ABSTRACT

ADJUSTMENT POSSIBILITIES ON COLOMBIAN FARMS UNDER ALTERNATIVE LEVELS OF PUBLIC LAW 480 IMPORTS

by Dale W Adams

This study attempts to determine what production adjustments Colombian farm units are likely to make in response to various levels of Public Law 480 Title I imports.

Agriculture is a major factor in Colombia's economy, but farm productivity is lagging well behind the rest of the economy. A general lack of rural investments helps explain this lag and also reduces the possibilities of farm adjustments. The organization of Colombian farm units and the structure of agricultural markets are additional factors which limit adjustments.

Wheat producing farms are principally diversified units because of various uncertanties, home consumption considerations, and crop combination possibilities. Strong competition from other enterprises, and limited amounts of land where wheat can be grown, make it doubtful that Colombian farms could produce all of the country's wheat needs. A termination of Title I wheat imports would not sharply increase internal wheat production, and formal or informal rationing plus additional commercial imports would likely follow. With a large increase in Title I wheat imports, the relative prices of wheat and its production com-

petitors would probably decline at nearly the same rate, and producers would have only modest incentives to switch out of wheat production.

The output of dairy and poultry products have recently expanded rapidly in Colombia. Future expansion will depend on the availability of adequate feed grain supplies. Many of the farm operators who presently grow corn do so only for home consumption. Commercial producers have found that sugar cane, cotton, oil crops, or dairy may yield higher returns than feed grains. Acute shortages of feed grains in Colombia are likely unless internal production is substantially increased. Annual feed grain imports of up to 300 thousand metric tons appear possible if relative prices of feed grains are to be kept from rising sharply.

A highly successful cotton development program has produced exportable surpluses of cotton fiber in Colombia. It is doubtful that future cotton imports under Title I programs will be necessary because of the expansion possibilities in cotton plantings.

The production of edible oils has increased along with cotton production, but large imports of edible oil products were still necessary in the early 1960's in order to maintain even the existing low per-capita rates of consumption. The prospects for an accelerated expansion in edible oil production appears slight without, (1) large commitments of capital to aid planters of oil palms, or (2) sizable investments in irrigation and drainage systems to benefit farms which can produce annual oil crops. A cessation of Title I edible oil imports would probably result in larger commercial imports; while larger Title I imports would reduce pressure for commercial imports, and lessen the need

to expand internal production.

The implications of three alternative levels of Public Law 480 imports were examined in view of these possible production adjustments. Broadly speaking, a continuation of Title I imports at the per-capita levels of recent years would yield similar results to those experienced in past programs. A termination of Title I imports would clearly aggravate some of Colombia's most critical problems. The third alternative examined showed that a substantial increase in Title I imports may be possible, but positive results will not automatically follow within Colombia's development plans. Unfavorable farm income effects could result, private agricultural investments reduced, and damage done to Colombia's ability, in the long-run, to produce its own food needs. Additional public investments in agriculture plus expanded agricultural credit facilities could substantially offset these detrimental effects.

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DALE W ADAMS

A THESIS

Submitted to Michigan State University
in partial fulfillment of the
requirements for the degree of

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Errors of fact and logic are the sole responsibility of the author.

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CHAPTER I

INTRODUCTION

This study attempts to determine some of the impacts of future imports of food and fiber surpluses upon the development of the Colombian economy. The perspective is the future, and the focus is primarily upon the agricultural sector. The analysis is concentrated on determining the adjustments which Colombian farm units are likely to make in response to alternative levels of imports under Title I of the U.S. 1954 Agricultural Trade Development and Assistance Act (PL 480).

Setting

The 20th century has seen a number of countries switch from a pure biological orientation on food, clothing and shelter toward a psychological orientation of quality, quantity, social equality and development. The tremendous increases in production of food and fiber experienced by the United States is a striking example of this change in orientation. Unfortunately, many of the values and institutions of the United States, and in fact of the world, have not been well adapted for integrating this additional food and fiber into an overall developmental framework.[1] Unused supplies of wheat, feed grains, cotton, coffee and

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[1]Because it took man thousands of years to develop marketing systems based on principles of scarcity, it should not be expected that the adjustments to surplus conditions would be either rapid or easy.

other agricultural goods in various countries of the world attest to this lack of adjustment.

With the high priority that mankind is presently placing on economic and social development it becomes imperative that better uses be made of these goods in emerging countries where food is still scarce.

United States Agricultural Surplus Disposal

The enactment of PL 480 in 1954 was only one of a number of steps taken by the United States to adjust to its agricultural surplus. Previous to this, these surpluses had been used to help carry out three wars, and to aid in post-war adjustments in affected countries. Lend-Lease, UNRRA programs, Mutual Security Act (PL 165 and PL 665) shipments and Point IV activities were some of the formal external programs.[2] Internal and external programs for "dumping" of surplus commodities and expansion of industrial uses also received emphasis.

As Cochrane points out, enactment of PL 480 was a marriage of domestic problems with a weak emphasis on overseas needs.[3] Although the early emphasis was on short term relief from internal surplus pressures, the continuation of these pressures has caused the program to be oriented toward long run considerations. Likewise, research

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[2] See Elmer L. Menzie et al., Policy for United States Agricultural Export Surplus Disposal, Technical Bulletin 150, College of Agriculture, University of Arizona, Tucson, 1962, especially pp. 22-54, for further discussion of the United States' surplus disposal programs.

[3] Willard W. Cochrane, "Public Law 480 and Related Problems," Annals American Academy Political and Social Science (September, 1960).

dealing with PL 480 has gone through the same change in emphasis. Early research tended to deal with PL 480's effects on U.S. commercial sales, later on competing countries' sales, and more recently on relationships between PL 480 imports and nutritional levels, foreign exchange problems, internal investment, and foreign aid in receiving countries.

By June 30, 1963, almost 15 billion dollars worth of commitments had been made under the four different Titles of PL 480. Over 100 countries had received commodity shipments, predominantly of wheat and flour, fats and oils, rice, feed grains, and cotton. Title I sales for local currency accounted for almost two-thirds of the total value committed.[4]

The use of surplus commodities under PL 480 has proved to be a more complex development tool than the use of grants or loans of hard currencies. The impacts of these goods on the receiving countries vary widely depending on timing, internal production, consumption patterns, and external trading relationships. Some generalities can be stated with regard to imports of these surplus goods, but it seems that useful guidelines for making better future decisions can only be developed on the basis of country-by-country studies. These studies can then be used in tailoring programs to meet the needs of individual countries.

Public Law 480 in Colombia

Up until mid-1963 Colombia had received, or was scheduled to

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[4]U.S. House of Representatives, Eighteenth Semiannual Report on Activities Carried on Under Public Law 480, 83rd Congress, House Document No. 149, 88th Congress, 1st Session (Washington: Government Printing Office, 1963), p. 62.

receive, almost 112 million dollars worth of products under various Titles of PL 480.[5] Over half of this value was included in Title I agreements (sales for local currency), over 40 percent shipped under Title III (food donations), and only six percent committed under Title IV (long term loans).[6] Wheat and flour, edible oil products, feed grains, dairy products, and cotton have all been important items in these shipments.

A total of five Title I agreements had been signed with Colombia prior to 1962. A Title IV agreement was added to these in March of 1963. Results of the activities under Title I in Colombia have already been examined in three closely related reports.[7] Goering concluded from his review of past PL 480 programs in Colombia that four major impacts had resulted. These were: (1) that some shifting of emphasis from wheat to barley production had occurred, (2) that local currency loans had tended to circumvent some rigidities inherent in

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[5] Ibid., pp. 88, 107, 109, 115.

[6] About 1.3 million dollars worth of commodities were also sent to Colombia under Title III barter agreements for platinum. This figure is included in the Title III donation figure above.

[7] T. J. Goering, United States Surplus Disposal in Colombia, Unpublished Ph.D. Thesis, Department of Agricultural Economics, Michigan State University (East Lansing, 1961).

T. J. Goering and L. W. Witt, United States Agricultural Surpluses in Colombia - A Review of Public Law 480, Agricultural Experiment Station Technical Bulletin 289, Michigan State University (East Lansing, 1963).

L. W. Witt and R. G. Wheeler et al., Effects of Public Law 480 Programs in Colombia - 1955-62, Michigan State University, Department of Agricultural Economics and Facultad Nacional de Agronomía Departamento de Economía y Ciencias Sociales (Medellín, Colombia, October, 1962). (Mimeographed.)

traditional credit facilities, (3) that there had been some improvement of the caloric intake of certain groups, and (4) that PL 480 imports had helped to ease some very serious foreign exchange problems which were aggravated by falling coffee prices.

Assumptions and Methodology

Imports of PL 480 have direct and indirect impacts throughout the economy, but the implications for agriculture are especially significant. Under ideal conditions, donations of food through Title III would have little effect on actual or potential prices of farm products in Colombia. On the other hand, imports under Title I enter into direct competition with locally produced commodities.[8] The effects of this are similar to a tax on many agricultural producers, and a subsidy to consumers of affected products. The extent of the tax largely depends on the producers' ability to switch production toward commodities whose price relationships are affected relatively less, and also upon changes in producers' cost structures.

In order to determine adjustment possibilities, detailed case studies were made of some 60 individual farm units located in several major agricultural areas of Colombia. The specific objective was to determine the probable responses of these and similar units, over the next 5 to 10 years, to changes in relative farm prices or production conditions resulting from possible variations in Title I shipments.

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[8] It appears that direct impacts upon the agricultural sector are almost identical for Titles I and IV programs. Although only Title I will be discussed here, the analysis is equally applicable to future Title IV imports.

Selection of Case Studies

During December 1962, over 1000 short preliminary schedules were completed for farm units. Approximately 200 schedules were taken in each of five different areas. These preliminary schedules were aimed at determining typical enterprise combinations, size and tenure patterns, and resources available to each operator. The schedules were later classified according to tenure, size, and type-of-farming. Some 10 to 15 units were selected which appeared to be representative of important groups of farm management units, in each of the five areas. These case-study farms were then revisited several times for additional information which included tenure arrangements, crop and livestock production, and income and expense data.[9] Information relating to labor force, investments, capital and credit was also gathered.

Alternative plans for each of these cases were later budgeted using prices for 1961-62 and price relatives projected for 1967-68. The case-study farms were again revisited, and the alternative plans discussed with the operators.

Alternative Levels of Title I Imports

In this study it is assumed that Colombia will find the United States ready to maintain or increase the quantity of commodities shipped under Title I agreements. Three general levels of future Title I

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[9] The case study method is used in this analysis as a means of identifying relevant variables, of developing hypotheses about important relationships, and in association with aggregate statistical information of inferring probable actions by groups of agricultural producers. For a more extended discussion of the case study method see, R. G. Wheeler and G. A. Guerra E., "Administración Rural En La Reforma Agraria y El Desarrollo Económico," Revista Facultad Nacional de Agronomía, Vol. XXIII, No. 59 (Medellín, 1963).

imports of wheat, edible oils, and feed grains are assumed.[10] They are as follows:

Level I	- Both Title I and commercial imports of wheat and edible oils will continue at per-capita averages of the 1955-62 period. Title I imports of feed grains will continue at the 1961 level of 55 thousand metric tons per year.
Level II	- All Title I imports will be discontinued. Market prices will be allowed to rise, but the rises will be tempered by additional efforts to provide educational and technical assistance at the farm level, and possibly by the use of direct controls in some cases.
Level III	- Imports of wheat and edible oils under Title I will be double the 1955-62 per-capita rates. Feed grains will be imported at a rate of 300 thousand metric tons per year.

An overall assumption regarding these import levels and associated adjustments in market prices is that changes in shipments of Title I commodities will not be largely offset by alternative programs of international origin.

Alternative Price Assumptions

Changes in the level of Title I imports will have both direct and indirect impacts upon the absolute and relative prices of agricultural products. At the same time other changes are likely to take place, apart from any Title I program, which will also alter price relationships. To provide a basis for the case analyses,

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[10] Cotton was imported under each of the first four Title I agreements. As will be shown in Chapter VI, recent increases in internal production make it unlikely that future imports of cotton under PL 480 programs will be necessary. Small quantities of dairy products and tobacco have also been imported under Title I or Title IV agreements, but because of their small size they will not be included in this analysis.

specific assumptions about national prices of farm products and inputs in the 1967-68 period were developed for each of the alternative levels of Title I shipments. These assumptions are presented in Table I-1 as price-relatives with a 1961-62 base. As can be noted they exclude any allowance for an upward movement of prices resulting from general inflation.[11] Similar assumptions with respect to prices of farm input items are summarized in Table I-2.

Under Level I imports of PL 480 commodities, there would be some upward pressure on the price of corn, oil crops, poultry, eggs, mixed feeds, and various other farm products and inputs. The prices of potatoes, coffee, beef, and fertilizers would probable fall. Additional pressure would be placed on prices under Level II where no PL 480 commodities were imported. Replacement within consumer budgets would keep prices for potatoes, platanos, and milk relatively constant under this level. Under Level III the supply of relatively cheaper feed grains would increase the expenditures on animal products, and prices of these items would be under relatively little downward pressure.

These price assumptions represent working hypotheses—not final conclusions—but they were chosen after a considered view of the forces likely to affect the final outcome. Prices received by individual farmers can, of course, vary widely from national averages depending on distance from markets, quality, and marketing institutions available. Therefore, the prices which were applied in budgeting for different farms were occasionally adjusted to reflect local conditions.

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[11] Over the past few years Colombia has experienced an average annual rate of inflation of roughly 10 to 12 percent. Some warping of the agricultural price structure may occur through this process, but the overall effects on this analysis would be small.

Table I-1. Farm product prices in Colombia, 1955-56 and 1961-62, and price relatives projected for 1967-68 under alternative levels of Title I imports

Product	Average prices		Prices of 1961-62 relative to 1955-56	Price relatives projected for 1967-68 under alternative levels of Title I imports[a/]		
	1955-56	1961-62		Level I	Level II	Level III
	(pesos per metric ton)		(percent)	(1961-62 price = 100)		
Wheat	665	839	126	100	120	80
Barley	423	714	169	100	115	85
Corn	325	635	195	110	120	105
Beans	1,215	2,260	186	105	105	105
Potatoes	262	425	162	95	100	95
Paddy rice	480	907	189	105	115	95
Cotton incl.seed	870	1,833	211	105	110	105
Sesame	760	1,875	247	110	135	105
Soybeans	n.a.	887	n.a.	110	135	105
Sugar cane	12	33	275	100	100	100
Coffee	2,871	3,445	120	90	90	90
Platanos	187	321	172	100	100	100
Yuca	196	355	181	105	105	105
Beef	3,340	5,340	159	95	95	95
Poultry	n.a.	7,600	n.a.	105	120	98
Milk	430	770	179	100	100	100
	(pesos each)					
Eggs	0.21	0.40	190	105	120	98

a/ With no allowance for any general inflation.

SOURCES: Various worksheets and unpublished data furnished by the Banco de la República, INA, ICE, and IFA.

Departamento Nacional de Estadística: Boletín Mensual y Anuario General de Estadística, various issues.

Table I-2, Prices of inputs for farm production in Colombia, 1953 and 1961-62, and price relatives projected for 1967-68 under alternative levels of Title I imports

Item	Unit	Average prices		Prices of 1961-62 relative to 1953	Price relatives projected for 1967-68 under alternative levels of Title I imports a/		
		1953	1961-62		Level I	Level II	Level III
		(pesos)		(percent)	(1961-62 price = 100)		
Hired labor							
-hill areas	day	3.00	6.00	200	105	105	105
-valley "	"	3.25	6.95	214	105	105	105
Seed							
-wheat	met.ton	700	890	127	100	120	80
-barley	"	500	850	170	100	115	85
-corn	"	380	535	141	110	120	105
-beans	"	1,000	2,265	227	105	105	105
-potatoes	"	350	381	109	95	100	90
-rice	"	600	946	158	105	115	95
-cotton	"	200	440	220	105	110	105
-sesame	"	700	2,081	297	110	135	105
-soybeans	"	n.a.	920	n.a.	110	135	105
-legumes	"	800	n.a.	n.a.	105	105	105
Fertilizers	"	395	953	241	95	100	95
Chemicals	"	2,540	4,712	185	100	100	100
Sacks	each	1.21	2.33	193	100	100	100
Mixed feed	M.T.	216	635	294	110	120	105
Salt	"	n.a.	116	n.a.	100	100	100
Gasoline	gal.	0.60	0.93	155	100	100	100
Lub. oil	"	2.50	4.98	199	100	100	100
Int.percent		14	12	86	100	100	100
Pullet chicks	each	n.a.	3.90	n.a.	110	120	105
Broiler chicks	"	n.a.	2.00	n.a.	110	120	105
Tractor of 50-60 h.p. with disc plow and disc harrow		n.a.	38,000	n.a.	100	100	100

a/ With no allowance for any general inflation.

SOURCES: Various worksheets and unpublished data furnished by the Banco de la República, INA, ICE, IFA, machinery dealers, and other vendors.

Areas Sampled

Five localities were selected that represented production of major crops which might be affected by Title I imports. Two of these areas were in the high mountain regions where cereals, dairy, potatoes, and some corn are typically grown. Another area was at medium altitude and included intensive coffee production in a rough mountainous area. The last two areas were both in flat fertile valleys where corn, oil crops, cotton, rice, and livestock are common. Specifically, the areas were as follows:

1. Three municipios including the towns of Madrid and Subachoque in the Departamento of Cundinamarca were sampled because of the large number of farm units found there with wheat, barley, potatoes, corn and livestock.[12] This area, like much of the Sabana, includes large mechanized dairy and cereal producers, and also a number of subsistence farms.

2. The two Municipios of Ipiales and Pupiales in the Departamento of Nariño were also sampled for the cool-climate crops grown there. Little of the land is fully mechanized and small minifundio dominate the area.

3. The Municipio of Fredonia in the Departamento of Antioquia was selected because of the large number of coffee producers found there. Platanos, bananas, cocoa, and dairy are also significant items of production. Small, owner-operated farm units

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[12] A municipio roughly corresponds to a county, and a departamento to a state

are typical in the area.

4. Nine municipios in the heart of the Departamento del Valle entered the study because of the cotton, soybeans, corn, and sugar cane grown. Much of the area is in mechanized production, and agriculture is generally further developed there than in other parts of the country.

5. Part of the Municipio of Cereté in the Sinú Valley of the Departamento of Córdoba was selected because of the farm units located there with cotton, rice, oil crops, and extensive livestock. It also illustrates a region which is just starting to develop intensive agricultural production. The area is typified by large land holdings which are primarily devoted to beef production.

General Organization

The future adjustments that can be made on Colombian farm units will depend mainly on present factor conditions and also on institutional structures. Chapter II discusses the physical situation, contribution to the economy, and relative position of the agricultural sector.

Chapters III through VI each spotlight a different commodity. Wheat and its associated cold-climate crops are discussed first, followed by feed grains, the livestock industry, and cotton and edible oils. Each of these chapters also treats the major products which are substitutes in production for the commodity spotlighted.

The summary and general conclusions of the study are found in the last chapter.

CHAPTER II

THE ECONOMIC STRUCTURE OF COLOMBIA WITH PARTICULAR EMPHASIS ON AGRICULTURE

It would be difficult to find another country of similar size which has such diversity in its economy, topography, climate, and cultural groups as Colombia. Likewise it would be hard to show a case where similar economic progress has occurred under such perplexing conditions. This chapter will present backgrounds on this diversity and economic progress, in order to set the stage for later discussion of various enterprise adjustments. Three general objectives are pursued. They are: 1) to form some general ideas regarding the growth and make-up of the Colombian economy; 2) to describe the role of agriculture in Colombia's developmental process; and 3) to formulate some general ideas with regard to the quantity and quality of factors available for agricultural production. A discussion of the overall economy is presented first; this is followed by additional information on the agricultural sector.

Background on the Economy

Early in the 16th century explorers were drawn to the coastal and high mountain regions of Colombia in search of gold, glory, and Christian converts. Unlike the later settlers of the United States and Canada, they did not intend to earn a living by tilling the soil. For

many years streams, mines, and Indian graves in Colombia were an important source of gold for the Spanish Crown. Up until the late 18th century gold taken from Chocó, Cauca and Antioquia by Indian and Negro slaves provided most of the lifeblood for trade and commerce in New Granada—later known as Colombia. During this colonial period the Crown made a number of large land grants which concentrated the resource ownership in the hands of a few, and helped establish the economic and social class distinctions which are still present.

Historically, there were four separate regions of development. The first two, in the Sabana and the Cauca Valley, were mainly oriented toward agricultural production. Large cattle units associated with small subsistence farms dominated their economies. A third region settled by gold seekers in the 17th century, in Antioquia, became one of the principla mining areas, later switched to coffee production and handicrafts, and finally developed into the leading industrial center of Colombia.[1] The fourth region included the north seacoast, and the lower part of the Magdalena River basin. Heavy dependence on trading with internal and external points, plus production of cotton and tobacco were the main economic activities. Income from Crown monopolies of tobacco and liquor in this area was an important source of revenue for the colonial government.[2]

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[1] See Everett E. Hagen, On The Theory of Social Change: How Economic Growth Begins (Homewood, Illinois: Dorsey Press, 1962), Chapter 15, pp. 353-348, for an interesting discussion of why Antioquenos developed into the leading business men of Colombia.

[2] Theodore E. Nichols, "Colombia In The Colonial Period," The Caribbean: Contemporary Colombia, Vol. XII, Ed. by A. Curtis Wilgus (Gainesville: University of Florida Press, 1962), p. 56.

The three large mountain ranges running from north to south forced the first three regions to develop with very little outside contact. A "mule road" from the Cauca Valley to the Pacific Ocean, for example, was not completed until 1866; a wagon road from the Sabana to the Magdalena River was not finished until after 1900; and wheeled transportation into Medellín from the outside was not possible until 1909.[3] Even in the 1960's, natives of each of the major geographic regions have distinct languages, customs, and loyalty orientations because of this geographic isolation. Regionalism, church-state relationships, and socio-economic class differences have caused sporadic outbreaks of civil disturbances, and have made it difficult to form a strong central government.

Because the Federal-type government has lacked strong overall control it has been forced to follow the lead of colonial officials and rely heavily on government monopolies and taxes on international trade to finance government activities.

Steps in Development

Prior to the 1880's, Colombia's economy was mainly oriented toward subsistence. The rapid colonization of the central cordillera by Antioquenos, and the big expansion in coffee production in these newly settled areas helped Colombia break out of this traditional framework.[4] The price umbrella which Brazil tried to maintain over world coffee

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[3] Hagen, op.cit., p. 361.

[4] See Albert O. Hirschman, Journeys Toward Progress: Studies of Economic Policy-Making In Latin America (New York: Twentieth Century Fund, 1963), pp. 98-100, for further discussion of this colonization and also for further references on the subject.

(mostly after 1920) aided Colombia in becoming the number two exporter of coffee. Exports increased from just over 100 thousand sacks of coffee in 1880, to about 390 thousand in 1899, to some 1,700 thousand in 1919, and to 2,800 thousand sacks in 1929.[5]

During the latter part of this period (1880-1929) large banana plantations were established in the north coastal region, some petroleum resources were developed, and railroad expansion was especially significant. Foreign investment in export producing enterprises, income from coffee exports, and the 25 million dollar indemnity paid to Colombia by the United States, in connection with the Panama question, were major items in early capital formation. Much of the indemnity payment, plus some foreign loans and export earnings were invested in the transportation system. Economic growth during the latter part of the 1920's was especially rapid; gross product increased at a rate of over 5 percent per year, and the coefficient of investment reached a high of over 26 percent.[6]

As Hagen notes, some traces of industrialization started soon after the turn of the century, with the building of a modern textile mill in Antioquia in 1906, and of a major cement plant in the Sabana in 1909.[7]

The depression of the 1930's followed by World War II helped to

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[5]Federación Nacional de Cafeteros, Boletín de Estadística, No. 37 (Bogotá, 1961), p. 58, as quoted in Garland P. Wood, Coffee Production in Colombia (Medellín: Facultad Nacional de Agronomía, 1962), p. 13. (Mimeographed.)

[6]Comisión Económica Para América Latina (CEPAL), Análisis y Proyecciones del Desarrollo Económico: III El Desarrollo Económico de Colombia (Mexico: United Nations, 1957), p. 11.

[7]Hagen, op.cit., p. 361.

retard the growth of the Colombian economy. From 1930 to 1945, foreign investments, except in the petroleum industry, were very limited.[8] Even though the quantity of coffee exported increased by over 40 percent from 1930 to 1940, the existence of lower coffee prices resulted in increased exchange earnings of only 20 percent.[9] During this period Colombia was forced to look inward for further growth. Programs to stimulate production of import substitutes were prominent among governmental activities up until 1945.

Following the end of the war from 1945 to 1956, foreign exchange earnings from coffee exports more than quadrupled, in terms of dollars.[10] In spite of the big increase in exchange earnings, imports of large quantities of capital and consumer goods during this period caused Colombia to incur trade deficits in seven out of the twelve years (see Table II-4).

The assassination of a liberal party leader, Jorge Eliecer Gaitán, in 1948 helped spark a series of events which eventually resulted in a 4-year dictatorship, widespread civil disorder, and rural violence — remnants of which still exist in the 1960's. No exact figure is available on the number killed as a result of this undeclared civil war, but

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8 CEPAL, op.cit., p. 29.

9 Banco de la República, XXXVIII Informe Anual del Gerente a la Junta Directiva (Bogotá, 1962), Appendix.

10 Ibid., Pesos were converted to dollars by using the official exchange rates of 1.752 pesos per dollar for 1945, and 2.51 pesos per dollar for 1956.

the best estimate runs as high as 200 thousand during the 1948 to 62 period.[11] Depopulation in a number of rural areas, especially in the coffee region, has been a direct result of this slaughter. It has been estimated that 800 thousand people changed their residence between 1948 and 1962 because of the violence.[12] In Tolima alone, it is estimated that almost 35 thousand farm units out of some 100 thousand had been totally abandoned by 1957 because of rural disorder.[13]

The population explosions in the three major cities from 1950 to 1962 are further evidence of the rural out-migration, and were also directly related to the violence. Bogota, Cali, and Medellin had estimated population increases of 105, 144, and 100 percent respectively over the above period.[14] Although some progress has been made in reducing deaths caused by rural violence, through large military and police expenditures, killings still numbered several thousand per year from 1960 through 1963.[15]

The failure of the Rojas Pinilla government to adopt effective fiscal and monetary policies for dealing with economic situations

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[11] Germán Guzmán, Orlando Fals Borda, y Eduardo Umaña Luna, La Violencia en Colombia: Estudio de un Proceso Social, Vol. 1, 2d Ed., (Bogotá: Ediciones Tercer Mundo, 1962), p. 292.

[12] Ibid., p. 296.

[13] Ibid., p. 293.

[14] Calculations made from population work sheets furnished by the Departamento Administrativo Nacional de Estadística (DANE).

[15] In the budgets for the national government presented for 1962, one-third of the funds allocated were for the armed forces or the police, whose principal task is to combat violence. Ministro de Hacienda y Credito Publico, Memoria de Hacienda: Presentada al Congreso Nacional de 1962 (Bogota: Imprenta Nacional, 1962), p. 166.

caused by wide fluctuations in coffee prices, experienced from 1953 to 1957, and the restrictions on civil liberties, led to the overthrow of his regime in 1957. The formation of a national front government, and changes in the monetary and fiscal structure followed this overthrow.[16]

The new government was faced with continued rural violence, low foreign exchange balances, and an official exchange rate for pesos which was seriously out-of-line with the "black market" rate. To further aggravate the situation, foreign prices of coffee, Colombia's principal export, continued to drop from eighty cents (U.S.) per pound in 1956-57, to about forty cents (U.S.) in 1962. Tight controls on imports, a devaluation of the peso to a free market rate, and some large foreign loans helped ease Colombia's tight economic situation.[17]

In addition to restricting imports, the Colombian government re-emphasized production of import substitutes in both the industrial and agricultural sector. Furthermore, the government, under the leadership of President Lleras Camargo, attacked the land tenure problem by passing an impressive agrarian reform law in 1961.

Throughout the period from 1880 to 1963, fundamental changes were taking place in some parts of the social and economic structure of the country. The large investments made in the internal transportation

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[16] See Federico G. Gil, "Colombia's Bipartisan Experiment," in The Caribbean: Contemporary Colombia, op. cit., pp. 87-101, and V. L. Fluharty, Dance of the Millions: Military Rule and Social Revolution in Colombia 1930-1956 (Pittsburg: University of Pittsburg Press, 1957), for further background on this phase of Colombia's history.

[17] See Colombia University School of Law, Public International Development Financing in Colombia, Report No. 6, (New York: June, 1963), pp. 1-9, (Mimeographed) for further discussion of these foreign loans.

system helped draw a number of isolated areas into a market environment.[18] This expansion in the markets enabled some regional specialization to begin in both industry and agriculture. Furthermore, the transportation network welded the country together and helped reduce the traditional regionalism which has been a problem since the country was formed.

Several commonly used measures indicate that there has been a gradual shift of importance away from the agricultural sector. The growth of the industrial and service sectors, for example, has lowered the proportion of people employed in agriculture, and has also lowered the proportion of gross national product contributed by agricultural production. In spite of these measures, agriculture has and is furnishing the large majority of human and capital resources upon which Colombia's development depends, and is still the most important single economic activity. Additional measures to show how important agriculture is, are developed in the following discussion.

Recent Trends in Sectors' Growth

During the 1950's and early 1960's there was a rapid growth in the output of Colombia's industrial sector. Its gross output approximately doubled during the 1951-1961 period (Table II-1). Output in the agricultural and mining sectors increased only slightly more than the 36 percent increase in population. In spite of the undeclared

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[18] It is estimated that investments in the internal transportation system from 1900 to 1950 averaged three-quarters of the total public investment. See CEPAL, op. cit., p. 20. The expansion of roads continued during the 1950's and rose from 20,804 to 36,890 kilometers in the period 1952-1960. Departamento Administrativo Nacional de Estadística (DANE), Anuario General de Estadística, 1952 and 1960 (Bogotá, 1954 and 1962 respectively).

Table II-1. Trends in Colombia's real gross product, by sectors, 1951-61

Sector	Gross product at 1958 prices			Index	
	1951	1956	1961	1956	1961
	(millions of pesos)			(1951 = 100)	
Agriculture	5,637	6,568	7,883	119	140
Mining	575	695	829	121	144
Industry	1,974	2,867	3,799	145	192
Other	5,991	8,277	10,018	138	167
All sectors -total	14,177	18,407	22,529	130	159
-per capita[a/]	1,237	1,381	1,449	112	117

a/ Calculated on the basis of the following population estimates from the Revista del Banco de la República No. 420, October 1962.

1951	11,459,000
1956	13,334,000
1961	15,546,000

SOURCE: Banco de la República, Departamento de Investigaciones Económicas: Cuentas Nacionales, 1950-61, (Bogotá: 1963 mimeo), p. 14.

civil war and falling coffee prices in the latter part of this period, gross per-capita product increased by about one-sixth.

The growth of several industries within the industrial sector was especially impressive from 1952 to 1962. Textile and cement production more than doubled, electricity output practically tripled, and gasoline production went up almost fivefold (Table II-2).

In addition to the growth in the industries shown in Table II-2, one cannot help but be impressed by the number of items in Colombian stores with "made in Colombia" labels. These include most of the drugs, clothing, small appliances, and light machinery.

The gradual modernization of the marketing and processing of agricultural commodities has also been a factor in the growth of the non-agricultural sector. As shown in Table II-3, handling of agricultural products contributed more than one-fifth of Colombia's internal gross product in 1958. In total, agriculture and related production contributed almost six-tenths of the 1958 internal gross product.

Recent Trends in Exports and Imports

Since World War II, coffee has made up more than 75 percent of the value of Colombia's exports, with petroleum and bananas furnishing most of the balance. There was relatively little change in the mix of these exports from 1945 to 1962. Agricultural commodities furnished from 78 to 87 percent of the total value of goods exported during this period (Table II-4). The increase in total value of exports and also the increase in the percentage of exports furnished by agricultural commodities from 1945 to 1954-55, largely reflect rising coffee prices. Likewise, the decreases in value of exports, and in the percentage contributed by agricultural commodities from 1956 to 1962 were mainly

Table II-2. Growth in output of selected industrial products, Colombia, 1952-62

Industry		Output			Index	
		1952	1957	1962	1957	1962
					(1952= 100)	
Textiles	Thousand met. tons[a/]	27	37	59	137	218
Petroleum	Mil.bbls.	39	46	52	118	134
Gasoline	Mil.bbls.	2.2	6.0	11.1	265	489
Electricity	Mil.KWH	84	138	218	176	285
Cement	Mil.met. tons	0.7	1.2	1.7	175	245

a/ Tonnage of cotton used.

SOURCES: El Colombiano (newspaper) March 30, 1963, p. 19, for cotton used in 1952 and 1962.

Instituto de Fomento Algodonero, Departamento de Investigaciones Económicas: Colombia-Algodón y Oleaginosas Información Estadística, 1960 (Bogotá: 1960), p. 9, for 1957 cotton data.

Revista del Banco de la República No. 422 (Bogota: Diciembre de 1962), pp. 1648-9, for data on petroleum, gasoline, and cement.

Departamento Administrativo Nacional de Estadística: Anuario General de Estadística 1952, 1957 (Bogotá: Diciembre 1953 and 1958 respectively), and Boletín Mensual de Estadística No. 146 (Bogotá: Mayo de 1963), p. 45.

Table II-3. Agriculturally related production in Colombia's internal gross product, 1958

Item	Value	Relative share
	(million pesos)	(percent)
Production from farming, fishing and forestry	7,177	35
Marketing and processing of agricultural products[a/]	4,530	22
Other	8,769	43
Totals	20,476	100

a/ Includes 64 percent of the output of the industrial sector, based on detailed data for various divisions; 61 percent of the output of the financial sector, based on the types of loans made; and 50 percent of the output of commerce and transport.

SOURCE: Calculated from data of the 1958 Industrial Census. Banco de la República: Informe Anual del Gerente a la Junta Directiva, 1959-60 (Bogotá: 1961), p. 153.

Table II-4. Trends in Colombia's total value of exports and total value of imports, with percentages of each related to agriculture

Year	Total values		Percentage related to agriculture	
	Exports	Imports	Exports[a]	Imports[b]
	(millions of dollars)		(percent)	
1945	141	161	79	15
1946	201	230	83	12
1947	225	365	82	11
1948	277	324	86	13
1949	321	265	80	9
1950	396	365	81	8
1951	463	419	82	8
1952	473	415	83	9
1953	596	547	85	6
1954	657	672	86	6
1955	584	669	87	6
1956	537	657	84	7
1957	511	483	83	8
1958	461	400	81	9
1959	473	416	81	18
1960	465	519	78	10
1961	435	557	80	10
1962	403	540	81	9

a/ Coffee has accounted for 90 to 95 percent of the agricultural exports. Bananas, tobacco, cotton, sugar, and cattle account for most of the remainder.

b/ Imports related to agriculture include tractors, general farm machinery, pumps, breeding cattle, fertilizers, insecticides, and similar items.

SOURCES: Departamento Administrativo Nacional de Estadística: Anuario de Comercio Exterior, 1945-1961 (Bogotá: various years): also, Boletín Mensual, Nos. 144 and 145 (Bogotá: March and April 1963).

the effect of generally falling coffee prices.

Despite numerous import substitution programs and the reduced income from coffee exports, Colombia still derived 20 percent of its national product in 1960-61 from the activities associated with imports or exports.[19]

As can be noted in Table II-4, imports of tractors, general farm machinery, fertilizers, and other items which could be used in agricultural production, made up only a small portion of total imports from 1945 to 1962. Generally speaking, about one out of each eight dollars earned from exports of agricultural commodities from 1945 to 1962 was spent for imports of agricultural inputs.

Colombian Investment Patterns

Colombia has continued to make large investments in its internal transportation system. In 1961 the north seacoast was finally connected by rail with the interior of the country. By 1961, the road system had also been improved and extended into municipios containing more than 90 percent of the country's population.[20] As shown in Table II-5, about one-quarter of the gross new investments in fixed capital made in Colombia in 1959 and projected for 1961-64 were for transport. Housing and manufacturing were two other important items, while gross new investments in agriculture made up only about one out of each eight pesos.

