was not significant. It can be assumed that neither the proportion used for seed and wasted nor the extraction rate changed during the period. Perhaps more corn and yuca were used for feed during the later years, however, assuming these amounts to have been constant would not alter the results significantly.

Calculation of an average daily calorie intake per capita indicates that the variation in agricultural production could not have been as great as governmental statistics propose. Daily per capita calorie intake was definitely too low during the middle 1950's for human survival unless there was a substantial substitution of other products for the seven major food items (Table 1).

The official production estimates indicate that the average Bolivian was receiving only 993 calories per day -- even the small stature of the Altiplano Indian could not have been adequately nourished on that amount of food. There is no record of widespread starvation during this period, thus it appears as if there was no drastic decrease in agricultural production following the land reform.

^{3/} The food balance is calculated by taking production + imports - exports + changes in stock = total supply - seed - waste - feed - industrial use = gross food supply x extraction rate = net food supply. The net food supply is then converted into daily calories per capita to determine if the reported food production has been adequate to sustain the population.

Table 1. Estimated daily per capita calorie intake, Bolivia, 1950-62

Year	Calories	Year	Calories
1950	1,384	1957	2,135
1951	1,281	1958	2,162
1952	1,191	1959	2,043
1953	1,193	1960	1,745
1954	1,173	1961	1,958
1955	993	1962	2,104
1956	1,152		

COLONIZATION IN PERSPECTIVE

The term colonization is used in Bolivia to designate the relocation of people, both foreign and native, from their original environment to an unpopulated area. The term is mostly used to indicate the resettlement of people in the Lowlands. There are varying degrees of colonization, it is most convenient to speak of: 1) sponsored colonies -- those who have had direct government assistance and 2) spontaneous colonies -- those who have not benefited from any government assistance except through the existing infrastructure.

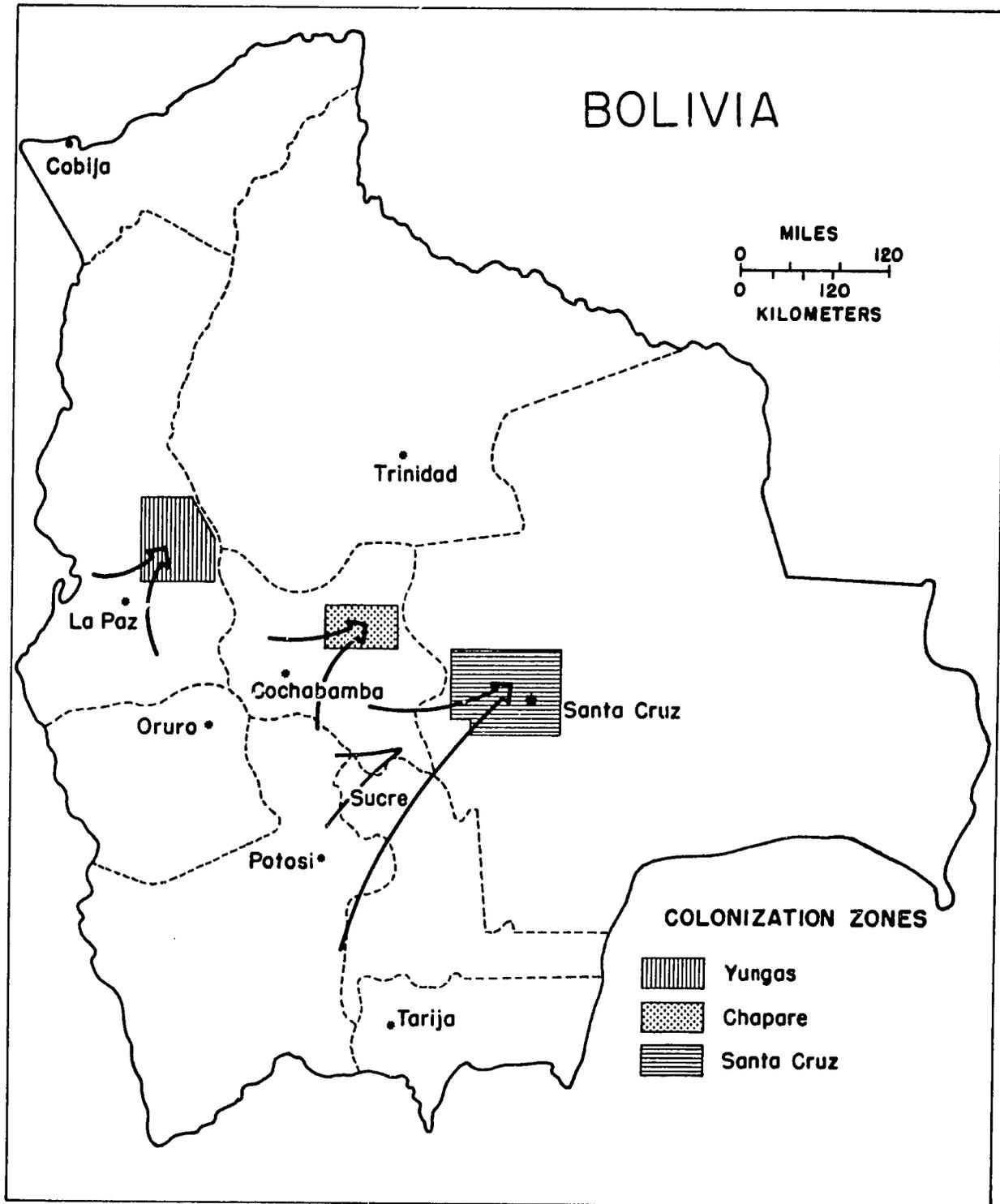
Internal Migration

Two forces are the primary causes of migration: 1) the "push effect" resulting in the feeling "things can't get any worse, so I'll go" and 2) the "pull effect" based on the philosophy of "there are riches and a better life to be had, so I'll go". The first is a feeling of desperation and the latter is one of adventure. On the surface, it would appear as if internal migration in Bolivia has been motivated by the "push effect"; actually, it has been more the result of the "pull effect". Only a small proportion of the colonists who migrated to the first sponsored colonies during the 1950's remained for more than one year and very few of the original colonists are in the same colony today (6, page 33).

When the adventurous spirit prevails among migrants, there is little economic basis for investing large sums of money in individual families through a sponsored program. Once the fringe benefits stop, the people either move on to "greener pasture" or they remain and are dissatisfied because the government does not provide for them.

The three Lowland regions in Bolivia which have received most of the internal migration from the Highlands are: 1) Yungas -- located in the provinces of North and South Yungas in the Department of La Paz, 2) Chapare -- located in the provinces of Chapare and Carasco in the Department of Cochabamba, and 3) Santa Cruz -- an area in the same Department extending from the Grande River to the Ichilo River and including parts of the provinces of Warnes, Ibanez, Santisteban, Gutierrez, and Ichilo (see Map 1).

Map 1. Internal migration patterns during recent decades, Bolivia, 1966



Both the Yungas and Chapare regions have definite colonization advantages from the aspect of proximity to markets. However, they are seriously handicapped by either the amount of land suitable for sustaining a population devoted to agricultural production or the soil will not support continued agricultural production. Bolivians have been migrating into the Yungas and Chapare regions since about 1930 when roads connecting these two regions to La Paz and Cochabamba, respectively, were constructed.

Significant migration into the Santa Cruz region began after the Cochabamba-Santa Cruz highway was completed in 1954. The total impact on migration can be seen by comparing the number of persons resettled through sponsored versus spontaneous colonization.

Sponsored. During the 1950 decade, the Bolivian Government encouraged the resettlement of Highland peasants, through several colonization projects, in the Santa Cruz area. The four principal colonies, all begun during 1954 and 1955, are Cotoca, Huaytu, Cuatro Ojitos, and Aroma. However, none of these colonies have been spectacularly successful. Estimates of the number of colonists who have deserted after arriving in the colonies varies from 60 to 80 percent. Some of the colonists have returned to the same colony and others have moved to another colony. The number of colonists who have deserted and settled in Montero or Santa Cruz is not known, however, the phenomenal growth of these two cities is the result of internal migrants -- many of whom are ex-colonists.

The estimated number of families living in the three colonization zones in 1966 was 19,870 which were distributed as follows:

Area	Sponsored	Spontaneous
Yungas	754	3,400
Chapare	400	6,900
Santa Cruz		
Bolivian	2,570	5,000
Foreign	854	
Total	4,578	15,300

The sponsored and foreign colonization efforts in the Santa Cruz area have been more effective than in either of the other two colonization zones. A total of 3,424 families, or about 13,698 persons, had settled in the zone through some form of directed colonization.

Through laws enacted on November 7, 1959 and April 19, 1963, the National Congress granted CBF (Corporacion Boliviano de Fomento) the rights to 1,629,200 hectares of land within the three regions in the Lowlands (7, pages 103-104).

In 1961, CBF obtained a \$US 9.1 million loan, mostly from the Banco Interamericano de Desarrollo (BID), for the immediate purpose of resettling 8,000 Highland peasant families in the Lowlands. The colonists were to be resettled during a 30 month period beginning the latter part of 1963. Colonization was to be in three

different projects: 1) Alto Beni -- located 280 kilometers from La Paz in the Yungas, 2) Chimore -- located 230 kms. from Cochabamba in the Chapare, and 3) Yapacani -- located 125 kms. from Santa Cruz in an area between the Yapacani and Ichilo Rivers. The number of colonists actually resettled and the amount of land occupied by them was far below the expected numbers after three years of activity (Table 2).

Table 2. Planned number of colonists, number actually resettled and hectares given each family in three selected colonization projects, Bolivia, 1963-65

Project	Expected number of colonists	Number of families actually resettled	Hectares given each colonist
Alto Beni	1,500	223	12
Chimore	4,000	156	20
Yapacani	2,500	850	20-24

Source: Valencia, Jorge, Monson, Miguel, and Maldonado, Gonzalo, La Situacion Agropecuaria Nacional: Estudios Socio-Economicos Regionales y Planes de Produccion Agropecuaria de las Zonas de Colonizacion CBF-BID (La Paz, Bolivia, June 1965), p. 1.

Spontaneous. There has been very little research directed toward the spontaneous colonist who has settled in the Santa Cruz area. Data are not available concerning the possible effect directed colonization has had upon the spontaneous settlement pattern.

The spontaneous resettlement in Santa Cruz has been limited to a few areas. First, and most important, has been the last 100 kms. of the Cochabamba-Santa Cruz highway after it descends from the mountains. After completion of the road in 1954, this became a prime location for spontaneous settlers. Settlers have penetrated the area on both sides of this road, but usually along existing trails which permit trucks to enter during the dry season. Approximately 2,000 families have settled in this area during the past ten to 15 years. However, some of these families have migrated from the Valle Grande region -- which is not considered a part of the Highlands.

Secondly, the sponsored colonies north of Montero required construction of communication roads. These roads opened the periphery of the privately owned land which was not being utilized and Highlanders were quick to establish squatter settlements. The migrants cleared small plots of land in the unused virgin forest and then refused to move. Perhaps 1,000 families have settled in this region which includes an area extending from the colony of Cuatro Ojitos east to the Chane River and then north to the Grand River.

Finally, the Huaytu and San Juan colonies in the Buena Vista region brought about an improvement of the road from Montero to the Yapacani River. Up to 500 spontaneous colonists have followed this artery of transportation. This figure includes the approximately 140 Bolivian families living in the Japanese colony of San Juan -- many of these Bolivians obtain their main livelihood working as peones in the Japanese colony.

Other individual or small pockets of colonists could add another 1,500 families to the number who have settled in the Santa Cruz zone. This would make a total of approximately 5,000 families, or a total of 15,000 to 20,000 people, who have spontaneously migrated to the Santa Cruz region during the past ten to 15 years.

This does not include two other important groups of Highland migrants. First, those who have settled around the three sugar mills of San Aurelia, Guabira, and La Belgica. Some of the seasonal laborers required by the sugar mills remain in the area throughout the year. They subsist on small, garden-sized plots and other seasonal jobs during the off-season of sugar cane. The number of these migrants could equal that of the spontaneous colonists engaged in farming. Certainly the growth of La Belgica from a farmstead a decade ago to a village of over 5,000 habitants attests to the influx of migrants. Secondly, many Indians and Mestizos have migrated directly to the cities of Santa Cruz and Montero from Highland cities. These people have entered various business and service activities in the two cities. This number could also equal that of the spontaneous colonists.

In summary, a new population census in the Department of Santa Cruz could show that the population increase includes 30,000 to 60,000 persons of Highland Indian and Mestizo origin.

Foreign Immigration

There were three different collections of foreign colonists in Bolivia. The Japanese, Okinawan, and Mennonite colonies were all located in the Santa Cruz area. The Mennonites were mostly from Paraguay and Canada, but of German-Russian origin. An Italian colony was formed in 1954 near Warnes, but had completely dispersed. Many German families presently living in the Santa Cruz area migrated to Bolivia before World War II. These German families have established themselves on larger, individual farms and cannot be classified as colonists in the Bolivian interpretation of the word. The entrepreneurship of the German-born people has probably served as the spearhead for increasing and modernizing agricultural production in the zone. Their productivity has been especially noticeable in beef cattle, dairying, swine, sugar cane, and other commercially-oriented enterprises.

No less spectacular has been the success of the Mennonites. This religiously motivated sect has a history of migration dating back three centuries. Their quest for religious and personal freedom has led them across Europe, through Russia, into Canada, down to Paraguay, and essentially to the four corners of the world. They are a closely-knit group who wish to be tillers of the soil and masters of their own lives. They persist in speaking their ancient Low-German dialect and insist upon educating their children in their own religiously-oriented schools.

There has been little assimilation of the Mennonite colonists with the native population. They are prudent farmers who are able to thrive in areas which others have either abandoned or avoided. It is doubtful if many of their farming techniques have been adopted by other native farmers.

The first Mennonite contingent of six men arrived in Bolivia on January 15, 1964. By November, 1966, there were 101 families living in seven villages. The "traditional"

pattern of immigration appears to have been reversed coming into Bolivia. The economic minded were the first to arrive and the orthodoxly religious were the last.

