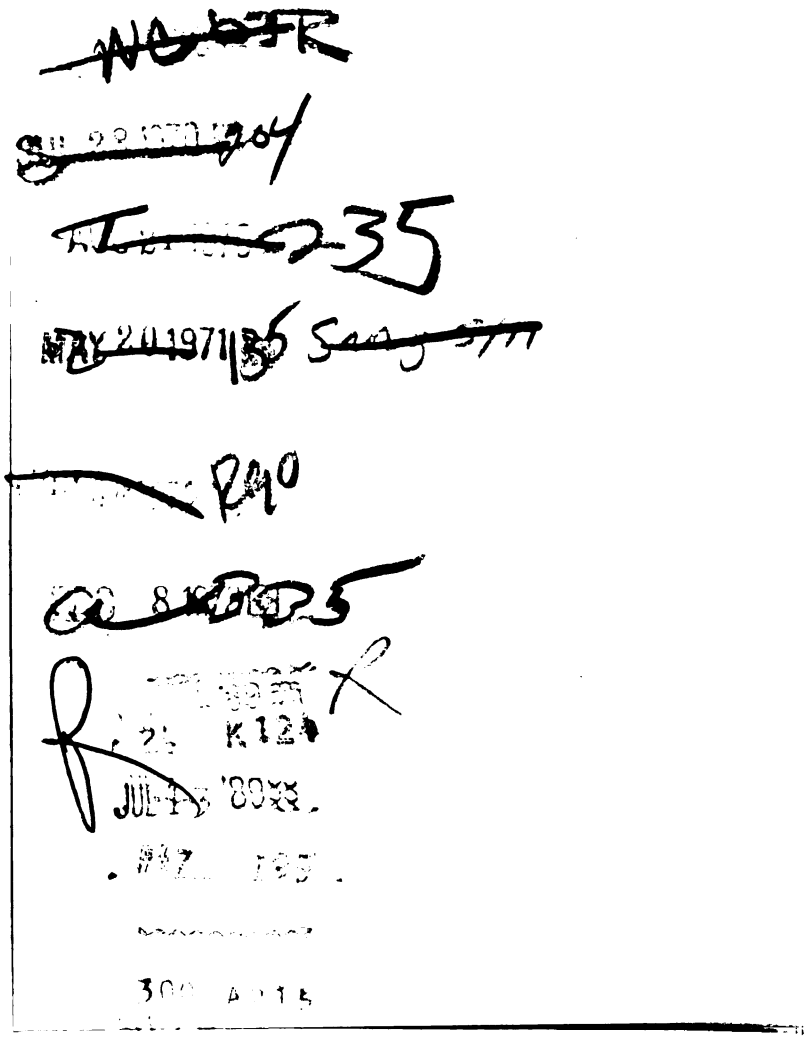

ABSTRACT

IMPROVING PERFORMANCE OF THE PRODUCTION-DISTRIBUTION SYSTEM FOR POTATOES IN COLOMBIA

By

Christopher O. Andrew

The primary objective of the research was to identify areas in which marketing processes influence present and potential productivity increases for the potato production and distribution system in Colombia. The diagnostic analyses investigate problems related to modernizing the production process and to improving coordination in the distribution process. General performance criteria such as potential productivity increases, reducing seasonal production and price instability, and improved market coordination evidenced by functional information, grading and standardization programs, were identified and performance of the potato subsector was evaluated.

The research was based at the Instituto Colombiano Agropecuario (ICA) Bogotá, Colombia as a portion of an interdisciplinary technical assistance program under the auspices of the University of Nebraska. The Ford Foundation provided funding for the research.

Primary data sources were potato producers in the departments of Boyacá, Cundinamarca and Nariño; truckers entering and leaving Bogotá and Cali; processers in Bogotá and Cali; and wholesalers, retailers and consumers in Bogotá.

An analysis of the production process indicated that the limited availability of improved seed and information about its use restrict the producers ability to augment per hectare yields. Credit and purchased inputs, such as fertilizer and pesticides, do not appear to be restraining factors for per hectare yield increases. Many producers are motivated

toward the attainment of high yields per unit of seed planted instead of high yields per hectare, resulting in some practices contrary to recommendations of the agricultural experiment station at ICA.

Price instability was the major marketing problem for nearly all potato market participants. Seasonal price instability is due to wet and dry seasons, frost, and a seed supply shortage for the small harvest. The greatest amount of storage in the potato marketing system is at the wholesale level but it is not sufficient, even when combined with the government facilities, to prevent wide seasonal price fluctuations. Major problems or risks inhibiting storage are potato spoilage, lack of credit and liquid capital, price instability and the anti-speculation law.

Spoilage and damage to potatoes in marketing contribute to unnecessary costs and wide price spreads, particularly at the retail level. Losses due to quality reductions affect fifteen percent of total production but often spoiled and damaged potatoes are salvaged for consumption by low income families.

Modernizing the potato subsector to allow attainment of economic efficiencies probably will result in some displacement of small firms. If these displaced individuals can obtain either urban or rural employment accompanied by improved incomes, they will be a stimulus to the developing economy. At present, the alternative employment opportunities for displaced farmers and food distributors are limited and should these opportunities increase, improved work skills for this potential labor force will be needed.

Recommendations to improve the complex and interdependent processes of potato production and distribution in Colombia are as follows:

1) The role of small producers and distributors in either urban or rural development must be considered as Colombia pursues programs to modernize the agricultural sector.

2) Credit policy can be used to stimulate investments in both improved potato productivity and in improving human resources for future rural and urban employment. Credit subsidies for potato production with non-competitive interest rates, however, probably should be reduced. While the supply of credit for producers at commercial rates should be unrestricted, credit programs are also needed for distributors.

3) Potato production research and extension specialists along with agricultural economists must give more emphasis to farm management and economic problems of producers.

4) A program to reduce seasonality of prices must consider problems leading to production instability as well as market stabilizers such as storage. The seed supply problems for the small harvest and for improved varieties must be reduced if production instability is to be decreased. Both public and private storage alternatives must be evaluated before launching a major storage program.

5) Continued emphasis should be given to developing a market information program with a timely dissemination system that will be useful to producers and distributors in their market decision making processes.

6) Vertical coordination in the potato subsector to reduce excessive handling and losses can be improved by developing an efficient rural assembly system, encouraging forward purchase and sale agreements, and improving credit and technical assistance to potato producers and distributors for improving their marketing practices.

IMPROVING PERFORMANCE OF THE PRODUCTION-DISTRIBUTION SYSTEM FOR POTATOES IN COLOMBIA

By

Christopher O. Andrew

A THESIS

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PREFACE

A two-year assignment beginning in September 1967, with the University of Nebraska Mission in Colombia provided the opportunity to perform thesis research. The Nebraska Mission is funded by US/AID, Kellogg Foundation, and Ford Foundation, the latter supporting agricultural economics and this research endeavor. As primary contractor for the Mid-American State Universities Association (MASUA), the University of Nebraska Mission in Colombia directs an interdisciplinary technical assistance team including agricultural economists, rural sociologists, agricultural engineers, extensionists, animal scientists, crop physiologists, and veterinarians. This team assists the Instituto Colombiano Agropecuario (ICA) and the National University in efforts to develop a coordinated program of agricultural teaching, research and extension.

A post-prelim instructor program emphasizes the training of Colombian agricultural economists by research demonstration as applied to pertinent agricultural problems. This research, directed by Nebraska Mission instructors, also fulfills Ph.D. thesis requirements. Thesis supervision became possible through a joint agreement between the Michigan State University guidance committee and the Nebraska Mission agricultural economists, with the latter providing in-country consultation.

ICA provided physical facilities and in-country transportation as well as counsel, counterpart assistance, data processing assistance, and

aid in selecting the commodity to be studied and in making the varied and numerous contacts necessary for successful completion of the study.

Two primary benefits to ICA and Colombia evolve from the research: 1) Specific barriers to innovation and change throughout the potato production-distribution system are identified. Recommendations, if adopted, can foment improvements in the potato production and distribution system. 2) Another benefit accrues to National University students and ICA staff counterparts associated with the research program. An appreciation and understanding of agricultural marketing problems has been stimulated. At least 25 individuals have learned and applied agricultural economic research methods in a specific problem situation which has helped develop a small cadre of Colombians capable of sustained agricultural marketing research.

In addition to ICA personnel, individuals from the following Colombian Institutions were identified with the research by providing secondary data and valuable counsel: Universidad Nacional, Departamento Administrativo Nacional de Estadística, Caja Agraria, Instituto de Investigaciones Tecnológicas, Instituto Latinoamericano de Mercadeo Agricola, Instituto de Mercadeo Agropecuario, Asociación Colombiana de Cultivadores de Papa, Secretaría de Agricultura de Nariño, Centro de Estudios sobre Desarrollo Económico, Instituto Colombiano de la Reforma Agraria, Sociedad de Aprovechamiento de los Recursos Naturales de Cundinamarca, and the Wisconsin Land Tenure Center.

ACKNOWLEDGEMENTS

Appreciation is due to the Instituto Colombiano Agropecuario and the University of Nebraska Mission in Colombia for contributing financial support, consultation and human resources to the research program. Sincere gratitude is also expressed to Dr. Daniel D. Badger, Dr. Peter E. Hildebrand, Dr. Lauro Lujan, Mr. Rafael Samper A., and Mr. Eduardo Ramos L. who were working with the above institutions during the research program.

Special acknowledgement should be given to Dr. Harold M. Riley, thesis advisor, for his continuing interest in and devotion to the research. The location problems usually associated with thesis research in a foreign country were avoided by Dr. Rileys personal guidance on at least eight occasions in Colombia. For the flexibility in planning complete thesis program abroad, recognition is due to the liberal graduate policies and appreciation for foreign research programs displayed by the Agricultural Economics Department at Michigan State University.

To Dr. Lawrence W. Witt, major professor, sincere gratitude is expressed for his consultation in Bogotá on one occassion and his suggestions on early drafts of the thesis. Dr. Witt also provided valuable guidance throughout the author's Masters and Ph.D. programs. The guidance of other committee members through the Ph.D. program must be recognized including Dr. James D. Shaffer, Dr. Robert D. Stevens, and Dr. Everett M. Rogers.

Recognition is due to Dr. James L. Driscoll for untiring assistance with the computer work and to Maria Cristina Arciniegas

for typing preliminary and final drafts of the thesis.

Finally, loving gratitude is expressed to my family, my parents and my wife's parents for encouragement and interest. To my wife Linda, words inadequately express my appreciation. To Jeff, Shane and Kristi, with whom I shared too limited hours of relaxation and enjoyment, I remain obligated.

Errors of fact or logic are the responsibility of the author.

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GLOSSARY OF TERMS AND INSTITUTIONS

Año Grande - The largest potato harvest in Colombia representing about 60% of total annual production occurring primarily in June, July and August.

Asociación Colombiana de Cultivadores de Papa (ASCOLPA) - The Association of Colombian Potato Producers - Emphasizes assistance to members to increase potato production; displaying interest in processing and storage problems.

Barrio - One of the districts or suburbs into which a large town or city is divided.

Bodega - Store room or warehouse.

Bulto - A measure of weight:
1 bulto = 62.5 kilograms = 137.5 pounds.

Campesino - A peasant.

Carga - A measure of weight:
1 Carga = 2 bultos = 125 kilograms = 275 pounds.

Carulla - The largest supermarket chain in Bogotá consisting of eight retail stores and a central wholesaling warehouse.

Caja de Crédito Agrario Industrial y Minero - Caja Agraria - A primary agency administering credit to agricultural producers including potato producers.

Centavo - The hundreth part of a peso.

Centro de Estudios sobre Desarrollo Económico (CEDE) - The Center for Economic Development Studies - General economic research and a brief study of potato markets in Bogotá; presently doing a consumer panel study of food consumption in six Colombian cities.

Cooperativas - Food retail outlets usually patronized by employees of specific public or private companies or institutions.

Departamento - A subdivision of the country similar to states in the United States. Cundinamarca, Boyacá and Nariño are examples in Colombia.

Departamento Administrativo Nacional de Estadística (DANE) - The National Department to Administer Statistics - Compiles census data and periodic data on demographic, economic and agricultural changes.

Fanegada - A measure of land area:
1 fanegada = 0.64 hectares = 1.58 acres.

Gota - Late blight in potatoes.

Gran Central - A large wholesaling warehouse in the food retailing and wholesaling center of Bogotá where wholesalers rent a stall.

Hectare - A measure of land area:
1 hectare = 2.47 acres = 1.56 fanegadas.

Instituto Colombiano Agropecuario (ICA) - The Colombian Agricultural Institute - A federal government supported institution with responsibilities including research, graduate education and extension in the field of agriculture.

Instituto Colombiano de la Reforma Agraria (INCORA) - The Colombian Agrarian Reform Institute - Programs for land settlement land redistribution and irrigation projects; a limited number of loans to potato producers.

Instituto de Investigaciones Tecnológicas (IIT) - The Technical Institute of Investigations - Conducts food processing research.

Instituto Latinoamericano de Mercadeo Agrícola (ILMA) - The Latin American Marketing Institute - FAO supported international project (phased out in June 1969), which conducted marketing research and provided a two year training course in marketing for students from all Latin American countries.

Instituto de Mercadeo Agropecuario (IDEMA) - The Agricultural Marketing Institute - Has responsibility for price, storage, international trade and other national marketing programs for agricultural products in Colombia.

Mitaca - The smallest potato harvest in Colombia representing about 30% of total annual production occurring primarily in January and February.

Municipio - An administrative unit or subdivision of a department similar to a country in the United States.

P-D System - A production - distribution system.

Papa - Potato.

Papa de año - Common potato varieties averaging from 3 to 6 centimeters in diameter.

Papa criolla - A Colombian potato with a dark yellow interior averaging from 2 to 4 centimeters in diameter.

Peso - The monetary unit of exchange which averaged about 16.5 pesos to one dollar for the research period, (1968).

Plátano - Plantain, a fruit similar to the banana.

Plaza - A market square or market place where primarily food is sold.

Pueblo - A town or village.

Reten - A check point operated by the police for trucks hauling agricultural and industrial products within Colombia.

Sociedad de Aprovechamiento de los Recursos Naturales de Cundinamarca (SARC) - The Society for Profitable Utilization of Resources in Cundinamarca - A departmental development organization that, among other activities, cooperates with IDEMA in potato storage.

Tienda - A small retail food store usually ranging in size from 200 to 400 square feet and not allowing self service for customers.

Tonelada - Is a long ton. All ton measures in this research are long tons.
1 tonelada = 16 bultos
= 8 cargas
= 1,000 kilogramos
= 2,000 libras (500 grams/libra)
= 2,200 pounds (16 oz/pound)

Universidad Nacional - The National University in Colombia - Campuses in Bogotá, Medellín, and Palmira - Federally funded and trains students in six colleges including Sciences, Engineering, Arts, Human Sciences, Health, and Agricultural Sciences.

Wisconsin Land Tenure Center - Phased out in June 1969, conducted a teaching and research program on socio-economic problems related to agrarian reform.

Yuca - A root-plant eaten like potatoes commonly called casava in the United States.

Zorras - Manual-or animal-drawn carts used in transporting produce.

CHAPTER I

INTRODUCTION

The Problem

In attempting to attain economic development, a less-developed country encounters problems unique to its own cultural, social, political and economic conditions. Colombia, along with most Latin American countries must struggle with at least three major problems which hinder economic development. These problems include a high rate of population growth competing with food production-distribution advancements, a rapid rural-to-urban migration rate causing serious sectoral distortions, and geographic barriers that inhibit improvements in the transportation and communication systems.

The potato production-distribution (P-D)[1] system, an important subsector in the food sector of the Colombian economy, includes specific cultural, social, political and economic problems. While most potato farms and distribution firms are small and underemployment of labor is common, neither in rural nor urban areas are alternative employment opportunities capable of productively utilizing the excess supply of underemployed and unskilled urban and rural workers. Yet, as Colombia develops, the potato subsector moves to more commercialization accompanied

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[1] A glossory, pp. xvi - xviii, includes the Spanish words and abbreviations of names of institutions used in the thesis. A production-distribution system will be referred to as a P-D system.

by larger, more efficient firms, and displacement of underemployed laborers. Commercialization, however, is hampered by uncertain and risky economic conditions while limited labor alternatives stifle economic growth. Thus, the problems are interdependent, complex and multi-faceted.

Geographic Barriers to Economic Integration

Colombia is the only South American nation bordering on two major bodies of water: the Caribbean Sea and the Pacific Ocean. Several navigable rivers also span great distances of the country. Tropical forests, barren desert lands, temperate valleys, wind-swept plateaus, steaming lowlands, and snow-capped mountains all occur within the Republic.[2] Such diversity can support a variety of economic activities but geographic diversity also makes it difficult to stimulate social mobility, to improve communication and transportation, and to facilitate numerous other institutional adjustments necessary for agricultural and economic growth.

Colombia includes five major market centers, in the cities of Barranquilla, Bucaramanga, Cali, Medellín and Bogotá (Figure 1). These market centers service five somewhat separated and relatively well developed economic regions. Other less developed economic regions, such as the eastern planes (Llanos Orientales) and the Pacific Coast remain to be developed.

The potato production and distribution system is influenced by these geographic orientations. Because of inadequate transportation and the

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[2] Preston E. James, Latin America, Third Edition, Odyssey Press, Inc., 1959; p. 100.

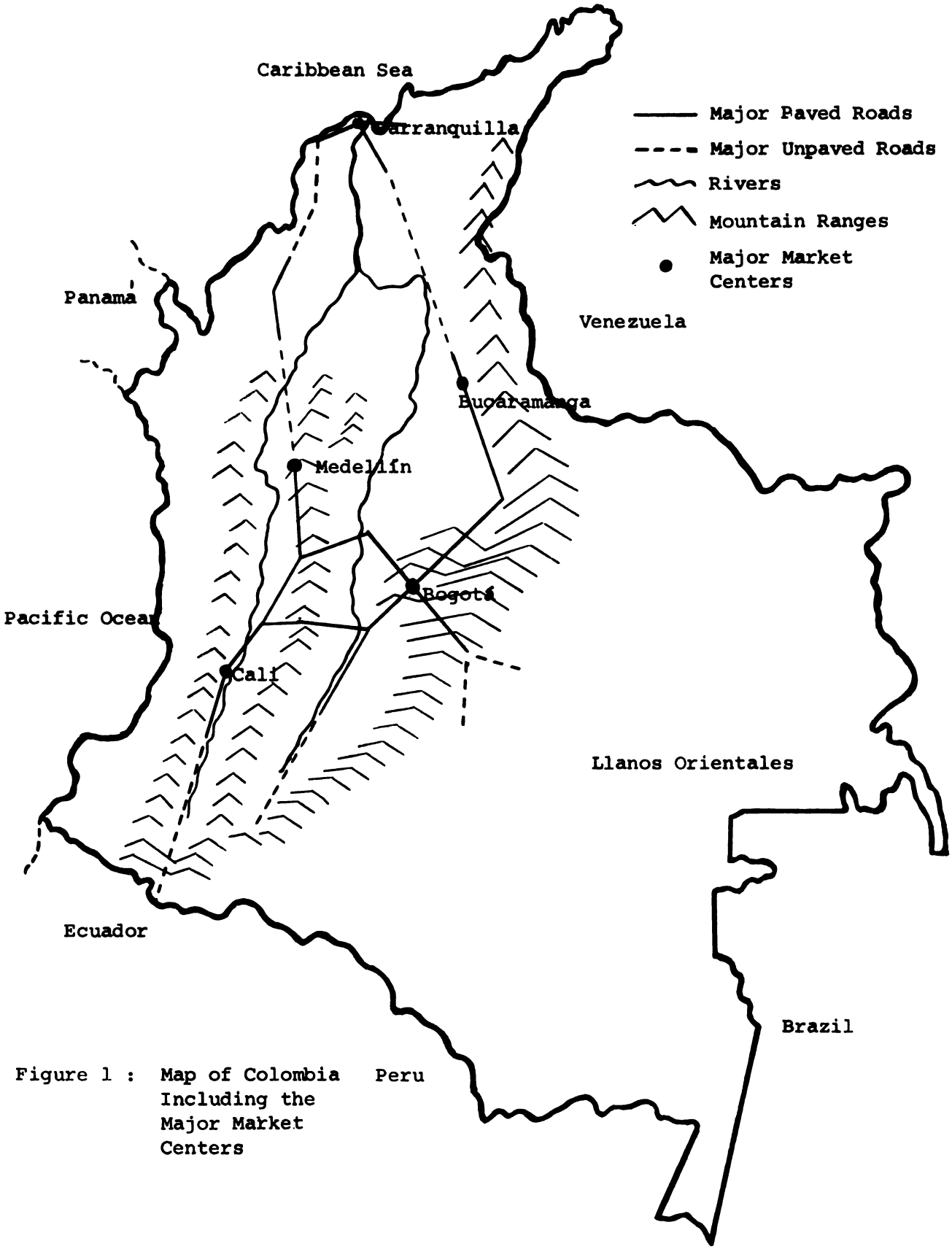

Figure 1 : Map of Colombia Including the Major Market Centers

bulky nature of the commodity, long distance potato flows remain difficult. Potato producers must cope with frost periods and dry seasons which accentuate and perpetuate seasonal productivity and seasonal price fluctuations. Though potatoes are not produced in warm climates, they are consumed in these climates despite inadequate or non-existent storage facilities. Thus, income and product losses occur between the two major harvest periods, dictated by frost and dry seasons.

The Food Demand and Supply Race

Success of the agricultural sector in Colombia depends not only on agricultural reform and development programs, but also upon rates of population growth and migration, and upon economic growth in the urban-industrial sector. A well-coordinated food P-D system, while essential for rural and urban development in Colombia, must be accompanied by effective demographic and macro economic programs.

Population Migration and Growth

Estimates of the current annual rate of population growth in Colombia range from 3.2 to 3.5%.[3] At this rate Colombia will double its population in 20 to 22 years. Even if the family planning efforts, now gaining momentum, are reasonably successful, population growth rates cannot decline rapidly because 46.7% of the Colombian population is under

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[3] Robert C. Cook and Jane Lecht, People: An Introduction to the Study of Population, Population Reference Bureau, Columbia Books, Publishers, Washington D. C., 1968, p. 60.

15 years of age.[4] These young people, many of whom owe their lives to reduced infant mortality over the past fifteen years, will soon contribute significantly to population growth even if they apply family planning methods.

Nearly one-half of Colombia's 19.8 million people are engaged in agriculture. As in many Latin American countries, rural-to-urban migration continues at a relatively rapid pace, challenging present food P-D systems, income-earning capacities of migrants, and, in turn, the effective consumer demand for food. Bogotá, the capital city with more than 2.1 million inhabitants in 1968, experienced a rapid average annual population growth rate of 6.8% from 1951 to 1964[5], and 6.1% from 1964 to 1968.[6]

From 1951 to 1964, the average rate of population increase in the 26 departmental capital cities, which accounted for about one-third of total population, was 7.9%.[7] Since urban population was about half of total population, one-sixth of the urban population is not accounted for in the 7.9% rate. The one-sixth unaccounted for probably expanded at a rate similar to the rural population growth rate which would be 1.9% based upon 7.9% urban increase and a 3.5% national population rate of growth. Thus, the rate of population growth in all urban areas was about 5.8%.

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[4] Departamento Administrativo Nacional de Estadística, "Colombia Boletín Mensual de Estadística", Año XVI, Número 194, Bogotá D.E., Mayo 20 de 1967, p. 11.

[5] U. S. Department of Commerce, Basic Data on the Economy of Colombia, prepared by Herbert A. Lindow, No. OBR 6645, July 1966.

[6] DANE, unpublished data, June 1968.

[7] DANE, XIII Censo Nacional de Población, Resumen General, Julio 15 de 1964.

At least two factors contribute to the Colombian rural-to-urban migration phenomenon. Rural poverty and inadequate social services cause a "push" complemented by the "pull" of hope for a better life in the city. Also, during the 1950's and early 1960's, rural violence created a push to urban areas.[8] But, in either case, most migrants leave a sub-culture of peasantry, lacking modern attitudes and skills necessary for effective participation in a modern urban socio-economic system. A sub-culture of peasantry reflects a mutual distrust in interpersonal relations, lack of innovativeness, fatalism, low aspiration levels, a limited world-view, and lack of empathy.[9]

Many individuals migrating from a sub-culture of peasantry transmit a low income and tradition bound socio-economic status to urban areas which contributes to the culture of poverty, a typology advanced by Oscar Lewis.[10] Urban-oriented economic and social traits such as unemployment and underemployment, low wages, lack of skills, low educational levels and feelings of resignation and fatalism here constitute the culture of poverty.[11] Urban poverty traits often involve traditional orientations

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8 Mons German Fals Borda, and Eduardo Umaña Luna, La Violencia en Colombia, Ediciones Tercer Mundo, Bogotá, Colombia, 1962.

9 Everett M. Rogers, Peasant Modernization: The Impact of Communication, New York, Holt Rinehart and Winston, 1968.

10 Oscar Lewis, The Children of Sánchez, Vintage Books, 1961, (see the preface where Lewis describes the culture of poverty and lists over twenty traits).

11 A sub-culture of peasantry and a culture of poverty imply a homogeneity within these groups that does not exist. The terms are a theoretical approach to the problem. It is probably true, however, that many socio-economic traits are relatively common both within and between the two general distinctions.

similar to traditional traits of peasants. Poverty-stricken urban dwellers either have just migrated or have not achieved socio-economic mobility from a poverty position of migrant ancestors. Aside from individual deprivation, these peasantry and poverty traits significantly restrain the effective demand for agricultural products.

Thus, while mobility alters cultural orientations, numerous traditional characteristics are retained, reinforcing a culture of poverty and a lagging consumption sector. Bonilla presents this issue in the following manner:

> It may turn out that insofar as mobility is oriented toward occupation or social groups whose status and style are importantly rooted in traditional values... mobility far from impelling change serves to reinforce tradition... The city grows irrationally because life in the rural areas is intolerable; the faster the city grows, the less urban it becomes.[12]

Regardless of the cause of persistance of acute poverty, the low level of income and productivity of three-fourths of Colombia's population, contributes little to agricultural and general economic development because of a limited effective demand.[13]

Agricultural producers, except where export potentials are high, will always be dependent upon the effective demand of domestic consumers

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12 Frank Bonilla, "The Urban Worker", in Continuity and Change in Latin America, edited by John J. Johnson, Stanford University Press, Stanford, California, 1964, p. 190 & 188.

13 "If half or more of the population economically do not exist, or are unemployed, and if only, say, 20 percent of the remainder can exert a really effective demand for goods, the market is considerably smaller than appears at first sight" Lauchlin Currie, Accelerating Development, The Necessity and the Means, McGraw Hill, 1966, p. 45.

which will not be enhanced by driving rural peasants to urban poverty. An essential aspect of economic development is the distribution of consumer purchasing power, which is affected by rates of population growth and migration.

Distribution of Income

Income distribution critically affects the effective demand for food, and the levels of nutrition. All of the potential food production and distribution system improvements within the grasp of Colombian institutions cannot solve consumption and nutrition inadequacies when income distribution remains highly skewed.

The average per capita income in Colombia was $254 dollars in 1967. The rural income per capita was $167 dollars while urban per capita income was $352 dollars. Table 1 indicates that rural incomes, although about 50% of urban incomes, are increasing more rapidly. This phenomenon can be explained by the rural-to-urban migration of low income families. Even though these low income, unskilled migrants may increase their incomes slightly above the average rural income level by moving, they usually do not achieve incomes in excess of the urban average. Thus, urban income growth is stifled somewhat by rural-to-urban migration.