A similar pattern is shown in Table II-6, for the public external

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[19] Banco de la República, XXXVIII Informe, op. cit., p. 160.

[20] Ministry of Public Works, Plan for Improvements in National Transportation, a study conducted by the engineering firm of Parsons, Brinkerhoff, Quade and Douglas of New York (Bogotá, December, 1961), pp. I-X.

Table II-5. Percentage distribution of gross new investment in fixed capital, by sectors, 1959 and projected 1961-4

Sector	1959	Projected 1961-4
	(percent)	
Agriculture	13.0	12.3
Mining	7.5	7.1
Manufacturing	13.7	17.9
Housing	23.5	16.6
Electricity	4.9	7.2
Transport	25.3	23.8
Other	12.1	15.1
Totals	100.0	100.0

SOURCE: Consejo Nacional de Política Económica y Planeación, Departamento Administrativo de Planeación y Servicios Técnicos: Colombia--Plan General de Desarrollo Económico y Social, Part I (Bogotá: 1962), p. 178.

Table II-6. Distribution of public external loan disbursements to Colombia by purpose 1945 to June 30, 1963

Purpose	Amount	Percentage of total
	Millions of dollars	percent
Balance of payments	269	46
Transportation	116	20
Power	67	12
Agriculture	42	7
Industry & Commerce	30	5
Public Services	47	8
Other	14	2
	585	100

SOURCE: Columbia University School of Law: Public International Development Financing in Colombia Report #6 (New York: June, 1963) (Mimeograph).

loans made to Colombia during 1945 to 1961. Forty-six percent of the funds loaned during this period were applied to resolve temporary balance of payments adjustments; investment effects from these would be indirect, and depend mainly on the types of goods imported. One-fifth of the loans were invested in transportation, one-eighth in power facilities, and only seven percent in agriculturally related projects.

The Agricultural Sector

A wide range of physical and climatic conditions allow Colombia to grow a large variety of commodities. Coffee is the most important crop, both in terms of value produced and in terms of area (Table II-7). Corn, rice, cotton, potatoes, platanos, bananas, and yuca follow in importance. The value of beef produced in 1962, mainly for internal consumption, was roughly comparable with that of coffee. Likewise, the combined output of other animal products such as milk, poultry, swine, sheep and goats amounted to a similar value.[21]

Only a small portion of the agricultural output is produced on specialized farm units.[22] The incidence of specialization is higher in coffee producing areas, among large beef producers, in banana production for export, and in the production of cane for refined sugar. Risk considerations, needs for home consumption, and adaptations to existing conditions cause diversified farm units to be the principal type of farm organization.

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[21] Based on calculations from slaughter records and production estimates of various agencies.

[22] The term specialized is applied if 80 percent or more of a farm unit's real product is from one enterprise.

Table II-7. Relative importance of principal crops in Colombia, in terms of area planted and value of production, 1962

Crops	Planted area	Value of production
ANNUAL	(thousand hectares)	(million pesos)
Corn	697	482
Rice	269	476
Cotton	177	422
Yuca	138	260
Wheat	129	150
Barley	48	77
Potatoes	75	305
Beans	74	107
Peas and other pulses	42	32
Onions and garlic	8	53
Tomatoes	4	20
Other vegetables	38	100
Tobacco	18	88
Sesame	40	53
Soybeans	15	21
Peanuts	3	9
Sorghum	10	10
Sub-totals	1,785	2,665
PERENNIAL		
Coffee	840	1,689
Cane-for sugar	75	12
-for panela	200	18
Platanos	220	376
Bananas	54	286
Cacao	32	90
Grapes	2	40
Pineapples	2	25
Miscellaneous fruits	161	108
Sub-totals	1,586	2,601
TOTALS	3,371	5,266

SOURCES: Data on areas planted were assembled from estimates by various agencies such as INA, IFA, and ICE; production data from the same agencies were multiplied by Banco de la República price estimates, in most cases, to obtain value data.

Agricultural production in Colombia is carried out under almost all levels of technology. Modern techniques such as aerial spraying of crops, mechanized planting and harvesting, and use of chemical fertilizers occur in many parts of the country. At the same time, the use of oxen, the hoe, and native varieties of seeds are still common. Specific cases can be found where agricultural resources are being used intensively and efficiently, but most of the agricultural land and human resources are being employed at rates far below capacity. The lag in agricultural growth (shown in Table II-1), and the under-utilized capacity is an indication of deep-rooted problems, the solution of which would have important implications for Colombia's future.

Agricultural Policy

In attempts to increase agricultural productivity and total production, the Colombian government has followed a policy favoring agricultural self-sufficiency since the early 1930's.[23] Import and export controls, plus tariffs, were early devices used to implement this policy. Internal market controls, special credit facilities, price supports, and developmental activities by semi-governmental agencies have also received substantial emphasis.

As Witt and Wheeler point out, Colombia has pursued several closely connected, although not always mutually consistent, objectives in its agricultural policy.[24] Among these are the following: (a) to

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[23] See Theodore J. Goering, Colombian Agricultural Price and Trade Policies (Palmira: Facultad Nacional de Agronomía, 1961), (Mimeographed) and L. W. Witt and R. G. Wheeler, op. cit., pp. 36-47, for further discussion of policy during this period.

[24] Ibid., pp. 39-40.

encourage agricultural exports in order to increase foreign exchange earnings; (b) to ensure some measure of internal price stability for agricultural goods; (c) to restrict export of certain items such as beef in order to protect consumers; (d) to replace imports of agricultural commodities by internal production; and (e) to draw off some of the export earnings from coffee, in the form of multiple exchange rates, for use in financing other projects.

One of the results of pursuing these objectives has been the elevation, above world levels, of internal prices for a number of agricultural products. As is shown in Table II-8, the average internal prices in 1962 for wheat, rice, and copra all were well above those of imports. Internal prices of feed grains, beans and oil crops were also above import prices, but to a lesser degree.[25] Of the commodities shown in Table II-8, only internally produced cotton could have competed, price-wise, with unrestricted world imports in 1962.

The general lack of response by agricultural producers to this favorable price structure, plus the failure of a large part of the rural sector to share in the fruits of economic progress, indicate the presence of serious problems within the agricultural resource base. At this point a more detailed discussion of these resources and associated institutions is appropriate.

Capital and Credit

Most of the capital in the agricultural sector is committed to

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[25] Witt and Wheeler show similar price relationships for 1959 based on support prices and world prices without transportation charges. Ibid., p. 38.

Table II-8. Comparison of producer prices and import prices for selected farm products, 1962

Commodity	Average prices received	Import prices[a/]
	(pesos per metric ton)	
Wheat	957	651
Barley	714	592
Rice, polished	2,120	1,340
Corn	600	538
Sorghum	550	518
Cotton fiber	5,070[b/]	5,387[c/]
Soybeans	950	907
Beans	2,080	1,875
Copra	2,400	1,362

a/ Estimated prices which would have been paid for imports to Colombia from principal sources, including ocean freight.

b/ "Strictly middling" grade.

c/ Export price received, plus freight.

SOURCES: Computed with estimated adjustments for freight charges and exchange conversions, from various reports of Colombian agencies, the U.S.D.A., and the Food and Agriculture Organization.

land resources or cattle. The 1959-60 Census of Agriculture showed only 13,138 tractors being used on farm units.[26] Only about 20 percent of the presently cultivated land is farmed with mechanical equipment.[27] Capital investments in equipment vary widely between farms. A 100 hectare farm in the Cauca Valley producing corn, soybeans, and grapes may have 250,000 pesos invested in equipment, while a small potato, corn, and wheat grower in Nariño may have less than 100 pesos invested in hoes and a small hand sprayer.

For a number of reasons, special governmental actions have been necessary in order to channel credit toward agricultural production. Examples of these attempts are the formation of the Banco Agrícola Hipotecario in 1924, the Caja de Crédito Agrario in 1931, and various special banks for major commodities during the 1950's. In addition commercial banks are required to loan no less than 15 percent of their deposits for agricultural purposes. In spite of these special programs, the proportion of loans going into agriculture has not been especially large. Only 28 percent of the value of the new loans made between 1955-59 went to agriculture (Table II-9). Furthermore, almost 60 percent of the credit going to agriculture in 1960 was for cattle or land purchases.

Some loans by public agencies carry reasonable rates of interest, but commercial bank loans may change 8 to 15 percent per year, and private loans by individuals may carry interest rates of 5 percent

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[26] Departamento Administrativo Nacional de Estadística, Directorio Nacional de Explotaciones Agropecuarias (Censo Agropecuario) Resumen Nacional 1960 (Bogotá, 1962).

[27] Garland P. Wood and Guillermo A. Guerra E., Land Use in Colombia (Medellín: Facultad de Agronomía, 1962), p. 5. (Mimeographed.)

Table II-9. Comparative distribution of new loans made and of the gross national product by sectors, 1955-59

Sector	Gross national product	New loans made
	(percent)	
Agriculture	37	28
Industry	16	22
Commerce	12	38
Services and other	35	12
Totals	100	100

SOURCE: Ministerio de Agricultura (STACA); La Estructura del Crédito Agrícola en Colombia (Bogotá: 1962 mimeo), p. 26.

per month or more.

The relatively low rates of agricultural investments shown in Tables II-5 and II-6, plus the tight credit situation faced by most agricultural producers, are prime reasons for the slow modernization of the agricultural sector. Because credit is difficult and costly to obtain, many farm operators are very unwilling to undertake practices which could result in financial losses.

Agricultural Land Resources

The total area of Colombia is about the same as of Texas and California combined. A large part of this is formed by the Andean Core which takes up the central part of the country. Another sizable portion along the west coast and in the Amazon basin is covered with heavy jungle. Of Colombia's 114 million hectares, less than one-third are exploited in agricultural production (Table II-10). Although one-quarter of the land area is in pastures, much of this is in rough mountain country, dry eastern plains, or on wet land along the north coast.

As can be seen in Figure II-1, crop production runs from north to south along the rich river valleys and is also found on the sides and tops of the mountain ranges. The type-of-farming associations shown in Figure II-1 illustrate the diversity of agriculture.

Only 5 percent of the land is in crop production; roughly 60 percent of this is in temporary crops, and 40 percent in perennials such as coffee, sugar cane, platanos and bananas. The relatively high proportion of the cultivated land in permanent crops is a factor which slows changes in land use, with respect to changes in product or factor prices.

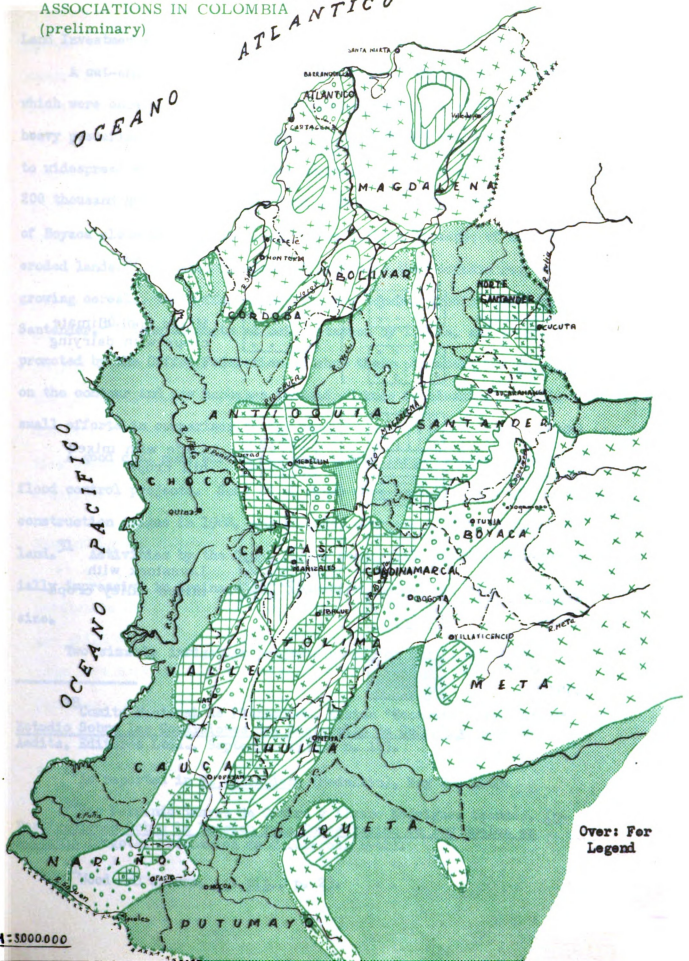
Table II-10. Total land use in Colombia, 1957, and use of land in farms in 16 Departamentos, 1960

Use	Total land use, 1957		Land in farms in 16 Departamentos 1960
	Area (thousand hectares)	Percentage distribution (percent)	(thousand hectares)
Permanent crops	--	--	1,458
Temporary crops	--	--	2,015
Sub-total	--	--	3,473
Commercial crops	3,231	2.8	--
Idle farm land	2,569	2.3	1,581
Natural and artificial pastures	30,000	26.3	14,626
AGRICULTURAL	35,800	31.4	19,680
CITIES and TOWNS	3,240	2.9	--
RIVERS, LAKES, SWAMPS	5,360	4.7	--
OTHER	69,435	61.0	7,692
Totals	113,835	100.0	27,372

SOURCES: Ministerio de Agricultura: Memoria al Congreso Nacional, 1957-8, Tomo I (Bogotá: 1958), p. 190.

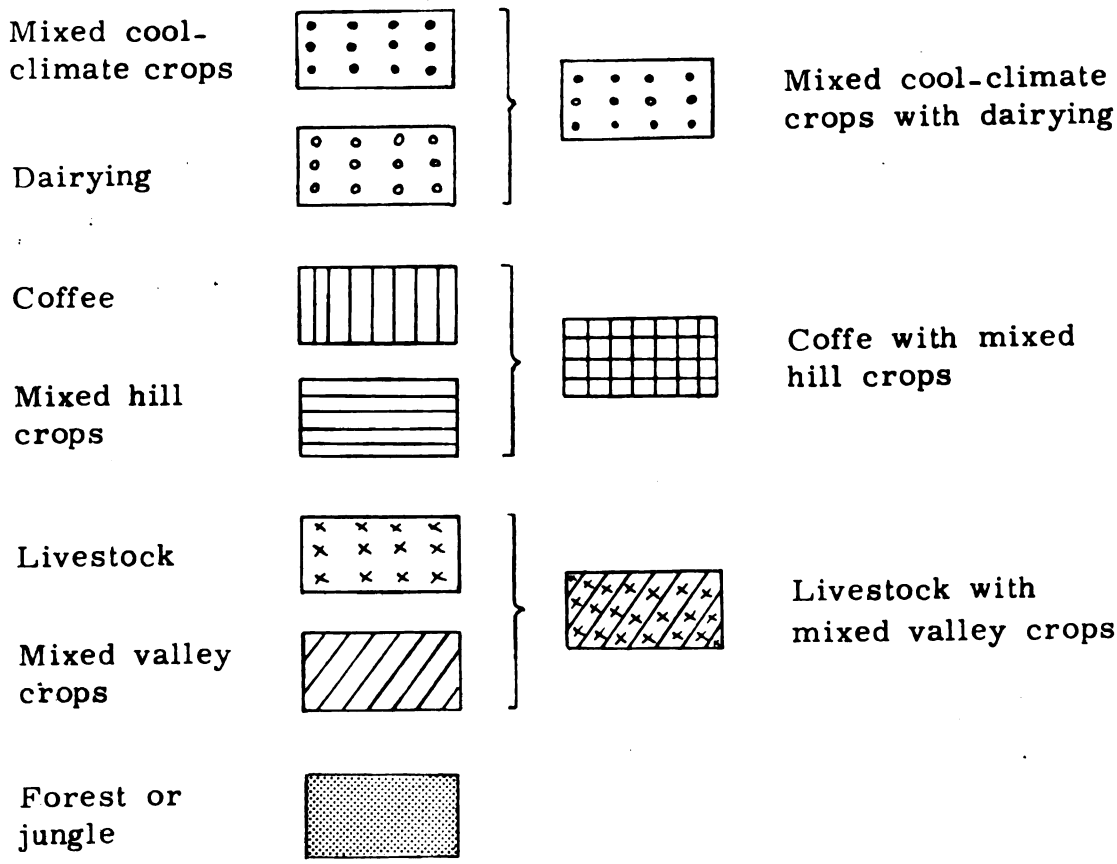
Departamento Administrativo Nacional de Estadística: Directorio Nacional de Explotaciones Agropecuarias 1960, Resúmen Nacional (Bogotá: Dic. 1962 processed), p. 16.

Figure II-1. TYPE-OF-FARMING ASSOCIATIONS IN COLOMBIA (preliminary)



LEGEND

for preliminary map of
TYPE-OF-FARMING ASSOCIATIONS
IN COLOMBIA



Land Investments

A cut-and-burn type of farming has cleared thousands of hectares which were once in timber and undergrowth. Intensive cultivation and heavy pasturing without appropriate soil conserving practices have led to widespread erosion. It has been estimated that Colombia loses over 200 thousand hectares of arable land each year.[28] The Departamento of Boyaca alone is estimated to have one million hectares of seriously eroded lands.[29] Erosion is also noticeable in the mountain regions growing cereals, the coffee areas, and the tobacco growing areas of Santander.[30] Some attempts at reforestation by INCORA, and programs promoted by the Coffee Federation to show their producers how to plant on the contour and use machetes instead of hoes in cleaning are only small efforts in comparison to the need.

A good deal more effort has gone toward large irrigation-drainage-flood control projects. Some 20 of these were in early planning or construction stages in 1962, and included over one million hectares of land.[31] Activities by the Cauca Valley Corporation (CVC) were especially impressive in drainage and irrigation projects of small to medium size.

Two sizable irrigation projects completed during the 1950's

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[28] Comité Nacional de Planeación, Misión "Economía y Humanismo," Estudio Sobre las Condiciones del Desarrollo de Colombia (Bogotá: Aedita, Editores Ltda., September 1958), p. 123.

[29] As reported in El Colombiano (Medellín), May 20, 1963.

[30] See Fernando Suarez de Castro y Alvaro Rodriguez Grandas, Investigaciones Sobre la Erosión y la Conservación de los Suelos en Colombia (Bogotá: Federación de Cafeteros, 1962).

[31] Wood and Guerra, op. cit., p. 23.

in the Departamento of Tolima illustrate the problems connected with these types of investments. Some 15 thousand hectares were scheduled for irrigation in the Coello River area, but only one-quarter of the capacity is being used.[32] Rice is practically the only crop now being irrigated, in spite of the fact that both intensive cotton and sesame production can be found within the project. Similar results have been experienced in the neighboring Saldana River project which included 10 thousand hectares. At least for these two cases, the engineering, planning, and operations appear to have been superior to the economic, and social studies and applications necessary to make a success of the project. Other projects have been planned for areas with from 40 to 100 inches of rainfall per year. Sizable benefits have been predicted for some of these projects, but the economic justification of them appears rather shaky to a number of experts who have examined the available evidence.

Size of Land Holdings

The large land grants previously mentioned caused a disproportionate distribution of land among farm units. Large land holdings are still common, even though a number of downward modifications in size have been made in the original grants through division among families, parcelization and sale, and legalization of squatters' claims.

Partial data from the 1959-60 agricultural census for three important departamentos show that only 2.3 percent of the units emmerated

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[32] Arcesio Tovar Andrade, "Problemas Agronómicos de los Distritos de Riego y su Posible Solución," Economía Gran Colombiana, Vol. 6, No. 17 (Bogotá, 1962), p. 212.

had over 100 hectares, but included almost 50 percent of the total area (Table II-11). Almost the reverse was true for units under 3 hectares which made up over 50 percent of the units, but only had 4 to 5 percent of the land. Estimates for 16 departamentos by CEPAL, based on 1951 data, roughly agree with the partial 1959-60 census results, although definitions used may have been slightly different.

In 1962 INCORA began to register large land holdings, starting first with all individual or corporate holdings of over 2 thousand hectares. A total of 1,238 holdings with almost 7.5 million hectares were declared.[33] Almost one-half of these holdings were located in the eastern Llanos.

Out of this group INCORA selected 257 for further study. A frequency distribution by size appears below.[34]

Size of Holdings (Hectares)	Properties (Number)
2,000 - 2,500	93
2,501 - 3,000	25
3,001 - 4,000	36
4,001 - 5,000	27
5,001 - 10,000	32
10,001 - 20,000	21
20,001 - 100,000	14
100,001 - 500,000	9
Total	257

This information on land holdings, being collected by INCORA, should be some of the most accurate data collected on large land ownership to date,

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[33] Instituto Colombiano de la Reforma Agraria (INCORA), Informe de Actividades en 1962 (Bogotá: Imprenta Nacional, 1963), Appendix, p. 21.

[34] Jesús M. Montoya Restrepo, Alternativas de Producción y Uso de la Tierra en Grandes Propiedades de Colombia, a preliminary draft of a thesis to be submitted to the Facultad de Agronomía at Medellín.

Table II-11. Number of farms and land in farms by size of holding, with percentage distributions, in the Departamentos of Caldas, Cundinamarca and Valle del Cauca in 1959-60 and in 16 Departamentos of Colombia, 1951

Size of holding	Farms		Land in Farms	
	Three depts. 1959-60	Sixteen depts. 1951	Three depts. 1959-60	Sixteen depts. 1951
(hectares)	(numbers)		(thousand hectares)	
less than 1.0	68,939	112,090	34	56
1.0- 2.9	72,167	225,480	135	408
3.0- 4.9	36,539	121,810	139	487
5.0- 9.9	43,443	136,510	305	1,024
10.0- 49.9	42,526	165,481	876	3,911
50.0- 99.9	6,450	29,943	442	2,246
100.0- 499.9	5,392	25,072	1,084	7,522
500.0- 999.9	576	2,902	382	2,176
1,000.0-2,499.9	184	1,212	254	2,121
2,500.0 or more	34	342	137	2,738
Totals	276,250[a]	820,842	3,788[a]	22,689
PERCENTAGE DISTRIBUTIONS: (percent)			(percent)	
less than 1.0	25.0	13.7	0.9	0.3
1.0 - 2.9	26.1	27.5	3.6	1.8
3.0 - 4.9	13.2	14.8	3.7	2.1
5.0 - 9.9	15.7	16.6	8.0	4.5
10.0 - 49.9	15.4	20.2	23.1	17.2
50.0 - 99.9	2.3	3.6	11.7	9.9
100.0 - 499.9	1.9	3.1	28.7	33.2
500.0 or more	0.4	0.5	20.3	31.0
Totals	100.0	100.0	100.0	100.0

a/ The 1960 totals for 16 Departamentos were 1,209,663 farms and 27,371,771 hectares.

SOURCES: Universidad del Valle, Facultad de Ciencias Económicas: Censo Agropecuario del Valle del Cauca, 1959, Edición Preliminar (Cali: October 1961), Cuadro 1.

Departamento Administrativo Nacional de Estadística: Directorio Nacional de Explotaciones Agropecuarias, 1960, Vols. I and II and Resúmen Nacional (Bogotá: 1962).

Comisión Económica para la América Latina: Análisis y Proyecciones del Desarrollo Económico--III. El Desarrollo Económico de Colombia--Capítulo VII. La Agricultura Colombiana E/CN-12/1365/Add. 1 (Bogotá: Naciones Unidas Consejo Ecnnómico y Social mimeo., July 20, 1955), Cuadro VII-48.

but still probably understates the size of operating units. This arises because it is common practice for titles to different parcels of land to be distributed among family members, even though the land is operated as one unit.

Much of the land in these large units is in rough mountain country, wet coastal areas, dry eastern plains, or is not serviced by a satisfactory transportation system. Cattle production is the most common type of economic exploitation on these large units.

Tenure

About three-quarters of Colombia's farm land is owner operated, although some of this may be through a hired manager or under some special family arrangement (Table II-12). About 14 percent of the land is operated by colonos or squatters, who do not have clear title.

Farm production under rental arrangements, share cropping, and special partnerships, does not take up a large percentage of the land in farms, but is important in terms of number of farms involved and is especially prominent in certain crops. About half of the cotton, for example, is grown on rented land, and almost three-quarters of the area in tobacco is operated by sharecroppers. Tangled tenure arrangements are also very common in the cereal producing regions and in rice production.

Owner operated lands are more common in coffee regions, and in cattle and dairy units.

Land Tenure Policy

The formation of INCORA in 1961 was only one of a long series of public actions aimed at changing Colombia's land tenure system. Spanish

Table II-12. Distribution according to tenure of land in farms in 16 departamentos, 1960[a/]

Form of tenure	Area	Percentage Distribution
	(thousand hectares)	(percent)
Owner operated	20,568	75.1
Operated by renter		
- paying in cash	659	2.4
- paying in kind	73	0.3
- paying in cash and kind	26	0.1
- paying in share of crop	1,105	4.0
- paying in services	91	0.3
- paying in other forms	533	2.0
Operated by colonos	3,755	13.7
Other	562	2.1
Total	27,372	100.0

a/ Excludes the Departamento of Chocó, the intendencias, and the comisarías.

SOURCE: Departamento Administrativo Nacional de Estadística: Directorio, Nacional de Explotaciones Agropecuarias, 1960, Resúmen Nacional (Bogotá, Dic. 1962), p. 15.

kings as early as the 16th century were issuing decrees aimed at forcing more intensive use of large land grants,[35] Concessions made to Antioqueño colonizers in the late 1800's and early 1900's were important steps toward more intensive use of Colombia's land.

A high point in government attempts to legislate land reforms came with the passage of Law 200 in 1936. Two key points were included in this law: squatters who had been established on private property for over two years could not be evicted, and all privately owned land in units of over 300 hectares, which remained untilled for 10 years in succession, was to revert back to the public domain. Some titles were later granted to squatters on private lands, but nothing was done about confiscating under-utilized holdings.

Various tax schemes and special land classification programs were proposed and partially enacted during the 1950's.[36] None of these proved adequate to meet the problems at hand.

The formation of INCORA by Law 135 in 1961 had six principal objectives:

1. to eliminate the inequitable distribution of land resources,
2. to help form economic enterprises on under-utilized land,
3. to increase production and productivity of resources within agriculture,
4. to help raise the general standard of living in the rural areas,

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[35] See Albert O. Hirschman, op. cit., pp. 93-158, for further information on Colombia's land tenure policy.

[36] See International Bank for Reconstruction and Development, The Basis of a Development Program for Colombia (Washington, 1950), especially Chapters 5 and 18.

5. to assist in making better contractural arrangements for nonowners of land,

6. to aid in conserving the natural resources of Colombia.

By the latter part of 1963, INCORA had given new titles to nearly 7 thousand families for a total area of over 300 thousand hectares.[37] Many of these families were settled in colonization projects on public lands. A useful by-product of INCORA's activities has been the greatly decreased rate of land purchases by larger landholders.

Agriculture's Human Resources

The lack of public investments aimed at improving the economic and social well being of Colombian farm people is even more apparent than the shortcomings in land investments. The rural individual is often stereotyped as a poor manager, lazy, and largely indifferent to change, but the lack of education, health facilities, and other social opportunities largely helps to explain rural individuals' reactions.

Unfortunately, the problem of determining the number of people who live on farms, and the number who depend on farm income for part or all of their living, is largely unanswerable from data presently available. The process of using the place of residence, as was done in the 1951 population Census, gives a false impression since many operators and farm workers live in so-called urban centers.[38]

As a general rule, towns and communities in Colombia with less than 10 thousand inhabitants fail to take on many urban characteristics.[39]

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[37] As reported in El Colombiano, August 31, 1963, p. 3.

[38] The 1951 Census defined aggregation of more than 1500 inhabitants urban, and those with less rural.

[39] See two studies by the Facultad de Sociología of the Universidad

Using this as an approximate guide, over 65 percent of Colombia's population would be living in areas where agriculture is predominant (Table II-13).

Little or no research has been done on determining the sources and sizes of non-farm income earned by farm people. Sketchy information gathered while making the preliminary surveys and case studies suggests that in some instances non-farm income may contribute a sizable portion of so called farm-families' incomes. Small tiendas or shops are common in farm homes throughout Colombia. Also, a number of merchants, professional men, and government officials own agricultural land from which they earn significant portions of their total income.

Rural Health

Even though some excellent health facilities are available in Colombia, doctors, dentists, and hospitals are heavily concentrated in the larger urban centers. In a partial attempt to offset this rural health disadvantage the government requires new doctors to practice one year in rural service. Nevertheless, it can be observed that infant mortality in rural areas of Antioquia in 1960 was 118 per thousand while the average for the Departamento was only 72 per thousand.[40] Furthermore, one may note that residents of Bogotá in 1960 received

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Nacional, Andrew Pierce, Factores Sociales que Indicen en el Desarrollo Económico de la Hoya del Rio Subachoque (Bogotá, February, 1963), (Mimeographed); and A. Eugene Havens, A Socio-Economic Study of Cereté, Córdoba - An Area of Latifundio (Bogotá, June, 1963). (Preliminary Manuscript.)

[40]Governación de Antioquia, Departamento Administrativo de Planeación, Plan General de Desarrollo Para Antioquia, Part #1 (Medellín, October, 1961), p. 260.

Table II-13. Distribution of Colombia's population by size of community, July 1962

Size group	Population	Percentage distribution
	(thousands)	(percent)
A. Cities of 20,000 or more:		
100,000 or more	3,446	24
50,000 - 99,999	583	4
20,000 - 49,999	564	4
Sub-totals	4,593	32
B. Cities of 5,000 to 9,999 in municipios of 20,000 or more:		
10,000 - 19,999	402	3
5,000 - 9,999	313	2
C. All others	9,138	63
Totals	14,446	100

SOURCE: Unpublished data from the files of the Departamento Administrativo Nacional de Estadística.

innoculations for typhoid and paratyphoid at the rate of 97 per thousand, while residents of the heavily rural Departamentos of Córdoba and Nariño, where the water supply is less carefully protected, only received 36 innoculations per thousand.[41]

The DDT spraying program carried out in most of the warm climate regions has helped to reduce malaria and yellow fever in rural areas. In 1957, over 76,000 people, mainly in warm climate rural areas, reported cases of malaria. By 1962, with the help of house-to-house spraying programs, this number had dropped to less than 18,000.[42] Malaria and yellow fever appear to be well on the way to being controlled with innoculations and sprays, but internal parasites, malnutrition, and dysentery continue to sap energy from rural residents.

Platanos, rice, yuca, potatoes, corn, beans, and panela (crude brown sugar) make up the staples of rural diets. Low intake of protein and green vegetables leads to a generally inadequate diet. The consequence of this diet is reflected in the short stature, bad teeth, and general debility of rural people.

Although some 47 million dollars worth of PL 480 foods had been donated to Colombia under Title III up to mid 1963,[43] relatively little of this food reaches the rural areas. One cannot help but wonder what the effect on overall productivity would be in agriculture if health

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[41] Departamento Administrativo Nacional de Estadística (DANE), Anuario General de Estadística 1960 (Bogotá, 1962).

[42] Unpublished data provided through the courtesy of the Ministerio de Salud, Bogotá.

[43] U. S. House of Representatives, op. cit., (18th Semi-annual Report), p. 107.

facilities and standards in rural areas were as high as in the urban areas.

Primary Education in Rural Areas

As of July 1963, it was estimated that 1.7 million of Colombia's 3 million children of school age (7 to 14) could not read or write.[44] The paucity of education in agricultural areas is especially noticeable, and affects the productivity of operators as well as of workers.

By law, five years of elementary education are obligatory. In fact, almost 80 percent of the rural schools offer less than three years of education (Table II-14). This contrasts with over half of the urban schools which have a complete 5 years. As could be expected, few rural children complete their primary education and are eligible for further formal training. The data in Table II-15 show that more students register for the first grade in rural areas than in urban areas, but that only a small fraction of these rural children are able to complete the required 5 years. In addition, the proportion of eligible students attending school in the rural areas is obviously lower than elsewhere, although no dependable data are available to substantiate this. Some rural schools offer classes only on a half-time basis, since it is common to use a single building and teaching staff for separate groups of boys and girls. The level of education, moreover, of rural teachers is considerably below that of their urban counterparts. Data for 1960 showed that 68 percent of the rural teachers had less than 10 years of formal education, while only 31 percent of the

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[44] Departamento Administrativo Nacional de Estadística, Boletín Mensual de Estadística, No. 151 (Bogotá, October, 1963), p. 13.

Table II-14. Distributions of urban and rural schools according to the highest year offered, 1960

Highest year offered	Numerical distribution		Percentage distribution	
	Urban[a/]	Rural	Urban[a/]	Rural
First	308	907	5	7
Second	731	9,581	12	72
Third	776	1,947	12	15
Fourth	1,038	631	17	5
Fifth	3,388	209	54	1
Totals	6,241	13,275	100	100

a/ Urban schools are those in the central city of each municipio. They are generally much larger than the rural schools.

SOURCE: Departamento Administrativo Nacional de Estadística: Anuario General de Estadística, 1960 (Bogotá: 1962), pp. 224-7.

Table II-15. Registrations and completions for the 5 years of primary school by urban and rural students, 1960

School year	Registrations		Completions	
	Urban	Rural	Urban	Rural
	(thousands)			
First	373.0	406.0	231.5	226.7
Second	256.7	192.0	169.8	128.4
Third	193.7	30.5	132.4	20.4
Fourth	133.8	8.4	96.2	5.8
Fifth	93.8	2.4	74.1	1.8
Totals	1,051.0	639.3	704.0	382.7

SOURCE: Departamento Administrativo Nacional de Estadística: Anuario General de Estadística, 1960 (Bogotá: 1962), various pages.

urban teachers did not have more than this. Over one-quarter of the rural teachers had less than 5 years of formal schooling while only 5 percent of the urban teachers fell into this group.[45]

The combined effect of these conditions is the virtual exclusion of rural students from secondary schools and universities, except for those few whose parents can afford to send them to city schools.

Higher Agricultural Education

Of almost 31 thousand university students in 1962, only six percent were majoring in agricultural subjects (Table II-16). This low proportion is hard to reconcile with the importance of the agriculture sector in Colombia, and the fact that it is generally this sector which has most of the non-Pareto-better adjustments to make during the growth process. Furthermore, the less than two thousand students majoring in agriculture are spread thinly among 9 institutions.

The agricultural educational deficiency is even more serious with regard to vocational or normal schools for training sub-professionals or expertos. Presently there is only about one experto for each three agrónomos and veterinarians, even though a reversal of this ratio could enable the limited number of professionals to extend their influence more widely.[46] Some sub-professional training is being provided by SENA (Servicio Nacional de Aprendizaje). In 1962 some 19 thousand students were registered for SENA classes, but only 11 percent of these

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[45] Computed from the Anuario General 1960, op. cit., pp. 224-237.

[46] Comisión de Educación Agrícola Superior, Educación Agrícola Superior en Colombia (Bogotá: Universidad Nacional, April, 1961).

Table II-16. Distribution of Colombian university students by majors, 1962

Majors	Numberical distribution			Percentage distribution
	Within Country	Outside Country	Total	
	(numbers)			(percent)
Agriculture	1,954	138	2,092	6
Education	1,536	95	1,631	5
Engineering	6,778	560	7,338	22
Fine Arts	2,511	136	2,647	8
Humanities	2,108	358	2,466	8
Law	4,387	48	4,435	13
Medicine	4,646	425	5,071	15
Natural Sciences	3,132	189	3,321	10
Social Sciences	3,837	468	4,305	13
Totals	30,889	2,417	33,306	100

SOURCE: Departamento Administrativo Nacional de Estadística: Boletín Mensual No. 146 (Bogotá: May 1963), pp. 119-20.

were for agricultural topics.[47] A few other agricultural vocational schools supply a trickle of technicians.

Extension Education

Rural extension activities began in Colombia in 1954. The number of agencies as well as the numbers of individuals involved have increased considerably since then. In addition to extension activities carried out by the Ministry of Agriculture, other groups such as the National Coffee Federation, the Cauca Valley Corporation, the Cotton and Tobacco Development Institutes and several other agencies function in an extension capacity. In 1961, the number of extension workers and administrators employed by the first five mentioned agencies totaled 678. About three-fourths of these were employed by the Coffee Federation alone.[48]

The division of responsibility for extension among these various agencies has somewhat reduced its effectiveness. Individuals promoting cotton production, for example, may not be well trained to handle farm management problems outside of cotton production. Furthermore, a number of extension agents have their interests divided between extension activities and private business. Few of the 1,000 farmers interviewed in the preliminary survey had made contact with and received help from extension people. A large proportion, especially outside the coffee areas, asserted that they had failed to receive technical

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[47] Servicio Nacional de Aprendizaje (SENA), Boletín de Estadística, No. 29, (Bogotá, 1963), p. 6.

