

ANALYSIS OF AN AGRICULTURAL ECONOMY WITHIN THE  
CENTRAL PLATEAU REGION OF COSTA RICA

By

HERACLIO A. LOMBARDO

Licenciante in Commerce  
University of Panama  
Panama City, Panama  
1949

Master of Science  
University of Arkansas  
Fayetteville, Arkansas  
1955

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Thesis Approved:

*L. A. Parcher*  
\_\_\_\_\_  
Thesis Adviser

*James H. Playford*  
\_\_\_\_\_

*W. Trenton*  
\_\_\_\_\_

*E. G. R. Booth*  
\_\_\_\_\_

*Carl E. Marshall*  
\_\_\_\_\_

*J. H. Brown*  
\_\_\_\_\_  
Dean of the Graduate School

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## CHAPTER I

### INTRODUCTION

The initiation of inquiry is predicated upon the existence of a problem.<sup>1</sup> A problem may be defined as a situation of lack of knowledge, of confusion, of not knowing possible outcome of policies or actions. This study is concerned with such a situation. It is about an area within an underdeveloped country undertaken with the major purpose of gaining a better understanding of the problems of development.

In the economic literature of recent years the subject of underdevelopment has been widely examined. A United Nations' report on Measures for the Economic Development of Underdeveloped Countries defined underdeveloped countries to "mean countries in which per capita real income is low when compared with the per capita real incomes of the United States of America, Canada, Australia, and Western Europe."<sup>2</sup> Higgins gives the statement a quantitative connotation by adding: "In general, underdeveloped countries in this sense are those with per capita incomes less than one-quarter those of the United States--or, roughly, less than \$500 per year."<sup>3</sup> From the standpoint of agriculture,

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<sup>1</sup>F. S. C. Northrop, The Logic of the Sciences and the Humanities (New York, 1947), Chapter I.

<sup>2</sup>Quoted by Benjamin Higgins, Economic Development (New York, 1959), p. 6.

<sup>3</sup>Higgins, p. 6.

underdevelopment is such conditions as a high contribution of the agricultural sector to national income, low productivity of resources employed, a high labor to land ratio, low levels of technology, and little or no opportunity for employment of farm labor force outside of agriculture. Other characteristics of backward nations are low rates of capital formation, high rates of population growth, low health and dietary standards, high degree of illiteracy, and low levels of technical skills.<sup>4</sup> Some of these latter characteristics also exist at times in advanced nations or parts thereof.

Economists appear to agree on the general characteristics of underdeveloped countries, but they differ in both explanations of the situation and recommended policies. Some economists stress insufficient capital formation in the areas of underdevelopment, and they suggest simultaneous massive doses of investment in all sectors of the economy as the remedy.<sup>5</sup> Others have questioned this approach as impractical and, instead, suggest fragmentary injections of capital.<sup>6</sup> A third group of economists emphasize obstacles relating to people and their institutions, and they advocate investment in human beings as the remedy.<sup>7</sup>

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<sup>4</sup>For an exhaustive list see Harvey Liebenstein, Economic Backwardness and Economic Growth (New York, 1957), pp. 40-41.

<sup>5</sup>Higgins, pp. 397-398.

<sup>6</sup>Albert O. Hirschman, The Strategy of Economic Development (New York, 1959).

<sup>7</sup>T. W. Schultz, "Investment in Human Capital," American Economic Review, LI (March, 1961).



Although industrialization of the nonagricultural sector has been considered a necessary condition of development,<sup>8</sup> many question its sufficiency and contend that the roots of the problem lie in agriculture. According to this view, initial efforts to solve the problems of underdeveloped countries should concentrate on developing this sector.<sup>9</sup>

The absence of agreement on explanations and remedial measures, with "remedial" meaning what could contribute to increases in incomes and standards of living in less advanced nations, has special significance to an investigator of problems of underdeveloped countries or of areas within these countries. The problem seems to be a lack of understanding of the problems. At this juncture one can proceed only with ideas from the conflicting theories with the major objective of adding to an understanding of the problems. This study was pursued in this vein.

The first objective of the study was to assemble and interpret available facts (including those obtained through a survey) about the agricultural economy of an area within Costa Rica for the major purpose of assessing its potential for agricultural development. The existence of surplus labor or disguised unemployment, and its relation with low productivity and low incomes was one of the characteristics receiving

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<sup>8</sup> Benjamin A. Rogge, "Economic Development in Latin America: The Prebisch Thesis," Inter-American Economic Affairs, IX (Spring, 1959) Number 4, pp. 24-49.

<sup>9</sup> Bruce F. Johnson and John W. Mellor, "The Nature of Agriculture's Contributions to Economic Development," Food Research Institute Studies, I (November, 1960), Number 3.

major attention in the theories about underdeveloped countries or areas. Therefore, a second objective of this study was to present selected hypotheses and theories about surplus labor or disguised unemployment and to briefly assess their relevance to the area of the study. A third objective was to identify some problems associated with selected alternative actions for developing the agriculture of the area. The selection of the particular area within Costa Rica for study was arbitrary. Many other areas would have been equally as well suited to the purposes of the study. Public officials of Costa Rica have continually described the area selected for the study as "a problem area in which repeated efforts by the government to improve conditions had been unsuccessful."

The study is confined to the agricultural sector of the area. This treatment is defended on several grounds. There is a large population of landless farm laborers in the area and a high proportion of the farmers with plots too small for efficient exploitation. Also, in Costa Rica, agriculture is significant as a main source of foreign exchange; its output, however inefficiently and atomistically produced, represents a large share of the national wealth. A country in which two-thirds of its population is mainly preoccupied with food production appears to need increased efficiency in the agricultural sector as a prerequisite to industrialization. Also, increases in income as a nation begins to develop will increase the demand for food, which, in turn, further increases the need for efficiency in farm production.

## CHAPTER II

### SOME SOCIAL AND ECONOMIC CHARACTERISTICS OF COSTA RICA AND THE AREA OF THE STUDY

The area of this study is located in Costa Rica, Central America (Figure 1). Costa Rica lies between the Pacific Ocean and the Caribbean Sea. It is bounded on the north by Nicaragua and on the south by Panama. Its total land area is approximately 19,700 square miles, or roughly the combined size of the states of Vermont and New Hampshire in the United States. The total length of the country is about 288 miles and the width is 170 miles at the broadest point. The Central Plateau, the country's most important segment, is about 60 miles long and 30 miles wide with altitudes ranging from 1,980 to 6,600 feet. The average temperature is about 68°F. with year round climate similar to that of United States Middle Atlantic States during May and June. Average annual rainfall is 80 inches with a five month dry season extending from December through April.<sup>1</sup>

The estimated population of Costa Rica for 1962 was 1,270,000. Three-fourths of the people live on the Central Plateau comprising about one-tenth of the land area of the nation.<sup>2</sup> The country has a rate of

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<sup>1</sup> Stacy May, et al., Costa Rica: A Study in Economic Development (New York, 1952), pp. 21-22.

<sup>2</sup> Administration for International Development, Latin American USOMs Seminar on Agrarian Reform (Washington, 1961), p. 113.



Figure 1. Map of Costa Rica and General Location of the Area of the Study.

population growth of 4.6 percent, which is the highest in Latin America.<sup>3</sup> It also has a comparatively high rate of literacy (80 percent).<sup>4</sup> Seventy-five percent of the population is rural. Production on farms accounted for 37 percent of the national income during 1957 through 1961.<sup>5</sup> Estimates were unavailable on the proportion of the national income accounted for by the production and marketing of farm inputs and by the processing and marketing of farm products. About 55 percent of the labor force is engaged in farming, forestry, and fishing.

Coffee is Costa Rica's chief source of foreign exchange. During 1957 through 1961, it accounted for approximately 52 percent by value of exports even though this was a period of depressed world prices for coffee. The foreign exchange earned permits imports of food to supplement agricultural output of the country and to import other goods and services. Export taxes on this commodity and duties on imported goods made possible by the coffee exports are important sources of revenue to the Government. One out of every six Costa Ricans find employment in coffee at least part of the year. Bananas accounted for 28 percent of the value of exports during the period 1957 through 1961.<sup>6</sup>

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<sup>3</sup>Banco Central de Costa Rica, Informacion Economica Semanal (March, 1962), Number 593.

<sup>4</sup>Administration for International Development, Report of the Seminar on Agricultural Marketing and Cooperatives held in Kingston, Jamaica, November 2-13, 1959 (Washington, D. C.), p. 299.

<sup>5</sup>Banco Central de Costa Rica, Informacion Economica Semanal (December, 1963), Number 630.

<sup>6</sup>Estimates made from published data by the Central Bank of Costa Rica.



Per capita income in 1960 was \$341.00 which was well above that for the other Central American Countries (Table I). Among the more important industries in Costa Rica were food processing, raw sugar production, paints, tobacco, shoes, textiles and clothing, and beverages. Other industries becoming important in the domestic economy are plastic products, fertilizers, feeds and insecticides. For some industries, such as fertilizers and insecticides, semi-finished ingredients were imported and used in manufacturing final products.<sup>7</sup> Plans were underway to construct the country's first cement plant. There also was a proposal for establishing a refinery.

Although there are relatively few isolated communities in the Central Plateau, roads in rural areas are mostly of dirt and gravel and so rough that travel time is considerable for the distances covered. The existing national highway network services a relatively limited part of the country. Most of the country still is inaccessible to overland transportation.<sup>8</sup>

#### The Area of the Study

The area of the study is located on the Central Plateau, 25 to 50 miles east of the capital city of San Jose (Figure 2). Cartago, with a population of 19,000, is located on the western edge of the area. The area is approximately 150 square miles representing .8

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<sup>7</sup>United States Department of Commerce, Basic Data on the Economy of Costa Rica. Bureau of Foreign Commerce, WTIS, Economic Reports, Part 1, No. 59-59.

<sup>8</sup>Ibid.

TABLE I  
POPULATION, NATIONAL INCOME AND PER CAPITA INCOME, FOR  
FIVE CENTRAL AMERICAN COUNTRIES, 1960

Country	Population (thousands)	National Income (million dollars)	Per Capita Income (dollars)
Costa Rica	1,171	399.3	341
El Salvador	2,501	457.7	183
Guatemala	3,765	583.6	155
Honduras	1,883	335.2	178
Nicaragua	1,477	a	a

<sup>a</sup>No data available.

Sources: United Nations, Demographic Yearbook, 1961; and United Nations, Monthly Bulletin of Statistics (January, 1963), pp. 154,158.

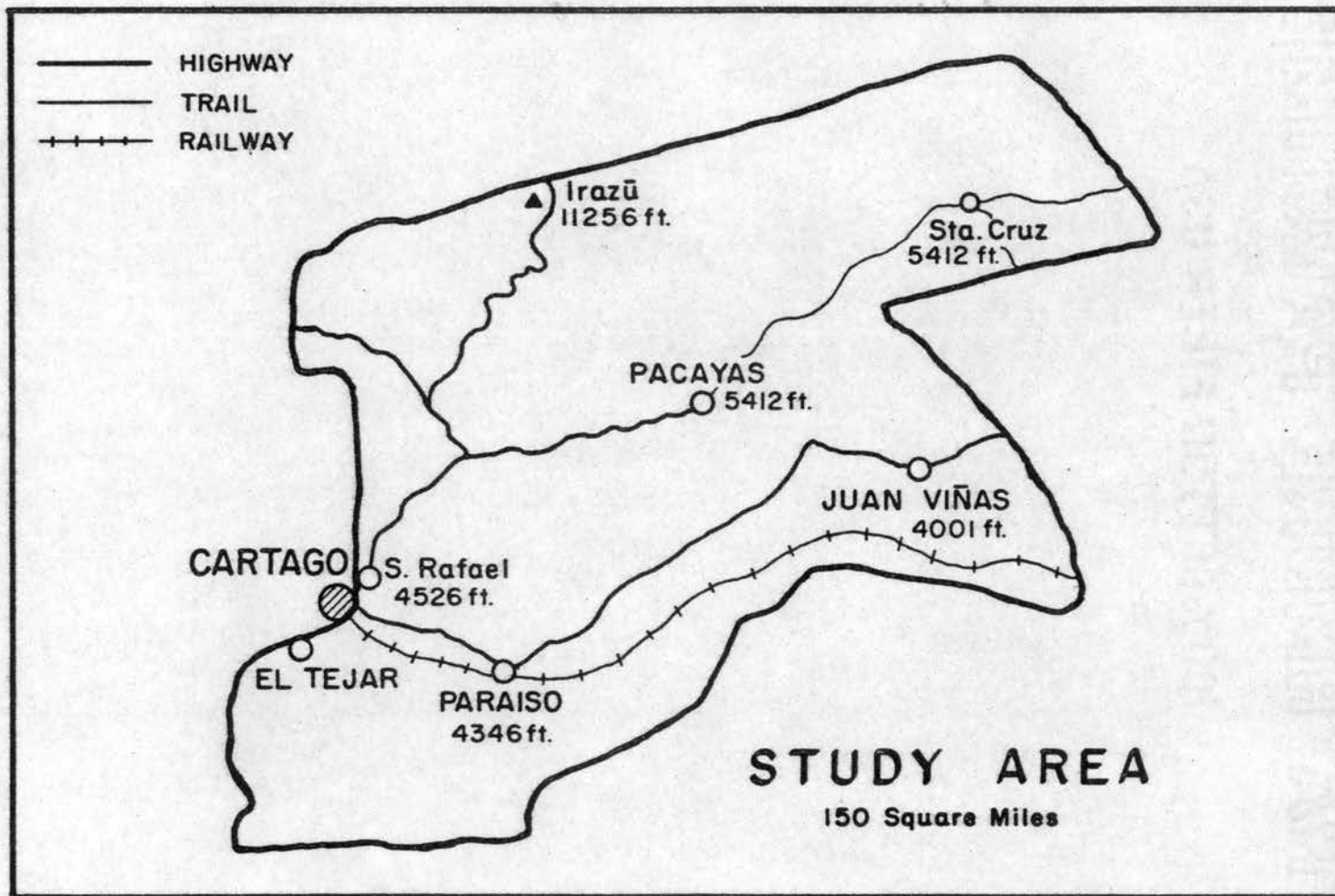


Figure 2. Map of the Area of the Study.



percent of the country's land area and eight percent of the Central Plateau. Its population is about 44,000 of which 80 percent or more is rural. The literacy rate is high, ranging from 86 to 95 percent.