Exact data on distribution of income within the urban and rural sectors are not available. Distribution of farms and farm land, indirectly explains the income earning base for rural people (Appendix I, Table I-1). Only 4.5% of the farm land (less than 5 hectares per farm) is owned by 62.6% of the Colombian farmers, while 3.5% of the farmers own 66% of the land (100 hectares or more per farm). Distribution of urban incomes is closely related to the employment-unemployment

Table 1 : Per Capita Income Levels in Colombia, 1960-1967

Per Capita Income[a]	1960	1961	1962	1963	1964	1965	1966	1967
National	234	238	242	242	248	243	263	254
Urban	338	335	331	331	336	330	345	352
Rural	145	153	163	162	167	162	165	167
Index of Growth[b]								
National	99.1	101.2	102.9	102.9	105.5	103.4	107.6	108.0
Urban	100.4	99.5	98.3	98.3	99.8	98.0	102.5	104.6
Rural	97.3	103.3	110.0	109.4	112.9	109.4	111.4	112.8

a In US dollars

b An index of change (base is 1960-1961 = 100)

Source: U. N. Economic Survey of Latin America - 1965 Economic Commission for Latin América, New York, 1967, p. 201; Los Problemas del Crédito Agropecuario y el Desarrollo Económico en Colombia, trabajo presentado al Seminario Latino Americano sobre Crédito Rural en el Salvador, Octubre 1968, Cuadro No. 2; and Departamento Administrativo Nacional de Estadística, "Boletín Mensual de Estadística", Bogotá, Colombia S.A.

situation. Only 74% of the urban workers were employed more than six months per year in 1964 and the rate of annual unemployment was about 21% (Appendix IV, Table IV-1).

Agricultural Production and Distribution

Population growth rates, migration trends and changes in per capita incomes place specific requirements upon the agricultural sector. Growth rates in agricultural production and in development of food

distribution facilities must accelerate rapidly to keep pace with demographic changes.

A simple exercise gives an indication of needed productivity changes within the Colombian agricultural sector.[14] The equation $D = P_r + E_i (N)$ is applied where D= rate of increase in effective demand, P_r = the rate of annual population growth, E_i = the income elasticity and N the rate of increase in per capita income. This equation will yield a general guide to production requirements.

Table 2 indicates a range of possibilities because (1) the figures

Table 2 : Estimated Required Rates of Increase in Food Productivity Based on Varied Rates of Growth in GNP and Population and Different Income Elasticities of Demand[a]

GNP Growth Rate		4.5			5.5			6.5		
Population Growth Rate (P_r)		3.0	3.5	4.0	3.0	3.5	4.0	3.0	3.5	4.0
GNP/Capita Growth Rate (N)		1.5	1.0	0.5	2.5	2.0	1.5	3.5	3.0	2.5
		Required Rate of Increase in Food Production								
Income Elasticity of Demand (E_i)	.4	3.6	3.9	4.2	4.0	4.3	4.6	4.4	4.7	5.0
	.6	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5
	.8	4.2	4.3	4.4	5.0	5.1	5.2	5.8	5.9	6.0

[a] For ease of computations this assumes that GNP/capita = GNP ÷ Population, even though an exponential factor should be included for explicit accuracy. These computed rates are, however, reasonably accurate.

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[14] For a more detailed discussion of food requirements for developing countries, see Robert D. Stevens, "Rates of Growth in Food Requirements During Economic Development," Journal of Farm Economics, Dec. 1965, Vol. 47, No. 5, pp. 1208-1212.

for rates of growth and income elasticity are not firmly agreed upon by social scientists and growth specialists; and (2) given the ranges, we can speculate about demand requirements under varied conditions.

The annual rate of growth required in agriculture production ranges from about 4.1% to 4.7%, assuming the present population growth rate to be 3.5%, an income elasticity of demand for food at 0.6, and the GNP growth rate at 4.5% to 5.5%.[15] Given the present population age distribution, a 4% population growth rate remains conceivable, and, when combined with an optimistic GNP growth rate of 6.5% and a 0.6 income elasticity, the required rate of growth in agricultural production is 5.5% per year. Some crop production specialists in Colombia feel that a 7% growth rate in food production is within the technical capacity of adapted varieties and land potentials.[16] Without expanding areas planted to potatoes, the annual rate of increase in production could probably exceed 7%. Most of these increases would result from planting improved varieties and application of improved seeding practices.

Food production potentials surpassing present growth rates have been possible in Colombia for several years. Why have these potentials not been accomplished? One explanation is that the food distribution system must be rationalized in order to meet both consumer and producer needs. Even if higher rates of production were attained, the impact on

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[15] The real rate of growth in 1968 was 5.5% and in 1967 it was 4.0%. See USDA-ERS, The Agricultural Situation in the Western Hemisphere, ERS-Foreign 261, Washington D.C., April 21, 1969, pp. 11-12.

[16] Comment by U.S. Grant, (Rockefeller Foundation) in a Seminar on the Colombian Agricultural Economy, Bogotá, Colombia, July 23, 1968.

the food situation in Colombia would be slight unless the product marketing system were improved.[17] Similarly, producers seeking to modernize their farm enterprises demand numerous inputs from the non-agricultural sector for which the distribution systems often are inadequate or non-existent.

Distribution requirements for an expanding agricultural production sector exceed the production growth rate. Concerning product markets, for example, a Colombian campesino family (small peasant farmer) producing 40 bultos (62.5 kilograms or 137.5 pounds) of potatoes may, with his family consume 30 bultos and market 10 bultos. Should he increase his potato production by 10 bultos (a 25% increase) and continue to consume 30 bultos, his potatoes sent to market will increase by 100%.

Augmenting production by 25% without expanding land use also requires improved practices and probably more purchased inputs which solicit significant increases in service market activities. Some, but not all, product and service market facilities overlap. Simply augmenting potato production by 25% and marketing this produce would require increases in social overhead facilities, service market facilities and product market facilities of significantly greater magnitude than the production increase itself.

Percentage increases in potatoes marketed by individual farms cannot be translated directly to market facility growth requirements because of aggregation and adjustment problems. The problem also may be illustrated by changes in the food demand structure. If the urban

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17 See Martin Kriesberg, "Marketing, Middlemen, and Mirales", International Agricultural Development Service, A paper prepared for presentation at the St. Joseph's Academy of Food Marketing, Philadelphia, May 27, 1968.

population growth rate is 6% and per capita income increases at 2% with the income elasticity of demand for food equal to 0.6 the increase in demand for market services would be 7.2%. So demand for market services increases more rapidly than total demand for food previously estimated at 4.7% per year in Table 2 when per capita income increases at 2% annually.

It is probably fair to say that distribution of food and farm inputs presently lags behind physical production potentials. Reducing this barrier to improved food production and distribution, while extremely important, will be a difficult task for the Colombian government.[18]

Agricultural Marketing in Development

A well coordinated P-D system for food, while not capable of solving population migration problems, unemployment and underemployment problems, and income size and distribution problems, can contribute to balanced rural and urban growth and lessen the impact of these problems. A national market strategy proposed by W.W. Rostow suggests that agricultural and industrial growth can be self-reinforcing. His strategy involves an interdependent set of activities to be performed simultaneously:

1. A build-up of agricultural productivity,

2. A revolution in the marketing of agricultural products,

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[18] See Herman Felstehausen, Local Government and Rural Service Barriers to Economic Development in Colombia, the Land Tenure Center, 68LTC - 10, June 1968.

3. A shift of industry to the production of simple agricultural equipment and inexpensive consumer goods for the mass market,
4. A revolution in marketing methods for inexpensive manufactured goods, especially in rural areas.[19]

This overview of the market system as a coordination mechanism for balanced economic growth, implies a need for solving specific problems. These problems become evident by evaluating market coordination techniques and market performance criteria which are unique to each socio-economic system.

To evaluate market coordination and market performance in the potato P-D system requires an understanding of attitudes, beliefs and values concerning expectations for the system. Evaluation and reform processes are determined in part by the system under study. The criteria, such as efficiency, yields, losses, product quality, employment, progressiveness, product distribution and income distribution suggest how the P-D system is coordinated. Based upon this evaluation, specific problem areas can be identified and recommendations specified for developing a market system capable of coordinating an economic growth process in both rural and urban areas.

The Potato Subsector in Colombia

For several centuries the geography of potato production and consumption has followed the ecological adaptations of people native to

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[19] Walter W. Rostow, View from the Seventh Floor, New York: Harper and Row, 1964, pp. 135 & 136.

South America and Colombia.[20] Potatoes originated in the New World, and the first recorded observation of their production occurred during the Spanish conquest of Perú in 1532. The potato was probably domesticated before the Inca empire began but the exact date is not known. Pedro de Cieza de León in Crónica del Perú, 1538, describes the potato and its preparation in the areas around Quito, Ecuador, and Pasto and Popayán in Colombia. From South America, the potato was sent to Spain in 1570, to England in 1596, and later to all temperate production regions of the world to become an important food crop, as it had been for the Incas and their forefathers.

As early as the sixteenth and seventeenth centuries, potatoes were frozen, dried and preserved by Indians in the Peruvian Andes. During the evenings, potatoes were placed in large, shallow earthen basins filled with water. The potatoes froze during the night and were removed from the basin and permitted to thaw the following morning. The Indians then walked on the potatoes with bare feet without breaking the potato skins, thereby forcing all of the moisture out of the soft tubers. Finally, the tubers were dried in the sun, resulting in a dehydrated potato capable of reconstitution with water. Thus, spoilage and surplus problems were reduced by preservation and a stable food supply during off-seasons and years of inadequate harvest became a reality.

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[20]The following brief history of potatoes is summarized from Hawkes, J.G. "Cinco Conferencias Sobre el Mejoramiento de la Papa", Boletín Técnico No. 1, Ministerio de Agricultura y Cría, Dirección de Agricultura, Instituto Nacional de Agricultura, Maracay, Venezuela, Junio 1951, p. 53.

Today more sophisticated preservation techniques are available to reduce loss problems, but these techniques remain virtually unexploited in Colombia. Seasonal production patterns continue to influence the Colombian potato subsector.

Farms growing potatoes, in general, are smaller than the average farm size in Colombia (Table 3). Approximately 108,000 producers or 8.3% of all farms were engaged in potato production in 1960. Appendix I contains detailed farm size classifications for all farms in Colombia and potato farms in particular.

Table 3 : Comparative Farm Size Data for Potato Farms and all Farms in Colombia

	Less than 1 hectare	More than 100 hectare
Potato Farms:	(percent)	
Proportion of Farms	70.8	0.01
Land Area	25.6	1.5
All Farms:		
Proportion of Farms	24.7	3.5
Land Area	0.5	66.0
Potato Farms as a Proportion of all Farms:		
Proportion of Farms	25.7	-
Land Area	23.9	-

Source: Appendix I

It is impossible to present the aggregate income value of Colombian potato production with precision. Table 4 presents ranges based upon the varied aggregate production estimates found in Appendix II, Table II-1. The lower estimate in terms of measured national income is probably more accurate because it represents more closely sales through commercial channels. Thus, from 1960 through 1965, the commercial value of the potato subsector represented about 2.4% of rural income while the value of total potato production averaged about 4.2%. These estimates do not include the 1964 values because it was an abnormal year with very high prices before a very large harvest and only unweighted average prices are available to determine the value of production estimates.

Tabla 4 : Value of Colombian Potato Production at the Farms Compared to Rural Income (in million of dollars)

	Farm Value of Potato Production[a]		Rural Income[b]	Value of potato production as % of rural income	
	Commercial Sales	All Production		Commercial Sales	All Production
1960	33.1	49.9	1,203.6	2.8	4.1
1961	33.5	71.7	1,300.0	2.6	5.5
1962	27.7	44.7	1,411.3	2.0	3.2
1963	41.6	76.3	1,434.0	2.9	5.3
1964	73.8	141.0	1,519.2	4.9	9.3
1965	28.2	45.5	1,532.4	1.8	3.0

Source: [a] Value from Appendix II, Table II-1 converted to dollars by using the exchange rate presented in Revista del Banco de la República, Bogotá, Colombia, Febrero, 1968, p. 300.

[b] U.N. Economic Survey of Latin America 1965, United Nations, New York 1967, p. 201.

The potato subsector includes many stages of growth and development. Numerous producers grow potatoes without any source of animal or tractor power, some use animal power, and some farms are large, mechanized, modern firms. Transportation varies from mule or donkey over narrow trails to boats on the rivers and trucks on modern highways. Most markets are primitive and price bargaining is common, but a limited number of supermarkets are by-passing the traditional markets by purchase agreements. Both rural poverty and modern farms are evident in the potato subsector. Potato consumption per capita varies from near zero in the warm coastal regions to over 100 kilograms in the potato production areas located in cool mountain regions.

Like many agricultural subsectors in developing countries, the potato subsector in Colombia requires careful stimulation by the government because of the number of low income and underemployed individuals involved. The time for concern now is upon the Colombian government because most of necessary tools for technical modernization of the subsector are rapidly becoming available. An approach to modernization must account for both economic and social problems in the potato subsector, the agricultural sector and the Colombian economy.

Thesis Plan

Orientation in General

The lack of descriptive material about the P-D system for most products in Colombia, and particularly potatoes, requires that this research report first describe and analyze the production and distribution system for potatoes in an attempt to identify the primary

interdependent factors influencing coordination and performance. The potato P-D system influences not only the agricultural economy but also the national economy. Hence, the research analysis and recommendations consider both micro and macro economic factors that affect potato production and distribution as well as how the P-D system for potatoes contributes to and/or inhibits growth within the agricultural sector and the national economy.

The research results and recommendations should be usable by both research and action agencies and should provide an understanding of the potato P-D system upon which further research can be initiated. The analysis also contributes to a small, but expanding, body of marketing research in the Colombian agricultural sector. Finally, it is hoped that the research will contribute to a better understanding of the role of agricultural marketing in both agricultural economic development and general economic and social development.

Objectives

Several general objectives of the research, while difficult to fulfill, provide important guidelines to useful market research programs. Of primary interest, is the role of agricultural marketing systems in economic development. One research project cannot specify this role, but a contribution can be made, by understanding how market coordination influences the P-D system for potatoes in Colombia.[21] The role varies

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[21] This research will complement a larger body of research on this topic. The Michigan State University, Agency for International Development-Latin America Food Marketing Study (LAFS) and the related Latin American Market Planning Center (LAMP) are extensive research and planning programs which assess the role of agricultural marketing in economic development and investigate Rostow's national market strategy. Direction for the project, with research completed in Puerto Rico, Northeast Brazil and Bolivia and research underway in the Cauca Valley of Colombia, comes from Dr. Harold M. Riley and Dr. Donald Taylor at MSU.

among countries and will only be specified by evaluating specific product industries.

A second objective of the research is to identify general performance criteria or goals and then evaluate performance in the potato P-D system. Performance goals, while displaying some common characteristics, differ between and within economies, sectors and subsectors. Thus, the analysis identifies conflicting goals and the research and recommendations illustrate alternative solutions.

Specific and operational objectives of the thesis are:

1. To describe the existing potato P-D system including the adoption of improved production practices, and coordination processes in distribution.
2. To conduct a diagnostic investigation of interdependent problems in modernizing the production process and improving coordination in the P-D system.
3. To identify alternative means of improving this P-D system while considering both economic and social goals for development. Two sub-objectives are implied: a) to identify those problems directly related to growth and development within firms, and b) to identify alternative macro economic and institutional policies related to growth and development in the potato subsector.
4. To recommend methods for improving the performance of the potato P-D system as a part of agricultural and economic development in Colombia.

The analysis to fulfill these objectives required the use of primary data collected by field interviews and organization of secondary

data. The field interview process was directed to every level of product market participation from producers to consumers. The primary market areas studied were Bogotá, and Cali and producers in Boyacá, Cundinamarca and Nariño.

Secondary data collection involved a difficult task of locating relevant data and determining why major discrepancies between sources occur in order to specify the data sources for use. Depth interviews with the data collection agencies helped solve this problem and provided information necessary to describe the major institutions associated with the potato subsector.

Further in-depth study involved members of the potato production program and the agricultural engineering program at the Instituto Colombiano Agropecuario (ICA). This research helped specify the technical production problems involved in modernizing the potato production, storage, transportation and processing functions. Numerous individuals were called upon for ideas about future policies and programs to improve performance of the potato P-D system.

A Chapter Brief

The first part of the thesis, including Chapters I and II, gives a brief overview of the Colombian economy, a sketch of the potato marketing situation, a general market research philosophy and the research methodology because geographic and demographic conditions significantly influence agricultural production and distribution in Colombia, a brief description of these factors has been included in the first chapter. General rate of growth requirements for agricultural production and distribution are also included which provide the macro economic setting within which the potato

P-D system operates.

In Chapter II a market system is defined. The relevant performance goals are specified and serve to orient the analysis and presentation that follow. Finally, the presentation of the research methodology applied in the field investigations discusses how sampling and interview techniques were adapted to an area of research where secondary data and experience were either nonexistent or conflicting.

The structural and functional aspects of the potato P-D system are described in Chapter III. General production and distribution relationships including regional production, market channel flows and price movements are presented. The consumer assumes an early position of importance because ultimate use and acceptance by consumers dictates success or failure for producers and distributors. A description of the organizational structure of the potato subsector and the institutions that influence change in the subsector complete the chapter.

Chapter IV discusses adoption of improved practices, potato yield results and management decisions of potato producers as major indicators of institutional success in augmenting growth and development in the potato subsector. The chapter presents the role of credit institutions and technical assistance institutions in modernizing the potato production process.

As a counterpart to Chapter IV, Chapter V discusses coordination of the potato distribution process. Price instability provides the central problem for potato market participants. Both physical and facilitative coordination processes are described and diagnosed to determine their ability to reduce price fluctuations.

The final part of the thesis, including Chapters VI and VII,

presents and evaluates policy alternatives for improved performance in the potato P-D system. Discussions of the future for the potato subsector, and economic and social problems related to the subsector are congruent with the major performance goals presented in Chapter II. Given these goals and the macro economic considerations, discussions of credit policies, price and storage policies, information system policies, and research and development alternatives illustrate possible future performance goals for potato production and distribution processes.

A general summary and conclusions appear in Chapter VII. Recommendations for market reform programs attempt to select specific lines of action that will fulfill competing policy and performance desires.

CHAPTER II

THE RESEARCH PLAN

An Approach

Numerous conceptualizations of agricultural market systems appear in the literature, some very specific and limiting, others more functional and encompassing. The broad approach explained below serves as a general guide to this research effort.

To Define a Food Production-Distribution System

A food P-D system, in its broadest sence, extends from within the farm enterprise to encompass input procurement and information seeking, and to and beyond consumer purchase including consumer satisfaction and welfare. More specifically, in discussing the Latin American Marketing Project, Riley views "the agricultural production-marketing system as a set of vertically related, interdependent activities which relate consumers, retailers, wholesalers, processors, assemblers, and farmers."[22]

A food production-distribution system is defined to include the physical production system, the physical distribution system and the

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22 Harold M. Riley, "The Changing System of Agricultural Production and Marketing", in The Role of Food Marketing in the Economic Development in Puerto Rico, Seminar Summary, Edited by Robert W. Nason, Published by the Latin American Studies Center, Michigan State University, East Lansing, Michigan, 1966, p. 53.

exchange system.[23] The physical production system includes those physical facilities, firms and institutions such as farms and food processors that create or physically transform a product. A physical distribution system includes those physical facilities, firms and institutions involved in physical movement of products through time and space. Finally, coordination of the production-distribution process is accomplished by the exchange system. The exchange system includes those market activities that unite buyers and sellers to accomplish the processes of bargaining and exchange of commodities.

Market coordination includes the dynamic processes that interact within the exchange system. The set of institutions forming the exchange system must determine who will produce, what products will be produced, what resources will be used, where products will be produced, and who will consume them.[24] Market coordination then facilitates the dynamic processes by which producers, distributors and consumers interact through information exchanges, establishing conditions of exchange, and finally the legal and physical exchange of products.[25] Thus, there are two important flows occurring within the food P-D system. Farace explains this issue by saying:

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[23] C.S. Slater and Harold M. Riley, et.al., Food Marketing in the Economic Development of Puerto Rico, Research Report No. 1, Latin American Studies Center, Michigan State University, 1969, pp. 11 & 12.

[24] Ibid.

[25] Kelly M. Harrison, Agricultural Market Coordination in the Economic Development of Puerto Rico, (unpublished Ph.D. dissertation, Michigan State University, 1966), p 68.

> It appears that the major role of communication is to aid in facilitating coordination of the production and consumption sectors of the economy. Along with flows in goods and services, or labor, capital, raw materials and supplies, there exists a concomitant flow of communications about these things and their inter-relationships.[26]

Underlying these two flows are the interrelationships between prices and economic incentives. Price is not simply an information mechanism; it is also an indicator of potential profits which in turn stimulate economic activity.

The Role of Agricultural Marketing in Development

Only within the past decade has attention been given to the role of marketing in economic development.[27] Neglect of marketing in the growth process by development economists and policy planners, according to Holton, stems from several reasons.[28] First, the distribution process tends to yield intangible marketing services in contrast to production of physical goods which are more easily equated with an improved real level of living. A second reason, associated with the first, is that less developed countries have difficulty in evaluating contributions made by

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26 R. Vincent Farace, "Communication Behavior and the Latin American Food Marketing Process: Some Preliminary Findings", in The Role of Food Marketing in the Economic Development of Puerto Rico, Seminar Summary, Edited by Robert N. Nason, Published by the Latin American Studies Center, Michigan State University, East Lansing, Michigan, 1966, p. 77.

27 For a very comprehensive review of literature including theories of economic growth, the role of agricultural marketing in development, and the national market see Kelly Max Harrinson, Op.cit., pp. 14-33.

28 Richard H. Holton, "Marketing Structure and Economic Development", Quarterly Journal of Economics, Vol. 67, August 1953, pp. 344-361.

the distribution sector to employment and net income. Third, inefficient market systems in less developed countries provide employment for the otherwise unemployed participants. And finally, economists have been predisposed to ignore the dynamic role of an improved distribution system in increasing real incomes.

In discussing the role of agriculture in economic development, Witt reviews the history of economic thought concerning agriculture and development. He states that after ignoring agriculture for several years a "more recent view is that agriculture is an intimately interrelated sector in the development process. It has a role to play, but so do other sectors. A balance of effort is needed, whatever that may be."[29]

At least three divergent positions specify possible roles for agricultural marketing in economic growth. These positions encompass the trend in economic development thought from lesser to greater emphasis on market processes.

Some believe or have assumed that an evolving agricultural market system <u>follows</u> or passively accompanies production changes in the agricultural economy. That is, the agricultural market system adapts itself to prevailing institutions and economic trends, but it is not a dynamic or leading force for agricultural development. As a follower, marketing provides neither necessary nor sufficient conditions for agricultural and economic development. Instead, a marketing system results from economic and institutional change within agriculture. This approach

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[29] Lawrence W. Witt, "Role of Agriculture in Economic Development", <u>Journal of Farm Economics</u>, Vol. 47, No. 1, February 1965, p. 122.

upholds a general lack of emphasis on market system analysis and reform as development tools.

This train of thought frequently accompanies the belief that industrialization will lead the way to economic development, including agricultural development, and little emphasis, if any, is given to market mechanisms. While emphasis is given to agriculture as a source of labor, tax returns, and food, investment emphasis is placed upon the industrial sector in arguments, such as the "big-push" or "bootstraps".[30] Food becomes a primary input for economic development but little thought is given to production and distribution of the food except that the agricultural sector must become commercialized.

Agricultural marketing as a development-fomenting mechanism provides an opposite approach to the role of the market system. As a fomenting system, appropriately instituted market coordination techniques serve as a leading catalyst to agricultural development and ultimately urban and industrial development. Based upon a very precise interpretation of this thesis, if a country can develop an adequate market system to fulfill its own needs, development would follow. Thus, the market in a fomenting role becomes both a necessary and sufficient condition for economic development.

The basis for this research program is that agricultural marketing systems are both facilitating and coordinating mechanisms and are necessary but not sufficient for agricultural development. This is the third

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30 See Gerald M. Meier, Leading Issues in Development Economics, Oxford University Press, 1964, pp. 92, 416, & 431-440 for discussions about the "big-push" argument; and Benjamin Higgins, Economic Development, W.W. Norton & Co. Inc., New York, 1959, pp. 457-463 concerning the "bootstrap" thesis.

view of the role of agricultural marketing; it both foments and follows change. In giving credence to this view Rostow emphasizes a critical position for the market system in bringing about "balanced" growth between the rural and urban sectors in less developed countries.[31] Without interdependent growth stimuli within the sector it may be impossible for a market system to either foment or follow agricultural development. Collins and Holton present this dilemma by stating that,

> ...automatic transformation of the marketing system may be impeded if the economies of scale in distribution are much greater than in production; under these circumstances the proper kind of distributive sector may not develop until the new pattern of production has already been established, but the establishment of this new pattern of production may in turn be dependent on the existance of the right kind of distributive sector.[32]

Both produce markets and factor markets must be considered in this process. Factor markets including both public and private input suppliers significantly affect production and distribution of agricultural products. Recent work by Michigan State University, and a dissertation by Larson investigates and emphasizes the role of factor markets.[33] The present research does not comprehensively analyze the

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[31] Walter W. Rostow, op. cit.

[32] N.R. Collins and R. H. Holton, "Programming Changes in Marketing in Planned Economic Development", in Agriculture in Economic Development, Edited by Carl Eicher and Lawrence Witt, McGraw-Hill Book Company, 1964, p. 365.

[33] C.S. Slater and Harold M. Riley, et.al., Market Processes in the Recife Area of Northeast Brazil, Research Report No. 2, Latin America Studies Center, Michigan State University, 1969; and Donald Walter Larson, Diagnosis of Product and Factor Market Coordination in the Bean Industry, (unpublished Ph.D. dissertation, Michigan State University, 1968).

factor input markets that affect the potato sector because of the magnitude of the product market studies. The factor market aspect, nevertheless, should not be ignored.

Often both large and small agricultural producers are reluctant to apply new innovations because of the risk of losing their limited capital where market outlets remain so tenuous. Even more threatening for the small producer is the risk of failing to produce enough for a minimum subsistance.[34]

In summary, the agricultural P-D system is an important aspect of economic development. Recently Gaitskell has emphasized agriculture's place with industry in economic development. He argues that,

> if agriculture is neglected, the chances of progress are very heavily restricted, and grave social, political and economic tensions may occur ... the optimum pattern is not haphazard investment in industry ... but rather a deliberate complementary advance of agriculture and industry, with agriculture supplying food and many raw materials for local processing industries and industry supplying the inputs for modernizing agriculture plus the consumer goods to liven up the rural areas.[35]

And it can be added that this interdependent development process will only become possible as the market systems between rural and urban areas become capable of facilitating the increased economic activity.

The problem of development causality can be shifted to one of development interdependence. And the interdependent growth mechanisms encompass agriculture and industry with the market system linking the two. Interdependence has been described by Zetterberg in a simple but

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[34] Clifton R. Wharton, Jr., "The Economic Meaning of Subsistance ", Malayan Economic Review, October, 1963.

[35] Arthur Gaitskell, "Importance of Agriculture in Economic Development", in Economic Development of Tropical Agriculture by W.W. McPhearson, University of Florida Press, Gainesville, 1968, p. 55.

significant manner.[36] He asserts that small increments in a single variable facilitate increments in a second variable, and the resulting increment in the second variable further creates increments in the first. This can be a multivariable system. Zetterberg continues by saying that extremely large increments in one variable probably will not facilitate large changes in the other variables. The large change, so often sought, occurs by a series of well instituted small interacting changes. This is the essence of interdependence and the essence of the agricultural market system as a development mechanism.