[48] Instituto Interamericano de Ciencias Agrícolas de la OEA, Estudio Analítico de Cinco Organizaciones de Extensión en Colombia (Turrialba, Costa Rica, 1962), Preface. (Mimeographed.)

assistance from anyone.

Heady's comments that education can be used for changing or maintaining the pattern of personal income distribution, and that the poor can be kept in a state of poverty by withholding education from them, have considerable applicability in Colombia—especially with respect to the agricultural sector.[49]

Summary

As has been noted in the previous discussion, agricultural production is still a major feature in Colombia's economy. The continued rapid growth in the industrial sector will largely depend on imports of capital goods paid for by exports of agricultural commodities, and upon raw materials furnished by agriculture. Furthermore, the degree to which agriculture is able to continue increasing production to meet these demands, while feeding a rapidly expanding population, will largely determine whether imports are to consist of capital goods or foods.

In 1960, the difference in product per person between the agricultural and industrial sectors was approximately 8 thousand pesos—roughly 3 thousand pesos to 11 thousand pesos respectively—this implies that significant progress can be made in increasing productivity in agriculture.[50] A recent proposal would do this by moving some 20

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[49] Earl O. Heady, Agricultural Policy Under Economic Development (Ames: Iowa State Press, 1962), p. 509.

[50] Consejo Nacional de Política Económica y Planeación Departamento Administrativo de Planeación y Servicios Técnicos, Plan Cuatrienal de Inversiones Públicas Nacionales - 1961-1964 (Bogotá, December, 1960), p. 17. (Processed.)

percent of the rural work force, idle hands and "marginal farmers", into the city over a period of several years, and by mechanizing much of the agricultural production.[51] This proposal, and others similar to it, overlook the fact that large investments must be made in the health and education of rural individuals before they can successfully move into an urban environment. Rural to urban migration, furthermore, tends to consist of young, healthy, and better educated individuals rather than of so-called "marginal farmers". It is therefore possible that increasing the rate of rural migration may decrease rather than increase rural productivity, even if this migration is partially offset by more farm mechanization.

Obviously no simple method exists for increasing total agricultural production and resource productivity. Special price incentives, crop development programs, land redistribution, and induced migration and mechanization will each only be partially successful. It is no mere coincidence that the United States invested billions of dollars in education in rural areas, and additional billions in agricultural land investments, before and during its large increase in food and fiber production in the mid-part of the 20th century, and that Colombia finds itself with a lagging agricultural sector, having failed to make similar investments.

Investments in rural health and education will need to have high priority if the present land reform program is to succeed. Furthermore, these investments will be needed if farm units are to develop the flexibility necessary to adjust to various external pressures and stimuli such as might be provided by various levels of PL 480 programs.

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[51] See Lauchlin Currie, Ensayos Sobre Planeación: Introducción a Una Teoría de Desarrollo Conocida Como Operación Colombia (Bogotá: Ediciones Tercer Mundo, 1963), especially p. 55.

CHAPTER III

PRODUCTION ADJUSTMENT POSSIBILITIES FOR WHEAT AND COMPETING ENTERPRISES

Wheat and flour made up 56 percent of the market value of all Title I commodities programmed for shipment to Colombia through mid-1963.[1] Large quantities of commercial imports were also necessary to satisfy internal needs. Imports of wheat in 1962 were valued at over 13 million dollars, which ranked wheat as the number one agricultural commodity import.[2] Wheat production made up less than three percent of the total value of the principal crops produced in 1962 (Table II-7), but it was an important enterprise and source of income for thousands of Colombian farms.

Production and Import Trends

The production of wheat in Colombia more or less doubled between 1932 and 1941, going from 77 thousand metric tons to about 142 thousand metric tons.[3] Bad weather, poor management practices, and

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[1] U. S. House of Representatives op. cit., (18th Semiannual Report), p. 67.

[2] Departamento Administrativo Nacional de Estadística, Boletín Mensual de Estadística, No. 145 (Bogotá, April, 1963), p. 36.

[3] Theodore J. Goering, Wheat Production in Colombia (Palmira: Facultad Nacional de Agronomía, 1962), p. 2. (Mimeograph.)

disease problems actually caused total production to drop as low as 81 thousand metric tons in 1945.[4] The introduction of rust resistant varieties, fertilizers and better production techniques in the early 1950's helped to return output to roughly the 1941 level.

Estimates of wheat production and area harvested vary a great deal among different reporting sources. It is not uncommon for agencies such as the Caja Agraria, and the Instituto Nacional de Abastecimientos (INA) to publish estimates which may differ by 25-50 percent (Table III-1).[5] The domestic production data presented in Tables III-1 and III-2 are, therefore, by no means precise, but they do indicate a fairly constant rate of total production during the 1950's and early 1960's.

It can also be noted in Table III-2 that imports of wheat tended to become a larger portion of total supply from 1958 to 1962. Unless internal production is significantly increased it is probable that Colombia will soon be consistently importing over half of its wheat needs.

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[4] Guillermo Palacio Del Valle, Desarrollo Agrícola de Colombia 1940-1952 (Bogotá: Ministerio de Agricultura, Economía Agrícola,

[5] See Goering, op. cit., (Wheat Production) pp. 3-6, for further discussion of these data discrepancies.

Table III-1. Total wheat production and area harvested in Colombia as reported from two different sources, 1950-62

Year	Total production		Area harvested		Yield per hectare	
	Caja	INA	Caja	INA	Caja	INA
	(thous. tons)		(thous. hectares)		(met. tons per hectare)	
1950	102	n.a.	144	n.a.	0.71	n.a.
1951	130	n.a.	174	n.a.	0.75	n.a.
1952	140	n.a.	188	n.a.	0.75	n.a.
1953	145	n.a.	175	n.a.	0.83	n.a.
1954	146	n.a.	195	n.a.	0.75	n.a.
1955	147	166.5	195	211.7	0.75	0.79
1956	150	160.0	132	203.4	1.14	0.79
1957	184[a/]	158.0	170	180.3	1.08	0.88
1958	156	129.0	178	121.8	0.88	1.06
1959	150	130.7	160	116.9	0.94	1.12
1960	153	145.2	170	135.6	0.94	1.07
1961	n.a.	142.1	n.a.	160.0	n.a.	0.89
1962	150	162.0	125	129.2	1.20	1.26

a/ Other estimates for 1957 have been as low as 100 thousand tons.

SOURCES: Caja de Crédito Agrario Industrial y Minero, Departamento de Investigaciones Económicas: Estimativos de Producción de Trigo (Bogotá: Marzo 14, 1961, mimeo)

_____: Carta Agraria, No. 80 and No. 101 and No. 124 (Bogotá: Enero and Noviembre 1962 and November 1963).

Instituto Nacional de Abastecimientos: mimeographed worksheets on production and consumption of wheat.

Table III-2. Principal sources of wheat and flour supply in Colombia, 1950-62[a/]

Year	Principal supply sources				Imports as a percentage of supply
	Domestic production	Commercial imports	P.L. 480 imports	Total	
	(thousand metric tons)				(percent)
1950	102	74	--	176	42
1951	130	65	--	195	33
1952	140	57	--	197	29
1953	145	58	--	203	29
1954	146	87	--	233	37
1955	167	55	22	244	32
1956	160	51	56	267	40
1957	157	58	63	278	43
1958	129	82	28	239	46
1959	131	24	86	241	46
1960	145	62	63	270	46
1961	142	82	82	306	53
1962	162	74	65	301	46

a/ The wheat equivalent of flour was calculated and included by assuming an extraction rate of 72 percent.

SOURCES: Domestic production from sources indicated in Table III-1. Imports calculated from data of USDA Foreign Agricultural Service: Colombian Agriculture (Bogotá: U.S. Embassy, July 1962 mimeo.), pp. 26-27, and from 1961-62 worksheet data provided by Instituto Nacional de Abastecimientos.

Area Harvested and Yields

The number of hectares of wheat harvested each year is somewhat in doubt, but both the Caja Agraria and ICA agree that there has been a significant decrease since the mid-1950's (Table III-1). Increasing competition from other enterprises found in cool climate regions, at elevations between 2000 and 3000 meters, have apparently been important factors in reducing the area planted to wheat. Barley, corn, potatoes, pasture for dairy, and some vegetables are all important competitors for land capable of growing wheat.

Especially significant in this respect are the barley development programs carried out by the Colombian breweries through Procebada. In spite of the fact that the area planted to barley showed no clear sign of increasing during the 1950's and early 1960's (Table III-3), the 100 percent increase in average yields of barley helped it to compete for quality wheat land. Improved seed, technical assistance to barley growers, timely price policies, and improved marketing channels were factors in the enhanced competitive position of barley. Mechanized producers of cereals in the Sabana, furthermore, have recently been double cropping barley; a practice that is almost impossible with wheat, which requires a longer growing period.

Unfortunately, there is little reliable aggregate data to show the relationship over time between the area of wheat and other serious competitors such as potatoes and pasture for dairy. The data gathered from the preliminary surveys in the Sabana indicated that the production of potatoes, vegetables and dairy had expanded during the past few years. The utilization of fertilizers and sprays for

Table III-3. Barley area, production, yield and use of improved seeds, 1950-62

Year	Area	Production	Average yield	Proportion of area planted with improved seeds
	(hectares)	(metric tons)	(kilos)	(percent)
1950	43,910	50,470	1,149	--
1951	47,000	56,200	1,196	--
1952	51,000	61,000	1,196	--
1953	62,900	79,000	1,255	--
1954	53,000	65,000	1,226	0.02
1955	43,000	52,000	1,209	2.0
1956	50,000	57,000	1,140	20.0
1957	48,000	60,000	1,250	50.0
1958	43,250	75,000	1,734	70.0
1959	60,500	115,000	1,900	90.0
1960	56,300	125,382	2,227	91.0
1961	48,140	99,390	2,064	95.0
1962	48,400	108,000	2,231	n.a.

SOURCES: Letter of Aug. 30, 1963 from Dr. Jorge Quintero of the Instituto Colombiano de Cereales, and unpublished data furnished earlier by the Asociación para el Fomento del Cultivo de la Cebada.

potatoes, and the availability of better quality dairy cattle and concentrates have also apparently improved these enterprises' competitive position vis-a-vis wheat. This is particularly true in the cool climate areas of Cundinamarca and Boyacá which supply the large urban market in Bogotá. The more or less constant rate of domestic production of wheat has apparently been the product of gradually rising average yields and a downward adjustment in the area harvested. In spite of improved yields, the average production of wheat has only been around one metric ton per hectare (15 bushels per acre) in recent years (Table III-1).

Organizations Dealing with Wheat Production

In 1962 the Instituto de Cereales (ICE) was initiated as a semi-official organization, partially financed by private funds. Functions of Procebada, plus the corn and wheat development programs of the Caja Agraria, were absorbed by ICE. Extension activities, soil analysis, fertilizer recommendations, and barley seed registration are ICE's main activities.

Funds for a wheat development program are to be furnished by the Instituto Nacional de Abastecimientos (INA). This semi-public agency, formed in 1944, is charged with helping in production, distribution, price stabilization, and importation of basic food commodities. INA handles all commercial and Titles I and IV imports of wheat. Goering calculated that a mark-up on PL 480 imports provided a large portion of INA's revenue, ranging from 28 to 83 percent of its total expenditures during the 1957-60 period.[6]

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[6] Op. cit., (Thesis), p. 93.

INA acts as the middle man who buys, stores, and distributes a sizable portion of the wheat in Colombia. Through the use of imports and storage of some internal production, they are able to regulate internal prices of wheat. However, in 1960-61 only 68 thousand metric tons of storage space was available in INA facilities--only enough to store 23 percent of the total supply shown for 1961 in Table III-2.[7] Only 5 percent of the internally produced wheat entered these facilities in 1961, since this space was also shared with other crops such as rice, potatoes and yuca.

The Caja Agraria handles most of the credit, seed, and fertilizer used by wheat producers. In addition, the Caja also handles the sale of some farm machinery.[8]

Price Relationships and Areas of Production

From 1952 to 1962 the upward movements in prices for wheat, barley, and potatoes were more or less proportional, while corn prices increased more rapidly (Table III-4). A large increase in barley prices can be noted after 1955, and in corn prices after 1960. The recent jump in corn prices is one explanation for continued production of this crop in cool climates where corn takes almost half

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[7] Instituto Nacional de Abastecimientos, Informe del Gerente al Señor Presidente de la República y a los Miembros de la Junta Directiva (Bogotá: Litografía Colombia, 1961), p. 105.

[8] For additional information on INA and the Caja see Goering, op. cit. (Wheat Production), pp. 32-36.

Table III-4. Average prices received by Colombian producers for wheat, barley, potatoes, and corn, 1952-62

Year	Wheat	Barley	Potatoes	Corn
		(pesos per metric ton)		
1952	630	410	212	205
1953	630	390	278	240
1954	710	380	319	330
1955	650	400	211	300
1956	680	425	312	350
1957	760	480	311	430
1958	870	580	370	385
1959	940	630	304	450
1960	880	624	350	474
1961	975	637	504	629
1962	963	630	303	638
		(percentage increase)		
Increase from 1952-53 to 1961-62	54	59	65	186

SOURCES: Banco de la República, Departamento de Investigaciones Económicas: unpublished data.

Instituto Nacional de Abastecimientos, Departamento de Investigaciones Económicas: unpublished data.

again as much time to mature as in warmer areas.

Prices for wheat are uniform on a national basis, although prices received by farmers may vary widely depending on general quality, moisture content and impurities. This is also true of barley. Prices of vegetables, potatoes, corn, and dairy products, on the other hand, vary widely among principal areas of production. On the basis of this price structure, one would expect the Sabana around Bogotá to tend toward specialization in bulky products like potatoes, vegetables and milk, while other regions with a disadvantage, transportation-wise, would tend toward production of wheat and barley. Only a slight hint of this trend is shown in Table III-5 by the increased wheat production in Nariño. If data were available they would likely show that production of potatoes and dairy for commercial sale was relatively less important in remote Nariño than in Boyacá and Cundinamarca.

Over the past few years one-third of the wheat has been produced in Boyaca, one-third in the Sabana of Cundinamarca, and one-third in Nariño and other high mountain areas. Most of the production comes in the second half of the year. Two crops a year are grown in some areas of Nariño, the Santanders and Boyacá (in 1962). The climate in these areas is cool to cold, and killing frosts are not uncommon at the higher altitudes in several months of the year.

Soil characteristics and topographical features vary greatly between wheat producing areas. In general the land in the flat fertile Sabana is quite acidic but responds well to applications of calcium phosphate. Wheat is also grown on farm units around the edge of the Sabana on land which is less fertile and more broken. Crops in the

Table III-5. Wheat production in primary producing areas of Colombia, by semesters, 1955-62

Year	Boyacá 2nd sem.	Cundinamarca 2nd sem.	Nariño 1st	Nariño 2nd	Other 1st	Other 2nd	Total
	(thousand metric tons)						
1955	58	54	5	20	8	21	166
1956	56	50	6	23	7	18	160
1957	45	50	7	30	6	19	157
1958	35	40	6	24	6	18	129
1959	43	34	7	28	5	14	131
1960	52	47	9	21	5	11	145
1961	29	55	12	30	3	13	142
1962	47 a/	65	7	23	4	16	162

a/ Includes 5,000 metric tons of first semester production.

SOURCE: Unpublished data furnished by the Instituto Nacional de Abastecimientos.

wheat areas of Boyacá are located mainly on land which is rolling to rough and often eroded, although some narrow valleys also supply fairly flat land for wheat and barley production.[9] Land planted to cereals in Nariño is even more broken than in Boyacá, but some areas near Pasto are level enough for mechanized harvesting.[10]

Experiments have been carried out since 1955 to develop a warm climate wheat, which could be used in rotation with rice in Valle, Tolima and Huila. The Federación Nacional de Arroceros and the Instituto de Fomento Algodonero (IFA) have both grown wheat on experimental farms. Goering calculated that up to 25 thousand hectares of rice land might be employed in a rotation with wheat if proper varieties can be developed.[11] Even if satisfactory varieties are developed, it is uncertain that wheat can compete economically with other crops which might be rotated with rice.

Characteristics of Producing Units

The social and economic compositions of farm units in the cool climate area are important factors in determining wheat output. Unlike wheat production in the United States and Canada, much of Colombia's wheat is produced on small to medium-sized diversified units.

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[9] See Orlando Fals Borda, El Hombre y la Tierra en Boyacá: Bases Socio-Históricas Para una Reforma Agraria (Bogotá: Antares, 1957), for additional background on Boyacá.

[10] See Ignacio Rodríguez Guerrero, Geografía Económica de Nariño: La Industria Agrícola, Tomo II (Pasto: Editorial Sur Colombiana, 1961) for additional background on Nariño.

[11] Op. cit., (Wheat Production), pp. 15-18.

Some larger, mechanized units are found in the Sabana, and in parts of Boyacá, but a large portion of the wheat is planted and harvested by hand. In 1958, it was calculated that only 34 percent of Colombia's wheat production was mechanized—some 56 percent of the wheat produced in Cundinamarca, 34 percent in Boyacá, and only 24 percent in Nariño.[12] Oxen and the hoe are widely used on smaller units where land may be too steep for mechanization.

Size and Types

In Cundinamarca almost 40 percent of the wheat grown is on farm units of less than 10 hectares (Table III-6). About 50 percent of the area planted, furthermore, is in lots of no larger than 5 hectares. The average area planted to wheat per farm was only a little over 2 hectares. Taking into consideration the generally smaller units in Boyacá and Nariño it is likely that average wheat plantings per farm for the nation are only between 1.5 and 2 hectares.

A rough summary of municipio data from the 1960 Census suggests that the principal wheat-producing areas include some 250 thousand farms, or about one-fifth of the total for the country. The farm area included is a smaller proportion of the country total since farm units are generally larger outside the wheat producing areas.

As can be noted in Table III-7, farms of all sizes in both Nariño and Cundinamarca carry a fairly even balance between livestock and crops. The farms in Nariño, however, generally have

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[12] Anibal Torres, Estimación de las Areas Mecanizadas en Colombia en 1958 (Bogotá: Instituto de Investigaciones Tecnológicas, November, 1959), p. 5; and data supplied by the Caja Agraria.

Table III-6. Area of wheat on farms in Cundinamarca, by size of farm with wheat, and by size of planting

Size class	Farms with wheat	Area of wheat		Percentage distribution of total wheat area
		Total	Per farm	
(hectares)	(number)	(hectares)		(percent)
SIZE OF FARM				
less than 1.0	2,636	1,010	0.4	3
1.0 - 4.9	7,152	6,709	0.9	19
5.0 - 9.9	3,251	5,918	1.8	17
10.0 - 19.9	1,643	4,792	2.9	14
20.0 - 49.9	1,036	5,445	5.3	16
50.0 - 99.9	309	3,591	11.6	10
100.0 - 199.9	161	3,664	22.7	11
200.0 - 999.9	100	3,314	33.1	9
1,000.0 or more	7	421	60.1	1
All Farms	16,295	34,864	2.1	100
SIZE OF PLANTING				
less than 1.0	8,942	4,555	0.5	13
1.0 - 1.9	3,854	5,760	1.5	16
2.0 - 4.9	2,248	6,932	3.1	20
5.0 - 9.9	789	5,251	6.7	15
10.0 - 49.9	412	8,300	20.1	24
50.0 or more	50	4,066	81.3	12

SOURCE: Departamento Administrativo Nacional de Estadística: Directorio Nacional de Explotaciones Agropecuarias, 1960, Vol. I. Cundinamarca (Bogotá: 1962), pp. 82 and 87.

Table III-7. Percentage distribution of crop and livestock enterprise units[a/] on 248 preliminary survey farms in Nariño and Cundinamarca, by size of farm

Area and size	Farms	Crops						Live-stock
		Wheat	Barley	Potatoes	Corn	Other	Total	
IPIALES-PUPIALES	(No.)	(percent of all enterprise units)						
Subsistence[b/]	42	14	8	15	10	10	57	43
Commercial:								
0.5 to 5.0 has.	23	19	9	29	10	5	72	28
5.1 to 10.0 "	29	19	16	29	11	4	79	21
10.1 to 50.0 "	30	20	21	19	8	4	72	28
50.1 has.or more	21	35	20	11	5	1	72	28
All farms	145	30	19	15	6	2	72	28
SABANA								
Subsistence[b/]	7	11	0	3	22	1	37	63
Commercial:								
2.0 to 10.0 has.	24	13	9	23	3	1	49	51
10.1 to 50.0 "	30	18	10	16	3	1	48	52
50.1 to 100.0 "	17	15	33	13	c/	c/	61	39
100.1 to 200.0 "	13	19	15	18	3	1	56	44
200.1 or more "	12	18	12	8	1	1	40	60
All farms	103	17	15	12	1	1	46	54

a/ One enterprise unit was assigned to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock.

b/ Farms were classified in the subsistence group when more than half of their agricultural activity appeared to be devoted to production for home use.

c/ Less than 0.5 percent.

proportionately less livestock. It is interesting to note that livestock production was important even on small subsistence farms in the Ipiales-Pupiales and Sabana samples. Many of these small units pasture one or two cows along fence lines, on roadsides, or on other public pastures.

In Nariño, the percentage of the enterprise units made up by wheat increased with the size of the farms, while in the Sabana only the smallest farms had less than 15-19 percent of their enterprise units in wheat.[13] The higher proportion of livestock units found in the Sabana is an indication of the large amount of dairy farming developing there to supply the Bogotá market.

Almost all of the small to medium-sized farms visited in the wheat areas had some other crops such as corn, potatoes, and beans, which were grown primarily for home consumption.

Data in Table III-8 show the classification of the commercial farms in Nariño and Cundinamarca on the basis of types. Only one-quarter of the units were classified as being specialized, based on their 1962 operating units. Many of those listed as specializing in potatoes and grain might be classified as mixed crop farms if several years' production were considered; on many farms potatoes follow cereals to take advantage of residual fertilizers. Furthermore, the inter-changeability of potatoes, wheat, and barley often depends on price relationships. Over half of the farms visited were diversified units with both cattle and crops.

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[13] See footnote in Table III-7 for definition of enterprise units.

Table III-8. Classification of 199 commercial farms in preliminary survey, by type and size, Nariño and Cundinamarca[a/]

Area and size	Specialized types			Mixed Crop and		
	Dairy	Potato	Grain	crop	livestock	Totals
IPIALES-PUPIALES						
0.5 to 5.0 has.	1	1	5	6	10	23
5.1 to 10.0 "	3	1	2	9	14	29
10.1 to 50.0 "	5	1	3	5	16	30
50.1 to 100.0 "	1	0	3	0	9	13
100.1 has. or more	0	0	1	0	7	8
Totals	10	3	14	20	56	103
SABANA						
2.0 to 5.0 has.	1	0	3	1	7	12
5.1 to 10.0 "	1	0	2	1	8	12
10.1 to 50.0 "	4	3	4	1	18	30
50.1 to 100.0 "	1	1	2	2	10	16
100.1 has. or more	2	0	2	0	22	26
Totals	9	4	13	5	65	96

a/ The classification by type was made by assigning one enterprise unit to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock. Farms were classified as diversified crop and livestock unless 80 percent of their enterprise units were within one of the more specialized type classifications.

Use of Improved Seed and Fertilizer

Improved varieties of wheat have been available to producers in Colombia since 1952 through joint research efforts of the Ministry of Agriculture and the Rockefeller Foundation. These new varieties have generally shown a marked increase in disease resistance and yields.[14] Unfortunately, the adoption of these varieties has been rather slow. The Caja Agraria, which sells most of the improved wheat seed, estimated that only 30 percent of the total wheat plantings in 1963 were with improved seed.[15]

Most of the producers in wheat areas are familiar with chemical fertilizers, but application rates are generally low. All of the eleven case-study farms in Nariño used chemical fertilizers, especially for potatoes but also in some cases for wheat and barley. Rates of use, however, were only one-quarter to one-half of those recommended. Only limited supplies of fertilizers have been available in the past, but with bright prospects for domestic production of urea it is likely that wheat producers will be able and willing to apply more fertilizers.[16] The advantages of doing so

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[14]See Goering, op. cit., (Wheat Production), pp. 19-24, for further information on these improved varieties of seed.

[15]Caja de Credito Agrario, Dept. de Investigaciones Económicas, Carta Agraria No. 124 (Bogotá, November 1963), p. 2.

[16]Up until 1962-63, much of Colombia's commercial fertilizer was imported. Recently, the Industria Colombiana de Fertilizantes has expanded its production of urea, and expects to produce over 200 thousand metric tons annually by 1965. This will probably provide for internal needs of nitrogenous fertilizer in the near future. (See newspaper article in El Colombiano, Medellín, August 2, 1963).

seem reasonably clear, in spite of the lack of experimental data on marginal economic responses.

Farm Tenure

Relatively few of the wheat producing farms are strictly owner-operated enterprises. For example, in the Nariño preliminary survey, 35 percent of the farm units had a majority of their land under other than direct owner operation. Only 15 percent of the non-subsistence farmers interviewed had no special tenure arrangements with a hired manager, share-cropper, a relative, or renters.

A farm unit composed of several parcels of land was studied in the Sabana as an example of the tangled tenure arrangements, and of the sharing of management decisions commonly found in wheat areas. The principal producer, A, lives on a small tract of land owned by his wife. He is the owner of three other plots, in each of which he grows crops for his own account. In the first of these parcels, he was also, engaged in growing wheat in compañía with Producer B in 1962; in the second, he was engaged in growing wheat in compañía with Producer C and potatoes in compañía with Producer D; and in the third parcel he grew potatoes in compañía with Producer E.

As the land owner in these compañías Producer A provided a share of the seed and fertilizers as well as the land; his compañero provided labor, machinery, and the remainder of the variable inputs. Producer B, moreover, was also a land owner, and had separate agricultural activities on his own land.

In addition, Producer A grew crops in compañía with two neighboring land owners (sisters) possessed of separate but

adjoining properties. On still another parcel of land owned by a different individual, Producer A was a compañero in growing potatoes. Finally, Producer A was involved in a compañía for the operation of a tractor. In this compañía, Producer A was the owner of the tractor, his compañero was the operator, and the two shared in the tractor rental income, which included charges billed to Producer A for the work on his own crops. A total of nine different individuals, therefore, participated in the management decisions of these interlocking units.

Complicated tenure arrangements such as these are further evidence of the general lack of capital and credit in the agricultural sector, and are means of partially compensating for their absence. These arrangements are also indications of the pressure on the man-land ratio and the general difficulties of acquiring additional property to expand a farm unit. The diversification of farm units and the distribution of production costs among several individuals are the principal methods used to lessen risks encountered in an uncertain market, and under variable climatic conditions.

Representative Producing Units

Farm units which are able to produce wheat can be classified into three different groups. They are:

1. The very small unit, heavily oriented toward subsistence production, and typically growing potatoes, corn, beans, a few livestock products, and possibly some wheat or barley. Production decisions on these units are mainly motivated by consumption needs and are only faintly related to market prices. Oxen, the hoe, and family labor are used almost exclusively on these units.

2. Small to medium-sized commercial units which are committed to production of different commodities for the market, but also produce a sizable portion of the foods consumed on the farm. A considerable amount of hired labor is often used on these units especially during harvest, although some mechanization is not uncommon.

3. Larger commercial units which may have narrowed their combinations of enterprises somewhat, but still include livestock and at least two or three main crops. Production on these farm units is almost exclusively oriented toward the market, producers are responsive to price changes within their ability, and mechanization is present but incomplete. Owners of these larger units often have their interests divided between farm and non-farm interests. Motivations for operating the farm are frequently other than the maximization of net operating incomes.

Three farms which are discussed below illustrate the adjustment possibilities and problems on farms within these groups. These three farms were among 11 in Nariño and 12 in the Sabana selected for special study--largely on the basis of the classification which appears in Table III-8, plus some consideration of tenure.

Adjustment Possibilities on Farm S

Farm S is located in the high mountain region along the Ecuadorian border. The 68-year-old operator of Farm S, and the 7 members of his family, live in Pupiales, a town of some 5 thousand inhabitants. There are several small stores in the community, but most of the marketing functions are performed in Ipiales--a city of about 25 thousand inhabitants located at a distance of some 10 kilometers.

The elevation of around 3,000 meters causes the climate to be cold and raw. Killing frosts are not uncommon in almost any month of the year.

Psychologically, the individuals have a religious, conservative attitude and are dominated by an Indian background. Poverty in this part of Nariño is as intense as in any other area in the country. The population pressure is so extreme here that wages for farm workers are at less than half of the level found in other major agricultural areas of Colombia.

Farm S is composed of but two hectares of land.[17] In 1962, half of this area was in corn interplanted with a broad bean called habas, and the remainder was in potatoes, and small plot of onions, garlic, and cabbage. Thousands of other small farm units in Nariño, Cundinamarca and the Sabana have almost identical cropping patterns. Crops are often rotated between lots, but almost the same mix of enterprises is found year after year. Many farms similar to S would also have one or two head of cattle.

All of the work on Farm S is done by hand, and only a small amount of hired labor is used, mainly during potato harvests. All crops receive a limited amount of commercial fertilizer, and potatoes are regularly sprayed with insecticides. Native varieties of corn, beans, and potatoes are planted, in spite of the availability of improved, higher yielding varieties of corn and potatoes.

In 1962, the farm produced 1,000 to 2,000 pesos worth of home-consumed products, and some 1,000 pesos worth of commodities that were marketed. In addition, the operator earned 1,000 pesos selling

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[17] The Caja Agraria calculated that there were about 2883 farm units in the municipio of Pupiales. Over 65 percent were of less than 5 hectares, 24 percent were between 5 and 20 hectares, and only 11 percent of the units were larger than 20 hectares. (Interview, Ipiales office of Caja Agraria, July 5, 1963.)

newspapers and ruanas, and a daughter earned about 1,000 pesos from sewing. Total earnings for the family in 1962 were between 4 and 5 thousand pesos.

Low yields from the native varieties, the constant threat of frosts, the lack of moisture at planting time, and extreme price variability are major problems. The projection, by large operators, of present prices to make cropping decisions, the lack of storage facilities, and crop failures, cause wide swings in product prices. As an example of this, the first 1962 crop of potatoes in Narino sold for about 330 pesos per metric ton; the second crop sold for about half this price, and the price just before the first crop was harvested in 1963 was up to 660 pesos per ton. Similar price swings, to a lesser degree, are also common for corn. Such variations in price make subsistence producers very cautious about abandoning production for home consumption, and about relying mainly upon one crop for sale in an uncertain market.

Alternative plans for specializing in the production of wheat, barley, and corn were discussed with Operator S. Even though wheat or barley production would increase his real income, on the average, he was strongly opposed to changing his present cropping program, primarily because of the uncertainties involved. An alternative plan which would simply replace his present native variety corn with an improved variety interested him most.

Adjustment Possibilities on Farm M

As has already been noted in Table III-6, almost half of the wheat area in Cundinamarca was on farm units with a total size of 5 to

50 hectares. This particular size range also included 23 percent of all preliminary survey farms in Nariño and about 40 percent of those in the Sabana (Table III-7). Farm M in Nariño illustrates characteristics of units within this group.

Two parcels of land with a total of 23 hectares make up the operating unit. One 5-hectare lot is located about 10 kilometers from Pupiales, and can only be reached by traveling on horseback. The remaining 18 hectares are 5-6 kilometers from Pupiales, in the opposite direction, on a trail sometimes passable by car. Six adults live on the larger lot, but the mother of the family lives in Pupiales in another home which she owns. Title to the larger lot is held by the mother, and the smaller lot is owned by the father.

Like many other units, Farm M is operated as a family unit. The labor force is made up of four adult sons, the father, and additional temporary workers hired at planting time and at harvesting time. Major decisions are made by the family as a whole, but day-to-day management is the responsibility of the second oldest son who is designated here as the operator.

The larger lot can be worked with a tractor, but it has a slope of 20 to 25 percent. The smaller lot is only worked by oxen. The quality of the land in the general area is not as high as that found in parts of the Sabana, or in the fertile valleys of Boyacá, but it has a high capacity for responding to fertilizer applications.

Benchmark Plan

Some wheat, barley, corn, potatoes and dairy have been produced on Farm M in each of the past 10 years. The mix of enterprises has

been fairly constant over time, but there have been year-to-year changes reflecting rotation variation. Between 1962 and 1963, for example, the operator reduced the area in potatoes from 4.5 hectares to 0.5, in response to low 1962 prices for potatoes in Nariño. The area in barley was also reduced from six hectares to four, and corn increased from four to seven hectares as part of the normal rotation. Five hectares of wheat and eight hectares of pasture were grown in 1962 and 1963.

Five milk cows, 12 head of young stock, 13 work animals, 5 sheep, 2 pigs, and 30 chickens represented the farm's livestock. The previously mentioned pasture, land lying idle between crops, and a little rented pasture furnished the forage for the livestock. Some low quality barley and wheat was fed to the chickens.

A physical summary of the Benchmark Plan, based largely on the 1962 and 1963 operations, can be found in Table III-9. The financial summary can be found in Table III-10. Using 1961-62 prices, the net income from the Benchmark Plan would be 7,500 pesos. The value of home-grown foods consumed by the family is estimated at about 4,800 pesos; therefore, farm earnings amount to a little over 12,000 pesos, or about 280 dollars each for the five full-time male family workers.[18] Since the market value of the land on this farm is between 3,000 and 5,000 pesos per hectare, and since interest rates for a farm mortgage loan would be at least 10 percent, one might easily impute most of the farm's net earnings to a return on the capital investment in land.

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[18] This is calculated by using an exchange rate of 8.5 pesos per dollar.

Table III-9. Land use, crop yields, and livestock program under four alternative plans for Farm M.

Item	Benchmark Plan	Plan II	Plan III	Plan IV	Plan V
			(hectares)		
LAND USE					
Potatoes	4	1	1	1	1
Corn	6[a/]	-	-	13	4[a/]
Barley	3	21	-	-	7
Wheat	5	-	13	-	5
Rotation pasture	5	5	5	5	5
Permanent pasture	3	3	3	3	3
CROP YIELDS			(kilos per hectare)		
Potatoes	3,000	3,000	3,000	3,000	3,000
Corn	1,000	-	-	2,500	2,000
Barley	1,000	2,000	-	-	2,000
Wheat	1,000	-	1,800	-	2,000
LIVESTOCK ON HAND			(numbers)		
Milk cows	5	5	5	5	5
Young cattle	12	12	12	12	12
Sheep	5	5	5	5	5
Pigs	2	2	2	2	2
Chickens	30	30	30	30	30
Work animals	13	13	13	13	13
MILK PRODUCTION			(kilos per year)		
PER COW	1,640	1,640	1,915	1,915	1,640

a/ Interplanted with habas, beans and squash.

Table III-10. Comparative financial summary for five alternative plans for Farm M, at 1961-62 prices

Item	Benchmark Plan	Plan II (barley)	Plan III (wheat)	Plan IV (corn)	Plan V (diversified)
			(pesos)		
RECEIPTS					
Potatoes	1,220	--	--	--	--
Corn	380	--	--	11,030	1,230
Barley	1,230	24,270	--	--	7,830
Wheat	3,650	--	17,470	--	7,800
Milk	3,250	3,250	3,940	3,940	3,250
Cattle	2,000	2,000	2,000	2,000	2,000
Pigs	900	900	900	900	900
Workstock	400	400	400	400	400
Wool	30	30	30	30	30
Totals	13,060	30,850	24,740	18,300	23,440
EXPENSES					
Labor	2,070	2,400	2,090	800	2,080
Seed	740	1,970	1,710	600	1,510
Fertilizer & sprays	810	5,380	3,330	2,850	2,960
Feeder pigs	100	100	100	100	100
Pasture rental	150	150	--	--	150
Machinery rental	1,000	1,200	800	500	1,000
Taxes	120	120	120	120	120
Interest on loans	310	400	280	200	310
Transport & misc.	310	860	810	260	660
Totals	5,610	12,580	9,240	5,430	8,890
NET INCOME	7,450	18,270	15,500	12,870	14,550
Home-grown food	4,840	3,040	3,200	3,740	4,710
NET EARNINGS	12,290	21,310	18,700	16,610	19,260

Problems and Possibilities

It is almost impossible for farm operators to purchase additional land in much of Nariño. Population pressure on the land resources has pushed land values up and caused excessive parcelization of family holdings among heirs. Tight credit conditions also make it difficult to obtain capital for purchases of additional land. It would thus be very unlikely that the owners of Farm M could add to their land holdings.