The area is mostly a hilly to mountainous region with generally severe topography forming innumerable small valleys and gorges and short spaces of level land. Altitudes vary from about 3,000 to 9,000 feet, with peaks as high as 10,000 to 11,000 feet. Three tropical forest formations cover most of the area: the Lower Montane Wet Forest, the Subtropical Moist Forest, and the Subtropical Wet Forest. The Lower Montane Wet Forest has altitudes ranging from 5,000 to 8,000 feet, mean average temperatures of 54° to 64° Fahrenheit, and annual rainfall between 80 to 160 inches. Potato production and the better dairy farms are concentrated in this belt. At times the potato crop is damaged by frost. The Subtropical Moist Forest varies in altitude from 1,700 to 5,000 feet with average yearly temperature of 64° to 75° Fahrenheit and with rainfall of 40 to 80 inches. It is characterized by a wet and dry season. Besides dairy enterprises, sugar cane and coffee are grown in this belt. In the Subtropical Wet Forest, temperatures and elevations are the same as in the Subtropical Moist Forest, but annual rainfall is 80 to 160 inches. Most of the coffee and sugar cane grown in the area is found in this belt. Neither the Subtropical Moist nor Wet Forest formations are well suited for sugar cane production. However the crop is grown in these belts because of tradition or other reasons.

Three general soil groups in the area may be distinguished: volcanic ash and lava, laterite, and alluvial, with volcanic ash and lava

predominating. The most common type of soils are sandy loam, sandy clay loam, and sandy clay. The soils of volcanic formation are considered to have high fertility but they are stony. Laterite soils are high in clay content, very permeable, well drained, but they are generally low in fertility. Alluvial soils drainage properties range from poor to good. Their fertility generally is good. The rugged topography and rainfall subjects the land to serious erosion. Some farmers, particularly potato growers, follow recommended erosion control practices.

Gross per capita income for the area in 1955 was estimated to be \$126. For this same year, estimated gross agricultural labor productivity was \$613.<sup>9</sup> This figure was above the national average of \$599, but only half the gross labor productivity of \$1,223 estimated for the industrial sector of the country.<sup>10</sup>

About 97 percent of the nation's potatoes were produced in the area in 1955. This perhaps was the area's most significant contribution to national agricultural production. The contribution of coffee and sugar cane was smaller. Only 4.8 percent of the country's total coffee output in 1955 originated in the area. Sugar cane output represented 12.5 percent of the nation's crop for this same year. The area appeared to be better suited for milk production. About 66 percent of total land in farms in 1955 was in pasture. Most of it was native

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<sup>9</sup>Estimates were computed by using production and price information for the area, provided by the Bureau of Statistics and Census of Costa Rica. The monetary exchange rate was 6.62 colones to a dollar.

<sup>10</sup>Universidad de Costa Rica, "Estudio del Sector Agropecuario," El Desarrollo Económico de Costa Rica, (Costa Rica, 1959), Number 3.

pasture but improved varieties were found. Production figures for the same year showed that 15 percent of national milk production came from the area although it had only four percent of the total number of milk cows in the country. The area's average daily milk production per cow of nine pounds was significantly higher than the national figure of 5.6 pounds.

In 1955 there were approximately 1,240 farms, with an average size of 44 manzanas<sup>11</sup> which was smaller than the national average of 56. Eighty-six percent of all farms were operated by their owners. These farms contained 86 percent of all the land in farms. Figures for the country indicated that 76 percent of all farms were operated by their owners and had 89 percent of all land in farms. Of the total land in farms in the area, 97 percent was privately owned as compared with a national figure of 95 percent. The distribution of sizes of farms in the area was highly skewed. Ninety-two percent of farms contained only 28 percent of all farmland and 72 percent of land in farms was held by eight percent of the farmers.

Farm production in the area was of two broad types: crop and dairy. The main crops were potatoes, coffee, and sugar cane. Corn, beans, and garden crops also were raised, but they were of lesser importance. Of the 15 "districts"<sup>12</sup> comprising the area, four had no coffee, six districts contained 94 percent of the farms growing this crop. Seven districts contained 97 percent of the farms growing sugar

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<sup>11</sup>One manzana equals 1.7 acres.

<sup>12</sup>Political subdivision roughly equivalent to a township in the United States.

cane, and no sugar cane farms were reported in four districts. Although potato farming was more general, 84 percent of farms growing the crop were concentrated in six districts. Potato farming was located in the higher, cooler lands of about 5,500 to 9,800 feet in elevation, and coffee and sugar cane enterprises were found in the warmer, lower portions.

Some coffee and sugar cane are produced on plantation type farms in communities resembling feudal social order. Within the area there is a sugar cane plantation vertically integrated forming a community of about 6,500 persons. On the other hand, potato output is concentrated on small farms with the largest acreage in potatoes on any one farm being 20 manzanas.

Dairy farming was general to the whole area. About 56 percent of all farms reported the production of milk, and the value of milk produced represented 34 percent of total value of farm output in 1955 for the area (Table II). About 39 percent of farms reporting milk production in 1955 were in the cooler climate districts. These farms had 54 percent of the milk cows and an average daily production of ten pounds per cow, as compared to seven pounds per cow in the lower altitudes.

According to the 1955 Census, 63 percent of farm workers in the area were earning wages and, of those not earning wages, 51 percent were on farms of less than ten manzanas. Figures for the nation show that, in 1955, about 45 percent of farm workers were earning a wage. Coffee and sugar cane provide most of the permanent and seasonal employment opportunities, however, the potato enterprise also required

TABLE II  
 VALUE OF FARM PRODUCTION IN THE AREA OF THE STUDY, 1955

Product	Gross Value (Dollars)	Total Value (Percent)
Coffee	926,192.24	25.7
Sugar Cane	489,755.19	13.6
Potatoes	813,206.90	22.5
Milk	1,215,722.44	33.7
Corn	133,338.32	3.7
Beans	13,689.84	a
Garden Crops	16,405.39	a
Rice	79.00	a

<sup>a</sup> Less than one percent.

Source: Bureau of Statistics and Census, Costa Rica.

the hiring of labor. Most of the labor for potato production was needed at planting and harvesting times. The sugar cane harvesting and processing, lasting approximately nine months per year, provided work opportunities for peons as well as others connected with the industry such as truckers and their helpers. Coffee picking, encompassing a period of about three months, provided seasonal employment for labor not normally counted in the labor force such as housewives and children of school age. No other enterprise within the area provided such seasonal employment opportunities. Dairy farming also was an important source of labor employment with the advantage that most of it was year-round.

Minimum daily wages for farm labor fixed by law ranged from \$1.10 in general farm work to \$1.28 for work on coffee farms.<sup>13</sup> Although the law made no difference between male and female labor, women were paid less, with their daily wages averaging \$0.76.

Farmers in the area and in Costa Rica generally have a degree of technology above that of farmers in the rest of Central America and Panama. There is extensive use of fertilizer by potato, coffee, and sugar cane growers. Disease and pest control also is practiced. Sources of power on farms mostly are animal and human. Ox driven ploughs and carts for hauling products and materials are common, but all other chores are done primarily with human power.

Transportation and communication facilities for the area are limited. There are about 40 miles of paved all weather roads and

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<sup>13</sup> Carlos Ma. Campos, Aspectos Juridicos de la Actividad Agropecuaria de Costa Rica, mimeo., p. 30. The prevailing wage rate was \$1.13.

about 40 miles of gravel and dirt roads over which only jeep type vehicles and trucks can travel. Feeder roads connecting farms to the main roads are almost nonexistent. There is no telephone communication; wire and mail service is limited to a few community centers. A railroad connecting the city of San Jose with Limon on the Atlantic east coast crosses a section of the area,

Government assistance to the farmers of the area is provided through credit agencies, research, and extension. There is only one extension office within the area. Two extension offices in adjacent areas provide some assistance.

The National Bank of Costa Rica, a public institution, provides credit to farmers through Rural Credit Boards. There are three credit boards within the area and two in adjacent areas. Short and medium-term loans for up to eight years are provided at six percent rate of interest. Short-term loans are mostly for production purposes and repayable at the end of the crop year. Coffee and sugar cane farmers obtain most of their credit by indirect financing, "Beneficios"<sup>14</sup> and "Ingenios"<sup>15</sup> borrow from the banks and, in turn, extend credit to growers. This form of financing is under government control. Every year the Central Bank announces the credit allowance for "manzana" of coffee or cane. The National Production Council, a public

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<sup>14</sup>Plants where coffee cherries are processed into beans.

<sup>15</sup>Sugar cane processing plant.

institution with a program of commodity price supports, purchase, storage and distribution designed to stimulate agricultural production, is not active in the area.

The Ministry of Agriculture and the University of Costa Rica have experiment stations outside the area. Research pertinent to the area includes tests of new varieties of plants, practices in fertilization, control of weeds and breeds of dairy cattle.

#### Marketing of Farm Products

The markets for agricultural production in the country can be divided into international and domestic. Coffee, raw sugar, bananas and cocoa are the main exports. The United States is the main consuming center for most of the exports, but West Germany is the chief buyer of coffee. Domestically, there is only one major consuming center, the capital city of San Jose. This metropolitan area has about one-fourth of the population of the country.

There is a limited amount of information about markets and prices. Prices actually received, or observed at the primary markets provide the only information to a farmer for making production decisions. Reliable statistical data on markets and prices do not exist even for coffee, the main export product of the country. Only crude empirical figures of yearly production of coffee are computed.

At the farms, facilities to store or preserve products do not exist. However, farmers usually have an old wooden shack to protect crops from excessive humidity. The situation is no better in marketing channels beyond the farms. Packaging, transporting, and



handling practices are crude. Losses through spoilage are substantial. At retail stores cold storage facilities are limited to meats, thus fresh goods last very few days. The net result is that the consumer has to pay a high price for a low quality product.

Grading is done subjectively along every step of the marketing process with appearance the principal criterion, but size is of importance in the case of vegetables. The international market for coffee, bananas, cocoa, and minor exports has made grading and standardization a mandatory procedure.

Most of the main crops and some fruits in Costa Rica are processed domestically and distributed to national and export markets. Dominant attention is again on coffee and sugar cane. Coffee cherries are processed into beans for export and domestic use. Sugar cane goes into three different processes each with a different pattern of distribution and market. First, part of the processed cane is exported to the United States as raw sugar. Second, a substantial amount of national output is processed as "dulce" or "panela," or solidified brown cakes of cane juice, and it is consumed mainly by the lower income groups. Generally, about two-thirds of the cane output is processed in this form. Third, part of the crop is processed into white unrefined sugar for domestic consumption. It is mainly purchased by middle and high income groups, and it generally is retailed in the supermarkets.

Milk is processed into a variety of products for domestic consumption. It is pasteurized, made into powder, and converted into cheeses and ice cream. Tomatoes are sold fresh or processed into paste and ketchup. Meats undergo minor processing into cold cuts. Most of the

meat is sold fresh the day following slaughter. Fruits are processed as jellies and preserves. Produce and other foods are assembled in the public market building where consumers converge to make their daily purchases. There still are very few supermarket-type stores in Costa Rica.

In the area of the study, growers sell coffee cherries to "beneficios" and sugar cane to "ingenios" located within or adjacent to the area. The price of coffee and of sugar cane is set by fiat. Every year the Coffee Office, a government agency with private industry representation, establishes the price to be paid to domestic producers. This office is in charge of all coffee sales, domestic and export. The price paid to producers is influenced by world market conditions, the quality of the coffee, and sales handled by a "beneficio." The amount a given grower receives depends on the price set for the "beneficio" to which he sells. Final prices for a crop year are known after the crop has been sold in the world market. Before the harvesting season begins, the Coffee Office announces the preliminary prices. Adjustments in prices to producers are made later. The estimate made by the Coffee Office usually is well below the final price.