In comparison with the other colonists in Bolivia -- both national and foreign -- the Mennonites were much better off. An average family of seven people had a net farm income of \$b 7,350. Out of this, the family had to pay for its education, taxes, and personal transportation; they also had to purchase staple foods and fuel to light their home and attempt to repay the principal of their debt -- which amounted to an average of \$b 6,970 per family.^{4/}

The Okinawans were another group of foreign colonists in Bolivia who have had an interesting history of growth. The first group of 269 persons entered Bolivia via the railroad from Santos, Brazil and arrived at Pailon, on the Rio Grande River, on August 15, 1954.

In March, 1956, work began on a new site 44 kms. east of Montero in the province of Warnes. An access road, from Montero, was constructed before any of the families were resettled. By October, 1956, all of the families had moved to a new settlement called Okinawa Colony I. As the number of families increased, the formation of new colonies became necessary with the result that Colony II was founded in 1959 and Colony III in 1960. Colonies II and III were located directly south of Colony I and were connected by a road, traversable only during the dry season.

Rice was -- and will continue to be for several years -- the mainstay of agriculture in the colonies. As farming changes to incorporate less rice, the whole aspect of the Okinawan colonies will change. This is already evidenced by the number of families leaving the colonies. One ex-colonist was encountered driving a taxi in Santa Cruz. He had sold his land in the colony and borrowed enough money to purchase a taxi. He reported an average gross income of \$b 3,000 per month. This is more than double the \$b 10,000 to \$b 15,000 which he could earn in a long, hard year of farming in the colony.

Last, but not least, of the foreign colonies in Bolivia were the Japanese. Colonization was initially begun on July 20, 1955 with the arrival of 16 families. The families founded a colony along the Yapacani River, in the province of Ichilo, which they named San Juan.

By 1964, a total of 269 families had received 13,450 hectares of land. Of the land possessed by the colonists, 7,900 hectares had been cleared and 5,550 hectares remained in virgin forest. This indicates that perhaps 60 percent of the land owned by the colonists was cleared during their first four to six years of residence in the colony. Furthermore, of the 7,900 hectares of cleared land, approximately 4,820 hectares (61 percent) was fallow. This represented a land-use relationship of about the same as that found in the Okinawan colonies. However, the Japanese colonists have relied much more on the use of peones for clearing land -- which partly explains why they have cleared a greater proportion of their land.

^{4/} The rate of exchange was \$12.00 = \$US 1.00 during 1965-66. This rate has been used throughout this paper.

Rice is the principal crop grown in the Japanese colony and has traditionally accounted for 80 to 90 percent of the land under cultivation.

Like the Okinawan and Mennonite colonists, the Japanese emphasized livestock production. Indeed, these three colonies had a much better opportunity than any of the Bolivian colonies to embark upon livestock production because: 1) the colonists possessed more land, 2) the colonies had more financial ability to weather the period between initial investment and first returns, and 3) the colonies had more experience in animal husbandry or were in a better position to use technical assistance.

The future of the Japanese and, to a lesser extent, the Okinawan colonies depends upon the extent to which they become engaged in commercial agriculture. The colonists are not satisfied with a subsistence type of agriculture. In other countries, the Japanese have traditionally concentrated close to large cities and have engaged in intensive agriculture. Their location in Bolivia prevents this; therefore, the logical route is for them to think more about extensive agriculture -- which would be very feasible in the Santa Cruz area.

SAMPLING PROCEDURE

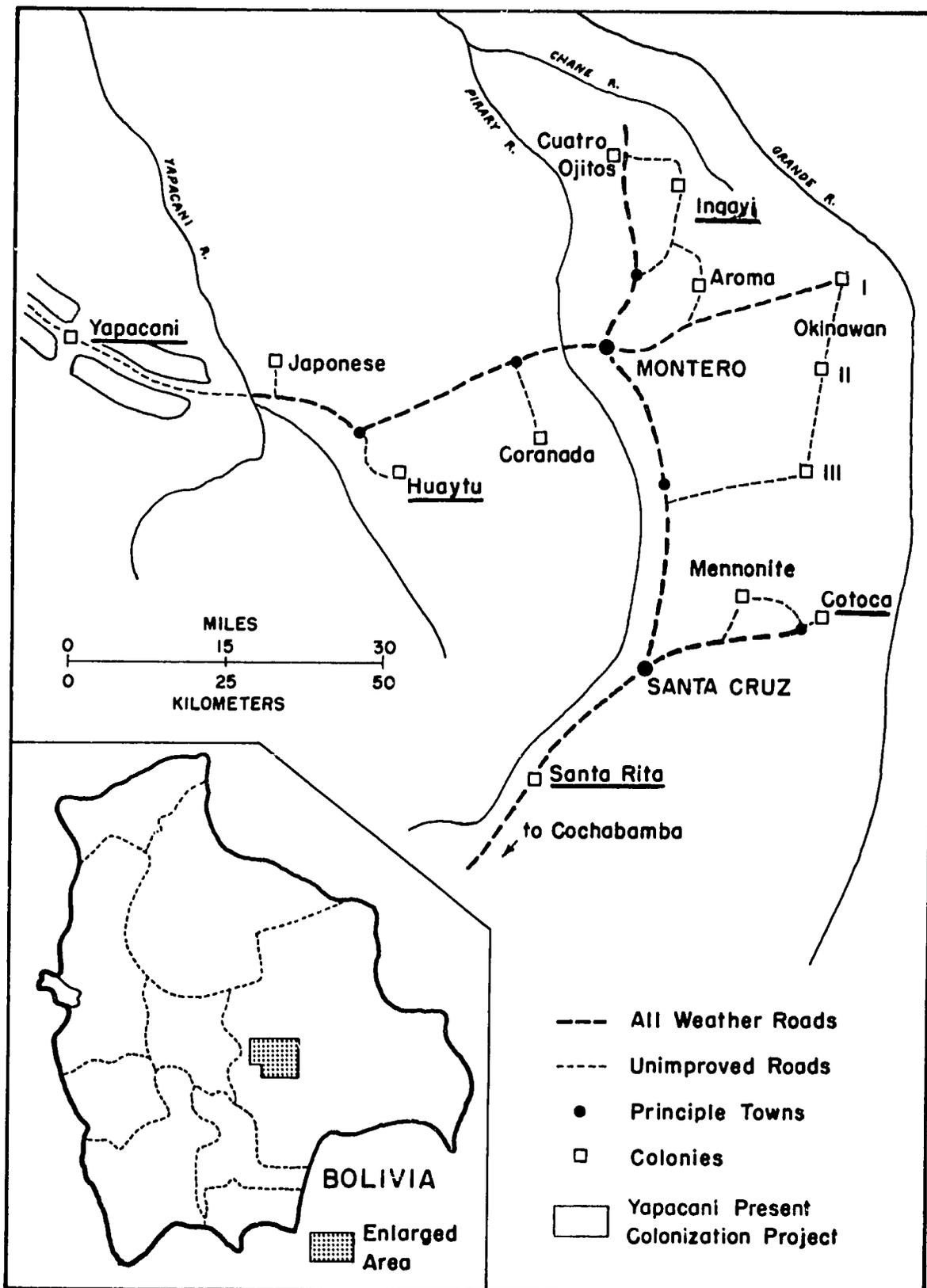
To analyze the alternatives available to Bolivia in its agricultural development program, field data was obtained in both the Highlands and the Lowlands. To completely evaluate the position of the colonists, it was necessary to study some farming communities in the Altiplano which were representative of the areas from which the colonists had come. Using this scheme, a comparison was made of those who "have gone" and those who "have remained".

Communities Studied

The zone presently being colonized in Santa Cruz can be roughly divided into quarters, its center lying somewhat southwest of Montero. The five colonies selected for the study are located such that one is in each of the quarters and the other approximately in the center. Yapacani is in the northwest quarter, Ingavi in the northeast, Cotoca in the southeast, Santa Rita in the southwest, and Huaytu is somewhat to the west of center (see Map 2). This method of selection not only provides for comparison of spontaneous versus sponsored colonization, but also permits an evaluation of the different sections of the zone with respect to future value for colonization and agricultural production.

There are many communities on the Altiplano; therefore, the task of selecting two or three communities for intensive study would seem simple. Actually, it was much easier to select the colonies. For instance, there are thousands of Altiplano communities which have received no outside influence, but to find a community of sufficient size, compactness, and with the population willing to cooperate became a problem. Also, the ideal non-help community should have been "typical" of all Highland communities not receiving outside aid -- this was an impossibility. Selecting a community which had benefited from a good agricultural extension program or other

Map 2. Colonization projects, Department of Santa Cruz, Bolivia, 1966



outside influence became an equally challenging task. For this outside influence to have any measurable effect upon the economy of the community, it had to have occurred in sizeable force and over a prolonged period of several years. There are many communities where extension agents claim to have had an influence. However, after visiting these communities, it was found that the agent had only pioneered building a sheep-dip or had only introduced improved seed to a few families. The majority of the population was unaware of the agent's activities as a "change agent".

For a Highland community which had been influenced by an extension program, Coipasi in the Department of Potosi was selected. The community is located about 55 kms. from Potosi and ten kms. from Betanzos. Two non-help Highland communities were included in the sample. San Miguel is located in the southern part of the Department of Potosi approximately 30 kms. north of Tupiza. Bolivar is situated in the Department of Cochabamba, but is only 60 kms. from Oruro and actually has most of its social, economic, and political ties with this city (see Map 3).

Selection of Sample

Both Bolivian and American officials were contacted regarding areas from which the Lowland colonies and the Highland communities should be selected for inclusion in the study. The original plan of study required four distinct types of agricultural communities. The communities were to include:

1. A sponsored colony in the tropics where the incentives, the costs of resettling, and the infrastructure costs were all provided through government supervision.
2. A spontaneously settled tropical colony where only access roads and other essential services were provided by the government.
3. A community in the Altiplano where an agricultural extension and/or other similar programs were involved in an effort toward improving the level of living of the people. This community would have to be in the area where many of the colonists had come from.
4. A community in the altiplano which had not received assistance from any outside organization. This community would also have to be representative of the region where a majority of the colonists had originally lived.

Final selection of the colonies and communities was made with the assistance of local officials who were acquainted with the surrounding rural area. After explaining the purpose and scope of the study to the officials, they were asked to indicate several communities which might be classified into spontaneous or sponsored colonies, if in the Lowland, and extension or non-help communities, if in the Highlands and where: 1) all of the people in the area considered themselves a part of the same type of farming community, 2) there were approximately 100 families living in the community, and 3) the spirit of cooperation in the community was sufficient to permit an intensive study.

Between 50 and 60 households, approximately 50 percent of the families, were interviewed in each community. A modified version of stratified sampling was used to obtain a representative sample in each community.

Map 3. Location of five Lowland colonies and three Highland communities studied during 1965-66



Data Collection

The field work was done from July, 1965 through July, 1966. All questionnaires were completed by Bolivian enumerators. Three enumerators were used for interviewing in the colonies and two of the same three persons did the interviewing in the Highland communities.

The farm interviews were with the heads-of-family, except in a few cases where the head-of-family was elderly and a son had assumed managerial responsibilities; this son was then interviewed and designated the head-of-family. Interviewing was always done at the respondent's house or farm and was always done with no more than the immediate family present. All responses were from recall or records, except when the respondent was unsure of the correct response, then the enumerator would accompany the respondent to make a field count or measurement.

A total of 449 family interview schedules were completed. Of these, 20 were deemed unsatisfactory. Not analyzed were: 1) incomplete records, 2) those with no agricultural production, 3) foreign nationals, 4) when a woman was the head-of-family, and 5) if the respondent owned a truck. It is obvious why all but the last two of these were eliminated. If a woman was the head-of-family or if the respondent owned a truck, it was felt that these factors had a strong distorting effect upon the farming operation.

The number of farm survey records actually analyzed for each of the communities was:

<u>Lowlands</u>		<u>Highlands</u>	
Santa Rita	53	Coipasi	56
Ingavi	56	San Miguel	50
Huaytu	57	Bolivar	55
Cotoca	51		<u>161</u>
Yapacani	51		
	<u>268</u>		

COMPARISON OF HIGHLAND AND LOWLAND AGRICULTURE

Quantitative Factors of Production

The factors affecting production can be grouped under the traditional headings of: land, labor, capital, and management. Sociological factors could be included and might be as important as any of the others, however, like management, they are difficult to quantify and consequently are not usually included in economic models.

Land. The ownership of land has been held in high esteem in Bolivia for centuries. Until the agrarian reform, most of the land was absentee owned by a relatively small

segment of the population. The really large estates were in the Lowlands. The Highland haciendas, with their semi-feudalistic labor force, have been the cause of tremendous social pressures. One of the principal goals of the Indian has always been to become the tiller of his own land.

There have always existed communities of indigenous free landholders in the Altiplano. All of the peasants in the three Highland communities included in this study were small, free landowners who had inherited or purchased their land. The agrarian reform had not affected land ownership patterns in these communities. However, the average family possessed only 2.4 hectares of land. This is about the minimum amount of land necessary for a family to obtain a subsistence level of living. Therefore, many farms can be inherited by only one sibling if they expect to earn their livelihood solely from the farm.

In contrast, the colonists possessed an average of 19.5 hectares of land in the Santa Cruz area. The prospect of owning eight times as much land in the Lowlands has been one of the major factors behind internal migration. Within each sponsored colony, all families have been given the same quantity of land. A colonist may acquire more land when he has cleared all of his first allotment or by purchasing the improvements made by another colonist who does not wish to remain in the colony. In addition, some colonists take a plot of land in another colony under an assumed name. In practice, relatively few colonists possessed a second plot unless their first one was unproductive because of natural conditions.

Many spontaneous colonists have purchased their land from large landowners; consequently, the amount of land owned depended upon each individual's ability to pay. Some of the spontaneous colonists, especially in Santa Rita, received their land through the agrarian reform.