The uncertain market conditions, mentioned previously, and general climatic conditions are limiting factors in Farm M's operation. In this part of Nariño, crops are subject to killing frosts in almost any month of the year. Farmers adjust to this threat by planting soon after heavy frost periods which occur in December and January, and also during June and July. Furthermore, they adjust plantings of different crops to fields which are subject to frosts in varying degrees. Rainfall is generally well distributed for cultivation, but time is occasionally lost waiting for sufficient rainfall to plant crops. This lost time may cause producers to have trouble in getting crops matured before a period of heavy frost.

Wages for farm labor are only about half the country's average, but Nariño has a serious cost disadvantage with respect to transportation because of the distance to the principal population centers of Cali, Bogotá and Medellín. Prices of bulky products such as potatoes and milk are therefore considerably lower in Nariño, while prices of wheat and barley, as mentioned previously, have uniform national prices. Commercial farm operators must balance the use of cheap labor in producing intensive—often bulky crops, with the

associated disadvantage in product prices, against the less labor intensive but more favorably priced cereals.

There is little doubt that better results could be obtained on Farm M if recommended fertilizer rates, weed sprays, and improved seeds were used. This is especially true in the corn and potato enterprises. Another promising alternative would be to narrow the combination of crop enterprises. In light of these possibilities, several alternative plans which would modify the present farm organization are discussed below.

Plan II

More emphasis on barley production, along with use of more fertilizers and weed sprays, represent the principal changes of this plan. A total of 13 hectares of barley would be planted in the first semester, and 8 hectares in the second. Potato production would be limited to one-half hectare which would be double cropped and used mainly for family consumption (Table III-9). No change would be made in the livestock enterprises. The operator of Farm M is presently using improved varieties of barley, and this practice would be continued. Fertilization rates would be increased to the recommended level of 200 kilograms per hectare, and all barley fields would be sprayed for weeds. With these improved practices, barley production should rise to about 2 metric tons per hectare.

Plan III

In this plan emphasis would be placed on production of wheat under improved practices. Since wheat requires 6 months to mature in Nariño, and barley only 4-5 months, only one crop of wheat would be

grown. The operator of M had had favorable experiences with wheat production, and was giving thought to trying a second crop on some fields. The ability of Operator M to do this without incurring high losses from frost on the second crop is unknown. Experimental data on frost losses are unavailable, and it remains to be seen if a second crop of wheat can be profitably raised at these higher altitudes around Ipiales. As can be noted in Table III-5, over one-quarter of Nariño's wheat is harvested in the first semester, but most of this is at lower altitudes than Farm M.

Operator M is presently using improved varieties of wheat. With the application of appropriate fertilizer at the rate of 200 kilograms, and with the proper use of weed killers, a yield of 1.8 metric tons per hectare (27 bushels per acre) could reasonably be expected (Table III-10). With some additional forage available from the uncropped wheat land in the second semester, milk production would be expected to rise by 275 kilograms per cow.

Plan IV

Emphasis in this plan would be placed on corn production with improved rather than native varieties. Thirteen hectares of corn would be planted and the recommended rates of 200 kilograms of mixed fertilizer would be used (Table III-9). Corn in Nariño takes 10 months to mature; therefore, only one crop would be possible. Yields could reasonably be expected to rise to 2.5 metric tons per hectare, providing the operator followed the above practices.

Plan V

In this plan a reduction would be made in the area devoted to potatoes and corn, and an increase would be made in the area in barley over that of the Benchmark Plan. The operation would remain widely diversified, but an increase in fertilization rates and the application of other recommended practices would boost most crop yields. As in the Benchmark Plan, the corn would be interplanted with subsistence crops, a practice which would result in a lower average yield than that shown for Plan IV (Table III-9). Part of the land devoted to barley and potatoes would be double cropped; other land would be pastured between crops. The cropping sequence would provide a year's pasture between wheat and barley to avoid the problem of a mixed seeding as a consequence of shattered grain.

Evaluation of Alternative Plans

Because the production of food for home consumption varies significantly between plans, the value of this is added to net income estimates to provide a better base of comparison (Table III-11). As can be noted in Table III-11, Plan II with emphasis on barley shows the highest net earnings under 1961-62 prices, while Plan IV with emphasis on corn shows the lowest net earnings except for the Benchmark Plan. The net earnings for the diversified Plan V were about 2,000 pesos less than the barley plan but the operator seemed to feel that Plan V was the most feasible. He admitted that he did not realize there were better corn varieties available, and agreed with the results in Table III-11 which show that corn is at a comparative disadvantage in the area. He rejected the idea of specializing in

Table III-11. Estimated net earnings from five plans for Farm M, calculated under alternative price situations related to levels of P.L. 480 programs

Price situations[a]	Benchmark Plan	Plan II (barley)	Plan III (wheat)	Plan IV (corn)	Plan V (diversified)
	(net incomes in pesos of 1961-62)				
1961-62	12,290	21,310	18,700	16,610	19,260
1967-68 - I	12,380	21,270	18,660	17,830	19,550
- II	13,900	25,090	21,410	19,120	22,720
- III	10,250	17,460	14,920	17,170	16,440

a/ See Chapter I, p. 9.

potatoes or dairy because of the uncertain marketing conditions and the high capital requirements.

Family M was unwilling to enter the market to buy either their corn or potatoes. They had vivid memories of how expensive these items often became just before harvest time. Less corn would probably be produced in cool climate areas by small to medium-sized units if individuals had more confidence in a relatively stable price for corn.

Under the alternative price assumptions for the 1967-68 period (Tables I-1 and I-2), net earnings under the various plans would vary appreciably, although Plan II would return the highest net earnings in each case (Table III-11). The differences between the net earnings of Plans II and V under various levels of Title I imports would not be very great. With a rise of 10 to 15 percent in the relative price of wheat and barley, as might be expected to follow a complete cessation of Title I imports, the operator would give serious consideration to increasing wheat and barley production. Expanded use of fertilizers and weed killers could also be expected.

Farmers such as operator M generally are slow to respond to price changes. They are often interested, furthermore, in minimizing the risk of loss rather than in maximizing a long-run average income. This leads them to avoid specializing in one crop or enterprise. The disutility of a loss is far greater than the utility of a similarly sized gain for many of these small to medium-size wheat producers.

One may conclude that Farm M will be slow to change the amount of area devoted to wheat production. Without any change in area planted, however, wheat production could almost double as a result of

increased use of fertilizers and other recommended practices.

Adjustment Possibilities on Farm L

The 1960 Census of Agriculture showed that about one-third of the wheat grown in Cundinamarca was on farms with a total size of over 50 hectares (Table III-6). Wheat producing units of this size are not as prevalent in other areas, but it is likely that 40 to 50 percent of the country's wheat is grown on these larger units, since their yields are generally above the national average.

A 160-hectare farm near the town of Subachoque, Cundinamarca, illustrates the adjustments possible on farms in this large-size group. The unit is located about 10 kilometers from Subachoque by rough road, and at 25 to 30 kilometers from a paved road which leads to Bogotá. Most of the products of the farm are sold in Bogotá, which is about two hours away by truck.

Benchmark Plan

In 1962-63 the farm was divided into three closely grouped lots of 13, 19, and 128 hectares. The property is owned and operated by the 50-year-old producer, but he does not have clear title to all of the land. In spite of the fact that neither the producer nor his wife is able to read or write, all nine of their children have completed at least primary education. One 18-year-old son lives on the farm and assists in the operation.

The labor force is made up of the father, his son, four full-time workers and an average of seven occasional workers who help with planting, weeding, and harvesting. Occasional workers received 6-8 pesos per day in December 1962, but after the devaluation, these wages

rose to 10-11 pesos per day by July 1963. A new tractor purchased in 1962, plus some oxen, help in the land preparation.

In almost all of the past 10 years, the production of some wheat, barley, potatoes, and milk have made up the operations of Farm L. During the past 5 years, potato and milk production have increased relative to the cereals. In 1962 the farm enterprises included 19 hectares of barley, 64 hectares of wheat, 64 hectares of potatoes, and 70 head of cattle, of which about 35 were being milked (Table III-12). The cows are grades and produce only some 1400 kilograms of milk per head per year. About five hectares of wet or rough land were used as pasture; additional forage was furnished by 32 hectares of rotation pasture and by wheat and barley stubble. A small lot of corn for home consumption was grown in 1962.

Several of the crop yields on Farm L were higher than those for Farms S and M in Nariño. In general, mixed fertilizers were being applied at close to recommended rates, on soils which were quite acidic. Improved varieties were also regularly planted. Almost all of the land could be worked with a tractor. Some flooding in certain parts of the farm occasionally washed out crops.

Problems and Possibilities

The occurrence of very heavy frost in the Sabana in December and January makes it almost impossible to double-crop wheat in the area. It is possible, however, to grow two crops of barley because of its shorter growing period. This is especially true for producers who are able to harvest their cereals mechanically.[19]

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[19]Brewery-owned equipment stations furnish machinery for planting and harvesting barley in the Sabana and Boyacá.

Table III-12. Land use, crop yields, and livestock program under six alternative plans for Farm L

Item	Benchmark Plan	Plan II	Plan III	Plan IV	Plan V	Plan VI
			(hectares)			
LAND USE						
Potatoes	64	--	--	--	--	100
Corn	1	--	--	110	--	--
Barley	19	192	--	--	--	50
Wheat	64	--	128	--	32	50
Rotation pasture	32	32	32	50	128	60
Permanent pasture	5	5	5	5	5	5
CROP YIELDS			(kilos per hectare)			
Potatoes	10,000	--	--	--	--	10,000
Corn	1,000	--	--	2,000	--	--
Barley	1,800	1,800	--	--	--	1,800
Wheat	1,500	--	1,500	--	1,500	1,500
LIVESTOCK ON HAND			(numbers)			
Milk cows	35	35	35	35	132	35
Young cattle	30	30	30	30	225	30
Bulls	3	3	3	3	--	3
Sheep	12	12	12	12	12	12
Chickens	8	8	8	8	8	8
Burros	2	2	2	2	2	2
MILK PRODUCTION			(kilos per year)			
PER COW	1,400	1,400	1,400	1,400	2,500	1,400

In addition to the previously mentioned problems with occasional flooding, rains often make access roads into the farm impassable for several days and make milk pick-up difficult.

The proximity of Farm L to the large market in Bogotá offers an opportunity to produce bulky commodities such as potatoes and milk for a rapidly expanding market, especially with improvements in the local roads. A number of farm units in the Sabana are expanding their dairy production, and artificial insemination service is available for upgrading the quality of the cattle, but Producer L preferred crop production to dairy.

Some increase in rates of fertilization and a narrowing of the combination of crop and animal enterprises appear to be possible alternatives on Farm L. The following five plans test the economic feasibility of undertaking these adjustments on Farm L.

Plan II

Under Plan II, a total of 192 hectares would be planted to barley, including 128 hectares in the first semester and 64 in the second (Table III-12). The practice of using 32 hectares for rotation pasture each year would be continued. No change in the livestock operation is assumed in this plan, and crop stubble would continue to be an important source of forage.

Plan III

The emphasis in this plan would be on producing wheat rather than barley. A total of 128 hectares would be planted once each year, and the stubble would be used for pasture during the rest of the year. As in Plan II, no change is assumed in the livestock operations.

Plan IV

Plan IV proposes to grow an improved variety of corn on 110 hectares of land. Less land could be cropped in this plan than under Plans II and III, because of the longer growing period needed for corn, and the forage requirements for the livestock. The net earnings for this plan, shown in Table III-13, bear out the producer's feeling that corn production does not pay on Sabana land costing around 8,500-9,000 pesos per hectare.

Plan V

In Plan V, Farm L would switch to intensive dairy production, with wheat used only as a crop to rotate with pastures. The milking herd would be increased to 132 cows, plus the necessary young stock for replacements. In addition, some of the steers would be kept until they were 2 to 2.5 years of age before being sold. An additional investment of about 25,000 pesos would be necessary in this plan. Up-breeding and additional forage could raise average production per cow to 2,500 kilograms. Additional production could be expected if concentrates were fed, and if calves were allowed less milk and more concentrates. The expected income for this plan after a period of readjustment is shown in Table III-13.

Plan VI

A diversified organization with more emphasis on potato production would compose Plan VI. A total of 100 hectares of potatoes would be planted, fifty in each semester. Fifty hectares each of barley and wheat plus 60 hectares of rotation pasture would be used to follow potato production in order to utilize residual fertilizer

Table III-13. Comparative financial summary for six alternative plans for Farm L, at 1961-62 prices

Item	Benchmark Plan	Plan II (barley)	Plan III (wheat)	Plan IV (corn)	Plan V (dairy)	Plan VI (diversified)
			(pesos)			
RECEIPTS						
Potatoes	190,800	--	--	--	--	299,000
Corn	--	--	--	125,300	--	--
Barley	20,400	207,200	--	--	--	53,800
Wheat	79,700	--	159,200	--	39,600	62,200
Milk	31,900	31,900	31,900	31,900	217,800	31,900
Cattle	8,800	8,800	8,800	8,800	59,000	8,800
Totals	331,600	247,900	199,900	166,000	316,400	455,700
EXPENSES						
Labor	46,500	25,800	20,400	23,500	31,900	64,700
Seed	24,400	19,000	20,300	3,300	6,100	52,300
Fertilizer	31,000	36,500	24,300	20,900	18,800	32,200
Spray materials	5,300	1,900	1,300	1,100	300	8,000
Miscellaneous dairy exp.	600	600	600	600	21,700	600
Machine hire	8,600	22,800	12,700	--	3,200	10,900
Gas and oil	2,900	3,800	2,600	2,200	600	4,000
Upkeep	5,000	5,000	5,000	5,000	7,500	5,000
Taxes	800	800	800	800	800	800
Fences	1,000	1,000	1,000	1,000	2,000	1,000
Transport	6,200	2,700	1,500	1,800	400	9,300
Interest	8,000	7,200	4,000	1,600	26,000	6,400
Totals	140,300	127,100	94,500	61,800	119,300	195,200
NET INCOME	191,300	120,800	105,400	104,200	197,100	260,500
Home-grown food	2,500	1,300	1,300	1,200	1,300	2,500
NET EARNINGS	193,800	122,100	106,700	105,400	198,400	263,000

(Table III-12). No change would be made in the livestock operation under this plan.

Evaluation of Alternative Plans

The plans emphasizing wheat and barley production (II and III) showed substantially lower net earnings than either the Benchmark Plan or Plan VI. In addition, the operator felt that specialization in wheat, barley, or potatoes would involve higher risks. As in Narino, the production of corn proved to be relatively uneconomical.

Operator L did not care to expand his dairy production, but the income prospects shown in Plan V indicate that other producers in the Sabana and Boyaca may have a real interest in considering additional dairy production.

Under the 1961-62 prices used to calculate Table III-13, the diversified Plan VI with emphasis on potato production would return the highest net earnings. This plan is the one which Operator L felt was most promising for his farm. In addition to increasing potato production, the operator felt he might try double cropping barley since other producers were successful in this practice in the Sabana.

If the future price of wheat were to drop appreciably relative to the price of barley, Operator L would be ready to increase barley production at the expense of wheat. The potato crop would likely continue as the principal enterprise, unless the prices of potatoes fell or fluctuated more drastically than in the past. A continuation or expansion of the potato enterprise would likely favor wheat production, since it is a more profitable crop to follow potatoes than is barley. Variations in Title I imports are not likely to affect

Farm L's production much, as can be noted in Table III-14. Furthermore, the opportunity for increasing yields does not appear as great on Farm L as on Farm M.

Adjustment Possibilities on Other Farms

The reluctance of small farmers like Operator S to become fully dependent on the market place is common throughout the wheat producing regions. Thirty percent of the 145 preliminary survey farms in Nariño fell into this small farm group. With credit both expensive and difficult to obtain, few small producers are willing to change their present cropping patterns for some other more risky combination. As mentioned previously, the disutility of risking the loss of land holdings is beyond economic measure to many producers.

Even though a good deal of potential exists on small and medium-sized farms to improve management practices and thus to increase total production and net earnings, limited education, lack of extension facilities, and incomplete channels of communications will retard these adjustments. Some 20 years ago, for example, a small farmer near Ipiales was induced to plant a hectare of alfalfa; since then, he has done no additional seeding or reseeding. None of the neighbors of this farm have planted alfalfa. This producer, nevertheless, considers his alfalfa as his most important crop and would be very hesitant to replace it. The alfalfa is sold to a neighboring farm, and returns a cash income which is an important supplement to the subsistence crops grown on the rest of the property.

Another factor which limits change among these small farm units is the large number of old people and/or widows who are property

Table III-14. Estimated net earnings from six plans for Farm L, calculated under alternative price situations related to levels of P.L. 480 programs

Price situations a/	Benchmark Plan	Plan II (barley)	Plan III (wheat)	Plan IV (corn)	Plan V (dairy)	Plan VI (diversified)
	(net incomes in pesos 1961-62)					
1961-62	193,800	122,100	106,700	105,400	198,400	263,000
1967-68 - I	184,200	122,100	106,700	118,000	198,400	248,000
- II	212,800	153,200	138,600	130,500	206,400	283,600
- III	155,500	91,000	74,900	111,700	168,600	212,400

a/ See Chapter I, p. 9.

owners. Furthermore, even if most small wheat producers were to adopt improved seed and improved management practices, their additional contribution to total production would be small.

Among the Nariño preliminary survey farms in the 5 to 50 hectare size group, half were diversified crop and livestock units like Farm M, and the remainder were not very far removed from the same resource base and pattern of resource usage. Of the six case-study farms in this group, all six grew some potatoes and corn in 1962 and 1963, and were thus partially oriented toward production for home consumption. Inadequate application of fertilizers and other recommended practices resulted in yields for all crops being well below those attainable. For example, none of the six operators obtained more than one metric ton of wheat per hectare in 1962; moreover, none of the six farmers in Nariño nor the four medium-sized case-study farms in the Sabana felt they could be sure of success in double cropping wheat. Increases in wheat production among this group will likely occur only as more fertilizer, improved seed, and generally better management practices are used.

There were six case-study farms in the Sabana which included more than 50 hectares of land. One of these units was reduced in size to less than 50 hectares in early 1963 by the sale of land. A combination of grain production with a herd of dairy or dual purpose cattle was found on all of the remaining five large units. The production trend in this group seemed to be toward more dairy (see Farms MS and G in Chapter V). In Nariño three operators with more than 50 hectares also had more interest in developing their dairy enterprises than in expanding cereal production.

Generally speaking, these large farms are better able to adjust to price changes than smaller units, but they have less potential for increasing production by better management techniques.

Overall Prospects

On farm units in the cool climate regions, wheat is under heavy competition, for a variety of reasons, from other enterprises such as barley, dairy, potatoes, and home consumption products. Any expansion in production of wheat within these units will likely result from a wider use of better seed, additional fertilizer, and other improved practices. Expanded extension programs or other methods of disseminating information to the small to medium-sized producers will be needed to induce many of these changes.

Since there is considerable opportunity to shift between wheat and barley production, and since breweries have a strong interest in maintaining only sufficient internal production of barley to meet brewery needs, it is unlikely that the price relationship between wheat and barley will be altered much. It is therefore somewhat doubtful that any of the alternative levels of Title I imports assumed in this analysis would bring about major changes between plantings of these two cereals. Furthermore, it is unlikely that these changes in Title I imports would cause major adjustments between cereal plantings, on the one hand, and the use of land for corn, potatoes and pastures, on the other. Long-run pressures for more dairy production in heavily populated, cool climate regions plus additional production of potatoes could continue to reduce the total area in cereals.

Aside from some favorable income impacts upon cereal producers, a reduction in wheat imports under Title I will have the largest impact upon consumers, through higher prices and short supplies. A number of producers could be expected to respond to a certain degree with more emphasis on increasing production of wheat by using more fertilizers, weed killers, and improved seed. The effects of these changes would only be gradual, however, since a continuing need to expand all types of agricultural output would exist.

It may be possible over a number of years to expand the area in wheat by developing a variety which can be rotated with warm climate crops. Furthermore, it may be possible to draw more operators of small and medium-sized units into the market to buy corn for home consumption, thereby freeing some land for additional cereal production. Both of these possibilities will occur slowly if at all.

CHAPTER IV
FEED GRAIN PRODUCTION

The 1959 Title I agreement was the first to allow feed grain imports into Colombia. This included a total of 80 thousand metric tons of corn or grain sorghum, but only 15 thousand tons of sorghum and 40 thousand tons of corn were finally imported under this agreement in 1961. Late in 1961 INA applied for and received permission to import an additional 25 thousand tons under the 1959 agreement. Unfavorable producer reaction to the proposed imports resulted in the cancellation of this plan. Little or no importation of feed grains has occurred outside of these made under PL 480 in 1961.[1]

Trends in Production

In terms of area planted and value of production corn ranks next to coffee in crop importance (Table II-7), and is by far the most important source of feed grain. As was noted in Chapter III, a substantial quantity of barley is grown in Colombia, but its use as feed grains is only incidental to its use in brewing. Grain sorghums have been a minor item in overall agricultural production, but appear to have a good deal of future potential.

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[1] The Minister of Agriculture recently announced that additional imports of grain sorghum in excess of 10 thousand metric tons would be authorized according to a newspaper report in El Tiempo (Bogotá) November 6, 1963.

The production of corn in Colombia has been very slow to increase, even though corn prices almost doubled between 1955-56 and 1961-62 (Table I-1). Data with respect to corn production are by no means precise. The Caja and INA, for example, differ a good deal in their estimates of area and production (Table IV-1). The Caja data show no clear trend either upward or downward over the 1950 to 1960 period, whereas the INA data indicate that there may have been a rather sharp drop in both area and production since 1959. Both agencies agree that there has been some upward movement in the yield per hectare over the 1950-62 period.

Some evidence indicates that the trend shown by INA is more nearly correct. For some time the production of crops such as cotton, cane for sugar, oil crops, and in some cases pasture for intensive dairy, has apparently competed strongly for land in commercial corn production. This is especially true for cotton, whose plantings jumped from 77 thousand hectares in 1958, to 131 thousand hectares in 1959, and to 177 thousand hectares in 1962 (Table VI-1). Much of this increase probably took place on land formerly planted to corn. In addition, there has likely been some movement of corn production onto less productive lands—a possible explanation for the drop in yields per hectare from 1959 to 1962 noted in the INA data in Table IV-1.

Uses of Feed Grains

Until recently relatively little feed grain has been fed to poultry and livestock in Colombia. The initiation of mixed feed production by several large companies during the late 1950's, and

Table IV-1. Area, yield, and production of corn in Colombia, 1950-62

Year	Area		Production		Yield per hectare	
	Caja	INA	Caja	INA	Caja	INA
	(thous.has.)		(thous.metric tons)		(metric tons)	
1950	652	---	620	--	0.95	--
1951	768	--	845	--	1.10	--
1952	844	--	928	--	1.10	--
1953	700	--	770	--	1.10	--
1954	680	--	750	--	1.10	--
1955	660	830	770	736	1.20	0.88
1956	677	811	790	748	1.20	0.91
1957	513	624	746	718	1.45	1.15
1958	704	693	852	832	1.21	1.20
1959	730	726	891	858	1.22	1.22
1960	806	724	983	866	1.22	1.20
1961	--	711	--	758	--	1.06
1962	--	697	--	754	--	1.08

SOURCE: Records of the Caja Agraria and the Instituto Nacional de Abastecimientos, as furnished in correspondence, in copies of worksheets, and as published for 1958-60 by The Caja de Crédito Agrario, Industrial y Minero in the Carta Agraria, No. 80 (Bogotá, January 1962).

the rapid expansion in demand for poultry products, dairy products, and pork has changed this situation. In 1958 some 72.5 thousand metric tons of mixed feeds were produced; about 20 percent of this was for poultry, 70 percent for dairy, and 10 percent for other uses. By 1962 total mixed feed production had more than tripled to 240 thousand metric tons; 50 percent was used for poultry, 35 percent for dairy, and 15 percent for other uses.[2]

The big increase in mixed feeds and industrial uses, has reduced the proportion of corn directly consumed by humans, but in 1962, INA still estimated that up to 50 percent of the local production was directly consumed.[3]

Presently, most of the 30 commercial feed producers are centered near the large urban centers of Colombia. Purina de Colombia, for example, has a large plant in Cartagena, one near Cali, and is building another near Bogotá. In 1962 INA estimated that 20 percent of the corn crop, 150 thousand metric tons, was fed to livestock. Some 15-20 thousand tons of barley, unsuitable for brewing, and an additional 20-25 thousand tons of brewers' grains also went into livestock feed. In addition about 10 thousand tons of grain sorghum were also used. Thus, a total of about 200 thousand tons of feed grains were available for commercial feed producers in 1962.

Food processors have also come to use a sizable portion of Colombia's total corn production. Maizena's plant in the Cali area

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[2]Data supplied by Dr. D. G. Piña C., Director of the Feed Grains Council, Bogota, August 20, 1963.

[3]Unpublished data furnished by INA.

has an annual capacity to process 32 thousand tons of corn into starch, dextrin, glucose, and other products. Other important users include Kellogg (cereals) and Bavaria (brewing). Maizena and Bavaria are both active in trying to stimulate production of corn in the Valle del Cauca.

Development Programs

The Departamento de Investigaciones Agropecuarias (DIA) of the Ministry of Agriculture has 6 experiment farms in various parts of the country, which carry on corn variety improvement programs. These farms in Córdoba, Valle, Nariño, Antioquia, Boyacá, and Cundinamarca include the major types of growing conditions found for corn in Colombia. Native varieties, in general, produce only about one, to one-and-a-half metric tons of corn per hectare. DIA researchers report that outstanding commercial producers in the Sabana, using improved varieties, get yields of up to 4 and 5 metric tons per hectare, yet this is not the most favorable corn growing area.[4]

The use of these improved varieties of corn is, unfortunately, not very wide-spread. Since 1954, the Caja Agraria has distributed improved corn seed, but in 1960 only enough to plant a little over 45 thousand hectares was sold.[5] In 1963 DIA personnel estimated that only eight percent of the country's corn output was from improved

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[4]Interview with DIA corn specialists, July 11, 1963.

[5]Caja de Crédito Agrario, Industrial y Minero, Informe de Gerencia (Bogotá, 1961), p. 130.

seed.[6] In the Valle del Cauca this percentage may have been as high as 60 percent, while in Antioquia it may have been as low as three percent.[7]

In late 1963 the Ministry of Agriculture announced an "Operación Maiz," with the purpose of encouraging more feed grain production by the use of improved seed.[8] Both corn and grain sorghum were included in this program. Technical assistance to producers is to be provided by the Instituto Colombiano de Cereales (ICE), and it is planned that the Caja Agraria will continue its corn seed reproduction and sale.

This feed grain development program reflects: (a) the tight supply situation for feed grains experienced the past three years, (b) the preference by the government for domestic production rather than imports, (c) the strong opposition to corn imports by producer organizations such as the Federación Nacional de Cultivadores de Cereales (FENALCE), and (d) activities by food processors and feed mixers who face a rapidly expanding demand for their products, without a secure supply for feed grain.[9]

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[6] Interview, July 11, 1963, op. cit.

[7] A newspaper report, El Colombiano, September 10, 1963.

[8] Ibid.

[9] The decision to import grain sorghum rather than corn in late 1963 appears to have been a compromise between the different interest groups.

Areas of Production

A number of native varieties are available which allow corn to be grown in almost all sections of Colombia. Even though corn takes 9-10 months to mature in the cool climate areas, large quantities are found throughout high mountain regions of Nariño, Cundinamarca, Boyacá, and Antioquia. Additional production is located on rough mountain slopes in Caldas, Cauca, Antioquia, and the Santanders. In terms of area planted and total production, Antioquia is the most important departamento for corn (Table IV-2). The production there, like most of the other mountainous and cold climate areas, is primarily for home consumption. Commercial production of corn is concentrated in the lowlands, especially in the north coast, in the upper Magdalena River basin, in the eastern llanos, and in the Valle del Cauca. As can be noted in Table IV-2, the national average production of corn per hectare is only a bit over one metric ton, but the areas which are more concentrated on commercial crop production generally have somewhat higher yields than the national average.

The Valle del Cauca

An important portion of Colombia's commercial corn production is centered in the Cauca Valley. Feed producers and industrial users of corn are more prominent in the Valle than in any other part of the country.

During the 1950's and early 1960's there has been a quiet revolution going on among the farm units in the flat part of the Valle. Ten to 15 years ago much of the land was in large land holdings, mainly in pastures, and over 800 thousand hectares of the

Table IV-2. Area, yield, and production of corn by departamentos, 1962

Departamento	Area	Production	Yield per hectare
	(hectares)	(metric tons)	(metric tons)
Antioquia	82,000	92,500	1.1
Atlántico	7,100	11,700	1.6
Bolívar	73,000	73,000	1.0
Boyacá	45,000	40,000	0.9
Caldas	16,700	20,000	1.2
Cauca	32,000	32,000	1.0
Córdoba	65,000	68,500	1.1
Cundinamarca	55,000	55,000	1.0
Chocó	12,000	9,738	0.8
Huila	14,000	15,100	1.1
Magdalena	44,000	47,100	1.1
Nariño	60,000	52,000	0.9
N. Santander	39,000	28,000	0.7
Santander	48,100	48,000	1.0
Tolima	23,000	28,875	1.3
Valle del Cauca	33,000	66,000	2.0
Meta[a/]	48,000	66,400	1.4
All departamentos	696,900	753,913	1.1

a/ Includes area outside of established departamentos.

SOURCE: Mimeographed worksheets furnished by the Instituto Nacional de Abastecimientos, Departamento de Investigaciones Económicas.

valley's bottom land was regularly flooded.[10] In 1954 the Corporación Autónoma Regional del Valle del Cauca (CVC) was organized to help develop the Valle. By 1959, partially as a result of CVC's efforts, almost 50 thousand hectares or one-eighth of the area on the valley floor was under irrigation.[11]

Much of the irrigated land has gone into intensive crops. From 1952 to 1962 the area dedicated to cane for sugar, for example, increased from 26 thousand hectares to 50 thousand hectares.[12] Likewise, the area in cotton jumped from 124 hectares to about 36,000 hectares over the same 10 year period.[13] Sizable increases in production of soybeans, rice, dry beans, and dairy production, were also experienced.

Recently formulated plans call for a large expansion in sugar cane production in the Cauca Valley. By 1970, these plans project Colombian sugar exports at a rate of 400 million dollars,[14]—up from 7.5 million dollars worth shipped in 1962.[15] Even though actions

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[10]Miguel Camacho Perea, El Valle del Cauca: Estudio Sobre el Hombre Vallecaucano, Su Habitat, La Tenencia de la Tierra y Su Proceso Cultural (Cali: Imprenta Departamental, 1962), pp. 26-27.

[11]Censo Agropecuario del Valle del Cauca, op. cit., Cuadro 57.

[12]Unpublished data furnished by the Asociación Nacional de Cultivadores de Caña de Azúcar (ASOCAÑA).

[13]Alberto Sandoval A., Estudio Geo-Económico del Valle del Cauca (Cali: Instituto Vallecaucano de Estadística, 1960), p. 132; and information furnished by the Instituto de Fomento Algodonero (IFA).

[14]A newspaper report in El Colombiano, August 20, 1963.

[15]Departamento Administrativo Nacional de Estadística, Boletín Mensual de Estadística No. 144 (Bogotá, March 1963), p. 58.

realized are often short of initial planning in Colombia, a tremendous increase in the sugar cane area will be necessary to even remotely approach this goal.

In 1937 corn was the most important crop, in area, in the flat part of the Departamento of Valle del Cauca.[16] The area in corn steadily increased until 1958, when there were almost 58 thousand hectares in corn.[17] By 1962 it was estimated that only 33 thousand hectares of corn were planted (Table IV-2). This decrease in corn area is very closely associated with the sharp jump in cotton planting in Valle since 1959.

The North Coast Region

About one-fourth of the 1962 corn production came from the north coastal Departamentos of Córdoba, Bolívar, Atlántico, and Magdalena (Table IV-2). Much of the commercial sorghum production is also found in these Departamentos. Land in this area is often being cultivated for the first time, and is often initially planted to corn or sorghum. This is especially true of the developing Simí river basin, the area around Codazzi, and in Valledupar.

Most of the sorghum grown in the north coast is found between Cartagena and Barranquilla. In 1962-63 one large feed company encouraged sorghum production in the Cartagena area by distributing quality seed and guaranteeing a fixed price. In 1963, through these

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[16] Camacho Perea, op. cit., p. 132.

[17] Censo Agropecuario del Valle del Cauca, op. cit., Cuadro 13.

efforts, about 6 thousand metric tons of grain sorghums were grown in the Cartagena area alone. The crop appears to be especially well suited for this region where lack of rainfall during certain periods of the year limit the production of other crops.

The large increase in the plantings of cotton in the north coastal region has also replaced some corn but the increased emphasis on crop production in the area as a whole probably has caused an increase in both cotton and corn plantings over the past five years.

Cotton is planted in the north coastal area following the heavy rainy season, and there is generally not enough moisture to grow a second crop. Serious damage may result from late rains or early planting of crops like cotton. With irrigation, and some flood protection, crops such as corn and sesame might be used to follow cotton in a program of double cropping.

There have been a number of studies done in the north coastal region with regard to the possibilities of exploiting large additional areas through drainage, flood control, and irrigation.[18] The Magdalena Valley Corporation was created in 1960 to aid to overall valley development. In addition, INCORA's "Córdoba No. 2" project is in the planning stage and is due to benefit some 70 thousand hectares through flood control, irrigation and drainage, in the immediate

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[18] Fundación para el Progreso de Colombia: Estudio Agro-Económico Preliminar del Valle Aluvial del Río Sinú (Bogotá, August, 1962); and Robert R. Nathan Associates, Programa de Desarrollo Económico del Valle del Magdalena y Norte de Colombia, a study directed by Lauchlin Currie for the Ministry of Public Works, the Colombian National Railways, and the Colombian Petroleum Company (Bogotá, 1960).

vicinity of Cereté.[19]

The Llanos

Thousands of hectares of land in the eastern llanos of Meta and Boyacá appear to have potential for future feed grain production. As can be noted in Figure II-1, most of this area is now in pasture for extensive type cattle rearing. In some cases, the variable inputs include little more than the labor for driving the cattle to the nearest road for marketing.

Transportation has been the most serious limitation on the development of this area. The land is generally flat, but large rivers running off the eastern Cordillera make it necessary to construct a number of large costly bridges. New passable roads, nevertheless, are opening up thousands of hectares suitable for cultivation. This is especially true of the areas to the northeast and southwest of Villavicencio where cotton, rice, yuca, coffee, corn, and African palm are important crops. As can be noted in Table IV-2, the Departamento of Meta was one of the leading producers of corn in 1962 with over 60 thousand metric tons.

The rainfall distribution in much of the Llanos may be a limiting factor in the crops that can be grown there. Rainfall is concentrated in the period from April to August, and it is common for many of the rivers to dry up from December to February. Double cropping will be difficult to impossible without supplemental irrigation. Rainfall and

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[19] Announcement in El Colombiano, August 12, 1963.

soil quality both diminish as one moves eastward from the mountains.[20]

Although no sizable quantities of sorghums are planted in the Llanos, a good deal of potential appears to exist for future production. Varieties of grain sorghums which can mature on relatively little moisture will be especially suitable for planting at some distances from the mountains. A further expansion in corn production can also be expected in lands near the mountains.