Sugar cane prices to producers follow a similar procedure to that for coffee. The Sugar Board, an industry wide private organization formed by sugar mill owners and cane producers, regulates supply and prices of granulated sugar on the local market and prices paid to growers. This board sets the preliminary yearly price to be paid producers by "Ingenios" but subject to Government approval. Prices are influenced by world market conditions, the quality of the cane and the expected size of the crop. Both coffee and sugar are bought by volume

(not grade) and at uniform prices. This practice facilitates bulk handling by buyers, but it provides little incentive to farmers to improve the quality of coffee or sugar cane.

Coffee commonly is transported in family owned ox carts to assembly points where it is carried in trucks to the "beneficio." Sugar cane first is assembled in heaps next to the nearest possible road from where it is taken to the "beneficio." Transportation charges for cane amount to about 20 percent of the average price received by producers. Weekly payments are made to producers for deliveries of both coffee and sugar cane.

There is no government or industry controls in potato markets. Once a week, on Sundays, buyers and sellers get together in the Cartago market area. Transactions are made on the basis of samples. After a sale is agreed upon, the buyer provides his own workers to wash and grade the potatoes, and to transport them from the farm to the consuming center. The selling-buying transaction is completed without a written contract on price and payment provisions. The agreement is verbal. Generally, payment to the grower is made after the middleman has disposed of the potatoes. Unlike coffee and sugar cane, growers of potatoes get higher prices for the better varieties. However, there is little grower response in producing the better varieties due to higher cost of seed. Although potatoes are marketed throughout the year, prices fluctuate sharply seasonally. The lowest prices occur in the late months of the year when the major part of the crop is harvested. The absence of storage facilities adds to the seasonal price variation.

Most of the milk produced in the area of the study is marketed as fresh milk. Where production of milk cannot be transported by daily pick-up trucks, it is processed into cheese on the farms and sold by farmers to retailers. Milk prices are fairly uniform during the year. They tend to be higher during the summer months but contract arrangements limit the extent of price variation. Those farmers with the larger volumes of production belong to a producers' cooperative. This cooperative maintains relatively high standards of quality for milk, and prices are paid producers on the basis of fat content. Other dairymen prefer to sell milk directly to retailers.

#### Values and Institutions

Because of culture and other factors, Costa Rica has characteristics more like the Western World than most other underdeveloped countries. There is not, therefore, an incisive cultural cleavage between this country and the United States as that which might exist between the United States and less advanced countries in Asia and Africa. But there are, nevertheless, differences between the two countries. In Costa Rica for instance, the Catholic religion is professed by a majority of the population, and its civilization was forged by the Spanish settlers. This institutional and cultural background is distinct from the religious and Anglo-Saxon heritage of the United States.

A distinct feature of the people of Costa Rica, as compared to other Central American countries, is that about 90 to 95 percent of the

country's inhabitants are of European stock.<sup>16</sup> This means it is relatively free of the fetishes and superstitions commonly associated with Indian cultures.

The people in the area of study generally display an extrovert attitude towards strangers which may be the result of their ethnic ancestry and level of education. This group behavior does not prevail in the rest of Central America. Even the poorest farmers are aware of the benefits that can be obtained by using fertilizers. They respond to economic stimuli. Potato growers, for example, will not harvest their crop immediately if they judge prices to be low. The grower is willing to risk some losses from spoilage if the potato remains too long in the ground rather than take a price he deems inadequate. The gentleman's agreement in potato marketing described previously gives an insight on how high growers and middlemen value personal integrity. Notwithstanding the quality of the institutions and values of the farmers and the rest of the people the endemic agricultural structure characteristic of underdeveloped regions is found in the area.

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<sup>16</sup>May et al., pp. 22-24.

## CHAPTER III

### SAMPLING PROCEDURE

In order to gain additional understanding of agricultural production, income and economic problems in the area selected for study, 121 individual farms were surveyed in December and January of 1962-63. Information was obtained from the individual farmers on land resources, machinery and livestock, family labor supply, land uses, output from the different enterprises, production practices, production costs, sales, marketing practices, and amount and sources of income other than that obtained on own farms. Results of this survey were tabulated by classes of farms (Chapter IV). This chapter contains a brief explanation of the sampling procedure.

Information for a stratified systematic sampling method was obtained from the Census Bureau of Costa Rica. In the area of the study there were 1,240 farms in 1955. These farms were grouped into four classes by size as follows: (1) one to less than five manzanas, (2) five to less than 15 manzanas, (3) fifteen to less than 100 manzanas, and (4) one hundred manzanas and over.

The farms were stratified by size in order to minimize the number of sample farms needed within each class and total number of farms in the sample. These were formed by regrouping census classes in an arbitrary manner but the groupings were judged to be representative of farm sizes in the area.

To estimate variation within the different classes, estimates of variance for each were computed from a 10 percent sample allocated among the classes. The estimated variances were:

$$s_1^2 = 1.19 \quad s_2^2 = 5.78 \quad s_3^2 = 443.16 \quad s_4^2 = 19,114$$

A five percent degree of precision tentatively was selected for determining total sample size. The sample size by use of this procedure was about 250 farms. Since resources for the survey permitted a sample size of only about 125 farms, this procedure was re-examined. The high degree of variability in the fourth class seemed to be mainly responsible for the large sample size than resources for the survey permitted. Thus, to lower the total sample size, the precision for the fourth class was changed to 10 percent (without changing the initial procedure for the other classes), and estimated sample size then was within the limits of the resources for the survey (Table III).<sup>1</sup>

The application of a precision of five percent to the first three classes yielded 100 farms. Allocation of these 100 farms to the three classes was performed by use of the formula:

$$n_i = \frac{100 N_i S_i}{\sum N_i S_i} \quad i = 1, 2, 3$$

where:

$n_i$  = sample size for the  $i^{\text{th}}$  class

$N_i$  = population of farms for the  $i^{\text{th}}$  class

$S_i$  = standard deviation of farm sizes in the  $i^{\text{th}}$  class.

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<sup>1</sup>Also, a sample size larger than the existing population for the fourth class would have been required to meet the five percent precision criterion, due to an arithmetical property of weighted averages.

For the fourth class the application of the precision of 10 per cent yielded the sample size of 25 farms. Thus, the intended total sample size of 125 was attained (Table III).

TABLE III  
NUMBER OF FARMS IN THE POPULATION AND SAMPLE BY STRATA

Class	Population	Planned Sample	Actual Sample	Used in the Analysis
1	480	6	7	7
2	360	11	17	17
3	328	83	77	74
4	72	25	20	14
Total	1,240	125	121	112

Since the list of farms by sizes was based upon 1955 data, changes in sizes, and in size classes by individual farms, could not be ascertained prior to the interview. Thus, the number interviewed by size classes differed with the planned sample. In addition, seven of the farms included in the sample taken were extremely large farms and thus, they were excluded for reasons of "abnormality." Two farmers failed to provide enough information to be included in the analysis.

Selection of the farms to be interviewed from the initial list was done systematically by class and by districts in the area. There were 15 districts in the area.

The sampling followed provides general reliability for the estimate of average farm sizes only. Reliability of estimates for other



characteristics would depend upon how closely correlated they were with size of farm.

## CHAPTER IV

### RESULTS OF THE SURVEY

The information obtained in the survey was summarized by use of a classification of farms developed after the data were obtained. No statistical tests of significance or confidence limits were calculated for the individual attributes of the data. Instead, the previously assessed "general reliability" of the sample as representative of the area was deemed to be sufficient for the purpose of the study. The first task was to develop a classification of the farms meaningful for the purpose of describing the attributes of farming in the area. Then, other data were tabulated by these classes.

#### Classification of Farms

The general uses of the individual farms, that is, number of manzanas in crops, in pasture, or in "other land," was the first information tabulated from the schedules. It was found that little relationship existed between the size of individual farms and the quantity of manzanas that were or could be used for crops or for pasture. Next, gross income for each farm in the sample was estimated by the individual products. With this information, farms were classified by enterprise specialization into (A) potato farms, in which this commodity was the leading source of income, (B) sugar cane-coffee farms, in which either

sugar cane or coffee was the main source of income, and (C) dairy farms, in which milk production was the leading source of income.

Next, each of the above three general divisions by enterprise specialization were divided into two subgroups each using as criterion the proportion of total income contributed by the leading enterprise (that is, in case of crops, more or less than 60 percent). Finally, the two subgroups by enterprise specialization were subdivided using the information on amount of manzanas actually in crops or in pasture, in the following manner: (a) crop farms, with less or more than 10 manzanas of cropland,<sup>1</sup> and (b) dairy farms, with less or more than 20 manzanas of pastureland. The resulting 12 classes of farms contained four to 17 farms per class (Table IV)

#### Size of Farms

Average size of farm for classes  $A_1$  through  $B_3$  exhibited several common and dissimilar features (Table V). Classes  $A_1$ ,  $A_3$ ,  $B_1$ , and  $B_3$  are the small crop farms. These farms had, on the average, 5.80, 2.92, 5.56, and 4.42 manzanas, respectively, of cropland. For the small farmer, this seems to indicate a similar scale of crop operations whether he grows potatoes, sugar cane, or coffee. Examination of size of farms within each of the classes also reveals some similarities. Farms in Classes  $A_1$  and  $B_1$  ranged in size from one to 10 and one to

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<sup>1</sup>As here used, cropland means land actually used for crops. It does not bear any necessary relation to topography. For the area of the study, a given tract of land may be cropland or pastureland, depending on what the farmer was doing with it.

TABLE IV

## CLASSIFICATION OF FARMS IN SAMPLE BY SPECIFICATIONS OF ENTERPRISES, INCOME AND SIZE

Farm Class	Number of Farms in Class	Enterprise Specification	Enterprise Income Specification	Size Specification
A <sub>1</sub>	9	Potatoes	60 Percent or more of Income from Potatoes	10 or less Manzanas <sup>a</sup> of Cropland
A <sub>2</sub>	4	Potatoes	60 Percent or more of Income from Potatoes	More than 10 Manzanas of Cropland
A <sub>3</sub>	9	Potatoes-General	Less than 60 Percent of Income from Potatoes	10 or less Manzanas of Cropland
A <sub>4</sub>	6	Potatoes-General	Less than 60 Percent of Income from Potatoes	More than 10 Manzanas of Cropland
B <sub>1</sub>	12	Sugar Cane	60 Percent or more of Income from Sugar Cane	10 or less Manzanas of Cropland
B <sub>2</sub>	9	Sugar Cane	60 Percent or more of Income from Sugar Cane	More than 10 Manzanas of Cropland
B <sub>3</sub>	6	Coffee-General	Less than 60 Percent of Income from Sugar Cane <sup>b</sup>	10 or less Manzanas of Cropland
B <sub>4</sub>	13	Coffee-General	Less than 60 Percent of Income from Sugar Cane <sup>b</sup>	More than 10 Manzanas of Cropland
C <sub>1</sub>	6	Dairy	90 Percent or more of Income from Dairy	20 or less Manzanas of Pastureland
C <sub>2</sub>	17	Dairy	90 Percent or more of Income from Dairy	More than 20 Manzanas of Pastureland
C <sub>3</sub>	8	Dairy-General	Less than 90 Percent of Income from Dairy	20 or less Manzanas of Pastureland
C <sub>4</sub>	13	Dairy-General	Less than 90 Percent of Income from Dairy	More than 20 Manzanas of Pastureland

<sup>a</sup>One Manzana equals 1.7 acres.

<sup>b</sup>For these classes B<sub>3</sub> and B<sub>4</sub>, income from coffee exceeds the income from sugar cane.

TABLE V  
 AVERAGE MANZANAS OF CROPLAND, PASTURELAND, AND OTHER LAND  
 BY CLASSES OF FARMS

Farm Class	Number of Farms	Manzanas of			Total
		Cropland	Pastureland	Other Land <sup>a</sup>	
A <sub>1</sub>	9	5.80	7.36	.61	13.77
A <sub>2</sub>	4	17.38	6.62	2.73	26.75
A <sub>3</sub>	9	2.92	5.58	.42	8.92
A <sub>4</sub>	6	19.17	34.00	19.17	72.17
B <sub>1</sub>	12	5.56	4.92	1.98	12.46
B <sub>2</sub>	9	36.75	28.39	19.22	84.36
B <sub>3</sub>	6	4.42	7.25	16.21	27.88
B <sub>4</sub>	13	31.25	16.13	11.77	59.15
C <sub>1</sub>	6	.17	10.37	4.62	15.16
C <sub>2</sub>	17	2.38	53.76	44.18	110.32
C <sub>3</sub>	8	6.69	14.28	.97	21.94
C <sub>4</sub>	13	10.73	51.92	13.23	75.88
Total Average	112	11.85	23.91	13.76	49.52

<sup>a</sup>Woodland, wasteland, farmsteads, and roads.

