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INTRODUCTION

The subject of minifundia, although mentioned in almost every article or book which deals with land tenure problems or various aspects of land reform, has been studied very little in itself. Proof of this assertion is the fact that even at the present, there is still controversy on the criteria to be used in the definition of minifundia.

Since I started to gain interest in the subject of minifundia, it became evident that minifundia would provide a fruitful field of meaningful research. Furthermore, knowing that minifundia was a key issue in Latin American land reform programs, I thought that research on this field should be not only valid from a theoretical point of view, but also very useful for countries where land reform programs are undertaken.

One of the aspects that is many times associated with minifundia is that agricultural productivity of land is low. What is actually implied in this assertion is that small land holdings, being defined as minifundia sometimes without a theoretical understanding of other aspects, may or may not make a small holding a minifundia. As a result, and to clarify the issue, it was decided that productivity should be studied both in small holdings that can be determined to be minifundia, and in those parcels that are not. Although only the first part of what I consider to be the full study was undertaken, that is the determination of productivity in minifundia, some conclusions that could be useful were arrived at and the hope is to complete the second part of the study at a later time.

Productivity of land was thought to be not only a function of the classification of the landholding as minifundia, but also a result of other conditions such as differences in educational attainment. The fact that land was acquired through purchase before land reform, or was given free through land reform, was also considered. The conclusions derived on this part of the research were fairly interesting, and perhaps could be useful, both for future research and for countries that are in the process of initiating land reform programs in Latin America.

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MINIFUNDIA, PRODUCTIVITY, AND LAND REFORM IN COCHABAMBA

By

Carlos Camacho Saa

This paper is an abbreviated version of the author's Ph.D. thesis of the same title.

CHAPTER I

STATEMENT OF PROBLEM AND HYPOTHESES

Definition of Minifundia

The word minifundia is derived from the Latin and it literally means small landholdings. This is the usual meaning of minifundia throughout Latin America. However, it seems that presently there is not a sufficiently precise definition of what can be considered minifundia for purposes of writing specialized papers or books, or of undertaking research. For example, Thomas F. Carroll[1] sees minifundia mainly in terms of the inability of a small landholding to provide an "acceptable minimum level of living," implying that for general purposes farms of less than twenty hectares in Latin America might be considered minifundia. One can see immediately that such a definition only begs the question by raising the issue of what may be an "acceptable minimum level of living" when this rises gradually as new goods and services become more commonplace. On the other hand, Poblete,[2] while dealing with the problem of minifundia in macro-economic terms, defines minifundia as properties of less than five hectares. In this way size becomes the basic determinant of minifundia. Here, one can see that size alone cannot be made a definition of minifundia, for the simple reason that fertility, soil characteristics, etc., determine the productivity of a small farm much more than does size alone. One cannot call parcels of savannah only good for grazing animals extensively and parcels of land near a market producing vegetables minifundia just because they happen to be five hectares or less. However, the criterion of size probably is best, and much better than a landholding incapable of providing an acceptable minimum level of living when a definition is necessary on a general macro-economic level.

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1 Thomas F. Carroll, "The Land Reform Issue in Latin America," printed in Latin American Issues (Albert O. Hirschman, ed.), The Twentieth Century Fund, New York, 1961.

2 Moises Poblete Troncoso, La Reforma Agraria en America Latina, Editorial Andres Bello, Ahumada 131, Santiago de Chile, 1961.

Parsons[1] defines minifundia as a plot of land worked by a self-employed cultivator, or a plot given as compensation for work, which is cultivated using traditional farming practices and which does not provide for the full employment of family labor. The definition of minifundia used in this study is based on two of Parsons' considerations, namely the use of traditional farming practices and the underemployment of the family labor. Under these conditions a specific size for minifundia could possibly be determined for a region with relatively homogeneous characteristics, such as soil type, water availability, cropping patterns, market opportunities, etc.

Importance of Minifundia in Latin America

There seems to be general agreement among persons concerned with land tenure issues and problems in Latin America, and with agricultural transformation generally, that the minifundia problem is one of the key issues in policies affecting the systems of land tenure or even in policies designed to improve agricultural production in general.

Most policies affecting the systems of land tenure in Latin America contain an implicit assumption that the present ownership structure of land, usually characterized by latifundia[2] is inadequate and should be replaced by a more efficient system of ownership, usually assumed to be a family farm, owner-operator type of tenure. Generally, the elimination of latifundia has proved to present fewer problems than the elimination of minifundia because, although the persons affected are usually influential, their number is small. Furthermore, not all large landowners can be considered latifundistas. On the other hand, the number of people affected by any policy measure to eliminate or change a minifundia-based structure is large, and in some countries may even affect the majority of families in the agricultural sector. Another consideration to be made is that, although minifundia may be small and inefficient in terms of the agricultural techniques employed, such holdings still provide opportunities for subsistence to the families or groups involved, and thus some employment opportunities. Thus, talk of consolidating small minifundia

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[1] Kenneth H. Parsons, Notes for a Study of Minifundia Areas in Western Guatemala: Toward a Project Statement, Unpublished Research Proposal of the Land Tenure Center.

[2] The term latifundia usually implies a large landholding using traditional agricultural techniques with payment of a money wage to agricultural labor non-existent or marginal, and with a pyramidal type of management usually characterized by absentee ownership. This type of holding is prevalent in much of Latin America.

holdings is fatuous until some alternatives are found to employ the displaced agricultural people either on new lands or in non-agricultural employment, such as industry or services.[1]

To have an idea of the relative importance of minifundia in Latin America as a whole it is necessary to rely on a measure of size. We will accept Poblete's definition of farms of less than five hectares. The extent of the minifundia problem in Latin America, using this definition, can be readily seen in Table 1.

Table 1. Minifundia in Latin America

Country	Number holdings less than 5 has. (1950)	Percent of total number of holdings
Argentina	59,616	15.65
Brasil	458,676	22.21
Colombia	534,556	54.90
Ecuador	251,686	76.92
Honduras	89,016	57.10
El Salvador	140,473	90.00
Mexico	1,004,835	73.58
Panama	44,442	51.99
R. Dominicana	209,407	42.10
Uruguay	10,953	15.85
Bolivia[1]	26,472	30.64

[1] Before land reform.

Source: Troncoso, Ibid.

Table 1 is incomplete because not all the countries give their census data in terms of holdings of less than five hectares. It can be seen that the problem of minifundia, although generalized throughout Latin America, is more acute in the Central Andean countries,

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[1] This merely shows how grave this problem is, for most countries in Latin America are not creating non-agricultural employment opportunities rapidly enough to employ the absolute increase in the agricultural population, let alone actually diminish that population. Thus, the problem of minifundia, despite talk of consolidation, will continue for a long time to come.

in the smaller Central American republics, and in Mexico. The percentage of landowners that will be affected if policies which even touch on the problem of minifundia are enacted is as high as 90 percent in the case of El Salvador.

Minifundia and Other Economic and Social Factors

In Bolivia, in the Upper Valley of Cochabamba, land reform distributed almost all land in minifundia sized plots. To illustrate this assertion, the only landholdings in the Upper Valley which exceed five hectares are either those few lands to which past owners still may have some rights (but are not cultivated by them presently because of fear of campesino reaction), or public landholdings such as those around experiment stations.

This type of reform, however, has resulted in a more even distribution of income and in the incorporation of the campesinos into the mainstream of national life, politically, socially, and economically. To the extent that they are able to produce an agricultural surplus on their farms or to engage in activities other than farming, most campesinos become integrated into the national economy, instead of remaining entirely subsistence producers and consumers as they were before the land reform. However, if industrial growth is small or non-existent and if there are no sizable migration outlets, population growth is likely to lead to the further creation of minifundia sized plots. Minifundia is self-perpetuating unless strong policies are devised to correct the situation, especially in fields such as agricultural research, credit and extension services, and creating opportunities outside agriculture. Although credit and extension services are direct tools to tackle the problem of minifundia their effectiveness is limited if the general economic development of the country is lagging.

The minifundia problem is mainly a result of systems of land tenure that have existed in the past in a given region. When a country chooses to redistribute property rights in land to those who work the land--that is, a policy of land reform such as took place in Mexico and Bolivia--one of the necessary by-products of such a policy is an increase in the number of minifundia sized holdings, especially in countries or regions which have a high population density. This may result in minifundia as practically the only type of landholding in some areas or regions.

In this thesis we are considering minifundia as a land parcel that is insufficient in size to fully use the available family labor using traditional agricultural techniques. It is only as regards this underemployment of labor that it may be judged whether a family income is "inadequate," for if a family labor force is fully employed, by definition no higher level of income can be attached if all present opportunities are being exploited.

Hypotheses

The hypotheses that will be tested in this thesis are the following:

a. A definition of minifundia that used the criteria of underemployment of labor and persistence of traditional agricultural techniques constitutes a useful tool in research projects concerned with minifundia and their development. The importance of this hypothesis is that the conditions that must be looked at to classify a plot as minifundia should be known first to be able to derive further conclusions involving the relations of minifundia with other factors such as low productivity, education level, or agricultural development in general.

b. Agricultural productivity per unit of land under minifundia conditions is low in relation to productivity obtainable with an optimum allocation of resources. It is desirable to know whether minifundia sized plots do actually have low productivity per unit of land. If this is so, minifundia will involve not only a problem of underemployment of labor but also a problem of low agricultural production within the country or region where minifundia are predominant.

c. Lack of alternative opportunities for the campesinos and population growth after the land was redistributed has resulted in further subdivision of land either by legal or by extra-legal means. It is desirable to try and determine whether there have been enough alternative opportunities to absorb the excess population. If the land has been further subdivided it is possible to have an idea of how the man-land ratio has evolved and what it is likely to be in the future.

d. Within the minifundia range the larger farms have a higher average productivity per unit of land than the smaller farms. The determination of whether further subdivision of plots that already are minifundia will result in a decrease in total production in a minifundia area is important in relation to future agricultural development, and also in relation to policies or laws which may be implemented to forbid further subdivision of lands.

e. Differences in education are reflected in differences in productivity among individual campesinos. The argument has been made by Lewis,[1] among others, that universal primary education is not a highly productive investment because people with little education are

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[1] Arthur W. Lewis, The Theory of Economic Growth, Richard D. Irwin, Inc., New York, 1955, p. 183.

probably not more productive than uneducated people. If it could be shown that increased education and increased productivity are related, then the argument could be made that there are grounds to believe that education can, in fact, be considered a productive investment when it is made available to all--even at the primary level.

f. Land purchased by campesinos before the land reform has a higher productivity per unit of land than land distributed by the Bolivian land reform. If a campesino was able to buy land before agrarian reform, it is likely that he will take better care of it than the person who got land through land reform, free of charge. The reasons behind this argument are that the campesinos who were able to save money and buy land were more productive on the average, and that having made an economic sacrifice they will take better care of the land and use it more efficiently. The testing of this hypothesis is especially important to obtain guidelines as to when campesinos should be charged for the land they receive in countries where land reform programs are underway.