Feed Grain Producing Units

The farm units producing feed grains in Colombia can be placed in one of two groups. The first group is the thousands of small to medium-sized units which grow a small plot of corn mainly for home consumption. The second group is the mechanized units producing corn or sorghum almost totally for commercial sale.

Corn for Home Comsumption

The form in which corn is consumed in Colombia varies somewhat from area to area. In Antioquia, Caldas, and Valle, for example, arepas and mazamorra are very popular. In the coastal area and Cundinamarca corn is commonly eaten on the cob. Soups and empanadas made from corn are other important foods which are popular in most parts of the country.

Many of the small to medium-sized farm units which are located

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[20] See A. Escher, Estudio de los Problemas Hidráulicos en Los Llanos Orientales de Colombia (Bogotá: FAO, June 1963), and Instituto Geográfico Agustín Codazzi, Departamento Agrológico, Levantamiento Agrológico de Los Llanos Orientales (Bogotá, 1959) for further description of this area.

outside the specialized coffee producing regions have several hectares of corn as a part of their farm operation. This corn is frequently produced on rough rocky land, generally without fertilizer, and often interplanted with other crops such as beans and squash. Few of these farm units utilize improved corn varieties, and yields seldom run over a ton per hectare, and are often considerably less. The lack of proper storage facilities on the farm commonly results in large losses to vermin and spoilage.

Local taste preferences and also climate considerations determine the use of available native varieties. Various types of flint corn are popular for arepas in Antioquia and a dent corn is more popular in Valle del Cauca and Tolima. A soft floury type corn is most often grown in Boyacá, Cundinamarca and Nariño.

Almost 60 percent of the farm units with corn, according to the 1959-60 Census of Agriculture in Valle del Cauca, Caldas, and Cundinamarca were smaller than five hectares in size, and only included about one quarter of the total corn area (Table IV-3). Many of the farms in this size group had corn plantings of less than one hectare. It is probable that most of these units produced corn strictly for home consumption.

The 1960 Agricultural Census of Cundinamarca showed that about 70 percent of the farms with corn had less than one hectare planted to corn. A small farm studied in the Sabana illustrates some of the characteristics of units within this group.

Table IV-3: Area of corn in Valle del Cauca, Caldas, and Cundinamarca 1959-60, by size of farms with corn, and by size of plantings

Size class	Farms with corn	Area of Corn		Percentage distribution of total corn area
		Total	Per Farm	
Hectares	number	hectares		percent
Size of Farm				
less than 1.0	20,367	7,062	.3	4
1.0-4.9	43,908	40,552	.9	23
5.0-9.9	19,615	28,339	1.4	16
10.0-19.9	12,620	24,231	1.9	13
20.0-49.9	8,025	25,072	3.1	14
50.0-99.0	2,996	16,840	5.6	9
100.0-199.9	1,483	14,961	10.1	8
200.0-999.9	1,046	18,460	17.6	10
1,000.0 or more	73	4,202	57.6	3
All Farms	110,133	179,719	1.6	100
Size of Planting				
Less than 1.0	68,084	29,709	.4	17
1.0-1.9	23,657	33,435	1.4	19
2.0-4.9	12,409	37,326	3.0	21
5.0-49.9	5,760	58,581	10.2	33
50.0 or more	223	20,668	92.7	11

SOURCE: Universidad del Valle, Facultad de Ciencias Económicas, Censo Agropecuario del Valle del Cauca, 1959, Edición Preliminar (Cali: October 1961) Tables 32 and 35;

Departamento Administrativo Nacional de Estadística, Directorio Nacional de Explotaciones Agropecuarias (Censo Agropecuario), 1960, Vol. I and II, Bogotá, 1962.

Farm X—a Subsistence Corn Producer

Farm X is located along the edge of the Sabana near the town of Subachoque. It is composed of 5 separate lots ranging in size from 0.3 to 2.6 hectares. All parcels are owned outright by the 63 year old operator, and total area amounts to about 9 hectares. The soils are flat, and moderately well drained, but strongly acidic and lacking in available phosphorus.

The main enterprise of the unit is some 10 grade dairy cows, and about as many young stock. Milk production is rather low, and income from livestock sales is nearly as important as sales of milk. A few chickens, pigs, and sheep are kept to produce items for home use and for sale.

About one hectare of land was planted to corn for home consumption, and another small parcel of land produced two crops of potatoes per year for home use. Farmer X has, on occasions, raised both potatoes and wheat in partnership (compañía) with other individuals.

Even though Operator X was only getting 400 to 600 kilograms of corn per hectare (6-10 bushels per acre) he could see no convincing reason for shifting his corn land into another use. He cited the high prices which often occur for corn 3-4 months prior to harvests, and the fact that it was difficult to buy the variety his family liked as principal reasons for not changing. As on farms S and M (Chapter III) the traditional tastes plus associated risks of depending on the market (for home consumption purchases) outweighted any modest gains which might be realized by substituting a more productive enterprise for corn. Similar responses would be common for the thousands of

other small corn producers who depend on the market even less than do operators S, M, and X.

Commercial Feed Grain Production

The data in Table IV-3 show that farms with over two hectares of land in corn made up 65 percent of the total corn area in these three Departamentos. Producers with more than five hectares of corn contribute 44 percent of the total corn area, but probably a higher percentage of corn output. Farm units with larger size plantings of corn are more often users of improved seeds, are often partially mechanized, and generally have higher quality land for corn production. These larger units often use mixed fertilizers, but the practice of applying these fertilizers to corn is not common.

Most of the larger producers of corn and sorghum prepare and plant their land mechanically. Weeding and harvesting are almost exclusively done by hand.

At one time corn was called the colonizer's crop in Colombia. As new areas were opened and settlers moved in corn was one of the first crops planted. This is till true to some extent for land which is being colonized, and also for land which is switching from pastures to cultivated crops. When other crops such as cotton, rice, and oil crops start to enter the area, commercial farm units commonly work out some crop rotation which may or may not include corn.

Farm organization in the Valle del Cauca illustrates how corn enters into commercial production in an area which is well advanced in terms of agricultural cropping. It also gives some hints as to the possible future make-up of crop producing farms in areas which are

presently less developed.

On the 108 preliminary survey farms in El Cerrito area (in the valley floor), corn made up 20 percent of the area cropped, and was about 12 percent of all enterprise-units (Table IV-4). Corn contributed rougly the same proportion of the enterprise-units in all farm size groups. The contrast between farm make-up in the valley area, where commercial corn production is common, and hill area, where corn is grown as subsistence crop is shown in Table IV-5.

None of the 100 commercial farms visited in the El Cerrito area was a specialized corn producer. Rather, corn was grown in conjunction with other crops and/or livestock. Nearly 70 percent of these 100 units were classified as mixed crops or crop and livestock farms. Almost all of these units were raising corn, or could easily raise corn if the operator chose to do so. A medium-sized farm unit in the Cauca Valley illustrates some of the adjustments and problems which face commercial corn producers.

Farm Y—a Commercial Corn Producer

Farm Y is located in the Valle, and is made up of 86 hectares of land. Two lots of 15 and 71 hectares are owned by two brothers who work the farm as joint operators. The smaller lot is located in the foothills, and is used exclusively as pasture for about 20 head of cattle. The larger lot is a flat fertile piece of land with ample access to water.

Up until about 10 years ago the father of the two operators had run most of the principal lot as part of a 192 hectare, extensive cattle ranch. In addition, adjacent parcels totaling 20 hectares have

Table IV-4. Percentage distribution of crop and livestock enterprise units[a/] on 108 preliminary survey farms in the El Cerrito area of Valle del Cauca, by size of farm[b/]

Size of farm	Farms	Crops							Live-stock
		Corn	Cotton	Soybeans	Beans	Grapes	Others	Total	
(hectares)	(number)	(percent of all enterprise units)							
Subsistence[b/]	8	15	0	0	2	15	15	47	53
Commercial:									
1.1 - 5.0	33	13	0	0	5	19	24	61	39
5.1 - 10.0	11	14	8	0	0	9	6	38	62
10.1 - 50.0	30	12	5	7	2	3	10	39	61
50.1 -500.0	20	13	29	13	13	c/	1	69	31
500.1 or more	6	10	8	3	0	0	25	46	54
All farms	108	12	17	8	6	1	12	56	44

a/ One enterprise unit was assigned to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock.

b/ Farms were classified in the subsistence group when more than half their agricultural activity appeared to be devoted to production for home use.

c/ Less than 0.5 percent.

Table IV-5. Classification of 170 commercial farms in preliminary survey in two areas of Valle del Cauca, by type and size[a/]

Area and size	Specialized types				Mixed crops	Crop & livestock	Totals
	Dairy	Cotton	Coffee	Other			
EL CERRITO (valley area)							
1.1 to 5.0 has.	0	1	0	2	24	6	33
5.1 to 10.0 "	2	0	0	1	3	5	11
10.1 to 50.0 "	9	1	0	2	4	14	30
50.1 to 500.0 "	6	3	0	2	4	5	20
500.1 or more "	2	1	0	0	1	2	6
Totals	19	6	0	7	36	32	100
LA CUMBRE--DAGUA (hill area)							
1.1 to 5.0 has.	0	0	16	0	6	1	23
5.1 to 10.0 "	1	0	6	0	11	5	23
10.1 to 50.0 "	1	0	4	0	9	8	22
50.1 to 500.0 "	1	0	0	0	0	1	2
Totals	3	0	26	0	26	15	70

a/ The classification by type was made by assigning one enterprise unit to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock. Farms were classified as diversified crop and livestock unless 80 percent of their enterprise units were within one of the more specialized type classifications.

been purchased by the operators of Y and combined with their original inheritance.

The cropping patterns of Farm Y have changed steadily toward more intensive utilization of the land over the past 10 years. Corn has been grown each year since the pastures were plowed up, soybeans were grown from 1957 to 1963, and some cotton or dry beans had been grown in 1961 and 1962. In addition, about 12 grade milk cows and one hectare of grapes rounded out the operation in 1962-63.

Farm Y is located in an area which has a good deal of cane for sugar, cotton, rice, and vineyards. Irrigation is also common on a number of neighboring farm units.

Benchmark Plan: The larger parcel of land is well suited for intensive crop production. In 1962-63 the crops grown included corn, soybeans, and cotton. The farm is well equipped with three tractors, tillage implements, and a combine for harvesting dry beans or soybeans. Additional equipment is available for use on the farm from nearby units owned by brothers, or cousins. In 1962, the operators also invested in a sprinkling system which included a portable pump, pipes, and sprinklers sufficient to irrigate 10 hectares at a time. With this equipment they hoped to be able to increase yields, and also to regularly double crop their land. The total value of equipment on the farm amounted to over 250 thousand pesos in 1962.

Three permanent workers are employed on the farm, with one living on the principal lot. Additional workers are hired for planting, weeding, and harvesting. The two operators live with their families in the nearby village.

In 1962 cotton was grown on Farm Y for the first time, but owning to unidentified disease problems, associated with unfavorable weather, a considerable financial loss was incurred. Even though cotton may be tried again in a couple of years, a rotation of corn and soybeans is considered as the normal cropping program for Farm Y (Table IV-6).

The operation of the livestock enterprise is somewhat limited because of the violence problems encountered in the general mountain area where the cattle herd is situated. No buildings are located on the smaller lot. A worker goes up daily and milks the cows and then returns to the local village.

Alternative Plans: Plans II through VI each test the income prospects of several alternative cropping patterns. The first considers a double cropping of corn; the second, two crops of soybeans; and the third, two crops of dry beans. Plans V and VI include cotton during the first semester followed by corn in one case, and soybeans in the other. Both the cotton-corn and cotton-soybean rotations are popular with cotton producers in the Valle. Recommended rates of fertilization are also applied in each plan. No changes are assumed in the livestock enterprise.

The net earnings for Plans II and III, as well as the Benchmark Plan, would all be approximately equal (Table IV-7). But the Benchmark Plan with a rotation of corn and soybeans would make weed control somewhat easier than a double cropping of corn. The operators noted that losses from corn thefts were often substantial, and they were therefore, somewhat hesitant to plant only corn. They liked the additional time available for land preparation between two crops of

Table IV-6. Land use, crop yields, and livestock program under six alternative plans for Farm Y

Item	Benchmark Plan	Plan II	Plan III	Plan IV	Plan V	Plan VI
LAND USE			(hectares)			
Corn	67	134	--	--	67	--
Soybeans	67	--	134	--	--	67
Dry beans	--	--	--	134	--	--
Cotton	--	--	--	--	67	67
Grapes	1	1	1	1	1	1
Permanent pasture	15	15	15	15	15	15
CROP YIELDS			(kilos per hectare)			
Corn	3,100	3,100	--	--	3,100	--
Soybeans	1,900	--	1,900	--	--	1,900
Dry beans	--	--	--	1,200	--	--
Cotton	--	--	--	--	2,000	2,000
			(boxes per hectare)			
Grapes	600	600	600	600	600	600
LIVESTOCK ON HAND			(numbers)			
Milk cows	12	12	12	12	12	12
Young cattle	20	20	20	20	20	20
Bull	1	1	1	1	1	1
MILK PRODUCTION			(kilos per year)			
PER COW	1,200	1,200	1,200	1,200	1,200	1,200

Table IV-7. Comparative financial summary for six alternative plans for Farm Y, at 1961-62 prices

Item	Benchmark Plan	PLAN II (corn)	PLAN III (soybeans)	PLAN IV (dry beans)	PLAN V (cotton corn)	PLAN VI (cotton, soybeans)
RECEIPTS			(pesos)			
Corn	124,600	249,300	--	--	124,600	--
Soybeans	114,600	--	229,200	--	--	114,600
Dry beans	--	--	--	268,600	--	--
Cotton	--	--	--	--	241,200	241,200
Grapes	12,000	12,000	12,000	12,000	12,000	12,000
Milk	8,300	8,300	8,300	8,300	8,300	8,300
Cattle	3,800	3,800	3,800	3,800	3,800	3,800
Totals	263,300	273,400	253,300	292,700	389,900	379,900
EXPENSES						
Labor	77,700	84,400	71,000	71,000	104,500	97,800
Seed	8,100	7,200	9,200	11,200	4,800	5,800
Fertilizer	23,300	23,300	23,300	23,300	29,100	29,100
Spray mtls.	3,000	5,000	1,000	1,000	39,800	37,800
Containers	1,800	1,800	1,600	1,600	6,700	6,500
Transport	3,300	4,200	2,600	1,600	6,600	5,800
Gas & oil	6,000	6,000	6,000	6,000	6,000	6,000
Upkeep	6,500	6,500	6,500	6,500	6,500	6,500
Taxes	4,200	4,200	4,200	4,200	4,200	4,200
Interest	4,000	4,000	3,200	3,200	6,400	6,400
Other	1,000	1,000	1,000	1,000	1,000	1,000
Totals	138,900	147,600	129,600	130,600	215,600	206,900
NET INCOME	124,400	125,800	123,700	162,100	174,300	173,000
Home grown food	3,200	3,200	3,200	3,200	3,200	3,200
NET EARNINGS	127,600	129,000	126,900	165,300	177,500	176,200

soybeans since soybeans only require 100 to 110 days to mature in the Valle. With a sprinkling system the operators thought they could get 5 crops of soybeans in two years. If this were possible it would improve the income prospects of Plan III by 15 to 20 percent, and may lead the operators to specialize in soybeans. The operators also considered that specialized production of dry beans was an attractive alternative now that irrigation was available.

Both Plans V and VI, with cotton production, would return higher net earnings than any of the other plans, assuming that disease problems could be controlled and that proper irrigation practices were applied. The operators were hesitant to try cotton again, but it is likely that future economic incentives will be strong enough so that they will do so. If cotton is replanted in the future the operators of Farm Y felt they would use soybeans as a second crop.

With the flexibility in crop production which Farm Y has, it could be expected that the production on this farm would be rather sensitive to price changes. With Title I imports at a zero level (Level II), for example, the economic enducements for operators of Y to produce soybeans, or cotton and soybeans would be rather strong (Table IV-8). On the other hand, if Title I imports are continued at the same per-capita rate (Level I) there would be less inducement to change from the Benchmark Plan organization. Under Level III, with a doubling in the rate of Title I imports, the plans with cotton production would offer substantially more net earnings than any of the first four plans.

A further possibility, not budgeted here, is that Farm Y would be drawn into specialized production of cane for sugar. Such a change

Table IV-8. Estimated net earnings from six plans for Farm Y, calculated under alternative price situations related to levels of P.L. 480 programs

Price situations[a]	Benchmark Plan	Plan II (corn)	Plan III (soybeans)	Plan IV (dry beans)	Plan V (cotton corn)	Plan VI (cotton, soybeans)
		(net earnings in pesos of 1961-62)				
1961-62	127,600	129,000	126,900	165,300	177,500	176,200
1967-69 - I	151,300	153,800	149,700	178,600	177,600	175,400
- II	188,400	178,700	207,000	178,600	226,400	240,200
-III	139,600	141,300	138,200	178,600	195,600	193,800

a/ See Chapter I, p. 9.

would place the operators in a position of depending upon contractural relationships with a single cane buyer. The operators presently prefer to maintain their full independence, but it is possible that at some later date they will be willing to accept a favorable long-term contract for sugar cane production.

Other Commercial Corn Producers

Many of the relationships and conditions described for Farm Y existed on other farms studied in the Valle. Of ten sizable mechanized producers of corn in the Municipio of Candelaria, for example, all but one had cropping patterns roughly similar to Farm Y. Corn, soybeans, dry beans, and cotton were the main cultivated crops. One farm had only corn as a crop, but also had a large dairy enterprise. Irrigation systems were also found on a number of these units.

A large rented farm in the Municipio of Palmira illustrates that even under non-owner operations, cropping patterns are about the same. The unit included 330 hectares, all rented, and almost all double cropped. Cotton was the principal enterprise, with beans, corn, soybeans, and rice following in importance. Detailed income data for this farm showed cotton to be the biggest money maker per hectare in 1962. Cotton yielded a net income of 882 pesos per hectare, rice 802 pesos, corn 563 pesos, and dry beans 486 pesos. Returns for soybeans and dry beans were extremely low in 1962 due to a shortage of water for the irrigation system. The producer stated that in normal years the net return per hectare from soybeans and corn were about equal.

Aggregate Prospects

It is likely that one-third to two-thirds of Colombia's corn production takes place on units much like Farm S, M, and X, which are not primarily oriented toward commercial corn production. It is not probable that corn output, in the short run, on these units would be responsive either upward or downward to price variations induced by alternative levels of PL 480 programs. Furthermore, adoption of improved seed and use of more intensive fertilization will be slow on these units.

As demonstrated in Chapter III, corn will have difficulty in competing for land in cool climates with potatoes, wheat, barley, and dairy. There is some reason to believe that corn plantings in cool climates will decrease as more of the subsistence units are combined into commercial farms, and as more producers enter the market for their corn needs.

In the warmer climates where ideal physical conditions are found for the commercial production of corn, serious competition for the use of land also exists from other high value crops such as cotton, cane for sugar, oil crops, etc. Increases in production of corn from existing crop enterprises in these regions will depend on the use of improved varieties, extended use of commercial fertilizers, and appropriate application of irrigation and drainage.

Production of corn and milo can be expanded rapidly on new lands in developing areas like the Llanos and the north coastal region. But this will take large amounts of public and private investment in roads, drainage and flood protection, clearning, and other public services.

As noted in Chapter II, past investments have not been heavily oriented toward these types of agricultural development projects. Furthermore, if investment projects of high capital intensity do take place, high value crops such as cotton will have distinct advantages over corn or sorghums. Irrigation and drainage, especially, in the north coast region will likely boost corn production by allowing producers to follow cotton with corn or sesame.

CHAPTER V

ADJUSTMENT POSSIBILITIES IN LIVESTOCK AND POULTRY PRODUCTION

Small quantities of dairy products had been included in two of the first five Title I agreements. The total market value of these products was less than 500 thousand dollars.[1] Although Title I shipments of animal products have not been an important factor in Colombia's internal supply, livestock enterprises are important competitors for agricultural resources. Moreover, any future expansion in intensive dairy and poultry enterprises will have a direct relationship to the demand for feed grains in Colombia.

Dairy and Livestock Production

Cattle production has been a large and important segment of the Colombian economy, but the commercial production of dairy products is relatively new and has not been extensively studied. As was noted in Chapter II, the value of livestock production in 1962 including beef, dairy, poultry, swine, and sheep probably amounted to more than double the value of the coffee produced.

Historians report that cattle were introduced into Colombia as early as 1540. Some of these cattle entered by the north coast and

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[1] U. S. House of Representatives op. cit., (18th Semiannual Report) p. 67. Title III shipments of dry milk for use in school lunch programs and food donations have been significantly larger than Title I imports of milk products.

moved up the Magdalena River. Others came overland from Ecuador and Peru into Nariño, Cauca, and Valle del Cauca. From these original cattle four native breeds developed in separate parts of the country. The Blanco Orejinegro, a relatively small, dual purpose animal, developed in the rough mountain areas of Antioquia and Caldas. The Romosinuano and Costeño con Cuernos, more meat type animals, originated along the Atlantic coast. In the eastern llanos another meat animal called San Martinero came to be a popular breed.[2]

As early as 1893 Cebú breeding stock was brought into the country to improve the meat producing qualities of native cattle. Their ability to thrive under tropical conditions has now resulted in Cebú blood being evident in a large proportion of Colombia's beef cattle. Dairy and beef breeds of European origin have also been imported in limited numbers (Table V-1). As a result of these imports a sizable number of quality herds of Holstein, Red Poll, Ayrshire, and Brown Swiss, can now be found throughout the country, but most milk is still produced by dairy-breed-crosses or native-Cebú cattle. As can be noted in Table V-1, more than two-thirds of the breeding cattle imported from 1945 to 1962 were from the United States.

Cattle Inventory

Estimates of the 1963 cattle inventory range from a 25 million figure attributed to the Executive Director of the National Association of Livestock Funds, to a more conservative estimate of

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[2] Emigdio Pinzón, and others, Bovinos Criollos Colombianos, DIA Boletín de Divulgación No. 5 (Bogotá: Ministry of Agriculture, 1959).

Table V-1. Imports of breeding cattle from the United States and other sources, 1945-62

Year	Total imports	Source	
		United States	Other
		(number of head)	
1945	1,281	908	373
1946	643	473	170
1947	994	394	600
1948	414	372	42
1949	82	81	1
1950	318	265	53
1951	272	241	31
1952	576	472	104
1953	447	413	34
1954	5,368	4,074	1,294
1955	7,010	5,105	1,905
1956	934	814	120
1957	24	21	3
1958	44	39	5
1959	21	6	15
1960	526	102	424
1961	336	220	116
1962	470	n.a.	n.a.
	19,760	14,000	5,290

SOURCES: Departamento Administrativo Nacional de Estadística: Anuarios de Comercio Exterior, 1945 through 1961 (Bogotá: various years).

El Colombiano: Sept. 12, 1963

16 million by the Ministry of Agriculture.[3] To further confuse the issue the 1959-60 Census of Agriculture reported slightly less than 10 million head of cattle in 16 Departamentos.[4] The Census count is substantially lower than estimates prepared by the same agency after a 5 percent sample census in 1955, and is far below the over 15 million national total estimated by the Banco Ganadero for 1959.

Three of these sets of data, with regard to cattle inventory, are presented in Table V-2. It should be kept in mind that the 1955 Sample Census and the 1959 Banco Ganadero estimates are not completely independent since the Banco's distribution was partially derived from the 1955 surveys. It is interesting to note that the 1960 Census figures are much lower than the 1959 Banco estimates for all of the north coast Departamentos, where 40 to 50 percent of Colombia's cattle are raised. In this region cattle units are large, include a lot of wet swampy ground, and the land is often partially or totally covered with heavy vegetation. This makes it very difficult for census enumerators to check on numbers of cattle reported, especially when owners may be led by tax considerations to underestimate their holdings.

ttle Slaughter

Some indication of the trend in the size of the cattle ulation, and also the size of the cattle inventory in 1962 is

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[3] As reported in newspaper articles of El Tiempo, September 20, 3, and El Colombiano, September 12, 1963.

[4] Resumen Nacional, op. cit., p. 16.

Table V-2. Total cattle population by Departamentos, 1959-1960, according to two sources of data

Departamento	1955 Sample Census (thousands)	1959 estimates by the Banco Ganadero (thousands)	1960 Directorio Agropecuario (thousands)
Bolívar	1,976	2,382	941
Magdalena	1,684	2,065	1,090
Córdoba	1,119	1,535	917
Antioquia	1,402	1,485	1,159
Boyacá	540	1,056	1,203
Cauca	793	922	332
Cundinamarca	768	738	673
Valle del Cauca	818	691	569
Tolima	710	649	425
Santander	624	619	618
Nariño	310	598	218
Caldas	609	462	488
N. Santander	375	462	206
Huila	464	454	349
Atlántico	290	202	141
Meta	n.a.	a/	313
Chocó	n.a.	21	n.a.
Other	n.a.	829	n.a.
Totals	12,482	15,168b/	9,640b/

Meta became a Departamento in 1959. In the Banco's estimates, Meta is included with the intendencias and comisarías under "other".

Difference between total and sum is due to rounding.

SOURCES: Banco Ganadero: Informes y Balance, 1959 (Bogotá: 1960), as quoted by M.M. Riley.

Departamento Administrativo Nacional de Estadística: Muestra Agrícola Nacional, 1955 (Bogotá: no date), p. 53.

_____: Directorio Nacional de Explotaciones Agropecuarias 1960, Resúmen Nacional (Bogotá: Dec. 1962, processed), p. 16.

given by cattle slaughter records (Table V-3). Most of the cattle killed in Colombia go through municipal facilities, where local taxes are collected. In addition to these officially slaughtered cattle, a significant number of animals are killed in clandestine operations, or driven over the border into Venezuela. Riley reports estimates of a 10 percent rate of clandestine slaughter, and 100,000 to 300,000 head per year being contrabanded into Venezuela.[5]

As can be noted in Table V-3, there has been a 40 to 50 percent increase in the number of cattle officially slaughtered in Colombia over the 1946 to 1962 period. The more or less constant rate of female slaughter implies that there has been a fairly consistent increase in cattle inventory over the past 17 years. Counting the clandestine slaughter, and contraband movement it is likely that Colombia produced over 2 million cattle for slaughter in 1962. Legal exports in that year amounted to only 5 thousand head.[6] A complete ban on cattle exports had existed prior to November 15, 1960, as a means of protecting Colombian consumers against higher beef prices.

In the United States the ratio of cattle on farms to number slaughtered has averaged less than three to one for more than 30 years. In Argentina the ratio has been roughly four to one. Apparently the inventory-slaughter ratio in Colombia is much higher. Beef animals have a slow rate of growth in Colombia and are often held for 4 to 6

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[5] Harold M. Riley, A Study of the Colombian Beef Industry (Palmira: Facultad Nac. de Agronomía, 1962), pp. 10 and 92. (Mimeographed.)

[6] As reported in El Colombiano, September 12, 1963.

Table V-3. Number of cattle slaughtered and officially reported, by sex, 1946-62

Year	Males	Females	Total[a/]
	(number of head)		
1946	743	517	1,259
1947	788	565	1,354
1948	798	574	1,372
1949	773	566	1,338
1950	792	604	1,397
1951	797	634	1,431
1952	815	599	1,414
1953	788	548	1,336
1954	868	444	1,313
1955	871	483	1,354
1956	963	587	1,550
1957	989	688	1,677
1958	993	659	1,651
1959	970	587	1,557
960	1,006	565	1,571
61	920	610	1,530
62	1,120	680	1,801

Some years do not sum, due to rounding.

URCES: Departamento Administrativo Nacional de Estadística: Anuario General de Estadística (Bogotá: various years), and Boletín Mensual de Estadística, Nos. 121, 133, and 143.

years before slaughter. In some areas such as the eastern llanos cattle are not fed minerals nor are bull calves castrated. Few young beef animals are fed concentrates. Calving rates are only in the 50 to 70 percent range, and death losses for the entire cattle population may approach 8 percent per year.[7]

The approximately 2 million animals produced in 1962 imply a cattle inventory of between 12 and 16 million head if the inventory-slaughter ratio is between six to one and eight to one in Colombia.

Dairy's Relation to Beef Production

Unlike production in the United States, dairy products in Colombia are often produced by dual purpose animals. Moreover, significant quantities of milk are produced on farm units specializing in beef production, or on smaller farms where income from sale of animals may exceed returns from sale of dairy products. The picture is further complicated by the fact that "dairy" cows are exempt from property taxes under a special interpretation of the 1961 tax law;[8] hence, cattlemen in areas of the north coast are inclined to think of their brood cows as dairy animals even if they are only milked for a couple of months during the year.

For 1958, the Caja Agraria estimated the total milk cow population at 3.1 million, with 1.9 million in production, and with a

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[7] Riley, op. cit., p. 36.

[8] Federacion Antioqueña de Ganaderos, Revista Ganadería No. 8 (Medellín, December, 1962), pp. 9-24.

total milk output of 1,908 million bottles (weight unspecified).[9] A later estimate placed the number of cows milked at just under two million head.[10]

Use of Dairy Products

The CEPAL report of 1955 estimated that Colombian per-capita consumption of milk products (in milk equivalents) was about 182 pounds per year in 1953.[11] During the same period consumption of milk products in the United States was at a rate of 691 pounds per year.[12] Even though milk consumption has likely increased since 1953, it is doubtful in 1963, if per-capita consumption rates were more than one-third of those found in the United States.

Traditionally much of the milk production has been processed into various types of cheese. This was, in part, due to the deficiency of handling facilities for fresh milk in rural areas. Furthermore, the lack of refrigeration facilities in most homes forced housewives to buy milk daily or purchase other dairy products which did not need refrigeration.

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[9] Caja de Crédito Agrario, Departamento de Investigaciones Económicas, Carta Agraria, No. 29 (Bogotá, November, 1959).

[10] Unpublished data from the office of the Agricultural Attaché, U. S. Embassy, Bogota.

[11] Comisión Económica para la América Latina, Análisis y Proyecciones del Desarrollo Económico: La Agricultura Colombiana, (Mexico: United Nations, 1955), Cuadro VII-3.

[12] U. S. Department of Agriculture, A. M. S., "Supplement for 1959 to Agricultural Handbook No. 62," Consumption of Food in the United States 1909-1952 (Washington: Government Printing Office, August, 1960) p. 3.

Rapidly expanding demand for fluid milk in the large urban centers is shifting the emphasis from cheese production to fresh milk processing. In Medellín, for example, the manager of Proleche, which sells over 80 percent of Medellín's milk, reports that sales of fluid milk have gone up almost 100 percent from 1958 to 1963.[13]

In spite of the fact that per-capita consumption of fluid milk has likely increased there are still large segments of the population which do not regularly consume milk. A recent survey of 851 farm units in Antioquia, mainly in the coffee regions, showed that 36 percent of the families did not consume milk during the week preceding the survey, and that 27 percent of those that did used less than 4 liters (4¼ quarts) per week.[14] The lack of pasteurization facilities, refrigeration, local supplies, and income are important factors in explaining why these families do not consume more milk.

Developing Milk Markets and Producing Regions

During the past 10 years there have been some significant shifts toward dairy production in several areas. This is especially true in the Sabana and Valle where a rapidly expanding demand for dairy products, heavy competition from cultivated crops, and resulting high land values have forced beef out and helped bring dairy in. Land selling in these areas for from 7,000 to 15,000 pesos per hectare

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[13] Interview, September 18, 1963.

[14] Gilberto Zapata Lotero, "Antioquia Rural," published in the magazine La Nación Agrícola, Nos. 13 and 14 (Bogotá: Editorial Guadalupe Ltda. no date), p. 4.

(280 to 600 dollars per acre) in 1963 could not be extensively farmed in any economic sense.

Generally speaking there are six geographic demand centers developing for dairy products. The three dominant markets are Medellín, Bogotá, and Cali, with lesser centers located in Caldas (Pereira, Manizales, and Armenia), the Santanders (Bucaramanga and Cúcuta), and the coastal cities (Cartagena, Barranquilla, and Santa Marta).

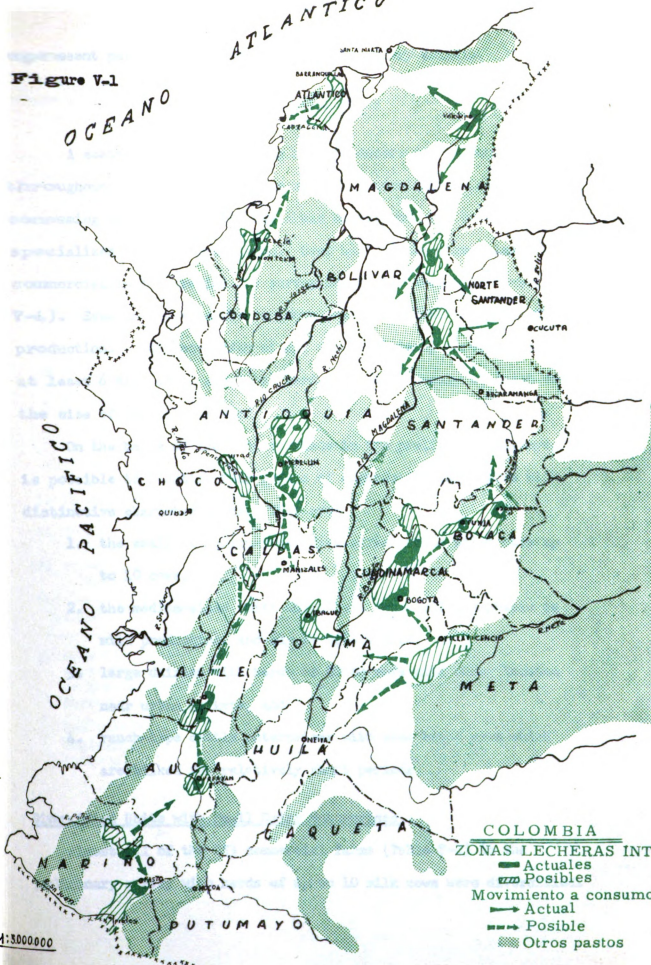
Bogotá is the largest market, and is presently drawing milk from the surrounding Sabana, and Boyacá to supply its needs. It is likely that future expansion in demand will create a need to draw milk from both Tolima and Meta to supply the Bogotá market (Figure V-1).

Cali presently receives most of its milk from the Cauca Valley, but increasing economic pressure from sugar cane, cotton, corn and other intensive crops is giving dairy serious competition for land. Shipments from Nariño, Cauca, Tolima, and Caldas will likely be necessary in the future to satisfy Cali's demands.

Medellín faces more problems in filling its future milk needs than any of the other markets. Large quantities of milk are presently being trucked in from northern Caldas, and Cereté, Córdoba. The milk hauled from Cereté to Medellín takes 18 to 20 hours by unrefrigerated trucks. Other areas in Antioquia, at some distance from Medellín, are being called upon to supply large quantities of milk. Seven cooling and pick-up stations have been established to serve small producers in these distant areas.

The solid color in Figure V-1 denotes the areas in Colombia where milk production was concentrated in 1962-63. The hatched areas are regions of potential production, and the spotted areas, therefore,

Figura V-1


OCEANO ATLANTICO
OCEANO PACIFICO
SANTA MARTA
BARRANQUILLA
ATLANTICO
CARTAGENA
MAGDALENA
VALLEDUPAR
CESAR
BOLIVAR
CORDOBA
MONTERIA
NORTE SANTANDER
CUCUTA
RIO CESAR
RIO NECHI
BUCARAMANGA
ANTIOQUIA
SANTANDER
MEDELLIN
RIO MAGDALENA
CHOCO
QUIBDO
BOYACA
CALDAS
MANIZALES
CUNDINAMARCA
BOGOTA
GIRARDOT
TOLIMA
VALLE
META
HUILA
NEIVA
CAUCA
POPAYAN
CAQUETA
NARIÑO
PASTO
TUMACO
PUTUMAYO
COLOMBIA
ZONAS LECHERAS INT:
Actuales
Posibles
Movimiento a consumo:
Actual
Posible
Otros pastos
E = 1:3000000

represent pasture or potential pasture for dairy animals.