Comparing the total amount of land possessed is not completely realistic because permanent grazing land in the Highlands is considered communal land. Also, the dense jungle covering most of the land in the Lowlands is of no value to the colonist unless cleared or a definite pattern of shifting cultivation practiced. A more meaningful comparison of land in the Highlands and Lowlands can be made by examining the amount of tillable land -- land suitable for cultivation without any capital investment for clearing, draining, or irrigating -- possessed per family. The average amount of tillable land per family was more than three times greater in the Lowlands than in the Highlands -- 8.2 and 2.3 hectares, respectively. This difference is significant in a country where land ownership carries many social and economic connotations.

Tillable land reflects the accumulation of effort spanning years as land is cleared, drained, terraced, irrigated, etc. to make it useful for agricultural cultivation. The extent to which land is cultivated annually or the annual effort which the farm family devotes to agriculture is better indicated through the use of: 1) hectares in crops -- the number of hectares of land used for crops during the current year; double or mixed cropping is counted only once with orchard, pasture, fallow, wooded, or waste land excluded and 2) crops hectares -- crops grown and not land use is greater than hectares in crops by the extent of double and mixed cropping (orchard, pasture, fallow, wooded, and waste land are excluded). Orchard and pasture land were excluded because they required only a minimum of tillage and most fruits had relatively little commercial value in the tropical area studied. Bananas, also a perennial crop, were

included when calculating land utilization because they required more care and had to be replanted periodically -- there was also a better market for bananas than other fruits in the Santa Cruz area.

Because of the limited quantity of land available in the Highlands, the amount of hectares in crops relative to tillable land was a good indicator of the carrying capacity of the soil. In all three Highland communities, nearly all of the land possessed was tilled and about 74 percent of the tillable land was cropped. Only 55 percent of the tillable land in the tropics was cropped.

In the Lowlands, where land is less restrictive, the amount of hectares in crops per family is an approximate indicator of the capacity of peasant families to clear and tend land under tropical conditions. It appears that the average colonist and his immediate family can cultivate four to six hectares of tropical land -- with the absolute maximum being about ten hectares. It is doubtful if the hectares in crops per colonist could greatly exceed the present level unless there is some shift away from traditional methods of farming.

Although much of the Lowlands have climatic conditions which permit crops to be grown throughout the year, there was very little double cropping in the colonies. Mixed cropping was more frequently found and usually consisted of maize planted as a windbreaker for rice. In those colonies where rice was the principal crop, multiple cropping accounted for about 51 percent of the hectares in crops. In those colonies where vegetables and sugar cane were the principal crops, approximately 30 percent of the land was multiple cropped.

In the Highlands where water was available for irrigation, multiple cropping was also practiced. Commercially grown vegetables were most often double cropped and frequently, three harvests per year were obtained.

Few of the colonists had all of their land cleared; therefore, one would expect that they would select the land most suitable for cultivation to be cleared first. This did not appear to have happened. There was little difference in the proportion of different land types which had been cleared for cultivation. This was equally true of the different soil textures. Some colonies had mostly loam soil cleared and others mostly clay land cleared. This tends to indicate that the colonists engaged in slash-and-burn, subsistence agriculture are either ignorant of soil fertility or during the first few years after clearing the virgin forest, all soils are equally productive. Convenience to the house and/or road appeared to be the chief factors determining which land was cleared first.

Crops and Production. Because of the nature of peasant agriculture, they tended to grow several products for home consumption, but marketed only one or two products. Despite the fact that the colonists are primarily engaged in subsistence agriculture, they must have at least one crop which can be commercially marketed to provide the colonists with the income for purchasing necessary staples.

Rice, maize, yuca, and bananas were the most important crops in the colonies -- both in number of families growing them and in hectares cultivated. However, in two colonies, a substantial proportion of the colonists grew vegetables and sugar cane.

Due to the climate, the crops grown in the Highland communities were completely different from those grown in the colonies. The exceptions were potatoes and maize -- the latter grew in some valleys and protected areas of the Altiplano. The principal crops grown by the Highland families were potatoes, maize, and broad beans, commonly known as haba (vicia faba) and oca (oxalis crenata) -- a tuber plant related to the potato.

Wheat was widely grown in Coipasi and by some families in the other Highland communities. However, barley was much more frequently grown and was harvested in both the green fodder and grain stages. Some barley grain was shipped to the breweries in the larger cities, however, most of the production was consumed by the family.

Vegetables were the chief source of income in all three Highland communities. Several types of vegetables could be grown throughout the Altiplano in areas which were protected from the harsh, cold winds. Onions and garlic were the vegetables most often produced for marketing and were important sources of cash income in the communities of Coipasi and Bolivar.

Maize was the only crop grown in all communities studied. It was grown principally for home consumption by 85 and 66 percent of the families in the Lowlands and Highlands, respectively. The Altiplano climate is not very favorable for the production of maize whereas, favorable climatic conditions and the importance of maize as a staple food resulted in more colonists cultivating maize than any other crop. Average maize production per farm in the Lowlands was seven fold that in the Highlands.

Potatoes were also grown in both the Lowlands and Highlands. This crop was the most important one in the Highlands both from the number of families cultivating (98 percent) and from the average production per grower (896 kilograms). Only 25 percent of the colonists -- mostly in Santa Rita and Cotoca -- reported any potato production. However, the production per grower (2,141 kgs.) was more than twice that in the Highlands. These were the only two colonies with a climate favorable for potato production.

Finally, broad beans were grown in both regions. These beans were an important source of protein -- 26.4 percent when toasted (8, page 66) -- for the Highland peasants. The beans thrive under varied soil and climatic conditions and are usually sown as a mixed crop with potatoes, maize, etc. Production in the Lowlands was limited to a few families who had not given up some of their Highland eating habits.

The yields for the three principal crops in the colonies -- rice, maize, sugar cane -- were considerably lower than that found in other countries which specialize in the production of these crops. The yields of barley and wheat in the Highlands were so low that it is doubtful if their production for commercial purpose would ever be economically feasible.

One of the prime factors in the success of any colonization project is that at least one marketable crop can be produced. The Santa Cruz colonists produced both sugar cane and rice for commercial marketing. For this reason, recent colonization projects in this area have been relatively more successful than in other areas of Bolivia. More colonists in Santa Cruz cultivated maize than any other crop, however,

the value of rice production was nearly four times that of maize. Rice accounted for 54 percent of the total value of crop production in the colonies. With the exception of sugar cane, which returned an average of \$b 3,674 per grower, rice returned more per grower (\$b 3,553) than any other tropical crop cultivated by the colonists.

For the 17 percent of the colonists able to obtain a government quota, sugar cane returned more per grower than rice grown by 87 percent of the colonists. For several reasons, rice is much more suited to the small cultivator opening up new frontiers. First, sugar cane must be produced for commercial sale with very little use to the cultivator as food. In contrast, rice is an important source of food for the small producer and could be even more important if simple and inexpensive methods of storage were introduced. In most Lowland areas of Bolivia, rice cannot be stored on the farm from one harvest until the next because of damage by insects and humidity which often forces the small producer to "sell low" and "buy dear". Secondly, sugar cane is a bulky product which must be transported with modern equipment, often for long distances. This means that all-weather roads must penetrate as far as each individual producer. However, rice can easily be transported by animals or humans for several kilometers to the nearest all-weather road. Finally, the processing of sugar cane requires a large investment in refinery equipment. This means that an adequate supply of cane has to be produced in the region to supply the mill and delivery has to be relatively even throughout the harvest season. This task becomes very difficult when there are many small producers each with only a few tons of cane. In contrast, rice can be hulled in small, local factories and processing can be spread evenly over a longer period.

Improvements and Equipment. The number of families possessing various farm improvements varied considerably between communities. In some cases, the family owned an improvement, but did not feel that it had any value. Land, with its improvements, was handed down from father to son; therefore, there was little basis for a true evaluation of its net worth. Because construction materials were mostly from the farm and family labor was used during slack seasons for construction work, it was difficult to obtain their real cost. The average total investment in land and improvements per farm in the Highlands was nearly double that in the Lowlands, \$b 4,900 and \$b 2,600, respectively. However, the colonists had a greater average investment in improvements on their land than did the Highland peasants, \$b 713 and \$b 197, respectively.

In both the Highlands and the Lowlands, investment in tools and equipment was minimal. The largest piece of farm equipment owned was a plow -- found only in the Highland communities. A few families had a cart or sledge for hauling produce from the fields to the farm buildings. The rest of the farm equipment consisted of hand tools.

The average family owned five or six different tools. Items most frequently owned in the Lowlands were: ax, machete, weeding shovel, hoe, and sickle -- in that order of frequency. In the Highlands, the most important tools owned were: pick ax, shovel, wooden plow, sickle, and ax. However, many families owned more than one of some tools. The average investment per family in tools in the colonies was \$b 380 and in the Highland communities, it was \$b 285.

Livestock. Except for nomadic shepherds in isolated and arid areas of the Altiplano with their herds of sheep, goats, and llamas, there are few peasants in Bolivia who specialize in livestock. However, most peasants engaged in agriculture own some domestic barnyard fowl (mostly chickens, but some turkeys and ducks) or animals. Barnyard fowl were owned by 98 percent of all colonists and 86 percent of the Highland peasants.

The animals most frequently owned, in order of importance were: in the Lowlands -- chickens, hogs, and horses; in the Highlands -- chickens, sheep or goats, donkeys, and oxen. Although two-thirds of the Highland peasants owned oxen, none of the colonists owned any. Donkeys and pack animals were owned infrequently by the colonists. The majority of Highland peasants owned some beasts of burden to transport their produce to market, however, the colonists relied upon commercial trucks and buses for transportation of themselves and their produce. One question arises. "Why does the colonist regress in his agricultural tilling methods -- from oxen to manual -- and progress in his transport methods -- from beasts of burden to modern transportation?" The answer to the first part is partly because of the nature of slash-and-burn agriculture in the Lowlands. Until a field is void of tree trunks and stumps, draft animals are not very useful. Why the colonist pays for motorized transportation instead of using animals is more difficult to answer. Certainly it is not because of the lack of mechanical transportation in the Highlands and the excess of it in the Lowlands -- transportation is about equally difficult and costly in both regions. One possible cause is that cash crops in the Lowlands tend to be more bulky and are sold in more distant markets.

In neither the Highland nor the Lowland communities was livestock considered either a store of wealth or a source of prestige (9, pages 69 and 78). A herd or flock was increased until it would provide its owner with a desired annual flow of meat products or work. Thereafter, the number of animals was maintained at a fairly constant level and fluctuated from this only in case of an emergency caused by disease or crop failure -- in which case, the animals were eaten.

The average value of livestock production per farm in the Highlands was \$b 720 or about 40 percent of the value of crop production. In the Lowlands, the average value of livestock production per farm was \$b 1,360 which was only 25 percent of the value of crop production.

Resettlement in some of the sponsored colonies in Santa Cruz has been encouraged with the long-range goals of converting the colonists into cattlemen. It has been estimated that each colonist could net no more than \$b 1,000 annually from his land if it were totally devoted to cattle (6, page 25). This is less than one-third the average income of colonists engaged in crop production with less than ten hectares of cleared land which would tend to indicate that cattle will not replace crops in the colonies.

Qualitative Components of Production

Labor Force. There are three forms of labor available on most peasant farms in Bolivia: 1) family -- often including the extended family, 2) peones -- hired by the day or on contract, and 3) ayne -- a form of exchange labor on a day-for-a-day basis

between relatives and/or neighbors. Ayne is actually more commonly practiced in the Highlands than in the Lowlands.

Family labor is both qualitative and quantitative. The farm operator's age is an important qualitative measure of labor in an agriculturally orientated society. The active working life of a Bolivian peasant is between ages 15 and 65. However, the quality of labor differs both within and between individuals. For example, a person 40 years of age can be said to be better qualified than when he was 30 years, but not necessarily better qualified than his son who is presently 30 years of age. The transference and accumulation of knowledge permits the progeny to benefit from experience gained during the previous generation and to apply it with the vigor of youth.

Farm operators interviewed were between the ages of 18 and 78 with an average of 34 years in the Lowlands and 44 years in the Highlands. Most of the operators in the Lowland communities were in the 32 to 45 years old range. An obvious difference of the distribution in age of operators was the large number of colonists who were under 25 years of age and the large number of Highland operators who were over 52 years.

All manpower in this study was converted into man-equivalents -- the equivalent of one man who devotes his principal efforts during the year to the farming business. If part-time, off-farm work was done during the slack season, one man could still qualify as one man-equivalent. Women and children were included in the labor force at reduced man-equivalents according to age and sex.

Most families in all communities consisted of one to three man-equivalents of labor. None of the Highland families, and very few of the Lowland families, had more than six man-equivalents of labor. In the Lowlands, the average number of man-equivalents per family varied from 2.1 in Ingavi to 2.9 in Cotoca. In the Highlands, family labor varied from 2.3 man-equivalents in Bolivar to 3.2 in San Miguel. The Highland families averaged only 0.1 man-equivalent per family more than the Lowland families with 2.6 and 2.5, respectively.

With the exception of the operator's age, no significant difference existed between the composition of the family labor force in the Lowlands as compared with the Highlands.

The use of peones was much more prevalent in the colonies than the Highland communities. This was partly because of the nature of the agricultural crops and also because of the higher degree of commercialization of agriculture in the Lowlands which meant that cash was more readily available to hire labor. Some colonists reported using as much as 600 man-days of peon labor per year. Of the 268 colonists interviewed, 181 (68 percent) reported using a total of 589 man-days of hired labor for an annual average of 14 man-days per family. Thus, not only did more of the colonists use peones, but they used more man-days than did their counterparts in the Highlands. The greatest change occurring in the traditional family farming pattern as people moved from the Highlands to the Lowlands was the tendency of peasants to become the employers when they had traditionally been the employed.

Education. Management can be thought of as: 1) ability -- using technology which is already known by the individual and 2) susceptibility -- accepting new technology

technology and its advantages by the individual. For food and fiber production to keep abreast of increasing demand, the susceptibility of farm managers to changes may be more significant than their present managerial ability. This is more important in peasant societies than in more advanced societies. Individual agricultural production in advanced societies can often be increased substantially by merely increasing the amount used of one or more of the factors of production. Increased output depends on managerial ability. Increased production in peasant societies is more difficult because some factors of production are being used at their maximum. In this case, increasing production depends upon managerial susceptibility rather than ability.