Agricultural Productivity

It has been stated that minifundia are characterized by low productivity. However, primary and secondary factors that determine the level of productivity should be explored in order to determine what might be the causal relationships underlying the definition. At the primary level, productivity can be thought of as a function of technology, and technology can be assumed to be a function of size as well as other variables. At a secondary level, technology, size, and other proximate factors may be considered a function of institutional and social variables. Under these conditions, an understanding of the social and institutional framework in which a society operates is necessary in order to deal successfully with the primary determinants of productivity.

Productivity as a Technological Problem

It has been stated that minifundia involve the use of traditional agricultural techniques, which in turn implies that the rate of adoption of new techniques in minifundia type landholdings is low. Traditional agricultural techniques are also defined as being related to low productivity, since productivity is a function of the level of technology. Hence, minifundia are characterized by the absence of new techniques and low productivity.

Productivity and its relation to technology should be studied with two problems in mind: 1) the existing level of productivity, and 2) the changes of productivity over time resulting from introduction of new techniques. A number of methods of analysis have been

developed to measure productivity in the present[1] or to measure the changes in productivity. However, changes in productivity can only be measured if there is an adequate source of production data from the past. In the case of the community analyzed in this study there was no past data of this sort. The only possibility was the measurement of productivity in the present. It should be added that the lag between the discovery of new techniques and its general use seems to be slow, even in progressively minded industries and agriculture in Europe or North America. W. E. G. Salter[2] has found that it took 15 years, from 1911 to 1926, for the average of the steel industry in the United States to reach productivity per man hour similar to that of the best plants in former years. Generally, in any country, the lag between the agricultural practices recognized as being the best and the practices actually in use in agriculture is large, and this is true also in the Upper Valley of Cochabamba. This is promising, in the sense that the techniques are available and the problem is more one of understanding what the conditions are that make a society adapt new techniques and increase productivity than one of devising new techniques. In fact, in cases where the gap is very large, improvement might not be thought of in terms of the latest technological changes but in terms of the technological changes that already have taken place, in Europe, the United States, and in some of the other developing countries; that is, when the process of transforming traditional into modern agriculture was in its first stages.

The adoption of technologies that represent only a small change from the existing ones in use is desirable, not only because it will be easier to accomplish, but also because the technologies might reflect rational behavior better under conditions of labor abundance. Recent improvements in technology in the more advanced countries have often been of a labor saving nature, and by definition labor is abundant on minifundia landholdings.

Productivity as a Problem of Land Availability

In relating productivity to farm size, one should take into account the nature of the new technology itself. A case may be made for the correlation of productivity with size in United States

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[1] Methods for the measurement of productivity are discussed in Chapter VI.

[2] W. E. G. Salter, Productivity and Technical Change, Cambridge University Press, 1960.

agriculture. On the other hand, the case might be made that Japan, with a very small size of farm, has one of the highest returns per unit of land in the world and its agriculture is generally considered to be efficient. The two cases might seem contradictory at first glance. However, they should be looked at in terms of the scarcity of the various factors of production and the usual conception of efficiency. In the United States, efficiency is mainly considered in terms of productivity of labor, as labor is the critical resource, land being relatively abundant. In Japan, on the other hand, labor is a relatively abundant resource and land is the critical factor, and efficiency is analyzed in terms of productivity of land. Considering the opportunity cost of resources, this way of thinking constitutes a well-based application of economic theory which says that when one resource is available in large quantities, and has no opportunity cost, the maximization solution will involve the use of this resource until it reaches a marginal productivity of zero at the highest possible average product of the scarce resource.

In Bolivia, although land in general is extremely abundant, lack of communications and mobility make land the critical factor in some areas. One such area is the Upper Valley of Cochabamba where the study was made. This fact will make the analysis of productivity of land (if the hypothesis is confirmed) the main concern of the analysis of productivity in this region. However, a determination of the productivity of labor should also be useful, in the sense that it will give an idea of the extent of the relative abundance of this resource, and possibly the extent to which this resource is underemployed.

Productivity and Its Relation to Institutional and Social Factors

The economic causes that can be measured by various statistical techniques are only the result of more complex social, cultural, and institutional characteristics which must, in turn, be analyzed if a thorough study is to be done. Solution of a given problem is possible only when the socio-cultural characteristics of the people are understood and their institutions well defined and analyzed. In general, the term "secondary variables" will be used to describe these socio-cultural factors, as their influence on productivity is only felt through changes in other variables. For example, land has a low average production not because the farmer is uneducated, but because the lack of education of the farmer makes him unaware of the techniques that can be used to increase productivity.

The variable to which most attention is given in this study is the way in which land was acquired. Piqueros,[1] for example, were able

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[1] A piquero is a campesino who acquired land before the land reform--generally an owner-operator on a small scale.

to buy land before 1952 through a process of natural selection. Thus their productivity should be greater than that of the people who acquired land by means of land reform.

Education is also considered. Better educated people are likely to have more access to information and possibly are more aware of the possibilities for increasing productivity. The main advantage gained through education, at least at the level that most of the people in Ucurena receive it, is the ability to speak Spanish. It would seem that the two variables are almost identical and thus may be treated as one. The hypothesis is that the more educated people are, the more productive they are.

Selection of the Method of Analysis

With the topic of study and the area to be studied chosen, the first thought was to do a statistical type of analysis that would permit generalization of the results. However, the drawing of a sample required the knowledge of characteristics of the population by means of census data or maps. The last agricultural census in Bolivia had been taken in 1950 before the land reform law and, thus, was of only limited usefulness.

A second possibility was to analyze closely the expedientes that were made for all farms affected by land reform and which included the name and land extension that each of the beneficiaries had received with land reform. However, this method was considered to be only a partial sample because it did not include small owner-operators who were not benefitted by land reform. In view of the fact that the investigation was partly concerned with the differences that might exist between people who obtained land through land reform and people who were able to buy their lands before 1952, the final alternative was to secure aerial photos of the Valley of Cochabamba and select the people to be interviewed by means of geographical cluster sampling. This was, indeed, a very promising approach, since photos on a scale of 1-35000 were available. However, economic and time restrictions ruled out the feasibility of this method of sampling.

The problem of determining a method to draw a sample was not the only one, or even the first one, that had to be considered. There was also the question of what was the population that the study was to deal with. Initially, the farms of the whole Valley of Cochabamba were considered as the population to be analyzed. But as more knowledge of the area was gained, it became evident that other regions in the Cochabamba Valley area were significantly different and should be dealt with as different universes, at least for the purposes of this study.

Lack of knowledge of the area was also relevant to the problem of the definition of causal relationships to be used in correlation analysis. This problem could have been solved by using Salter's method of grouping, but the consideration still prevailed that this type of analysis has not been tested to any large extent and that the economic considerations and time available made impossible the drawing of a random sample.

Considering all these factors, the method chosen was the case study, (although not in its typical form, considering that a relatively large number of units were to be analyzed). However, the most important attribute of the case study, namely the inquiry into the important economic and social relationships that might exist in one economic unit, was preserved. The way in which the study was undertaken, using a careful examination of all the related attributes and attendant circumstances of the case study, hopefully would protect the validity of the generalizations.

CHAPTER II

THE VALLEY OF COCHABAMBA AND THE COMMUNITY OF UCUREÑA

The Valley of Cochabamba was selected as the site for this study because the problems associated with the existence of minifundia are extremely acute in this area. The other reasons for choosing Cochabamba were the existence of a relatively large number of minifundia previous to land reform[1] and the importance of this region in the general picture of Bolivian agriculture. The important role that the campesinos of Cochabamba played in the process of land reform was another reason to study this region and in this way get better acquainted with leaders and places that played a key role in the Bolivian land reform.

General Description

What is generally known as the Valley of Cochabamba is really formed by three valleys with roughly the same climatic characteristics which are inhabited by very similar populations of Quechua-speaking campesinos. The largest of the valleys is the Upper Valley or Cliza Valley. The smallest is the Sacaba Valley. Both of these valleys are to the east of the city of Cochabamba. The city of Cochabamba is built in the Lower Valley, which is intermediate in size between the two valleys mentioned before, as shown in Table 2. Table 2 also shows the extreme concentration of population in the Valley of Cochabamba--an average of .37 hectares (about one acre of cultivated land per person in agriculture)--when the minimum required is usually calculated at one hectare per person, or about two and a half acres per person. Projections for 1971 indicate an increase in population and further aggravation of the minifundia problem, for there are no new areas in the valley where people may move to take up new lands.

The average rainfall is 20 inches in the area of Cochabamba and about 18.3 inches in the area around Cliza. In the latter, 11.5 inches fall during the months of November through February and only 6.8 inches during the remaining months. The average temperature is 64 degrees F. in November, January, and February and 57.3 degrees F. in June, July, and August. On occasions the temperature may drop

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[1] The existence of a large number of people who acquire small farms of minifundia size before land reform was important to be able to determine if there were significant differences between them and people who acquired land by means of land reform. In Cochabamba one finds side by side, areas, communities, and individuals who had acquired different tenure status before the reform. This was another major reason for picking this area as the site of the study.

Table 2. Land and Rural Population in Cochabamba

	1960			1971 (Projected)		
	Rural Population	Cultivated Hectares	Hectares Per Person	Rural Population	Cultivated Hectares	Hectares Per Person
Lower Valley	66.891	16.353	.24	84.597	16.353	.19
Upper Valley	104.935	50.000	.48	132.711	50.000	.38
Sacaba Valley	16.765	4.000	.24	21.203	4.000	.19
TOTAL	188.591	70.353	.37	238.511	70.353	.29

Source: Bolivia, Junta Nacional de Planemiento, Nos. 3-4-5, Cuadro No. 31, September 1961, La Paz, Bolivia.

to 37.4 degrees F. and during the months when the study was underway, the temperature dropped below the freezing mark a few times.

The Upper Valley extends from Angostura to Arani, a span about 30 miles with an average width of seven miles. Its total area is about 145,000 to 150,000 acres. The hydrographic system of the Upper Valley is dominated by the Punata River, which is the only one that carries an important amount of water year round. Other rivers are only of seasonal importance.

The soils in the Upper Valley might be divided into three principal groups. The soil found on the base of the surrounding mountains, which is alluvial and slightly alkaline with a pH of 7 to 8, is low in organic matter as well as in phosphorus and potassium. This group of soils accounts for 18.7 percent of the total area of the valley and has a very low fertility.

The second group of soils, found in the lower land on the valley, and as it is the receptable of the drainage water of the valley, has become highly alkaline and its only agricultural use is for seasonal grazing purposes. This type of soil accounts for 22.8 percent of the total land area.

The third class of soils, which constitutes the best agricultural land in the Upper Valley, accounts for 41.6 percent of the total.[1] This soil is slightly alkaline, deficient in organic matter, medium to high in phosphorus, and low to medium in potassium. Proper cultivation practices permit the utilization of the water table for dry farming. It has been calculated that the water table stands 11.4 feet below the surface. Water for irrigation is scarce and for the most part available only during the rainy season.

About ten miles to the east of Cochabamba a large dam was finished around 1950. The "Angostura," as it is called by the people, or "Represa Mexico" (which is its official name), was built by Mexican engineers and occupies 10,000 acres of good agricultural land. The Angostura provides year-round irrigation for the lower valley, while the upper valley is irrigated only during the rainy season with the rain water that is conducted by canals to the agricultural lands.