Milk Producing Units

A scattering of small-scale milk producers can be found throughout the country, and some heavier concentrations seen around consuming centers, but very few areas of Colombia can be counted as specialized in dairy production. Over half of the farms classified as commercial in the preliminary survey had one or more milk cows (Table V-4). Even in the subsistence group over 40 percent had some milk production. About one-fifth of all the preliminary survey farms had at least 6 milk cows, and total herd size was commonly at least double the size of the milking herd.

On the basis of the contacts made in the preliminary surveys, it is possible to identify four groups of commercial dairy farms with distinctive characteristics. They are:

1. the small to medium-sized diversified units which have up to 10 cows,
2. the medium-sized units which have substantial emphasis on milk production, and may be specialized,
3. large dairies with herds of 40 or more milk cows, located near urban markets, and
4. ranch-type cattle enterprises with some brood cows which are milked for relatively short periods.

Diversified Units with Small Dairy Enterprises

Almost all of the 253 commercial farms (Table V-4) in the preliminary survey with herds of up to 10 milk cows were diversified.

Table V-4. Classification of preliminary survey farms in five sample areas according to size of milking herd[a/]

Herd size group	Sample area					Five Areas
	Ipiales	Sabana	Valle	Cereté	Fredonia	
	(number of farms)					
SUBSISTENCE FARMS						
No cows	11	3	7	26	17	64
One or more cows	31	4	1	10	1	47
Subtotals	42	7	8	36	18	111
COMMERCIAL FARMS						
No cows	21	25	325	36	93	500
1-2 cows	25	10	28	3	49	115
3-5 cows	28	13	24	9	10	84
6-10 cows	11	12	21	3	7	54
11-20 cows	6	7	22	7	2	44
21-50 cows	12	15	19	6	1	53
51 or more cows	0	14	17	18	1	50
Subtotals	103	96	456	82	163	900
Totals[b/]	145	103	464	118	181	1,011

a/ Many of the cows milked at some time during the year, and therefore counted in the milking herd, were of beef breeding or kept primarily for beef production, especially in the Cereté area.

b/ The totals exclude operating units smaller than the following minimum sizes: 0.5 hectares in Fredonia; one hectare in Ipiales, Valle, and Cereté; 2 hectares in the Sabana.

Some of the specialized coffee units in Fredonia with only one or two cows were the main exceptions.

In many cases a sizable portion of the milk production on these units is consumed on the farm. Additional milk may be sold to neighbors, or hauled by mule, boat, bus or truck to the nearest urban market. If the farm is located some distance from transportation facilities or markets, excess milk production is often converted to various types of cheese before being transported to market.

Cows on these farms are usually of dual-purpose type, and the use of artificial insemination is very rare. Forage is often limited and on steep hillsides, along roadsides, fence lines, or rough brushy land. Concentrates are very seldom fed to animals on these farms. In general, sizable opportunities exist for increasing the productivity of these dairy enterprises. Soiling crops such as imperial (oxonopus scoparius), plus other improved pasture grasses could make significant contributions of badly needed forage. Artificial insemination, which is available in several areas of Colombia, could also benefit a number of these dairy producers.

Farm M (cont.)

The medium-sized, Nariño wheat farm discussed in Chapter III is representative of dairy producers in this group. The five grade milk cows kept on this unit were all low producers, and were fed no concentrates. Pastures are unimproved and offer less forage than the herd could profitably utilize. The producer has little access to technical information, and artificial insemination services are not yet available in this part of Colombia. Furthermore, the producer's

interests are divided among several enterprises, and he is not likely to be very aggressive in improving his dairy operation.

About 25 to 30 percent of the herd's milk production is consumed on the farm. Transportation facilities are limited in the area, and operator M must haul his excess milk several kilometers by horse to Pupiales, where it is picked up and hauled 8 to 10 kilometers to Ipiales by bus.

Farm F

Another case in Fredonia, Antioquia, illustrates additional characteristics often found among units with small dairies. This unit, like thousands of other coffee producing farms, has few promising production alternatives. Since many of these coffee farms are located near densely populated areas, and often have some dairy cattle, it appears that more intensive milk production offers some promise.

Farm F has a principal tract containing 38 hectares of which 32 are in mature plantings of coffee. Two hectares of sugar cane, and 4 hectares of pasture account for the remainder of the land use. A second tract includes 32 hectares of rough steep land, all devoted to pasture. In addition, the operator has a one-sixth interest in a 64 hectare tract, which is located in a distant part of the Municipio where productive activities have been largely suspended due to violence. As can be noted in Table V-5, the principal lot of Farm F alone is much larger than the average coffee unit found near Fredonia. Over half of the commercial farms visited in the Municipio of Fredonia has less than 5 hectares of land.

Sales, other than coffee, include platanos, citrus fruits, milk,

Table V-5. Classification of 163 commercial farms in the Municipio of Fredonia, by type and size[a/]

Size class	Specialized coffee	Mixed crops	Crop and livestock	Totals
	(number of farms)			
0.5 to 5.0 has.	74	9	11	94
5.1 to 10.0 "	24	-	5	29
10.1 to 50.0 "	22	-	7	29
50.1 or more "	3	1	7	11
Totals	123	10	30	163

a/ The classification by type was made by assigning one enterprise unit to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock. Farms were classified as diversified crop and livestock unless 80 percent of their enterprise units were within one of the more specialized type classifications.

and meat animals. About half of the total milk output from the 8 cows is consumed by the operator's family and hired workers living on the farm. The remainder is sold to 8 to 10 rural families which live nearby.

Gross income at 1961-62 prices for this farm was estimated as follows:

	(Pesos)
Coffee	68,000
Platanos	500
Citrus fruit	500
Milk	2,300
Cattle	3,000
	74,300

Expenses included 33,000 pesos for hired labor, principally for cleaning and picking coffee, and 5,300 pesos for supplies, upkeep, taxes, and interest. This left a net income of approximately 36,000 pesos per year.

The dairy operation on F, like farm M, is only one of several enterprises. Furthermore, the operator sees only limited opportunities to market milk in Fredonia or Medellín, since there is no collection of milk in the locality. Nevertheless, one neighbor in a slightly more accessible location is planning to expand his dairy herd and sell milk in Fredonia, which now receives bottled milk trucked in from Medellín, some 60 kilometers away.

It can reasonably be expected that as transportation facilities expand and improve, and as processors in urban centers continue to search for more production of milk, that more coffee producers will be able to diversify into some dairy production. A pre-requisite for this

will be drastic changes in technical practices, and additional educational programs in coffee areas.

Medium-sized Commercial Dairies

Near the principal consuming centers there are a number of medium-sized dairy units which are moving toward specialized dairy production. A unit of this type located near Subachoque in the Sabana illustrates some of the characteristics of these farms.

Farm MS

In 1954 a family driven from Boyacá by the violence settled on a 27 hectare farm midway between Subachoque and Madrid. Two additional adjacent lots of nine hectares each, plus a 29 hectare lot no longer available, were also rented. In early 1963 the father of the family sold 9 hectares of land, and moved into Bogotá with most of the family. The eldest son took over the management of the farm, and is aided by his younger brother who hires-out with the family tractor.

During the past few years about 22 fair quality Holstein cows and an equal number of young stock have been built up. Wheat and barley have been regularly grown on both rented and owned land, with the stubble, plus additional rotation pasture furnishing forage for the livestock. Improved practices such as fertilization and pasture rotation are used. Although artificial insemination services are available, the operator has preferred to keep his own bull.

In 1962 about 200 leghorn pullets were purchased and a small laying house erected according to recommended standards for the area. The results from these had been satisfactory enough so that the operator was thinking of increasing the flock in 1963.

The present plans of the young operator include continuing his diversified farm program. Even though the soils on the farm are rich and well suited for most intensive crops, the operator prefers to emphasize pasture and dairy on his own land and plant barley and wheat on the rented land. It appears that giving up the dairy enterprise to specialize in barley, one of the most profitable crop alternatives, would reduce net earnings of farm MS considerably (see Plan IV in Tables V-6 and V-7). Potato production might yield more average income than barley, but the operator felt that the price uncertainties and hazards from disease made dairy preferable.

A good deal of opportunity is present for improving the productive capacity of the dairy herd through artificial insemination, and also through feeding concentrates at a higher level. Plans II and III, shown in Table V-6 and V-7, involve increasing concentrate feeding per cow to 500 kilograms and 730 kilograms respectively, as compared with the rate of 180 kilograms under the Benchmark Plan. The response in additional milk production per cow is estimated at 400 kilograms under Plan III.[15] On the basis of 1961-62 price relationships the higher levels of concentrate feeding are clearly profitable.

Plan III, with the heaviest rates of concentrate feeding, would return almost 80 percent more net earnings than the double cropping of barley in Plan IV. Since wheat cannot be double cropped with much success in the Sabana it would have even less opportunity than barley

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[15] C. R. Hoglund, A Budgeting Guide in Estimating Feed Inputs and Milk Production, Michigan State University, Agricultural Economics Department (Mimeographed) No. 670 (East Lansing, Michigan, 1957).

Table V-6. Land use, crop yields, and livestock program under four alternative plans for Farm MS

Item	Benchmark Plan	Plan II	Plan III	Plan IV
LAND USE		(hectares)		
Barley	6	6	6	66
Wheat	12	12	12	--
Rotation pasture	15	15	15	--
CROP YIELDS		(kilos per hectare)		
Barley	2,200	2,200	2,200	1,900
Wheat	2,000	2,000	2,000	--
LIVESTOCK ON HAND		(numbers)		
Milk cows	22	22	22	--
Heifers and calves	10	10	10	--
Dairy steers	7	7	7	--
Bull	1	1	1	--
Layers	200	200	200	200
MILK PRODUCTION		(kilos per year)		
Per Cow	2,500	2,900	3,100	--

Table V-7. Comparative financial summary for four alternative plans for Farm MS, at 1961-62 prices

Item	Benchmark Plan (very low conc.feeding)	Plan II (low concentrate feeding)	Plan III (moderate concentrate feeding)	Plan IV (double cropped barley)
RECEIPTS		(pesos)		
Barley	7,920	7,920	7,920	75,240
Wheat	17,520	17,520	17,520	--
Milk	35,570	41,460	44,410	--
Cattle and calves	19,900	19,900	19,900	--
Eggs	13,000	13,000	13,000	13,000
Fowl	1,800	1,800	1,800	1,800
Totals	95,710	101,600	104,550	90,040
EXPENSES				
Labor	5,660	5,660	5,660	2,830
Seed	2,490	2,490	2,490	6,510
Fertilizer & lime	5,400	5,400	5,400	16,170
Spray materials	180	180	180	660
Dairy feed	2,510	6,500	8,030	--
Poultry feed	7,980	7,980	7,980	7,980
Repl. pullets	4,200	4,200	4,200	4,200
Misc. livestock expense	1,500	1,500	1,500	200
Transport	300	300	300	1,000
Gas and oil	360	360	360	1,320
Machine hire	1,920	1,920	1,920	6,500
Upkeep	700	700	700	400
Rent	8,280	8,280	8,280	8,280
Taxes	680	680	680	680
Interest	800	800	800	1,800
Totals	42,960	46,950	48,480	58,530
NET INCOME	52,750	54,650	56,070	31,510
Home-grown food	3,020	3,020	3,020	2,200
NET EARNINGS	55,770	57,670	59,090	33,710

for replacing dairying on this farm.

It does not appear that the three future levels of Title I imports would alter the relative profitability of higher concentrate feeding rates (Table V-8). The cessation of Title I imports under Level II, and the resulting higher costs of concentrates would discourage dairymen from increasing their rates of feeding concentrates. On the other hand, large imports under Level III would surely be more favorable to higher rates of concentrate feeding than under a situation characterized by high feed prices and feed grain scarcity.

Since most of the dairymen are unfamiliar with the responses possible in milk production from concentrate feeding, many of them will have to experiment with modest changes in feeding rates before the responses assumed in this analysis can be accepted as indicative of results on an aggregate basis. Production responses calculated for the United States may not necessarily apply in Colombia, but one must depend on this limited data pending better experimental evidence. On this basis it can be concluded that many commercial dairy producers will find it profitable to expand feeding of concentrates in the future. This will be especially true of producers close to consuming centers where mixed feeds are available, and where favorable marketing conditions for milk exist.

A number of dairy operations will be expanding the size of their herds in the next few years in addition to utilizing more concentrates. The expansion will be both time-consuming and expensive for the farm units involved. The operators will have to sacrifice immediate income from cash crops while developing improved pastures, and rearing heifers. Many of them will also have to make investments in buildings

Table V-8. Estimated net earnings from four plans for Farm M8, calculated under alternative price situations related to levels of P.L. 480 programs

Price situations a/	Benchmark Plan (very low concentrate feeding)	Plan II (low concentrate feeding)	Plan III (moderate concentrate feeding)	Plan IV (double cropped barley)
	(net earnings in pesos of 1961-62)			
1961-62	55,770	57,670	59,090	33,710
1967-68 - I	55,140	57,800	58,120	33,200
- II	63,280	64,590	65,770	47,200
- III	51,730	53,630	55,050	20,080

a/ See Chapter I, p. 9.

and additional stock. Some of the difficulties, as well as possible benefits of a transition to more emphasis on dairying, are illustrated in the following discussion of a medium-sized unit at the edge of the Cauca Valley.

Farm TC

For the last 5 to 10 years the principal enterprises of Farm TC have been rice production and dairying. Approximately 13 hectares of rice have been double cropped each year, and a milk cow herd of 13 maintained. A 54 year old operator directly manages the 33 hectare farm. His 22 year old son owns adjoining property and gives limited assistance to his father. The operator of Farm TC also controls a 19 hectare share of land in his father's estate, which has not been officially divided. This land is cropped under a partnership arrangement with another heir, who pays half of the expenses and receives half of the income. The balance of the receipts and expenses for the crops of cotton and soybeans are included in the financial summary for Farm TC, but no changes in land use on this inherited tract will be considered in the alternative plans discussed later.

The dairy herd has not been intensively managed. Even though the cattle are of Holstein breeding, average annual production in 1962 was only estimated at 1,100 kilograms per cow. No concentrates were fed in 1962, and the 20 hectares of pasture are not regularly rotated or fertilized. The operator of TC had been fairly well satisfied with the results of his operation in the past. It has financed the education of his 10 children, and provided the family with a comfortable standard of living. But in 1962-63, the operator of TC

felt that he should make substantial improvements especially in his dairy operation. The fact that most of the nearby farm units were being intensively cropped with sugar cane, cotton, soybeans, corn and rice, plus the fact that his land had appreciated to a value of 6 thousand pesos per hectare were important reasons for this decision.

Experimental evidence suggests that artificial pastures such as pangola (Digitaria decumbrens), under irrigation and fertilization, will produce substantially higher yields than the native pastures presently found on farm TC. Under carefully managed rotation-grazing, pangola can be expected to provide high quality forage for at least three head of adult cattle per hectare.

Alternate Plan: By reducing the area in rice to 5.5 hectares and planting the remainder to improved pasture, at least 50 milk cows plus young stock could be maintained. The purchase of most of the animals needed for expansion would provide an opportunity to upgrade the average productive ability of the herd. In addition the rations for both cows and young stock would be supplemented by concentrate feeding. With improved pasture, concentrates, and some increase in productive capacity of the herd it seems reasonable to expect that an annual production of 3,000 kilograms of milk per cow could be attained after a transition period. Additional investments in livestock and buildings needed to realize this plan would amount to about 91,000 pesos. With less cultivated land the operator could sell his 5 year old tractor and rent cultivation time from his son who also owns a tractor.

The annual financial summary for a normal year, under the 1962 organization of the farm, and the results for the Alternate Plan after

a period of transition are shown in Table V-9. Net income could be expected to rise from about 50 thousand pesos to over 80 thousand, after including allowances for replacement and interest charges on the additional investments in structures and equipment.

A central point in operator TC's decision to expand the size and intensity of his dairy herd will be the distribution of income over the transition period.

The Transition: Table V-10 shows the planned changes in the dairy enterprise during a 7 year transition period. With the purchase of 45 two to three year old heifers in the first two years, the herd could be increased to 50 milk cows within 7 years. Table V-11 summarizes the annual cash transactions excluding loans and repayments for the seven year period. Table V-12 presents a summary of the annual net cash income including credit transactions over the same period.

The decrease in cash income from rice production plus the outlay of 69 thousand pesos for additional heifers, would force operator TC to borrow 65 thousand pesos in the first two years. Even with these loans net cash income, after credit transactions, would be reduced by 28 percent the first year over the Benchmark Plan (Table V-12). Income would still be 11 percent lower than the Benchmark Plan in the first year, but after that would be substantially higher.

On an aggregate basis it can be expected that many operators will be hesitant to undertake a rapid expansion in their dairy herds because of the length of time necessary to recover fixed investments. Furthermore, many of these operators will heavily discount the utility of expected higher income after the transition period, because of the

Table V-9. Annual financial summary for two plans in a "normal" year after a transition period, Farm TC

Item	Benchmark Plan	Plan I
	(pesos)	
RECEIPTS		
Rice	48,000	13,600
Cotton	27,000	27,000
Soybeans	16,900	16,900
Milk	7,800	113,800
Cattle and Calves	1,600	15,100
Total	101,300	186,400
EXPENSES		
Permanent workers	1,800	8,800
Temporary workers	23,900	12,600
Machinery rental	--	4,400
Seeds	6,300	2,600
Chemicals	9,400	6,700
Fertilizers	500	10,300
Livestock feed	--	43,600
Gas and oil	1,400	700
Purchase of livestock	--	--
Veterinary and medicine	400	4,000
Containers	1,400	1,400
Transport	700	700
Water rights	100	100
Taxes, insurance	600	600
Miscellaneous	1,000	1,000
Repairs	3,000	1,500
Current replacements	1,000	1,000
Added replacements	--	500
Interest on added invest.	--	3,800
Total	51,500	104,300
NET INCOME	49,800	82,100

Table V-10. Changes in the dairy enterprise during the transition period on Farm TC

ITEM	Unit	Years of the transition						
		First	Second	Third	Fourth	Fifth	Sixth	Seventh
Number of animals in the herd								
Milk cows	No.	15	35	43	43	47	49	50
Heifers, 2-3 years	"	25[a/]	20[a/]	14	18	18	18	16
" 1-2 "	"	--	14	18	18	18	16	16
" 0-1 "	"	14	18	18	18	16	16	16
Bulls	"	2	2	3	3	3	3	3
Animals purchased								
Heifers, 2-3 years	No.	25	20	--	--	--	--	--
Bulls	"	--	1	--	1	--	--	--
Animals sold								
Cull cows	No.	5	12	14	14	16	17	16
Calves	"	18	26	28	31	36	37	36
Milk production								
Production per cow	Kgs.	1,500	1,800	2,100	2,400	2,700	3,000	3,000
Total production	"	22,500	63,000	90,300	103,200	126,900	147,000	150,000
Consumed by heifers	"	4,200	5,400	5,400	5,400	4,800	4,800	4,800
Home consumption	"	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Sold		15,400	54,700	82,000	94,900	119,200	139,300	142,300
Concentrates fed								
To milking cows	Kgs.	7,500	21,000	30,100	34,400	42,300	49,000	50,000
To dry cows	"	2,000	4,700	5,800	5,800	6,300	6,600	6,700
To young stock	"	4,900	6,300	6,300	6,300	5,600	5,600	5,600
Total	"	14,400	32,000	42,200	46,500	54,200	61,200	62,300

a/ Purchased

Table V-11. Comparison of annual cash transactions, excluding loans and repayments, for two plans during a seven-year transition period on Farm TC

Item	Benchmark Plan	Alternate Plan, by years during the transition						
		First	Second	Third	Fourth	Fifth	Sixth	Seventh
		(Pesos)						
RECEIPTS								
Rice	48,000	13,600	13,600	13,600	13,600	13,600	13,600	13,600
Cotton	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Soybeans	16,900	16,900	16,900	16,900	16,900	16,900	16,900	16,900
Milk	7,800	12,300	43,800	65,600	75,900	95,400	111,400	113,800
Cattle and calves	1,600	3,100	7,700	12,100	12,300	13,300	15,100	15,100
Total	101,300	72,900	109,000	135,200	145,700	166,200	184,000	186,400

(cont' next page)

(Table V-11 cont')

OPERATING EXPENSES								
Permanent workers	1,800	5,400	5,400	8,800	8,800	8,800	8,800	8,800
Temporary workers	23,900	12,600	12,600	12,600	12,600	12,600	12,600	12,600
Machinery rental	--	4,400	4,400	4,400	4,400	4,400	4,400	4,400
Seeds	6,300	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Chemicals	9,400	6,700	6,700	6,700	6,700	6,700	6,700	6,700
Fertilizers	500	10,300	10,300	10,300	10,300	10,300	10,300	10,300
Livestock feed	--	10,100	22,400	29,500	32,600	37,900	42,800	43,600
Gas and oil	1,400	700	700	700	700	700	700	700
Purchase of livestock	--	--	--	--	--	--	--	--
Veterinary and medicine	400	1,000	2,000	2,200	2,800	3,100	3,600	4,000
Containers	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Transport	700	700	700	700	700	700	700	700
Water rights	100	100	100	100	100	100	100	100
Taxes, insurance	600	600	600	600	600	600	600	600
Repairs	3,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Current replacements	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Added replacements	--	--	--	--	--	--	--	--
Miscellaneous	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total	51,500	60,100	73,400	84,100	87,800	93,400	98,800	100,000
CAPITAL OUTLAYS								
Buildings	--	3,000	--	--	--	--	--	--
Permanent fences	--	1,000	--	--	--	--	--	--
Dairy equipment	--	1,000	600	600	--	--	--	--
Livestock purchased	--	35,000	34,000	--	4,500	--	--	--
Sale of tractor	--	-40,000	--	--	--	--	--	--
Total	--	0	34,600	600	4,500	--	--	--
NET CASH INCOME	49,800	12,800	1,000	50,500	53,400	72,800	85,200	86,400

Table V-12. Net cash income under two plans, before and after adjustment for credit transactions, Farm TC

	Benchmark Plan	Plan I, by years during the transition						
		First	Second	Third	Fourth	Fifth	Sixth	Seventh
					(pesos)			
Net cash income, before credit transactions	49,800	12,800	1,000	50,500	53,400	72,800	85,200	86,400
Loans	--	25,000	40,000	--	--	--	--	--
Payments of interest	--	2,000	5,400	5,400	4,400	3,600	1,600	--
Payments of principal	--	--	--	10,000	10,000	25,000	20,000	--
Net cash income, after credit transactions	49,800	35,800	35,600	35,100	39,000	44,200	63,600	86,400

reduction in income during the transition. When a number of dairy units are involved, the overall scarcity of quality heifers will also limit expansion.

Large Commercial Dairies

There are a number of large dairy units developing around the major consuming centers in Colombia. A total of 14 units visited in the Sabana, and 17 units in Valle, had more than 50 head of milk cows (Table V-4). Seven of these units could be called specialized in dairy production, the others being classified as diversified.

In general these larger units had quality cattle, utilized some artificial insemination, and also used milking equipment. Two types of feeding patterns were generally followed--depending on the climate. In the Sabana operators depend heavily on pasture with some supplemental concentrates or freshly cut green silage. In the warmer climates units tended to depend more on rapidly growing soiling crops such as elephante or imperial, along with rotation pastures. In general these larger units have capable managers who have access to most of the latest technical information.

Farm G

A unit located in the Sabana illustrates some of the characteristics of these large dairy herds. Nearly 900 hectares of land, made up of two adjoining parcels, form the unit. In 1962, the operation included about 800 head of Red Poll cows with some 500 head of younger stock. In addition to the livestock enterprise about 300 hectares of wheat and barley were also grown. The unit is run as a corporation with the business office in Bogotá, and a hired manager on the farm.

Communication between the owners in Bogotá and the manager on the farm is maintained by a two-way radio.

A total of 60 regular workers are employed, plus some additional workers hired during harvest seasons. The unit is fully mechanized, with eight tractors, and a rather complete line of other equipment. Part of the land is irrigated with sprinkling equipment, and the cows are milked with a double-eight parlor of modified herring-bone design. Some rotation pasture, the crop stubble, and 128 hectares of irrigated alfalfa and rye grass, furnish the forage for the herd. Some low quality wheat and barley produced on the farm has occasionally been used as a diet supplement, but concentrates are not regularly fed to the dairy animals.

During 1962 about 20 percent of the gross income from the dairy operation was from the sale of animals for breeding or meat. This took place even though the unit was increasing the inventory of cows. The manager reported a ready market for cull animals and breeding stock, and felt that his true dual-purpose breed represented a wise economic choice under the existing circumstances. He was dissatisfied with the small premium for clean milk which prevails on the Bogotá market, and felt that the price of dairy concentrates was too high to make their use feasible. Possibly he was correct in the latter view, considering the ample supply of forage which he had available on the farm. However, a ratio of more than 1 to 1 between the price of milk and the price of concentrates per pound or per kilogram is often conducive to at least limited feeding of concentrates. It is likely that these larger units will be the first to adopt higher feeding rates when their economy has been demonstrated.

Milk Production on Cattle Ranches

In Chapter II it was noted that there were 1238 individual land holdings of over 2 thousand hectares declared with INCORA in 1962. Many of these units are located in the eastern llanos or the north coastal region where large beef ranches are the principal enterprises. In a number of these large cattle ranches, especially along the north coast, operators are starting to commercially milk some of their brood cows. Undoubtedly, the overwhelming weight of farm decisions are still oriented toward beef production, but milk production is profitable enough so that some of the producers are selecting their better milk producing cows to keep for the brood herd.

This kind of dairying is prevalent around Cereté, where 18 of the 82 commercial farms in the preliminary survey supported herds of 50 or more cows that were milked during some part of the year. A number of these producers were also growers of cotton and other cash crops. The relationship between milk production and beef production is well illustrated on Farm R.

Farm R

The operator of this unit is a young man who maintains a livestock enterprise on 1,200 hectares of his own land and also exercises some control over an adjoining hacienda of equal size owned by his father. In many respects the two haciendas are managed much like a single unit, although ownership is divided, and business activities are recorded in two separate sets of books. Quite recently the father divided his land holdings equally among his four children and himself.

The 2,400 hectares were stocked with 4,500 to 5,000 head of

cattle in 1962. Only 40 to 50 hectares of the land were cropped and this was exclusively for the consumption by the 50 to 55 regular workers on the farm. Counting the value of the cattle and the land there was close to 15 million pesos (1.5 million dollars) tied up in capital in 1962.

Roughly 1,500 cows were kept for breeding purposes on this unit. Of these it was common to have about one-third which were giving some milk. Since the proportion of Cebú blood was high, cows are seldom milked for more than 4 months. Calves were generally allowed to run with the cows. Milk production in 1962 amounted to a little more than 60 kilograms per head for the 1,500 cows. About 40 percent of the production was consumed on the farm in the form of butter and cheese, the remainder was sold as fluid milk.

The 20 thousand pesos received for the sale of milk in 1962 was very small compared to livestock sales of over 2.5 million pesos. The direct cost of producing the milk included little over the labor involved, however, and this was usually available from the regular work force.

During the rainy season from May to August it is often difficult to deliver the milk to Cereté since roads are often impassable. For this reason it is often necessary, during this period, to convert the milk to cheese and ship it by boat to Cereté.

Presently the operator has no intention of increasing the milk production on his farm, either through selecting better milk producing cows, or through cross-breeding with dairy type bulls. It is likely though, that other large ranchers will find it advantageous to milk their brood herd in this non-intensive manner. Furthermore, it is

likely that some of the smaller beef operations will find it profitable to put more emphasis on dairy operations as the transportation system improves, and as processors in urban markets reach further out for supplies of milk.

Poultry Production

In the past the consumption of poultry products has been a distinct luxury for the overwhelming majority of the Colombian families. Even in 1962 an average farm worker in the area around Ipiales, Nariño, could only buy two-thirds of a dozen eggs with a full day's wages, and mature chicken often sold at almost a week's wage. The situation for urban workers was somewhat better, since they could purchase two-to-three dozen eggs with their day's salary. Even at that, there is some indication that the price of eggs has fallen, over the past few years, relative to some of the principal food staples. As can be noted in Table V-13, egg prices increased less over the 1955-56 to 1962-63 period than did rice, corn, panela, milk, or platanos. The rate at which the relative price for poultry products continues to decline, plus the speed with which a sizable middle-income class can be formed, will largely determine the extent of the future demand for poultry.

Poultry Numbers and Production

Some poultry can be found on all but the poorest of Colombian farms, but commercial production is centered around the large urban areas. Incomplete tabulations available from the 1959-60 Census show a total chicken population of 4.5 million head on 276,000 farms in the

Table V-13. Changes in retail prices of popular food in the Bogotá market, June 1955-56 to June 1962-63

Item	June prices 1955-56	June prices 1962-63	Percentage increase
	(pesos per kilogram)		(percent)
Eggs	5.55	10.90	96
Beef	3.45	6.40	86
Coffee	3.57	3.87	8
Beans	2.51	4.44	77
Rice	1.19	2.40	102
Corn	.51	1.35	164
Yuca	.51	.97	90
Potatoes	.51	.75	47
Panela	.50	1.14	128
Milk	.44	.93	112
Platanos	.36	.90	150

SOURCE: Departamento Administrativo Nacional de Estadística: Boletín Mensual, Nos. 65 and 148 (Bogotá: 1956, 1963).

Departamento of Cundinamarca, Valle del Cauca, and Caldas.[16] This would give a rough average of 16 chickens per farm. The national average was probably somewhat lower than this, hence, one might estimate a total population of 12 to 15 million head for the country in 1960.[17] It is almost certain that there has been a significant increase in the number of chickens from 1960 to 1963, if poultry feed production can be taken as an indicator. In 1958 only 14.5 thousand metric tons of poultry feed were sold, while in 1963 it was estimated that about 150 thousand metric tons would be marketed.[18]

On the basis of 10 million chicks hatched by Colombian hatcheries in 1962, it is conceivable that there were upwards of 15 to 20 million chickens commercially raised in 1962.[19] Thus, an estimate of 27 million chickens raised in Colombia in 1962 made by the U. S. Feed Grains Council, or the 34 million chicken estimate made by the Ministry of Agriculture could both be reasonable.[20]

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[16] Agricultural Census of Cundinamarca, Caldas, and Valle, op. cit., pp. 105, 54, and Table 46 respectively.

[17] Based on a total of 1,209 thousand farms in 15 Departamentos. Resúmen Nacional, op. cit., p. 15.

[18] Interview with personnel from Purina of Colombia, Medellín, September 25, 1963,

[19] Interview with personnel working for Avícola Colombiana Itda., Medellín, September 27, 1963,

[20] Conversation at U. S. Feed Grains Council, Bogotá, August 20, 1963, and as reported in F. A. S. Report, October 17, 1962, op. cit., p. 20.

Most of the modern techniques of poultry production are available in Colombia, mainly through the efforts of feed mixers, hatcheries, drug manufacturers, and equipment makers. Marketing facilities are generally less well developed; ungraded eggs, and live poultry still make up a large portion of the poultry products purchased by Colombian consumers.

By United States standards the prices of both feed and eggs are high. The price of laying mash in Medellín, for example, in September 1963, was around 5.50 to 6.00 dollars per 100 pounds. Ungraded eggs were selling for the equivalent of 60 cents (U. S.) per dozen. This meant that 10 dozen eggs would pay for 100 pounds of mash, however, a more favorable ratio than generally prevails in the United States.

Farms with Poultry

Even though feed costs have been high and the relative price of eggs falling, a number of farm operators have found it profitable to expand poultry production. This includes a few big broiler and egg producers around the larger cities, and also a number of small diversified farms scattered throughout the country.

Of the 900 commercial farms visited in the preliminary survey, some 85 had flocks of chickens with more than 50 head (Table V-14). There were 18 farms with one hundred to five hundred head, and 15 farms with more than 500 head of chickens in their flock. These larger producers were generally using more or less advanced techniques of poultry production.

The picture of how poultry production is expanding with regard to flock size is rather unclear. Feed manufacturers and commercial

Table V-14. Classification of preliminary survey farms in five sample areas according to number of chickens on hand

Flock Size	Sample area					Five Areas
	Ipiales	Sabana	Valle	Cereté	Fredonia	
SUBSISTENCE FARMS						
No chickens	22	1	2	6	5	36
One to 50 head	20	6	6	30	13	75
Subtotals	42	7	8	36	18	111
COMMERCIAL FARMS						
No chickens	42	42	79	33	21	217
1 to 50 head	58	46	332	24	138	598
51 to 100 "	2	5	21	20	4	52
101 to 300 "	1	2	8	5	--	16
301 to 500 "	--	--	2	--	--	2
More than 500 head	--	1	14	--	--	15
Subtotals	103	96	456	82	163	900
Totals	145	103	464	118	181	1,011

hatchery people report that their sales to both small diversified farms, and large specialized producers are expanding rapidly. Managers of small diversified units are finding that a small poultry enterprise can be started with little additional investment, and that it often uses family labor resources which are abundant for this type of light work. It also allows the family to increase their consumption of poultry products. Eggs and chickens from these farms are often sold in local open markets or stores. On the other hand, larger poultry producers have found favorable marketing arrangements with restaurants, hotels, and super markets. Several of these producers near Cali, Bogotá, and Medellín are vertically integrated, at least to the extent of having their own processing plants.

It is apparent that larger producers have a distinct advantage in better access to technical information, credit, and modern marketing systems. Many potential producers are disadvantageously located so that they lack adequate farm-to-market transportation systems, and access to mixed feed, technical assistance, and quality stock. An interesting experiment toward providing some of the lacking facilities is underway in the coffee area around Manizales. This program to stimulate poultry production on coffee farms is supported by the Federación de Cafeteros, other local agencies, and the Comité Interamericano de Desarrollo Agrícola.

Farm PS

The effects of alternative levels of PL 480 imports on the commercial sector of the poultry industry is illustrated below in terms of a small, diversified farm located near a rural village in the

Valle del Cauca. The unit includes a total of only 3.5 hectares, of which 1.5 are in pasture. The farm is operated as a family partnership with a brother acting as the manager. Two adult sisters and an aged father live on the farm and do much of the light work. A brother lives 18 to 20 miles away in Palmira with his wife and children. One of the sisters earns a salary as a school teacher in the nearby village, but the remainder of the family's income is furnished by the farm.

The farm was acquired in a trade for urban property in 1960. Over a three year period, additional grapes have been planted, a laying hen operation added, three grade milk cows purchased, and a swine operation started. The family has received a good deal of assistance in planning these changes from a technician of the Cauca Valley Corporation (CVC). After some careful thought the family feels that a small dairy herd offers the most possibilities for their farm, perhaps in conjunction with an increase in the size of their laying flock or a shift to broiler production

Benchmark Plan: The most important source of farm income in 1962-63 was about 500 laying hens. These were kept in a fenced-in-yard with limited overhead shelter, and the hens had an average production of about 180 eggs per bird per year. Pullet chicks were purchased each year for replacing most of the flock. One hector of grapes, some of which were not yet in production, was also an important source of income. Only natural pasture is supplied for the three dairy animals, and their annual milk production is roughly 2,000 kilograms per cow. A sow produces two litters of pigs each year, providing about a dozen

for sale at weights of around 100 kilograms each. One full-time worker is employed, and occasional temporary labor is hired for work in the grapes.

Plan II: This plan would include increasing the milk cow herd to six animals, and planting two-thirds of a hectare of pasture to elefante (Pennisetum purpuracena) to provide cut forage. In addition, concentrates would be fed to the milk cows at a rate of 820 kilograms per year. Investment in three additional heifers plus a small stable would total about 9,000 pesos. Artifical insemination services would be utilized to upgrade the quality of the herd, and milk production would be expected to rise to about 2,900 kilograms (Table V-15).

Plan III: In Plan III, the only changes from the Benchmark Plan would be a doubling of the size of the laying flock, and purchasing ready-to-lay pullets rather than chicks for replacements. Additional investments in shelter and equipment would amount to about 1,500 pesos.

Plan IV: Under this plan broilers instead of layers would be raised. Four different broodings of 1,000 each would be grown. Birds would be held until they weighted 3.5 pounds each, and they would require feed inputs of 8.75 pounds per bird to reach this weight. Mortality is estimated at 10 percent.