Thus, improved and rationally coordinated market systems facilitate economic growth by both cause and effect relationships which parallel and integrate with other growth mechanisms such as increased agricultural productivity, social change and industrial development.

Performance Evaluation

The research problem is to evaluate the facilitative and coordinative capacity of the potato P-D system as a guide to market reform programs. Shaffer presents a very useful research approach in an explanation of three distinct research attitudes. For example, a pure science attitude desires to learn how markets function only for the purpose of knowing how they work and for developing market theory. An engineering attitude accepts a problem as given and proceeds to a solution. A clinical attitude defines the problem before proceeding to a solution.

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[36] Hans L. Zetterberg, On Theory and Verification in Sociology, 3rd enlarged edition, the Bedminister Press, 1965, p. 73.

> A major difference between the clinical attitude, as I am defining it for our special purpose, and the engineering attitude is that the clinician does not accept the client's definition of or diagnoses of the problem. He considers it part of his responsibility to identify symptoms and diagnose the problem. He does not assume that the client knows or can articulate his problem and neither does he assume necessarily that the client really wants the truth and is anxious to act upon it. Rather than finding a means to achieve a clearly defined end, he perceives the identification of the problem as a major task.[37]

The clinical attitude provides an approach to market research and serves as a guide for this research project.

Probably, application of the clinical approach to market research programs in less developed countries is even more important and undoubtedly more difficult than in more highly developed countries. While the present effort is not cross-cultural in orientation, one must not forget that the author is North American, but the subject matter is South America. Thus, some cross-cultural judgements and conclusions are inevitable because, even with counsel from a good staff of Colombians, one can not completely free himself from engrained attitudes of his own culture.

Three cross-cultural research problems must be recognized: 1) Non-comparability of terminology. Even when words and phrases can be given a denotative translation, one is frecuently uncertain about the connotation. To phrase questions correctly or to be correctly understood is difficult in one's native language and at one's own social and educational level. But cross-cultural, educational, and social adjustments are necessary because language is culture-bound and only one of numerous communication methods. Preparation of varied interview devices for each socio-economic

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37 James D. Shaffer, "Some Conceptual Problems in Research on Market Regulations", in Federal State and Local Laws and Regulations Affecting Marketing, (NCR-20) No. 5, Regional Res. Bul. No. 168, No. Dakota State University, September, 1965, p. 10.

level at various stages in a market channel requires an understanding of different culturally-oriented behavior patterns. 2) Non-comparability in normative evaluations extends the language problem to absorb interpretational problems of communication which differentiate cultures. One's interpretations of normative practices again becomes tainted by the cultural differences between the investigator and the investigated. Normative problems may or may not be emphasized and may or may not be important because of cross-cultural differences. A major normative issue is not how we ask the question but whether the question should be asked or whether it is the correct question. 3) Non-comparability in pragmatic evaluations. Pragmatic comparisons, as bases for market analysis, are even more subject to cross-cultural errors than are normative issues. This research emphasizes a pragmatic and clinical approach in evaluating market performance and the facilitative force, or the lack of it, provided by the potato market system as a stimulus to the production-distribution process. A major pragmatic issue then is not how the question is asked or if it is "right" but once the answer is in, "so what".

Use of the clinical attitude to investigate the P-D system for potatoes necessitates expression of three basic beliefs. First, the potato subsector cannot be analyzed by applying static economic assumptions and investigation techniques because it involves complex problems of farm organization and distribution in market channels.[38]

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[38] Richard G. Wheeler, "Research Orientations in Economic Development with Special Reference to Brazil", Agricultural Economics Research, Vol XIX, No. 3, July 1967, p. 82.

The analysis must be dynamic in order to assess these problems.

Second, any complete and relevant analysis of the potato marketing system in Colombia must account for the interdependent nature of the system. It is a system where one function acts, not on the sole basis of its own structure, but upon structures and performance of each of the other functions and activites of the system. By observing the interdependency of the system, one can identify specific barriers to improved market system performance.

Third, marketing research should be interdisciplinary in its orientation. Agricultural economists now recognize the importance of interdisciplinary research activity in less developed countries.

> The basic dissatisfaction with existing social and economic conditions and the urge to change the institutional structures makes the need for an interdisciplinary approach to research in the social sciences more pressing for Latin America than for the United States or Europe.[39]

Anthropologists, sociologists, political scientists, agricultural economists, agricultural engineers, and potato breeding and disease specialists all can provide valuable assistance in analyzing the market system for potatoes in Colombia.

In summary, this research program incorporates two general philosophies: 1) sustained economic growth in Colombia requires several interdependent development processes including the agricultural marketing process, and 2) successful marketing reform programs entail purposeful coordination among all stages of the production-distribution process. Research efforts must also observe each interdependent stage in the marketing and development process in order to diagnose adequately marketing

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[39] Carlos Massad, "Economic Research in Latin America", in Social Science Research in Latin America, Edited by Charles Wagley, Columbia University Press, New York and London 1964, p. 216.

problems. For this reason, both input markets and product markets related to the potato subsector are analyzed at each production and distribution stage in the P-D system.

Applying the Approach

Performance Goals

Numerous criteria have been specified for evaluating P-D systems. Some argue that numbers of buyers and sellers and competitive relationships should be the primary criteria. Others believe that P-D systems should be evaluated according to behavior of the participants along preconceived legal and ethical guidelines. But all markets display unique structures and means of coordination. Hence, to evaluate production-distribution characteristics in unique situations, one must observe political, social and economic goals of the society and/or commodity group involved. Four general economic development goals can be specified:[40]

1. Gross product growth
2. Full employment of labor
3. Rising levels of productivity
4. Less concentrated distribution of income

But these goals are very general and without a series of sub-goals, detailed investigations cannot be meaningful. This specificity requires understanding of beliefs and values of economic participants concerning performance of the economic and agricultural economic

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[40] C.C. Slater and Harold M. Riley, et.al., Research Report No. 2, op.cit.

systems.[41] "If the perceived goals of the political group in power are not in harmony with the values and goals of the people, pressures will be brought to bear in an attempt to effectuate a change in leadership."[42]

Performance goals for the Colombian potato subsector can be defined as production goals, distribution goals, and P-D system goals.

A. Specific potato production process goals include:

   1. Wise resource use within the firm in order to maximize "something" such as profits, incomes, yields, leisure or some combination of these measures.

   2. Raising levels of productivity by:

      a. Adoption of improved practices and varieties.

      b. Use of government supported credit programs.

B. The potato distribution process goals are:

   1. Reduction of seasonal price fluctuations by :

      a. Developing a storage program.

      b. Equalizing and reducing seasonal production.

   2. Improved market coordination and consumer satisfaction by:

      a. Better information systems.

      b. Better product grading and standardization.

C. Goals of the potato production-distribution system include:

   1. Wise resource use within the potato P-D system and as it relates to the national economy.

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41 James Duncan Shaffer, "A Working Paper Concerning Publicly Supported Economic Research in Agricultural Marketing", Economic Research Service, U.S. Department of Agriculture, Washington D.C., March 1968, p.30.

42 Harrison, op.cit., p. 60.

2. Welfare and income considerations for the potato subsector participants including per capita income increases and equitable income distribution.

These goals are not universally accepted by all potato market participants and policy makers. Some of the goals are conflicting, some are complementary, but usually policies designed to maximize the chances of attaining one goal will reduce the chances of attaining other goals. Where agreement as to goals prevails, often the means to goal attainment differ because of differing beliefs and values. A further problem occurs when means are not properly differentiated from goals which causes unwise resource use and performance results short of potentials. Finally, economic and political participants may value many of these goals but disagree about importance of each goal. Thus, performance evaluation must consider the package of goals and means which best fit desires for Colombian economic development and development of the potato subsector.

The Research Hypotheses

Several research hypotheses specify further the problems in modernization and coordination of the P-D system for potatoes in Colombia:

1. The potato P-D system is not achieving the level of output and coordination of market flows that are possible.
2. Present institutional arrangements are not achieving the levels of coordination and assistance that are possible and necessary to accelerate development of the potato subsector.
3. Marketing reforms which reduce risk will stimulate the adoption of potato production and distribution innovations.

4. Most participants in the potato subsector are profit maximizers and display economic rationality dependent upon varied degrees of firm size and development.

The test of these hypotheses and related sub-hypotheses will provide a base from which to prepare recommendations for achieving the performance goals.

The Research Methodology

If the methods utilized to prepare samples and obtain interviews seem unsophisticated compared to a market research program in the United States, it is because of the nonexistence or insufficiency of data concerning the populations to be sampled. Yet this problem does not invalidate the research because the investigation describes a market system heretofore lacking information necessary for public and private decision making. Every effort was made to prepare representative, if not complete, lists of the populations while randomly drawing the samples from these lists.

Market participants included in the analysis were producers in Nariño, Cundinamarca and Boyacá, truckers entering and leaving Bogotá and Cali, wholesalers in Bogotá, processors in Bogotá and Cali, retailers in Bogotá and consumers in Bogotá.

Producers - The departments (equivalent to a state in the United States) of Nariño, Cundinamarca and Boyacá produce from 75% to 80% of Colombian potatoes. Nariño is the most isolated department studied in that Cali, located will outside the department, is the only major outlet for potatoes (Figure 2). Potatoes from Nariño move by truck to Cali in not less than twelve hours.

Figure 2 : Map of Colombia Including the Potato Production Departments Studied and their Major Markets

The three departments represent varied production and marketing problems. Cundinamarca potato producers are favored by the large Bogotá market located within the department. Boyacá producers also are relatively near to the Bogotá market and have fewer transportation problems than Nariño producers. Probably Nariño is the best area for producing potatoes with respect to supply stability because harvests can be realized nearly year around. Even so, frost is a problem in certain areas of Nariño such as Tuquerres. Potato production costs in Nariño compare very favorably with other potato producing regions in Colombia.

The sample of potato producers was drawn by first selecting municipios (similar to a county) within each department and then selecting producers from each municipio. The municipio was used as a cluster sampling unit in order to save both time and money. The municipios were selected to represent various population characteristics including size of farm, distance from markets, and physiographic variations.

No complete list of potato producers was available by municipios. The Caja Agraria loan agency, INCORA (the land reform agency), ASCOLPA (the potato producers association), and the departmental secretaries of agriculture assisted by providing producer lists including farm size and areas planted to potatoes from which random samples were taken. From these producers, a total of 125 interviews were taken. The municipios and the number of producers interviewed appear in Table 5.

Truckers - Trucker interviews were taken at retenes (truck stops or check points) on major roads leading into Bogotá and Cali. In each case, trucks hauling potatoes were stopped for about five minutes to collect flow data.

The Cali study was performed during a two week interval in October

Table 5 : Distribution of Potato Producer Interviews by Selected Departments and Municipios

Boyacá		Cundinamarca		Nariño	
Municipio	Interviews	Municipio	Interviews	Municipio	Interviews
Cacaita	2	Une	10	Pasto	10
Santa Rosa	4	Subachoque	10	Ipiales	16
Belén	6	Pasca	10	Cumbal	6
El Cocuy	8	Carmen de Carupa	8	Others	7
Ventaquemada	6	Ubaté	8		
Aquitania	5	Madrid	9		
Total	31	Total	55	Total	39

Source : ICA Potato Marketing Survey of Producers, 1968

1967.[43] Every truck hauling agricultural produce was stopped at each of the six retenes around Cali on a twenty four hour per day basis. The six retenes represent approximately 95% of the potato flows in and out of Cali during the time of the investigation. The remaining trucks did not pass through the retenes. A total of 1,094 truckers hauling potatoes were interviewed.

The Bogotá investigation occurred within a two week period in January and February 1968. There are eleven retenes on roads entering Bogotá but from a preliminary flow investigation of employees at these retenes,

[43] This was part of a larger study performed in 1967 by David Lloyd Clare, visiting professor, Faculty of Economic Sciences, University of Valle, Cali.

four retenes on the major roads entering Bogotá were selected.[44] These four retenes were manned from 3:00 AM to 9:00 PM for one week at the two northern retenes and the following week at the two southern retenes. This sampling represents approximately 90% of the flow from the North and the South for each respective week. The flows through other retenes were negligible as were the flows from 9:00 PM to 3:00 AM through the four major retenes. A total of 790 complete interviews were taken and another 200 incomplete interviews were obtained from truckers who were passing through the reten for the second time or more.

Wholesalers - Wholesaler interviews were taken in February, 1968, in Bogotá. No list of potato wholesalers was available so a census was taken by walking through the major food wholesaling section. This enumeration identified 92 private wholesalers who either rent or own a bodega (warehouse). Based on the census a 50% random sample was taken from each city block containing potato wholesalers. A total of 44 interviews were obtained. Another eight wholesalers rent a stall in Feria Central and approximately 175 potato wholesalers rent stalls in Gran Central. Two interviews were taken from Feria Central and 16 from Gran Central, again by a random sample. The potato wholesalers in Gran Central display relatively homogeneous characteristics so a small sample was drawn. A total of 62 interviews were obtained from all wholesalers.

Processors - Commercial potato processing presently includes only potato chip production. A total of 13 plants were included in the interviews in Bogotá and another 5 in Cali. Once again, it was difficult

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[44] From January 25 to February 1, interviews were taken in the retenes el Norte and Occidente, and from February 1 to February 7, 1968 in retenes Oriente and Del Sur.

to obtain a list of processors because numerous potato chip plants operate out of household garage type facilities. The sample probably represents about 80% of the chipping plants in the two cities.

Retailers - The retailer sample and data collection procedures for the 114 interviews collected were the most difficult to develop of any single group of market participants. There were no complete lists of food retailers in Bogotá from which to draw a sample and unlike the wholesaling function they are not centrally located. To compound the problem further not all retailers sell potatoes. Retailers are classified as supermarkets, cooperatives, tiendas and market plazas. The following methods were used to prepare the sample from each classification:

1. Supermarkets: There are 20 supermarkets in Bogotá and 6 appear in the sample. A supermarket was distinguished from a tienda by the existance of check out services and self service.

2. Cooperatives: Several incomplete lists of cooperative food retailers including those of the Federación Colombiana de Cooperativas de Consumo Ltda. and the Superintendencia de Cooperativas (both are organizations of cooperatives) were used as well as the telephone directory. Not all cooperatives sell potatoes but a sample of 13 of those selling potatoes was drawn from an estimated 75 to 100 cooperative food retailers. All of these cooperatives are affiliated with either a particular private or public institution or group of laborers.

3. Tiendas: The tienda is usually located in a residence garage or very small building and proprietors change location relatively often so even if lists of tiendas were available, which they were not, the lists could not have been current. For these reasons the sample was drawn first by selecting barrios at random from four sections of Bogotá (Figure 3) and randomly selecting city blocks within each barrio. Interviews were instructed to prepare a census of tiendas selling potatoes in each of the selected blocks and to randomly select one to be interviewed. Blocks from the random sample of barrios were ordered so that the interviewer encountering no tiendas in one block could proceed to another up to a total of 6 blocks. Thus, in barrios where tiendas were sparse the sample process included fewer tiendas than in other barrios.

   Tienda interviews are difficult to obtain because in most cases only the owner works in the store. Thus, due to frequent sales it can take up to four times as much time to get a tienda interview as an uninterrupted interview. A total of 69 tienda interviews were completed.

4. Market Plazas: Eight of the largest market plazas representing various sectors of Bogotá were chosen for analysis. The interviewers were instructed to enter the plaza and select 3 or 4 potato stall operators randomly. The number of interviews per plaza

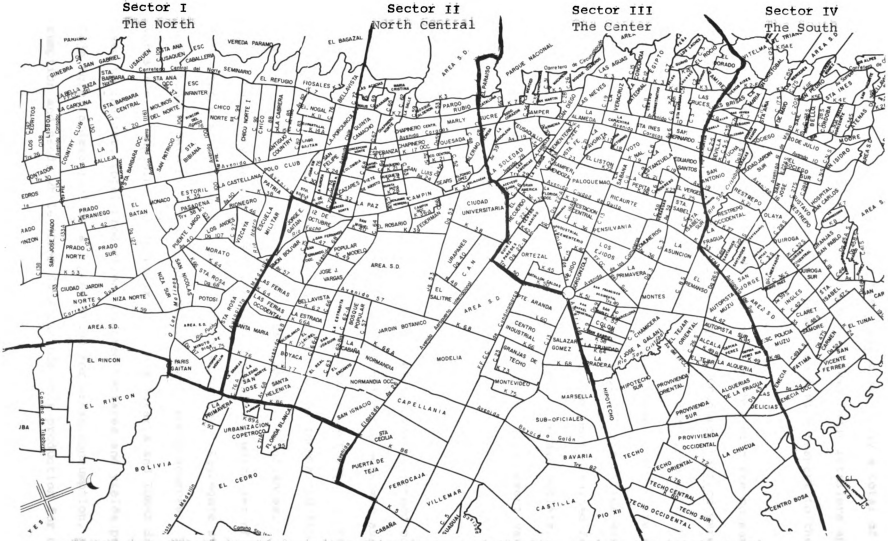

Figure 3 : Map of Bogotá Including Major Sectors of the City Used in the Retailer and Consumer Investigation

Source : DANE

dependend upon the plaza size. Only a total of 26 interviews were taken because these retailers appear to be relatively homogeneous with respect to their market practices.

Consumers - Two methods were used in obtaining the consumer interviews. Similar to the tienda sample procedure, barrios were randomly selected from the four sectors of the city from which blocks were similarly selected and an interview was taken at the house nearest the northeast corner of the block. A total of 100 interviews were collected in this manner. Another 97 interviews were obtained from consumers while they were purchasing potatoes in retail outlets. For these interviews stores and plazas were selected to represent various income levels within the city.

Data Analysis

A significant amount of the data analysis was performed on a desk calculator. Computer programs to perform socio-economic analysis were neither available at ICA nor the National University. A program from Michigan State University was adapted to the INCORA IBM 360 computer to provide frequency histograms, means and variances.

Secondary data analysis required determining which set of aggregate statistics best describe the potato subsector. Aggregate statistics describing potato production vary significantly among sources. This variation is explained in Appendix II. Caja Agraria and IDEMA data were used to indicate total production, planted hectares and yields per hectare. Caja Agraria data include all production for urban consumption, rural consumption and seed, while IDEMA data include only production for commercial

sales. DANE data were used to express price movements, ownership of land, and urban and rural employment.

CHAPTER III

A DESCRIPTION OF THE POTATO PRODUCTION-DISTRIBUTION SYSTEM

Production-Distribution Relationships

Geography of the Potato Industry

Potato production and consumption in Colombia is concentrated in the mountain regions. Inter-regional transport of potatoes occurs but potatoes must compete with several starchy substitutes that are grown in warm-climate areas. The departments represented in this research (Boyacá, Cundinamarca and Nariño) provided 70% to 80% of total Colombian production from 1955 to 1967.[45] About 65% of total production and about 50% of total consumption of potatoes occurs in Cundinamarca and Boyacá.[46]

Potatoes are an important staple in the diets of many Colombians along with yuca, plátano, corn and rice. Per capita consumption of potatoes at 89 pounds[47] ranks behind the United States per capita

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45 Production data for the 10 largest potato producing departments appear in Appendix II, Tables II-2 & II-4.

46 The consumption estimate is based upon an estimate of 2.3 million urban inhabitants and a urban per capita consumption in the two departments of 121 kilograms. Rural consumption is 24% of 650,000 tons. This assumes that total production in Colombia is one million tons, and 83% of all production is for consumption. The estimates are based on survey data from the ICA Potato Marketing Survey, 1968.

47 Ministerio de Agricultura, Plan Cuatrienal Agropecuario 1967-1970 para Ocho Productos de Consumo Popular, Serie de Planeamiento No.1, Bogotá, Colombia, Febrero de 1967, p. 9.

potato consumption of 112 pounds.[48] Potato production per capita remained relatively stable over the 1960-1967 period (Table 6). The IDEMA estimates follow most closely the commonly stated per capita consumption estimates. But, based on a description of the variance between data sources in Appendix II, the estimates of total production per capita by Caja Agraria are most realistic because they include rural consumption. When the Caja

Table 6 : Per Capita Potato Production, 1960-1967 (in kilograms)

Year	Caja Agraria	IDEMA
1960	64.3	42.5
1961	74.6	34.7
1962	85.6	53.2
1963	61.9	33.8
1964	78.7	49.5
1965	66.6	41.4
1966	61.4	40.8
1967	49.8	41.6
Average	67.8	42.3

Source : Appendix II, Table II-1

48 USDA-ERS, National Food Situation, NES-127, February 1969, p. 18.

Agraria average per capita production statistic is reduced by 17% for seed, the per capita potato consumption estimate is 56 kilograms or 123 pounds. Per capita consumption varies from near zero in the coastal, warm-climate regions to 121 kilograms (Bogotá average)[49] in major production and consumption regions.

Even though more potatoes are consumed per capita in the high potato production departments, these departments export potatoes to warm-climate, non-potato producing departments. Aggregate interdepartmental flow patterns, presented in percentages, from major surplus regions to deficit regions are presented in Figure 4. The data presented total 100% and only represent interdepartmental flows. Consumption and flows within departments are not included. This information, while only based upon the 1961 crop year, is relatively representative. The flow to Venezuela is probably exaggerated and no information is shown for flows between Ecuador and Colombia. Since 1961, Nariño has become a more important supply source for the Cali market, exceeding the flow from Cundinamarca and Boyacá. The remaining flows, particularly to the North Coast area, have not changed, primarily because transportation barriers limit movement.

Current data describing inter-country potato flows between Colombia, Venezuela and Ecuador are not available. Venezuela, having a warm climate encounters problems in maintaining good seed stocks particularly due to inadequate storage for seed during the dormancy period. Seed and potatoes for consumption from Santander and Boyaca enter Venezuela by way of Cúcuta, Colombia, and San Cristobal, Venezuela. Only part of this

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[49] ICA Potato Marketing Survey of Consumers in Bogotá, 1968.

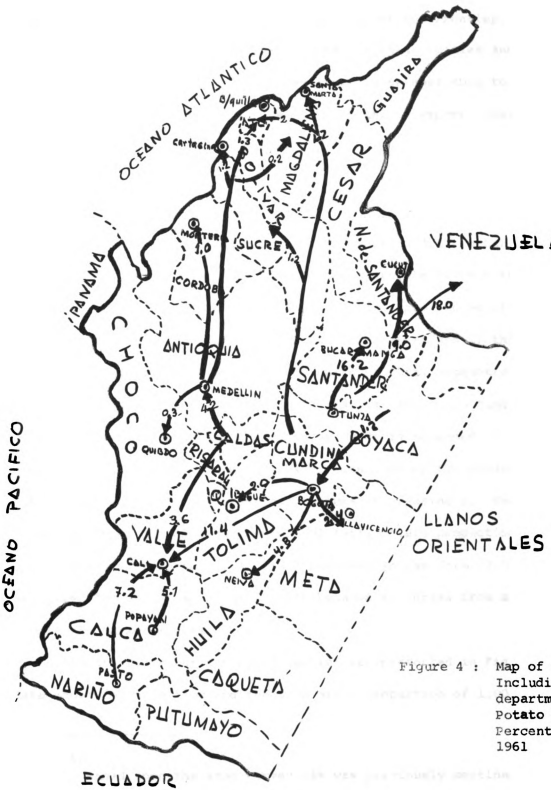

Figure 4 : Map of Colombia Including Inter-departmental Potato Flows in Percentages in 1961

Source: Weitz - Hettelsater Engineers, Economic and Egineering Study of Marketing and Storage Facilities for Grain and Tuberous Crops in Colombia, A Division of the Weits Co. Inc. Kansas City, Missouri, August 1965, p. 149.

flow is recorded by import-export authorities at the frontier. The contraband flow of potatoes from northern Ecuador through Ipiales and to the Cali market is also difficult to quantify. Those most able to explain the contraband activity are also most reluctant to expose their activity by relating their day-to-day practices.

Market Channel Flows

Producer data in Cundinamarca and Boyacá, and the urban data for the Bogotá market were used to develop the aggregate flows presented in Figure 5. Total production data can be divided into two major categories: 1) those potatoes that do not leave the rural areas and 2) those potatoe sales for urban consumption. Of 1000 units of total production at harvest time, 121 units or 12.1% is lost during harvest due to cutting, another 17.0% is saved for seed and 208 units or 20.8% is consumed in rural areas.[50] Part of the harvest losses are consumed by the producer's family and laborers while livestock consume the remainder. Seed losses amount to 19.4% of the seed supply. Of total potato production, 50.1% enters commercial channels, 40.2% is consumed in raw form, 2.0% is processed for chips, and 7.9% is attributable to losses from all levels within the market system.

Potato flows for the Bogotá market are presented in Figure 6. The data shown for each flow and function are a proportion of 1,000 units.

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[50] Based upon the same survey 24% was previously mentioned as the amount of rural consumption because the estimate of total production used did not include losses at harvest.