As is shown in Table 2, the land available per person working in agriculture in the Upper Valley is twice as large as in the Lower

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[1] The three types of soils include only 83.1 percent of the total area. The remaining 16.9 percent are not accounted for according to Patch in an unpublished study by Ing. Jorge Espinoso Canelas, Professor at the Universidad Mayor de San Simon Cochabamba.

Valley. Thus, the average size holding is likely to be smaller in the Lower Valley. Most holdings in the Upper Valley, according to this study, might be classified as minifundia. However, as an hypothesis for future testing, it is asserted that a substantial number of holdings in the Lower Valley are not minifundia in the sense that minifundia is defined in this study.

According to people who live there, many of the large haciendas in the Lower Valley had been cultivated before the land reform with traditional crops, such as corn and potatoes, or, in some cases, dairy enterprises. At the present time this land is used almost exclusively for the cultivation of vegetables, mainly onions and carrots. According to rough calculations the present occupants of the land are grossing at least ten times more than the landlord before land reform. As capital outlays are small and the opportunity cost of labor is zero because of lack of opportunities elsewhere, gross returns should be very close to net returns. Thus, it is safe to assert that net returns have been increased many fold with the distribution of land.

The picture in the Upper Valley is different, although the distribution of land, as was mentioned before, is roughly similar. Before land reform, the Upper Valley was also made up of large haciendas. Agriculture was mainly of the traditional type. At present, the products that the campesinos grow are still corn, wheat, potatoes, and some alfalfa. Yields are low, and the change to other, more intensive crops is impossible because water is not available during six months of the year.

If an explanation of this apparently contradictory situation is southt it has to be looked at in terms of economic differences. Socially and culturally, the people who lived in the Upper and Lower Valleys are almost identical.

The people of the Lower Valley had the opportunity to shift to a more labor-intensive type of agriculture than existed under the hacienda system. This intensive type agrigriculture requires a careful attention to details that the hacendado or his overseers could not afford to give. Irrigation is a complicated process that often involves round-the-clock work channelling water through the fields. Alternative methods, such as spraying, involve adoption of new technology which is unlikely in most of the haciendas of Cochabamba.

Marketing of vegetables in Bolivia is a highly complicated process which requires all the available family labor in order to harvest the produce the night before the weekly fair. Under hacienda conditions it is very difficult to assemble all the labor needed to get the produce ready for sale.

Planting and cultivating vegetables is a process where intensive care is needed, care which is more likely to be provided by the direct beneficiary of the crop. Work in the haciendas, for the most part, is done to fulfill an obligation, and the quality tends to be low.

The question could be asked whether a sharecropping arrangement would have permitted the shift to a more labor intensive type of agriculture. The answer is that the landlord was reluctant to give the campesino a claim to the land by permitting him to work it by himself, as the campesino will tend to oppose any move to evict him from the land that he has been cultivating, whatever the tenure arrangement migh be. Added to this is the fact that vegetable growing uses labor in relatively large quantities compared to corn and alfalfa. Labor was the only factor of production that was abundant after the land reform. It appears that the campesino used it and that the results were favorable.

In the Upper Valley, the possibility of shifting to a relatively labor intensive agriculture did not exist because of the lack of irrigation, and the campesinos had to continue to cultivate corn and potatoes, with the added disadvantage that capital inputs were reduced. Corn and potatoes can only absorb labor profitably in relatively small amounts. Diminishing returns are reached earlier. Thus the campesinos had no use for their surplus labor and production has remained at a low level.

The campesinos of the Lower Valley raise two crops of onions and one of potatoes in a year. In the Upper Valley, only one crop can be raised and many times potatoes are lost for lack of water. The campesinos use their surplus labor for small industries and various types of marketing.

Land Reform in Cochabamba: Brief Analysis

As indicated before, the process of land redistribution increased considerably the number of minifundia existing in the Valley of Cochabamba. The political forces that brought about this process have been analyzed briefly in Chapter I. However, the practical problems posed by the implementation of the agrarian law in an area where the campesinos had, for the most part, forceably occupied the land will serve to point out that the division of the land as it was finally done, was the only available solution.

When the government authorities reached the Cochabamba Valley the campesinos had occupied most of the land and had divided it into individual plots, or, in some cases were cultivating the land collectively. The task of giving titles to all the campesinos or resettling them in a more orderly way was a very difficult one given the scarcity of resources that were available to implement the reform.

In most cases, the agrarian judges who were in charge of the surveying and providing of titles merely recognized the existing structure and legalized the type of redistribution that the campesinos had accomplished themselves. In a few cases, resettlement was done and a better distribution secured. Due to the difficulty of surveying lands that were going to be distributed, the process of giving titles to that land was slow, and up the present time many campesinos remain without title.

Ucureña as a Case Study

Uruceña, a community situated in the Upper Valley of Cochabamba, was selected for a case study. It is located between the towns of Cliza and Punata, about 30 miles to the east of the city of Cochabamba. The community has no definite limits, as it is not incorporated. However, what is usually acknowledged to be Ucureña starts about one-half mile from Cliza and extends three miles over the Cliza-Punata Road and an average one and a half miles to each side of the road. Nobody knows for sure the total number of families in Ucureña, but sindicato leaders placed this number at about 1,500. Most of the people in Ucureña live along the Cliza-Punata road, but there are also secondary settlements along the railroad line and other roads connecting the agricultural fields with the main road.

The condition that is required to select one unit of a universe as a case study is that this unit will not have any characteristic that makes it significantly different from the other units in aspects relevant to factors that are to be analyzed. It must be a "typical" unit of the universe. Furthermore, it should possess the various characteristics that are thought to be relevant to the analysis. Given an equal choice, the unit on which more information is available should be preferred. Ucureña, which was the community chosen for the study, should be evaluated in these terms. The variables that are thought to be relevant are the following: a) the existence of colonos[1] and piqueros; b) the existence of a relatively wide range of small sizes; c) the availability of data in the form of historical information as well as maps and other geographical information.

Definition of what constitutes a typical community is difficult. There are no two identical communities in the Upper Valley of Cochabamba or even in the province of Jordan (Cliza). Research there has shown, for example, that there are substantial differences between the communities of Chillijchi and Ucureña which are only 7 km. apart,

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[1] Colonos--people who had no land at the time of agrarian reform and who in the case of Ucureña were awarded land with the agrarian reform.

both in the province of Jordan. The system of distribution of water is different. In Ucureña the use of fertilizers is unknown and even manure is used only in small quantities. In Chillijchi, the use of both fertilizer and manure is widespread. There are large differences in the size of plots in the two communities, and important differences also in the activities in which communities specialize, both in and outside agriculture.

It was felt that a community which had not been extensively exposed to outside influence, or which did not possess unusual characteristics, such as a complete lack of irrigation or round-the-year irrigation, might be thought of as typical. Most of the communities of the Upper Valley meet this condition. Ucureña was chosen because it not only has all these necessary conditions, but also because Ucureña has played a key role in the process of land reform. Ucureña is the place where one of the first agrarian syndicates or farmers' unions was formed by the campesinos to rent lands and to build a school. The land reform law was signed here on the 2nd of August, 1953. Also, one of the more important campesino leaders, José Rojas, comes from Ucureña. Considering the importance of Ucureña, a study conducted there might be more effective in bringing to the attention of the national government some of the problems of the campesinos in Cochabamba.

Ucureña has not been subject to any influence which would change its traditional agricultural practices. The crops which are grown are the traditional ones for the area--corn, potatoes, and wheat. Modern techniques, such as better plows or fertilizers, are virtually unknown, despite attempts to promote their use.

Ucureños, at least in the last few years, have not been subjected to more political activities than the average community around Cochabamba, and particularly in the Upper Valley. The armed campesinos which come into the cities for one reason or another are usually from communities other than Ucureña. Recently, when the armed campesino militias were called to support the regime of Paz Estenssoro in September 1964, the Ucureños came only in the final days and remained in Cochabamba, although the government wanted to send them to fight the miners in Oruro.[1]

The few people in Ucureña who have been influenced considerably by the outside world are the higher level dirigentes (union leaders). The majority of Ucureña campesinos, however, are not significantly different from others in the region.

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[1] This information was obtained from Antonio Torrico who is leader of one of the sindicatos in Ucureña.

Predominance of Minifundia

Ucureña was especially good for a case study in the sense that the size of holdings varied from 2,000 square meters (one-fifth of a hectare) to about four hectares. This situation permits measurement of the way in which size affects such things as productivity and self-sufficiency, as well as activities outside of agriculture.

One of the most important points that this study will test is the differences which exist between colonos and piqueros. The community chosen had to have both types of owners within its boundaries. There are some differences between the piqueros in Ucureña and piqueros in most other communities, such as Chillijchi. We need to evaluate the differences and determine if they are significant for the purposes of this study.

Most piqueros of the valley acquired their lands through voluntary sales by landowners who were either unwilling or unable to cultivate the land themselves. The piqueros were probably the highest bidders, and no organization of campesinos was needed to acquire the land. In Ucureña, however, the piquerías[1] were formed through a sindicato that bought their lands from the Convent of Santa Clara and another one from the owners of Ledezma.[2] The one included in our sample is the latter.

The main factor that, from our point of view, accounts for the differences that might exist between piqueros and colonos is the process of natural selection. People who are able to acquire land by themselves might constitute an elite among the campesinos. However, the piqueros in Ucureña acquired land through the formation of the first campesino sindicato in Bolivia. Syndicate members were able not only to collect money to buy the properties but were also able to organize themselves when fearful landlords tried to prevent them from buying land. For the purposes of this study, the differences between the piqueros in Ucureña and piqueros elsewhere were judged to be irrelevant.

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[1] Places where piqueros own land.

[2] Ledezma--a part of Ucureña.

CHAPTER III

LAND TENURE

Ucureña at the present time is characterized by an extreme subdivision of the land and by a dependence on traditional types of crops for most of its agricultural production.

The division of the land in Ucureña is summarized in Table 3. The median size farm in Ucureña, among the farms included in the sample, is 3.50 arrobadas[1] and the average size is 3.73 arrobadas.

Table 3. Size of Sample Farms in Ucureña

Area	Number
Less than 1 arrobada	2
1 - 1.99 "	27
2 - 2.99 "	29
3 - 3.99 "	17
4 - 4.99 "	16
5 - 5.99 "	36
6 - 6.99 "	7
7 - 7.99 "	4
8 - 8.99 "	3
9 - 9.99 "	0
10 - 10.99 "	1
Total	142

Individual landholdings in Ucureña are usually formed by two, three, or even four separate plots, which shows a considerable degree of fragmentation.[2] This characteristic of multiplicity of small landholdings makes for less efficiency in the use of some resources, such as animal power and labor. Furthermore, if future improvements in agricultural techniques should come, fragmentation will make the use of machinery even more difficult, or even impossible if the division is excessive.

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[1] One arrobada is approximately .89 acres.

[2] In other places of the valley individual campesinos own up to seven or eight plots, which all together barely reach two or three arrobadas.