9.75 manzanas. Class B<sub>3</sub>, with a smaller average size, had individual farm sizes ranging from one to seven manzanas, but most of the farm sizes were bunched around the average for the class. Class A<sub>3</sub>, which had the smallest average size of cropland had farms ranging in size from one to seven manzanas, but all except one were below three manzanas. Farms with the larger number of manzanas in crops exhibited less uniformity. The sugar cane and coffee farms of classes B<sub>2</sub> and B<sub>4</sub>, with an average of 36.75 and 31.25 manzanas of cropland, respectively, exceeded the larger potato farms, classes A<sub>2</sub> and A<sub>4</sub>, in size. There were, however, small differences in the average size of the two large potato farm classes, A<sub>2</sub> and A<sub>4</sub>, although class A<sub>2</sub> derived most of its income from potatoes and class A<sub>4</sub> was diversified. The same relation existed for farm classes B<sub>2</sub> and B<sub>4</sub>, although one was specialized in sugar cane and the other in coffee. Sizes of individual farms in classes A<sub>2</sub> and A<sub>4</sub> ranged from 11 to 30 and 11 to 43 manzanas, respectively, with only one farm in each class with more than 20 manzanas. Individual farm sizes in classes B<sub>2</sub> and B<sub>4</sub> ranged from 10.50 to 88 and 10.50 to 82 manzanas, respectively. Dairy farms generally do not show the same similarities found in the crop group discussed. The small dairy farms of classes C<sub>1</sub> and C<sub>3</sub> are different in average size with 10.37 and 14.28 manzanas of pastureland, respectively, but sizes of the large farms, C<sub>2</sub> and C<sub>4</sub>, were closer with 53.76 and 51.92 manzanas, respectively.

Land classified as "Other Land" ranged from four percent of the average size of classes A<sub>1</sub>, A<sub>3</sub>, and C<sub>3</sub> to as high as 58 percent for Class B<sub>3</sub>. In an extreme case, 92 percent of the land in one farm was so classified. The average farm in the sample, in terms of acres, had

about 20 acres used as cropland, 41 acres used as pasture, and 23 acres of other land, for a total of about 84 acres. For the farms used in the analysis, the size ranged from about two to 1,250 acres. The distribution of sizes in the population, however, was skewed, with the majority below 17 acres.

#### Tenure

A striking characteristic of farm tenure in the area as compared to many other underdeveloped regions, was the high percent of ownership by the families. Only two farmers in the sample were full tenants; one farmer reported share-crop arrangements and nine farmers were part-owners of land they farmed. All the other farms were fully owner-operated. The combined size of the two rented farms was 34 manzanas. One was in class  $C_1$  with six manzanas and the other in class  $C_3$  with 28. Rented "other land" amounted to 186 manzanas of which 89 percent was held by three farms in class  $C_4$ .

#### Land Use

Patterns of farm land use in the area of the study indicated a tendency of the farms to specialize in a relatively few products (Table VI). Most farm classes had a higher proportion of pastureland than of cropland. Only classes  $B_2$  and  $B_4$ , the large sugar cane and coffee farms, had appreciably more cropland than pastureland. The practice of keeping land idle or fallow was not common. Only class  $A_2$  farms, the large, more specialized potato farms, had a substantial acreage of fallow land. Those farmers growing potatoes or general crops used land more intensively

TABLE VI

## USES OF CROPLAND AND PASTURELAND BY FARM CLASSES (MANZANAS)

Farm Class	Cropland						Pastureland		
	Coffee	Sugar Cane	Potatoes	Other Uses of Cropland		Total	Grazing Land	Green-Chop	Total
				Not Double Cropped	Double Cropped				
A <sub>1</sub>	0.00	0.00	4.06	1.74	3.87	5.80	6.42	0.94	7.36
A <sub>2</sub>	0.00	0.00	11.25	6.13	6.25	17.38	6.12	0.50	6.62
A <sub>3</sub>	0.00	0.11	2.22	0.59	2.92	2.92	4.97	0.61	5.58
A <sub>4</sub>	0.00	5.00	8.00	6.17	3.67	19.17	29.91	3.75	33.66
B <sub>1</sub>	0.52	4.48	0.00	0.56	0.00	5.56	4.85	0.06	4.91
B <sub>2</sub>	1.39	34.94	0.00	0.41	0.00	36.75	28.33	0.06	28.39
B <sub>3</sub>	2.59	1.54	0.02	0.27	0.00	4.42	7.08	0.17	7.25
B <sub>4</sub>	17.48	12.96	0.00	0.81	0.00	31.25	16.06	0.08	16.14
C <sub>1</sub>	0.00	0.00	0.00	0.17	0.08	0.17	7.62	2.75	10.37
C <sub>2</sub>	0.00	0.62	0.12	1.64	0.12	2.38	41.02	12.75	53.77
C <sub>3</sub>	0.00	0.09	3.19	3.41	2.37	6.69	12.72	1.56	14.28
C <sub>4</sub>	0.54	0.15	5.35	4.69	2.77	10.73	39.75	12.17	51.92
Average	2.40	5.27	2.20	1.98	1.48	11.85	19.93	3.98	23.91

<sup>a</sup>Includes corn, beans, garden crops and fallow cropland.

<sup>b</sup>Corn, beans and garden crops are double cropped with potatoes, and beans are double cropped with corn. The manzanas double cropped are not counted in the total cropland.



by double cropping. There was as much or more corn and beans grown double cropped than separately. Class A<sub>2</sub> farms grew all their corn and beans double cropped. Farm classes A<sub>1</sub> and A<sub>3</sub> had more acreage double cropped than in corn and beans alone. Farm class A<sub>4</sub> grew as much of these two crops double cropped as singly. Farm classes C<sub>3</sub> and C<sub>4</sub>, which also raised potatoes, had corn and beans double cropped. In fact, the beans in these two classes were practically all double cropped. The most common practice was to sow potatoes first, then corn, and finally beans.

Double cropping with corn raises some questions about the manner in which land is being used in the potato growing region. Not only is there competition for plant nutrients between the two crops but, in addition, because of climatic conditions, corn takes from 11 to 13 months to mature.<sup>2</sup> This means that, when corn is planted following potatoes, a second potato crop from the same plot is not possible within the same year. Where it is planted alone only one crop every two years is possible. However, corn yields of about 2,100 pounds per manzana for the area are above the national average of 1,160 pounds. Yields of beans in the area of 430 pounds per manzanas are below the national average of 470 pounds.

Sugar cane and coffee farms (class B farms) used most of their land for these two crops. Because of climate and elevation, sugar cane took about 24 months to mature after seeded, and about 18 months was required between cuttings thereafter. This means that about twice as much land was needed to produce a given output than was required in those areas where maturity took only 12 months after seeding.

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<sup>2</sup>May et al., p. 76.

Yields per manzana, nevertheless, of 43 tons were above the average of 26.3 tons for the Central Plateau where most of the sugar cane was grown under climatic conditions similar to the area of the study. Growing sugar cane in more suitable areas was slowly increasing. The average yield for these areas was 19.6 tons per manzana which compared favorably with the average for the area of the study.

Although pastureland on the crop farms was a high proportion of total land for these farms, it was not as high as the proportion of total land in pasture for the dairy farms (class C farms). However, the dairy farms were more diversified than the sugar cane-coffee farms. They grew sugar cane, potatoes, corn, beans, and some garden crops. The more diversified farms of class C<sub>4</sub> had coffee. Double cropping also was practiced. The column titled "green-chop" in Table VI was used to describe a practice of harvesting (not grazing) tall pasture grasses and feeding to the cows in uncured form.

The farms in the survey averaged 11.85 manzanas of crops and 23.91 manzanas of pastureland. More than 80 percent of the cropland was used for coffee, sugar cane, and potatoes. Nearly half of the land in crops was used in sugar cane production.

#### Farm Production Costs

Cash production expenses for the 112 farms included in the analysis averaged about \$4,098 per farm (Table VII). The major items making up this cost were hired labor, chemicals (including fertilizer), and machinery replacement, repair, and operation.

TABLE VII

ESTIMATED CASH FARMING COSTS BY SELECTED CLASSES OF ITEMS AND BY FARM CLASSES (DOLLARS)

Farm Class	Expenditures								Total Cash Costs
	Hired Labor	Estimated Machinery Replacement and Repair Operation <sup>a</sup>	Chemicals	Feed and Veterinary Expenses	Transportation	Rented Land, Machinery and Workstock	Taxes	Other <sup>b</sup>	
A <sub>1</sub>	160.19	34.67	494.96	29.08	21.38	40.10	26.08	5.45	825.09
A <sub>2</sub>	897.76	342.62	2,258.87	22.50	78.74	0.00	46.94	56.64	3,704.63
A <sub>3</sub>	103.79	26.91	233.20	50.74	20.81	5.63	5.79	3.36	458.74
A <sub>4</sub>	2,633.81	610.89	2,052.62	542.06	110.27	0.00	68.48	10.07	6,081.04
B <sub>1</sub>	89.08	22.30	108.72	6.48	130.69	2.89	34.39	1.51	406.53
B <sub>2</sub>	4,336.59	1,689.55	926.43	15.55	348.12	11.75	102.85	246.83	7,742.87
B <sub>3</sub>	305.05	9.25	46.78	0.00	36.91	8.18	10.66	12.59	441.09
B <sub>4</sub>	5,310.60	519.07	973.80	1.16	161.70	7.55	83.46	20.38	7,125.10
C <sub>1</sub>	320.84	39.69	59.31	146.32	85.63	22.66	2.97	2.01	689.97
C <sub>2</sub>	3,173.65	1,212.87	515.01	1,394.97	212.58	0.00	96.92	8.01	6,670.15
C <sub>3</sub>	570.39	285.79	664.21	440.47	67.96	55.23	18.06	103.38	2,226.46
C <sub>4</sub>	2,981.40	1,255.40	1,301.51	1,099.62	97.84	314.02	85.67	24.29	7,222.41
Average	2,061.91	619.02	730.64	417.01	127.90	47.85	56.22	37.83	4,098.38

<sup>a</sup>Also includes replacement cost of oxen used for farm power.<sup>b</sup>Repairs to fences, farm roads, etcetera.

More than half of the production costs for the larger sugar cane and coffee farms ( $B_2$  and  $B_4$ ) was cost of hired labor. Hired labor also was a high proportion of total costs for other crop farms with more than 10 manzanas of cropland, and the dairy farms with more than 20 manzanas of pastureland.

Machinery and farm power costs were of minor significance on the smaller farms (classes  $A_1$ ,  $A_3$ ,  $B_1$ ,  $B_3$ , and  $C_1$ ). For these farms, very little machinery existed, and farm power was provided mostly with human labor.

Topography was a serious limitation to use of machinery in the area. Only five farmers in the sample had tractors, and these were used mainly for power in transportation rather than in plowing or cultivating. Most of the machinery expenses for the larger farms was associated with trucks.

Costs of chemicals, including fertilizers and materials for weed and pest control, amounted to one-third or more of total cash production costs on the larger farms specializing in potato production ( $A_2$  and  $A_4$ ). Feed and veterinary expenses mainly were associated with the dairy enterprise.

Other than scale of operations, but related to it, the production expenses reflect the kind of production practices, or the state of technology, used in farming in the area. Fertilizer commonly is applied to all crops, and, for some classes of farms, it exceeds the cost of labor. Fertilizer is imported into the country from the United States, and the price to farmers in Costa Rica is about 50 percent higher than would be paid by farmers in the United States for comparable

fertilizers. This higher price partly accounts for its significance in farm production costs in the area of the study. Only sugar cane and coffee farms use relatively low quantities of fertilizer. Weed and pest control by the use of chemicals generally is practiced on all farms, but it is of particular importance in potato and dairy farming. Imported protein supplements for dairy rations, such as cottonseed meal, make up most of the feed expense to dairy farmers.

#### Gross Farm Income

The leading sources of farm income in the area of the study, by order of magnitude of gross receipts, were dairy, sugar cane, potatoes, and coffee (Table VIII). Some income from dairying was received by all farm classes. Nearly half of the gross farm income for farms in the sample was from dairy. Most of the gross income from crops was nearly evenly divided among sugar cane, potatoes, and coffee. Farm class  $C_4$  had the highest gross income of all farm classes, and it was the only farm class receiving some income from all the main enterprises. Next, in order of gross receipts, were farm classes  $C_2$ ,  $B_4$ , and  $A_4$ .

In the class A group of farms, farm classes  $A_1$  and  $A_2$  received three-fourths of gross income from potatoes, with gross receipts from dairy and other crops about evenly distributed. In farm class  $A_3$ , potatoes, other crops, and dairy contributed to gross income about equally, and, in class  $A_4$  farms, potatoes and dairy were the major sources of gross income with 44 and 36 percent of the total, respectively.