Comparative results: It can be noted in Table V-16 that Plans II and III would return the highest net earnings to farm PS. Plan IV with broilers would not compete favorably with dairy or laying hens, and furthermore, would likely involve more risk than either of the other

Table V-15. Land use, crop yields, and livestock program under four alternative plans for Farm PS.

Item	Unit	Benchmark Plan	Plan II	Plan III	Plan IV
LAND USE					
Grapes	has.	1.0	1.0	1.0	1.0
Misc.fruits	"	0.1	0.1	0.1	0.1
Pasture	"	2.0	2.0	2.0	2.0
CROP YIELDS					
Grapes	boxes	500	500	500	500
LIVESTOCK NUMBERS					
Milk cows	head	3	6	3	3
Young cattle	"	3	5	3	3
Sow	"	1	1	1	1
Pigs raised	"	12	12	12	12
Layers (av.no.)		500	500	1,000	--
Broilers raised yearly		--	--	--	4,000
LIVESTOCK PRODUCTION RATES					
Milk per cow yearly	Kilos	2,000	2,900	2,000	2,000
Eggs per layer yearly	doz.	15	15	15	15

Table V-16. Comparative financial summary for four alternative plans for Farm PS, at 1961-62 prices

Item	Benchmark Plan (diversified)	Plan II (more dairy)	Plan III (more layers)	Plan IV (broilers)
		(pesos)		
RECEIPTS				
Grapes	10,000	10,000	10,000	10,000
Misc. fruit	300	300	300	300
Milk	2,280	9,690	2,280	2,280
Eggs	34,750	34,750	70,750	--
Cattle & calves	1,250	5,500	1,250	1,250
Pigs	6,600	6,600	6,600	6,600
Poultry	6,300	6,300	12,600	44,100
Totals	61,480	73,140	103,780	64,530
EXPENSES				
Labor	6,030	6,800	6,800	6,800
Seed & fertil.	370	680	370	200
Mixed feed-swine	4,800	4,800	4,800	4,800
- poultry	22,050	22,050	46,000	18,900
- dairy	--	2,460	--	--
Pullets	8,250	8,250	16,500	--
Broiler chickens	--	--	--	8,000
Supplies	1,850	1,950	2,050	2,540
Gas and oil	800	800	800	800
Tractor rent	90	90	90	90
Transport	220	220	220	220
Upkeep	1,600	3,200	3,200	4,200
Taxes	140	140	140	140
Interest	640	1,280	1,600	2,400
Totals	46,840	52,720	82,570	49,090
NET INCOME	14,640	20,420	21,210	15,430
Home-grown food	3,510	3,510	3,510	2,360
NET EARNINGS	18,150	23,930	24,720	17,790

three plans.

Under the alternative price assumptions, related to levels of Title I imports, income for farm PS would vary significantly (Table V-17). With a continuation in the present rate of Title I imports income would likely slip some from the 1961-62 level. The increasingly short feed grain supply would likely force feed concentrate prices up at a faster rate than poultry product prices.

Under Level II, where no Title I imports are made, feed grain prices would be under heavy pressure to rise. Feed producers would face very short supplies and possible rationing of the corn and grain sorghums. With less feed grains available poultry product prices would also be under considerable pressure to rise; because of the relatively inelastic nature of the demand from high-income families it is probable that poultry product prices would rise more rapidly than feed prices. Producers such as PS would probably find it profitable to expand poultry production, but also find it very difficult to obtain the necessary concentrates.

If Title I imports of feed grains were substantially increased (Level III) net earnings from farm PS would be slightly lower than for 1961-62. Since the demand schedule for feed grains is likely relatively elastic on the down side, it is doubtful that feed grain price would fall from the 1961-62 level. On the other hand a continued rapid expansion in poultry production following from more feed grains, could be expected to put some downward pressure on egg and poultry meat prices. The rising per-capita income, population growth, and a continued fall in relative prices, however, would likely result in a relatively elastic demand schedule on the down side. A

Table V-17. Estimated net earnings for four plans for Farm PS, calculated under alternative price situations related to level of P.L. 480 programs

Price situations[a]/	Benchmark Plan (diversified)	Plan II (more dairy)	Plan III (more layers)	Plan IV (broilers)
	(net earnings in pesos of 1961-62)			
1961-62	18,150	23,930	24,720	17,790
1967-68 - I	16,150	21,570	21,280	15,980
- II	22,090	27,300	33,530	23,470
- III	16,910	22,480	22,630	16,320

a/ See Chapter I, p. 9.

larger market would, thus, stimulate improved marketing facilities, producer efficiency, and likely amplify feed producers' programs of technical assistance to poultry growers. These factors could help cause a substantial increase in small poultry enterprises on small to medium sized farms like PS.

Aggregate Prospects

A continued rapid expansion in Colombian population, further growth in per-capita income, and the present low rates of per-capita consumption, imply that substantial increases in dairy and poultry products consumption are likely. The degree to which relatively lower prices for these products can be realized, mainly through lower production costs, will also be important in determining how fast demand will expand. The principal limitation on lower production cost will be the supply of feed grains for mixed feed. It is evident that producers could be found to convert almost any given quantity of feed grains to additional poultry, milk, or pork, provided expansion of these enterprises did not take place so rapidly as to drive product prices to unfavorable levels.

A 2.8 percent rate of growth will add 17 percent to Colombia's population by 1967-68. Demand schedules for meat, milk and eggs, considering population and income effects, could easily increase by 20 percent or more. A corresponding increase of 20 percent in the total production of pork, chicken and eggs would require at least 160 thousand additional tons of feed grains, assuming (a) that mixed feeds would provide the entire ration for the increase in pigs, and poultry; (b) that 70 percent of these mixed feeds would consist of feed grain;

and (c) that reasonably high feeding efficiency would be maintained.

Similar increases in milk production would only partly depend on additional feeding of mixed concentrates, since this could only be expected to take place in commercial herds under relatively intensive management. Assuming that such herds account for only a third of the total milk, and that production in these could be increased by 20 to 25 percent through increased concentrate feeding as anticipated on Farm MS, Farm TC, and perhaps on Farm G, then an aggregate increase of 150 million kilograms of milk would be compatible with the use of 120 thousand tons of feed grain and 30 thousand tons of other concentrates.

Under rather conservative assumptions, then, livestock and poultry producers could increase their use of feed grains by 280 thousand tons between 1961-62 and 1967-68, just to keep pace with population growth and very modest increases in real per-capita incomes. An alternative projection could be based on the upward trend in the amount of mixed feed manufactured between 1958 and 1962. At the past rate of 42 thousand additional tons of mixed feed per year, with a 70 percent feed grain content, the use of feed grains would increase by 176 thousand tons by 1967-68.

Furthermore, direct human consumption and further industrial uses of corn could dispose of 90 thousand to 120 thousand additional tons of corn by 1967-68. In total, Colombia could use at least 265 thousand to 400 thousand additional tons of feed grain by 1967-68. The possibilities of expanding feed grain production by this amount will mainly depend on Colombia's willingness to make major investments in relatively underdeveloped areas, and in part, upon competitive relationships between feed grains and other farm enterprises.

Altogether, the prospects of expanding livestock and poultry production at a rate more-or-less equal to the population growth, in the absence of imports of feed grains, seem rather dim. It is entirely possible that Title I shipments of up to 300 thousand metric tons of feed grain annually in 1967-68, would do little more than eliminate or ease an otherwise urgent need for expanding the domestic supply of feed grains.

CHAPTER VI

COTTON AND EDIBLE OIL PRODUCTION IN COLOMBIA

The recent success of the cotton development program has been one of the principal reasons why no cotton imports under PL 480 programs were necessary after 1958. Prior to that time some 16,800 metric tons of fiber had been shipped in under the first four Title I agreements.[1] The large increase in domestic production of cotton seed has helped expand the internal supply of edible oils, but Colombia still found it necessary to import large quantities of edible oil products. Each of the first five Title I agreements, plus the recently signed Title IV agreement included sizable quantities of edible oil products.[2]

The production of cotton is limited to the warm flat areas of Colombia, where it is common to find sesame and soybeans in both a complementary and competing relationship. These three crops currently account for most of the domestically produced edible oils. A combined discussion of production possibilities for these three, plus other oil crops will be presented in this chapter.

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[1] Witt and Wheeler, op. cit., p. 105.

[2] Information on the composition of the first five Title I agreements can be found in: U.S. Department of Agriculture, FAS, Colombian Agriculture, A report submitted by the U.S. Embassy Agricultural Attaché (Bogotá, 1962), pp. 32-34. (Mimeographed.) The Title VI contract is on file at the U. S. Agricultural Attache's office, Bogotá.

Background on Cotton Production

The use and production of cotton has played a long and fairly important part in Colombia's economic development. Early settlers along the north coastal regions and up the Magdalena River discovered that cotton was one of the important crops grown by the Indians living in that area, and soon found that they could profitably cultivate the crop themselves. Some of Colombia's first recorded exports, made in the early 1830's, were shipments of cotton from the Departamentos of Magdalena, Santander and Bolívar.[3] Up until the latter part of the 19th century exports of cotton and tobacco were important sources of foreign exchange for Colombia.

Production Trends

The production of cotton rose steadily during the first half of the 20th century, but continually fell short of supplying internal needs. Limited production information indicates that some 14,000 bales of fiber were produced in 1925, and that about 30,000 bales were grown in 1937-38.[4] The latter figure was raised on some 41,000 hectares, 88 percent located in the north coastal region, 11 percent in Santander, and only 6 percent in the upper Magdalena valley.[5] By 1950, the upper Magdalena accounted for about a third of all plantings, although the

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[3] Luis Eduardo Nieto Arteta, Economía y Cultura en la Historia de Colombia, 2d Edition (Bogotá: Ediciones Tercer Mundo, 1962), pp. 289-291.

[4] Horace G. Porter, The Cotton Industry of Colombia, Cotton Division, F.A.S. USDA, April 1961, p. 6.

[5] Ibid., p. 5.

country's total had not increased in the meantime.[6]

During the 1950's and early 1960's the production of cotton shot up rapidly. From 1951 to 1958 output more than doubled, and from 1958 to 1962 almost tripled (Table VI-1). The tenfold growth in output over these two periods was made with an increase of only four and one-half times in the amount of land planted to cotton. The continued shift of cotton production onto the highly productive lands in the upper Magdalena River basin and Cauca Valley, plus the use of improved seed and management practices were largely responsible for the more than doubling of yields experienced from 1951 to 1962.

These changes in cotton production followed closely upon the founding of the Instituto de Fomento Algodonero (IFA) in 1948, a semi-governmental agency which has played an important part in the extension and research activities associated with cotton production. IFA has also been responsible for the classification, ginning, and up until 1961, the distribution of fertilizer, seed, and exports of cotton. These latter activities are now handled by the Federación Nacional de Algodoneros, an organization which directly represents the cotton producers.

The Market for Fiber

Much of the incentive for establishing IFA, and encouraging internal production of cotton has come from Colombia's growing textile industry. Since 1907, when Coltejer set up a modern textile mill in Medellín, favorable tariff protection and the scarcity of textiles

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[6] Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas, Informacíon Estadística-Algodón Oleaginosas 1959 (Bogotá, 1960), p. 6.

Table VI-1. Trends in area, yield, and production of seed cotton, 1951-1963a/

Year	Area	Production of seed cotton	Average yield per hectare	Index numbers		
				Area	Production	Yield
	(hectares)	(metric tons)	(kilos)	(1951 = 100)		
1951	39,700	19,002	479	100	100	100
1952	55,163	31,668	574	139	167	120
1953	67,080	50,556	754	169	266	157
1954	82,280	80,286	976	207	423	204
1955	84,050	70,103	834	212	369	174
1956	68,578	64,125	935	173	337	195
1957	63,000	57,864	918	159	305	192
1958	77,000	73,165	950	194	385	198
1959	131,371	157,356	1,198	331	828	250
1960	152,150	193,661	1,272	383	1,020	266
1961	153,509	196,892	1,283	387	1,036	268
1962	176,928	218,040	1,232	446	1,148	257
1963b/	142,326	182,212	1,280	359	959	267

a/ Calendar-year data.

b/ Preliminary.

SOURCE: Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas: Colombia--Algodón y Oleagiosas--Economía y Estadísticas 1961-62 (Bogotá: 1963), and various monthly reports.

during the Second World War has helped Colombia establish a thriving textile industry. In 1961 textile firms employed over one-third of the industrial workers for the country, and helped make textiles the third largest employer, behind agriculture and food handling-processing.

During the 1940's and early part of the 1950's textile mills found imported cotton somewhat less expensive than locally produced fiber. In an attempt to offset this, a 1950 government decree favoring local producers was issued, which established obligatory fixed-price-quotas for textile mills' use of internally produced cotton.[7] Despite this, domestic fiber only accounted for 55 percent of mill consumption in 1957 (Table VI-2). In that year, a sharp currency devaluation resulted in a more or less doubling of the price (in pesos) of imported cotton. Because of this, the textile mills and government agencies acted rapidly to encourage internal production through development programs and significant price increases. The price of Grade 5 cotton had been held at 2.50 pesos from 1951 to November 1956. In December 1956 this was raised to 2.96, in 1957 to 3.92, in December 1958 to 4.12, and in June 1959 to 4.61 pesos per kilogram.[8] This additional price incentive plus vigorous developmental activities by IFA have helped Colombia produce sizable net exports of cotton in the years 1959 to 1963, although some producer-paid subsidies have occasionally been necessary to move these exports.[9]

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[7] Decree No. 1986, Article I, June 12, 1950.

[8] T. J. Goering, Cotton Production in Colombia (Palmira: Facultad Nacional de Agronomía, 1962), pp. 5-6. (Mimeographed.)

[9] Imports are still made of small quantities of long fiber cotton used in making sewing thread.

Table VI-2. Production and mill consumption of cotton in Colombia, 1951-63[a/]

Year	Production (metric tons)	Mill Consumption (metric tons)	Production relative to consumption (percent)
1951	22,575	6,474	29
1952	26,981	10,567	39
1953	28,685	17,031	59
1954	31,455	27,884	89
1955	33,682	24,672	73
1956	35,640	22,529	63
1957	37,172	20,573	55
1958	40,378	25,873	64
1959	43,839	56,408	127
1960	49,079	68,732	140
1961	50,785	71,509	141
1962	55,090	82,354	147
1963	62,252/b	66,547/b	107

a/ Calendar-year data.

b/ Preliminary.

SOURCES: Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas: Colombia--Algodón y Oleaginosas--Economía y Estadísticas, 1961-62 (Bogotá: 1963), and various monthly reports.
News item in El Colombiano (Medellín: Sept. 3, 1963), p. 19.

Areas of Cotton Production

In order to control certain diseases, cotton is only planted once per year, in different semesters, in the two production zones. In the internal zone, which includes the Cauca Valley and the upper Magdalena River basin, cotton is planted in the first half of the year and harvested in the second. In the exterior zone, which includes Meta, Santander, Magdalena, Guajira and the Sinú Valley, plantings are made in the second half of the year, and harvested in the first. The data presented in Table VI-3 shows that the emphasis in cotton production has shifted between these two zones in the past five years. In 1959, the upper Magdalena region produced almost half of the country's cotton, but by 1963 less than one-quarter was grown there. On the other hand, over the same period, production in the north coastal region more than doubled. In total, cotton production in the exterior zone more than doubled in the five year period, while the output in the interior zone was lower in 1963 than in 1959. This shift in production was a reversal of the change which occurred during 1940 to 1950.

The opposite change in the production of the two zones is an indication of the different physical and economic conditions under which cotton is grown in Colombia. In the exterior zone, for example, expansion in cotton plantings are directly related to the new lands being developed, and to the shifting of lands out of pasture and into crops. This is largely the explanation for the doubling in cotton area experienced in this zone from 1959 to 1963 (Table VI-4). As was noted in Chapter IV, it is likely that some of this expansion in cotton has been at the expense of corn and other crops. Water management problems have so far limited most of this zone to a single cropping program;

Table VI-3. Production of seed cotton by zones and areas, 1959-63/a

Zone and area	1959	1960	1961	1962	1963
	(thousands of metric tons)				
EXTERIOR					
North coast	42	71	65	82	88
Meta	0	0	0	/b	2
Santanders and others	1	1	1	1	/b
Sub-totals	43	72	66	83	90
INTERIOR					
Upper Magdalena	75	82	84	77	40
Cauca Valley	40	40	47	58	52
Sub-totals	115	122	131	135	92
Country totals	158	194	197	218	182

a/ Data for harvests by calendar-years.

b/ Less than 300 metric tons.

SOURCE: Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas: Colombia-- Algodón y Oleaginosas-- Economía y Estadísticas, 1959, 1960 and 1961-62 (Bogotá: 1960, 1961, 1963).

Table VI-4. Area of cotton by zones and areas, 1959-63/a

Zone and area	1959	1960	1961	1962	1963
EXTERIOR			(thousands of hectares)		
North Coast	39	60	56	70	74
Meta	0	0	0	/b	1
Santanders and others	2	1	3	1	3
Sub-totals	41	61	59	71	78
INTERIOR					
Upper Magdalena	69	72	74	68	34
Cauca Valley	21	19	21	36	30
Sub-totals	90	91	95	104	64
Country totals	131	152	154	175	142

a/ Planted area according to calendar year of harvest.

b/ Meta had only 130 hectares in 1962.

SOURCE: Instituto de Fomento Algodonero, Departamento de investigaciones Economícas: Colombia-- Algodón y Oleaginosas-- Economía y Estadísticas, 1959, 1960, and 1961-62 (Bogotá: 1960, 1961, 1963).

crops such as corn are, therefore, often displaced when cotton is planted.[10] Cotton appears to have first economic call on new lands in this zone. This is especially true in Meta, where cotton plantings jumped from 130 hectares in 1962, to an estimated 6,000 hectares in 1964.[11]

Plantings for 1963 in the upper Magdalena were halved after the January devaluation, which had the effect of raising cotton production cost by 30 percent.[12] Higher buying prices for cotton were announced in April 1963, but sesame prices had been raised earlier, and producers showed their responsiveness to forward prices by shifting to the latter crop. The lack of credit for cotton production was also cited as a reason for the decrease in cotton.

A less striking reduction in cotton production was also noted in the Cauca Valley in 1963. Yields in this area averaged 1.6 metric tons per hectare in 1962, versus 1.1 reported in the upper Magdalena, and help to explain the relatively smaller shift away from cotton. The 15 percent decrease experienced, nevertheless, gives evidence of the strong competition from sugar cane and other crops which are widely grown in the Valle.

Techniques in Cotton Production

Much of the land preparation and planting of cotton is mechanized.

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[10] See studies by Robert R. Nathan, op. cit., and Fundación Para el Progreso de Colombia, op. cit., (Rio Sinú), for further discussion of these water management problems.

[11] Instituto de Fomento Algodonero, Boletín Mensual de Información, Nos. 7 and 8 (Bogotá, August, 1963).

[12] Instituto de Fomento Algodonero, Departamento de Investigaciones Económicas, Costos de Producción de Algodón en Colombia 1961-62 (Bogotá, 1963), p. 40. (Mimeographed.)

Aerial application of insecticides is also widely used especially on the larger units. Harvesting, on the other hand, is almost all done without the aid of machinery.

Very little of the land in cotton production receives chemcial fertilizers. In 1959 it was estimated that only 3,500 metric tons of chemical fertilizers were applied to cotton.[13] At an average rate of 200 kilograms per hectare this would have only fertilized 10 percent of the land planted to cotton in 1959. In areas like Cereté it has been rather difficult for producers to procure fertilizers because of internal shortages. In 1962 only 40 metric tons of chemical fertilizers were available for producers in that area, which would have only been enough to fertilize moderately 200 of the 2,500 hectares planted in that year.[14] The opening of plants in Cartagena and Barrancabermeja for the manufacture of urea should make more fertilizer available for those producers who care to use it, but many cotton growers are not yet convinced that their rich valley soils will respond profitably to application of fertilizer.

The IFA cost of production study, mentioned previously, showed that of 97 farms sampled only 11 were using irrigation in their cotton production. Most of these units were located in the Valle del Cauca. As noted previously, producers in Tolima were not generally using irrigation for cotton, even though it was available in some areas.

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[13] Gustavo Peres A., op. cit., pp. 34-35.

[14] Information furnished by the Cereté office of the Federación de Algodoneros, July 16, 1963.

Cotton Producing Units

Farms producing cotton in Colombia vary a good deal with respect to size of plantings. In 1961, over half of the small farms with cotton made up only 6 percent of the country's total area of cotton (Table VI-5). On the other hand, 11 percent of the farm units had over 50 hectares of cotton and made up 60 percent of the country's total area. Unfortunately, little information is available to show the trends in the changes of size of cotton plantings. Informed individuals in Cereté claimed that in their area there had been a significant reduction in the number of small cotton parcels over the past couple of years. Problems of using aerial spraying in small lots, and the risk involved in cotton production in general, were reasons given for this decrease.

A surprisingly large proportion of the cotton production is on rented land. More than half of all plantings in the interior zone in 1961 was on rented land, while 43 percent of the land and one-third of the units in the exterior zone were on other than owner-operated lands (Table VI-6). By and large most of these rental arrangements are on a cash rather than percentage basis. The higher incidence of cotton grown on rented land in the interior is likely a reflection of the higher land values in that zone, which often induces absentee landlords to rent their land for cropping rather than leaving it in extensive livestock production.

There are very few farm units in Colombia which can be called specialized in cotton. This is quite understandable where year-around cropping is possible, and only one crop of cotton can be grown. In Tolima, Cundinamarca, and Huila, sesame, corn or sorghum are often

Table VI-5. Number of producers and area of cotton, by size of planting, with percentage distributions, 1961

Size of planting[a/] (hectares)	Producers (number)	Area of cotton (hectares)	Percentage distributions Producers (percent)	Area (percent)
0.1 to 5.0	3,604	9,217	51	6
5.1 to 20.0	1,866	20,446	26	15
20.1 to 50.0	809	26,593	12	19
50.1 or more	803	84,547	11	60
Totals	7,082	140,803[b/]	100	100[b/]

a/ Data for crops harvested in calendar 1961.

b/ Omitting 12,696 hectares in units of unespecified size.

SOURCE: Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas; Colombia--Algodón y Oleagionosas--Economía y Estadísticas, 1961-62 (Bogotá: 1963), Tables 11 and 17.

Table VI-6. Number and percentage distribution of cotton producers and land in cotton, by region and by class of tenure for land in cotton 1961 a/

Region and Tenure class	Farms	Area of cotton	Percentage Distribution Farms	Percentage Distribution Area of Cotton
	(number)	(hectares)	(percent)	
Exterior				
Owned	1,002	29,280	66	57
Rented	486	20,271	32	40
Mixed	35	2,114	2	3
Sub-total	1,535	51,664	100	100
Interior				
Owned	2,384	38,797	43	44
Rented	2,966	45,433	53	51
Mixed	209	4,909	4	5
Sub-total	5,559	89,139	100	100
Country totals	7,082	140,803 b/		

a/ Tenure class refers to the tenure exercised over the land planted to cotton in 1961 by the individual producer.

b/ Data omitted for 12,696 hectares of land with unspecified tenure.

SOURCE: IFA, Departamento de Investigaciones Economicas, Colombia Algodón y Oleaginosas Economía y Estadísticas 1961-62 (Bogotá: IFA, 1963).

grown on the land following cotton. In the Cauca Valley soybeans, dry beans, and corn are popular crops to follow cotton. In the exterior zone, less favorable conditions generally force cotton producers to use the land as pasture following the cotton crop.

In the Cereté area many of the cotton producers also have sizable herds of cattle. This is especially true of the larger units which have a majority of their operation oriented toward livestock (Table VI-7). As can be noted in Table VI-8, only 13 of the 82 commercial units surveyed in Cereté were specialized cotton producers, and several of these operators had relatively large income from sources outside their farm operation. There were 19 producers in Cereté who maintaintained a balanced operation which included both cotton and cattle. The balance in these operations reflects the high risk incurred in cotton production in this region, and also the wise economic use of land between cotton crops. The make-up of enterprises found in the Cereté area is intermediate, in many respects, between those found in other parts of the exterior zone, on the one hand, and the Valle on the other. Since the Cereté area is also intermediate in its development as a cotton area, the selection of a cotton producer from this area for special analysis is appropriate.

A Cereté Cotton Producer

Diversified Farm AA is a 230 hectare unit located in the eastern part of the Municipio of Cereté. Three separated parcels of land make up the unit. Two parcels of 30 and 130 hectares are used exclusively as permanent pasture for the 220 head cattle enterprise. Both of these parcels are subject to extensive flooding during the rainy season. The third parcel, hereafter called the principal lot, has 70 hectares of

Table VI-7. Percentage distribution of crop and livestock enterprise units[a] on 127 preliminary survey farms in the Cereté area of Córdoba, by size of farm

Size of farm	Farms	Crops						Livestock
		Cotton	Sesame	Corn	Rice	Others	Total	
(hectares)	(number)	(percent of all enterprise units)						
Subsistence[b]	45	1	0	8	8	34	51	49
Commercial:								
0.5 - 5.0	14	13	2	6	13	27	61	39
5.1 - 10.0	11	26	10	2	7	20	65	35
10.1 - 50.0	17	13	1	4	7	9	34	6
50.1 - 100.0	13	31	0	2	5	6	44	56
100.1 - 500.0	17	14	1	c/	c/	1	16	84
500.1 or more	10	2	0	1	c/	1	4	96
All farms	127	6.6	0.3	0.6	0.7	2.0	10.2	89.8

a/ One enterprise unit was assigned to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock.

b/ Farms were classified in the subsistence group when more than half their agricultural activity appeared to be devoted to production for home use.

c/ Less than 0.5 percent.

Table VI-8. Classification of 82 commercial farms in preliminary survey in the Cereté area of Córdoba, by type and size[a/]

Size	Specialized		Mixed crops	Cotton and cattle	Other diversi-fied	Total
	Cotton	Cattle				
0.5 to 5.0 has.	4	1	7	0	2	14
5.1 to 10.0 "	2	0	5	1	3	11
10.1 to 50.0 "	2	4	4	1	5	16
50.1 to 100.0 "	4	1	1	5	3	14
100.1 to 500.0 "	1	6	1	9	0	17
500.1 or more "	0	5	0	3	2	10
Totals	13	17	18	19	15	82

a/ The classification by type was made by assigning one enterprise unit to each hectare of crops, to each cow, and to equivalent numbers of other productive livestock. Farms were classified as specialized if 80 percent or more of their enterprise units were in either cotton or cattle.

higher land located some 15 kilometers from the other property. The co-operators of the unit, a father and son, live in a small village not far from the latter parcel. Village residents conduct most all of their marketing activities in Cereté which is some 20 kilometers away.

Much of the land was originally inherited by the father when his father's landholdings were divided among 8 children. Before the land was divided most of it was in natural pastures. Since the division, additional small parcels of land have been purchased from other members of the family, or from small adjacent landholders, and the principal lot has been regularly cropped with cotton.[15]

Cattle raising is the main enterprise in the general area. Several nearby ranches have over 2,000 hectares, and one unit has 15,000 hectares, all in pasture. Much of the low land near Farm AA is subject to heavy flooding during the rainy season, and roads are often impassable because of the imundations.

The operating responsibilities are divided on the basis of the son focusing attention on the production of cotton and the father supervising the cattle enterprise. Cotton is usually planted on about 67 hectares of the 70 hectare principal lot, with the remainder being used as pasture for 5 or 6 cows kept to furnish milk for the families of the operators. About 10 hectares of the principal lot are occasionally flooded. This has happened in 3 of the last 10 years, but the rest of the parcel is higher and much better drained than most of

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[15] In one corregimiento near Cereté, the number of landowners decreased by 50 percent between 1953 and 1963. Most of the small owners moved into the local village and now work on nearby large units. See Havens' study of Cereté, op. cit., for further reference.

the land in the general area. The fertility of this land has been demonstrated over the last six years by average yields of almost two metric tons of seed cotton per hectare, without the use of commercial fertilizers.[16]

Some milk is produced by the 100 cow brood-herd, and most of this is processed into cheese before it is transported by horseback to the nearest road for delivery to Cereté. At the beginning of 1963, additional young heifers were being kept with a view to increasing the brood-herd to 160. Steer numbers were at a relatively low level. The operators had been regularly purchasing and selling as many as 100 head of feeder cattle each year to adjust stocking rates to available pastures. This included using the cotton land as pasture in the semester following harvests. The operators hoped that by increasing the size of their brood-herd they would be able to avoid purchasing feeder stock each year.

The equipment of the farm included a new tractor with some additional implements, and a jeep truck. The total capital investment including equipment, cattle, and land is estimated at 840,000 pesos, with the cotton land valued at 5,000 pesos per hectare and the pastures at 2,000 pesos per hectare.

The operators of Farm AA, like many of the other landowners in the north coastal region, are seeking better ways of adjusting to existing rainfall patterns and of solving their water management problems. The rainy season between May and September is commonly followed by hot

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[16] The average yield of seed cotton for 1960 and 1961 in the Cereté area was only 1.3 metric tons per hectare, according to data supplied by local representatives of IFA in an interview on July 16, 1963.

dry weather between November and April. If crops are planted too soon after July 1st they are often washed out by heavy rains. On the other hand, if the crops are planted too late there is a good possibility that not enough moisture will be available to mature the crops. Dry weather after the harvesting of the cotton also limits the possibility of planting an "off-season" crop. In some years, however, there are possibilities of double-cropping on land which is productive and well drained.

Supplemental irrigation along with some flood protection and drainage will undoubtedly allow much of the cotton land near Cereté to produce two crops annually. A planned project by INCORA (Córdoba No. 2) is intended to serve this need within this specific area. The sections below, however, present alternative plans for Farm AA in the absence of any area-wide development project.

Benchmark Plan

The Benchmark Plan includes the planting of 67 hectares of cotton each year, as has been the custom in the past. The size of the brood herd is assumed to have increased to 160 head in line with the present plans of the operators. As in the past, the average sale age of young stock would be relatively low, since the producers would likely continue to sell feeder stock to other ranchers in the area.

It is probable that past cropping of the cotton land has started to exhaust some of the plant nutrients, and that future cotton yields will be lower than those experienced in the past. It is assumed here that yields will average out to be 1,800 kilograms per hectare over the next few years. In other respects the plan reflects past operation and results of the farm.

Plan II

In Plan II corn would replace the cotton which has been regularly planted. No fertilizer would be used and the other practices would correspond to the Benchmark Plan. Cattle would continue to use the crop land after the crop of corn, and all of the corn would be sold for cash.

Plan III

Under Plan III 27 hectares of corn would be planted on the cotton land in the early part of the year after the cotton harvest. The remaining 40 hectares would be held ready for planting to cotton during the early part of the normal planting season. As the corn was being harvested, the 40 hectares of land would be prepared and planted with cotton. Since one year in three or four would probably be too dry to mature a normal crop on the late-planted 27 hectares, it will be assumed that only 60 hectares of cotton can be harvested, on the average, under this plan.

With the additional cropping on the 27 hectares of corn land it will be necessary to add 200 kilograms of urea per hectare to this land in order to maintain fertility. Less area will be available for grazing with the extra cropping so some feeder cattle will have to be sold at a younger age.

Plan IV

Plan IV is similar to Plan III except that 27 hectares of sesame rather than corn would be planted.

Plan V

In Plan V it is assumed that a supplemental irrigation system

would be installed on the land presently producing cotton. This would include the drilling of four shallow wells, and a 90,000 peso investment in a portable pump and sprinkling system. Sesame would be planted in the early part of the calander year on all of the 67 hectares, and would be irrigated as needed. The harvest would take place just before the start of the rainy season, and cotton would be planted toward the end of the rainy season. Each crop would receive 200 kilograms of mixed fertilizers per hectare.

Plan VI

This plan would be similar to Plan V except that rice would be planted instead of cotton. Harvesting of both crops would be done by hand.

Comparative Summary

Details of the physical make-up and financial summaries for the six plans appear in Tables VI-9 and VI-10. Under the 1961-62 set of prices only Plan V with irrigated sesame and cotton would return more net earnings than the Benchmark Plan. As can be noted in Table VI-11, under the three alternative sets of price assumptions for 1967-68, the operators of AA would have heavy economic incentives to plant corn or sesame between two crops of cotton. Furthermore, they would have a good deal of economic stimulus to invest in a supplemental irrigation system. It appears that the operators will be slow to install an expensive irrigation system, however, until it is clear what the public program will be along this line. In summary then, the various levels of Title I imports will probably only vary the rate at which Farm AA moves toward more intensive use of the land.

Table VI-9. Land use, crop yields, and livestock program under six alternative plans for Farm AA

Item	Benchmark Plan	Plan II	Plan III	Plan IV	Plan V	Plan VI
			(hectares)			
LAND USE						
Cotton	67	--	60	60	67	--
Corn	--	67	27	--	--	--
Sesame	--	--	--	27	67	67
Rice	--	--	--	--	--	67
Pastures	131	131	131	131	131	131
CROP YIELDS			(kilos per hectare)			
Cotton	1,800		1,800	--	1,800	--
Corn	--	--	3,000	3,000	--	--
Sesame	--	--	--	650	650	650
Rice	--	--	--	--	--	3,500
LIVESTOCK ON HAND			(numbers)			
Brood cows	160	160	160	160	160	160
Young stock	150	150	120	120	120	120
Bulls	3	3	3	3	3	3
MILK PRODUCTION						
PER COW	780	780	780	780	780	780

Table VI-10: Comparative financial summary for six alternative plans for Farm AA, at 1961-62 prices

Item	Benchmark Plan (cotton)	Plan II (corn)	Plan III (cotton, corn)	Plan IV (cotton, sesame)	Plan V (cotton, sesame, irrigation)	Plan VI (rice, sesame, irrigation)
RECEIPTS			(pesos)			
Cotton	253,300	--	226,800	226,800	253,300	--
Corn	--	100,500	40,500	--	--	--
Sesame	--	--	--	33,300	82,700	82,700
Rice	--	--	--	--	--	215,800
Cattle	57,000	57,000	54,800	54,800	52,500	52,500
Dairy products	18,500	18,500	18,500	18,500	18,500	18,500
Totals	328,800	176,000	340,600	333,400	407,000	369,500
EXPENSES						
Labor	45,400	25,500	49,200	49,900	76,000	63,100
Seed	1,900	3,000	2,800	2,300	3,500	17,700
Fertilizers	--	--	5,400	5,100	12,700	12,700
Spraying	42,000	--	37,700	37,700	42,000	31,200
Containers	2,200	4,000	3,500	2,700	2,600	2,700
Transport	6,600	6,000	10,000	6,800	8,800	13,300
Gas and oil	5,000	5,000	6,500	6,500	10,000	10,000
Upkeep	6,500	6,500	6,800	6,800	14,300	14,300
Taxes	2,300	2,300	2,300	2,300	2,300	2,300
Interest	2,400	1,600	2,400	2,400	6,400	6,400
Other	3,000	3,000	3,000	3,000	2,800	2,800
Totals	117,300	56,900	129,600	125,500	181,400	176,500
NET INCOME	211,500	119,100	211,000	207,900	225,600	193,000
Home-grown food	6,600	6,600	6,600	6,600	6,600	6,600
NET EARNINGS	218,100	125,700	217,600	214,500	232,200	199,600

Table VI-11. Estimated net earnings from six plans for Farm AA, calculated under alternative price situations related to levels of P.L. 480 programs

Price situations[a/]	Benchmark Plan (cotton)	Plan II (corn)	Plan III (cotton, corn)	Plan IV (cotton, sesame)	Plan V (cotton, sesame, irrigation)	Plan VI (rice, sesame, irrigation)
	(net earnings in pesos of 1961-62)					
1961-62	218,100	125,700	217,600	214,500	232,200	199,600
1967-68-I	228,300	157,900	230,300	236,500	250,600	216,100
-II	240,700	143,100	245,800	246,300	284,000	258,400
-III	228,000	127,900	228,300	224,900	246,400	190,400

a/ See Chapter I, p. 9.

Adjustment Possibilities on Other Farms

Four other case-study farms near Cereté had some cotton production as a part of their overall operation. Two were producing cotton on rented land and the other two utilized only their own property.