Education, both formal and informal, is a prime indicator of managerial ability. If Highland production factors are limiting economic success given the present managerial ability, it would appear that more educated people would be migrating to the Lowlands. Thus, the average educational level of the colonists should be greater than that of the Highland peasants.

Approximately 75 percent of all farm operators interviewed reported they had one or more years of schooling and considered themselves literate. However, if completion of the third grade is considered as the minimum requirement for literacy, 65 to 75 percent of the operators would be classified as illiterate. No significant difference was found in the average level of education in the colonies as compared with the Highland communities. However, in the Highland community of Coipasi, more than one-half of the farm operators had no schooling. Whereas, more than one-half of the operators in Bolivar had four to six years of schooling.

Extension Service. Only two of the eight communities had a trained technical person readily available for consultation. In the colony of Yapacani, CBF had three extension agents who had the responsibility of working with the colonists during their readjustment to tropical agriculture. The actual assistance given to the colonists was minimal. The extension agents were able to advise the new colonist when he should clear and burn the forest or when crops should be planted. However, most of the agent's time was devoted to distribution of seed which the colonist received for planting his first crop.

Some colonists expressed a desire for the extension agent to initiate 4-H type projects, however, because of transportation difficulties, the regular agents in the Santa Cruz area were not able to extend their program into all of the communities.

The Highland community of Coipasi was included in the study because the extension agent for that region was one of the more active in Bolivia and he indicated that he had done more work in Coipasi than in the other communities in the area. Of the 56 farm operators interviewed, 52 reported they knew the extension agent and 17 reported the agent had visited them at their farm. However, only two persons in the community reported they had attended an annual field day held at the Chinola Agricultural Experiment Station -- located approximately five kilometers from the community.

The dissemination of farm management information is only one aspect of technology. More important is the actual application of technological factors such as fertilizer, insecticides, and improved tools or management practices. The use of fertilizer, either chemical or animal, was practically non-existent in the Lowlands -- only four

operators in the five colonies reported using any form of fertilizer. However, in the three Highland communities, approximately 50 percent of the families used animal manure on some of their crops. The reverse situation existed in the use of insecticides. Approximately one in five of the colonists reported using some insecticides whereas, none of the operators in the three Highland communities used any insecticides.

Sociological Factors. All persons interviewed were asked to rank five factors (land, education, health, money, and family name) in accordance with the importance they felt each factor held as something to leave their children. The ranking was the same in the Lowlands and Highlands. However, the colonists placed relatively more weight on education and money whereas, the Highland peasants placed relatively more weight on health and family name.

Factor	Lowlands		Highlands	
	Rank	Weight	Rank	Weight
Education	1	31	1	28
Land	2	23	2	23
Health	3	18	3	21
Family Name	4	15	4	17
Money	5	13	5	11
		<u>100</u>		<u>100</u>

The respondents were also asked to rank seven factors (money, education, religion, health, land, respect of neighbors, and modern materials) from most important to least important as factors necessary to prosper. The colonists appeared to be more materialistically minded than the Highland peasants in both the ranking and weighting of the factors. Religion certainly placed low in all communities.

Factor	Lowlands		Highlands	
	Rank	Weight	Rank	Weight
Land	1	20	4	14
Education	2	18	1	20
Health	3	16	2	18
Modern Materials	4	15	5	13
Respect	5	14	3	18
Money	6	9	7	7
Religion	7	8	6	10
		<u>100</u>		<u>100</u>

Farm and Family Business Analysis

The primary objective of human activity is to obtain sufficient food, fiber, and shelter to keep body and soul together. Both up to and beyond this level of production,

people are involved in economic decisions. One of the basic concepts of economics is that persons involved in the production of goods and services are motivated by the desire to make a profit. The profit motive prevails throughout all levels of economic activity and increases in intensity as the spectrum of demand for goods and services is broadened.

Bolivian peasants are subsistence agriculturalists not because they are just providing for their daily requirements of food, fiber, and shelter, but because their demand for goods and services has not progressed very far beyond the minimum essentials. It can be reasoned that productivity has been curtailed because demand has not increased at a sufficiently rapid pace. That the peasants have entered into the economic activities of the country during the most recent decade is substantiated by the increasing number of families with bicycles, radios, and ready-made clothing. Purchasing of these items by a subsistent population presupposes that productivity has increased.

This section compares the economic productivity in four types of farming^{5/} through the analysis of the farm-family business. Both farm and non-farm income are included because frequently the first stage of transition from subsistence to some commercial production begins with off-farm income.

Income. -The extent to which peasants contribute to the national economy is dependent upon the amount of their farm produce or services which are marketed. Perhaps one of the greatest benefits of internal migration in Bolivia during the past decade has been the changing of a large segment of peasants from subsistence to more commercially oriented agriculture. This is especially noticeable when the receipts and expenses of Lowland colonists are compared with those of the Highland peasants.

Average farm receipts were four to eight times greater in the Lowlands than in the Highlands. Farm expenses constituted about 26 percent of gross farm income in the Lowlands, but were relatively unimportant in the Highlands. There are too many uncertain factors of production for peasants to invest their meager earnings into the application of fertilizer and purchasing improved seed or pesticides. There were exceptions to this in the Lowlands where a few individual colonists sparingly applied pesticides to some crops and in the Highlands where animal compost was purchased for use on the fields which were irrigated and consequently cropped annually. The most significant farm expenditure was for hired labor to clear land and for transportation of farm products to market.

The proportion of gross farm income channelled into farm expenses in the Highlands was less than one-half that in the Lowlands, approximately 12 and 35 percent, respectively. Of course, it must be realized that there is less risk involved in hiring labor to clear additional land -- which will almost certainly produce more than enough to pay for the labor -- than in purchasing fertilizer or improved seed.

Comparison of net farm income in the four types of farming indicates why peasants who are interested in farming as a livelihood consider the Lowlands a superior alternative to the Highlands.

^{5/} Type of farming is used throughout this paper instead of agricultural communities to refer to the four physiographic regions studied.

<u>Type of Farming</u>	<u>Farm Income</u>
Spontaneous Colonies	\$b 4,766
Sponsored Colonies	3,323
Non-Help Communities	946
Extension Community	619

Evaluation of the colonies and communities through farm income alone leads one to the conclusion that even if peasants were only minutely motivated by economic gain, there should have been a mass exodus to the Lowlands. This has not occurred which indicates that comparison of the two agricultural regions should include more than just the returns to farming.

Throughout the world, substandard areas or occupations are first demarked by the younger population engaging in part-time employment outside of the area. Land has been divided among siblings until it can no longer provide adequate production. Thus, some persons are forced to seek off-farm employment to supplement their livelihood obtained from the dwindling farm resources. Therefore, total farm-family income must be used when a comparison of regions is made.

Non-farm receipts were usually from income earned off-farm working as a laborer, a commercial business operated in the home by members of the family, or receipts from members of the family who were living away from home. In all communities except Bolivar, working as a laborer provided the major source of off-farm income -- both in number of families and the amount earned. In Bolivar, approximately 80 percent of the families interviewed were involved in some type of commercial enterprise. The business frequently consisted of only a few staple items which were sold through the front door. However, some families offered food and lodging to passers-by and some purchased local products or animals which were then sold in nearby mining towns or cities.

Non-farm receipts exceeded farm receipts in the Highland communities, but accounted for only a small fraction of total income in the Lowlands. When off-farm receipts were added to farm income, the financial status of the two regions was more nearly equal than when comparison was made using farm income.

<u>Type of Farming</u>	<u>Farm-Family Income</u>
Spontaneous Colonies	\$b 5,127
Sponsored Colonies	4,060
Non-Help Communities	2,904
Extension Community	1,466

In both the spontaneous and sponsored colonies, non-farm receipts were only a small part of total farm-family income. However, in all of the Highland communities, non-farm receipts were greater than farm receipts.

In each of the communities, the proportion of total farm-family receipts used for non-farm expenses was approximately the same. This tends to reflect that the peasant class has a high propensity to consume and gives rise to the idea that one of the most effective initiators of development may be to provide work for the underemployed population so they can obtain money with which to purchase goods and services.

An average family spent between 60 and 90 percent of their farm-family income for non-farm items. The major family expenditure was for foodstuff and accounted for 50 to 80 percent of total farm-family expenses. Illness accounted for approximately five percent of total expenses. Other expenditures included, in lesser degrees, money given to family living off-farm (most frequently for children in school), education, and kerosene.

Earnings. Farm privileges were more important in some areas than others; therefore, they should be included when comparing types of farming. Throughout the Altiplano, an evaluation of agricultural production must include farm privileges or grossly underestimate the productivity of the people. Frequently, almost all farm production was consumed or utilized on the farm. In predominately subsistence agriculture, the value of farm privileges is closely related to the size of family. Unless some families consume products which have a greater market value, farm privileges for a family of four persons should be approximately the same in all areas.

Those types of farming with less farm earnings had a greater proportion of total farm production being consumed on the farm. Families in the Lowlands had average farm earnings considerably greater than those in the Highlands, however, the discrepancy was much less than that found for farm income.

<u>Type of Farming</u>	<u>Farm Earnings</u>
Spontaneous Colonies	\$b 6,444
Sponsored Colonies	5,304
Non-Help Communities	2,549
Extension Community	1,605

Farm earnings appear to be better than farm income for comparing the financial status of the different types of farming. If one wishes to compare or evaluate the economic status of families rather than farms, neither of these financial measures is adequate. Many families, especially in the Highlands, supplemented their farm earnings with off-farm income. This income was somewhat similar to farm privileges because the Highland peasants were closer to the mines, the larger cities, or to Argentina where they could obtain work during the slack season of the year.

Day laborers were also in demand in the Lowlands, however, fewer of the colonists were forced to engage themselves as peones because they could always sustain their families from the natural products of the Lowlands. Also, colonists were less free to work part-time than their Highland counterparts because their battle with the jungle never ends. Between planting and harvest or harvest and planting, the Highland peasant can relax from his toils in the fields. This is not true for the colonist. He

must continuously work to keep his crops clear of weeds or to clear more virgin land to replace that which has been depleted. Therefore, an economic comparison of agricultural families in the two regions must be based on average farm-family earnings for the four types of farming.

Type of Farming	Farm-Family Earnings
Spontaneous Colonies	\$b 6,802
Sponsored Colonies	6,071
Non-Help Communities	3,843
Extension Community	2,446

The colonists were still better off than their Highland counterparts. However, the earnings were more evenly distributed among all families in each of the communities. If the median is used instead of the average, there is very little difference between the Lowland colonies and the Highland non-help communities.

In summary, if the economic analysis is made on the basis of the farm-family rather than just the farm production, the opportunity of migrating to the Lowlands appears less attractive for the average family. The difference between the Lowlands and the Highlands decreases as non-farm income and farm privileges are added to farm income (Table 3). Further reasoning for why the Highlander has not migrated to the Lowlands can be seen in a couple of very simple ratios. Average farm-family earnings in the Lowlands were 1.8 times that found for the Highlands. However, average farm-family earnings in the Lowlands were only 1.4 times the average for the non-help communities in the Highlands. To the peasant, this is inadequate to cover the risks of moving and re-establishing his family in a strange and foreign land.

Table 3. Comparison of Four Types of Farming Using Different Measures of Profitability - Bolivia, 1966

Type of Farm	Income			Farm Privileges	Earnings	
	Farm (1)	Non-Farm (2)	Farm-Family (3)		Farm (5)	Farm-Family (6)
	(\$b)					
Spontaneous	4,767	360	5,127	1,677	6,444	6,803
Sponsored	3,322	738	4,060	1,982	5,304	6,042
Non-Help	947	1,957	2,904	1,602	2,549	4,575
Extension	621	845	1,466	984	1,605	2,450

(1) Farm Income Farm Receipts Minus Farm Expenses

(2) Non-Farm Income Income From Off-Farm Work

(3) Farm-Family Income (1) (2)

(4) Farm Privileges Value of Farm Products Used by the Family

(5) Farm Earnings (1) (4)

(6) Farm-Family Earnings (2) (5)

The Lowlands do offer an attraction for the young-of-spirit and the adventurer. The potential for getting rich looms greatly. Many young men have accumulated relatively great wealth within a few years in the Lowlands. They often return to the Highlands and erect beautiful houses to impress their friends and neighbors. However, these people seldom remain in either their Highland community or their first colony. They are off seeking their fortune in some other endeavor. The opportunities for this type of adventure seldom exist in the Highland communities. Some families in the Lowlands earned as much as \$b 45,000 per year whereas, \$b 15,000 was the most earned by any family in the Highlands.

Cash Balance. The net cash balance of families can be of major importance for macro-economic policy decisions. This balance represents the savings of society which are available for purchasing consumer and/or capital goods. The progress of an economy ultimately depends upon whether a positive net cash balance can be generated by the population. From the development standpoint, cash savings are a source of funds which can be taxed -- if individuals in a society are not using these funds in the best interests of development -- and then directed into the economic structure where the optimum use of society's productivity can be realized.