TABLE VIII

AVERAGE GROSS RECEIPTS BY MAJOR ENTERPRISES AND BY FARM CLASSES (DOLLARS)

Farm Class	Coffee	Sugar Cane	Potatoes	Other Crops <sup>a</sup>	Dairy	Other Farm Income <sup>b</sup>	Total Gross Receipts
A <sub>1</sub>	0.00	0.00	1,408.64	218.48	211.41	15.26	1,853.79
A <sub>2</sub>	0.00	0.00	3,781.69	524.22	648.24	50.98	5,005.13
A <sub>3</sub>	0.00	19.30	564.60	552.68	452.35	53.72	1,642.65
A <sub>4</sub>	0.00	569.48	4,685.27	1,513.51	3,778.54	74.27	10,621.07
B <sub>1</sub>	63.57	818.38	0.00	0.00	52.59	0.00	934.54
B <sub>2</sub>	441.67	8,171.58	0.00	22.32	222.31	0.00	8,857.88
B <sub>3</sub>	646.08	135.95	1.89	14.40	106.89	27.19	932.40
B <sub>4</sub>	7,116.01	3,399.30	0.00	86.45	67.86	290.49	10,960.11
C <sub>1</sub>	0.00	0.00	0.00	0.00	1,521.41	8.62	1,530.03
C <sub>2</sub>	0.00	93.39	14.22	30.34	10,902.09	109.29	11,149.33
C <sub>3</sub>	0.00	25.49	893.26	260.98	2,006.50	52.50	3,238.73
C <sub>4</sub>	41.83	51.13	2,951.22	750.83	8,276.79	218.45	12,290.25
Average	907.74	1,200.16	953.24	284.77	3,156.32	92.67	6,594.90

<sup>a</sup>Corn, beans and garden crops.<sup>b</sup>Livestock other than dairy.

Sugar cane and coffee were the leading sources of income in the class B group of farms. In classes B<sub>1</sub> and B<sub>2</sub>, about nine-tenths of gross income received were from sugar cane. In farm classes B<sub>3</sub> and B<sub>4</sub>, coffee contributed about two-thirds of gross receipts with sugar cane contributing most of the remaining portion.

In the class C group of farms, farm classes C<sub>1</sub> and C<sub>2</sub> received 99 and 98 percent of gross income from dairy, respectively. In classes C<sub>3</sub> and C<sub>4</sub>, about two thirds of gross receipts were from dairy, and, of the remainder, potatoes contributed most to gross receipts.

#### Net Farm and Total Family Income

The net income figures for the different farm classes shown in Table IX were returns to land, labor, and capital. Only cash expenses actually incurred in farming were considered.

There was some relationship between size of farm and net income (Table IX). All farm classes with more than 10 manzanas of cropland or 20 of pastureland, excepting classes B<sub>1</sub> and B<sub>3</sub>, had higher returns than the farm classes with less land. The dairy and potato farm classes generally obtained higher average net incomes than the other farm classes. Classes A<sub>4</sub> and C<sub>4</sub> had the highest net incomes with \$4,540 and \$5,067, respectively. The large dairy farms, class C<sub>2</sub>, were next with \$4,479 in net income per farm, followed by the large coffee-general crops farms, Class B<sub>4</sub>, with \$3,835. Diversification, which may enable a more efficient utilization of available land and labor appears to be a factor influencing net income received by farmers in the area. In all cases, excepting farm classes B<sub>1</sub> and B<sub>3</sub>, the diversified farm classes exhibited a greater

TABLE IX

GROSS RECEIPTS, TOTAL CASH COSTS, NET INCOME, OTHER INCOME, AND TOTAL FAMILY INCOME PER FARM CLASS (DOLLARS)

Farm Class	Gross Receipts	Total Cash Costs	Net Income	Other Income	Total Family Income
A <sub>1</sub>	1,853.79	825.09	1,028.70	0.00	1,028.70
A <sub>2</sub>	5,005.13	3,704.63	1,300.50	135.95	1,436.45
A <sub>3</sub>	1,642.65	458.74	1,183.91	25.26	1,209.17
A <sub>4</sub>	10,621.07	6,081.04	4,540.03	151.06	4,691.09
B <sub>1</sub>	934.54	406.53	528.01	178.36	706.37
B <sub>2</sub>	8,857.88	7,742.87	1,115.01	904.32	2,019.33
B <sub>3</sub>	932.40	441.09	491.31	70.16	561.47
B <sub>4</sub>	10,960.11	7,125.10	3,835.01	552.63	4,387.64
C <sub>1</sub>	1,530.03	689.97	840.06	210.22	1,050.28
C <sub>2</sub>	11,149.33	6,670.15	4,479.18	382.08	4,861.26
C <sub>3</sub>	3,238.73	2,226.46	1,012.27	453.17	1,465.44
C <sub>4</sub>	12,290.24	7,222.41	5,067.83	115.38	5,183.21
Averages	6,594.90	4,124.35	2,439.06	290.89	2,729.95



income than the specialized farm classes, with the same size specification. Thus, classes  $A_3$  and  $C_3$  with less than ten manzanas of cropland or less than 20 of pastureland, respectively, had a higher average income than classes  $A_1$  and  $C_1$ , which also had less than ten manzanas of cropland or less than 20 of pastureland. For the first two, incomes were \$1,183 and \$1,012. For the latter, they were \$1,029 and \$840. The same income pattern was found in the large farm classes but with wider differences. Farm classes  $A_2$  and  $B_2$  were specialized in potato and in sugar cane production, and they had a cropland acreage of above ten manzanas; class  $C_2$  farms were specialized in milk production and had over 20 manzanas of pastureland. These farms had incomes of \$1,300, \$1,115, and \$4,479, respectively, which were less than the income of classes  $A_4$ ,  $B_4$ , and  $C_4$  with the same acreage specification but diversified. Income for this last group was \$4,540, \$3,835, and \$5,067, respectively.

Not all farms included in the study had a positive income. Ten farms in the sample had negative net incomes. The range in net incomes was -\$1,727 to \$21,765. The lowest income farm was in farm class  $A_2$  with 16 manzanas of cropland and 5.5 of pastureland. The highest income farm was in farm class  $C_2$  with 20 acres of cropland and 135 of pastureland. This farm had the second largest number of manzanas in use. Average income for the population of farms in the area was estimated using two methods.<sup>3</sup> The respective estimates were

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<sup>3</sup>See Appendix for methodology followed.

\$1,373 and \$1,573. The net incomes received by the individual farms were grouped below specified levels of income as shown in Table X. More than half of the farms in the sample received less than six percent of total net income. Only about 2.5 percent of all farms had incomes over \$15,000, but their combined incomes amounted to about 22 percent of the total.

In a study of 371 farms in another area of the Central Plateau, net returns to labor were estimated to be \$1,138 dollars. Returns to labor on coffee farms in the same study were \$1,920 and in sugar cane, returns were \$1,007.<sup>4</sup> It has been estimated also that the average income per farm on the Central Plateau is \$600 annually.<sup>5</sup>

Income obtained by farm families from sources outside their farm is also shown in Table IX. This income came from part-time employment by members of the family on other farms or in other businesses. Farm class A<sub>1</sub> reported no additional income while classes A<sub>3</sub> and C<sub>3</sub> reported very low amounts. These farm classes contained the smaller farms in the sample. The high "other income" figures of classes B<sub>2</sub>, B<sub>4</sub>, and C<sub>3</sub> may be due in part to the type of operator of the larger farms (Table IX). For some of these farm families, the head of the household

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<sup>4</sup>Oscar Benavides R., Estudio Agrícola Económico de la Cuenca Media del Río Grande (Costa Rica, 1956), p. 31. Sugar cane and coffee were the two most important crops. No potatoes were grown and only minor dairy production was reported. Some corn, rice, beans, and tobacco also were grown. The figures given are not strictly comparable. They are provided merely as an indication of what farm income in another area of the Central Plateau may be. No other similar studies are known to exist.

<sup>5</sup>Administration for International Development, Latin American USOM, Seminar on Agrarian Reform (Washington, 1961), p. 113.

TABLE X

## A. CUMULATIVE DISTRIBUTION OF NET INCOMES FOR FARMS INCLUDED IN THE STUDY

Income less than	Percent of Farms	Percent of Income
\$ 1,000	52.68	5.89
2,000	66.96	14.51
3,000	76.78	24.22
4,000	83.92	34.13
5,000	86.60	38.82
6,000	89.28	44.77
7,000	91.07	49.49
10,000	93.75	59.01
15,000	97.32	78.44
25,000	100.00	100.00

and other members were able to secure better paying employment with the Government and private enterprises. In general, work on other farms part-time was the only income opportunities available for farm families of the small farms.

Perhaps a more realistic meaning of the farm and family income figures discussed may be given by examining the size of the family, its consumption habits and the cost of food they normally buy with their income. Sample data shows there are 7.8 persons per farm.<sup>6</sup> The main items of the farm family diet are shown in Table XI, with the estimated consumption per capita and prices of the main items of food consumption. It takes about \$61 a year per person to buy the staple commodities in the daily diet. For a family of 7.8 members, this amounts to \$480 a year, or about one-third of the highest estimate of average farm income for the area. The estimated cost of the main food items is high for most farm families in the sample in relation to their income. It represents about ten percent of total family income for farm classes A<sub>4</sub>, B<sub>4</sub>, C<sub>2</sub>, and C<sub>4</sub>, the large farms with the higher incomes. For farm classes B<sub>1</sub> and B<sub>3</sub>, the small farms in the sugar cane-coffee region, the situation is critical. For families in the B<sub>1</sub> farm class, expenditures for the most common staples were about two-thirds of total income, and for families in farm class B<sub>3</sub>, expenses on the same food items amounted to almost nine-tenths of this income. For the other farm classes, consumption of the main dietary items took from 25 to 50 percent of family income.

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<sup>6</sup>In 1950 by Census estimates the size of the rural family was 5.7 persons.

TABLE XI  
ESTIMATED CASH EXPENSES PER YEAR FOR FOOD PURCHASED BY FARM  
FAMILIES OF COSTA RICA

Item	Yearly Per Capita Consumption (Pounds)	Price Per Pound (Dollars)	Total Value (Dollars)
Rice	88	.12	10.56
Corn	76	.31	23.56
Beans	23	.11	2.53
Dulce <sup>a</sup>	88	.17	14.96
Coffee	5	.53	2.65
Wheat flour	52	.08	4.16
Yucca <sup>b</sup>	8	.05	.40
Lard	8	.33	2.64
Total Expenditures			
Per Capita	--	--	61.46
Per Family	--	--	479.39

<sup>a</sup>Brown sugar in solid cake form.

<sup>b</sup>A root crop, similar to cassava or manioc.

Sources of Data: May, et al., Costa Rica: A Study in Economic Development (New York, 1952), and Bureau of Statistics and Census, Costa Rica, Indice de Precios al por Menor (April, 1963), Number 130.

### Opportunities for Technological Advance

The widespread use of some recommended technological practices by farmers in the area, but the realization of low yields, create some questions about their effectiveness. Potato growers, for example, follow recommended practices in plowing the land, applying fertilizer, using fungicide and pest control measures, controlling weeds, controlling erosion, and conserving moisture with terraces and other measures. Yet, yields are relatively low. Average yield of potatoes for the area are about 100 hundred-weight per manzana. Yields in the United States are over three times as high.<sup>7</sup> Also, the seed input to output ratio is low. On the average, one pound of seed is necessary for 4.85 pounds of harvested potatoes. This is only from one-third to one-half of the input-output ratio in the United States.<sup>8</sup> Although the region where potatoes are grown has generally good climatic and soil fertility conditions, there are several factors which limit the present output. The heavy rainfall intensifies the incidence of diseases. Farmers do not select their seed with the proper care. The use of improved varieties is limited.<sup>9</sup> Further, the practice of double-cropping with corn severely limits the nutrients available for potatoes. Rotation of crops in production usually is not practiced, thus, the soil reinfest new plantings.

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<sup>7</sup>United States Department of Agriculture, Agricultural Statistics (Washington, 1962), p. 284.

<sup>8</sup>R. E. L. Greene, Estudio Economico de la Produccion de Papas en Costa Rica (San Jose, 1959), MAG, Boletín Técnico, No. 29, p. 13.

<sup>9</sup>Ibid., p. 6.

The situation in sugar cane is not any better. Yields of sugar cane in the area are above the national average, and above those yields obtained in areas with more favorable climatic conditions for sugar cane production. Through government assistance, high yielding varieties have been introduced. Many follow recommended fertilization practices. Yields of sugar cane in comparison with those of other countries, however, are low. In Panama, for example, where the level of technology applied in cane production is known to be generally lower than in Costa Rica, but where climatic conditions permit yearly harvesting, yields are 33 tons per hectare,<sup>10</sup> or 23 tons per manzana. Production per unit of land in Panama is above that of the area of the study. Other than adverse climatic conditions for sugar cane production, the crop is grown as if it were a perennial. Most fields are over 15 years old. In a few cases renewal of sugar cane fields is done about every ten years. The 1955 Census reveals that, in the area of the study, only 14 percent of total acreage is newly planted cane. Another injurious practice is to double crop corn and garden crops during the year the cane is planted.

Coffee is the only crop with yields consistent with the techniques and cultural practices in production, and yields comparable with those in other coffee producing countries.

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<sup>10</sup>FAO, Monthly Bulletin of Agricultural Economics and Statistics, XI (July/August, 1962).

Notwithstanding the generally good practices followed in dairy feeding and care and the upgrading of herds, production per cow remains low. Average yearly production per cow is about 3,200 pounds, as compared to an average of 7,200 pounds per cow in the United States.<sup>11</sup>

The deficiencies noted in the manner in which farmers in the area of the study apply techniques to raise a crop, and the absence of better production methods in other cases, indicates that improvements in technology, leading to higher incomes, still are possible.