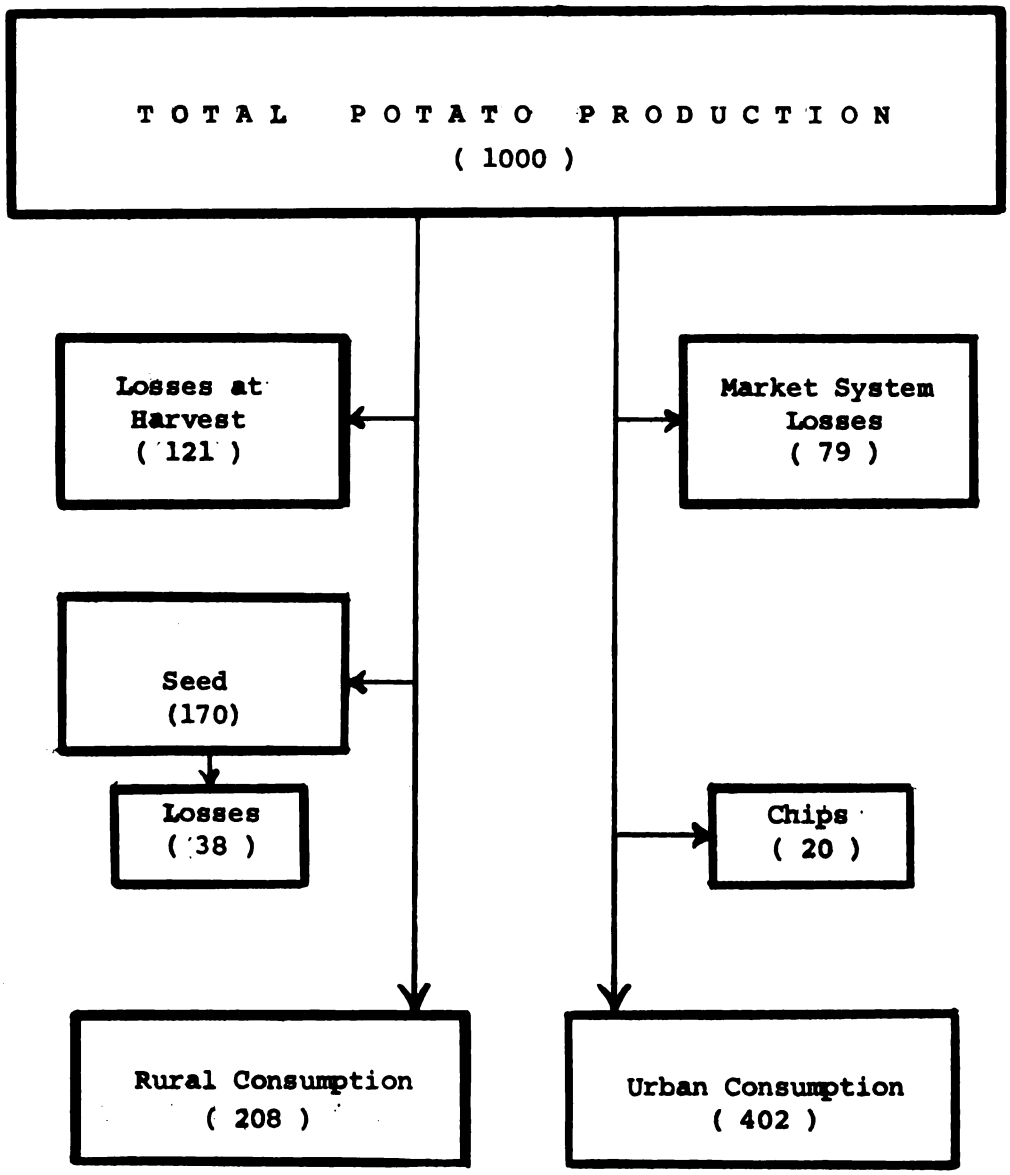

Figure 5 : Distribution of Total Potato Production in the Bogotá Market Area

Source : ICA Potato Marketing Survey, 1968

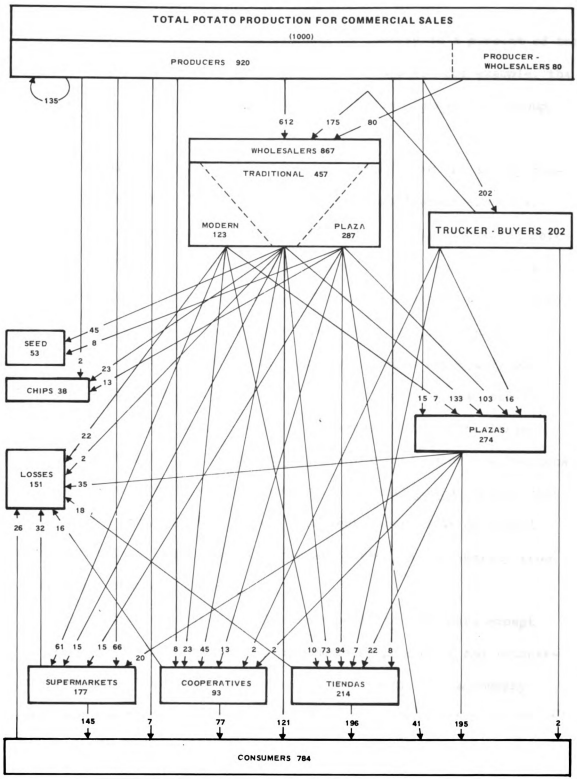

Figure 6 : Total Potato Production Entering Commercial Channels in the Bogotá Market Area

Source : ICA Potato Marketing Survey, 1968

Thus, specific flow figures can be converted readily to a percent of the total potato production entering commercial channels. For example, the flow from plazas to tiendas represents 2.2% while tiendas as a group purchase 21.4% of the commercial flow.

Of total commercial sales from production areas, 8% are by producer-wholesalers and 92% by producers. Some small producers do sell to larger producer-assemblers which represent 13.5% of commercial sales but this amount is not included in the direct flows. Wholesalers are divided into three groups as follows: 1) modern wholesalers who wash, grade and bag in small bags ranging from 5 to 25 pounds in size, 2) traditional wholesalers who operate a private potato warehouse, but who seldom grade potatoes and neither wash nor bag potatoes, and 3) plaza wholesalers who operate a small wholesale stall in the large wholesale warehouse called Gran Central. Inter-wholesaler transactions occur particularly where wholesalers sell to retail plaza outlets that also perform a wholesale function. This represents 16.4% of retail plaza dispositions. Wholesaler purchases however, are primarily from producers and trucker-buyers.

Every group of market participants sells to consumers except the modern wholesaler but sales to consumers by producers and trucker-buyers represent less than one percent of the total. To accompany Figures 5 and 6 the percentage contribution of each market participant group to the demand and supply situation for potatoes is presented in Table 7. The supply sources and purchasers for each group are specified.

When consumer purchases were isolated by supply source, the results were accurate when cross-checked with the retailer results except for supermarkets having greater sales than cooperatives. But based upon the

Table 7 : Distribution of Purchases and Sales by Each Group of Market Participants

PRODUCERS

Acquisition	Percent	Disposition	Percent
Other Producers	13.5	Wholesalers	34.6
		Seed	17.0
		Rural Consumers	20.8
		Losses at Harvest	12.1
		Trucker-Buyers	10.1
		Supermarkets	3.3
		Plazas	0.8
		Tiendas	0.4
		Cooperatives	0.4
		Consumers	0.4
		Processors	0.1
			100.0

WHOLESALERS

Acquisition	Percent	Disposition	Percent
Producers	68.0	Plazas	28.2
Trucker-Buyers	20.3	Tiendas	20.7
Producer-Wholesaler	11.7	Consumers	18.0
	100.0	Supermarkets	10.7
		Cooperatives	9.5
		Seed	6.2
		Processing	4.2
		Losses	2.5
			100.0

TRUCKER-BUYERS

Acquisition	Percent	Disposition	Percent
Producers	100.0	Wholesalers	86.9
		Plazas	8.2
		Consumers	0.8
		Tiendas	3.3
		Cooperatives	0.8
			100.0

(Table 7 : Continued)

CHIP PROCESSORS

Acquisiton	Percent	Disposition	Percent
Traditional Wholesalers	60.9	Tiendas	63.5
Plaza Wholesalers	34.8	Schools	17.9
Producers	4.3	Street Venders	12.6
		Supermarkets	4.2
	100.0	Restaurants	1.4
		Cooperatives	0.4
			100.0

PLAZAS

Acquisition	Percent	Disposition	Percent
Traditional Wholesalers	48.5	Consumers	70.9
Plaza Wholesalers	37.6	Losses	12.7
Trucker-Buyers	6.1	Tiendas	7.9
Producers	5.4	Supermarkets	7.3
Modern Wholesaler	2.4	Cooperatives	1.2
	100.0		100.0

TIENDAS

Acquisition	Percent	Disposition	Percent
Plaza Wholesalers	44.2	Consumers	91.5
Traditional Wholesalers	34.1	Losses	8.5
Plazas	10.0		100.0
Modern Wholesalers	4.7		
Producers	3.9		
Trucker-Buyers	3.1		
	100.0		

(Table 7 : Continued)

COOPERATIVES

Acquisition	Percent	Disposition	Percent
Traditional Wholesalers	47.3	Consumers	82.5
Modern Wholesalers	24.6	Losses	17.5
Plaza Wholesalers	14.0		100.0
Producers	8.8		
Plazas	3.5		
Trucker-Buyers	1.8		
	100.0		

SUPERMARKETS

Acquisition	Percent	Disposition	Percent
Producers	37.4	Consumers	82.2
Modern Wholesalers	34.6	Losses	17.8
Plazas	11.2		100.0
Plaza Wholesalers	8.4		
Traditional Wholesalers	8.4		
	100.0		

CONSUMERS

Acquisition	Percent	Disposition	Percent
Tiendas	25.0	Consumption	96.6
Plazas	24.8	Losses	3.4
Supermarkets	18.6		100.0
Traditional Wholesalers	15.8		
Plaza Wholesalers	5.1		
Cooperatives	9.9		
Producers	0.8		
	100.0		

Source: ICA Potato Marketing Survey, 1968

retailer interviews, cooperatives had both larger weekly sales and a higher percent of sales attributable to potatoes than supermarkets. There are two causes for this inconsistency. First, only cooperatives selling potatoes were included in the retailer sample so the number of cooperatives in the sample probably was about equal to the total number of supermarkets, in Bogotá, all of which sell potatoes. Second, the supermarket sample and results did not include Carulla. Probably Carulla's eight supermarkets represent 75% of all supermarket volume in Bogotá which would raise the weekly sales volume average for all supermarkets above the average for cooperatives.[51]

The exclusion of Carulla from the flow results biases the supply flows to supermarkets. Carulla buys directly from producers when possible and, otherwise, from traditional wholesalers. Carulla grades, washes and bags potatoes in its own central warehouse. Thus, if Carulla were included with the other supermarkets, the direct flow from producers would definitely increase. The change in flow from traditional wholesalers is unknown; the flows from modern wholesalers, plaza wholesalers and plazas would be decreased; and the flow to losses would expand slightly.

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[51] The supermarket data do not include Carulla, the major supermarket chain in Bogotá, because store managers and the warehouse produce managers of Carulla are not permitted to answer specific questions or give detailed information without consulting the board of directors. The board will give only very general information.

Price Movements

Fluctuations in Prices - Two major harvest periods account for 90% of the annual Colombian potato production.[52] For the entire country, 60% of total production occurs during the Año Grande harvest period (June, July and August) while 30% occurs during the Mitaca harvest period (January and February). Marginal potato producing zones account for the remaining 10% of production occurring outside these harvest periods.

As might be expected, potato price fluctuations are common and significant. Bogotá prices varied from 300 to 800 pesos per ton from 1963 to mid 1964 and returned to 300 pesos (Figure 7). Although the pattern is not consistent, cyclical price fluctuations are present. Price variability and differences between regions also appears to be substantial.

Seasonality of prices due to both economic and ecological or climatic conditions influence potato production. This phenomena is explained by using Figure 8. The general magnitude of the "price" and "quantity of seed" curves is not important, but the relative changes occurring between the curves and their interdependent relationships are important. From the Año Grande (AG_1) harvest of year one, seed must be saved from four to six months for planting in order to yield AG_2 in year two. Planting for AG_2 occurs about the same time as the Mitaca (M_1) harvest. Some seed loss from AG_1 results from spoilage but enough seed is planted to perpetuate the large annual harvest in the June to September period. Of the M_1 harvest, however, seed is saved for planting near the time of the AG_2 harvest. Once again, seed is lost to spoilage but in addition, seed

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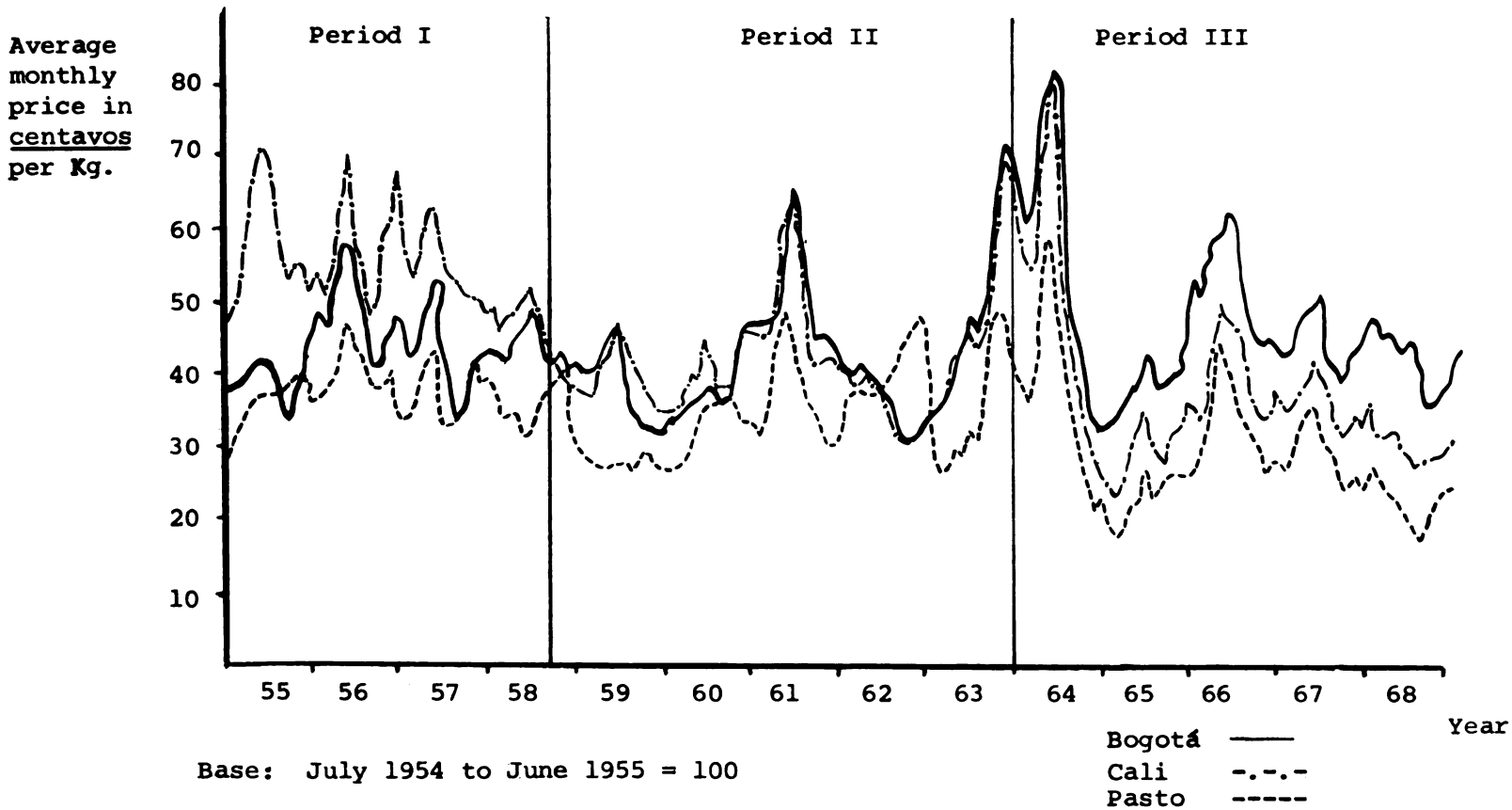
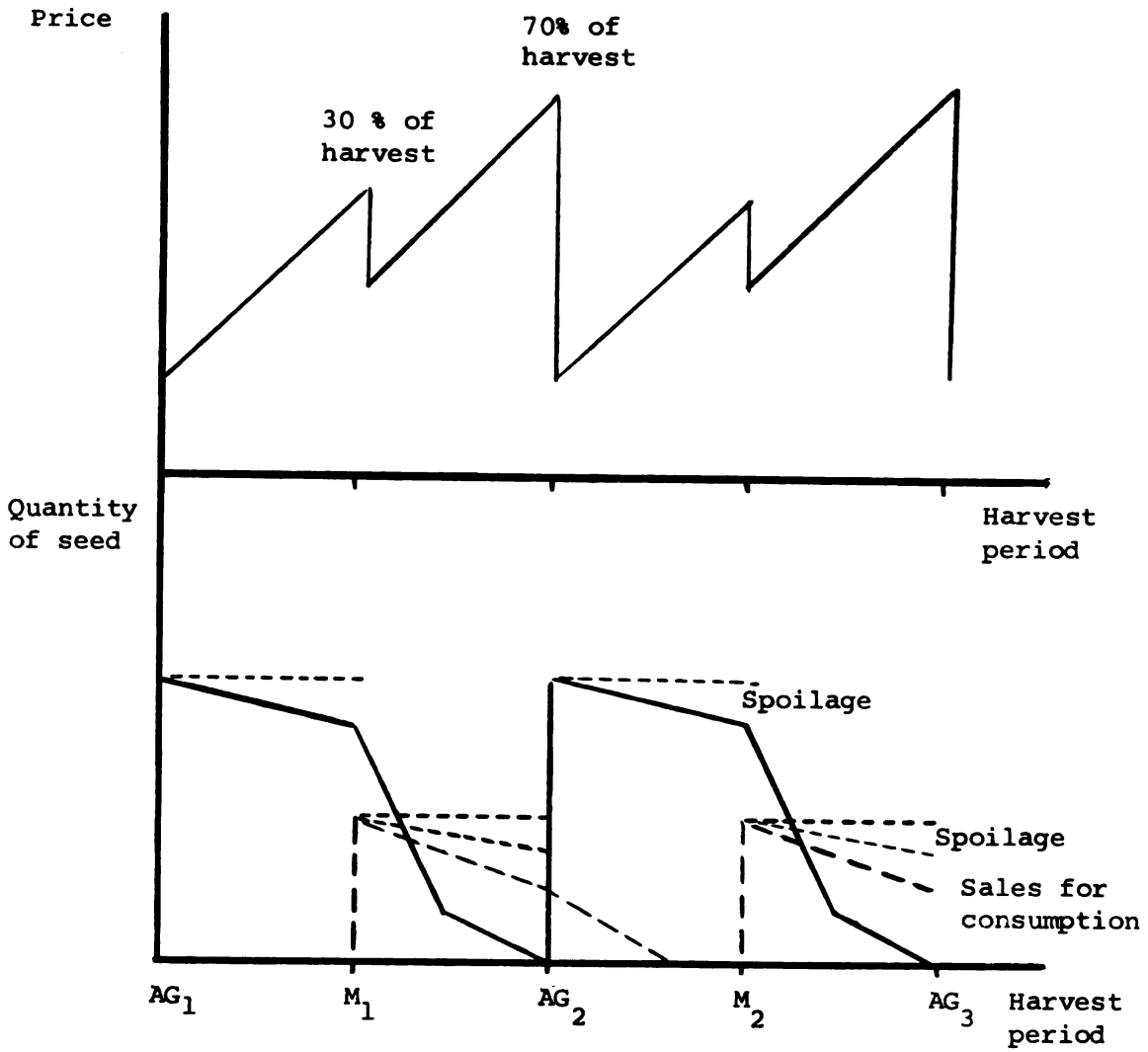
52 Comments taken from "Comité de Estudio de la Papa" Coordinador Fabio Arango Tamayo (unpublished monograph), February 1967.



Base: July 1954 to June 1955 = 100

Figure 7 : Monthly Potato Prices Deflated by the Consumer Price Index for Workers in Bogotá, Cali and Pasto

Source : Departamento Administrativo Nacional de Estadística



——— Seed for Año Grande
- - - - Seed for Mitaca

Figure 8 : Theory of the Seasonal Potato Cycle in Colombia

also enters consumption channels because the low productivity of the M_1 harvest leaves a short supply and rising prices up to the AG_2 harvest. Thus, the short seed supply, low seeding and low harvest cycle of the Mitaca is perpetuated. These fluctuations continue and reinforcement prevails some years due to a dry season or a killing frost that will affect a Mitaca more often than an Año Grande and thus aggravate the seed supply problem.

Interdepartmental Price Differentials - Price differentials between the Bogotá, Cali and Pasto markets from 1955 through 1968 indicate changes in pricing patterns. Figure 7 presents three different periods of relative prices for the three markets. Period I, January 1955 to September 1958, shows Cali prices highest and Pasto prices lowest, except for two short periods totaling five months. The Bogotá price was between the Cali and Pasto prices. Period II is a transition from September 1958 to January 1963, with each city displaying both higher and lower prices than the other two cities. Bogotá and Cali prices were always close and usually higher than Pasto prices. Again in Period III from January 1963 to present Pasto prices are always lowest but, contrary to Period I, Bogotá now exceeds Cali.

These changes in interdepartmental price differentials indicate numerous changes in regional potato markets. During Period I prices in Cali were high compared to Bogotá and Pasto. Cali prices are important to Nariño because Cali is the major market for Nariño potatoes and, through the Cali market, price fluctuations from the Bogotá region are felt by Nariño producers. Bogotá prices were about 20% greater than Pasto prices in Period I but, in Period III the differential increased

to 65%. Cali prices, however, were 50% greater than Pasto prices in Period I and for Period III are only 30% greater.

Availability of transportation for potatoes has contributed to this change. During Period I transportation between Pasto and Cali was difficult and sometimes impossible. The road has been improved but not paved and now transportation is somewhat less difficult. Roads between Bogotá and Cali have been improved also making the aggregate influence of transportation on price differentials among the three markets difficult to specify.

The demand and supply structure changed to influence the changing price relationships among the three markets. While the population in the Bogotá area expanded by 137% between 1951 and 1964, the rate of population growth in Valle (the department including Cali) for the same period was 63.9%. Information about price changes for substitute crops and changes in income, if available, would help explain the changing demand situation, but it appears that demand for potatoes has increased more rapidly in Bogotá than in Cali. Total production, however, has increased more since 1955 in Nariño than in Cundinamarca and Boyacá (Appendix II, Tables II-2 & II-4). Based on average total production figures for the 1955-1960 period compared to the 1961-1965 period, potato production increased by 10.8% in Cundinamarca and Boyacá, and by 69.7% in Nariño.

Besides reduced transportation difficulties as one explanation of increased production in Nariño, the rapidly growing credit program of Caja Agraria for potato producers in Nariño was an important factor.

Consumer Demand Characteristics

Per Capita Consumption

Of the 197 consumers interviewed in Bogotá, 70.6% were housewives, 21.3% were maids, and 8.1% were other members of the family. The city was divided into four zones for analysis. The distribution of occupational characteristics for each zone and for the entire sample appear in Table 8.

Table 8 : Occupational Characteristics of the Bogotá Consumers Included in the Sample

Occupation[a]	North (32)	North Central (52)	Central (71)	South[b] (42)	Total (197)
			(percent)		
Professionals	53.1	21.2	36.7	2.3	28.9
Workers	6.2	28.9	29.6	33.4	25.4
Merchants	15.7	17.3	12.7	23.9	16.7
Small Industry	-	13.5	5.6	21.4	10.2
Large Industry	15.7	11.5	5.6	7.1	9.1
Self employed	9.3	7.6	9.8	11.9	9.7
Total	100.0	100.0	100.0	100.0	100.0

[a] Professionals includes government employees and all other white collar workers. Workers are day laborers, chauffers, carriers, etc.

[b] The South was somewhat under-represented in the sample which causes a slight bias toward professionals in the total results.

Source: ICA Potato Marketing Survey of Consumers, 1968

Potato consumption per capita in Bogotá ranks above estimates for Colombia due to the production concentration in Cundinamarca and Boyacá. Per capita consumption in Bogotá is 121 kilograms per year compared to about 56 kilograms for all of Colombia. Data including per capita income and per capita potato purchases by zones of Bogotá are presented in Table 9. For all consumers interviewed, 5% of the total food expenditures are for potatoes while 53% of total income was spent on food, Tubers and plantains, including potatoes, represent 35% of the total calories and 20% of the total cost of present Colombian diets.[53]

Table 9 : Income Per Capita and Potato Purchases Per Capita in Bogotá and Zones of the City

Zone	Per Capita Income (Pesos)[a]	Per Capita Potato Purchases (kgs)
Bogotá (combined sector data)	8036	121
North	10346	119
North Central	8068	122
Central	8926	125
South	4752	112

[a] About 16.5 pesos were equal to one dollar for the research period.

Source: ICA Potato Marketing Survey of Consumers, 1968

[53] Cecilia A. Florencia, The Efficiency of Food Expenditure Among Certain Working-Class families in Colombia, (Ph.D. Thesis, Michigan State University, Department of Foods and Nutrition, 1967) pp. 63 & 69.

The relationship between per capita income and per capita potato consumption (Figure 9) indicates that as incomes rise to about 14,000 pesos, consumption will rise and then fall as income rises beyond 14,000 pesos. The rise in per capita purchases of potatoes as incomes rise indicates a preference for potatoes compared to lower cost close substitutes. But as income continues to rise beyond 14,000 pesos per capita, consumption declines and consumers prefer to substitute animal products, fruits and vegetables for part of the potatoes. Consumers, however, desire potatoes in their diets, even though potato expenditures as a percent of total food expenditures decline as per capita income increases (Figure 10). When annual per capita income increases by 1000 pesos, the percent of food expenditures on potatoes declines by 0.4 or nearly one half of a percentage point. At the average per capita income of 8000 pesos, based upon the consumer sample, 5.1% of all food expenditures are for potatoes.

Purchase and Preparation Habits

Tiendas and plazas each include about 25% of potato sales to consumers, cooperatives and supermarkets - 28%, wholesalers - 21%, and producers - 1%. As could be anticipated, consumers in higher income areas of Bogotá and consumers purchasing at supermarkets and cooperatives buy potatoes least frequently (Table 10). The distribution of tiendas throughout the city within not more than two or three blocks from most consumers probably accounts for the high number of purchases and the low average size of purchases. These tiendas often service the lower income relatively immobile consumers lacking personal transportation. When consumers were questioned about why they purchased

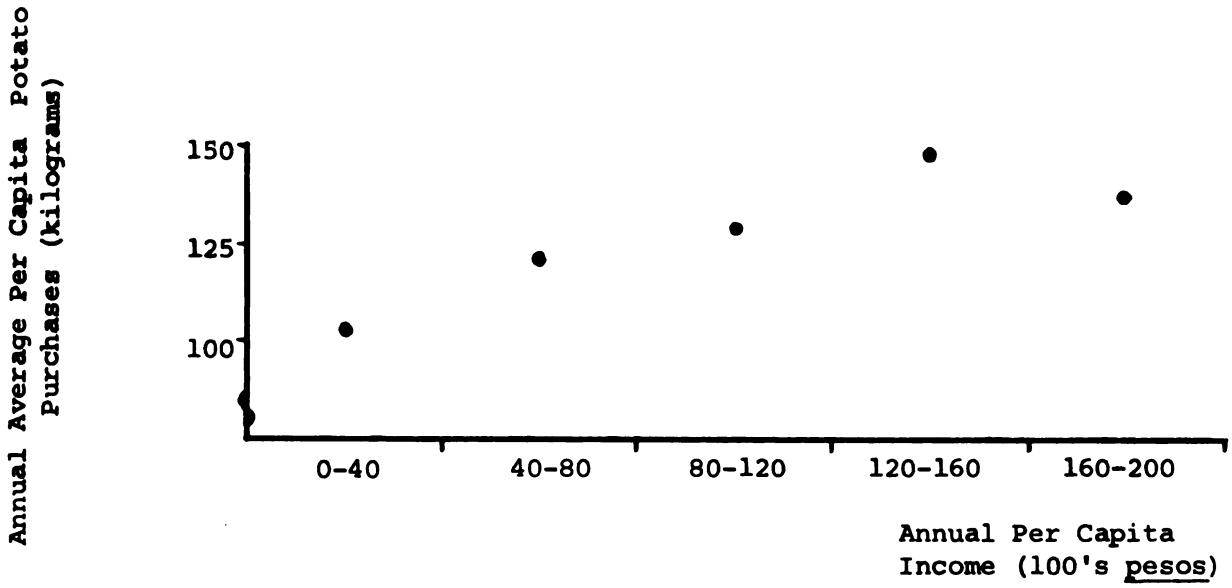


Figure 9 : Relationship Between Average Per Capita Potato Consumption and Per Capita Income Ranges

Source : ICA Potato Marketing Survey of 197 Consumers, 1968

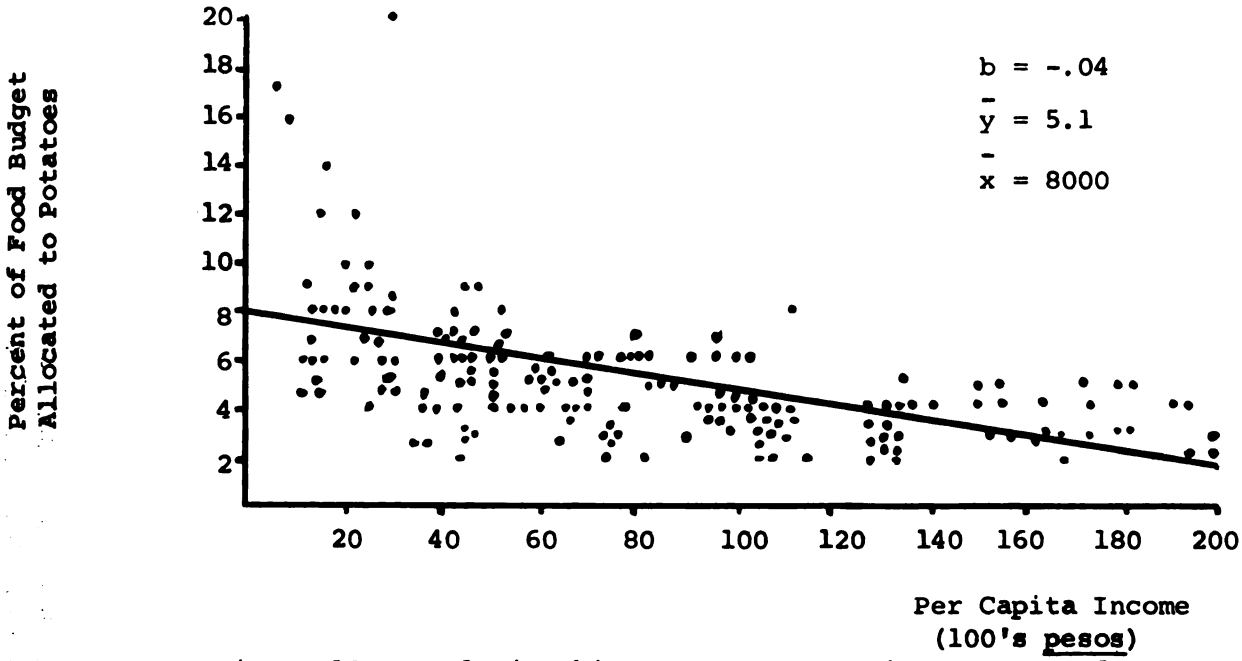


Figure 10 : Relationship Between Per Capita Income and Percent of All Food Expenditures Allocated to Potatoes

Source : ICA Potato Marketing Survey of 197 Consumers, 1968

Table 10 : Average Quantity Purchases for Household and Average Number of Potato Purchases Per Month by Zone of Bogotá and by Type of Retail Outlets

	Papa Criolla		Papa de Año	
	Average qty. in pounds	Number of Purchases per month	Average qty. in pounds	Number of Purchases per month
Zone of Bogotá:				
North	6.1	3.5	33.8	6.1
North Central	5.1	4.0	33.3	10.3
The Center	6.0	4.0	29.8	9.6
The South	3.4	4.4	10.5	24.5
Type of Retail Outlet:				
Plazas	5.0	4.2	30.2	11.0
Tiendas	3.5	3.9	5.9	27.1
Cooperatives	6.4	3.5	31.0	3.8
Supermarkets	6.6	3.9	32.4	4.0
Average of all consumers :	5.3	4.0	27.0	12.4

Source : ICA Potato Marketing Survey of Consumers, 1968

potatoes at the retail outlet they had previously specified, 78% stated that other food purchases are made there, 14% gave lower prices as the reason, 2% stated that they were able to get better quality, and 6% gave other responses.