The fact that individual landholdings are made up of a number of very small plots is related to the minifundia problem in the sense that both stem from the scarcity of land in the valley. Individual campesinos who desire to enlarge their landholdings are able to do so only on the rare occasions when land is offered for sale.

Crops Grown

The crops grown in Ucureña are to a large extent the same crops that have been grown in the Upper Valley for a long period of time--corn, potatoes, and wheat. Alfalfa is also a relatively important crop in Ucureña and, according to people who have known the region for a long time, the cultivation of alfalfa has been increasing in recent years. Table 4 will help in the evaluation of the importance of the various crops in the individual landholdings and their importance in the community.

Table 4. Size Distribution of Farms Cultivating Various Agricultural Products in Ucureña

	Arrobadas				TOTAL
	Up to 2.99	3-4.99	5-5.99	Over 5.99	
Corn	56	33	36	15	140
Potatoes (manure)	12	10	14	9	45
Potatoes (no manure)	41	22	21	6	90
Wheat	3	3	15	7	28
Dairy	43	30	30	12	115
Number of Farms by Size	58	33	36	15	142

Table 4 shows that corn is the crop cultivated by most people in Ucureña. One hundred and forty of the 142 farms cultivated this crop. Potatoes is the crop second in importance, with 135 farms cultivating them. One-third of the farms cultivating potatoes used manure. This is the only case in which some type of improvement of the land other than lameo[1] is used. Dairying, which involves the cultivation of alfalfa, was carried out on 115 farms. In most cases the campesino

[1] Lameo--practice of flooding the land with water that comes in the rainy season and which carries a relatively large amount of lime and organic matter.

owned only one cow or, at most, two cows with calves. Wheat was cultivated on only 28 farms. It is clearly a marginal product, and wheat acreage declines every year.

Commercialization

It was possible to determine commercialization for only the main agricultural crops--corn, potatoes, and wheat. The main reason for this was that the campesinos were unable to recall even approximately how much they sold.

With respect to the main crops, only 74 of the 142 reporting farms reported any sales, and out of the total product obtained in these 74 farms only 31.5 percent of the total value of these crops reached the market.

With respect to livestock, 43 farms reported sales of livestock with an average per farm value of $B 1014.19.[1] From observations in the field it is apparent that most of the livestock disposed of is sold rather than consumed. Only on very few occasions will the campesino kill an animal for his own consumption.

For other products, such as cheese and minor livestock, it is apparent that most of the production goes to the market, although in this case, the assertion is necessarily based on eye estimates because of the reason already mentioned.

In short, the commercialization of staple, traditional agricultural products in Ucureña is a marginal activity in the sense that the produce obtained from most of the agricultural land is used for household consumption.

Credit

Commercial credit in Ucureña is almost non-existent. Of all the people interviewed very few had this type of credit, and most of them borrowed money from their friends and relatives when they needed it. Even this type of credit seems to be unimportant in the community. Most people meet their economic needs through the sale of animals, especially cattle.

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[1] One peso is equal to 8.5 American cents.

Extension Services

Extension services in Ucureña are almost unknown and very few of the campesinos know of their existence. It is the policy of the extension services not to open an agency in Cliza or to send extension agents to the province of Jordan, apparently because they have had problems in the past. However, now that conditions have changed,[1] the beginning of the program to provide extension services is likely.

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[1] During the time of the study no member of the group was ever threatened; the campesinos were always helpful and the leaders gave their cooperation without any restriction.

CHAPTER IV

THE ECONOMY OF UCUREÑA

Almost without exception, campesinos think of agriculture as the most important of their sources of income. All other activities are considered of lesser importance, and are marginal in most cases. Although the campesinos involved in the study sell only 31.5 percent of the major agricultural products that they produce, and while in a number of cases the cash income derived from activities outside agriculture could be higher than the cash income derived from the sale of agricultural products, the inclination of the average campesino is to place primary emphasis on agriculture and to use his time in other economic activities only to the extent that his labor is not needed in agriculture.

This emphasis on agriculture, regardless of the relative profits derived from agriculture and from other industries, is one of the most important characteristics of traditional agriculture, where production decisions are made on the basis of consumption needs and not on the basis of profitability of the product grown. On many occasions, campesinos who have profitable activities outside agriculture still cultivate the land by themselves, even if they lose money in the process. Most of the sindicato leaders also cultivate land by themselves. However, during the last few years the increasing scarcity of land (largely due to population pressure), has forced the campesino to devote a relatively larger percentage of his time to activities outside agriculture.

Other Economic Activities

Involvement in and the exploitation of economic activities other than agriculture are undertaken by the campesinos in Ucureña as a means to compensate for the decreasing subsistence opportunities available on the land. Almost every campesino has at least one supplementary activity, and often two or more such activities. Table 5 gives an indication of the outside activities of those campesinos interviewed.

The table shows that the most widely performed activity outside agriculture in Ucureña was hilado. However, this activity is usually less important, in economic terms, than agriculture or other activities. Hilado is the spinning of thread from sheep or llama wool and most women do it with the intention of selling it in the weekly market at Cliza. But it is marginal, in the sense that a week's work is not worth over $B 10.00.

Table 5. Economic Activities Outside Agriculture

Industry	Number
Hilado (spinning)	66
Weaving	17
Hat making	38
Chicha making	18
Masonry	9
Business	15
Knitting	18
Butchery	37
Other (bicycle repair, tailors, cattle merchants)	17
Total	235

It seems that a more important business in Ucureña is hat making and the elaboration of chicha, a common maize beer. In the last few years, however, other service industries like bicycle repairing and tailoring or barbering have gained in importance. Although data on the time when these small businesses and industries were started are not available, the general impression that a person gets from talking to the campesinos is that traditional activities such as hat making, chicha making, weaving, and hilado are losing importance and other new activities such as bicycle repairing, tailoring, and cattle marketing have increased in importance since land reform.

Marketing of Agricultural and Non-Agricultural Products

The main outlet for the products that the people in Ucureña sell is the weekly market at the neighboring town of Cliza. It is difficult to determine the proportion of the total products sold which goes to middlemen and the proportion that goes directly to consumers. But from observations in the market there is some evidence as to which group is the more important purchaser of each of the different products.

Corn is sold mainly as a raw material to producers of chicha or corn meal. Only small quantities, usually under 100 pounds, are sold directly to consumers. The volume sold is larger right after the harvest (around May and June) and at that time the price is low. For the most widely sold variety it is about $8 40 per hundredweight. In February and March, however, prices can be as high as $8 120 per hundredweight.

Potatoes are sold in Cliza mainly to consumers. People of the surrounding communities take their produce to the market mainly in

April and May--right after the harvest takes place. It seems that the volume sold and the price do not fluctuate as much as in the case of corn. Potatoes were reported to range from a high price of $B 90 per hundredweight to a low price of $B 60. The reason for smaller fluctuations in the price of potatoes seems to be that potatoes are grown in different parts of the Department of Cochabamba at different times during the year. Thus, the cycles of abundance and scarcity are not as marked as with corn.

The sale of livestock is mainly to merchants, who take the cattle to Cochabamba to be sold as meat. However, a significant part of the trade in livestock is done between campesinos, who consider livestock as a good form of readily available capital and sell animals when they are in need of money, or buy them when they have spare funds which they want to save. Price variations do not seem to be significant in this case.

Cheese is sold mainly to retailers who take it to Cochabamba. In this case, price variations are of some importance, the price being higher during the dry season. The prices fluctuate from a high of about $B .750 to about $B .500 a piece during the rainy season.

In general, it seems that the weekly market provides a relatively efficient way of handling perishable products including cheese and potatoes. Furthermore, facilities such as refrigeration for preserving these products and thus stabilizing prices are costly and out of reach.

The efficiency of the weekly market for commodities that do not have seasonal fluctuations, such as livestock, seems to be adequate. The markets provide a convenient place where campesinos can sell their cattle to merchants or to other campesinos. The function of the merchant is to acquire a large number of animals to be used for meat, a function which is essential to the completion of the marketing cycle. There are, however, serious objections to the weekly market as a way of handling seasonal, non-perishable commodities such as wheat and corn. Minifundia owners, who are usually in need of money, have to sell their products after the harvest at a relatively low price. The flour mills, chicha makers, or wholesalers are able to resell the product at a price which is relatively high, or use it year round for their industries. If some warehouse facilities were made available to the campesinos to stabilize the price during the year, the campesino would receive a higher average price, and the profits of mills or chicherias and middlemen would be more a function of their efficiency as producers than a result of their monopolistic situation with respect to liquid capital resources.

The Farm Family as a Socio-Economic Unit

The family is the basic socio-economic unit in Ucureña. Most social and economic activities are undertaken at the family level and each family member has a differentiated role in the performance of the various activities undertaken by the family.

The family in Ucureña is still of a traditional type, where the father is the dominant personality and where women and children consider him as the final authority. There are, however, some signs which indicate that the organization of the family might have started to change in some aspects. In a traditional family it is usually expected that the children will have the same occupation as their fathers and receive the same education. However, in Ucureña it was observed that young people are receiving more education than their parents and that most fathers expect their children to have an occupation other than agriculture. In fact, the average education for heads of family interviewed is 2.33 years and the average education for wives of family heads is only .17 years of schooling. The large majority of wives have had no education. On the other hand, the average education of all sons and daughters age 13 and over is 4.35 years of school. Even this average is likely to rise significantly in years to come.

Table 6. Average Education of Different Family Members

Family Role	Years Education
Family heads	2.33
Wives	0.17
Sons, daughters over 13	4.35

Empirical evidence for the statement that most fathers would like their sons to choose an occupation other than agriculture is given by the fact that only three out of the 142 persons interviewed wanted their sons to become farmers. However, the desire by parents for better education and different occupations for their children can trigger a sustained process of social change within the family only if economic conditions permit the better educated youngster to find an occupation where his knowledge can be used under better conditions than those provided by the tillage of a minifundia sized plot.

The seemingly slow rate of social change within the family, however, does not hold true for the community as a whole. The way in which the community has organized into sindicatos and the change of

relationships between community members and city people or governmental authorities points to the large social change that individuals have accomplished as members of Bolivian society. The present campesinos constitute a strong pressure group in Bolivian politics. Campesino leaders are elected to the senate or appointed as ministers. In short, the changes in roles of campesinos as a whole have been very significant, and these changes have been in the direction of an equalization of campesinos as individuals and as a class.

The fact that the family has remained organized in very much the same terms as it was before the revolution points to the fact that the economic conditions of the campesinos are still depressed and the lack of opportunities for women and young people have contributed to maintaining an organization of the family which is rational under the economic conditions created by minifundia. The way in which the farm family is organized is related mainly to the ways in which they adjust to meet economic conditions.

CHAPTER V

POPULATION PRESSURE AND THE SUPPLY OF LAND

Minifundia, as does any other type of landholding, involves an intimate relationship between the people and the land. An analysis of the characteristics of the population is basic to the fuller understanding of the problem of minifundia, as well as in the evaluation of future possible subdivision or consolidation of land.