#### Employment and Underemployment of Labor

It was not possible to develop estimates of supply and employment of labor for the area of the study since the entire population was not represented by the sample. However, for the farm sector included in the sample, it was possible to make some estimates of labor employment and underemployment (Table XII). The agricultural labor force consisted of the labor supply of farm families and of other families in the area dependent upon farm work for a livelihood. The latter mostly were a landless class considered to be peons. This class was excluded from the sample. Thus, the estimates of underemployment of labor for farm families only may have underestimated the actual degree of underemployment, or disguised unemployment, per worker in the area.

The man-years of labor available per farm was determined for each family in the sample farms. The members of the family were assigned a

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<sup>11</sup>United States Department of Agriculture, Agricultural Statistics (Washington, 1962), p. 453.



TABLE XII

## ESTIMATES OF LABOR AVAILABLE FOR OFF-FARM WORK AND UNDEREMPLOYMENT OF LABOR, PER FAMILY AND BY FARM CLASSES (MAN-YEARS)

Farm Class	Labor Available Per Farm <sup>a</sup>	Labor, Hired <sup>b</sup>	Labor Required on Own Farms <sup>c</sup>	Labor Available For Off-Farm Work <sup>d</sup>	Man-Year Equivalent of Other Income <sup>e</sup>	Estimate of Under-employment of Labor <sup>f</sup>
A <sub>1</sub>	4.30	0.46	2.23	2.53	0.00	2.53
A <sub>2</sub>	2.52	2.56	4.97	0.11	0.38	*
A <sub>3</sub>	3.18	0.30	2.17	1.31	0.07	1.24
A <sub>4</sub>	2.00	6.81	8.10	0.70	0.43	0.28
B <sub>1</sub>	2.06	0.24	2.09	0.21	0.50	*
B <sub>2</sub>	2.17	11.08	12.94	0.31	2.56	*
B <sub>3</sub>	1.83	0.87	2.24	0.46	0.20	0.26
B <sub>4</sub>	1.62	13.24	13.28	1.58	1.57	0.01
C <sub>1</sub>	2.39	0.83	1.51	1.71	0.60	1.11
C <sub>2</sub>	1.31	6.73	7.66	0.38	1.08	*
C <sub>3</sub>	2.70	1.45	3.28	0.87	1.28	*
C <sub>4</sub>	1.75	8.16	7.98	1.93	0.33	1.60
Averages	2.20	5.13	5.30	2.03	0.83	1.20

\*Man-year equivalent of other income exceeded estimated labor available for off-farm work. See text for possible explanations of this phenomenon.

<sup>a</sup>See Appendix Table III for method of computing labor available for a farm family.

<sup>b</sup>Obtained by dividing the hired labor cost (Table VII) by the average wage per year of \$352.56 (312 days times an average wage per day of \$1.13).

<sup>c</sup>Labor required on own farms estimated from results of research on enterprises in the area and from the information obtained in the survey. The estimates by farm classes are based upon average labor requirements for the area.

<sup>d</sup>Labor available on farms plus labor hired minus labor required on own farms.

<sup>e</sup>"Other income" (Table IX) divided by the average annual wage per farm worker.

<sup>f</sup>Labor available for off-farm work minus man-year equivalent of "Other income."

rate of participation in work based on age and sex.<sup>12</sup> To this rate of participation was applied the proportion of the average wage rate received by adult male workers in the area which corresponded to the particular member of the family because of sex and age. A man-year equivalent of available labor then was computed for each family.

For all the farms in the sample, the average number of man-years of labor available was 2.02. Classes A<sub>1</sub> and A<sub>3</sub> had the highest amount of labor available per farm. The number of man-years available per farm ranged from 1.31 for class C<sub>2</sub> to 4.30 for farms in class A<sub>1</sub>.

The amount of labor hired per farm class was estimated by dividing the hired labor cost (Table VII) by the average wage per year.<sup>13</sup> An average of 5.13 man-years of labor were hired by farms in the sample, and a total of 576 man-years of labor was hired by all the farm classes. Only 29 percent of this amount was seasonal employment. The sugar cane-coffee farms hired the greatest amount of labor, or 49 percent of the total. Dairy farms hired 41 percent and potato farms 10 percent of total hired labor. A large proportion of total hired labor was concentrated in a few farm classes. Farm class A<sub>4</sub> accounted for 69 percent of all labor hired by class A farms. The large coffee farms of farm class B<sub>4</sub> hired 61 percent of the labor employed by the sugar cane-coffee farms. The large specialized dairy farms in class C<sub>2</sub> hired 48 percent of the labor employed by their group. The importance of coffee farming as a source of employment in the area was evident.

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<sup>12</sup>See Appendix Table III.

<sup>13</sup>See footnote b to Table XII.

Near one-third of all labor hired was in farm class B<sub>4</sub> alone. This same class had 43 and 25 percent, respectively, of total seasonal and year round employment. Ten percent of total labor hired by the sample farms was to harvest coffee. Year round employment was concentrated in the dairy and sugar cane-coffee farms. The former employed 48 percent of the total and the latter 45 percent.

The amount of labor required on the farms was determined from published data for enterprises within the area and in other regions of Costa Rica. Estimates of labor requirements in dairying were derived from information obtained in the survey. For crops that were double-cropped, only the marginal labor was taken into account.<sup>14</sup>

Farms included in the analysis required an average of 5.30 man-years of labor. The average amount of labor hired in relation to the amount required indicated that farms in the sample had a tendency not to use the labor available for work on farms to its full extent.

Estimates of labor available for work on other farms were derived by taking the labor available on farms plus labor hired minus labor required on own farms. An average of two man-years of labor were available for off-farm work per farm in the sample. The highest amounts

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<sup>14</sup> Sources of Data: Potatoes: Mario Cordoba. "Estudio de Costos de Produccion, Labores y Materiales Requeridos en el Cultivo de Una Manzana de Papa" Suelo Tico, XI, Number 42, Ministerio de Agricultura e Industrias, p. 13; Coffee and Sugar Cane: Oscar Benavides R., Estudio Agricola Economico de la Cuenca Media del Rio Grande, informe preliminar (Costa Rica, 1956); I.C.E. Tables 20 and 33. Corn and Beans: Gregorio Alfaro et al., Produccion de Frijoles en la Zona de Cartago-Paraiso and Produccion de Maiz (Costa Rica, 1962), STICA Bulletins, P-36, Numbers 2, 4, 5, and 6.

were recorded by families in classes  $A_1$ ,  $A_3$ , and  $C_1$ , which were the small farms having the largest amount of labor available per farm and the least amount of hired labor. Farm classes  $B_4$  and  $C_4$  had relatively high amounts of available labor for work on other farms even though they were among the larger farms in the sample.

The estimates of "other income" per farm was divided by the average annual wage per farm worker to convert these to man-year equivalents. For the farms included in the analysis, this amounted to an average of .83 man-years of labor. The extreme cases were those of class  $A_1$ , for which no off-farm employment was reported, and class  $B_2$  which had the equivalent of 2.56 man-years in "other income."

With the estimates on labor available for off-farm work and the man-year equivalent of "other income" it was possible to obtain an estimate of underemployment of labor per farm in the sample. The result was an average of 1.20 man-years of underemployed labor. Farm class  $A_1$ , which had no "other income," but had the highest amount of labor available for off-farm work, had the largest amount of underemployed labor of all farm classes.

Several classes had estimates of man-year equivalents of "other income" higher than the estimates for years of labor available. The estimates of underemployed labor for individual families in the sample could be overestimated or underestimated, depending on several factors. If wages received in off-farm work were lower than the average wage rate for the area, the estimates of man-years equivalent of "other income" would be smaller and the estimate of underemployed labor would be overestimated. If wages received in off-farm employment were

higher than the average wage rate for the area, the estimates for underemployed labor would be underestimated. Another factor contributing to an underestimate of underemployment would be an underestimate of the man-year equivalent of family labor available. Also, if more labor was used on own farms than reflected by use of the average labor requirement data, the amount of underemployment would be overestimated. An additional factor influencing underemployment estimates would be the hiring of labor at a wage rate above the average for the area. In this case, the man-years of labor hired would be overestimated, and the estimates of underemployment also would be overestimated.

Although the estimates on employment and underemployment of labor per farm included in the sample are crude, they indicate the possible existence of a substantial amount of underemployment, or of disguised unemployment, in the area of the study. The average of 2.2 man-years of labor available per farm exceeds the estimated amount employed by 1.2 man-years, or alternatively, about half of the labor supply on farms in the area appears to be surplus. Whether the surplus labor, or any part of it, can be removed without decreasing farm output will depend upon whether efficiency in the utilization of remaining labor will increase following this removal. Some hypotheses about this phenomena in underdeveloped countries or areas will be presented in the chapter to follow.

## CHAPTER V

### SOME ALTERNATIVES IN POLICY FOR AGRICULTURAL DEVELOPMENT OF THE AREA

The participation of economists in formulating policy has been traditional and expected.<sup>1</sup> This participation notwithstanding, policy is a subject on which the opinions of professional economists are divided. There are those who stress the objective approach insisting on detachment from the ethical judgment of the ends desired and limiting participation to the confines of theory. A dissenting group manifests that loftiness from the values of the society in which the economist works is not realistic. The ends to which a society may aspire should be studied, not merely accepted as given. Besides, the normative approach is inherent in the procedure followed by those claiming imperviousness to subjective factors.<sup>2</sup> What seems to be an eclectic position considers that economists are not scientific enough on one hand, and on the other, that they fail to understand the values of the people concerned.<sup>3</sup> Sustained interest on the matter has been the source of discussion at professional meetings exclusively held to examine the

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<sup>1</sup>Kenneth H. Parsons, "Value Problem in Agricultural Policy," Agricultural Adjustment Problems in a Growing Economy, ed. E. O. Heady, et al. (Iowa, 1958), p. 297.

<sup>2</sup>Ibid., pp. 295-299.

<sup>3</sup>G. E. Brandow, "The Current State of Agricultural Economics: The Policy Controversy," Journal of Farm Economics, XLI (December, 1959), pp. 919-920.

point.<sup>4</sup> The issue of policy in less advanced nations is no less pertinent. Matters of policy in these regions are highly charged with dogmatic attitudes, subjective preferences and emotional impulses. The existence of unstable political situations, administrative deficiencies, social and economic problems, cultural and other environmental problems<sup>5</sup> contribute to the difficulty of advancing suggestions intended to generate improvements in the prevailing conditions.

#### Purposes or Ends Desired

In order to prescribe means to achieve goals, the goals must be stated as if known (whether this is the case or not). A statement by the Government of Costa Rica delineating its objectives for the agriculture of the country does not exist. However, the activities of the different public agencies seem to indicate that increases in production, as a mean of improving the welfare of farmers, is the major national objective for agriculture.<sup>6</sup> In formulating policy recommendations for the area of the study, the assumed objective will be improvements in economic welfare. As described in the preceding chapters, the situation in the area may be summarized as the existence of (1) surplus labor; (2) low productivity of labor, (3) low farm and family income, (4) inefficient land use, and (5) a highly skewed distribution of farm size. These

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<sup>4</sup>Center for Agricultural And Economic Adjustment, Goals and Values in Agricultural Policy (Iowa, 1961).

<sup>5</sup>Mordecai Ezequiel and Alfredo Saco, "The Problem of Planning Agricultural Programs in Less-Developed Countries," Monthly Bulletin of Agricultural Economics and Statistics (December, 1952), FAO.

<sup>6</sup>For example the bylaws of the National Production Council, a Government agency, states its specific objective to be the expansion of agricultural output.

conditions must be altered in achieving the major policy objective of increase in economic welfare of the people in the area.

### Policies for Achieving the Ends

#### Research

Because research is fundamental in identifying and analyzing means for attaining the assumed main objective of policy, a brief statement on its importance to underdeveloped countries generally, and to Costa Rica and the area of the study in particular, seems to be appropriate. Research designed to factually describe the characteristics of agriculture are important and useful in making policy decisions for its improvement. However, factual knowledge about existing physical, biological and social conditions is insufficient. The lack of knowledge of the consequences of alternative farm policies may result in choice of actions with results inconsistent with purposes. In Latin America, generally, there is little tradition in research, and there is not a clear understanding of the need for it. The existing educational system contributes to this lack of understanding by stressing verbal instruction and memorizing over library materials, instead of field and laboratory work<sup>7</sup> and research programs in the social and natural sciences.<sup>8</sup> There appears to be a major departure from reality in the

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<sup>7</sup> Student helpers in the survey of the area for this study had studied potato production in their agronomy classes, but they had never observed actual ongoing practices in potato production.