The distribution of consumers making potato purchases was:

Wife	80.7%
Husband	3.0%
Wife and Husband	0.5%
Other family members	8.7%
Maids	7.1%
	100.0%

Fifty six percent of the consumers indicated that a maid prepared family meals, Where maids are available to prepare potatoes, particularly chips, demand for processed potatoes will be restrained. Convenience in potato preparation is not important when low costs household labor is available.[54]

Presently the potato is classified by consumers as either papa de año or papa criolla. Consumption of papa criolla represents 16% of all potato consumption. Papa de año includes varieties similar to those produced in other countries except that they are usually smaller, averaging from 3 to 6 centimeters in diameter. Some of the possible techniques used in preparing papa de año are boiling with a tomato onion sauce, boiling

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[54] Maids employed by Colombian families currently receive 200-300 pesos or 12-13 dollars per month. Probably the percent of the consumers employing maids is high due to a slight sample bias to professionals (Table 8).

in soups, french fries, sliced and fried, mashed, hash-browns, potato salads, baked, and potato chips. By far, boiled whole potatoes with salt, in soups, and with a tomato-onion sauce are most common.

Baked and fried potatoes are not common. Papa criolla, however, is fried but is unique, having no equal in North America. This potato usually has a dark yellow interior, varies from 2 to 4 centimeters in diameter, has a distinctly different taste from other varieties, and is fried without removing the skin. Papa criolla is also prepared in soups and boiled.

Consumers also prefer dark or red skinned potatoes to white skinned varieties. The Sabanera and Tuquerreña varieties are exactly the same potato by all measures of breeding and quality. But the white skinned Sabanera produced in clay soils of the Sabana de Bogotá is less acceptable than the dark skinned Tuquerreña which is produced in the Paramo (dark loam soil). Soil conditions yielding different skin color have altered the value of this potato in the eyes of the consumer where no qualitative distinction can be made.

A set of seven attitude statements were administered to consumers (Table 11). In general consumers desire better information and improved quality control. More than half of the consumers interviewed did not believe quality of potatoes in the market had improved over the past five years. They feel supermarkets sell better quality but are not in agreement about whether supermarket prices are lower than potato prices in tiendas. Carulla supermarkets sometimes do feature potatoes at a special price and use potatoes to attract more customers.

Table 11 : Consumer Attitudes Toward Conditions in Potato Markets

Statements	Response		
	Agree	Indifference or no response	Disagree
		(percent)	
Both potato quality and potato varieties are better now than they were five years ago.	10.2	29.9	59.9
The scales at retail outlets are exact and fair.	21.8	25.9	52.3
Supermarkets usually sell better quality potatoes than do tiendas.	45.2	26.4	28.4
Supermarkets usually have lower potato prices.	38.1	20.8	41.1
Consumers need more and better information about quality and prices of potato.	89.3	10.7	0.0
Potato quality should be regulated to protect the consumer.	96.5	3.5	0.0
Potato processing is a good idea.	58.4	36.5	5.1

Source : ICA Potato Marketing Survey of Consumers, 1968

Chip Consumption

Consumers believe that potato processing is "a good idea" but they are not heavy users of commercial potato chips (Table 12). Seventy eight percent of the consumers who by potato chips prefer specific brands of chips and 48% specified one particular brand.

Table 12 : Consumer Preferences for Potato Chips

Question	Response	Percent Responding
Do you buy potato chips when you go to market?	Frequently	6.1
	Once in a while	22.8
	Never	71.1
		100.0
Do you fry potato chips at home?	Frequently	11.2
	Once in a while	64.5
	Never	24.3
		100.0
Why don't you buy more potato chips?	I don't like them	33.4
	They are of bad quality	0.6
	They are difficult to obtain	4.8
	Prices are too high	13.2
	We fry them at home	47.4
	Other	0.6
		100.0

Source: ICA Potato Marketing Survey of Consumers, 1968

Potato chips are also prepared by frier-venders working on the street. The potatoes are fried in small pots and the chips are placed in bags. This practice is common particularly on weekends and holidays and it competes favorably with chipping industries because of low cost labor and a very low investment in equipment.

Retailer responses to questions about potato chips appear in Table 13. It is interesting to note that both consumers and retailers emphasize "dislike" of potato chips but place little emphasis upon the poor quality issue. In fact, most of the chips are of bad quality due

Table 13 : Retailer Responses about Potato Chip Sales

	Tiendas	Plaza Retailers	Supermarkets & Cooperatives
		(percent)	
Do you think potato processing is a good idea? (yes responses)	91.3	88.5	66.7
Do you sell potato chips? (yes responses)	68.1	3.8	61.1
What % of potato sales do chips represent? (is % of yes response group above)	9.3	5.0	15.4
Why don't you sell more chips?			
Consumers don't like them	7.3	--	11.1
They are of bad quality	2.9	3.9	5.6
They are difficult to obtain	47.8	76.9	44.4
Prices are too high	17.4	--	5.6
No response	24.6	19.2	33.3
	100.0	100.0	100.0

Source : ICA Potato Marketing Survey of Retailers, 1968

to inadequate machinery and technical knowledge for preparing good quality.[55]

[55] Potato chip manufactures under modern conditions use a highly scientific process to obtain uniform and good quality. For comprehensive discussions of all physical aspects of potato chipping including 1) the yield of chips which is produced from any given quantity of potatoes and the factors which bring this about, 2) color of chips and factors affecting color, 3) oil content of chips and the contributing factors and 4) the flavor of chips and factors affecting flavor, see William F. Talbutt and Ora Smith, Potato Processing, the Avi Publishing Company Inc. 1967, pp. 262-339; and Reynaldo Bernal González and Oscar Bautista Gamboa, Cualidades Culinarias de la Papa : Papa Frita, Tesis de Grado Universidad Nacional de Colombia, Facultad de Agronomía, 1968.

Colombian consumers have not experienced uniformly good quality in commercial potato chips and home frying which may produce good quality is very difficult and time consuming. Thus, probably the issue is not that Colombians dislike potato chips as could be inferred from the response but that, unfortunately, they cannot make quality comparisons because no norm exists. Given the large number of small retailers it is not surprising that retailers find potato chips difficult to obtain. The narrow market for the present chips often causes chips to lie longer on retail shelves causing quality deterioration. Deliveries of potato chips, particularly to small retailers, are infrequent.

Processors attempt to produce potato chips with good color and flavor, but in most cases they do not recognize the chemical factors producing color and taste such as water content, sugar content, quality of oil, temperature of oil and fry time. Processors, by experience and not by scientific tests, prefer certain potato varieties for chipping because they yeild more chips per kilogram of raw potatoes and produce better color and taste. From 18 interviews, 5 in Cali and 13 in Bogotá, the following results concerning varieties purchased were obtained:

Varieties	First Choice	Second Choice
Parda Pastusa	14	7
Sabanera	3	2
Monserrate	1	2
Capiro	-	3
Tuquerreña	-	1
No response	-	3
	18	18

Based upon research at ICA, varieties rank as follows with respect to chipping quality: Monserrate, Sabanera and Tuquerreña, Parda Pastusa, Capiro. Due to availability and price, processors prefer Parda Pastusa. Only one large farmer is producing Monserrate and he can demand a high price for his product. Likewise, although the supply is greater for Sabanera and Tuquerreña than for Monserrate, the Sabanera and Tuquerreña wholesale price exceed the price for Parda Pastusa by 40% to 50%.

Consumer behavior with respect to both the use of potatoes and the utility received from the P-D system by consumers is not well understood in Colombia. This brief consumer study was not sufficient to describe completely consumer actions and attitudes concerning potato consumption but the analysis does emphasize the need for interdependent research by potato production specialists and agricultural economists.

Price Change Responses

In Colombia a wider variety of starchy substitutes compete with potatoes than in most other potato producing countries because of extreme climatic differences that influence agricultural production. Yuca and plátano compete in all market centers but particularly in low altitude cities because they are warm climate crops.

When consumers in Bogotá were asked if they purchased more potatoes when prices fell substantially, 72.1% responded negatively. When prices rise substantially, however, 92.4% said they purchased the following substitutes:

Vegetables	43.2%
Platáno	19.8%
Yuca	14.2%

Arracacha	13.7%
Rice[56]	1.5%
Using no substitutes	7.6%
	100.0%

Thus it appears that the consumption adjustment for potatoes in Bogotá tends to be inelastic for downward price movements and elastic for upward price movements to a minimum level of consumption (Figure 11).

When prices fall below the normal price range consumers have nearly reached their maximum desire for potatoes so quantity consumed increases slowly. When prices rise above the normal range they will

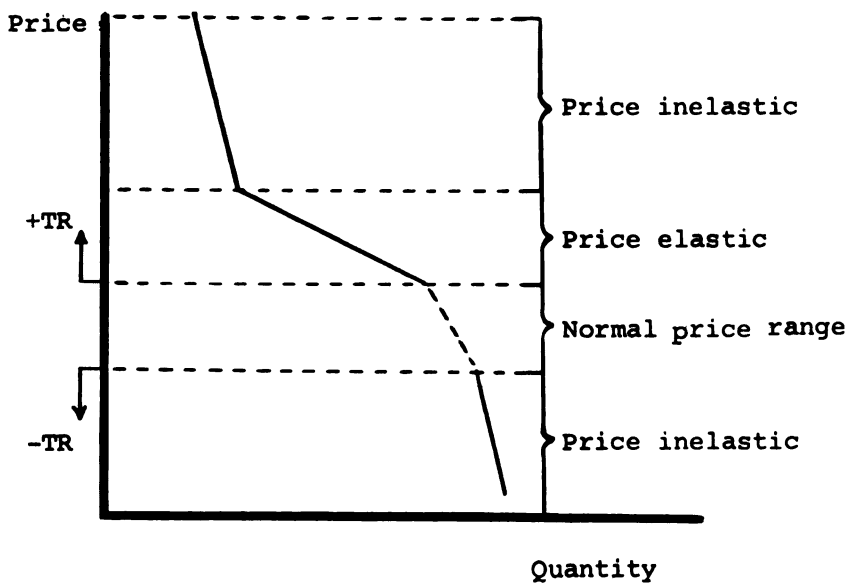

Figure 11 : Hypothetical Demand Curve for Potatoes in Bogotá

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56 Rice as a substitute appears to be insignificant. Consumers, however, do not view rice as a substitute for potatoes; instead rice is a major staple in nearly every consumers diet. Rice might be a strong substitute at a much lower price.

substitute other products creating a more elastic response situation. But at some point the substitution will nearly cease and the response tends to be price inelastic because consumers desire a minimum amount of potatoes in their diets evidenced by the 7.2% using no substitutes. The quality of potatoes consumed, particularly by the low income consumers, changes with these price movements. When prices are high salvage of low quality potatoes is common, but when prices are low, these consumers can obtain better quality potatoes both by salvage and by purchases.

For both price increases and decreases, the P-D system may not profit substantially from this consumer response pattern. Although no data are available to substantiate this hypothesis, downward price movements probably lower total returns (TR) to potato producers while upward price movements only increase TR slightly.

The impact of close substitutes for potatoes explains the variation in per capita consumption at different income levels. For example, at a per capita income level of 5,000 pesos per year, consumption per capita varies from 65 kilograms to 175 kilograms (Figure 10). This variation, while unlikely in most northern hemisphere countries, is probably possible in Colombia because of substitute products. Bogotá has experienced an in-migration of population for several decades. Some of these migrants are from warm climates where previous consumption habits, in the form of warm climate starchy foods, influence today's purchases. Other consumers are from families who have lived for several generations in Bogotá and their potato consumption habits have been well established.

Organizational Structure of the Subsector

Size of Firm

In general, potato farms are small, non-mechanized units, many of which do not produce for the commercial market. The farm survey, however, did not include a proportionate or representative sample of the very small farms. Farm size and areas planted to potatoes both from survey results and from secondary data are presented in Table 14.

Table 14 : Potato Farm Size Statistics From Survey Data[a] and Census Data[b]

Characteristics	Boyacá	Cundinamarca	Nariño
Average Potato Farm Size (hectares)[a]	32.1	49.0	46.0
Hectares in Potatoes:[a]	20.4	28.9	14.3
Hectares in Mitaca	20.2	12.7	9.5
Hectares in Año Grande	19.1	23.9	8.6
Percent having 10 hectares or less in potatoes from survey data[a]	63.3	49.0	61.7
Percent having 10 hectares or less in potatoes from secondary data[b]	90.4	79.0	84.2

Source:

[a] ICA-Potato Marketing Survey of Producers, 1968

[b] Appendix I

Care should be observed in analyzing the survey data because it is biased toward large producers. Hectares in potatoes do not represent the total of the Mitaca and Año Grande harvest. The time of year for each of the separate harvests varies among the departments as well as the length of time for each harvest period so that the Mitaca and Año Grande statistics often overlap.

Transportation of potatoes utilizes numerous trucks. According to the reten survey data taken at the close of the small Mitaca harvest period, over 1000 trucks per week hauled potatoes either to or from Bogotá. One-half of these trucks made only one trip during the week and another 200 trucks made two or more trips per week. Thus 700 different trucks entered or left Bogotá with potatoes during the sample period. There are no large trucking firms and usually not more than two or three trucks are owned by one individual. Forty-two percent of the trucks were driven by the owner, 56% hired drivers and 2% were rented trucks driven by the owner of the potatoes.

Potato wholesaling is performed by several wholesaler combinations. The wholesalers identified herein may sell to consumers or may produce potatoes, but the quasi wholesaler - retailers in market plazas are not included. They appear in the retailer analysis which presents no major problems due to similarity of the retailer and wholesaler interview techniques. Table 15 presents a general summary of the structural characteristics of Bogotá wholesalers.

Four major types of firms retail potatoes in Bogotá. The structural characteristics of retailers appearing in the sample survey are in Table 16. The supermarket data does not include Carulla, the major supermarket chain in Bogotá.

Table 15 : Average Structural Characteristics of Potato Wholesalers in Bogotá

Characteristics	Plaza Wholesalers	Wholesalers
Storage Capacity (tons)	18	44
Sales in 1967	3,526	4,175
Proportion potato wholesaling is of all wholesaling (percent)	92.8	91.5
Ownership: (percent)		
Individual	62	85
Partnership	38	15
	100	100

Source : ICA Potato Marketing Survey of Wholesalers, 1968

Table 16 : Average Structural Characteristics of Potato Retailers in Bogotá

Characteristics	Plaza Stalls	Tiendas	Cooperatives	Supermarkets
Average weekly sales (pesos)	2,792	2,884	71,615 (both)	52,800
Proportion potatoes are of total sales (percent)	43.7	16.4	14.3	
Proportion chips are of total sales (percent)	-	1.0	1.3	
Proportion chips are of potato sales (percent)	-	6.3	9.3	
Ownership Characteristics:				
Cooperative (percent)	-	-	100	-
Private (percent)	93	97	-	80
Incorporated (percent)	7	3	-	20

Source: ICA Potato Marketing Survey of Retailers, 1968

Carulla, named for its owner and organizer began as a small import firm and later became a food retailing firm in 1951. The supermarket chain consists of eight stores, seven of which are in North Bogotá because the greatest proportion of middle to high income families live in that part of the city. One store is located in Ciudad Kennedy a lower middle class barrio and lower quality foods removed by a good grading system can be channeled into this store. Additional stores are either in a planning stage or under construction in northern Bogotá.

Potato chip processors were interviewed in both Bogotá (13 interviews) and Cali (5 interviews). All but two chipping firms in each city were included in the sample. As indicated by the structural characteristics presented in Table 17, chip processing is not a large

Table 17 : Average Structural Characteristics of Potato Processing Firms in Cali and Bogotá

Characteristics		Cali	Bogotá
Weekly output:	Total[a] (tons)[a]	1.9	31.6
	Average (kgs)	276	2,106
Potato Storage Capacity:	Total[b] (cargas)	370	8,360
	Average (cargas)	74	643

[a] This is an estimate of total chip production. The average of each city was multiplied by the total number of chipping plants in each city. There were 7 plants in Cali and 15 in Bogotá.

[b] Data for sample firms only.

Source: ICA Potato Marketing Survey of Chipping Firms, 1968 & 1969

industry both when measured by firm size and by the percent of potato sales that enter chip processing.

It is somewhat difficult to specify output of potato chip processors. Output was measured by the number of small bags (tamaño popular - popular size) but the capacity of these bags varies from 20 to 30 grams. The bags of chips produced in Cali usually contain 25 or less grams while the Bogotá bags contain up to 30 grams. To give a better idea of range in output by firms, three firms in Bogotá have a weekly output of more than 100,000 bags each with one firm at 300,000 bags, while the remaining firms produce less than 60,000 bags each per week, with the smallest at 3,000. In Cali the largest and smallest firms produce 28,000 and 3,000 bags of chips respectively per week.

Numbers of Buyers and Sellers

Within the area of influence of the Bogotá market, except for isolated rural markets, both potato buyers and sellers are numerous at all levels. Bogotá, the largest city and located within the most important potato producing region, is the major potato market in Colombia. The Bogotá market is characterized by numerous retail outlets most of which are small tiendas or plaza stalls. The actual number of these small outlets is not available. Only about 100 cooperatives and supermarkets operate within the city. Although potato chip processing is more common in Bogotá than any other city, volume is extremely low from the 15 small processors. About 275 wholesaler outlets buy and sell potatoes, 175 of which are stall wholesalers in a large building in El Centro of Bogotá. Often it

is very difficult to differentiate between wholesaling and retailing of potatoes because wholesalers sometimes sell to consumers and the traditional retail plaza often sells to other retailers. Some producers sell their potatoes in Bogotá, however, most sell to retailers or wholesalers who buy in rural areas.

The isolated rural market usually in not only physically isolated but also exchanges insufficient quantities of potatoes to justify more than one or two outside buyers. The sellers may be numerous because they are very small producers and they do not have access to transport facilities to by-pass the limited buyer problem. Where producers have attempted to collectively bargain with buyers in these small markets, they usually have not been successful. In one small market (Zipacón) near Bogotá, buyers refused to raise prices and boycotted the market. As a result, the producers lost their local market. They must now transport their potatoes 15 kilometers to the larger Facatativa market and there they again lack bargaining power.

Numbers of buyers and sellers encountered by market participants were specified in the questionnaire. Of the Bogotá wholesalers, 53.2% purchased from more than fifty producers or assemblers in the year prior to the interview.[57] Most wholesalers did not have any idea about their number of sales contacts in a year but the amount is larger than purchase contacts. Bogotá retailers indicate the following average number of suppliers for

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[57] Chapter V includes a discussion of assembly functions occurring throughout the potato distribution system.

the previous year: plazas - 8.2, tiendas - 4.9, and supermarkets and cooperatives - 3.1. Cundinamarca producers did have more buyer contacts due to proximity to the Bogotá market. While Boyacá producers averaged 5.2 contacts and sold to an average of 3.8 buyers per year, Cundinamarca producers averaged 9.1 contacts and sold to an average of 6.2 buyers.

Conditions of Entry

At present, entry into and exit from potato production and distribution are relatively unrestricted. Agressive firms face numerous obstacles and high risk investments. Carulla and other supermarkets advance more cautiosly than consumers might desire and the Colombian economy needs to keep from antagonizing small retailers. When asked if small retailers fear the advance of supermarkets, 22.2% of the supermarket operators, 40.6% of the tiendas and 38.5% of the plazas said yes. For most producers and processors of potatoes, availability of modern equipment is limited. Import licenses, quotas and taxes restrict the flow of equipment and raise equipment prices.

Often laws and attitudes against particular distributor practices restrain the use of improved techniques and entry into new businesses. A law against any activity that can be construed to appear as speculation and the attitude that the law has created discourage individuals from entering potato storage.[58] A general attitude against intermediaries or

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[58] The following activities are prohibited by the anti-speculation law: 1) Selling for prices above those authorized by the Superintendencia Nacional de Precios; 2) Sale of products at prices higher than the current prices in each respective plaza when the Superintendencia has not authorized a price diviation; 3) Fraud in weights, measures, quality and general conduct; 4) Any rise in prices that is a pretext to sales prices when the products are not taxed; 5) To obtain exhorbitant profits as

middlemen based upon insufficient evidence encourages excessive criticism of food distributors. Poor market coordination also provides higher risks for "would be" investors.

Neither entrance of large potato wholesaling firms nor significant changes in size of existing firms occurred from 1962 to 1967. Actual annual sales of 37 of the 62 wholesalers interviewed who were in business both in 1962 and 1967 increased from an average of 3,030 tons in 1962 to an average of 3,970 tons in 1967. The remaining 25 wholesalers who entered business after 1962 had average annual sales of 3,400 tons in 1967. Forty-eight percent of the wholesalers expressed a desire to increase their potato wholesaling activities.

Retailers and wholesalers were asked about changes in the potato subsector over the past five years and what they expected to occur in the next five years (Table 18). Those wholesalers indicating that they expected the number of producers to decrease said that there is too much competition, prices are low and losses are common. Both retailers and wholesalers anticipating increases in the number of producers and wholesalers expect demand to increase rapidly due to the rapidly expanding population.

Producers may not view the future with as much enthusiam as retailers and wholesalers. When asked if they would borrow more money than they are presently borrowing with specific emphasis on increasing

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(footnote 58 continued)
judged by local authorities or the Superintendencia 6) Infrigements to legalities with respect to prices, discounts, margins (profit percentages) and "cutthroat competition; and 7) Changes of name, reference, packing, quality, quantity and form of presentation without authorization. Source: Decreto 46/65 (Enero 14); Decreto 149/63, art. 3; y Decreto 437/66 (Febrero 26), art. 1 y 2.

Table 18 : Retailer and Wholesaler Actitudes About Changes in Number of Firms

		Wholesalers about Producers	Wholesalers about Wholesalers	Retailers about Wholesalers
			(percent)	
Change in Number over the past five years (1962-1967)	Increased	80.6	87.1	70.8
	Equal	3.2	6.5	22.1
	Decreased	9.7	3.2	3.5
	No response	6.5	3.2	3.6
		100.0	100.0	100.0
Expected change in number over the next five years (1967-1972)	Increase	64.5	77.4	72.6
	Equal	14.5	8.1	22.1
	Decrease	12.9	8.1	1.8
	No response	8.1	6.4	3.5
		100.0	100.0	100.0

Source: ICA Potato Marketing Survey of Wholesalers and Retailers, 1968

potato production, 66% responded negatively. A major problem is the risk of unfavorable price changes and losses due to frosts diseases and droughts.

Institutional Framework

Numerous public and private institutions influence potato production and distribution. This research has centered upon only those public institutions involved directly in credit, technical assistance, pricing and producer organization.

Investigation, Extension and Education

The Instituto Colombiano Agropecuario (ICA) promotes, coordinates and initiates agricultural research, teaching and extension.[59] It also controls and supervises quality of agricultural inputs and works with programs of human development and education. ICA is divided into five departments: Agronomy, Animal Science, Agricultural Engineering, Social Sciences, and Agricultural Economics. Each of the departments is divided into national programs that function in the areas of extension, education and investigation. For example, the agricultural economics department includes national programs in farm management and production, marketing and policy. The National Potato Program within the Department of Agronomy has been closely associated with this research as has the Department of Agricultural Engineering.

Technical assistance for the potato P-D system has been limited to means of augmenting yields. Since 1949, ICA has been involved in potato breeding and disease research; since 1954, an ICA National Potato Program has worked with improvements in production. Improved varieties such as Purace, Capiro, Monserrate, and Parda Pastusa with yields ranging from 24 to 40 tons per hectare and with resistance to gota (blight), except for Parda Pastusa, are important results of this program. Extension materials have been developed explaining use of these varieties, seeding practices and use of pesticides.[60] While

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59 DECRETO NUMERO 736 de 1968 "Por el cual se aprueban los Estatutos del Instituto Colombiano Agropecuario (ICA) May 12, 1969.

60 Nelson Estrada, et.al., "El Cultivo de la Papa" , ICA , Programa Nacional de Papa y Yuca, No. 10, Marzo, 1968.

the research has been successful by providing the technical means to expanded production, actual adoption of improved varieties and practices has neither approached its potential nor attained ICA's expectations.

The ICA extension program, now two years old, has 48 rural offices and agents are being trained to work with varied production problems. Short course programs for producers are also being organized. Major extension problems lacking attention include farm management and produce marketing. The greatest difficulty for extension is man-power training.

The National University in Bogotá, Medellín and Palmira has programs of agricultural education and investigation some of which are in cooperation with ICA. In agricultural economics, the educational program only includes training of undergraduates. Attempts are underway to coordinate the programs at ICA and the National University.

Agricultural Inputs and Credit

Both Caja Agraria and INCORA provide short term loans to potato producers. Caja Agraria grants numerous loans to potato farms of various sizes. Of 635 rural Caja Agraria offices, 509 compile data, but not all of these are in potato production areas. INCORA, except in a limited number of municipios, is not a major loan source for potato producers.