Bolivia, in general, is a grossly underpopulated country. Its rate of population growth is among the lowest in Latin America. But the problems of Ucureña are more like those of overpopulated Asia because of the high population concentration that exists there, which is typical of the fertile, traditional areas of settlement in the Central Andes. For purposes of comparison it can be said that the concentration of population in Bolivia as a whole is only slightly higher than that of Canada. But the concentration of population in the Cochabamba Valley would compare with that of Puerto Rico or Haiti. It may be said that the minifundia sized holdings in Ucureña reflect the existence of a population which is large in relation to the land resources of the region. With population growth, other things remaining equal, there is likely to be a further subdivision of land, a possible decline in levels of living, and an increase in the number of holdings.

The history of population growth and population pressure in Ucureña is similar to that of most of Latin America. That is, some sort of equilibrium at a low level between population and land resources has existed for a relatively long period of time. It seems, however, that population was increasing at a fairly rapid rate in the years prior to 1952. Population pressure on limited land resources was probably one of the major factors that strengthened the desire for land redistribution and indirectly lent support to the Bolivian revolution thus resulting in the elimination of the landlords and the assignment of almost all available land to the campesinos.

Since 1952, with the more extended control of diseases and resulting decreased mortality rate, the pressure for land, even with the escape valve of migration and some development of household industries, has been increasing considerably. This is shown by the fact that at the moment of land redistribution in 1954 all the campesinos in Ucureña received close to two hectares of land, and some land was allocated for future distribution. This land was distributed a few years later and only about one-half hectare was available for each campesino. At present, no land is available for distribution and people who get married either leave the community or get a small parcel of land from their parents, usually a quarter of a hectare. Many supplement their income with household industries or trades.

Present Situation

The study consisted of 142 family interviews, and the total number of individuals in the sample was 340 females and 362 males. The total area cultivated by these families was 529.7 arrobadas[1] which amounts to a cultivated area of .75 arrobadas per capita or .27 hectares. It is judged that under circumstances similar to those existing in Ucureña, at least one hectare per capita is desirable. The amount of cultivated land per person places the Valley of Cochabamba among the most densely settled regions in the world. It should be remembered that here we are dealing with a relatively small unit of population and the possibilities of increased migration are fairly high at the present. The fact remains, however, that such a high concentration of population could only have been caused by a very low mobility of the population or very few alternative opportunities before the land reform. An analysis of the causes of this phenomenon follows.

Mobility was low before the revolution of 1952, mainly because the eastern lowlands were not connected with the rest of the country, and the opportunities in Argentina were less known because of lack of education and difficulties of communication. With the opening of the new Cochabamba-Santa Cruz highway, the east became easier to reach and land was relatively abundant there. It has been estimated that since 1920, 9,361 families have settled in colonization areas. The fact that 2,622 families settled from 1958 to 1962[2] indicates that the pace of colonization is increasing. Colonization has been at best a partial answer to the problem of population growth, having absorbed only a relatively small part of the increased population. On the other hand, increased education and awareness made migration to Argentina possible and this country is still the main avenue of out-migration.

Future Outlook

An evaluation of future population growth in Ucureña based as much as possible on the data obtained during the survey is necessary if any conclusions about the future can be drawn. The fertility ratio

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[1] Arrobada is equivalent to 3,618 square meters, .36 hectares, or .89 acres.

[2] Planeamiento, Revista Trimestral Secretaria Nacional de Planification y Coordinacion, La Paz, Bolivia, January-September 1963.

obtained for the population interviewed was .59. Using the formula derived by T. Lynn Smith[1] from United Nations material, Y equals -.0249 + 0.65 X, where Y is the birth rate and X is the fertility ratio, gives a calculated birth rate of 35.85. If we then take the death rate given for Bolivia in 1950[1] of 15 per 1000, population growth will be at the rate of 2.1 percent per year. This estimate, if anything, is too low, because the true fertility ratio for the population is likely to be higher if young landless families had been included in the sample. Even if we use only a simple aggregation rate, population in ten years will be more than 21 percent above present levels. The calculated growth rate is likely to increase considerably in the next ten years because of decreased mortality due to the introduction of sanitary measures. Fertility is not likely to decrease significantly as none of the factors determining a decrease in this variable is likely to become important in the next few years. However, it should be expected that at a later date the increased education that the children in Ucureña are now receiving may possibly result in decreased fertility and diminishing population growth.

How serious the problem of population growth against fixed land resources becomes depends upon a number of variables which include migration, industrialization, and increase in agricultural productivity.

Migration will probably continue at present levels, although Argentina will probably lose its importance as a migration outlet and the eastern region, especially the Chapare and the Santa Cruz area, will become more important. Industrialization of the cities, especially Cochabamba, should increase when current programs for industrialization start functioning. This might influence migration in a positive way. This, however, is dependent on a number of factors of political stability and economic growth. Agricultural productivity is not likely to increase to any significant extent until the better educated children take over their parents' land and again, this should coincide with the decrease in fertility. In the meantime, efforts should be made to make better extension and credit services available to the farmers.

To conclude, the next several decades should be critical for future improvement in levels of living, and at that time the pressure on the land should be the largest. It should be expected, however,

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[1] T. Lynn Smith, Fundamentals of Population Study, J.B. Lippincott Co., Philadelphia, Pennsylvania, 1960.

[2] Ralph Thomlinson, Population Dynamics, Random House, New York, 1965.

that variables now starting to develop, such as colonization, education, and industrialization, should improve the situation significantly at a later date. But if these alternatives are not created, increased population pressure on the land will result in further subdivision of landholdings, aggravation of the minifundia problem, and a decrease in the living standard of the population.

CHAPTER VI

PRODUCTIVITY IN A MINIFUNDIA ECONOMY

The problem of the selection of the method of analysis to be used in the measurement of productivity was mainly one of analyzing the various possible alternatives, keeping in mind the characteristics of the study under consideration. None of the experimental approaches is good or bad in itself, for all of them have some advantages or disadvantages which should be weighed according to the knowledge available in each particular instance. The methods that were considered for the measurement of productivity were production functions, budgeti and linear programming. A brief analysis of each of these methods seems to be relevant to an understanding of the reasons behind the selection of linear programming.

Production Functions

A study of productivity that uses production functions as a tool of analysis is based upon assumptions accepted by economics in general, but especially when applied to operations of individual farms If production functions are well measured they should reflect the exact nature of the production process, for it is possible to obtain the marginal returns to the factors of production. These measurements give an exact estimation of the production process and provide information for the optimal allocation of resources in that process.

The main problem presented by the analysis that uses this tool is specification of the inputs of production. Returns to labor, capital, land, and management are very useful as theoretical concepts, but practical applications are rather limited. A problem arises when one asks how labor is going to be used in enterprises like the ones which this study deals with. Is the campesino going to use his labor to plant corn or to plant something else, or is he going to use it to irrigate his land? The specification of all the various types of labor is a very difficult task.

The problem of specifying inputs is perhaps more noticeable in the case of capital inputs. Marginal returns to capital is a concept that has very little practical use, since capital comes in all sorts of different qualities and the marginal returns to fixed capital are not the same thing as the marginal returns to variable capital or to operating capital. It is usual in studies using production functions to divide capital into these various categories. Yet, operating capital may be used to buy improved seed or fertilizers, or it can be used to buy a tractor or build an irrigation ditch. In the case of

Ucureña, operating capital used to buy fertilizer for potatoes might have a different marginal return than operating capital used to rent a tractor to plow the land.

The determination of marginal returns to land does not pose as many problems as the determination of marginal returns to capital, especially if the land is homogenous in quality. However, if the analysis involves a number of enterprises, and more than one of them demands land, then determining the marginal returns of each of the enterprises demanding land will be more useful than determining marginal returns to land per se.

Another problem in most farm management studies which use production functions as a tool of analysis is the difficulty of estimating managerial ability. The returns to capital, land, and labor have a built-in return to managerial ability that may vary considerably according to the quality of this factor and that will show in the analysis in the form of increased or decreased efficiency in other factors of production.

To conclude, the use of production functions as a tool of analysis was discarded for the following reasons: 1) difficulties inherent in the specification of factors; 2) the problem of calculating returns to managerial ability; and 3) the realization that even if reliable production functions were estimated, the data would be in a form that will not be useful in terms of making policy recommendations. Answers to the questions of what crops should be encouraged by extension services or the measurement of the problem of over supply of labor would not have been provided had production functions been used as a tool for analysis.

Budgeting

Budgeting has been used for a long time in farm management analysis. It is a very useful tool in the sense that it does not involve complicated calculations, especially when only a small number of alternatives are considered. Budgeting assumes that the production possibility curve between the two or more enterprises being analyzed is linear and that these enterprises have a constant rate of product substitution. If these assumptions are true, then the farmer will use only one of the enterprises considered although an alternative plan might prove to be more profitable. This characteristic of budgeting studies is not a product of the assumptions but rather a consequence of the nature of the calculating process. In fact, if a sufficient number of enterprises is considered under budgeting, the single optimum may be isolated. However, burdensome computational procedures will make the accomplishment of this task practically impossible when there are many alternative possibilities.

Budgeting is a desirable procedure when the number of available possibilities is small, thus insuring the computations will not be excessively cumbersome. The nature of the results obtained through the use of budgeting is more practical for policy recommendations, such as the ones that this study is trying to provide, than the results obtained by the use of production functions.

The main reason that budgeting was discarded as a tool of analysis was that the number of processes to be considered, plus the restrictions that needed to be introduced to obtain a "practical" answer to the problem under consideration, would have made the calculations excessively time-consuming.

Linear Programming

The same results that are obtained through budgeting can be obtained by means of linear programming with the advantage that a larger number of sets of enterprises and restrictions can be introduced with relative ease. In fact, the solution might be obtained through either linear programming or budgeting if the same assumptions are made. The method that involves fewer calculations is preferable.

Linear programming must be examined in terms of the assumptions that are made in relation to the production process. These assumptions are additivity, linearity, divisibility, finiteness, and single value expectations.[1] The way in which the assumptions underlining linear programming are likely to affect the problem under consideration, becomes a necessity if the use of this method is considered.

Additivity means when two or more activities are used, the sum of its individual products must equal the total product; thus if there is interaction between two or more activities, these activities will have to be dealt with as a joint activity.

Linearity means that constant returns to scale are found in the expansion of each individual process.

Divisibility means that the limited resources and products are assumed to be perfectly divisible. In certain cases, such as production of livestock, this condition makes the results look awkward, when the optimum solution involves the use of fractional units of animals. However, under most circumstances, an approximation to the nearest whole unit is possible without a significant deviation from the optimum.

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[1] The characteristics of linear programming have been summarized from Earl A. Heady, Candler Wilfred, Linear Programming Methods, Iowa State University Press, Ames, Iowa.

Finiteness means that there is a limit on the number of activities that are possible to undertake. This limitation also applies to budgeting and it is more relevant there, as computational procedures for budgeting are very time-consuming when a large number of activities are considered. In linear programming, very little additional computer time is required to include activities and thus this limitation is not relevant in most cases.

Single value expectations means that the data used are assumed to be known with certainty. However, this limitation is also a characteristic of budgeting and production functions analysis, and thus solutions should be as realistic as those obtained through other methods which make the same assumptions.