<sup>8</sup> Jimmie S. Hillman "Problems of Increasing Agricultural Productivity in Less Advanced Countries," Journal of Farm Economics, XLIII (May, 1961), pp. 320-332.



content of existing educational programs, and there is a limited amount of interest in closing this gap through research. Thus, the need for research must be stressed as a means of acquiring knowledge of the alternatives in policy and what consequences can be expected of each alternative. Unless research is undertaken, satisfactory guides on how to proceed with measures to improve conditions in the area of the study will be difficult to obtain. The remainder of this chapter is intended to be suggestive of possible policies and actions, and some problems associated with these policies and actions, which may be useful in designing the needed research. Emphasis is placed upon policies designed to bring about adjustments in resource use in farm production.

#### Adjusting the Labor Input in Farm Production

There are at least two alternatives for reducing the quantity of labor used in farm production in the area: (1) transfer of surplus labor to nonfarm employment, and (2) resettle part of the families on lands with potential for development for farming. A third alternative, employment of a part of the workers on farms in other areas of Costa Rica, may exist, but, from the standpoint of an objective of increasing economic welfare of farm people in the country, this alternative will depend upon the existence of other areas with needs for additional farm labor. It is also likely to be dependent on the attitudes of local labor toward leaving their familiar region.

The opportunities in nonfarm businesses in the short-run would be very limited. A few new enterprises normally are created, but their

small scale of operations provide few job opportunities. Also, new businesses and some industries tend to be located in the metropolitan area of the capital city of San Jose, and the new job openings created thereby usually are filled with the unemployed urban workers.

In the long run, possibilities of improving the land to labor ratio in the area of the study appear to be more promising. Costa Rica is one of the countries participating in the Central American Common Market. If expectations about this market crystallize, it may stimulate the expansion of existing small scale industries and the establishment of new industries. It must be noted, however, that the surplus labor from the area would compete with other workers in the rest of Costa Rica for these jobs. The potential success of the Common Market gives no assurance of solving the surplus labor problem in the area of the study.

The efforts to decrease the labor input in farm production in the area, if successful, could have an adverse effect on farm production. If the remaining small farm labor force failed to adjust work methods by reducing idle time during employment in farming activities, there could be a decrease in the agricultural output of the area. This means that parallel action should be taken to improve the efficiency of those workers left on farms in order to avoid losses in total agricultural output of the area.

Some of the nonfarm employment opportunities may not be acceptable to the workers. Recent efforts by the Ministry of Labor to provide temporary employment in warmer regions did not meet with complete response from farm workers. There seems to be preference for the cool

climatic environment of the area, and some workers are unwilling to be separated from their families, even for a short time.

The alternative of resettling farm families on land yet undeveloped for farming amounts to increasing the effective supply of farm land in the country. Programs to implement this alternative are in effect in some of the Central American Countries, but not in Costa Rica. These programs are costly and difficult to administrate. Isolated virgin lands usually are chosen; thus, roads have to be built, and housing and other facilities have to be provided for the new settlers.

To implement this alternative as a policy, information would need to be developed on the unsettled lands in respect to potential for agricultural development and the costs of developing the needed facilities such as roads.

If a resettlement program were instituted, the regrouping of land holdings among farmers remaining in the area could be a problem. In particular, measures to avoid the establishment of small plot farming and decreases in production would be advisable.

### Initiating Economic Development

#### Increasing Capital

The type of increase in capital which could contribute most to increases in farm output of the area would be items with yield increasing effects such as fertilizer, improved varieties, terracing, etcetera. This kind of increase in capital can occur from improvements in credit facilities. Some credit facilities are available to the farmers of the

area. These facilities, however, should be studied to determine how they can be improved.

#### Factual Situation

The information obtained from the survey in the study area and about Costa Rica, in general, may be summarized as follows. There is a large surplus of labor in agriculture--perhaps half the present available labor force of the study area. The ratio of agricultural labor to farm land is also high. In the nation, the agricultural sector contributes 37 percent of total national income and employs about 55 percent of the labor force. The lack of adequate transportation facilities is a major difficulty in moving agricultural output from farm to market. The farm value of the two export crops grown in the area of the study, coffee and sugar cane, amounted to about 39 percent of the total value of farm production in the area. Relatively large amounts of the inputs of fertilizer are imported and relatively small amounts of machinery inputs are used in the area. There is a possibility of manufacturing fertilizer in the country. Transportation costs for fertilizer are lower than those for machinery. Opportunities for nonfarm employment are small.

#### Agricultural Adjustment for Development

The facts listed above are not inconsistent with the following highly simplified model of agricultural resource allocation in the aggregate. Assume that the agricultural industry of the area is atomistic and composed of reasonably homogenous firms producing a farm output with labor and a composite input of land and capital. If these firms

were producing one output at optimal efficiency, the aggregate production function would be linearly homogenous.<sup>9</sup> But this is not necessary to the argument.

Labor has been found in physical surplus, and thus, the combination of resources used in farm production may be assumed to lie in the area of the production function where nonlabor inputs are limitative.<sup>10</sup> This combination can be illustrated as point P in Figure 3 with the present farm output on isoquant X.

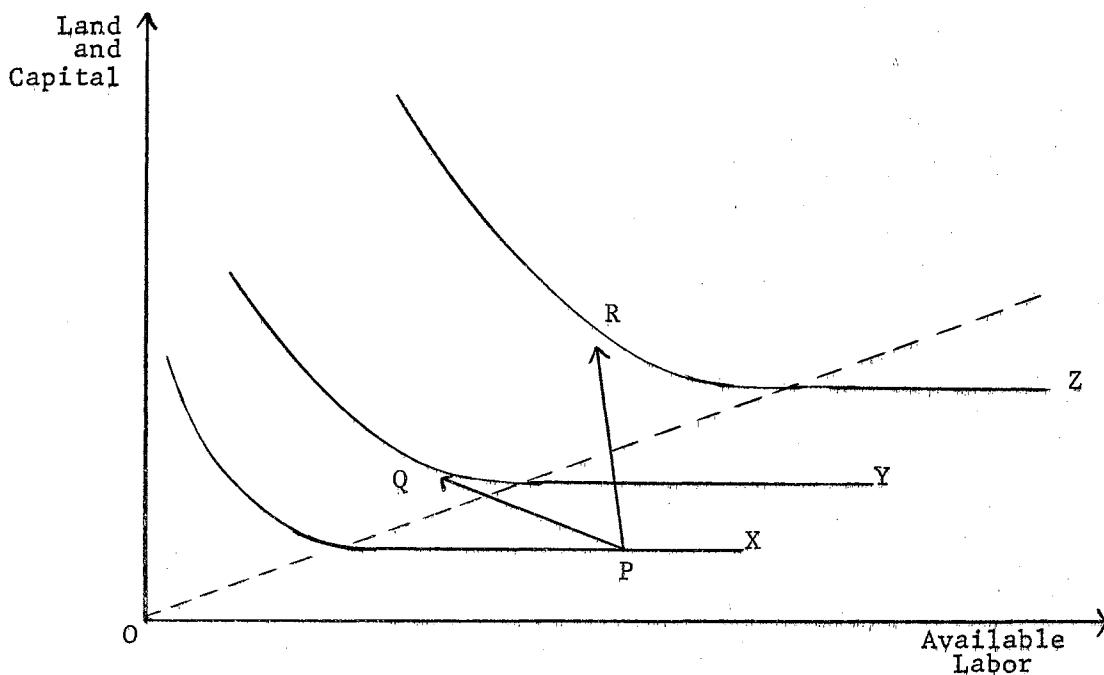


Figure 3. Aggregate Resource Use in Costa Rica Agriculture.

<sup>9</sup>For a discussion of this type of a function and its relationship to problems of surplus labor in the agriculture of underdeveloped countries see Nicholas Georgescu-Roegen, "Economic Theory and Agrarian Economics," Oxford Economic Papers, N.S., XII (February, 1960), pp. 1-40.

<sup>10</sup>When a necessary and sufficient condition for an increase in output is an increase in one output, that input is defined to be limitative. Some writers do not agree that the marginal productivity of labor can vanish. For this viewpoint see T. W. Schultz, "The Role of Government in Promoting Economic Growth," The State of the Social Sciences (Chicago, 1956), ed., Leonard D. White.

Assuming farm technology remains fairly constant, two feasible paths of farm factor adjustment are depicted by the rays PQ and PR. Other directions of adjustment are eliminated for the following reasons. With no decrease in farm output warranted by the Costa Rican situation, all southerly paths are ruled out. Easterly paths are likewise ignored since labor is already underemployed. PQ and PR are meant to illustrate possible but distinguishable types of useful adjustment. For the PQ adjustment, it is assumed that machinery is substituted for labor with a small increase in output to level Y. The introduction of labor saving capital in the form of machinery would reduce the quantity of labor used and increase the productivity of the labor remaining in agriculture. This adjustment would not result necessarily in an increase of farm output but some increase is possible as shown in the diagram. Further, this form of capital input is expensive for Costa Rica because it has to be imported, and it is not likely it will soon be manufactured locally. Perhaps, a more serious consequence of substituting machinery is the fact that very limited alternatives exist for nonfarm employment of the large amount of labor released by the use of machinery as economic substitute for labor.

Increases in the use of fertilizer appear to be a better alternative for the present circumstances of the nation. This input can be obtained at a lower cost than the machinery input and it is certain that local manufacture may soon increase due to recent plant construction. There may be a small release of labor in the PR adjustment, but labor productivity will tend to increase as shown by R in the graph, mainly through an output increase. Naturally, the increased use of fertilizer would

require extensive work among farmers of the area to insure the efficient management of this factor recombination. Information as to the availability, use, returns, and financing of increased fertilizer use would also be needed.

At this point, it becomes necessary to make assumptions about the demand situation facing farm products in Costa Rica. Unfortunately, little research has been accomplished in this field; yet it is much needed. It will be assumed that the increases in income due to some expansion of the nonagricultural sectors coupled with increased productivity in agriculture will result in increased consumption of farm products such as potatoes and milk. Certainly these income elasticities are positive. For the export products, coffee and sugar, no increase in quantity can be forecast. Improved productivity on smaller acreages could yield higher net revenues to farmers or at least not depress net farm income, even if gross farm receipts might fall due to presumably inelastic demand conditions.

#### A Sketch of a Program for Development

Aside from the need to train skilled labor and improving the level of education, no problem of labor shortage in the economy is anticipated. To increase agricultural output by the use of locally manufactured fertilizer, new capital for agriculture to finance the extra inputs and the training of workers for the fertilizer industry will also be required.

The increases in income, generated by development of the agricultural sector will tend to raise effective demand for food jointly with

increases in the food supply. The increase in fiscal revenues obtained from the fertilizer industry and higher national incomes may be used to build farm to market roads with the use of additional local surplus labor in agriculture. Further rounds of income increases plus reduction in farm to market prices spread, due to improved transportation, may result in either higher farm prices to farmers or greater retail sales. Either of these two factors will lead to higher farm income if income and price elasticities for farm output are as assumed.

As Rostow<sup>11</sup> has argued, this initial development, provided it can be fast enough and effective enough to overtake the present high rate of population growth, could allow the country to make the transition into sustained growth. A further condition would be the capacity of the nation to invest in new productive capacity outside of agriculture as well as in agriculture.

The existence of labor surplus in agriculture is thus not necessarily inimical to economic growth; in fact it may provide its necessary pre-condition. An important proviso is that not too much of this surplus labor be released at once and that capitalization of non-agricultural sectors and the training of agricultural workers can be financed until their income generating capacity can be self-sustaining. Increased agricultural productivity can help this process but cannot alone sustain it.

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<sup>11</sup>W. W. Rostow, The Stages of Economic Growth, A Non-Communist Manifesto (Cambridge, 1960).



### Increasing Efficiency of the Fixed Land Resource

If development programs were not fully successful in absorbing the high rate of population growth in the near future, a program for absorbing the increasing surplus of labor in agriculture might be needed. Such programs might involve further changes in farm technology.

The possibility of developing new methods of production for the type of farming in the area, which are both output increasing and labor increasing in effects, need to be investigated. It should be determined also whether presently known methods are properly carried out by the farmers. Improvements in the efficiency of application of presently known farming methods could add to the labor requirements. This would be the case if productive operations, such as cultivations, are added. A more intensive use of labor could be possible also by introducing new enterprises with greater labor requirements than required by present types of farming.

The possibilities of increasing the efficiency of the fixed land resource through reallocation of uses need to be investigated. For example, the possibility of using land currently in sugar cane for other productive purposes could be a major research need. The land presently used for sugar cane may not be used efficiently because more favorable growing conditions for this crop are found in the lowlands of Costa Rica; however, the importance of this activity to the area of the study must be taken into account. Any enterprise replacing sugar cane should be evaluated in terms of the additional costs and benefits it would create in the area. A prerequisite to any sound land use changes would be a soil survey.

Assistance to farmers is needed through an expansion of the existing extension services. Such expansion could emphasize assisting farmers in making decisions from among alternative choices in respect to enterprise selection and production methods. Dissemination of market news information and collection and publication of statistical data on production also are needed expansions in educational services.

A closer coordination among the government agencies serving the farmers would be desirable. Research oriented more to the problems of the area is needed. Also, improvements can be made in extension methods to give greater emphasis to the actual problems of farmers.