In 1968 all Caja Agraria loans had a value of 2,726 million pesos or about 165 million dollars.[61] Of this amount 53% was for

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[61] Caja Agraria, "Carta Agraria", Departamento de Relaciones Públicas, Caja de Crédito Agrario, Bogotá, No. 223, Enero-Febrero, 1969, p. 8.

crop production including potatoes, 31% for livestock production and 16% for other activities.

Caja Agraria also has 410 farm supply stores located throughout the country. These stores sell seed, numerous minor farm inputs and some consumer items such as clothing. Six plants are involved in seed classification and distribution to the supply stores and three factories manufacture fertilizer for distribution to the stores. The stores give some advice to producers about application of purchased inputs.

Price Policy and Storage

The Instituto de Mercadeo Agropecuario (IDEMA), previously called Instituto Nacional de Abastecimiento (INA) before the 1968 reorganization, for several years has been assigned the responsibility of buying potatoes during peak harvests and selling in off seasons to reduce price fluctuations. Some major goals of INA were:

> To fix price supports to improve markets for agricultural products near production points; to foment growth in associations that can assist in producer marketing problems; to finance production, marketing and consumption cooperatives; to contribute to efforts to improve transportation systems; to establish collection centers and processing plants for agricultural products; to construct storage facilities and organize wholesaling to benefit producers; to develop grades and standards; and to import and export agricultural products.[62]

In the 1968 reorganization of the Ministery of Agriculture INA, now IDEMA, while pursuing most of the previous objectives most specifically has the responsibility:

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62 Ministerio de Agricultura, Restauración del Sector Agropecuario, Serie de Planeamiento No. 3, Julio de 1967, pp. 37-40.

> To regulate the import-export market and set prices, accumulate stocks for export, to enter directly into international trade when economic conditions require such action, to loan to production and marketing cooperatives, to regulate markets and to organize private and public supported processing firms.[63]

Not until 1968 were there storage facilities ready to absorb IDEMA potato purchases. Thus, this activity has not yet developed into a price stabilizer and even at capacity levels will not have a significant impact. IDEMA cooperates with SARC (Sociedad de Aprovechamiento de Los Recursos Naturales de Cundinamarca) in potato storage at Chocontá, about 80 kilometers North of Bogotá, and there are also facilities in Fontibón and Tunja giving the government a potato storage capacity of 18,000 tons.

IDEMA also provides a price information service. The IDEMA system of price collection fits very closely to the needs of a price dissemination system and provides some very necessary functions of a price reporting system in its price collection and commodity classification procedures. The IDEMA program includes 41 cities that report prices on 6 commodities with several variety classifications for number one quality produce in each class. Four varieties of potatoes are included. The price information is collected on Mondays, Tuesdays, and Wednesdays and forwarded to Bogotá by telephone. It is then reproduced for publication the following week. Few producers receive this price information soon enough to influence their marketing decisions. IDEMA is now in the process of improving dissemination

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[63] DECRETO NUMERO 2420 de 1968 (Sept. 24/68) por el cual se restaura el Sector Agropecuario, EL PRESIDENTE DE LA REPUBLICA DE COLOMBIA en uso de las facultades extraordinarias que le confiere la Ley 65 de 1967.

procedures to better facilitate the needs of the P-D systems involved.

Producer Organization

The Asociación Colombiana de Cultivadores de Papa (ASCOLPA) was organized May 24, 1962, by a group of producers desiring to defend the interests of potato producers and consumers, and promote governmental assistance in commercialization of the potato industry, technical assistance, credit, land tenure, transportation, and storage of potatoes.[64] Primary emphasis is given to promoting production in regions of high potential yields, assisting in acquisition of inputs, assisting with seed improvement and use, and promotion of industrialization. Presently ASCOLPA is organizing supply stores for producers in Cundinamarca with plans to expand the service to other departments. In 1967, from three stores in Cundinamarca, 1,648 tons of fertilizer were sold.

About 4,000 potato producers (less than 4% of all producers) are members of the organization. More large producers are represented in the membership than small producers even though the organization is interested in serving all potato producers.

At least to present, ASCOLPA has given little emphasis to market problems of potato producers. There have been no concerted efforts to organize producers or members for purposes of selling potatoes. Some supply cooperatives not affiliated with ASCOLPA have

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[64] These comments were taken from the editorial by José Antonio Sierra in "ASCOLPA, Informativo de la Asociación Colombiana de Papicultores", Año II - No. 2, Enero de 1968.

attempted to bargain with assemblers and wholesalers in rural markets but without sufficient leadership and membership to be effective.

Summary

Potato production and consumption in Colombia is concentrated in the high altitude and cool climate regions. Boyacá, Cundinamarca (in central Colombia) and Nariño (in southern Colombia) produce nearly 80% of Colombia's potatoes and the Bogotá market area in Cundinamarca and Boyacá accounts for 52% of national consumption. The average annual per capita consumption of potatoes is 56 kilograms in Colombia and 121 kilograms in Bogotá. The distribution of total potato production is as follows: 40.2% urban consumption, 20.8% rural consumption, 17.0% seed, 12.1% harvest losses, 7.9% market system losses and 2.0% potato chip processing.

There are numerous consumption substitutes for potatoes such as corn, plátano, yuca and beans. Potatoes are usually prepared by boiling without pealing. Consumers prefer red or dark skinned potatoes that range from 3 to 6 centimeters in diameter. At present the demand for large light skinned varieties is limited. Commercially produced potato chips represent a very small portion of the market because consumers fry chips at home and either dislike commercial chips or consider the price to be excessive.

Potato production is seasonal because of frost and dry season conditions inter-related with a short seed supply for the small Mitaca harvest. The Año Grande harvest (June through August) includes 60% of total production; the Mitaca harvest (January and February) includes 30% of total production and the remaining 10% is

dispersed between the two harvests.

Nearly all firms in the potato P-D system are small. Over 70% of the potato farms have less than one hectare and produce 25% of total output, most of which is consumed in rural areas. Of total output, 20% is from farms of 10 hectares or more representing 1.1% of all potato producers. Retailing and wholesaling are characterized by small stores and plaza stall operators.

CHAPTER IV

PROBLEMS OF MODERNIZING THE POTATO PRODUCTION PROCESS

A dilemma exists in the process of modernizing potato production. Programs of technical and credit assistance have stimulated only limited adoption of improved varieties and seeding practices capable of raising per hectare yields of potatoes. Why does adoption lag substantially behind the store of knowledge that is accumulating at ICA? Is it because extension of new ideas, practices and varieties have failed to reach the producer? Or is it because the producer perceives the changes to be unprofitable? Shultz has stated that "the mistake made repeatedly by investigators is to take for granted that it would be profitable for farmers in a poor community to acquire and adopt a particular new agricultural factor on no more evidence than that it is profitable for farmers elsewhere to employ this factor".[65] Then is adaptation of research to producer needs a problem in the Colombian potato subsector?

These questions are difficult to answer. This chapter will discuss adoption of new technologies and changes in potato yields. A discussion of credit is included because it is considered to be one factor that influences adoption and production. Finally the wisdom of management decisions by producers will be discussed.

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[65] Theodore W. Schultz, Transforming Traditional Agriculture, New Haven and London, Yale University Press, 1964, p. 166.

Adoption of New Technologies and Yield Results

Adoption

Adoption of innovations is the essence of change.[66] The adoption process has been defined as a decision-making process whereby the meaning and consequences of new ideas and alternatives are evaluated and accepted or rejected.[67] This process, while performed by individuals is sometimes instigated by a change agency. The change agency must be progressive to initiate change among its clientel. Research results must be adaptable to producer needs, the new idea must be compatible with production conditions, and it must be profitable if the diffusion process is to be effective. If these criteria are not met adoption of new technologies will probably be followed by discontinuance which can create a credibility gap between the change agency and producers.

Producer use of selected practices and types of equipment in potato production appear in Tables 19 & 20. The reader should be reminded that the producer sample was biased toward larger farms which tends to raise the average use rates for some practices such as improved seed and tractors.

A high proportion of all farms use modern practices such as fertilizer, pesticides, manual sprayers and field grading. Larger farms tend to use more improved seed and mechanization. Use of pesticides and fertilizer was common on nearly all farms. Not only

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[66] "An innovation is an idea perceived as new by the individual". See Everett M. Rogers, Diffusion of Innovation, New York, The Free Press of Glencoe; London: MacMillan New York, 1964, p. 13.

[67] Ibid., pp. 305-307.

Table 19 : Use of Selected Practices by Varied Sizes of Potato Farms[a]

	Range in Hectares planted to Potatoes				
	0-2.4	2.5-9.9	10.0-19.9	20.0 or more	Total
No. of observations	24	39	21	33	117
Average no. of hectares planted to potatoes	2.0	6.1	14.2	49.9	19.1
Percent by Department:					
Cundinamarca	50	44	28	54	53
Boyacá	33	20	28	18	24
Nariño	17	36	44	28	36
Yields (Tons/Hectare):					
Mitaca	8.8	7.9	10.5	12.6	9.9
Año Grande	9.1	10.3	10.0	13.0	10.8
Owner of the potato land: (percent)	82	58	71	30	57
Practices: (percent using)					
Improved seed	42	54	48	73	56
Truck (hire, rent or own)	83	90	90	76	85
Burro	67	46	33	29	43
Bullock	92	69	71	26	62
Field grading	100	95	86	79	90
Scales	88	74	86	82	81
Fertilizer	96	95	100	100	98
Insecticides	92	97	95	94	95
Herbicides	8	13	10	18	13
Fungicides	96	97	100	97	97
Tractor	21	46	52	79	51
Tractor-sprayer	4	3	14	6	6
Manual-sprayer	92	95	86	94	92

[a] All of the practices included except improved seed were employed at the time of the interview. Use of improved seed implies recent trial and may or may not imply continuous use particularly for the Purace variety.

Source: ICA Potato Marketing Survey of Producers, 1968

Table 20 : Use of Improved Seed by Potato Producers in Cundinamarca, Boyacá and Nariño

Variety	Boyacá	Cundinamarca	Nariño
		(percent using)	
Purace	9.7	23.6	20.6
Capiro	6.4	--[a]	35.9
Parda Pastusa	3.2	25.4	--[a]

[a] The blank space implies that the variety was not used. Monserrate, an improved variety was not used by any of the producers in the sample.

Source: ICA Potato Marketing Survey of Producers, 1968

do most potato producers apply fertilizer, but according to ICA potato production specialists, the application rates are often excessive. Application of insecticides and fungicides is nearly imperative to obtain a potato crop; the question is not whether producers use these pesticides but how effectively they are applied. Thus, use of pesticides by potato producers as a measure of aggressiveness in adopting innovations probably is somewhat misleading.

When producers were asked to give their source of information about new technologies, interpersonal communication was the major source (Table 21). Technical production specialists were not a common source of information and were not mentioned at all for Cundinamarca.

Information flows often are a two stage process.[68] Change

[68] Everett M. Rogers, Peasant Modernization, op.cit.,

Table 21 : Information Sources About Adoption of New Practices in Boyacá, Cundinamarca and Nariño

Information Source	Boyacá	Cundinamarca	Nariño
		(percent)	
Family and friends	68.2	58.9	42.9
ICA agrónomo (technician)	2.1	--	10.7
Other agrónomo	2.1	--	7.1
Caja Agraria	12.7	4.1	19.6
Radio, magazines & newspapers	__	1.4	14.3
Other sources	14.9	35.6	5.4
	100.0	100.0	100.0

Source : ICA Potato Marketing Survey of Producers, 1968

agents from ICA, Caja Agraria and other agencies channel information to the more agressive agricultural producers who in turn communicate informally with their neighbors. Even in Cundinamarca where only Caja Agraria was mentioned as an official source, the two stage information flow is relevant. Often potato producers go to Tibaitatá (the ICA experiment station) to discuss production problems with ICA production specialists. These producers return to their farms and informally communicate new ideas to their neighbors. Thus,the other sources for Cundinamarca probably include personal visits to the experiment station. The Caja Agraria is an important source of information because of it's credit operations and numerous rural offices in potato production areas.

Use of modern inputs and practices necessitates, in many cases, additional liquid capital. The Caja Agraria has provided to potato producers short term loans for operating capital, some modern inputs in it's supply stores, and some technical advice. Probably use of modern inputs in potato production has been stimulated more by credit availability than by extension influence.

Private supply stores and the Caja Agraria supply stores have made modern inputs available to producers. The producers were asked to state whether selected modern inputs were available in their respective municipios (Table 22). Producers believe that improved seed will increase yields but seed is not as readily accessible as fertilize, and pesticides which helps explain why use of improved seed lags behind use of other modern inputs. The improved seed supply deficiency is both a public and private institution problem.

Table 22 : Availability in Municipios of Modern Inputs for Potato Producers

Modern Inputs	Boyacá	Cundinamarca	Nariño
	(percent available)		
Fertilizers	100.0	90.9	92.3
Insecticides & fungicides	96.8	94.6	94.8
Herbicides	74.2	76.4	74.4
Trucks for rent	93.6	98.2	79.5
Tractors for rent	64.5	89.1	76.9
Improved seed	41.9	29.1	55.3

Source: ICA Potato Marketing Survey of Producers, 1968

The amount of improved seed produced and made available to producers through supply outlets probably falls behind the potato producers willingness to adopt improved varieties.

Storage problems for seed and the desire by producers of improved varieties to sell in the more certain consumer market are major obstacles to reducing the seed shortage problem. Seed losses in storage are about 3.3% of total potato production (Figure 5), and 20% of the potato supply set aside for seed. Improved storage practices could reduce this loss to about 4% of seed stocks. This loss accounts for 27,600 tons of potatoes that might otherwise enter commercial channels or be available for seed. At 800 pesos per ton this loss exceeds 22 million pesos. Thus, to store either improved or unimproved seed beyond the producers own needs includes the risk of high storage losses as well as unfavorable prices for the seed.

Yields and Before-Harvest Losses

While adoption of improved practices in potato production has been relatively common, potato yields per hectare for Colombia have risen slowly (Figure 12). Improved seed, however, appears to be an important factor that might explain the higher per hectare yields (Table 23). The farms that used improved seed had yields exceeding the farms that used unimproved seed by one to two tons per hectare. Farms with twenty or more hectares had better results from improved seed than smaller farms, possibly due to mechanization and better management.

The historic growth in total production of potatoes has resulted from both slight increases in yields per hectare and extending land

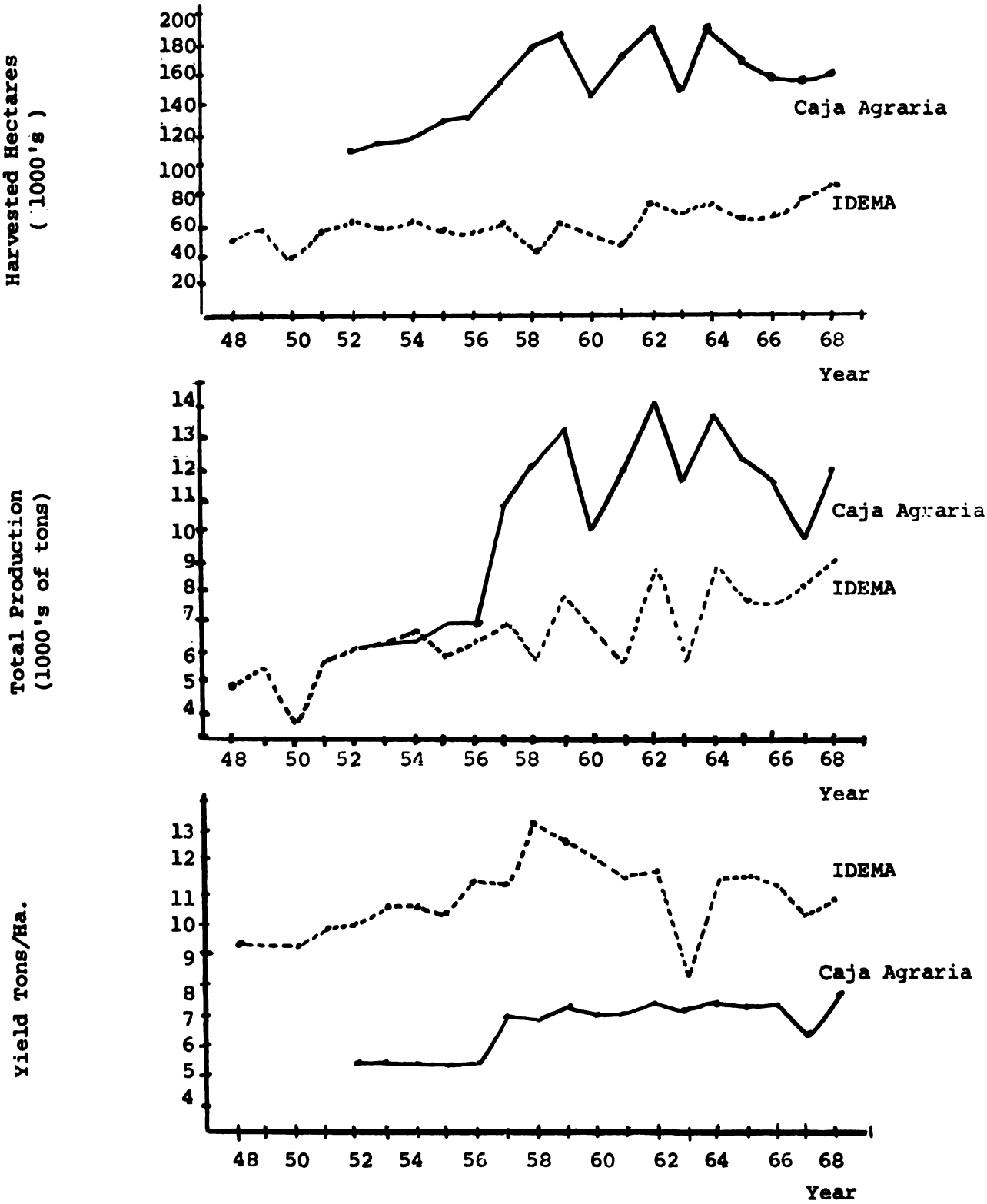

Figure 12 : Hectares Harvested, Total Production and Yield Per Hectare For Potatoes in Colombia, 1948-1968

Source : Appendix II, Table II-1.

Table 23 : Per Hectare Potato Yields for Improved and Unimproved Seed Use Based on Potato Farm Size

	Range in Hectares Planted to Potatoes			
	0-2.4	2.5-9.9	10.0-19.9	20.0 or more
	(tons per hectare)			
Improved Seed:				
Mitaca	8.8	9.7	10.9	12.6
Año Grande	11.0	11.0	9.7	13.0
Total	10.7	10.4	10.3	12.8
Unimproved Seed:				
Mitaca	9.6	8.6	9.1	8.9
Año Grande	8.4	8.2	9.4	11.6
Total	9.0	8.4	9.3	10.5

Source : ICA Potato Marketing Survey of Producers, 1968

areas planted to potatoes (Figure 12). These changes are difficult to identify because of the data variation between sources. Yields per hectare, however, have not risen significantly. Bringing new land into potato production may account for the slow rise in per hectare yields where the lands used were marginal and less productive.

Per hectare yield data from the producer survey (Table 24) differ little from the aggregate data (Table 25). Producers, however, traditionally express yields in terms of amount of seed planted or a seed : yield ratio. For example, if 15 cargas are planted per hectare and 300 cargas are harvested, the yield is termed "20%" or 20:1. This is an incorrect interpretation of the concept of percentages but is very commonly used. The calculated per hectare yields in Table 24 did not come directly from producers; instead,

Table 24 : Survey Potato Yields for Boyacá, Cundinamarca and Nariño

	Boyacá	Cundinamarca	Nariño
Tons per hectare:			
Mitaca	12.6	9.0	9.5
Año Grande	10.8	7.8	11.6
Cargas harvested to cargas planted:			
Mitaca	13.3:1	9.6:1	7.9:1
Año Grande	12.8:1	11.6:1	9.0:1

Source: ICA Potato Marketing Survey of Producers, 1968

they result from the producers indication of total production and hectares harvested. Each producer was also asked to express the so called "percent" yield.

Colombian potato yields per hectare average at most one-half of yields in the United States and those obtained by ICA (Tables 25 and 26). Of course, production conditions for producers in Colombia

Table 25: Comparative Potato Yields in the United States and Colombia and for the Three Largest Producing States in Each Country (average 1962-1966)

	Tons/Ha.[1]		Tons/Ha.	
United States:[c]	22.7	Colombia:	7.2[a]	10.7[b]
Maine	29.0	Boyacá	7.7	9.9
Idaho	22.8	Cundinamarca	8.2	13.2
North Dakota	14.2	Nariño	7.7	7.2

[1] 1 Hectare = 2.471 acres
1 Metric ton = 2,200 US lbs

Source:
[a] Caja Agraria (1960-1966), Appendix II, Table II-3
[b] IDEMA (1955-1967), Appendix II, Table II-5
[c] USDA, SRS, "Crop Production", C.P. 2-2-(11-68)

Table 26 : ICA Potato Yields by Varieties

Variety	Tons/ha	Production Area in Colombia[a]	Carga Harvested: Carga Planted
ICA-Purace (Improved)	40	1,2,3,4	20.0:1
Capiro (Improved)	25	3,4	12.5:1
Monserrate (Improved)	24	1	12.0:1
Parda Pastusa (Improved)	25	1,2	12.5:1
Tuquerreña (Unimproved)	15	2	7.5:1
Tocana (Unimproved)	20	2	10.0:1
Ojona (Unimproved)	17	3	8.5:1

[a] 1, Cundinamarca 2, Boyacá 3, Nariño 4, Antioquía

Source: Nelson Estrada, et.al., "El Cultivo de la Papa", No. 10, Marzo de 1968

differ from those both at ICA and in the U.S. There is room, however, for significant improvements in per hectare yields obtained on Colombian potato farms.

Based on ICA experience, yields from 17 to 40 tons per hectare are possible (Table 26). Average Colombian yields for 1962-1966 represent 29% to 42% of ICA yields, not including the Purace variety. In producer terminology, as presented by a seed yield ratio, producer yields appear to be comparatively better when measured by ICA standards than yields per hectare except in Nariño. For example, the average seed: yield ratios for Cundinamarca and Boyacá where Parda Pastusa is the most popular variety are very similar to the ICA ratio (Tables 24 & 26).

Producers seed:yield ratios are nearly equal to ICA's because producers use less seed per hectare; the seeding rate averages 60-80 centimeters between hills and 1.4 - 1.5 meters between rows for producers. ICA recommends 30 centimeters between plants and one meter between rows depending upon inclination of the land in order to achieve high per hectare yields which is an ICA goal.

Thus, part of the low per hectare yield problem is due to seeding rates. Producers usually place more emphasis on seed use efficiency and productivity than on land and labor efficiencies. With respect to marginal costs, seed costs must be compared to the additional costs of preparing, caring for and harvesting the additional lands used because of low seeding rates per hectare. For small producers who do not hire labor and have limited alternatives for their own labor, seed costs are somewhat more important. Where producers hire labor or use machinery, seed costs may be less important.

Two types of on-farm potato losses occur which reduce yields per hectare and the amount of salable potatoes for consumption. It is generally held to be true that losses can be prevented, an idea not entirely valid in the following discussion. The first type of loss includes drought, frost, insect and disease damage between planting and harvesting, all of which keep production from attaining potentials (Table 27). Insect and disease damage may be reduced by effective use of pesticides but often due to rain, the farmer has only a very short period of time to apply the chemicals. The rain will prevent effective plant contact which is necessary in application of pesticides. For some producers irrigation

is a possibility for reducing drought damage and to some extent, frost damage. These pre-harvest yield reductions at 11.6% understate actual losses because the estimate only includes those hectares not harvested. Yield reductions due to partial crop damage are not included.

Table 27 : Farm Losses for Potatoes Including Land Not Harvested Due to Natural Causes and Losses During Harvest

Department	Losses			
	Before Harvest (Lands not Harvested)		At Harvest	
	Mitaca	Año Grande	Mitaca	Año Grande
	(percent)			
Boyacá	14.6	15.0	27.2[a]	11.2[a]
Cundinamarca	4.6	12.2	17.3	17.1
Nariño	7.6	6.8	5.7	12.5
All	10.3	12.2	10.1	14.1
Average	11.6		12.1	

[a] Only four responses were available.

Source: ICA Potato Marketing Survey of Producers, 1968

Secondly, losses occur on the farm at harvest time due mainly to cutting by hand tools and hand labor when removing the tubers from the soil. Not all producers specified losses at harvest. Those indicating losses averaged 12.1% which are primarily due to cutting.

Another source substantiates a minimum of 10%.[69] Usually one man can harvest about three to five cargas of potatoes per day. He is paid about 15 pesos (less than one dollar) per day in Cundinamarca.

Only if these losses can be prevented should they be considered as actual losses. Mechanical harvesting might prevent part of the loss. And the 12.1% loss is not completely lost to consumption. The farmer cannot sell these potatoes but the laborers may glean the field for home consumption. Some of the potatoes also are consumed by livestock.

Losses also occur with mechanical harvesters due to some physical damage and to the fact that very small potatoes shake through with earth. While hand labor harvesting losses are greatest for varieties with large tubers and least for varieties with small tubers, the opposite holds for mechanical harvesting losses. Very small potatoes, contrary to the situation in the United States are a salable product in Colombia. Even so, mechanical harvester losses probably will not exceed 7% and may be as low as 3%.[70] As improved varieties that produce large tubers are adopted, mechanical harvesting will become more profitable. If a 5% mechanical harvester loss is assumed the added cost in losses due to hand harvesting is 7.1%. At 7.1%, the losses due to hand harvesting range from 27 to 44 kilograms

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[69] Discussions with Lauro Luján, ICA Potato Production Specialist, May 15, 1968.

[70] Interviews: Wes Hobbs, ICA-Agricultural Engineer and Lauro Luján ICA - Potato Production Specialist.

per day per man or 22 to 35 pesos per man based upon a farm price of 80 centavos per kilogram. This does not include efficiency considerations and costs per bulto for mechanical versus hand harvesting. But this loss at normal prices (which should not be used as final because an additional 7.1% in total product would drive prices down) represented up to 57 million pesos to producers in the one million ton industry in 1968.

The Role of Agricultural Credit

Scarcity of credit for agricultural producers may be over emphasized while allocation and productivity of loans is under-emphasized.[71] In a macro-development context, credit is usually scarce indicating that attention should be given to sectoral allocations among agriculture, industry and services. Likewise, in micro-development, credit allocations and credit productivity at the enterprise or subsector level as well as functions within the enterprise and industry levels need consideration. For example, when do loans to food processing and food distribution firms become more important to producers and consumers than direct loans to producers? And can, or should, loans for augmenting production require and stimulate adoption of improved practices? A general description of loan practices and policies may permit response to these questions.

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[71] For a comprehensive discussion of various external financing problems in agricultural development see John W. Mellor, The Economics of Agricultural Development, Cornell University Press, Ithica, New York, 1966, Chapter 17, pp. 310-326.

Farm Credit Statistics

Based upon survey results, farm loan statistics are presented in Table 28. This information describes loan activity for the year previous to the interview (June 1967 to July 1968). These results emphasize the intensive loan activity of the Caja Agraria. A slight bias may result due to the producer sampling technique which included comprehensive lists of producers prepared by the Caja Agraria. INCORA, ASCOLPA and the Departmental Secretaries of Agriculture also provided producer list but many of those producers were also Caja Agraria borrowers.