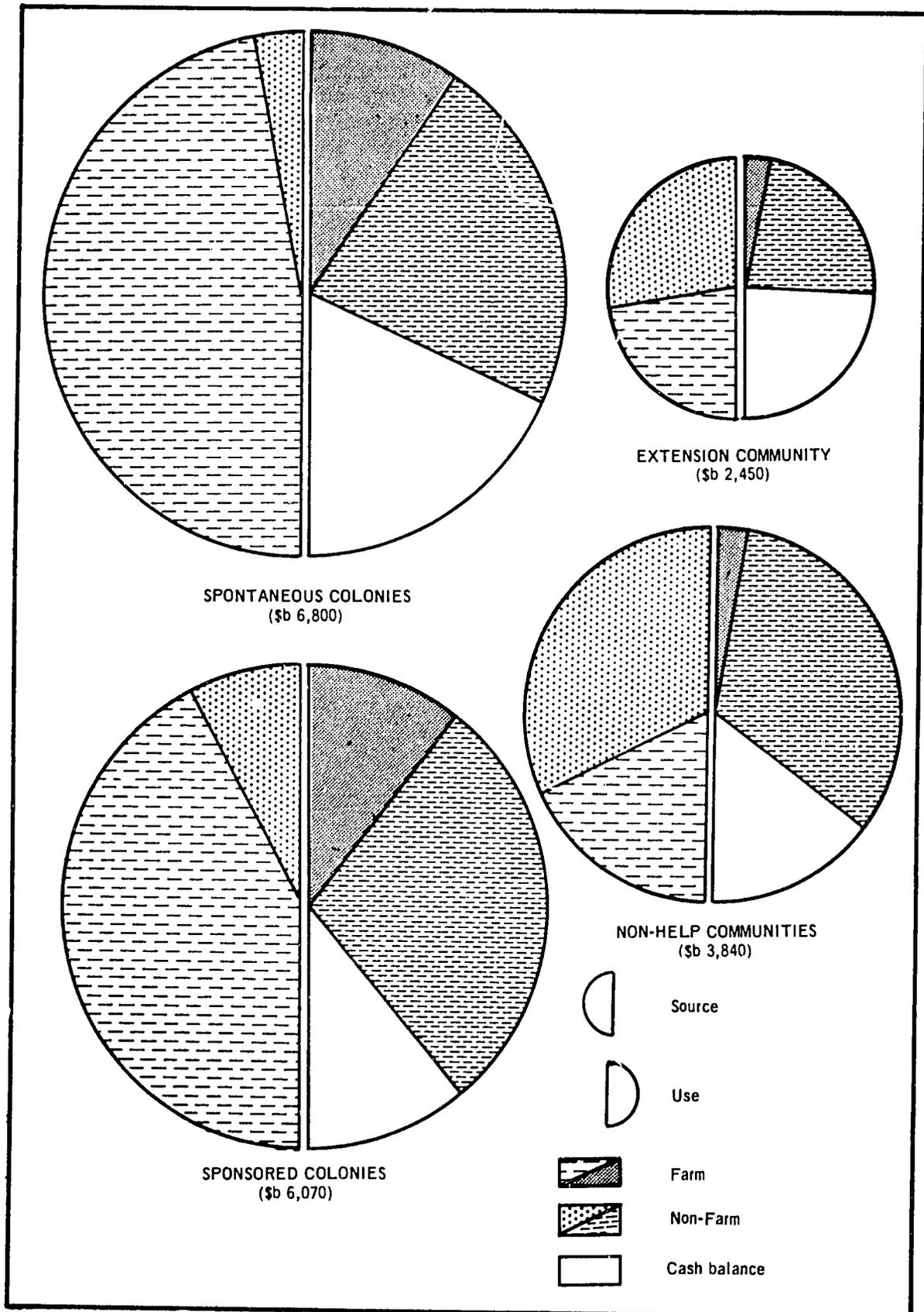
It would be naive to think that the central government could easily tax off all of the net cash balance of the population. Bolivia has a population composed of 70 to 80 percent Indians, most of whom are engaged in primary production, which could create many logistic, political, and sociological problems of collection. Primary production, especially in agriculture, is dependent upon many uncontrollable factors which means that it is subject to violent fluctuations. To compensate for these fluctuations, families must have some store of wealth. Therefore, the taxable amount would have to be something less than the net cash balance.

The average net cash balance per family in each of the four types of farming studied was:

<u>Type of Farming</u>	<u>Cash Balance</u>
Spontaneous Colonies	\$b 2,291
Sponsored colonies	1,149
Non-Help Communities	926
Extension Community	756

It is also of interest to note that the propensity to save does not go down with lower incomes. In fact, the extension community had the lowest average farm-family income, but the highest propensity to save (Figure 1). The reason for this high savings rate among the Highland peasants is difficult to explain. It could probably be explained by the frequent occurrence of drought with the consequent loss of crops and animals. The peasant saves during the good harvest years and lives off of his savings during the lean years. However, the 1965-66 crop was claimed to be very poor because of a lack of rainfall throughout most of the Altiplano -- yet each of the three Highland communities had a positive cash balance.

Figure 1. Source and use of Average farm-family income in four types of farming, Bolivia, 1966



The fact that extensive savings by the Highland peasants exist was demonstrated in the last community studied. During the meeting held in Bolivar to acquaint the community with the study, it was indicated that the local school was in very poor repair and had very few desks for the approximately 50 students enrolled. Most students sat on the ground and used two or three adobe bricks for a desk. The project vehicle was volunteered to haul sufficient lumber from the nearest city (a distance of approximately 125 miles one-way) if the community would raise \$b 500 in one week. Also, the project team members volunteered to assist in the construction of benches and desks. The applause was great and everyone rushed forward to extend the abrazo of true friendship. A committee was appointed to collect the contributions. After one week, less than \$b 50 had been collected -- the committee explained that it had been a very poor year for crops and the people just did not have any money.

Thus, the story might have ended had not several persons arrived in the village a few days later with a different mission. It was an election year in Bolivia and Bolivar had been selected by the presidential candidate for a campaign visit. "Of course", the visiting army colonels explained, "the community is expected to make proper preparations for receiving the future President". Among the preparations were a fiesta, a banquet, and gifts. The colonels remained overnight and promised to return from La Paz within a few days to check upon the preparations. The village came alive -- houses were cleaned and painted, the streets were repaired and swept, chicha (the local home-brew) was made, vast quantities of alcohol were ordered from the city, bread was made, and sheep were slaughtered.

Amazingly, within three days, a committee collected more than \$b 1,000 from people who had refused to give more than \$b 50 for school desks the previous week. Yet, tabulation of the questionnaires revealed that overwhelmingly, the people valued education more than anything else both for themselves and for their children.

Commercialization Index. The proportion of total production sold is frequently used as an indicator of commercialization in the farming operation. An index of 100 would represent the marketing of the total output from the farm. And, of course, if the index were zero, it would indicate the presence of truly subsistence agriculture. In reality, few societies, commonly identified as subsistence agriculture, are absolutely subsistence farmers.

There are many problems associated with any attempt to measure the degree of subsistence in agriculture. Even in more advanced societies, one of the greatest measurement errors in farm management studies is the determination and evaluation of farm privileges. In lesser developed agriculture, much consumption is of the vine-to-mouth type. Harvesting for daily consumption begins as soon as the crops start to mature. This process continues throughout the growing season. Therefore, much of the crop has already been consumed when the final "harvest" is made. It would be presumptuous to assume that peasants can recall the total sum of all the hills of potatoes dug before the crop is finally harvested.

It is equally difficult to assign a commercialization index level at which farming is no longer considered subsistent. The following table tends to indicate that the colonies are quite commercialized, however, observation of their standard of living leads one to conclude that they are still very much engaged in subsistence farming.

<u>Type of Farming</u>	<u>Commercialization Index</u>
Spontaneous Colonies	76
Sponsored Colonies	68
Non-Help Communities	36
Extension Community	39

It is significant that in a country trying to increase the participation of its population in the national economy, the commercialization index in the Lowland colonies is twice that in the Highland communities. This alone may be ample justification for the tremendous governmental interest in promoting resettlement in the Lowlands. Certainly the natural resources, which are the major factors of production in peasant agriculture, are more conducive to increased commercialization of farming in the Lowlands than in the Highlands.

RELATIONSHIP OF PRODUCTION FACTORS TO INCOME AND EARNINGS

The analysis this far of Bolivian agriculture, as represented by four types of farming, has been based upon simple averages. Averages are very useful, but they do not provide insight into causal relationships. This section continues to use averages which are based upon small groupings of the causal factors. For each frequency of a causal factor, an average income and earnings statistic is calculated. It must be remembered that an average of any data tends to conceal some facts. However, a conglomerate of individual observations also tends to obscure some important characteristics. Because of the positive skewness of the data, it has been necessary to leave one frequency open-ended. This often results in either a large or small number of observations in this group. The resulting average is frequently less representative for this group (especially if there are only a few observations) than for the others. Quantifiable factors of production are used as the dependent variables.

Land

One of the basic fundamentals of production economic analysis is to determine whether the optimum output is being obtained from a given set of resources. At least one of the resources has to be relatively scarce or the desired level of output could be obtained most efficiently by increasing all inputs in equal proportions.

Tillable hectares. Bolivia does not have unlimited resources. The population has concentrated in the Highlands which has become overpopulated -- at least relatively. Out of this relative density has grown the idea that land is the principal limitation of agricultural production in the Highlands. If this were true, one would expect a strong relationship between farm output and land. In contrast, the Lowlands have a bountiful supply of land which would tend to indicate that it is not a limiting factor. Therefore, the use of more land, relative to the other factors of production, should result in

declining returns to additional inputs of land. At least, there should be a weak relationship between farm output and land.

Using tillable hectares and farm earnings as measures of land and output, respectively, the above relationships did not hold. In fact, the relationship between farm earnings and land in the Highlands began strong then weakened at higher levels and actually became negative in the non-help communities -- the reverse of what one would expect if land were the most limiting factor of production. In the Lowlands, where one would expect land utilization to be at or beyond the optimum point, the relationship between farm earnings and land became stronger at higher levels of land (Figure 2). This tends to indicate that Bolivian peasants are capable of larger scale agriculture in the Lowlands than in the Highlands.

Hectares in Crops. As previously indicated, hectares in crops refers to the land which was actually cropped during the 1965-66 year. Thus, it could be considered a better input factor than tillable hectares. If so, the relationship between hectares in crops and farm earnings would follow the logical relationship expected between land and output. A positive relationship was found for all types of farming except the sponsored colonies -- which had a slight decline for the last open-ended frequency (Figure 3). Again the relationship was weak in the Highlands and strong in the Lowlands -- conversely to the traditional belief. Certainly, the returns to land are greater in the spontaneous colonies than in any other type of farming.

Capital

The three types of capital on farms operated by Bolivian peasants were: 1) buildings, 2) livestock, and 3) tools. Only a few of the peasants had capital invested in buildings which were solely for productive use in the farming operation. Therefore, this section deals with the relationships of farm earnings to the value of livestock inventory and to the value of tools.

Livestock. A positive correlation was found between farm earnings and the value of livestock inventory in all four types of farming. The relationship was much stronger in the Lowlands than in the Highlands. In the spontaneous colonies, families with less than \$b 400 invested in livestock had average farm earnings of \$b 4,280 whereas, those with an investment of more than \$b 1,600 had average farm earnings of \$b 13,337.

Equipment. A generally positive relationship was found between the value of farm tools and farm earnings. The relationship was strongest for the spontaneous colonies and most erratic for the sponsored colonies.

In the spontaneous colonies, an increase in the value of farm tools tended to increase farm earnings. This was also true in the sponsored colonies and the extension community -- but to a much lesser degree. There appeared to be no relationship between the value of farm tools and farm earnings in the non-help communities.

Figure 2. Relationship of farm earnings to tillable hectares for four types of farming, Bolivia, 1966