An expansion and reorientation of research and extension may require additional fiscal expenditures. Obtaining qualified personnel to perform the needed research and educational services may be a problem. Thus, a program may be needed to develop agricultural scientists.

#### Consideration of Institutional Changes and Time

The cultural and educational level of the farmers in the area of the study, is conducive to some changes in their present methods of farming. Acceptance of new methods mainly requires their understanding of the advantages. A greater resistance to change could be expected if efforts to improve their economic welfare involved movement from the area to new lands. The possible new lands are at low elevations having a warmer climate than exists in the area of the study.

Given the paucity of adjustment and change characterizing institutions in general, nothing can be said about the attainable rate of economic progress in the area. Major changes should not be expected

in a short time period. The agricultural development of the area of the study is envisioned as an evolutionary process in which improvements will take place gradually in productivity of labor and higher incomes of the farmers.

The alternatives presented for increasing economic welfare of people in the area of the study are based on judgment and what pretends to be some knowledge of agricultural conditions in the area and in Costa Rica. The suggestions are advanced merely with the intention of contributing ideas for additional research having a major purpose of improving the economic welfare of farmers such as those included in this study.

## CHAPTER VI.

### SUMMARY AND CONCLUSIONS

This study is concerned with problems of agricultural development in a rural area within an underdeveloped country. The area of this study is located in Costa Rica, Central America. This area is located on the Central Plateau of Costa Rica, 25 to 50 miles east of the capital city of San Jose. Cartago, with a population of 19,000 is located on the western edge of the area. The population of the area of the study is about 44,000 people, of which about 80 percent is rural. The literacy rate is about 90 percent.

Estimated per capita income of Costa Rica in 1960 was \$341. Estimated per capita income for the area of the study for 1955 was \$126. Estimated population of Costa Rica for 1962 was 1.2 million. About 75 percent of this population was rural, and it was increasing at an annual rate of 4.6 percent. Production on farms accounted for 37 percent of the national income during 1957 through 1961.

The major purpose of this study was to contribute to an understanding of problems of development in the selected rural area within Costa Rica. The specific objectives of the study were: (1) to assemble available facts (including those obtained through a survey) about the agricultural economy of an area relevant for assessing its potential for agricultural development; (2) to present selected hypotheses and theories

about surplus labor or disguised unemployment, and to briefly assess their relevance to the area of the study; and, (3) to identify some problems associated with selected alternative policies for developing the agriculture of the area. To accomplish these objectives, a survey of 112 farms in the area was made in December and January of 1962-1963. Information was obtained from the farmers on land resources, machinery and livestock, family labor supply, land uses, output from the different enterprises, production practices, production costs, sales, marketing practices, and amount and sources of income other than that obtained on own farms. Secondary data, such as the census of agriculture for Costa Rica, supplemented the information obtained from the farmers.

The farms were classified first by enterprise specialization into (A) potato farms, in which this commodity was the leading source of income, (B) sugar cane-coffee farms, in which milk production was the leading source of income. These three general classes were subdivided into two groups each according to the proportion of total income contributed by the leading enterprise. In turn, these groups were subdivided on the basis of manzanas actually in crops or in pasture as follows: (a) crop farms, with more or less than 10 manzanas of cropland, and (b) dairy farms, with more or less 20 manzanas of pastureland. A total of twelve classes of farms, with four to 17 farms per class, were obtained by this classification.

The average size of farms in the sample was 50 manzanas. Of this total, 12 manzanas were in cropland, 24 were in pastureland, and 14 were in other land. Farms in the sample ranged in size from one to

about 735 manzanas. There appeared to be no relationship between size of farms and enterprise specialization; that is, about the same ratio of small and large farms existed in each of the classes. Only two farmers in the sample were full tenants; one farmer reported share-crop arrangements and nine farmers were part-owners of land they operated. All the other farms were full owners.

Patterns of farm land use in the area of the study indicated a tendency of the farms to specialize in a relatively few products. The practice of keeping land idle or fallow was of minor importance. Those farmers growing potatoes or general crops used land more intensively by double cropping.

Cash production expenses for the 112 farms included in the analysis averaged about \$4,098. The major items making up this cost were hired labor, chemicals (including fertilizer), and machinery replacement, repair, and operation.

The leading sources of farm income, by order of magnitude of gross receipts, were dairy, sugar cane, potatoes and coffee. Other products yielded only five percent of the gross farm income. Some income from dairying was received by all farm classes. Nearly half of the gross farm income for farms in the sample was from dairy.

The net income estimates for the different farm classes in the study were returns to land, labor, and capital. Only cash expenses actually incurred in farming were considered in the costs. Net farm income, by classes of farms, ranged from about \$491 for the small coffee farms to about \$5,000 for the large diversified dairy farms. Average net income for the 112 farms was about \$2,400. Not all farms

included in the study had a positive income. Ten farms in the sample had negative net incomes. The range in net incomes was  $-\$1,727$  to  $\$21,765$ . More than half of the farms in the sample received less than six percent of total net income. Only about 2.5 percent of all farms had incomes over  $\$15,000$ , but their combined incomes amounted to about 22 percent of the total.

It took about  $\$480$  per year per family to purchase the main items of food in consumption per rural family, or about one-third of the estimated net income per farm in the area. For families in the  $B_1$  farm class, expenditures for the selected items of food were about two-thirds of net farm income, and for families in farm class  $B_3$  expenses on the same items amounted to almost nine-tenths of net farm income.

An estimated 2.2 man-years of labor per farm family in the sample was available for employment. Only about 1.2 man-years of labor per family was productively employed. Although these estimates of employment and underemployment were crude, they indicated the possible existence of a substantial amount of underemployment, or disguised unemployment, in the area of the study. About half of the labor supply on farms in the area appeared to be surplus.

Two paths of adjustment in the use of labor and nonlabor factors appear feasible: substituting machinery for labor, and increased application of fertilizer inputs. The use of machinery inputs would reduce the quantity of labor inputs used in farm production and increase the productivity of the remaining workers. With limited opportunities for employment elsewhere, the application of labor saving capital inputs does not appear to be a desirable adjustment. For present conditions

in Costa Rica a more promising farm factor adjustment seems to be increases in the amount of fertilizer inputs. There may be a small release of labor, but the productivity of workers would tend to increase mainly through increases in output.

The expected increases in income due to increased productivity in agriculture and to some expansion of nonagricultural sectors would tend to increase the demand for food concurrently with increases in the supply of food.

This initial development could allow the country to make the transition into sustained growth if the rate of growth is high enough and sustained to surpass the present high rate of population growth. Nevertheless, increases in agricultural productivity by themselves would not appear to sustain the process of economic development of Costa Rica.

The assumed objectives of agricultural policy was increases in economic welfare of the people of the area. The adjustments in resource use considered for implementing this objective of policy were: (1) reducing the farm labor force, (2) increasing nonlabor inputs, (3) increasing the proportion of high labor using enterprises, and (4) increasing farm output through technological advance. The agricultural development of the area of the study was envisioned as an evolutionary process requiring a gradual increase in productivity of labor and incomes of the farmers.



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## APPENDIX A

## METHODS FOLLOWED TO OBTAIN AVERAGE INCOME FOR THE AREA OF THE STUDY

Method 1

The 1955 census grouped all farms in the area into 18 different size classes (Appendix Table I). The income figure for each of the farms in the sample was distributed among these classes where they corresponded to the sample farm size, and an average for the census class was computed. There were several census classes not represented in the sample. For these, an income figure was estimated using the sum of average incomes for the eight middle groups. Income per census class was weighted by the percentage of total farms in the area in each class to obtain the average income for the area (Appendix Table II).

Method 2

The first method was modified by use of average income for the farm class to which the individual farm belonged instead of income for the particular farms to obtain the second estimate of average farm income for the area. All other steps in the computations were the same as Method 1.

## APPENDIX TABLE I

CENSUS CLASSES, NUMBER OF FARMS IN EACH CLASS, PERCENT OF TOTAL  
NUMBER OF FARMS AND NUMBER OF SAMPLE FARMS  
IN EACH CENSUS CLASS

Census Classes (Manzanas)	Number of Farms in Class <sup>a</sup>	Percent of Total Number of Farms	Number of Farms Included in Analysis
1-1.4	109	8.8	1
1.5-4.9	370	29.8	6
5-9.9	231	18.6	9
10-14.9	125	10.1	8
15-19.9	72	5.8	17
20-29.9	85	6.8	22
30-49.9	96	7.7	16
50-99.9	78	6.3	19
100-144.9	29	2.3	9
145-174.9	7	0.6	1
175-249.9	13	1.1	2
250-284.9	5	0.4	0
285-449.9	9	0.7	1
500-999.9	6	0.5	1
1,000-1,429.9	2	0.2	0
1,430-1,499.9	0	0.0	0
1,500-3,499.9	2	0.2	0
3,500 +	1	0.1	0
Total	1,240	100.0	112

<sup>a</sup>From 1955 Census of Agriculture for Costa Rica.

## APPENDIX TABLE II

CENSUS CLASSES, AVERAGE FARM INCOME PER CENSUS CLASS, AND ESTIMATED  
AVERAGE INCOME PER FARM FOR THE STUDY AREA,  
METHODS 1 AND 2

Census Classes (Manzanas)	Method 1		Method 2	
	Component of Total Per Farm <sup>a</sup>	Average Class Income	Average Class Income	Component of Total Per Farm <sup>a</sup>
1-1.4	25.17	286.00	1,021.70	89.91
1.5-4.9	186.33	625.27	831.56	247.80
5-9.9	103.43	556.08	838.11	155.89
10-14.9	49.16	486.73	1,099.86	111.08
15-19.9	68.22	1,176.18	1,300.79	75.44
20-29.9	63.30	930.85	1,626.74	110.62
30-49.9	139.62	1,813.21	4,280.70	329.61
50-99.9	270.88	4,299.76	3,754.48	236.53
100-144.9	137.78	5,990.22	2,458.12	56.54
145-174.9	130.59	21,765.18	4,479.18	26.88
175-249.9	38.70	3,517.75	4,552.14	50.09
250-284.9	30.33	7,581.71 <sup>b</sup>	3,938.22	15.75
285-499.9	46.19	6,598.98	3,563.73	24.94
500-999.9	45.43	9,086.87	4,479.18	22.40
1,000-1,429.9	15.16	7,581.71 <sup>b</sup>	3,938.22	7.83
1,430-1,499.9	<sup>c</sup>	<sup>c</sup>	<sup>c</sup>	<sup>c</sup>
1,500-3,499.9	15.16	7,581.71 <sup>b</sup>	3,938.22	7.87
3,500 +	7.58	7,581.71 <sup>b</sup>	3,938.22	3.94
Total per Farm	1,373.03			1,573.14

<sup>a</sup> Obtained by multiplying percent of farms each class was of the total by the average income per census class.

<sup>b</sup> Estimated.

<sup>c</sup> No farms reported for the area in this class by the Census.

## APPENDIX TABLE III

METHOD OF ESTIMATION OF AVAILABLE LABOR IN MAN-YEAR EQUIVALENTS  
FOR FARM FAMILIES IN THE SAMPLE

Family Member	Assigned Rate of Participation	Proportion of Adult Male Worker's Wages Received	Man-Years Equivalent <sup>a</sup>
Head	1	1.00	1.00
Wife	1/8 (.1250)	0.66	0.08
Adult males (18 yrs. and over)	1	1.00	1.00
Adult females (16 yrs. and over)	1/3 (.33)	0.66	0.22
<u>Children</u>			
Males (14-18 yrs. old)	2/3 (.66)	0.66	0.44
Males (7-14 yrs. old)	1/2 (.50)	0.50	0.25
Females (14-16 yrs. old)	1/4 (.25)	0.50	0.12
Females (7-14 yrs. old)	1/8 (.1250)	0.33	0.04

<sup>a</sup>Rate of participation times wages received.

VITA

Heraclio A. Lombardo

Candidate for the Degree of

DOCTOR OF PHILOSOPHY

Thesis: ANALYSIS OF AN AGRICULTURAL ECONOMY WITHIN THE CENTRAL  
PLATEAU REGION OF COSTA RICA

Major Field: Agricultural Economics

Biographical:

Personal Data: Born at Colon, Republic of Panama, June 6, 1922,  
the son of Jacinto Lombardo B. and Isabel Olmos de Lombardo.

Education: Attended elementary and secondary school in Colon,  
Republic of Panama and graduated from St. Joseph's College  
in 1941; Received Licenciante in Commerce degree from the  
University of Panama in 1949; Attended the University of  
Washington, during 1950-1951; Received the Master of Science  
degree from the University of Arkansas in 1955; Completed  
requirements for Doctor Philosophy degree in September, 1963.

Professional Experience: Employed, as stock tracer, by the United  
States Air Force in the Panama Canal Zone from 1941 through  
1949; Employed by the Government of Panama from 1950 through  
1958. During this period worked as auditor two years; was  
instructor in farm management for two semesters at the  
National School of Agriculture of Panama; served as agricul-  
tural economist for six years at the National Experiment  
Station. Employed as Agricultural Economist in the Inter  
American Institute of Agricultural Sciences of the Organiza-  
tion of American States from January, 1961 to date.