Most potato producers, particularly for commercial sales, are presently receiving or have recently received subsidized credit from the Caja Agraria. The Caja Agraria interest charge is usually about 12%. Since the Caja Agraria loan program began in 1960, the inflation rate has averaged 12.1% per year.[72] Thus, those producers that have qualified for a Caja Agraria loan obtained free use of the money.

In summarizing both Tables 28 and 29 it appears that short term capital may be less of a problem for Nariño potato producers than for Cundinamarca and Boyacá producers. Fewer Nariño producers have loans and the loans are granted at lower interest rates. Similarly, more Nariño producers say that they do not need loans and fewer say that it is impossible to obtain loans. Average loan sizes from the survey results for each department are larger than

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[72] Revista del Banco de la República, Octubre de 1968, Bogotá Colombia, pp. 1430 & 1431.

Table 28 : Farm Credit Statistics for Potato Producers in Boyacá, Cundinamarca and Nariño

	Boyacá		Cundinamarca		Nariño	
Number of loans: (percent)						
One	51.6		45.4		23.2	
Two	29.0		34.6		38.4	
Three	3.2		1.8		10.3	
Four	3.2		1.8		-	
Six	-		-		2.6	
Did not borrow	13.0		16.4		25.5	
	100.0		100.0		100.0	
Mean number of loans per producer:						
For the sample	1.3		1.3		1.5	
For borrows only	1.5		1.5		2.0	
	First Loan	**Second Loan**	**First Loan**	**Second Loan**	**First Loan**	**Second Loan**
Loan sources: (percent)						
Family	-	-	10.9	10.9	2.6	-
Commercial Banks	-	-	1.8	1.8	2.6	2.6
Caja Agraria	87.0	29.0	69.1	21.9	69.3	48.7
INCORA	-	3.2	-	1.8	-	-
Other	-	3.2	1.8	1.8	-	-
Did not borrow	13.0	64.6	16.4	61.8	25.5	48.7
	100.0	100.0	100.0	100.0	100.0	100.0
Mean loan value: (1000's of pesos)	16.7	21.5	21.9	35.7	31.7	65.7
Mean annual interest rate: (percent)	10.2	13.2	11.6	15.8	10.1	10.5
Lenght of loan period for cancelled loans: (months)	10.4	18.3	8.0	7.5	11.4	8.1

Source : ICA Potato Marketing Survey of Producers, 1968

Table 29 : Potato Producer Attitudes About Credit

	Boyacá	Cundinamarca	Nariño
		(percent)	
Reasons for not borrowing more money:			
Do not need credit	48.8	36.9	58.8
Too much risk	17.1	20.0	23.9
Impossible to obtain more credit	17.1	27.7	8.7
Lack collateral	9.8	9.2	4.3
It is not worth while	4.8	6.2	4.3
Other	2.4	-	-
	100.0	100.0	100.0
		(percent)	
If you did borrow more money for potato production how would you use it?			
To seed more land	21.2	33.6	19.6
To buy land	44.1	31.5	39.2
To employ more labor	-	-	3.6
To buy fertilizer	-	4.8	5.4
To buy improved seed	5.8	7.2	16.1
To buy machinery	15.4	13.2	10.7
To buy a tractor	13.5	9.7	5.4
	100.0	100. 0	100.0
Would you borrow money at 15%? (yes responses in percent)	68	78	44
How much? (1000's of pesos)	59.6	66.8	78.9
Would you borrow money at 25%? (yes responses in percent)	26	45	(none)
How much? (1000's of pesos)	20.6	41.4	(none)

Source: ICA Potato Marketing Survey of Producers, 1968

the average loan size statistics presented in the aggregate Caja Agraria data in Appendix V, Table V-1. This is not due to other loan sources raising the average significantly, but is due to a slightly disproportionate sample including several very large producer - borrowers in each department.

Limited credit availability was not the major reason for not borrowing (Table 29). Potato producers said they did not need more credit and also perceived further borrowing to be risky primarily because of unstable prices. But some Cundinamarca and Boyacá producers reversed their position as evidenced by more producers desiring credit at an interest rate of 15% than said they needed credit. Nariño producers, however, did not follow this pattern and were not interested in loans at 25% as opposed to Cundinamarca and Boyacá producers.

Macro Credit Statistics

Credit data are available only from Caja Agraria for all potato producers in Colombia and by departments. Caja Agraria makes loans to about 20% of all potato producers and to about 50% of the potato producers planting two hectares or more. Values of loans, average loan size and pesos loaned per hectare of total planted hectares are presented in both actual and real values (Appendix V, Table V-1). Based on average loan size and peso value per hectare, Cundinamarca is favored by more credit for potato producers than other departments. But more potato producers in Boyacá receive loans than in any other department. Average loan size has been growing most rapidly in Nariño, is

most stable in Boyacá and most sporadic but highest in Cundinamarca (Figure 13).

Average loan size varies substantially among municipios both within and between departments. Of those municipios in the three departments having total loan values exceeding 200,000 pesos, average loan size ranged from 1,320 pesos in Sogamoso, Boyacá, to over 15,000 pesos in several municipios in Cundinamarca.

Availability of liquid capital, probably has helped to stimulate the growth rate of Nariño potato production and contributed to the downward trend in prices received by producers. Average deflated loan size increased in Cundinamarca and Boyacá from 1,448 pesos in 1960 to 2,241 pesos in 1967 or 54.8%. In Nariño, for the same period, the increase was from 1,102 pesos or 98.7%. Likewise, number of loans granted for the period 1960-1967 increased by only 64.4%, in Cundinamarca and Boyacá but by 247.5% in Nariño. This loan analysis corresponds closely to the growth in total production since 1960.

Of course, credit availability was not the only reason for rapid increases in total production in Nariño. Use of improved seed, for example, was higher in Nariño than in Cundinamarca and Boyacá (Table 22). The costs of production estimates to specify supply conditions further will be forthcoming in another portion of this study.

Allocation of credit between crop enterprises is important to Colombian potato farmers. Most of the crops receiving Caja Agraria credit assistance are either substitutes in production or substitutes in consumption for potatoes (Table 30). Except for

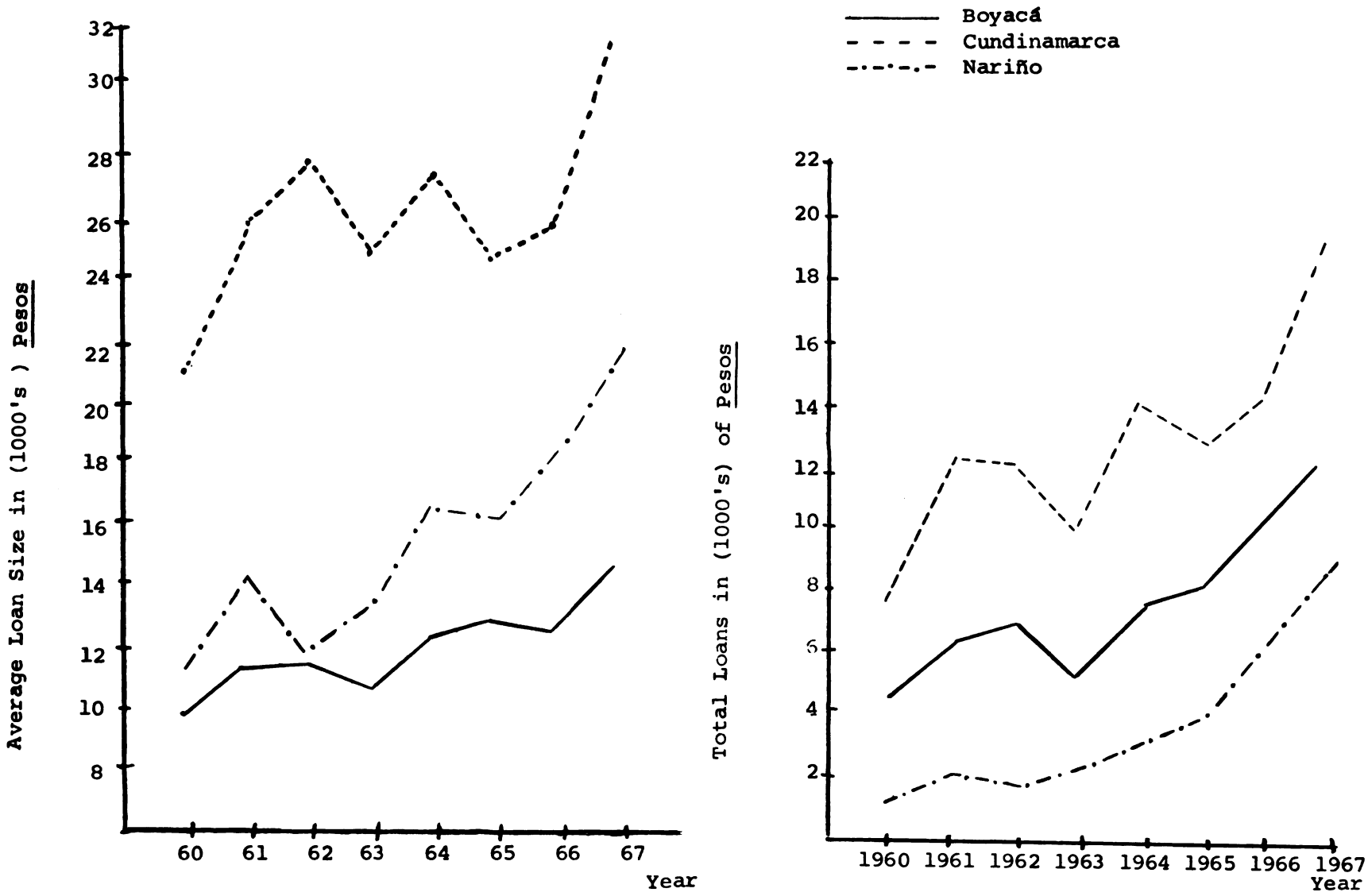

Figure 13 : Deflated Average Loan Size and Total Loans by Caja Agraria to Potato Producers in Boyacá, Cundinamarca and Nariño

Table 30 : Changes in Caja Agraria Loans from 1960 to 1966 for Eleven Crops

Crop	Change[a] Number of Loans	(rank)	Deflated total value	(rank)	Average Deflated Loan size	(rank)	Percent of all loans 1960-1966	(rank)
Beans	185.7	1	245.6	1	148.6	3	1.5	11
Corn	144.3	4	234.2	2	164.2	1	13.0	3
Rice	140.6	5	165.5	3	117.9	5	15.2	2
Yuca	153.3	2	138.2	8	135.2	4	4.0	9
Cotton	103.2	10	159.9	4	155.6	2	11.2	4
Sugar Cane	145.1	3	154.7	5	106.6	8	6.4	6
Potatoes	131.3	6	144.2	6	110.7	7	9.1	5
Sesami	123.4	7	140.2	7	115.7	6	4.3	8
Wheat	112.0	9	120.4	9	106.0	9	5.5	7
Barley	120.9	8	93.0	10	76.9	11	1.6	10
Coffee	96.5	11	90.4	11	93.7	10	26.8	1
Plátano	-	-	-	-	-	-	1.4	12
Total	132.0		138.5		104.6		100.0	

[a] Change for total number of loans, total deflated value of loans, and average deflated loan size for each crop is determined by dividing the average for 1964-1966 by the average for 1960-1963.

Source: Appendix V, Table V-2

the very small hill farms, wheat and barley are substitutes in production for potatoes. The degree of substitution in consumption varies for each commodity but beans, corn, rice, yuca and plátano compete with potatoes in consumer diets.

Relative credit statistics for Caja Agraria loans to farmers provide a view of possible substitution affects stimulated by credit. In Table 30, the crops are presented in order of the amount of change from the 1960-1963 period to the 1964-1966 period. Thus, number of loans, deflated total loan value and average deflated loan size changed most rapidly for beans. Beans represent, however, a small proportion (1.5%) of the loans from 1960 to 1966. Credit for all substitutes in consumption has grown more rapidly than for potatoes. A loan program began for plátano producers in 1965. Producers of corn and rice both received greater proportions of Caja Agraria credit than producers of potatoes. If credit, along with other cost conditions, stimulates greater output, then substitution may occur in consumer diets between competing crops that receive different credit allocations.

Contrary to the case for potato substitutes in consumption, loans for potato substitutes in production did not grow rapidly from 1960 to 1966. Wheat and barley loans represented only 7.1% of the total loan value and grew less rapidly than any other crop except coffee. Thus, even where terrain and farm size conditions permitted, potato producers desiring credit to change from potato production to either wheat or barley production faced a fairly tight credit market.

In summary, it appears that the potato producers have had sufficient low cost, short term credit. Due to inflation, and the low interest rates charged by the Caja Agraria, credit has provided

a substantial subsidy to potato producers. Both the findings from the producers survey and the aggregate loan statistics indicate growing credit supplies and producer satisfaction with credit availability. Allocation among varied sizes of potato farms, among potato producing regions and among the various substitute crops for potatoes probably needs more careful consideration.

Potato Farm Management Practices

Decision Making

Contrary to some beliefs, potato producers used new practices because they believed that their profits would be improved. Profitability, and the social interaction effect overlapped but adoption without some assurance of improved incomes was uncommon (Table 31).

Table 31 : Reasons for Adopting Improved Practices in Potato Production

Why have you adopted improved practices?	Boyacá	Cundinamarca	Nariño
		(percent)	
I thought the practices were profitable	73.7	87.0	75.0
My neighbors said the practices were profitable	23.7	4.4	12.5
I adopted the practices because my neighbors did but we were uncertain about profitability	2.6	8.6	12.5
	100.0	100.0	100.0

Source: ICA Potato Marketing Survey of Producers, 1968

In general, adoption of modern inputs was common except for improved seed. Attitudes about methods of improving production are not traditional. Over 80% of the producers agreed that fertilizer, insecticides, improved seed, and machinery would increase yields, without extending land areas planted. Seventy percent said irrigation would improve yields but only 55% agreed that increased seeding rates per hectare would improve yields.

Potato yields, to producers imply yields to amount of seed planted instead of yields per hectare. These are very different measures. Closer spacing of seed would probably increase per hectare yileds but the affect would be to reduce yields to amount of seed planted.

It appears that potato producers consider land and labor to be low-cost inputs. Seed however, is considered to be a high-cost input[73] and many producers desire yields that nearly maximize a seed: yield ratio which requires wider spacing of plants than ICA recommends. ICA places more emphasis on potato yields per hectare which requires different input combinations and closer spacing of plants. The ICA practice implicitly assumes that land and labor are high cost inputs. Figure 14 illustrates these cost conditions. Seed, fertilizer and pesticides (Inputs B) can be combined in varied proportions with differing amounts of land and labor (Inputs B). The iso-product curve is indicative of the same amount of product

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[73] Potato seed is a cost input even when it is not purchased because the producer has the alternative of either selling the seed or consuming it.

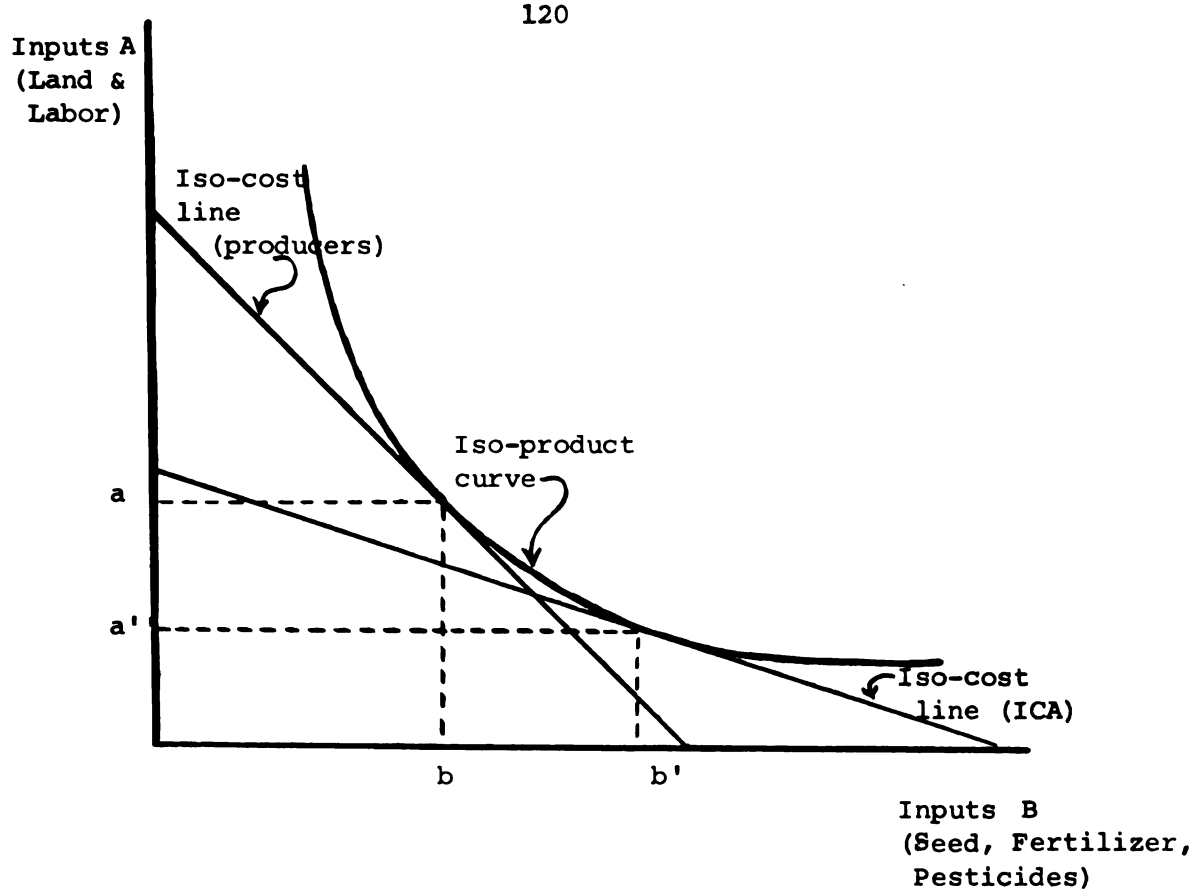

Figure 14 : Input Cost Differences Between ICA and Potato Producers

but produced with different combinations of Inputs A and Inputs B. The iso-cost lines represent the relative costs in using Inputs A and Inputs B to attain the production level indicated by the iso-product curve. As Inputs B become more costly relative to Inputs A, the optimal use of the two sets of inputs dictates that the iso-cost line become steeper. Thus, producers prefer to use (a) of Inputs A and (b) of Inputs B which indicates relatively low-cost for Inputs A and high cost for Inputs B compared to ICA which uses (a') (b'). Both producers and ICA would receive the same amount of product but with quite different input combinations because they consider the input cost differently.

One should not immediately conclude that the producer practice of emphasizing the seed: yield ratio creates bad performance results.

If potato producers attempt to maximize net income, given various combinations of seed, land, labor and other inputs, the hypothetical production functions in Figure 15, illustrate why producers might not desire to increase their seeding rates up to those recommended by ICA.

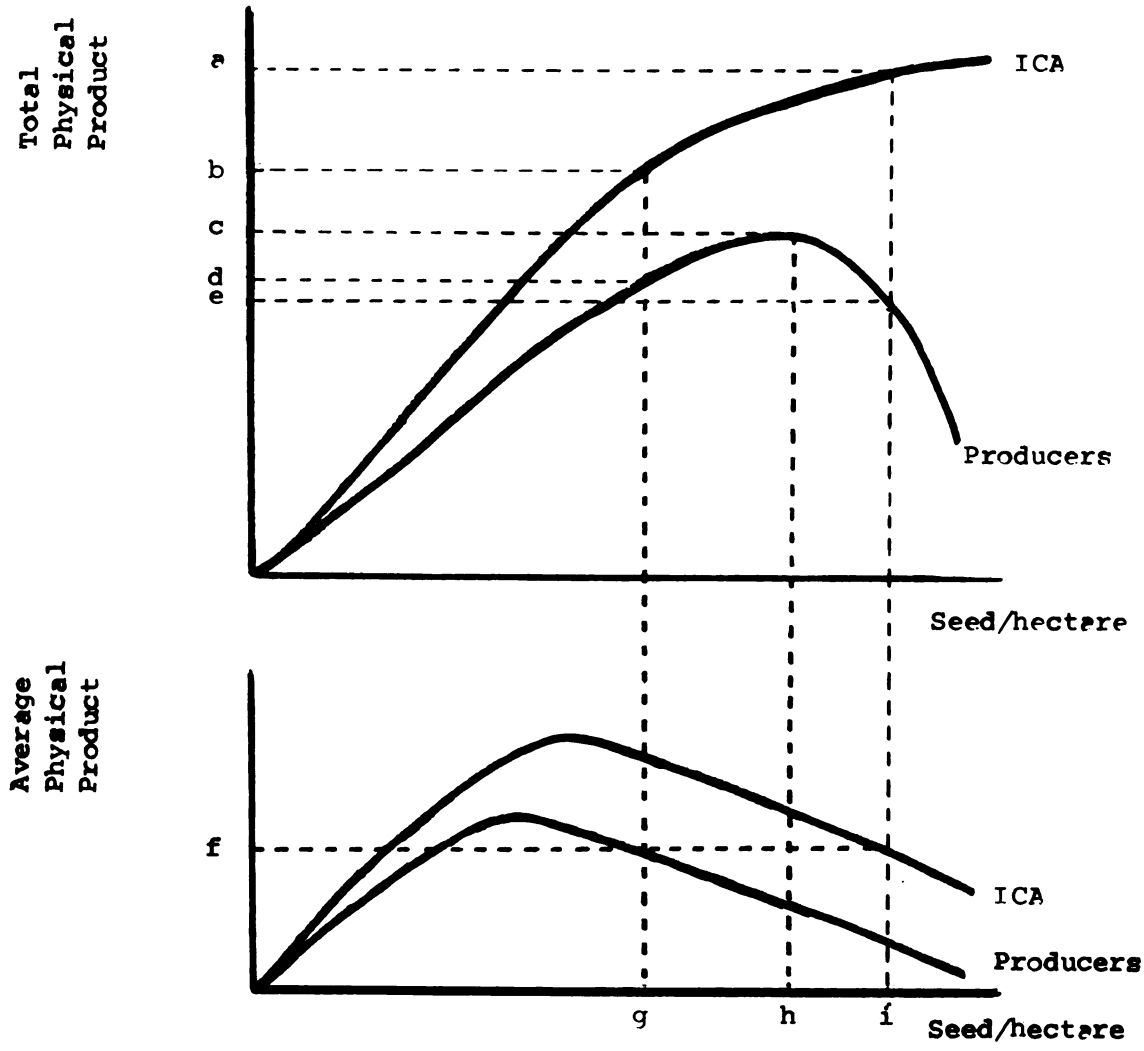

Figure 15 : Hypothetical Potato Production Relationships for ICA and Potato Producers

At present the seed: yield ratios obtained by ICA and by potato producers are similar (Tables 24 & 26). In Figure 15 average product for ICA and producers on a seed: yield ratio basis are equal at (f) but ICA uses more seed (i) than producers (g). Producers, however, are emphasizing the seed: yield ratio while ICA desires higher yields per hectare. On a per hectare basis, production for ICA is (a) and for producers it is (d). By reducing seed density to (g) ICA would still be producing with a higher per hectare yield (b) than producers (d). Hence, ICA has higher production functions than producers.[74] If producers increase seed density from (g) to (i) as recommended, they will lower per hectare yields to (e). Thus at density (i) producers are beyond maximum total physical product indicating negative returns to increased seeding rates per hectare (or negative marginal physical product).

Of course, this analysis is incomplete without considering at what seed density marginal factor cost is equal to the marginal value product but the average and total product function differences illustrate how the marginal conditions might also differ.

The hypothetical production curves illustrated in Figure 15 for ICA are above those for producers to illustrate how ICA recommendations might exceed the production potentials for some producers. Several factors could cause the production conditions at ICA to appear superior to those producers. First, the producers must consider natural risks such as frost, drought, disease, and insect

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[74] Other research also indicates that ICA's production functions exceed those of producers. See Jorge Lopera Palacios and Peter E. Hildebrand, The Agricultural Productivity Gap in Colombia, Instituto Colombiano Agropecuario, Bogotá,Colombia, June 3, 1969 (review copy).

problems. Second, ICA can allocate more labor and equipment to obtaining maximum yields and ICA is less concerned about costs than producers. Harvest losses at ICA probably are less than harvest losses for producers because more time and/or machinery can be allocated to loss reduction. The marginal factor cost of reducing harvest losses, however, may exceed the value of the potatoes saved or the marginal value product. Producers must consider labor costs because the supply of labor during harvest for some producers is limited even though it may be excessive at other times during the year. If producers decided to maximize either per hectare yields or the seed: yield ratio without regard to other costs such as labor, fertilizer and pesticides, the yields might rise but probably costs would rise more rapidly.

It is possible that extension of lands and emphasis on returns to seed is the least costly method of increasing potato production for many producers. For those potato producers a low-level equilibrium is one where the producer increases his income, yet is underemployed and has some unutilized land at his disposal. Thus land and labor are low-cost inputs with limited alternatives for their employment. Unskilled labor is abundant and alternatives are few, Mountain land, where machinery power cannot be used, has limited alternatives in production of wheat or barley and the land parcels may be too small to raise livestock. Thus, this potato producer emphasizes returns to high-cost inputs, primarily seed, and applies more land and labor creating a low-level equilibrium.

This low-level equilibrium is not a "trap" situation. The producer who rents land or must buy or rent more land to increase

output must place more value on the land input and desires to improve yields per hectare. This was true for producers with 20 or more hectares of potatoes. More of these producers rented land and had higher yields per hectare than producers with less than 20 hectares (Tables 19 & 23). But because seed, fertilizer, labor and pesticides are either purchased inputs or in the case of seed can be sold for consumption, producers should not maximize yields per hectare. They should desire to equalize marginal costs and returns for each of the inputs. Producer planting habits and management decisions, however, probably do not change to keep pace with the changing costs and returns to inputs due to new technologies. Similarly, it is difficult but essential that ICA recommendations keep pace with cost and return conditions.

As potato producers have adopted new varieties, fertilizer and pesticides, their production conditions and potentials have changed. Seeding practices possibly should have changed but probably the changes have lagged adoption of modern inputs. This lag cannot be blamed completely upon the producer. Where a potato producer is a renter or a share cropper, his seeding practices are often dictated by the land owner. The land owner may desire wide spacing in seeding because he knows little about potato farming and the practice is commonly accepted; or he may rationally desire to maximize return to seed if he has purchased part of the seed and considers land to be a low-cost input.

At present there is no good evidence to question the producers decision making ability. Yields per hectare have risen slightly over the past 20 years which indicates that extensive

land use is not the only production criteria for maximizing profits. Some producers can rationally justify intensive land use and these producers are probably responsible for raising the per hectare yield average. Other producers can rationally justify extensive land use which is not necessarily condusive to increasing yields per hectare.

Input Divisibility: The Mechanization Problem

Most modern inputs except farm equipment can be applied on varied farm sizes and land inclines. But use of farm equipment is more limited. Even though 59% of the potato producers interviewed used a tractor, this is not representative of the entire potato subsector. The small mountain farms were not represented in the sample and problems in mechanizing these farms are many.