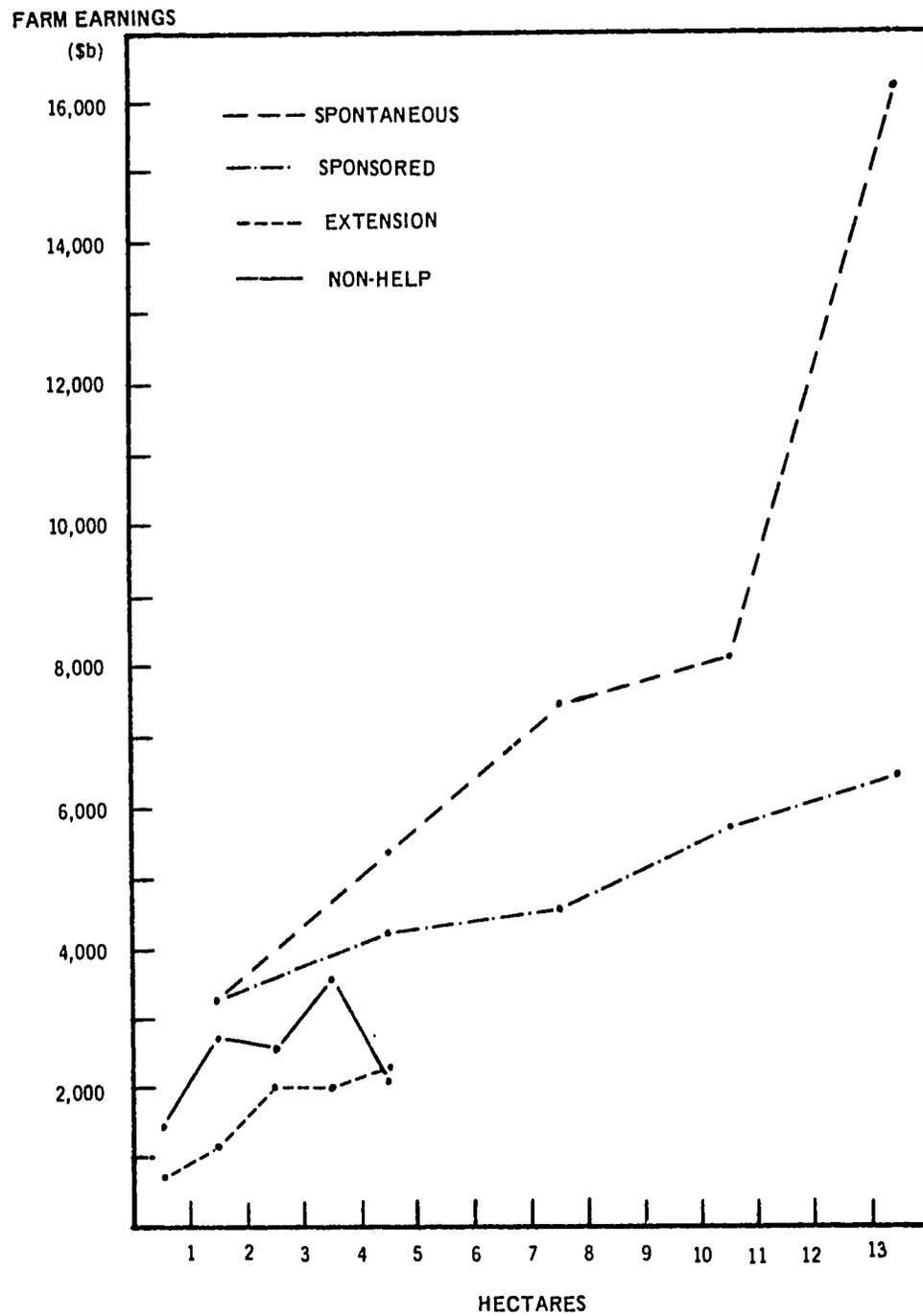
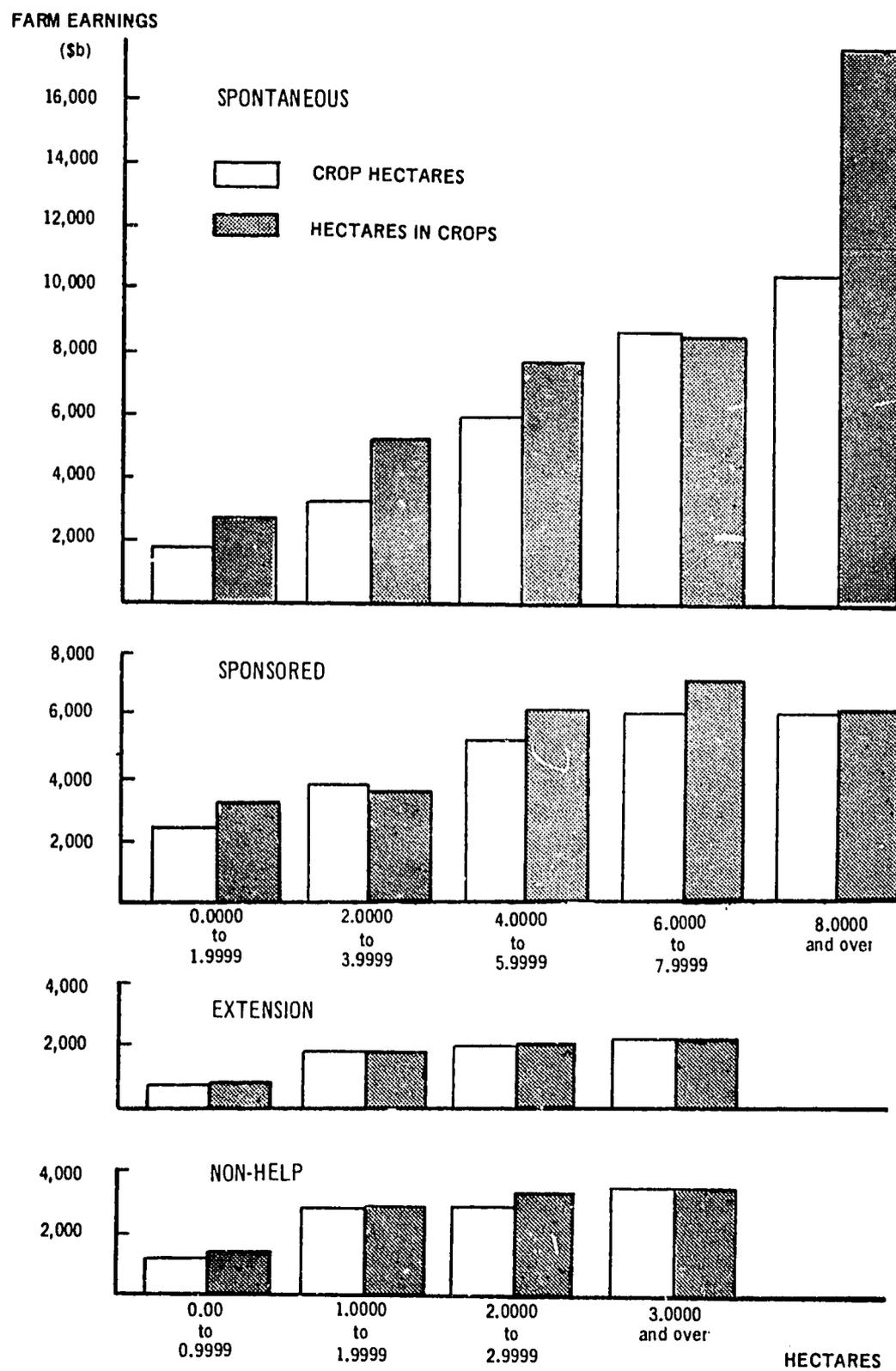


Figure 3. Average farm earnings for different frequency levels of crop hectares and hectares in crops for four types of farming, Bolivia, 1966



Because most of the peasants owned only small hand tools, an increased investment in inventory did not result in increasing the productivity of labor. Increased investment in tools indicated the use of more tools rather than those of better quality. A greater investment in tools generally indicated that more labor was available. Consequently, it was difficult to determine whether the increased earnings were due to capital or labor.

Labor

Labor has both quantitative and qualitative characteristics. Using additional labor will increase output, when all other inputs are held constant, until the point of decreasing returns sets in. However, improving the quality of labor will increase output at any stage of the production function. Essentially, the qualitative aspects of labor are the management factors.

Age of Operator. It is questionable whether age of operator is a qualitative or quantitative factor. Certainly, the knowledge obtained through experience tends to make it qualitative. However, in an agricultural society based upon manual labor, it appears as if the age of the operator has mostly quantitative value.

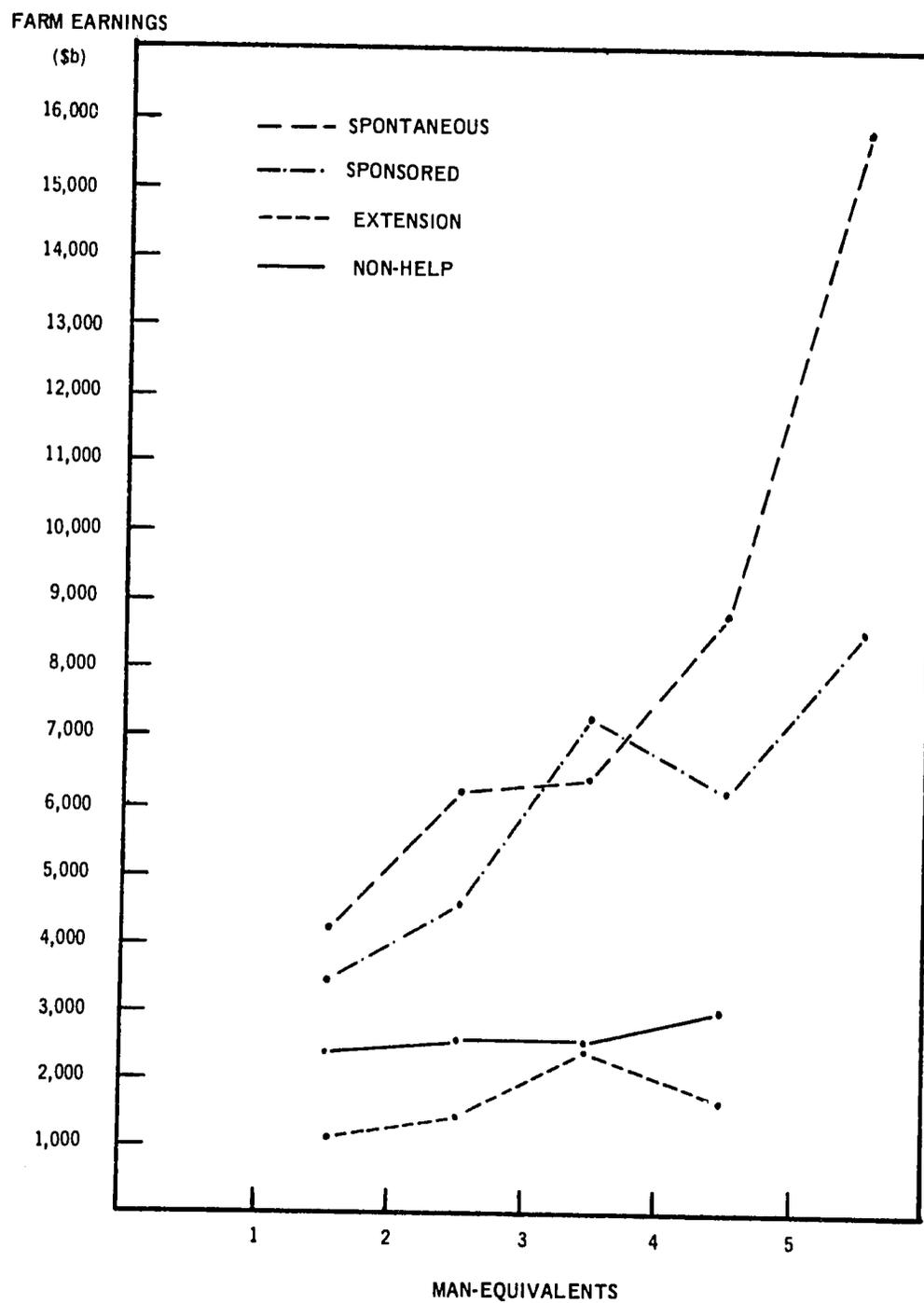
Using this criterion, one would expect output to gradually increase until maximum farm earnings were attained at about middle age. Then, with increasing age, farm earnings should decline. The expected relationship was found. Maximum farm earnings were between ages 32 and 45 for all types of farming except the non-help communities where the highest average farm earnings were in the above 60 age group. Less variation in farm earnings was found for different age groups in the Highlands than in the Lowlands.

The operator's age had an equally important impact upon farm-family earnings. Farm-family earnings were more nearly equal than farm earnings for all age groups in the sponsored colonies and the non-help communities. In the other two types of farming, the difference between earnings at the peak age group and the other age groups was greater when comparing farm-family earnings instead of farm earnings. Farm-family earnings generally tapered off as age increased. Thus, reflecting the fact that most off-farm income came from wages rather than business ventures.

Man-Equivalents of Labor. It has often been advocated that poor peasants have large families because they need many children to help with the farming. There was no evidence to indicate that families are planned for this purpose. As we have seen, the average family was approximately the same size in each of the communities.

The relationship of farm earnings to man-equivalents of labor was much more positive in the Lowlands than the Highlands (Figure 4). In the Lowlands, each additional man-equivalent of labor earned approximately the same as the previous unit. This was not true in the Highlands where those families with four to five man-equivalents of labor earned only 50 percent more than those families with one or two units of labor.

Figure 4. Relationship of farm earnings to man-equivalents of labor for four types of farming, Bolivia, 1966



Farm-family earnings per man-equivalent were also more favorable in the Lowlands. One would expect off-farm income in the Highlands to augment farm earnings sufficiently to result in nearly constant returns to labor. This did not hold; generally, each additional unit of labor resulted in less farm-family earnings than the previous unit.

Average farm earnings per man-equivalent in each of the types of farming were:

<u>Type of Farming</u>	<u>Farm Earnings Per Man-Equivalent</u>
Spontaneous Colonies	\$b 2,774
Sponsored Colonies	2,323
Non-Help Communities	1,597
Extension Community	1,928

Management

One of the more difficult tasks of farm production analysis is to quantify management factors. Few would argue that management is not important in more developed economies. Perhaps it is relatively as important in developing societies.

Formal education has always been considered an important management factor. During the year of field work, it appeared that education was an influencing factor in the social and economic life of the peasants. However, it was impossible to isolate the effect of one year of schooling upon income or earnings. Only 11 of the 429 operators (less than three percent) included in this study had attended school seven or more years. Therefore, the most logical educational division of the operators appeared to be: 1) those with no schooling, 2) those with a minimum education (one to three years), and 3) those with a useful education (four years or more).

There appeared to be no strongly positive relationship between farm earnings and level of education. However, farm-family earnings, farm-family earnings per man-equivalent, and net cash balance were all positively related to education in each of the four types of farming (Table 4). No data for the cost of education were available, but it appears that the peasant could improve his economic situation by obtaining more education. Because of the short productive life of the peasant, this is not too important for the present generation. But the economic future of the younger generation and the country can be improved through increasing the educational level.

COEFFICIENTS OF PRODUCTION

Regression analysis is an extension of, rather than a substitute for, other analytical techniques. Two types of equations are presented in this section. First, a set of linear functions is used to explain and evaluate the influence of 11 factors upon farm earnings. Second, a set of equations is based upon the use of whole farm production functions.

Table 4. Relationship of farm-family earnings to operator's education, by types of farming, Bolivia, 1966

Educational level	Number of families	Farm-family earnings	Farm-family earnings per man-equivalent of labor	Net cash balance
			(\$b per family)	
<u>Spontaneous</u>				
0	31	6,480	2,520	2,400
1 - 3	47	6,600	2,880	1,920
4	31	6,240	3,000	2,640
<u>Sponsored</u>				
0	40	5,400	2,040	960
1 - 3	77	6,240	2,280	1,200
4	42	6,480	2,640	1,320
<u>Extension</u>				
0	32	2,520	840	720
1 - 3	13	2,400	1,080	600
4	11	2,400	1,200	840
<u>Non-help</u>				
0	14	4,080	1,320	840
1 - 3	45	4,440	1,680	840
4	46	4,920	2,400	1,080

Explanatory Functions

Eleven variables have been included as factors which can be used as predictors of farm earnings. The factors and the units in which measured are:

- Y_i = Farm Earnings (\$b) -- Where $i = 1, 2, 3,$ or 4 and Represents the Equation for a Specific Type of Farming
- x_1 = Farm Improvements (\$b)
- x_2 = Livestock Inventory (\$b)
- x_3 = Farm Tools (\$b)
- x_4 = Variable Farm Expenses (\$b)
- x_5 = Hired Labor (\$b)
- x_6 = Tillable Land (Has.)
- x_7 = Operator's Age (Yrs.)
- x_8 = Years Operator Lived Here
- x_9 = Operator's Education (Yrs.)
- x_{10} = Lived Abroad (Yes or No)
- x_{11} = Man-Equivalents of Labor

When data from each of the types of farming were fitted to the above equation, the regression coefficients (b_i values) shown in Table 5 were obtained.