Once the limitations of linear programming have been specified, the next task is to determine the relevance of these limitations to the problems on hand. In the case which is being dealt with here, there is apparently no important interaction between any of the activities, which means that additivity is a reasonable assumption. If may be that if a field is used for alfafla for ten years the production of other crops increases. But if no technical data is available to measure this effect, it must be disregarded. Even if the data of interaction between production of alfalfa and production of other crops would have been known, the addition of joint activities of alfalfa and other products would have solved the problem.

There is no reason to believe that among the activities considered there was any case where increasing or decreasing returns to scale could be meaningful. Thus, linearity is not a serious limitation in this case.

The characteristic of divisibility of units perhaps poses a relevant limitation to the results of linear programming analysis, especially in activities such as livestock where an approximation to the nearest unit of dairy enterprise will change the results significantly from the optimum plan. Given the small units that are dealt with in this study and the relatively large percentage of the farm used by one dairy cow, the fact that the approximation to the nearest whole unit causes the farm enterprise to deviate from the optimum to a significant extent is a necessary weakness of the analysis.

Finiteness is almost completely irrelevant, as the number of activities that could be considered was few.

Single value expectations should be dealt with in terms of the availability and reliability of data and not as a problem of the method itself. It should be noted that, regardless of the methods used, the results cannot be better than the quality of the data used.

Activities

The activities considered for analysis are the crops grown in the community, which are potatoes, corn, and wheat. Crops that are not grown but could presumably be grown were not included, mainly because it is not likely that farmers will adopt, in the short run, any drastic change in the crops that they raise. Thus, more realistic recommendations can be made on changes within crops that the people in Ucureña are used to cultivating. It would have been interesting to include an analysis using other possible activities, especially fruit raising, to determine the potentialities of the land if a radical change in the products grown is accomplished. However, only a small proportion of the fruit produced in Ucureña and in the Upper Valley is sold. Although an experimental station has proven that the region could produce most temperate climate fruits, the yield that these crops would have under conditions of seasonal irrigation and without experimental station control is unknown. Thus, there was no realistic basis to estimate coefficients of production for these crops.

Considering that manure is used by a sizable number of campesinos in Ucureña for the cultivation of potatoes, potatoes grown with and without manure were first included as different activities. However, when the calculation of profits for the two activities was made, including the opportunity cost of using manure as fertilizer instead of fuel, potatoes without manure dominated potatoes with manure. Consequently, the latter was excluded from the matrix.

Dairy units are used instead of alfalfa units, mainly because of the difficulties involving nearly all calculations on resource requirements, especially on profits coming from alfalfa. Alfalfa is a semi-permanent crop which usually is left for ten years in the field and which does not demand much care after the first crop. The allocation of costs per year involved a pro rata allocation of costs in the first year, but the calculation was still feasible with a reasonable approximation. However, the calculation of profits was nearly impossible, as alfalfa is used almost universally to feed cattle owned by the campesino himself.

Production per unit of land for alfalfa is unknown, as the campesino cuts what he needs for cattle every day and he does not have any idea of how much he gets on a unit of alfalfa land. A more logical approach was to consider how much of alfalfa land is required by a dairy cow and then calculate the profits per unit of dairy which includes one cow and one calf assumed to be fed half of the year with alfalfa and half of the year with corn stalks, which is the usual practice in Ucureña. Thus, a unit of dairy requires one arrobada of land in corn and only one-half arrobada of land in alfalfa. Profit was calculated on the sale of quesillos (cheese), as this is the main form of commercialization of milk in the area. The questionnaire included information that permitted the calculation of the average number of quesillos per cow.

The activities of lending and borrowing were included at the start, with the assumption that the campesino would have the opportunity to lend his money at a 12 percent rate and that he could also borrow from the agricultural bank at the same rate. In the former case, the interest was determined on the basis of a rate lower than the usual rates in Bolivia and in the latter case it was made on the assumption that the campesino could conceivably borrow from the agricultural bank at that rate of interest and increase his profit in this way.

The reason why lending was eliminated in the second matrix was recognition of the fact that, in practice, the average campesino does not take advantage of this opportunity, although it is entirely feasible for him to do so. Some of the implications of including or excluding the lending activity are discussed in the analysis of the basic matrix.

Factors of Production

The factors of production included were land, planting labor, cultivating labor, cropping labor, investment capital, and operating capital. Land was hypothesized to be the limiting factor, under the assumption that farms in Ucureña are minifundia and thus the amount of land available could not provide enough sources of employment for existing manpower. The size restriction on land was the median size of farms in Ucureña. At first the plan was to use different sized farms and make separate analyses for each size. However, because of reasons specified in the following section, this approach was discarded.

A restriction on labor was used in the analysis only at critical points in the growing period: planting, cultivating, and harvesting, under the assumption of overabundance of labor at other times during the year. In other words, labor was tested as a limiting factor only at times during the growing period when the requirements for labor are larger. This implies the assumption that labor was overabundant during the rest of the year. Figures on the dates when the field operations were performed, which permitted the calculation of labor available for the various types of field work, were obtained by other members of the research team.[1]

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[1] I am indebted to Jorge Dandler who did work on the labor requirements at various times of the years on the different crops.

The limit[1] on the availability of operational capital was mainly an estimation, based not on survey data but on informal talks with campesinos. This was perhaps better, in the sense that it would have been difficult to get a satisfactory answer from every campesino to a subjective question about the amount of operating capital he would be willing or able to invest during the year.

Livestock investment was calculated as the average value of a cow and a six-month-old calf. Livestock constitutes reserve money for the campesinos, as it can be readily sold and the price does not vary to a great extent. This was one of the reasons for the inclusion of the lending activity in the first matrix.

Potato acreage was limited to one-half of the total area because potatoes usually require land that has been previously used for alfalfa production, making it impossible to grow potatoes on the same land every year.

A limit was placed on land used for alfalfa, as the campesino is not likely to forego food crops completely. A more realistic assumption is that he uses one-half of his land for alfalfa production. This limitation was unnecessary when dairy units were included instead of alfalfa units, as one dairy unit will use twice as much land for corn as it does for alfalfa.

Construction of the Basic Matrix

The basic matrix used in the linear programming analysis is reproduced in Table 7.

The reasons for the coefficients used in column Po have already been given in the previous section in terms of the limitations on the use of factors.

The figures used in the profit row were calculated from field data on average yields obtained in the interviews, plus data obtained through interviews with campesinos who were particularly good informants and who were asked questions on inputs needed per unit of production.

The profit row was calculated using the figures of average production multiplied by average price and subtracting the cost of the seed plus the rental of oxen, which is the most widely used practice

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[1] The imposition of a limit in linear programming analysis means that the activity limited can only enter the final solution up to an amount previously determined.

Table 7. Basic Matrix for Linear Programming Analysis

Profit	Po	83.3 1 Arr. Wheat	318.4 1 Arr. Corn	112.5 1 Arr. Pot.	619.6 Dairy Cow	+.12 Lend 1 Peso	-.12 Borrow 1 Peso
Op. cap.	500	191	145	450	145	0	0
Plant labor days	45	3	3	5	3	0	0
Cult. labor days	60	4	7	20	4	0	0
Cropping labor days	30	6	6	12	6	0	0
Alfalfa lan	1.75	0	0	0	.5	0	0
Pot. land	1.75	0		1	0	0	0
Total land	3.5	1	1	1	1.5	0	0
Invest. cap.	2000	0	0	0	2000	1	-1

since very few campesinos own oxen teams. Table 8 gives the breakdown of expenses necessary for the determination of profits.

Table 8. Profits Derived from Agricultural Activities in Ucureña

	Potatoes	Wheat	Dairy	Corn
Product	562.5	274.3	784.6	463.4
Seed	330.0	56.0	39.0	25.0
Oxen	120.0	135.0	126.0	120.0
Profit	112.5	83.3	619.6	318.4

The original basic matrix was modified later by eliminating all profit from the lending operations. In this way the activity was forced out of the final solution.

Determination of Optimal Enterprises

The initial solution involved the use of 3.34 units of corn, 0.10 units of dairy and the lending of 1793.1 pesos. There was a waste of 34.6 units of planting labor, 36.2 units of cultivating labor, and 9.3 units of cropping labor. The total profit was 1344.26 pesos. However, this solution is probably not feasible under practical conditions, for it involves the sale of most of the cattle and the lending of a relatively large amount of money. Campesinos will probably not be able to engage in extensive lending operations. However, one interesting by-product of the results is that agriculture, under present conditions, is not highly productive in Cochabamba. The return on investment is, for the most part, even below the subsidized rate of 12 percent offered by the agricultural bank. A test to determine at what interest rate it would be economical for the campesino to borrow under present conditions showed that seven percent was the maximum interest rate that campesinos could afford to pay. However, it has to be taken into account that supervised credit, which will eventually be available in Ucureña, should raise productivity of the farm as a whole. Thus, a higher interest rate might be justified.

Since the first solution was not feasible the lending activity was forced out of the matrix by giving it a return of zero. The optimal solution and this modification involved the use of 1.00 units of dairy and 2.00 units of corn. There was a waste of 36 units of planting labor, 42 units of cultivating labor, and 12 units of cropping labor. The total profit was 1,256.40 pesos.

This result implies that, under existing conditions, the most profitable operations in Ucureña are dairy and corn. In fact, given the composition of one unit of dairy, the optimum solution involved three arrobadas being used for corn and one-half an arrobada used for alfalfa. Potatoes and wheat did not enter the final solution, and the limitations for potato land, as well as for alfalfa land, were irrelevant to the solution of the problem.

Considering the relatively large quantities of potatoes that are grown in the Upper Valley (to which the best lands are usually allocated) the fact that research findings show that potatoes might no be an economical enterprise in the Upper Valley should be given consideration, especially in extension programs.

Although wheat is not grown to a large extent, there is the avowe policy of the Bolivian government to increase the production of wheat in the country. However, implementing any program for the increase of wheat production in the Upper Valley might decrease the overall agricultural production of the region.

Relative Scarcity of Factors of Production

A study of the results of the optimum solution for the problem at hand will help to support a number of the hypotheses that were made in this study. Agriculture in the Valley of Cochabamba is shown to have low productivity in the sense that existing rates of return do not compensate for borrowing money at 12 percent interest. The borrowing operation did not enter the solution when 12 percent interes was considered. This result poses the interesting question of whether a program of agricultural credit, without a simultaneous attempt to improve existing techniques is worthwhile at all. If the results obtained here are correct, the interest rates charged by the agricultural bank are higher than the profits obtained in the most productive agricultural enterprises under present conditions of technology. If the problem is not one of availability of ordinary agricultural credit but of improvement of technology, then the agricultura bank might consider the enlargement of supervised credit, which supposedly should help in the improvement of the general level of technology.

The existence of redundant labor, even at critical points during the growing period, supports the assertion that Ucureña is characterized by minifundia sized landholdings, according to the definition accepted here. In fact, the results show that even in periods of planting, cultivation, and harvest, there is a substantial surplus of labor. Some of this labor, as was pointed out earlier, is used for activities outside agriculture. Unfortunately, the average time that the campesinos devote to activities outside of agriculture was not

determined. However, these activities are apparently marginal and should not occupy a large share of the campesino's available time.