One of the owner-operated units with 110 hectares was subject to more flooding and drainage problems than Farm AA. An aged father and a 33 year old son were the co-operators of a few head of cattle, 5 hectares of corn, 15 hectares of rice, and 50 to 60 hectares of cotton. During the rainy portion of the year it is only possible to enter the principal part of the farm by boat or by horseback. Some 20 to 30 percent of the land is partially covered with flood waters during May through August. Although the cotton land is the highest and best drained on the farm it is often seriously affected by flooding in years of heavy rainfall. In 1962, for example, one-third of the 60 hectares planted to cotton were completely washed out by heavy rains and flooding. Roughly a 40 percent reduction in yields were also experienced on the land harvested. A river-diking project associated with drainage and pumping would be necessary before this farm unit can consistently produce a good crop of cotton.

Another owner-operated unit had similar water management problems. A total of 1,011 hectares of land made up of four widely separated lots formed this enterprise. Part of the land had been inherited by the 39 year old operator from his father, part by his wife, and some purchased. The principal enterprise was 1,200 to 1,500 beef cattle, some of which were milked. Since 1950, the operator had planted either cotton or corn on 100 hectares of his land which is the best drained. Other less well-drained lands were left in permanent pasture.

Much more of this land would probably go into crops when and if INCORA's Córdoba No. 2 project is completed.

Two smaller cases with cotton in the Cereté area were both renting at least part of their cotton land. One of these was run by a 26 year old who operated 33 hectares of family property, and 18 hectares of rented land.[17] A total of 34 hectares of cotton and 30 head of cattle made up his operation. He, like the operators of AA, used the cotton land after harvesting as a source of forage for his cattle enterprise. The other renter of cotton land had only a total of 4 hectares of land--three of which were rented. In 1962 only two hectares of cotton were grown and the operator was not sure that he would be able to secure the rented land in 1963 since it had recently been sold to another individual.

In general, it is clear that producers in the Simí Valley will continue to exercise considerable caution in selecting fields for cotton production. Owing to the variability of land resources, and the risks associated with cotton production, most farm units will likely continue to operate on a diversified basis. A continued trend toward more intensive farming can be expected, but any major shift to more cotton, or any large-scale expansion in the practice of double cropping will depend upon major investments in flood control, drainage, and irrigation.

The conditions are somewhat different in the Valle del Cauca, where development has progressed further, and land suitable for sugar

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[17] It was interesting to note that many of the cotton producers near Cereté were young individuals who found themselves with a good deal less land than their fathers once operated.

cane has recently been sold for from 7,500 pesos to 15,000 pesos per hectare. Intensive production, especially of cotton, has proved profitable there. The large rented farm near Palmira, discussed in Chapter IV, illustrates the place of cotton production in the Valle. As was noted previously, cotton on this farm returned the highest net income per hectare of any crops being grown on this farm. In the operator's mind it was the most profitable thing he could grow under the existing rental arrangements. He considered dry beans, soybeans, corn, and rice as crops of rotation rather than principal crops.

Aggregate Cotton Prospects

Although Colombian textile mills are increasing their rate of consumption of cotton fiber by about 10 percent per year (Table VI-2) it is likely that internal production can continue to provide for their needs. Since cotton is a high value crop it can compete favorably for most of the highly productive lands in the country. Furthermore, it offers the most prospects of helping to pay off the large costs of major development projects, designed to improve uses of water resources. Public investments of various kinds will be an important factor in determining how fast cotton production can advance. Since much of the cotton crop is already produced under an advanced level of technology, yield increases cannot be expected to have a drastic effect on future output. Higher rates of application of fertilizer will likely occur, but much of this will be needed to maintain the yields now being achieved by the better growers.

Supplies and Consumption of Edible Oils

Cotton seed, copra, soybeans, and sesame have been the principal

sources of edible oils for use in Colombia. The cottonseed and sesame oils are extracted from locally produced crops, the copra oil is mainly extracted from imported raw materials, and the soybean oil has been both imported and processed from local production. Only minor quantities of oil have been extracted from peanuts, African Palm, and the native palm, Noli.

The analysis of production and consumption of edible oils in Colombia is complicated by the fact that a high degree of substitutibility exists between lard and edible oils in consumption, and between edible and non-edible oils for certain industrial uses such as soap manufacturing. Available statistics do not provide an exact basis for separating the uses of these products. Vegetable oil consumption, nevertheless, has been estimated at around 5 kilograms per person, far below the average levels of 20 kilograms in France, 18 in the United States, and 17 in Spain.[18]

The production of vegetable oils from primary materials grown in Colombia has expanded rapidly over the past few years. As can be noted in Table VI-12 the supply available from these sources went up almost fivefold over the 1952-1962 period. Much of this expansion was furnished by the big increase in cotton seed production, but large quantities were also furnished by additional production of sesame and soybeans which were often grown in rotation with the cotton.

Unfortunately, this increase in internal production of edible oils has not freed Colombia from the need to import large quantities of these products. Even though the proportion of imports with respect to

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[18] Caja de Crédito Agrario, Departamento de Investigaciones Económicas, Carta Agraria No. 87 (Bogotá, April 1962), Anexo, p. III.

Table VI-12. Estimated production of vegetable oils from primary materials grown in Colombia, 1952-62

Year	Cottonseed oil[a/]	Sesame oil[a/]	Copra oil	Soybean oil	African palm oil	Total
			(metric tons)			
1952	2,295	2,185	2,352	--	--	6,832
1953	3,759	2,388	2,240	--	--	8,387
1954	6,092	3,132	1,792	446	182	11,644
1955	5,335	4,692	1,568	594	280	12,469
1956	4,800	4,985	1,232	1,040	364	12,421
1957	4,200	6,014	1,008	2,244	378	13,844
1958	5,280	8,622	840	890	385	16,017
1959	14,075	7,989	900	1,780	378	25,122
1960	17,488	8,910	300	2,700	350	29,748
1961	17,700	9,748	300	3,405	420	31,573
1962	19,350	9,256	300	4,050	420	33,376

a/ Includes minor amounts of imported materials.

SOURCE: Calculated from production data and extraction rates estimated by Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas: Colombia--Algodón y Oleaginosas--Economía y Estadísticas, 1961-62 (Bogotá: 1963), pp. 63-65.

total supply has been reduced somewhat, about one-third of the country's supply of edible oil products in 1961 and 1962 were imported (Table VI-13). Edible oils and primary materials for their production, in fact, have ranked second, valuewise, to wheat and four, among imports of agricultural products. The imports of copra, although traditionally a major source of edible oils, have been on the decline since the mid-part of the 1950's. Much of this decline is due to a Decree No. 2224 in 1958 which required that copra imports be reduced by 10 percent each year. Some decline in the imports of copra can probably also be traced to the big increase in cotton seed production which occurred after 1958.

Shipments of edible oil products to Colombia under Title I agreements occurred each year from 1955 to 1960.[19] The shipments in 1960 were especially significant, since they made up around 40 percent of the total imports of edible oils for that year. In total, edible oils have represented 15 percent of the market value of Title I commodities programmed for shipment to Colombia through June 30, 1963.[20]

It is not clear from the data presented in Table VI-13 whether there has been an increase in the per-capita consumption, or even an increase in total consumption of edible oils over the 1952 to 1962 period. It might be argued that prior to 1958 some of the edible oils were used in manufacturing soaps, etc., and since then tallow and lard have replaced part of this. The fact that imports of tallow increased from 4.5 thousand metric tons in 1958 to over 12 thousand metric tons

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[19] The Title IV agreement signed in March 1963 included 10 thousand metric tons of cottonseed or soybean oil.

[20] U.S. House of Representatives, op. cit., (18th Semiannual Report), p. 67.

Table VI-13. Trends in supplies of vegetable oils from three principal sources, 1952-62

Year	Oils produced from crops grown in Colombia	Oils from copra imports	Oils from P.L. 480 imports	Total from three sources
	(thousand metric tons)			
1952	7	17	--	24
1953	8	11	--	19
1954	12	20	--	32
1955	12	38	3	53
1956	12	45	4	61
1957	14	36	5	55
1958	16	33	1	50
1959	25	17	9	51
1960	30	21	14	65
1961	32	18	0	50
1962	33	16	0	49

SOURCES: Instituto de Fomento Algodonero, Departamento de Investigaciones Economícas: Colombia--Algodón y Oleagionosas--Economía y Estadísticas, 1961-62 (Bogotá: 1963), pp. 63-65.

Records from the Office of the U.S. Agricultural Attaché, Bogotá.

in 1961 is some evidence to substantiate this argument.[21] There is also discussion that recently some of the tallow may have gone directly into human consumption, but the author was unable to substantiate this. The fact that prices for edible oil products have moved up somewhat faster than the prices for other agricultural products gives some indication that the demand schedule is shifting.

In late 1961, IFA completed a study of the future demand and supply relationships for edible oil crops. They assumed that per-capita consumption of edible oils would increase to about 7 kilograms per year in Colombia by 1970, and that a growth of the population to 19.5 million would occur.[22] On the basis of these calculations they determined that Colombia would require 140 thousand metric tons of edible oils by 1970, almost three times the amount available in 1961-1962. Even if Colombia were only to maintain a per-capita consumption of 5 kilograms in 1970, it would need almost 100 thousand tons of edible oils. In order to increase internal production to meet these future needs IFA initiated a program to stimulate production of both annual and perennial oil crops, which is meeting with some success.

Production of Individual Oil Crops

It cannot be expected that the supply of cottonseed oil could be very independent from the demand for cotton fiber, since seed is only a small part of the value of cotton production. Also to some extent,

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[21] Departamento Administrativo Nacional de Estadísticas, Anuarios de Comerico Exterior, op. cit., issues for 1958, 1959, 1960 and 1961.

[22] Taken from unpublished material on file at Bogotá office of IFA.

the increases in soybean and sesame production will be closely tied to cotton production since they are both popular rotation crops, and in some cases competitors for cotton land. On the other hand, the increase in oil output from perennial crops such as coconuts and oil palms will depend on a different set of factors. Each of the major oil crops, plus a few of the factors which will likely affect their future production are discussed briefly below.

Sesame

About 85 percent of the production of sesame in Colombia is centered in the upper Magdalena Valley, where it is planted after the cotton is harvested. There is also some production in the north coastal region which accounted for about 6,300 of the country's total 42,000 hectares in 1962.[23] In 1957 IFA organized a Compaña de Fomento for the purpose of doing research on sesame seed varieties, fertilization, irrigation responses, and diseases. An improved variety called Chino Rojo has been distributed by IFA, but yields of sesame still averaged only 500 to 650 kilograms per hectare over the past few years.[24] Yields of almost 1,400 kilograms under experimental conditions have been reported where improved seed, irrigation, and some fertilization were used.

In general, the cultivation of sesame is mechanized except for the harvesting, which is commonly done by hand. The presently used

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[23] Instituto de Fomento Algonodero, Departamento de Investigaciones Economicas, Colombia-Algodón y Oleaginosas-Economía y Estadística, 1961-62 (Bogotá, 1962), p. 67.

[24] Eduardo Zuleta M., "El Ajonioli en Colombia," Agricultura Tropical Vol. 19, No. 7 (Bogotá, July 1963), pp. 416-422.

varieties are not adapted for mechanical harvesting because they shatter very easily. Since 1957 some producers have reported an unknown stem-and-root disease which has occasionally reduced harvests by as much as 30 percent of normal.[25] These problems with disease, the lack of fertilizer application, and the deficiency of irrigation, are explanations for the low yields experienced by producers.

IFA 's goal for sesame plantings by 1965 was 59,000 hectares.[26] It is likely that plantings in 1963 have reached this level, mainly because cotton growers in the upper Magdalena switched to two crops of sesame rather than their regular cotton-sesame rotation in response to the change in the price structure caused by the devaluation. It is doubtful that the 1963 level of plantings can be maintained, unless there is a significant increase in sesame yields, or another increase in the price of sesame relative to cotton.

Soybeans

Soybeans are a relatively new crop to Colombia, with commercial production only starting in 1954. Two processing plants located near Cali were instrumental in increasing soybean oil output almost tenfold over the 1954 to 1962 period (Table VI-12). Most of the land planted to soybeans is located in the Valle, where the area planted to soybeans increased from 2,500 hectares in 1956, to 5,800 in 1958, and to over 16,000 in 1962.[27] Experimental programs on soybeans have been carried

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[25] Ibid.

[26] Carta Agraria, No. 87, op. cit., Anexo, p. II.

[27] Sandoval A., op. cit., p. 133; Censo Agropecuario del Valle del Cauca 1959, op. cit., Cuadro 13; and IFA Economia y Estadisticas 1961-62, op. cit., p. 67.

out by IFA near Buga in Valle, and near Armero in Tolima. Results, so far, of these experiments suggest that the upper Magdalena River basin may be a bit too warm and dry for soybeans to grow well.[28]

Many of the producers in Valle apply irrigation and some fertilizer to their soybean crop. Most of them also utilize mechanical harvesting equipment which helps reduce labor costs to a lower level than that incurred for sesame. Farm operators report few if any disease problems with soybeans in the Valle.

In general, soybeans are grown on relatively large farms. Soybeans were produced on 15 of the preliminary survey farms in Valle; the smallest of these was 15 hectares in size. Five others ranged up to 40 hectares in size, 5 to 125 hectares, and 4 others up to 1,600 hectares in size. Typical producers, like the operators of Farm Y (discussed in Chapter IV), are well mechanized. All but 3 of these 15 preliminary survey farms irrigated at least some of their crops. Cotton, dry beans, corn, and rice were each produced on 4 to 7 of these farms.

Peanuts

The production of peanuts has been tried in the Departamentos of Tolima, Magdalena, Caldas, and Meta within the last few years. The 1962 yields of about one metric ton per hectare on 455 hectares in Meta were the best results experienced so far. IFA hopes to develop the cultivation of peanuts to the point where it could be grown profitably

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[28] Eduardo Zuleta M., "Resultadas Experimentales y Posibilidades del Cultivo de la Soya en las Zonas Algodoneras de Colombia," (Bogotá: IFA, 1963), (Manuscript).

in the cotton areas. In doing this, however, peanuts will have to compete with sesame and soybeans production, which is a good deal more familar to producers.

Coconuts

Some historians claim that coconuts originally came from the Valley of the Cauca River in Colombia. The north coast and the island of San Andrés have traditionally furnished most of the internally produced copra in Colombia. The presence of serious disease problems, and the failure to replant stands have sharply reduced output. Coconut palms in San Andres, for example, planted 50-100 years ago are now only producing 6-10 coconuts per palm, versus 100-150 which could be expected from young healthy trees, with proper fertilization and spraying.[29]

IFA has been providing technical assistance and selected seed to encourage coconut production in northern Antioquia, and in the west coastal regions near Tumaco and Buenaventura. The goal for these areas is to have 14,500 hectares in commercial production within the next few years.[30] It is still too early to tell if present techniques can overcome disease problems in these young coconut palms.

African Palm

As early as 1958-1959 IFA, with the assistant of FAO, began

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[29] Production in San Andrés was estimated at 3.4 million coconuts in 1962, according to Hernán Franco R., Anotaciones Sobre la Producción de Coco en las Islas de San Andrés (Bogota: INA , July 1963). (Mimeographed.) In 1959, the number of palms on the island was reported at 286,995 by the Ministerio de Agricultura: 1er Censo Agropecuario - San Andrés y Providencia (San Andrés: Informational Folder, 1959).

[30] Interview with J. Alfonso Barreneche E., Secretary of Agriculture for Antioquia, Medellín, June 17, 1963.

studies aimed at developing a sizable production of African Palm in Colombia.[31] High priority has been given this activity, and some sizable plantings of this palm have been made. In late 1962, IFA submitted a development project plan to the Agency for International Development (AID) which stated that there were over 275 thousand hectares of land suitable for African Palm production.[32]

The crop was first introduced into Colombia in 1932, but commercial production was not started until 1945.[33] A few additional plantings were made during the latter 1940's and early 1950's, which brought total area planted to between two and three hundred hectares by 1959. In 1959-60 IFA started planting African palms on experimental farms in various parts of the country. Continued planting on these farms and other commercial units raised the total area in African palms to 8 thousand hectares by the end of 1963.[34] Large commercial plantings can now be found near Tumaco, Buenaventura, Florencia, Turbo, Villavicencio, and in North Santander and parts of Magdalena. African palm apparently has few disease problems and adapts relatively well to wet and dry seasonal variations.

The principal limitation on expansion of African palm production is the lack of credit. Palms take 4-5 years after plantings before

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[31] See Maurice Ferrand, Informe al Gobierno de Colombia Sobre Plantas Oleaginosas y Especialmente Sobre la Palma de Aceite (Rome: FAO, 1960). (Mimeographed.)

[32] Instituto de Fomento Algodonero, "General Information on Oil-Palm Cropping in the Tropics: Possibilities of the Colombian Agricultural Sector" (Bogotá, 1962). (Manuscript.)

[33] M. Ferrand, op. cit., pp. 6-7.

[34] Interview with IFA personnel, October 11, 1963.

they begin significant production, and it has been estimated that investment and holding costs may run from 4,000 to 6,000 pesos per hectare before palms reach production.[35] Additional funds must also be invested in extraction plants and service roads. By late 1964 IFA hopes to have 8 of these plants processing oil in areas where palms will be starting to produce.

Plantings of African palms are composing an important part of some developing farm enterprises in Meta.[36] By late 1963 about 1,000 hectares had been planted in areas near Villavicencio. Some of the plantings are on farms of small size, but many are on sizable ranches which are just starting to introduce crop production. Since the palms are only planted at the rate of 143 per hectare, a return to use of land for grazing is possible after the palms are 3 or 4 years old. At this point, the palms provide shade and do not seriously reduce the carrying capacity of the pastures.

In an INCORA project in Caquetá African palms are planned as the principal source of farm income for units being colonized in 1963. Under satisfactory climate, soil, and management conditions, mature palms can be expected to produce roughly 2 metric tons of oil per hectare. In 1963, the raw oil was selling for from 4,000 to 5,000 pesos per metric ton; therefore, the gross income after processing costs would be in the order of 6,000 to 8,000 pesos per hectare. The major input, after establishing the plantations, is hand labor needed for harvesting

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[35] IFA General Information, op. cit.

[36] Gonzalo Uribe, "Fomento de la Palma Africana en el Departamento del Meta," Agricultura Tropical Vol. XIX No. 10, October 1963, pp. 618-623.

and cleaning - a factor which can largely be performed by family workers.

Native Oil Palm

Several varieties of native oil palm can be found in the coastal regions of Colombia. Noli or Corozo (Elaeis Melanococca) is the only one of these which is presently being economically exploited. It is estimated that 200 thousand Noli palms exist in the Simí Valley alone.[37] The fruit from these palms have been processed under crude conditions by Molinos in the Cereté area for a number of years. The crushing of the fruit is commonly done with a large roller and oxen, and extraction of the oil by a water flotation method produces only a small portion of the available oil. Only a small part of the palms in the Cereté area are exploited since they are usually thinly scattered over land which is often flooded during a number of months of the year.

For several years IFA has been working on a breeding program with Noli in the Cereté area. In many respects Noli and African palm are similar, except that Noli is much less productive, and is able to tolerate much more moisture. By careful selection and crossing Noli with African palm IFA researchers hope to be able to combine the best attributes of both palms, and provide a crop which will produce well in wet coastal regions.

Aggregate Prospects for Edible Oils

As was noted previously, the output of cottonseed oil can only be expected to expand at about the same rate as the growth in the rate of

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[37] L. Eduardo Montero, "La Industria de Aceites Vegetables y sus Posibilidades en Colombia," Ibid., p. 598.

cotton fiber consumption by Colombian textile mills. Although cotton producers have demonstrated that they can produce fiber in excess of internal needs, it seems unlikely that Colombia can afford to do so on any large scale, especially when one considers cotton's competition with other important enterprises, and the strong competition on world markets from other producing areas. On the basis of this, cottonseed oil production would reach a level 40 to 50 percent above the 1961-62 level by 1967-68 (Table VI-14).

The prospects for sesame production appear less favorable. It will be difficult for sesame to expand a great deal in the north coastal region unless producers are able to start double cropping. It can be expected, moreover, that continued planting of cotton and sorghums in this region will give sesame strong competition for new lands. In the upper Magdalena River basin, irrigated-mechanized soybean production may offer competition for sesame. It could be expected that sesame yields may increase by as much as 10 percent through varietal improvements.

It can also be expected that soybean production will increase along with cotton plantings in the Valle, and might have possibilities of replacing some sesame in the upper Magdalena if irrigation is used. In both Valle and Tolima, however, many different enterprises will be competing for the limited land available for intensive cultivation. If the gain in production of soybeans experienced from 1955-56 to 1961-62 is repeated by 1967-68, total soybean oil output could increase to about 6,800 metric tons.

The value of protein-meal by-products from sesame and soybeans could have an important influence on the price of the crops, and help

Table VI-14. Production of vegetable oils from crops grown in Colombia, estimated for 1961-62 and projected for 1967-68

Sources of oil	Estimated 1961-62	Projected 1967-68
	(metric tons)	
Cottonseed	18,500	28,000
Sesame	9,500	10,200
Soybeans	3,700	6,800
Peanuts	100	300
Copra	300	300
African palm	400	12,000
Totals	32,500	57,600

SOURCE: Instituto de Fomento Algodonero, Departamento de Investigaciones Económicas: Colombia--Algodón y Oleaginosas--Economía y Estadísticas, 1961-62 (Bogotá: 1963), p. 66, for 1961-62 data.

determine future production. Sesame seed yields 40 to 45 percent of its weight in oil, whereas soybeans only yields 15-19 percent. Therefore, if prices of vegetable proteins rise a good deal in response to continued demands for mixed feeds soybean production might be favored.

It is likely that any other sizable increase in edible oil production will largely come from the African palm. The 8,000 hectares that are presently planted will be well into production by 1967-68, and can be expected to produce around 1.5 metric tons of oil per hectare. The total production of edible oils in 1967-68 would, therefore, be about 57.6 thousand metric tons—less than 3.5 kilograms per-capita. Imports of roughly 19 thousand metric tons of oils will have to be made for each additional kilogram of per-capita consumption in excess of this amount.

The production estimates presented in Table VI-14 are primarily based on the Level I assumptions with respect to Title I imports. With no Title I imports (Level II) it could be expected that oil crop prices would move up considerably (Table I-1), but so would prices of competing crops such as corn, sorghum, and cotton fiber. The net effect might simply be an increased rate of African palm planting, and larger commercial imports of edible oil products.

With a doubling in the rate of per-capita imports (Level III), Colombia would still likely need to import edible oils outside of PL 480 agreements if per-capita rates of consumption were not to decline.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The objectives of this study were to determine what production adjustments farm units in Colombia are likely to make in response to alternative levels of Title I imports, and to examine some possible implications of these adjustments upon Colombia's future economic and social development. Preliminary surveys of over 1,000 Colombian farms, detailed case studies of about 60 of these, aggregate statistics, and other reports were the main sources of data. Three levels of Title I imports were assumed, related farm planning-prices for 1967-68 were developed, and budgets for a number of farm units were calculated on the basis of these planning-prices.

Adjustment Opportunities

Some of the principal findings of this study are as follows:

(1) Colombia has experienced significant economic growth in spite of tremendous physical obstacles to inter-regional transportation, and persistant problems with civil disorder and rural violence. Agriculture has been able to furnish much of the foreign exchange, internal supply of most foods and raw materials, and manpower for this growth; but, its productivity is now lagging well behind the rest of the economy.

(2) Over 60 percent of Colombia's population is directly dependent

on agricultural production for a living, and large quantities of land are also available for agricultural use. The paucity of investments in land resources, rural education, and health, plus the heavy concentration of land ownership in the hands of a few, help to explain agriculture's lagging productivity. In a number of situations these factors also help to account for the slow reaction by farm producers to sizable price incentives.

(3) Most of the farms in the wheat producing areas are diversified units which can often shift the emphasis of their production from one enterprise to another. A number of the smaller units, however, are mainly oriented toward production for home consumption, and react very slowly to changes in the market. Many of the medium-sized units have remained diversified in order to supply home consumption items, and to spread risks due to price variations and climatic hazards. The larger units may have fewer enterprises, but they still remain diversified to lessen risks and to utilize labor, land, and machinery more effectively. Wheat yields on a number of farms are low, and additional use of improved seed, fertilizer, and other modern practices could increase total production significantly. It can be expected, however, that changes in production practices will occur slowly unless extension programs and other methods of disseminating technical assistance to small and medium-sized producers are greatly expanded.

On most of the commercial units in cool-climate areas, dairy, potatoes, and barley give serious competition to wheat production. There is some reason to believe that this competition will increase

in the future. Since breweries have a strong interest in maintaining barley production, it is unlikely that the price relationship between wheat and barley will be altered much. This implies that barley prices would tend to move up with wheat prices if no Title I imports were made, giving producers little incentive to increase wheat production. Likewise, if a large increase were made in the rate of Title I imports, the prices of barley and wheat would fall more or less together because of the nature of the barley market, and producers would find little incentive to switch from wheat production. In the long run, as a result of this, more emphasis might be placed on dairy and potato production. Therefore, increases or decreases in the rate of Title I imports will have a larger impact on wheat producers' incomes than upon total wheat production. It is further evident that unless Colombia is willing to devote many more resources to increasing wheat output, it will need to continue to import large quantities of wheat. Even now the Colombian economy is paying much more than the world prices for domestically produced wheat.

(4) Livestock, corn, and coffee are the three enterprises most frequently found on Colombian farms. Low production rates for dairy animals, slow growth rates for beef cattle, and lack of adequate forage are common characteristics of these enterprises. Most of the milk production is from non-specialized farm units, but a few specialized units are developing in the major milksheds. Significant improvement in production is possible through upbreeding of cattle, better forage, feeding of concentrates, and improved marketing systems. Some poultry is also found on many

farm units, but commercial production is mainly clustered around the larger cities where feed concentrates are readily available. Almost unlimited possibilities exist for expanding poultry production on many Colombian farms. The main brakes on this expansion will probably be the limited supplies of feed grain, and the lack of additional technical assistance for potential producers. Using conservative estimates for the rate of population growth and income changes, it is reasonable to expect that demand for poultry products, pork, and dairy could easily increase by 20 percent or more between the 1961-62 period and the 1967-68 period. In order to satisfy this demand, without allowing the relative prices of poultry, dairy products, and pork to rise, it will be necessary to increase feed grain supplies by 265 to 400 thousand metric tons.

(5) Corn is a staple of human consumption in many parts of Colombia and the most important feed grain. The production of grain sorghums, especially in the eastern llanos and the north coastal region, appears to have a good deal of potential to supply larger quantities of feed grains. Much of the corn grown in cool-climate areas is on diversified farms and is used for home consumption. The economic competition from other cool-climate enterprises makes it difficult to produce corn commercially in these areas. The use of native varieties, hand cultivation, the lack of fertilization, and long growing periods are characteristics of corn production on these cool-climate farms.

In the warm, flat, fertile areas, corn is often found on mechanized

farms as a commercial crop. Other high value products such as cotton, rice, cane for sugar, oil crops, and beans also appear in these units as competitors of corn. There is some indication that increased plantings of competing crops, especially cotton, have reduced the total commercial production of corn.[1] Newly developing lands, largely outside of existing crop farms, can probably furnish large quantities of corn and grain sorghum, but sizable investments in these lands will first be necessary. A cessation of Title I imports to Colombia, combined with a rapid expansion in demand, could push up feed grain prices substantially. Without special development programs, it is probable that the land in feed grains will be under further pressure from cereals, potatoes and dairy in the cool-climate areas, as well as from cotton and oil crops on farms in warmer climates. There is reason to believe that high prices and scarcity of corn would lead to price regulation, and that rationing would result for the corn which goes into mixed feeds. Further development of intensive dairy enterprises and additional expansion in the poultry industry both would be slowed by the lack of concentrates. An increase in Title I imports of feed grains to 300 thousand metric tons, under Level III assumptions, would help keep corn and grain sorghum prices down. This, in turn, would encourage further expansion in the dairy, poultry, and swine industries. Colombia will probably need to increase its imports of feed grains, unless it can proceed

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[1] A recent newspaper cartoon showed corn being delivered to town by armored car (El Colombiano, November 18, 1963). This stresses the fact that corn was selling for over 1000 pesos per metric ton in late 1963, or over $2.75 U.S. per bushel.

rapidly with a successful feed grain development program.

(6) Colombia experienced a large expansion in cotton production during the 1950's and early 1960's. Since 1958, this increased output of cotton has largely eliminated the need for imports. Cotton is highly competitive for flat fertile lands which are presently being cultivated, and is also one of the most profitable single enterprises for use on newly developed lands in the north coastal region and eastern llanos. Prospects appear favorable for large mechanized farm units to continue to expand cotton fiber production sufficiently to supply internal needs. It is, therefore, unlikely that future imports of cotton fiber under Title I programs will be necessary.

(7) The production of edible oils in Colombia increased steadily from less than 7 thousand metric tons in 1952 to over 33 thousand metric tons in 1962. In spite of this increase, large imports of edible oil products were still required in the early 1960's to supply internal needs. Cotton seed furnished over half of the the internal production of edible oils in 1962, with sesame and soybeans providing most of the balance. Both of the latter crops are popular, in different areas of Colombia, for use in rotation with cotton. The introduction of irrigation in the Valle appears to have been an important factor in the increase in soybean output there. Prospects for increasing the output of oil from these three crops, therefore, appear to be closely tied to the expansion in intensive crop production--especially of cotton.

A recent development program for oil crops in Colombia has placed major emphasis on planting African Palm. Large quantities of land, not intensively utilized, are available for this crop. The shortage of long-term credit and high waiting costs have impeded plantings, but by late 1963 about 8 thousand hectares had been planted to African Palm. Unless development programs are substantially accelerated, however, production of edible oils will probably fall substantially short in 1967-68 of maintaining the present low rates of per-capita consumption in Colombia, regardless of which of the levels of Title I programs comes into existence.

(8) In total, a number of adjustments are possible in the production patterns of Colombian farms under the stimulus of price incentives and special development programs. These adjustments will be tempered by operator's risk and uncertainty considerations, the necessity to produce home consumption items, the lack of production credit, the low rates of advancing technology, and the overall need to augment the production of a number of commodities simultaneously. Simply to keep pace with population growth, total agricultural production will need to be increased by 15 to 20 percent between the 1961-62 period and the 1967-68 period. In this context, agricultural producers will find it very difficult to meet Colombia's needs for wheat, feed grains, and edible oils without large public investments in present and potential agricultural areas. Sizable imports of these commodities, therefore, will probably be necessary.

Future Development Needs

The degree to which Colombia continues to experience significant economic and social development will largely depend on the country's ability to cope with the following tasks:

(1) Satisfying the rising expectations for goods and services;

(2) Working out an equitable distribution of the fruits of economic progress among different economic classes;

(3) Maintaining an orderly transition of social institutions;

(4) Eliminating rural violence;

(5) Ensuring some measure of economic stability, through control of inflation, balancing external financial transactions, diversifying exports, and increasing the degree of self-sufficiency by producing import substitutes.

The fact that Colombian agriculture might continue to fall short of furnishing domestic needs for wheat, feed grains, and edible oils indicates that policy makers will face some critical decisions in trying to complete the above tasks. Alternative lines of action will include large investments in agriculture to increase production, an expanded import program, or policies to restrict domestic consumption. Each of these alternatives could have an immediate as well as an extended effect upon Colombia's development.

Restricting internal consumption of certain food items, by allowing higher prices, besides being politically unpopular, would adversly affect the nutritional levels of low income groups; inflation would be accelerated, and some income redistribution would take place between consumers and producers. It appears that few positive effects would result in the short-run from restricting consumption, aside from ad-

ditional stimulation to private agricultural investments.

The diversion of large quantities of investments to Colombian agriculture would slow, at least initially, the rate of industrial growth. But properly placed, these investments could help diversify Colombia's export bundle, and also substantially reduce the country's need to import critical food items. The increases in agricultural productivity, and the resulting market expansion for non-food items would be substantial.

Without a favorable upturn in the prices of Colombia's principal exports it is unlikely that sizable commercial imports of food commodities could be sustained without a reduction in importation of other critically needed items. Moreover, it seems unreasonable that large imports of food commodities should be made when large quantities of land and rural labor are being used far below capacity.

It, therefore, appears that future imports of Title I commodities can be an important factor in Colombia's treatment of its critical tasks. Some of the implications of including alternative levels of Title I commodities in Colombia's future development plans are discussed in the following:

Effects of Alternative Levels of Title I Imports

Level I

A continuation of Title I programs at the per-capita levels of recent years could be expected to yield similar results to those of past programs. That is, (1) that consumption levels of edible oils, wheat products, and some animal products would be higher than could otherwise be expected; (2) that some producers' incomes and incentives for in-

vestment in agriculture would be adversely affected; (3) that these adverse effects could be partially offset by directing Title I pesos to agricultural development; (4) that properly planned imports could help reduce internal price fluctuation and make conditions more conducive to private investments in agriculture; and (5) that under certain conditions, Title I imports could provide a positive contribution toward balancing external financial transactions.

Level II

A termination of Title I programs without offsetting increases in commercial imports would result in higher prices of edible oils, corn, cereals, and poultry. The consumption of these and other agricultural commodities would be somewhat restricted, especially among the lower income groups. A number of agricultural producers' incomes would be affected favorably, but greater year-to-year variations in agricultural prices could be expected. The higher prices would undoubtedly encourage some additional production of wheat, feed grains, and edible oils, but it is probable that prices for competing enterprises would also move up and that the net change in production would be small. An increase in both private investment and public programs in agriculture would be probable, although some dampening of private investments could be expected from additional variations in price.

Colombian policymakers would clearly face strong consumer protests because of higher prices, and might seriously consider rationing schemes or additional commercial imports. The latter alternative would put further pressure on foreign exchange balances, and more frequent devaluations would be likely. Aside from some favorable income impacts on agricultural producers and some additional investments in agriculture,

the termination of Title I imports would clearly aggravate some of Colombia's most critical problems.

Level III

A doubling in the per-capita rate of Title I imports would undoubtedly lower prices (relatively) for wheat, barley, potatoes, fats and oils, and poultry products. Some reduction in internal wheat production could be expected as farm operators placed more emphasis on dairy, potatoes, and barley. It is doubtful that oil-crop production would be seriously affected even if prices of edible oils fell relatively, but a continued rapid increase in poultry production and intensive dairying would surely result from the additional supplies of feed grains. Some dietary improvements could also be expected among lower income families in both the rural and urban areas because of the increased food supplies.

The impact of Title I pesos would depend on the purpose and timing of expenditures. If, for example, most of the funds were channeled toward the agricultural sector for critically needed investment and credit purposes, farm costs could go down and productivity up. This, in turn, would partially offset unfavorable income changes to agricultural producers resulting from lower commodity prices. Additional revenue earned by the Instituto Nacional de Abastecimientos (INA) from the sale of Title I commodities could also be used in improving and expanding marketing facilities. This could lead to improvement in the stability of agricultural commodity prices, less marketing waste, and higher quality agricultural products, which would benefit both producers and consumers.

The terms under which Title I pesos are loaned have important

overall implications for the economy.[2] If, on the one hand, most of the loans are for short-term uses only, and upon repayment the pesos replace normal dollar expenditures by the U.S. Government, the net effect is almost the same as Colombia paying for the Title I imports with dollars. On the other hand, if these funds are reloaned upon repayment, or if the loans are made for long terms and a continuous inflation "washes out" the value of the pesos in terms of dollars, the Title I imports approach being a grant. The implications on Colombia's balance-of-payments of these two types of loaning policies are obvious.

Because of consumer pressures it is not likely that Colombia will find it easy to terminate imports of Title I commodities. It will, likewise, be difficult for any democratic government to sharply increase shipments of Title I commodities because of producer pressures. It can be anticipated that agricultural producers will only be willing to allow additional imports if they can realize some material benefits through associated agricultural development. For these reasons, it is probable that only gradual changes in these imports can be expected in the future.

In summary, Title I imports into Colombia can play an important role in the country's development by supplying certain commodities that will be in short supply. Favorable results will not occur automatically, however, and careful planning of the timing and composition of imports, plus increased attention to use of local currencies and complementary development programs will be necessary.

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[2] Witt and Wheeler report that 28 percent of the Title I pesos in Colombia were used in covering U.S. Government expenditures, and the remainder loaned to various agencies and firms in Colombia, op. cit., pp. 131-145.

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