Logically, one would expect an investment in variable farm expenses (x_4), i.e., expenditures for seed, fertilizer, etc., to have a positive effect upon farm earnings. However, in three of the four types of farming, the equation shows a negative relationship between farm earnings and variable farm expenses.

The equations for the four types of farming had R^2 values of .39 to .66, thus, indicating that no more than 66 percent of the variation in farm earnings could be explained by the 11 variables.

The coefficient for land was the only one significantly different from zero in all four equations. However, there is still much valuable information in the equations. Referring only to those variables with acceptable coefficients in one or more equations, it can be seen that increasing farm improvements (x_1), livestock inventory (x_2), hired labor (x_5), and operator's education (x_9) by one unit would increase farm earnings more in the spontaneous colonies than in any of the other types of farming. Increasing the number of years the farm operator lived abroad (x_{10}) and man-equivalents of labor (x_{11}) would result in a greater increase of farm earnings in the sponsored colonies. And increasing farm tools (x_3) or tillable land (x_6) would result in the greatest increase in farm earnings in the extension community.

Three of the variables had coefficients which were unacceptable in all equations. Of the remaining eight variables, it is seen that only two (farm tools and tillable land) had greater returns per unit in the Highlands than in the Lowlands. Thus, if the price is the same for each variable in all four types of farming, investment in farm improvements, livestock, hired labor, education, experience abroad, or man-equivalents of labor, i.e., family labor, should be encouraged more in the Lowlands than in the Highlands.

The regression coefficients have another very important function. If the cost of bringing in an additional unit of a factor does not exceed the value of the coefficient, it pays to bring in another unit. For example, on the average, it would pay a spontaneous colonist to clear an additional hectare of land if it cost no more than \$b 232 -- this partly explains why many colonists hire peones to clear land. Peones clear land for about \$b 150 per hectare. Thus, a colonist can net about \$b 82 per year for every hectare of land he has cleared. Similar calculations can be made for all the variables in each of the equations.

With the exception of land, all variables had approximately the same price in all types of farming. Land was not only more dear in the Highlands, it was almost impossible to purchase. For ease of analysis, it can be assumed that a hectare of land was worth the same in both regions. If the price of a variable is the same in all types of farming, comparison of the importance of that variable can be made between types of farming by using the regression coefficient. Comparison of the importance of the factors within each type of farming is not so easily done because they do not have a common unit of measure. However, if each variable is expressed in terms of standard deviation units, then a coefficient (B_i) is obtained which indicates the relative contribution made by each variable toward farm earnings. This permits the relative ranking of each variable within each equation (Table 6).

Table 5. Regression coefficients of explanatory factors for four types of farming equations, Bolivia, 1966 ^{a/}

Type of farming ^{b/}	Regression coefficients ^{c/}												R ²
	a	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇	b ₈	b ₉	b ₁₀	b ₁₁	
Spontaneous colonies (Y ₁)	1,112	.575*	.821*	.283	-9.10	.959*	232*	-2.09	-13.0	302*	189	60.0*	.581
		(.169)	(.332)	(1.60)	(13.4)	(.569)	(120)	(40.9)	(118)	(180)	(1153)	(37.9)	
Sponsored colonies (Y ₂)	367	-.004	.672*	.765*	-3.79	.703*	78.1*	-21.2	99.1	254*	1014*	82.9*	.388
		(.062)	(.216)	(.326)	(6.53)	(.447)	(50.8)	(26.4)	(35.5)	(104)	(507)	(24.8)	
Extension community (Y ₃)	247	.273*	.039	1.15*	-6.97*	**	331*	-5.50	**	-26.1	114	7.33	.658
		(.131)	(.081)	(.569)	(5.14)		(70.2)	(7.78)		(52.3)	(197)	(9.86)	
Non-help communities (Y ₄)	1,295	-.055*	.315*	.093	.780	.894	.170*	-7.94	**	131*	-661*	41.1*	.465
		(.027)	(.050)	(.663)	(1.64)	(2.02)	(91.8)	(9.46)		(68.2)	(305)	(12.2)	

a/ Form of equation: $Y_i = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11}$

where: Y_i = Net farm earnings (\$b)
x₁ = Farm improvements (\$b)
x₂ = Livestock inventory (\$b)
x₃ = Farm tools (\$b)
x₄ = Variable farm expenses (\$b)
x₅ = Hired labor (\$b)
x₆ = Tillable land (has.)
x₇ = Operator's age (yrs.)
x₈ = Years operator lived here
x₉ = Operator's education (yrs.)
x₁₀ = Lived abroad (yes or no)
x₁₁ = Man-equivalents of labor

b/ Standard error of estimated Y_i and the degrees of freedom, respectively, were: Y₁ -- 3,441 & 97; Y₂ -- 2,670 & 147; Y₃ -- 514 & 46; Y₄ -- 1,057 & 94.

c/ Figures in parentheses indicate standard errors. See Appendix Tables 67 through 70 for matrix of correlation coefficients showing the inter-correlation between variables.

* Level of significance: $0 < p < .20$

** No observations

Table 6. Standard deviation regression coefficients of explanatory factors for four types of farming, regression equations, Bolivia, 1966^{a/}

	Coefficients ^{b/}										
	B' ₁	B' ₂	B' ₃	B' ₄	B' ₅	B' ₆	B' ₇	B' ₈	B' ₉	B' ₁₀	B' ₁₁
Spontaneous colonies	.319 (1)	.229 (2)	.018 (8)	-.050 (7)	.175 (3)	.171 (4)	-.004 (11)	-.008 (10)	.124 (6)	.011 (9)	.127 (5)
Sponsored colonies	-.005 (11)	.246 (2)	.165 (4)	-.040 (10)	.128 (6)	.125 (7)	-.061 (9)	.093 (8)	.168 (3)	.134 (5)	.260 (1)
Extension community	.244 (2)	.055 (9)	.235 (3)	-.137 (4)	*	.549 (1)	-.089 (5)	*	-.060 (8)	.072 (7)	.079 (6)
Non-help communities	-.196 (2)	.702 (1)	.015 (9)	.045 (8)	.042 (7)	.185 (5)	-.079 (6)	*	.196 (3)	-.193 (4)	.003 (10)

* No observations

a/ Form of equation:
$$\frac{Y}{\sigma Y} = A + B'_1 \frac{x_1}{\sigma x_1} + B'_2 \frac{x_2}{\sigma x_2} + B'_3 \frac{x_3}{\sigma x_3} + B'_4 \frac{x_4}{\sigma x_4} + B'_5 \frac{x_5}{\sigma x_5} + B'_6 \frac{x_6}{\sigma x_6} + B'_7 \frac{x_7}{\sigma x_7} + B'_8 \frac{x_8}{\sigma x_8} + B'_9 \frac{x_9}{\sigma x_9} + B'_{10} \frac{x_{10}}{\sigma x_{10}} + B'_{11} \frac{x_{11}}{\sigma x_{11}}$$

where: Y_1 = Net farm earnings (\$b) x_4 = Variable farm expenses (\$b) x_8 = Years operator lived here
 x_1 = Farm improvements (\$b) x_5 = Hired labor (\$b) x_9 = Operator's education (yrs.)
 x_2 = Livestock inventory (\$b) x_6 = Tillable land (has.) x_{10} = Lived abroad (yes or no)
 x_3 = Farm tools (\$b) x_7 = Operator's age (yrs.) x_{11} = Man-equivalents of labor

b/ Figures in parentheses indicate rank.

By ranking the variables both within and between equations, it can be determined which variable is the most important contributor to variation in farm earnings in each of the types of farming. Comparison of Tables 5 and 6 reveals that the following are the most critical factors in each of the types of farming:

Spontaneous Colonies - Farm Improvements
 Sponsored Colonies - Labor
 Non-Help Communities - Livestock Inventory
 Extension Community - Tillable Land

With the exception of livestock inventory, each factor ranked first both within and between the types of farming.

Obviously, increasing only one factor in each type of farming may not equalize farm earnings in all four areas. However, this does indicate that increasing each of these four factors as indicated above would result in the greatest impact upon increasing total farm earnings.

Whole Farm Production Functions

During the past several decades, increasing resource productivity in particular countries of the world has taken on a new level of importance. Stirred by ideology, disproportionate poverty, and the population explosion, the more developed countries have launched a major effort to assist less developed countries. This effort has been concerned chiefly with increasing the productivity of resources through the introduction of new technology. An attempt has been made to replace existing production functions with new ones which lie higher in the output plane. It is hoped that this will lead to the production of more output from the same quantity of inputs or to the same output with fewer inputs -- thereby releasing these scarce resources for other economic activities.

Valuable insight may be gained concerning the quantity of particular resources which should be employed and how several resources should be combined through a comparison of the estimated marginal value products of a resource factor to the probable cost of using a unit of that factor and similar comparisons among all other factors within one or more production systems.

Various mathematical functions approximate this concept. The most commonly used for this type of analysis is a power function known as the Cobb-Douglas function.

Only a small proportion of Bolivian development funds have been used to increase the efficiency of resource use within the context of given production functions. As it becomes more difficult to shift to new production functions, it becomes more important that particular functions be evaluated. Comparison of production function estimates provides empirical evidence of differentials which exist within countries. Such data may make it possible to evaluate the relative need for more advanced production processes and to determine between programs oriented toward the adoption of new production functions and programs with the objective of increasing resource use efficiency within a given technological environment.

In evaluating the implications of the analysis for individual variables within each of the production processes, account must be taken of the relative importance of that factor. A small measure of inefficiency per input unit of a major factor may have far more serious repercussions than a large degree of inefficient use of an input which is used only in small amounts. Although comparisons are made without always mentioning, the interpretation is based upon the situation which prevails on the average in the types of farming. While these interpretations may not be of great use to individual farmers, they are significantly important for the determination of policy decisions dealing with the allocation of land, labor, and capital within the country and they may give some indication of what might be done to improve the managerial ability of the farm operators as a whole.

The production functions used in this section have the form

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5}, \text{ where each of the variables represent:}$$

- Y = Value of Sales and Consumption of Crops, Live: ock, and Livestock Products (\$b)
- x₁ = Variable Farm Expenses Consisting of Seed, Fertilizer, and Insecticides (\$b)
- x₂ = Value of Productive Farm Capital Composed of the Ending Livestock Inventory, Farm Buildings, Farm Tools, Miscellaneous Other Items, and Equipment Rent Capitalized -- Amount of Annual Rent Times Ten -- (\$b)
- x₃ = Labor Used on the Farm (Man-Equivalents)
- x₄ = Tillable Land (Has.)
- x₅ = Education (Years of School Completed by Operator)

Interpretation of the whole-farm production function is different from that of the explanatory equation. The production function deals with factors which are known inputs into the production process of the farming operation. The implication is that of changes in one factor causing changes in another rather than a relationship between two factors with neither being the causal factor.

Four coefficients in the equations had negative signs where positive signs would normally have been expected. However, three of these signs can be explained. Only a few colonists had any variable farm expenses; therefore, because of the nature of the Cobb-Douglas function, a small positive value (.001) was assigned to those colonists with no variable farm expenses. Insertion of these small fractions resulted in a negative coefficient. Variable farm expenses could have been eliminated from all equations because of their insignificant role. The same was true of education in the extension community where 32 of 56 operators had no schooling and the others had approximately the same level of education each. Therefore, the inadequate distribution of the input factor produced no measurable effect upon output. There is no explanation of why farm labor had a negative coefficient in the non-help equation. However, it must be noted that the coefficient is not significantly different from zero (Table 7).

Table 7. Whole-farm production function coefficients for types of farming and regional equations, Bolivia, 1966^{a/}

		a	Regression coefficients ^{b/}					R ²	Σb_i
			b ₁	b ₂	b ₃	b ₄	b ₅		
<u>Type of farming equations</u>									
Spontaneous colonies	(Y ₁)	200	-.001 (.013)	.149* (.056)	.210* (.149)	.749* (.122)	.021 (.015)	.50	1.128
Sponsored colonies	(Y ₂)	9	-.007 (.009)	.369* (.046)	.554* (.128)	.229* (.074)	.021* (.013)	.50	1.117
Extension community	(Y ₃)	131	.0001 (.0117)	.085 (.073)	.237* (.175)	.570* (.104)	-.013 (.013)	.60	.879
Non-help communities	(Y ₄)	77	.006 (.008)	.421* (.056)	-.019 (.123)	.255* (.064)	.014 (.015)	.46	.677
<u>Regional equations</u>									
Lowland colonies	(Y ₅)	27	-.010 (.007)	.268* (.038)	.531* (.104)	.202* (.064)	.019* (.001)	.39	1.011
Highland communities	(Y ₆)	49	.013* (.007)	.377* (.043)	.107 (.106)	.278* (.054)	.011 (.009)	.51	.786

* Level of significance: $0 < p < .20$

^{a/} Form of equation: $Y_i = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5}$

where: Y_i = Gross farm output (\$b)
 x₁ = Farm expenses (\$b)
 x₂ = Farm capital investment (\$b)
 x₃ = Farm labor (M-E)
 x₄ = Tillable land (has.)
 x₅ = Education of operator (yrs.)

^{b/} Figures in parentheses indicate standard errors.

Because the Cobb-Douglas function is a curvilinear relationship, comparison of the regression coefficients between equations can be done on the basis of the marginal value product (MVP) at the arithmetic mean. The MVP indicates the increase in output which can be expected if the input factor is increased one unit. For example, adding one man-equivalent of labor (x₃) in the spontaneous colonies should increase farm output by \$b 586 (Table 8). Similarly, every peso invested in capital should result in an increase of \$b .55 in annual farm output.