The amount of redundant labor existing in Ucureña also points to the fact that land is the most important limiting factor in the determination of total income from agriculture. Although limitations on investment and operating capital should appear if larger units of land are considered, it is a reasonable assumption that the campesino could use his profits from the increased amount of land to increase both types of capital after a number of years.

A test to determine the size of farms that will be necessary to occupy the family labor was made by increasing the size of farm to 10 arrobadas. Even at this point, there was labor scarcity only during the cropping season. Considering that the average size of farm in Ucureña is 3.73 arrobadas, it can be argued that the area may adequately support only 37.3 percent of the existing familites.

To summarize, it might be said that the problem of productive resources should be evaluated in terms of changing existing practices to increase productivity in general and to try to increase or at least maintain the average size of farms. Any such adjustment or policy will necessitate a gradual channelling of the existing labor force into other activities in order to avoid aggravating the problem of increasing manpower and a fixed supply of land.

Farm Size as a Determinant of Efficiency

One of the objectives of the linear programming analysis was the testing of the hypothesis that larger minifundia are more productive than smaller minifundia. However, at least in the sizes that were available in Ucureña, this hypothesis was not supported by the research findings. The idea was to average separately different sizes of farms and to program for each size separately. However, averaging revealed no visible relationship between size and production, as is shown in Table 9.

The conclusion that can be derived from this part of the analysis is that useful comparisons of productivity involving size as a variable should compare minifundia with larger farms and not minifundia of different sizes among themselves. However, the overall low productivity of minifundia of different sizes is useful as empirical verification of the hypothesis of low productivity of minifundia, which was also a concern of this study.

Table 9. Farm Size and Production in Ucureña

	Arrobadas			
	2-2.99	3-4.99	5-5.99	over 5.99
Corn 100# per arr.	7.46	6.65	4.72	5.53
Pot. with manure 100# per arr.	7.42	8.97	5.67	9.70
Pot. without manure 100# per arr.	7.54	8.31	5.52	11.39
Wheat 100# per arr.	4.77	4.00	4.36	3.85
Dairy (number cheeses per cow)	4.13	4.04	3.75	3.65

CHAPTER VII

RELATION OF TENURE STATUS AND EDUCATION TO PRODUCTIVITY

It has been hypothesized that people who were able to buy land before Bolivia's land reform were able to do so because of their higher productivity, which permitted them to save the necessary money to buy the land. The present section will try to seek empirical verification for this hypothesis.

The practical importance of testing a hypothesis of productivity differentials between people who received land with land reform and people who bought their land through their individual effort is given mainly by the implications that these productivity differentials might have for future programs of land reform.

If it is shown that piqueros are more productive than colonos the implication might be that payment for land is a desirable measure in terms of increasing the efficiency of production in agriculture. However, if productivity is roughly the same for the two groups, the implication might be that payment for land by beneficiaries of land reform programs must be justified using arguments different from the increased efficiency in land use.

Piqueros and Colonos

Several times in this study, the existence of colonos and piqueros as two different tenure groups in Ucureña has been mentioned. Some analysis already has been made of the way in which these groups acquired their land. However, at this point other differences between these two tenure groups will be stressed, differences which apparently derive from the way in which they acquired the land and which give further grounds to the formulation of the hypothesis of differences in productivity between one group and the other.

Before land reform in Bolivia, colonos and piqueros formed two different social classes, the former being considered a class which had a lower status than the latter. Only the piqueros were able to come by enough money to buy land. In this sense, the process of social differentiation may also be viewed as a process of natural selection, with the more capable escalating into a different social class than the less capable. The social status of piqueros and colonos changed, to a large extent, after land reform, and the idea of the two groups as forming a superior and an inferior social class disappeared. However, before and during the Bolivian land reform the colonos were much more active in implementing land reform and in political activities, whereas the piqueros seem to have been reluctant to change the status quo.[1] When land reform was finally accomplished

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[1] This assertion is made mainly on the basis of the impression derived from conversations with piqueros.

the colonos emerged as a class which had more political power than the piqueros. It would seem that perhaps this active involvement in politics resulted from the necessity that the colonos felt of improving their level of living. This feeling could also have motivated them to increase their agricultural productivity.

Since the revolution transformed the piqueros into a social class with equal or even lower status than the colonos, the piqueros have remained resentful of the fact that they had to pay for their lands while colonos received land free. In some cases piqueros have taken a negative attitude toward anything that might mean further change. At present they are generally not as well organized and less involved with people outside their communities than the colonos. This lack of involvement with outsiders also may be a factor which makes them less aware of possibilities of increasing productivity. That is, piqueros might be inclined to think in terms of subsistence rather than in terms of the market.

To summarize, three reasons might account for a different level of agricultural productivity between the two tenure groups of colonos and piqueros: 1) the process of natural selection, 2) awareness of the necessity to improve levels of living, and 3) larger involvement with outsiders. Of these three differences, the process of natural selection would seem to influence the piqueros to have a larger average productivity than the colonos. The other two would probably have the opposite effect.

The major hypothesis as expressed in Chapter I was that the process of natural selection outweighs other influences and the piqueros should be expected to have a larger productivity than the colonos. The following section measures productivity differences between the two tenure groups.

Measurement of Differences in Productivity Between Piqueros and Colonc

Differences in productivity will be measured using two variables, productivity per man and productivity per unit of land. In light of the results obtained in the preceding chapter, more importance will be given to productivity per unit of land as this factor of production was shown to be limiting. The following table shows the differences in productivity between piqueros and colonos. The information summarized therein includes data from 24 piqueros and 118 colonos. The piqueros had an average of 3.58 arrobadas of land and 1.67 working men per farm. The colonos had an average of 3.76 arrobadas per farm and 1.42 working men per farm. These coefficients were used to determine productivity per unit of land and productivity per unit of labor respectively.

Table 10. Productivity of Piqueros and Colonos in Pesos

	Piqueros		Colonos	
	Per arrobada	Per man	Per arrobada	Per man
Cheese	93.49	205.09	131.50	348.20
Crops (corn, potatoes, wheat)	284.55	624.20	238.80	632.31
Minor livestock	48.47	106.33	48.20	127.67
Cattle	69.83	149.70	68.98	182.42
Total	496.34	1085.32	487.48	1290.60

The main conclusion which can be derived from Table 10 is that there do not seem to be significant differences between piqueros and colonos in terms of average production. The total figure for piqueros per arrobada is 496.34 pesos. This is very similar to that for colonos, which is 487.48 pesos. The explanation of this similarity may be sought in the relative importance of the three variables that were mentioned before. That is, what has apparently happened is that the effect of the process of natural selection, which seemed to favor the piqueros, has been balanced by the dual effects of colonos' involvement with outsiders, and their awareness of the necessity to improve levels of living. Thus, there is no apparent difference in total agricultural productivity of the two groups.

Productivity in traditional crops is larger for piqueros than it is for colonos--284.55 pesos per arrobada for the former versus 238.80 pesos per arrobada for the latter. According to persons who were acquainted with the area, before agrarian reform very few people used their land for crops other than corn, wheat, and potatoes. If the piqueros are more efficient in the production of these crops at the present it seems that they should have been more efficient in the past and that was the reason why they were able to make enough money to buy a parcel of land.

On the other hand, the colonos are more efficient than the piqueros in the production of cheese. Although this enterprise has existed for a long time in the valley it has gained increasing importance after land reform. The average production coming from cheese was $B 131.50 for colonos and only $B 93.49 for piqueros. The larger productivity of colonos in the production of cheese implies that they have been able to shift more rapidly from traditional enterprises to more commercially oriented operations such as dairying.

Regarding productivity per man, it appears that colonos are consistently more efficient than piqueros in all agricultural enterprises. However, this result is only a reflection of the relative overabundance of labor on piquero farms, which is one of the characteristics of minifundia. The reason for making this assertion is based on the fact that the man-arrobada ratio for piqueros is .46 men per arrobada, while for colonos it is .38. This gives a ratio of 1.21 (.46/.38). The production per man for piqueros is 1085.32 pesos, whereas the production per man for colonos is 1290.60 pesos, with an inverse ratio of 1.19. One can see that the ratio 1.21 and the inverse ratio of 1.19 are almost equal. Thus, it can be said that the productivity per man is a function of the relation of man per unit of land. That is, when land availability per man increases, productivity per man increases by roughly the same proportion. This is further demonstration of the existence of a scarcity of land and overabundance of labor.

To conclude, the hypothesis that piqueros have a larger average productivity than colonos was not supported by the data secured in Ucureña. However, the differences in productivity on the individual agricultural enterprises give some basis for the conclusion that piqueros are more efficient in the cultivation of traditional crops, but colonos are adapting faster to new enterprises, such as dairying, which are more productive than traditional crops.

It might be added, however, that although the results of this study show that there were no differences in productivity between colonos and piqueros, further studies on a wider basis are recommended to ascertain the validity of the results obtained here.

Education and Productivity

The level of education attained by the campesino may affect his productivity in a number of ways. In general, it might be said that the more education an individual receives the more aware he will be of the possibilities that exist to increase his income.

In this study, the concern is mainly with agricultural productivity, although the importance of the relation between education and increase in total income from all sources is an important aspect of the problem of minifundia. Unfortunately, the questionnaire included no data on income derived from sources other than agriculture.[1] At this point the analysis will have to be made only in terms of a relation between agricultural productivity and education. The problem

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[1] The main reason for not including questions on income outside agriculture was the reluctance of the campesinos to give complete information on their income because of fear of tax collectors.

of activities outside agriculture and the income derived from them in the context of an economy dominated by minifundia sized landholdings is a research area to keep in mind.

Subsistence agriculture which has a low productivity is usually associated with underdeveloped societies whose level of education is low. Usually, an increase in productivity of the economy is associated with an increase in education. However, in general, more education is available because the society is becoming more productive. Better education of the population, in turn, should foster still further increases in productivity.

Education is likely to influence productivity in a number of ways. In the first place, a higher level of education makes the individual more aware of the possibilities to increase productivity by adopting new crops or by improving the techniques in existing crops. Education makes the individual aware that there are alternative ways of doing things and that the crops and techniques used for generations are not the only ones available to him. Second, education can also make the individual more aware of the possibilities that exist to increase his income by producing for the market instead of producing mainly for his own consumption. The tendency to think in terms of total income rather than in terms of consumption needs is likely to be reflected in a higher average productivity. Third, education is likely to contribute to an increase in productivity by making individuals more aware of the opportunities that would be available to them if they had a higher income. In other words, there is an increased incentive to increase productivity when the horizon of opportunities is widened.[1]

It has been shown that, in Ucureña, productivity is at a low level, and it is unlikely that any important increases in productivity have occurred in the last few years. Thus, if there are any differences in productivity correlated with education there are grounds for saying that increased agricultural productivity comes from increased education.

A better education should be related to productivity in Ucureña also through the high correlation of education and ability to speak Spanish. In fact, Ucureña is a Quechua-speaking society, and almost the only way in which an individual can learn Spanish is by attending school. The knowledge of Spanish permits the campesino to be better informed on improvements that he can make in his agricultural enterprise. He can also deal better with credit or extension service agents,

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[1] Lewis, op. cit. In fact, Arthur Lewis puts a strong emphasis on the narrowness of the horizon of opportunities as a determinant of lack of incentive to increase productivity.

if there are any available, and increase his productivity through the use of credit or through the adoption of techniques recommended by the extension agents.

Determination of Productivity Differentials Between People with Variable Educational Attainments

Productivity differentials were tested for groups of campesinos in which the original 142 families were contained. As in the case of colonos and piqueros, productivity per unit of land and productivity per unit of labor were determined separately for traditional crops (corn, potatoes, etc.), cheese, minor livestock, and cattle.

The information on productivity differentials for people with different educational attainments is summarized in Table 11. Included are data for campesinos who have had no schooling, those who have been to school two years or less, those with three or four years of education, and those who have been to school more than four years. The first group included 42 campesinos; the seconded included 41; the third, 33; and the fourth, 26. The average landholding for the four groups was 3.99 arrobadas for the first group, 3.92 arrobadas for the second group, 4.01 arrobadas for the third group, and 2.66 arrobadas for the last group. The availability of manpower was 1.60 male workers per farm for the first group, 1.60 for the second, 1.33 for the third, and 1.08 for the fourth group. The coefficients on average size of landholding and average size of farm were used to determine productivity per unit of land and productivity per unit of labor respectively.

The man/land ratios for each of the groups are .401 (1.6/3.99), .408 (1.6/3.92), .33 (1.33/4.01), and .406 (1.08/2.66).

The fact that people with more education are also the ones who have a smaller average size of landholding reflects an important socio-economic factor of the community. The people with more education are the younger campesinos who, due to the scarcity of available land, have been getting smaller plots of land. In other words, the problem of minifundia has become more acute in recent years.

Table 11 shows that people who attended school three years or more are more efficient in terms of output per unit of land than people who received two years or less of education. People who received more than four years of education are the most productive of all groups. Thus, it can be said that education is positively associated with agricultural productivity.

There is, however, what seems to be a discrepancy between people who have not had any education (those who have an average productivity of $B 482.16 per arrobada), and people who have had one or two years of education (who have an average productivity of $B 439.27 per

Table 11. Education and Productivity[1]

	No Education		1-2 Years		3-4 Years		Over 4 Years	
	Per arrobada	Per man	Per arrobada	Per man	Per arrobada	Per man	Per arrobada	Per man
Cheese	129.43	322.77	102.94	243.09	131.32	395.60	158.54	390.49
Crops	239.67	597.69	241.50	570.30	252.46	761.20	268.65	661.68
Minor Livestock	43.84	109.34	33.49	79.09	53.56	161.49	84.38	207.83
Cattle	69.22	172.62	61.34	145.46	68.00	205.54	88.19	215.38
Total	482.16	1202.42	439.27	1037.94	505.34	1524.83	599.76	1475.38

[1] Data are given in pesos.

arrobada). This apparent discrepancy might be explained as resulting from the fact that in the group with one to two years of education there were fewer people who owned a dairy cow, and that this fact has influenced their average productivity in both cheese and cattle. The fact that these people owned, on the average, fewer dairy cows than the rest of the groups--including the group that did not attend school--seems to be more a result of chance (due to the smallness of the sample) than anything else. If one accepts this as chance discrepancy, then it becomes apparent that people with higher educational attainment are more productive than people with a lower educational attainment.

Furthermore, it appears that the positive correlation between education and productivity increases as the years of school attendance increase. The difference between people who attended more than four years of school and those who attended three to four years of school is larger than the difference between the latter group and the group of people with no education.

The facts mentioned above could be explained in terms of the relative change that the individual experiences as a result of being educated. People who have been in school only one or two years tend to forget in a few years what little they learned in school, and in later years they are not significantly different from people who have never been to school. On the other hand, people who have remained in school for a longer period of time experience a more lasting impact from education. They tend to be significantly different from people with fewer years of education. They speak Spanish better, on the average, and they are more aware of political and other national developments. In short, these people, given the average education in Bolivia, cease to be illiterates or functional illiterates. Thus, one would expect them to be more productive in agriculture, if education and productivity are related.

The fact that education has been shown to be related to productivity, especially after a certain level has been reached, has important implications for policies designed to implement economic development. Arthur Lewis[1] has made the point that elementary education should be considered more as a factor that improves the living standard of the population by permitting individuals to enjoy more of the pleasures of life rather than as an investment in the development of a country. The findings of this study indicate that investments in elementary education can be not only a means to increase the living standards but also as an investment in economic development. However, it should be stressed that further research to ascertain the validity of the results obtained here is recommended.

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[1] Lewis, Ibid., pp. 183-184.

The hypothesis tested in the previous section, that productivity per man is a function of the amount of land available per man, is also shown in this section, although the effect is not as clear because differences in productivity per unit of land between groups tend to change the relation between average production per man and availability of land per man. However, the general relation still holds, as shown in Table 12. The effect of differentials on productivity per unit of land, which tend to diminish this relation, can be observed. They are especially clear if the coefficients for groups one, two, and three are compared with their respective productivities per unit of labor, and productivities per unit of land. The three coefficients are roughly equal. However, the productivities per man vary in direct relation to the productivities per unit of land. The same effect can also be seen if group three is compared with group four, where a higher availability of land per worker for group three results in a higher production per unit of labor, although the production per unit of land is higher for group four.

This section has supported the evidence given previously that the concept of productivity of labor on minifundia, particularly where they are all as near the same size as those studied here, is a concept which has little use because it is only a reflection of the amount of land available per worker. In other words, the hypothesis of an absolute overabundance of labor, that is marginal returns to labor approximating zero, is supported.[1]

[1] The hypothesis of overabundance of labor and negative or near zero marginal returns for labor is important in the context of current theories of economic development that start with this basic assumption. W. Arthur Lewis is the basic proponent of the theory and its implications have been developed by other authors further.

Table 12. Productivity Per Man as a Function of Land Available

Group Number	Education	Units of labor per arrobada	Productivity per unit of labor	Productivity per unit of land
1	No education	.40	1202.42	482.16
2	1 - 2 years	.42	1037.94	439.27
3	3 - 4 years	.33	1524.83	505.34
4	Over 4 years	.41	1475.38	599.76

CHAPTER VIII

MINIFUNDIA AND LAND REFORM

Economic Results of Land Redistribution into Minifundia Sized Holdings

It is accepted generally that a program of land reform has two economic objectives: 1) redistribution of wealth among sectors of the population, 2) increase of efficiency in agriculture. It is apparent from this study of Ucureña that the Bolivian land reform resulted in a redistribution of wealth among the social classes in Bolivia. The campesinos, who constitute a majority of the population, were given a larger share of national wealth when they received the land without payment.

The landowners, of course, were the most strongly affected by land reform, for they lost most of their wealth which for decades had been concentrated in the ownership of rural property. Another group affected by land reform measures are the city dwellers who lived from the employment opportunities provided by the landowners' demand for goods and services. Whether this type of income redistribution is desirable or justifiable is outside the major focus of this study.

The next problem in relation to the economic results of land reform is related to the changes in agricultural productivity resulting from a redistribution of land in minifundia sized holdings. The findings of this study in Ucureña indicate that the creation of minifundia through land reform would result in a low level of average productivity, but not necessarily lower than before the land reform. The results of a land redistribution program in relation to average productivity should be looked at not only in terms of the level of productivity after land reform but also in relation to the level that existed before land reform. Unfortunately, it was not possible to obtain data on the level of agricultural productivity before land reform. However, some people who knew the area of Ucureña before the land redistribution took place are of the opinion that productivity per unit of land has decreased to some extent. It would seem, however, that the landowners who cultivated mainly staple, traditional crops, using about the same level of technology as is used presently, could not have achieved a level of productivity much higher than the campesinos are achieving presently.

A low level of agricultural productivity such as that existing in the Upper Valley seems to prevail in most of the regions that were affected by the land reform. This, to most observers, only shows that the Bolivian land reform was not used as an institution creating act, upon which programs of credit and agricultural extention and research could then be built with greater effectiveness. However, there is at least one significant exception to low agricultural productivity,

namely, the Lower Valley of Cochabamba where conditions permitted a profitable shift to more labor intensive agriculture (vegetable growing), and also permitted a manyfold increase in agricultural activity after land reform. There are indications that this has taken place in other regions also, especially around Lake Titicaca. It seems that the basic conditions necessary for this type of shift to a more intensive agriculture is the existence or creation of markets. A study of the marketing problems faced by the campesinos of Bolivia is outside the scope of this thesis. However, it has been shown that campesinos sell only a small percentage, if any, of their staple crops such as potatoes, and a large percentage of such things as cheese.

Land Reform and Social Change

The social change resulting from the Bolivian land reform was substantial for the campesino as a social class. The campesino class has been transformed into an important segment of Bolivian society, with opportunities for social and geographic mobility. Before land reform, campesinos, while forming a society of their own, also formed the lowest stratum of Bolivian society. They had basically no rights accorded to them, and little or no social mobility or interaction with other classes.

The social change which has taken place for the campesinos' class as a whole, has, however, not affected the basic social organization of the campesino family. The family remains organized in the same way as before land reform. One noticeable change at the family level was observed in terms of social mobility of occupations within the family. Sons and daughters sometimes adopt occupations different from those of their fathers and mothers. Another observable change at the family level is the change in attitudes toward education. In fact, it seems that after the land reform program the campesinos are placing a much higher value on education than before. This is perhaps the main reason why the campesinos now have greater geographic mobility, which results in generally better opportunities.

Foregoing portions of this study were focused on conclusions derived from the economic and social results of a land redistribution program which involves partitioning the land into minifundia sized holdings. However, the partition of land in Bolivia came about mainly because of political pressures. These political pressures came mainly from campesinos who felt that the ownership of land was the only means by which they could acquire dignity and security. In this sense, the distribution of land into minifundia sized holdings is performing an important social function.

The Social Function of Minifundia

In a society characterized by a low standard of living and few opportunities for employment outside agriculture the ownership of land or equitable access to the use of land is seen not only as a form of capital investment but also as a means to secure at least a subsistence level of living. People who have no land of their own and no opportunity to move elsewhere are likely to accept almost any type of tenure status as long as they have access to some land which assures them of subsistence, even if this subsistence is at a very low level. This was apprently the case in Bolivia before land reform, when campesinos provided free labor and a variety of services in exchange for the right to cultivate a piece of land. This dependence of the campesinos on the landlords for their subsistence and the abuses that the landlords comitted, as well as the rising population pressure in the area, caused resentment among the campesinos and undoubtedly led to pressures for land redistribution. When the campesinos were able eventually to take over the landlord's properties (with the help of middle class intellectuals from Cochabamba) the pressures were stronger in the direction of giving every campesino access to land and in this way assuring a subsistence living for them. The fact that even minifundia sized holdings assure at least a minimum subsistence to campesinos, and also assures them of a certain dignity as individuals within the national society, implies that minifundia sized holdings are fulfilling an important social and political function in an economy which offers few other opportunities within or outside agriculture.

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