Table 8. Marginal value product of whole farm production factors, at the arithmetic mean, for four types of farming and two regional equations, Bolivia, 1966

Type of farming	Farm expenses (\$b)	Capital investment (\$b)	Farm labor (M-E)	Tillable land (Has.)	Education of operator (Yrs.)
	x_1	x_2	x_3	x_4	x_5
			<u>Type of farming equations</u>		
Sponsored	-2.37	.87	1,232	152	54
Extension	.02	.07	134	373	-15
Non-help	.28	.28	- 19	313	12
			<u>Regional equations</u>		
Lowlands	-4.50	.76	1,300	174	54
Highlands	.73	.26	96	281	10

Joint examination of Tables 7 and 8 reveals some interesting facts. Most of the coefficients are both statistically and logically acceptable, however, the MVP of some variables indicates estimates which are inconsistent. It is very doubtful if additional capital investment by the average colonist would result in a 55 to 87 percent annual return on the investment. And given the homogeneousness of production factors in the spontaneous and sponsored colonies, it is doubtful if the MVP of labor could be \$b 586 and \$b 1,232, respectively, or that the MVP of land could be \$b 1,000 and \$b 152, respectively, in the two types of farming. The MVP for some of the factors in the Highlands appears to be equally unacceptable.

By now, it is apparent that the absolute value of the estimates based upon the whole-farm production functions can be doubted. However, this does not mean that the estimates cannot be useful as indicators of direction rather than magnitude. For policy implications, the direction of the estimate is as important as the magnitude. Once the direction is established, the magnitude can be ascertained through budgeting or other forms of analysis.

If each factor is assumed to have the same price in all areas studied, the MVP for each factor can be ranked between equations to determine the type of farming where the factor contributes most to farm output. And if the equations are stated in terms of standard deviations, the factors can be ranked within each equation according to the amount of variation in output they explain (Table 9). By combining the ranking between and within the equations, it can be determined which are the most important factors contributing to farm output and in which types of farming they should be stressed most.

Table 9. Standard deviation regression coefficients of whole-farm production factors for types of farming and regional regression equations, Bolivia, 1966^{a/}

	Coefficients ^{b/}				
	B' ₁	B' ₂	B' ₃	B' ₄	B' ₅
<u>Type of farming equations</u>					
Spontaneous	-.004 (5)	.210 (2)	.120 (3)	.522 (1)	.099 (4)
Sponsored	-.050 (5)	.503 (1)	.276 (2)	.182 (3)	.101 (4)
Extension	.001 (5)	.121 (3)	.139 (2)	.643 (1)	-.095 (4)
Non-help	.055 (4)	.607 (1)	-.012 (5)	.298 (2)	.070 (3)
<u>Regional equations</u>					
Lowland	-.064 (5)	.377 (1)	.282 (2)	.166 (3)	.089 (4)
Highland	.119 (3)	.541 (1)	.061 (5)	.297 (2)	.069 (4)

a/ Form of equation: $\frac{\log Y_i}{\sigma \log Y_i} = \log A + B'_{11} \frac{\log x_1}{\sigma \log x_1} +$

$$B'_{22} \frac{\log x_2}{\sigma \log x_2} + B'_{33} \frac{\log x_3}{\sigma \log x_3} + B'_{44} \frac{\log x_4}{\sigma \log x_4} + B'_{55} \frac{\log x_5}{\sigma \log x_5}$$

b/ Figures in parentheses indicate rank.

The cross rankings were:

Type of Farming	Farm Expenses x ₁	Capital x ₂	Labor x ₃	Land x ₄	Education x ₅
Spontaneous Colonies	3 (5)	2 (2)	2 (3)	1 (1)	1 (4)
Sponsored Colonies	4 (5)	1 (1)	1 (2)	4 (3)	2 (4)
Non-Help Communities	1 (4)	3 (1)	4 (5)	3 (2)	3 (3)
Extension Community	2 (5)	4 (3)	3 (2)	2 (1)	4 (4)

The numbers in () indicate ranking within an equation and the other numbers represent the rank of a variable between equations.

It is obvious that land is the most important contributor to farm output in the spontaneous colonies and capital investment in the sponsored colonies. In the Highlands, the most important factors are less obvious, however, indications are that land should be expanded in the extension community and capital investment in the non-help communities. From the above data, it can also be seen that an increase in labor would have the most positive effect on farm production in the sponsored colonies, increased education would be most rewarded in the sponsored colonies, and additional variable farm expenses would be more highly rewarded in the non-help communities.

It is apparent that no single ordering of priorities can be made either between or within the four types of farming included in this study. However, the data strongly evidence that disequilibria in the use of land, labor, and capital does exist. Certainly, the returns to the factors of farm production appear to be greater in the Lowlands, however, other economic opportunities in the Highlands and strong sociological or psychological factors have to be considered before shifts in any of the production factors are attempted.

POLICY IMPLICATIONS

One of the prime objectives of colonization is to raise the level of living of the people migrating. There appears to have been no substantial increase in the level of living for a majority of the colonists. Their annual income remains about the same, their homes are neither better built nor better furnished, they continue wearing dirty, tattered clothing, etc. There is one advantage the colonist has over his counterpart in the Highlands -- he is assured of a constant food supply throughout the year every year. Crops grow quickly in the tropics and can be planted during almost any month thus assuring a constant supply of food. Crop failure in the Highlands often means starvation whereas, crop failure in the tropics means eating less of the crop which failed and more of another crop which is in abundance. This factor alone, if properly explained to the peasants, could move thousands of people to the Lowlands.

Toward a Successful Colonization Infrastructure

There is no doubt that certain natural conditions must exist before any region can be settled. Among these are suitable soil, favorable climate, and adequate rainfall or availability of water. These natural conditions must be augmented with an infrastructure. Without the latter, only the hardest of colonists will enter and remain in a region. Four of the most important aspects of an adequate infrastructure are: 1) marketing, 2) transportation, 3) technical assistance, and 4) land tenure.

Marketing. The present marketing situation in Bolivia is principally controlled by either partial or complete monopolies. Prices paid to producers fluctuate so drastically that it often does not pay to harvest a crop -- this is especially true of tropical fruits.

If a new area is to sustain its population at more than a subsistence level, goods must be produced cheaper than in established areas of production or they will not be able to bear the increased cost of transportation from the more remote area. It is not impossible for transportation from the new area to eventually be cheaper than from the established area, however, this depends upon the supply and demand of goods produced and upon the transportation system.

Bolivia is unfortunate that its areas having the greatest agricultural potential are not readily accessible from the major population concentrations.

Transportation. Once there is an established or at least a potential market, there has to be adequate transportation facilities to supply the market with the goods it needs when it needs them. Bolivia has since its founding depended on the railroads for transportation, but the lines were built to service the mining industry.

Today, there are only two railroads which were constructed to service agricultural areas. Neither the railroad from Santa Cruz to Corumba nor from Santa Cruz to Yacuiba have greatly enhanced the production of the region because they connect with foreign countries rather than tending to tie Bolivia together internally.

During the last two decades, Bolivia has made a major effort to improve and expand its road network. Without a doubt, the improved road system has contributed more to increased agricultural production and colonization in the Lowlands than any other force. Without the road from Cochabamba to Santa Cruz and those branching out from the latter, there would have been very little colonization in this region. Whenever there are roads and the natural resources are favorable for agricultural production, people will settle in the region.

Roads are not the sole answer. A good road into a region unfit for agriculture will serve no purpose. Neither will an overconcentration of roads in a rich agricultural area without any arteries to the principal markets serve any purpose. The immediate area surrounding the city of Santa Cruz has a fairly good network of roads, however, transporting the produce from there to the internal markets is a long, slow, costly process. The roads leading to the Highland markets have been neglected.

Technical Assistance. Many people feel that spontaneous resettlement, which accounted for populating most of the world, is inferior to planned settlement schemes. This thinking continues despite the fact that few of the planned resettlement schemes in the world have succeeded.

Many countries are not willing to lay the foundation and then wait on the pioneering spirit to move people. Therefore, certain technical assistance programs can augment directed colonization and smooth the way for spontaneous resettlement.

Lack of knowledge about tropical farming is less a problem among spontaneous settlers than in directed programs. The former nearly always arrive in the Lowlands and settle close to friends or relatives who have had some experience in tropical agriculture. Often, the newly arrived will work for their friends or relatives for a year or more before taking their own land. This same experience is not gained by

colonists in sponsored colonization projects where people are mixed together who have no close ties to each other.

Land Tenure. To transpose the Bolivian peasants from subsistence agriculture in the Highlands to a subsistence level of living in the Lowlands results in no gain to either the migrants or the country. Some of the colonists have migrated because they want sufficient food and fiber to live at a slightly better level than they previously had. However, many others are entrepreneurs who are seeking economic opportunities which were previously not available because of the limited amount of land in the Highlands. They become discouraged when adequate land is not available in the Lowlands.

Therefore, colonists who have the desire and ability to become entrepreneurs should be permitted to accumulate sufficient land for a viable economic operation. Title to the land should be given as soon as it becomes apparent that the colonist intends to remain permanently.

The Influence of Foreign Colonization

It is often questioned whether the foreign colonists in Bolivia are making any contribution to the economy. It is doubtful that they have introduced any new techniques of agricultural production because of their tendency to remain basically closed societies. However, they have made a significant contribution to the increase in agricultural production.

Although less than five percent of the colonists are foreign, they contribute about 17 percent of the rice and maize produced by the colonists. If cotton is included, because it is the principal cash crop for the Mennonites, the two principal crops of the 860 foreign colonists account for about \$b 11 million annually whereas, the two principal crops of the 19,000 Bolivian colonists account for only about \$b 45 million annually.

The foreign colonists tended to have an average of three to four times as many hectares of rice and maize as the Bolivian colonists. Also, their production of these two crops tended to be four to five times that of the national colonists. Thus, the foreign colonists not only operated on a larger scale, but they also had greater productivity. The foreign colonists also had greater marketing ability and tended to obtain higher prices for their products. This was probably because they nearly always sold directly through their own marketing organization rather than through a middleman.

The combined results of the above factors earned the foreign colonists an average of \$b 12,500 as compared to \$b 2,400 for the Bolivian colonists from their two principal crops. If comparison is based on farm-family earnings and is confined to the more prosperous colonists in Santa Cruz, the foreign colonists still show up much more favorably than the nationalists. The Bolivian colonists had average farm-family earnings of about \$b 6,400 whereas, the foreign colonists averaged an estimated \$b 20,000.

One of the major causes of the difference in productivity of the foreign and national colonists has been attributed to the amount of capital available. Indeed, the Japanese families arrived with considerable personal wealth. Both the Japanese and the

Okinawans have received aid from their respective governments and/or the United States. However, their success has stemmed from the fact that they have had the managerial ability to use this aid to increase their level of living substantially.

In contrast to the other foreign colonists, the Mennonites have had no governmental aid. Yet they have been relatively prosperous in an area similar to where Bolivian colonists can barely subsist. The Mennonites can contribute more to increasing the production of dairy products in the Santa Cruz area than any other people. Their livestock inventory doubled during 1966 and will probably continue to grow at a rapid rate. There is every indication that much of the dairy and swine production in the Santa Cruz area will eventually be dominated by the foreign colonists or by foreign nationalists who have settled independently in the region.

Increasing Productivity or Expanding the Production Base

Bolivia's population is already increasing at a very rapid pace. As medical attention, education, income, and, consequently, better diets become more available in the rural areas of the country, the rate of increase in population will accelerate. To provide the food and fiber for the population, Bolivia can increase agricultural output by increasing productivity and/or expanding the production base. Given the limited financial resources of the country, it is essential that the optimum return on investment be obtained.

The Altiplano can never be a major agricultural region, however, it has sustained a rather dense population for centuries and can be made to sustain a greater population in the future. It is here where agricultural production is hindered because the natural elements are lacking or adverse and human technology must be more intensively applied.

Improved seed has been introduced in some communities and has increased yields. However, the increased yield from improved seed is limited because of the more critical factor -- water. Without finding ways of conserving and obtaining water on the Altiplano, agricultural production can never sustain the population. Water is the natural element which is the most restricting factor of agricultural production in the Altiplano.

Most of the water in the Altiplano is underground and at depths beyond the capability of the peasants to obtain. Geological studies need to locate underground supplies of water and determine the depth. Wells need to be drilled at the most advantageous points -- along the leeward side of slopes and in small depressions. And the peasants need to be instructed in the use of new seeds and fertilizer in order to obtain the greatest return on investment.

Vegetables are presently grown in the deeper valleys surrounding La Paz. And certain communities near Potosi, which have a sufficient quantity of water and are situated on the leeward side of a mountain, are successfully growing vegetables at 11,000 feet above sea level. Given a sufficient quantity of water, it appears that this could be duplicated in many areas throughout the Altiplano.

The agricultural potential in the Highlands is not as great as in the Lowlands, but enough favorable factors exist to warrant an optimistic rather than pessimistic attitude. There are indications that sufficient food can be produced within the area to feed the people living there.

One of the prime objectives of colonization is to raise the level of living of those persons migrating. There appears to have been an insufficient increase in the level of living for a majority of the colonists. Their homes are neither better built nor better furnished, they continue wearing dirty, tattered clothing, they do not experience better health, etc. The average income of the colonists is greater than what he had in the Highlands, however, the difference is probably not adequate to compensate for the risks undertaken in resettling. There is one advantage the colonist has over his counterpart in the Highlands, he is assured of a constant food supply throughout the year -- every year. Crops grow quickly in the tropics and can be planted several times a year thus assuring a constant supply of food. Crop failure in the Highlands often means starvation whereas, crop failure in the tropics means eating less of the crop which failed and more of another crop which is in abundance. This factor alone, if properly explained to the peasants, could stimulate thousands of people to migrate to the Lowlands.

There are several factors which could justify expanding the production base of agriculture through the continuation of colonization programs. First, people in the eastern Lowlands have never felt strong political ties to the rest of the country because of their isolation. A colonization program which would result in a significant number of people from the Highlands resettling in the Lowlands could tend to strengthen the political unity of the country. Second, one of the causes of peasant unrest has been the lack of land ownership. There is not enough land in the Highlands for everyone to have an adequate amount for a viable farming unit. This population pressure can be alleviated if an adequate number of people can be enticed to migrate to the Lowlands. Finally, the immediate need for increased agricultural output can probably be obtained more rapidly and at less cost in the Lowlands than in the Highlands. However, to accomplish these ends, the Bolivian government needs to carefully evaluate their present colonization programs to assure that they are viable and are accomplishing the desired results.

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