The department of Agricultural Engineering at ICA is developing equipment for use by medium sized and large potato farms. A two-wheel tractor with implements is nearly ready for commercial production and the sale price will be about 14,000 pesos.[75] This mini-tractor probably could be effective on farms of 2 to 20 hectares or about 11.4% of the potato farms including 29.6% of land in potato production (Appendix I, Table I-2). Smaller farms might find cooperative or custom use possible. But for farms of 10 hectares and larger (1.1% of the potato farms

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[75] Wesley Hobbs, Jorge E. Quintero & James K. McDermott, "Plan Para el Desarrollo de los Tractores de dos Ruedas y de una Industria de Maquinaria en Colombia", ICA Departamento de Ingenieria Agrícola, 1969.

including 20.1% of the land in potato production) three-wheel tractors and equipment can be used. Hence, even with mechanization, 88% of the producers and 46% of the planted hectares, probably will not benefit from any form of tractor mechanization except on a cooperative basis.

The question of allocating credit and developing other public policies to stimulate mechanization cannot be answered without further research. Which class of farms should be encouraged or should all potato farms be given an opportunity to mechanize? Will a program of mechanization including small farms bind small producers to potato production where prices relative to consumer durables decline and their costs may not decline as far or as rapidly as those of larger producers?

At present most harvesting is done with hand labor by using a large and heavy hoe. Mechanical harvesting can be accomplished with three-wheel tractors and new equipment developed by the ICA Agricultural Engineers but it is not possible with the mini-tractor unless the potatoes are plowed out. Possibly an animal-drawn plow or lister might perform the same function with less damage to the potatoes and a lower labor requirement which is an important consideration at harvest time. The cost of animal power versus the mini-tractor is an important consideration. Many small potato producers have neither source of power.

While these questions about alternatives for mechanization cannot be answered definitively because of inadequate knowledge about costs of mechanization, use of improved varieties, and use of recommended seeding practices, various alternative assumptions

can be made and efficiency investigations applied to determine results of alternative mechanization programs.

Summary : Potato Producers and Technical Assistance

ICA has been involved in potato research and limited extension of research results for 20 years. Emphasis has been upon improving varieties and developing disease and insect control methods. Credit to potato producers along with reasonably well distributed supply stores have become available within the last 10 years due to the Caja Agraria. Real potato prices, while unstable, have not declined except in Nariño.

Yet production has risen very little by improved per hectare yields. Improved varieties with good yield characteristics and resistance to blight, have been adopted by only a limited number of producers. Probably three reasons account for the problem, In a brief but interesting survey, Peace Corps volunteers working with potato producers related that lack of technical knowledge and lack of improved seed were major production problems.[76] Thus, probably the extension function has not been fulfilled but the recently organized ICA extension program should help to solve the problem.

Lack of seed, however, is not necessarily an extension problem. There may not be enough improved seed produced to meet producer

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[76]Chris O. Andrew, Bruce T. Heath, Stephen F. Matthews and Rafael Samper A., Problemas de Producción y Mercadeo del Campesino Colombiano: Un Estudio Preliminar, Instituto Colombiano Agropecuario, Depto. de Economía Agrícola, Septiembre de 1969.

demands and the market system for the seed is not well coordinated.

A second problem relates to applicability and credibility of information flows to producers. In some cases the extension mechanism functions fairly well. The technical information from ICA passes to Caja Agraria and then to producers or from ICA to agressive producers who relay the information to their neighbors. But often the needs of producers are not well understood. The assumption that potato producers should achieve high yields per hectare is common and where technical advice is available it usually pursues this goal. The rational producer will be suspicious of this information if it fails to fit his particular production situation.

A final less-understood and possibly even more difficult issue to resolve is that of stimulating potato production by improving product distribution systems and adequately assessing consumption desires. For example, at present consumers dislike the Purace variety of potatoes. Purace, a larger and high water content potato, is not suited to present consumer desires and preparation practices. Even the best extension program will not and should not convince producers to adopt varieties that will sell at a price discount in the market. ICA has developed improved varieties from traditional seed stock that are accepted by producers and consumers. A better seed distribution system and product distribution system for these varieties is needed. The issue of improving coordination in the potato distribution system will be considered in the following chapter.

CHAPTER V

PROBLEMS IN COORDINATING THE POTATO DISTRIBUTION PROCESS

Market coordination, or the dynamic processes that interact within the exchange system, connects the physical production system to the consumer through the physical distribution system. All P-D systems are coordinated, some more efficiently and effectively than others. Efficiency and effectiveness are both pragmatic and normative considerations that can be discussed for specific countries and specific commodity markets within a country.

Coordination of the exchange system for potatoes includes the interdependent flows of potatoes and flows of information about the potato market. The effectiveness of these flows depends upon the facilitative and functional capacities of the transportation, storage, pricing, communication and grading activities to coordinate the exchange system.

Major Indicators of Coordination

Price Instability

Potato producers and distributors must deal with price instability which is both an economic and an ecological problem.[77] Prices fluctuate seasonally because of the wet and dry season and the fluctuation is emphasized by frosts and seed supply problems. Price instability

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[77] See Chapter II for the general discussion of price instability and the production conditions that contribute to this problem.

and the accompanying instability of income was the major potato marketing problem for nearly all of the participants interviewed.

The price variations for the Bogotá, Cali and Pasto markets presented in Table 32 have both cyclical and seasonal origins. In

Table 32 : Price Variation in Bogotá, Cali and Pasto, 1955-1968

	1955-1960			1961-1968			1955-1968		
	$\bar{x}$ [a]	s [b]	$s/\bar{x}$	$\bar{x}$	s	$s/\bar{x}$	x	s	$s/\bar{x}$
Bogotá	41	4.9	0.12	46	10.4	0.23	44	9.0	0.20
Cali	50	9.5	0.19	40	11.5	0.29	44	11.3	0.26
Pasto	35	5.3	0.15	32	9.0	0.28	33	7.8	0.23

[a] $\bar{x}$ - Mean in centavos/kilogram

[b] s - Standard diviation

Source: Appendix III

all three departments potato price instability increased for the 1961-1968 period compared to the 1955-1960 period as indicated by $s/\bar{x}$. Prior to 1960, cyclical price fluctuations appear to have been nearly non-existent but since 1960 the cycle appears to be two to three years in length (Figure 7).

Most of the increase in price variation since 1960 compared to before 1960 is probably due to cyclical activity. This is substantiated by the year-to-year variation in total production by departments presented in Table 33. Based on the IDEMA production

Table 33: Total Product Variation in Cundinamarca, Boyacá and Nariño, 1955-1966

Department	IDEMA						Caja Agraria		
	1955-1960			1961-1966			1960-1966		
	$\bar{x}$[a]	s[b]	$s/\bar{x}$	$\bar{x}$	s	$s/\bar{x}$	$\bar{x}$	s	$s/\bar{x}$
Boyacá	219	34.8	0.16	235	87.1	0.37	350	53.0	0.15
Cundinamarca	243	15.6	0.06	273	62.1	0.23	355	55.9	0.16
Nariño	33	4.3	0.13	68	28.0	0.41	154	24.7	0.16

[a] $\bar{x}$ Mean in 1000's of tons

[b] s Standard deviation

Source: Appendix II, Tables II-2 & II-4

statistics, variation in total potato production has increased since 1960.[78] Due to bad years in 1961 and in 1964, the cyclical or "cobweb" price movement began.[79] Prices were at a high in mid 1961, a low in late 1962, a high from late 1963 to mid 1964, a low in late 1964, a high in mid 1966, a low in late 1968 and again began to rise in 1969 (Figure 7). Although only three peaks to the cycle

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[78] It is better to use annual production data to study the cyclical activity in prices because annual price data are unweighted averages which are inaccurate due to variation in seasonal production.

[79] See Geoffrey S. Shepherd, Agricultural Price Analysis, Fifth Edition, Iowa State University Press, Ames Iowa, 1966, pp. 35-37, for a discussion of the "cobweb theorem".

are evident, it appears that the duration from peak to peak in prices is from two to three years in length.

The Caja Agraria data are presented in Table 33 only for comparative purposes but do not include the 1955 to 1959 period. Based on the Caja Agraria data product variation for the three departments has been very similar since 1960 but IDEMA indicates similar product variation in Boyacá and Nariño and less variation in Cundinamarca.

Price variability, from the market participants view point is presented in Table 34. Each producer was asked to give the price he

Table 34 : Potato Price Variability as Indicated by Potato Market Participants, for 1967 and 1968

	Average Percent Variation	
Participant group	Between Years	Within Years
Producers:[a]		
Boyacá	39.6	40.6
Cundinamarca	42.0	44.2
Nariño	46.1	51.2
Wholesalers:[b]	-	37.5
Retailers:[b]		
Supermarkets & Cooperatives	-	29.5
Tiendas	-	25.6
Plazas	-	33.7

[a] Between years equals: Año Grande price received (AG)'67 minus AG'68 all divided by AG'67; and Mitaca price receives (M)'67 minus M'68 all divided by M'67. Within year for producers equals: M'67 minus AG'68 all divided by M'67.

[b] Within year for retailers and wholesalers equals: Highest price received (HP) minus lowest price received (LP) all divided HP plus LP.

Source: ICA Potato Marketing Survey of Producers, 1968

received for his product in 1967 and in 1968 for both the Año Grande and Mitaca harvests. By using these prices, the percent price variation within and between years was determined. For wholesalers and retailers, only within year price variation was determined, using highest and lowest prices received during the year. The percentages appear as averages in Table 34 for each group of potato market participants.

As anticipated, producer prices varied most and retailer prices least because (1) of the price differentials causing higher base prices at each market level nearer the consumer, and (2) some storage within the distribution system also causes prices to vary less at the consumer level than at the producer level. Both within-year and between-year price variations were similar for producers in the different areas with Nariño producers indicating greater price variation for both measures.

When producers were asked to specify the most critical potato market problem, price instability was an important response (Table 35). Although price instability was not considered as important in Nariño as in Boyacá and Cundinamarca, this does not necessarily imply that it is not a serious problem. Nariño potato producers are faced with two other problems. The contraband potato flow from Ecuador is unique and transportation problems are greater in Nariño. Ecuatorian potatoes enter Colombia with some seasonality and minor flows leave Colombia, both of which contribute to seasonal price instability in Colombia.

Price instability is also considered a restraint on income by wholesalers and retailers. All potato market participants consider

Table 35 : Major Market Problems Specified by Potato Producers

Problems	Boyacá	Cundinamarca	Nariño
		(percent)	
Price instability	84.1	76.4	30.8
Over production	3.2	1.8	2.6
Transport & communication	9.7	9.0	25.6
Contraband potatoes from Ecuador	-	-	28.2
Other	3.2	12.8	12.8
	100.0	100.0	100.0

Source: ICA Potato Marketing Survey of Producers, 1968

price instability important and an ever present threat to income but producers usually must absorb the losses due to fluctuating prices.

When producers were asked about the relationship between price conditions and planting practices the "cobweb" response pattern mentioned previously was encountered to explain the cyclical price changes. If prices were high in the present year, 53.6% said they would seed more for the coming harvest and, if prices were low in the present year, 60.8% would seed less. But when they were confronted with very dry conditions at planting only 20.8% would seed less, and 13.6% said that they would seed more.

Margins and Returns

One of the most difficult assessments to make in market system analysis under conditions of limited data is specification of marketing

margins. Two methods were used in arriving at these estimates: 1) a price survey was accomplished during a two-week period to specify price differences or spread at each level, and 2) market participants in the general survey were asked to indicate maximum and minimum prices paid and received during the previous year as a guide to calculating the margins. Cost information to specify marketing margins was not available.

Results from the price survey appear in Table 36. Based upon

Table 36 : Potato Prices per Carga (February 8-21, 1969)[a]

Variety	Weight	Retailer		Wholesaler		Producer
		Received	Paid	Received	Paid	Received
	(percent)			(pesos per carga)		
Parda Pastusa	70	128	91	89	78	75
Tuquerreña	15	132	127	127	105	92
Carriza	5	143	117	96	85	80
Sabanera	4	196	157	149	134	110
Criolla	4	194	122	110	70	60
Tocana	2	141	105	101	90	79
Weighted Ave.	100	135	102	99	84	79

[a] Retailer and wholesaler prices were obtained in Bogotá and the producer prices were taken from five rural markets ranging from 20 to 100 kilometers from Bogotá.

Source: ICA Potato Marketing Survey of Prices, 1969

the weight, or general importance of each variety, price differentials were determined and appear in column one of Table 37. Results from

Table 37 : Price Spreads for Potatoes in the Bogotá market

	Price Survey[a]	General Survey[b]	ILMA 1964[c]	CEDE 1959[d]
			(percent)	
Producers share	58.6	74.0	74.0	71.4
Producer to wholesaler intermediaries	3.7	5.7	7.0	-
Wholesalers	11.1	8.0	6.0	14.3
Wholesalers to retailer intermediaries	2.2	-	-	-
Retailers	24.4	12.3	13.0	14.3
	100.0	100.0	100.0	100.0

Source: [a] Table 36; [b] ICA Potato Marketing Survey, 1968, where producer to wholesale is the transport margin, the wholesaler and retailer information is an estimated margin determined by:

$$\frac{\frac{(3) - (1)}{(3)} + \frac{(4) - (2)}{(4)}}{2} = \text{a percent margin}$$

where (1) is highest price paid, (2) is lowest price paid, (3) is highest price received and (4) is lowest price received.

[c] Instituto Latinoamericano de Mercadeo Agrícola (ILMA), Supply Problems of Basic Agricultural Products in Colombia, Bogotá, Colombia 1964, p. 185.

[d] Guillermo Franço Camacho , Mercado de la Papa respecto a Bogotá, D.E., Centro de Estudios sobre Desarrollo Económico (CEDE), Monografía # 2, Bogotá, Colombia 1959, p. 26.

the general survey and from other research programs also appear in this table.

Although the price spreads are greater from the price survey, probably they are more accurate. The spread between producers and retailers is relatively consistent at from 13% to 17%. The latter estimate, however, is probably more accurate because it includes more handling and transportation charges. The retailer spread specified in the price survey is not high when losses and sales costs are considered. Retail losses of potatoes run up to 17.8% for supermarkets but average 13.3% for all retailers. Retailers also feel that a 10.6% spread is necessary to cover general operating costs. Losses and desired spread total 23.9%, or nearly equal to the 24.4% spread specified in the price survey. Thus, probably the spread estimates by the general survey and by ILMA and CEDE are low primarily because they do not include losses.

Distribution costs within the potato marketing system are difficult to specify because of the numerous transactions. The analysis is not simply an exercise in specifying costs for wholesalers and retailer because many and varied levels of potato exchange occur within these two general distinctions. Due to low productivity and underemployment of labor in potato wholesaling and retailing, margins may be wider than necessary. Profits and individual returns are probably not excessive but the continuous backhauling of potatoes within the wholesaling area in Bogotá is condusive to added cost. Few potatoes bypass this market where streets are narrow and potatoes are continually moved back and forth among trucks, warehouses, plazas, taxis and horse or manually drawn

carts. Until an improved grading system is developed and losses reduced at the retail level, the retail spread will continue to be significant.

Margins and incomes for potato market participants are also influenced by risks occurring within the market system. Some factors that producers considered to be restraints on their incomes or problems for averting risk appear in Table 38. The major problems were low prices, drought, frost and diseases.

Table 38 : Causes of Potato Producer Income Losses from 1963 to 1968[a]

Causes	Boyacá	Cundinamarca	Nariño
	(percent with positive response)		
Drought	5.7	20.4	20.5
Excess rain	11.5	2.9	2.6
Frost	15.4	24.3	33.3
Disease	13.5	10.7	18.0
Low prices:			
Due to bad markets	46.2	39.8	20.5
Due to bad quality	7.7	1.9	5.1
Total	100.0	100.0	100.0

Source : ICA Potato Marketing Survey of Producers, 1968

Of the retailers, plaza stall operators felt the market problems to be most pressing (Table 39). Lack of credit or liquid capital and price instability were major problems for wholesalers and retailers but lack of liquid capital is less pressing for supermarkets and

Table 39 : Income Problems of Potato Retailers and Wholesalers

Problems	Wholesalers	Retailers		
		Supermarkets & Cooperatives	Tiendas	Plazas
		(percent with positive response)		
Lack of sufficient suppliers	-	-	8.7	11.5
Price instability	96.8	72.2	81.2	92.3
Too much competition	92.0	27.8	71.0	80.8
Lack of market information	33.9	61.1	75.4	88.5
Lack of credit and liquid capital	80.7	50.0	97.2	92.4

Source: ICA Potato Marketing Survey of Wholesalers and Retailers, 1968

cooperatives. It is interesting to note that lack of market information was not so important for wholesalers probably because they are at a strategic point in the market system and are a source of information for the system.

Liquid capital for expanding potato wholesaling and retailing involves less credit and more difficult terms. When wholesalers were asked which capital source was most significant for the past 10 years, internal financing by personal funds and business profits was most common (Table 40).

Twenty-seven wholesalers had received loans during the year and the average loan size was 33,100 pesos. Five of the 27 had two loans giving a total of 32 separate loans. The mean nominal interest rate

Table 40 : Liquid Capital Sources for Potato Wholesalers in Bogotá

Source	Percent
Profits from the business	47
Personal funds	39
Loans	12
Inheritances	1
Other	1
	100

Loan Sources for those having loans:	First loan	Second loan	Total
	(number of loans)		
Commercial banks	16	4	20
Personal loans	8	-	8
Government loans	-	1	1
Other sources	3	-	3
	27	5	32

Source : ICA Potato Marketing Survey of Wholesalers, 1968

paid was 16.7% per year on the first loan and 22.0% per year on the second loan. Both of these rates exceed the mean rates paid by potato producers mainly because the wholesalers do not receive low interest rate government loans. Along with the price instability problem, high interest rates for potato distributor loans require wider margins in potato production and restrict new investments.

Physical Distribution Processes

Transportation

Potatoes are transported by various methods in Colombia, producers often use donkeys or horses to pack potatoes from their farms to rural markets. Horse and tractor-drawn wagons and trucks are also used for farm-to-rural market transportation. Long distance potato transportation is usually by truck but, in some areas, boats and aerial cable cars are also used. Movement of potatoes within urban centers includes trucks, taxis, buses, horse-drawn wagons and manually-drawn carts.

Only 11.7% of the wholesalers say that they transport potatoes to buyers while retailers indicated that wholesalers transport 14.8% of retail purchases. Of the 11.7% of wholesalers indicating that they transport potatoes to purchasers, 16% use their own trucks, 65% rent trucks and 19% hire zorras (manually and donkey-drawn carts). From both purchase and sale statistics of wholesalers, it appears that less than 2% of the wholesalers use their own trucks. Retailers transport 4.8% by their own trucks, 53.0% by rented trucks 18.8% by animal-drawn zorras, 4.8% by manually drawn zorras, and 3.8% by intermediaries. Consumers transport all but 0.3% of the potatoes that they buy.

Ownership data for potatoes in transit to Bogotá appear in Table 41. Usually the owners pay transport costs for the potatoes somewhat contrary to the Bogotá trucker survey, 20.5% of the Bogotá wholesalers said that they absorbed transport costs which probably indicates that producers paid transport on the other 7% but which

Table 41 : Ownership of Potatoes in Transit to Bogotá

Ownership	Percent
Producers	62.2
Wholesalers	27.2
Retailer	6.0
Trucker-buyers	4.1
Producer Cooperative	0.5
	100.0

Source : ICA Potato Marketing Survey of Truckers, 1968

could indicate a survey error. Of those wholesalers 8% used their own trucks, 73% rented trucks, and 19% hired truckers.

Backhauling or reshipment of potatoes through production areas from the Bogotá market was common for 9.5% of the truckers (Table 42).

Table 42 : Backhauls from Bogotá for Potato Truckers

Type of Backhauls	Percent
Farm supplies	27.8
All food items	19.5
Potatoes	9.5
All classes	6.6
Leave Bogotá without a load	36.6
Total	100.0

Source : ICA Potato Marketing Survey of Truckers, 1968

Potatoes were also included in the "all food items" category. These are often mixed loads of fruit and vegetables that go to small rural markets in the warm climate areas. Backhauling mixed loads of fruits and vegetables including potatoes for warm climate markets, possibly is not inefficient based on transportation costs because Bogotá acts as a major terminal and assembly market. The congestion in the Bogotá market, however, does make this assembly practice expensive.

Backhaul estimates in Table 42 only included interview data from those truckers that were entering Bogotá. Of all the truckers interviewed that were transporting potatoes, 29% were leaving Bogotá. Table 43 indicates major backhauls of potatoes in transit through production areas to deficit warm climate areas. Of total shipments through the Bogotá market 22.2% (southeast 2.4%, southwest 8.8% and north 11.0%) were backhauls that might have been avoided by an effective rural assembly system including a market information system.

Table 43 : Potato Flows Entering and Leaving Bogotá as an Indication of Backhauling

Location	Potatoes entering Bogotá	Disposal from Bogotá
	(percent)	
Southeast	3.3	2.4
Southwest	8.8	15.6
Fontibon - Madrid	26.4	-
Facatativa - Subachoque	19.9	-
Zipaquirá area	8.3	-
North	33.3	11.0
Bogotá consumption	-	72.0
	100.0	100.0

Source : ICA Potato Marketing Survey of Truckers, 1968

Two factors account for the backhaul problem. First, there are few interregional wholesalers or intermediaries with capacity to buy in rural areas and sell in several markets besides Bogotá, Second, and possibly more important, producers with trucks and rural based assemblers have no dependable market information service upon which to base day-to-day decisions about relative prices in alternative markets. So Bogotá acts as a terminal potato market that often contains potato surpluses for re-export through production regions to warm climate markets.

Assembly Functions

Rural-to-urban assembly functions for potatoes often involve numerous handlers and numerous product exchanges. Except for large producers, who transport potatoes to Bogotá for direct sales to wholesalers, rural assembly markets involve several transactions. Producers owned 62.2% of the potatoes in transit to Bogotá. Large producers who owned trucks sometimes acted as assemblers by purchasing from small producers. About 14% of producers sales were to larger producers who act as assemblers (Table 7). These producer-assemblers usually transport potatoes directly to Bogotá.

Other producers and small rural assemblers may buy and sell potatoes in several rural markets that are in close proximity such as Ventaquemada (Boyacá), Villapinzón and Chocontá (Cundinamarca). When these producers and assemblers cannot receive the desired prices for their potatoes they have the alternative of moving the potatoes to one of the nearby markets. Weekly market days for these markets usually do not fall on the same day of the week. If sellers

are not satisfied with the prices in several of these markets and if they own or can rent trucks, they will then transport the potatoes to Bogotá. This practice involves unloading and reloading the potatoes at each market. Storage facilities for these rural based assemblers are virtually nonexistent.

Where the rural markets are relatively isolated and nearby market alternatives are limited, large producers, trucker-buyers and wholesalers act as assemblers. The potatoes then go direct to Bogotá. Only a few small producers cooperate in potato transport by renting a truck.

Trucker-buyers handle about 20% of the potatoes passing from producers to wholesalers and retailers. These trucker-buyers own one-fifth of the potatoes that they transport and act as purchasing representatives for wholesalers and retailers for the remaining four-fifths.

Urban potato market transactions are of several types. Tienda retailers buy from several classes of suppliers but plaza wholesalers and retailers represent over one-half of their purchases. Transactions occur within the wholesaler function and within plaza retailing and wholesaling. The percent or number of these transactions was not clearly defined.

In summary, potatoes destined for consumption in Bogotá may have changed owners up to four times in rural areas and five or six times in the Bogotá market before the final consumer purchase. If the potatoes are re-exported from Bogotá to other market centers the potatoes may change owners up to twelve times between the producer and consumer. Often each exchange requires unloading the potatoes

from a truck, piling them in a warehouse or on the ground in a rural market and reloading them on another truck or other mode of transport. This handling causes product deterioration due to bruising and scaring the potatoes even though they are not removed from the bags. Where retailers, primarily supermarkets, buy direct from producers the handling losses are reduced.

Storage

Few producers store potatoes while waiting for improved prices. Most producers do store seed potatoes but not potatoes for commercial sales. Some producers can store potatoes in the ground up to 30 days prior to harvesting and also some store potatoes in tents near the field up to 30 days. Statistics for those producers having storage facilities are found in Table 44. Probably transportation difficulties

Table 44 : Storage of Potatoes by Potato Producers

	Boyacá	Cundinamarca	Nariño
Number and percent storing potatoes	2 (6.4%)	8 (14.5%)	7 (17.9%)
Average storage capacity	75 cargas	146 cargas	135 cargas
Average amount stored last year	30 cargas	73 cargas	74 cargas
Average storage time	37 days	72 days	51 days
Losses in storage	No response	14%	10%

Source : ICA Potato Marketing Survey of Producers, 1968

at harvest time between Nariño and Cali make storage more important. A primary reason for not storing potatoes is spoilage (Table 45).

Table 45 : Producer Reasons for Not Storing Potatoes

Reasons	Boyacá	Cundinamarca	Nariño
		(percent)	
I don't know how to store potatoes	16.7	18.7	16.0
They spoil too easily	36.7	33.3	30.0
I must sell immediately to pay debts	33.3	31.3	18.0
I need the money immediately for the family	-	6.3	6.0
It is not profitable	13.3	2.1	16.0
Other	-	8.3	14.0
Total	100.0	100.0	100.0

Source: ICA Potato Marketing Survey of Producers, 1968

Most retailers including large supermarkets do not store potatoes for long periods of time. Indicators of time in storage or time on shelves for retail outlets are frequency of purchases from wholesalers and average size of stocks (Table 46).

The greatest amount of storage within the potato marketing system occurs at the wholesale level, but even here storage is not of sufficient volume or duration to provide a semblance of price stability. To assess the average inventory of wholesalers is difficult. Total storage capacity averaged 394 cargas but only

Table 46 : Frequency of Potato Purchases and Average Stocks in Bogotá Retail Outlets

	Frequency of purchases in times per month	Average stocks in cargas
Supermarkets and cooperatives	10.5	9.4
Tiendas	6.7	3.3
Plazas	5.0	4.9

Source: ICA Potato Marketing Survey of Retailers, 1968

21 of 62 wholesalers gave storage data. Of those, average inventory was 81.6% of capacity. Eighty-nine percent of the wholesalers said they did not store potatoes from harvests to times of scarcity and only 22.6% indicated that potatoes were always in their warehouses. Of 32 responding to the question concerning average inventory duration, the mean was 23.2 days.

Wholesalers responses to major problems inhibiting more storage are presented in Table 47. Again spoilage is a major problem.

Table 47 : Problems Inhibiting Storage by Wholesalers

Problems	Yes responses (percent)	Rank
It is too risky	77.4	27.5
Potatoes spoil easily	90.4	37.5
Storage facility is too small	67.8	12.5
It is not profitable	69.4	11.2
I don't have enough money	45.2	10.0
I cannot borrow enough money	32.3	1.3
		100.0

Source: ICA Potato Marketing Survey of Wholesalers, 1968

Risk is also very important to wholesalers and they too are concerned about price instability in the potato market.

A final but very detrimental factor that discourages potato distributors from storing potatoes is the adverse public attitude and law against speculation. Many individuals, both private and within the government, believe speculation raises marketing margins and is an evil method used to take advantage of producers and consumers. It is common to hear derogatory statements such as "the government should replace all intermediaries and speculators in food distribution".

But insufficient storage throughout the potato distribution system fails to assist in achieving the goal of minimizing price instability which is held by producers, distributors, consumers and the government. Storage at the wholesale level is probably more common than the survey indicated. Wholesalers were reluctant to give information about their storage practices possibly because of the anti-speculation law and the adverse public attitude of the government. To pursue an anti-speculation policy that implies limited storage by the private sector may assume that the government can more effectively and efficiently store and distribute potatoes than the private sector. No data are available to prove or disprove this thesis. Further research should be applied to this problem before pursuing a policy that appears to be in direct conflict with the important price stability goal of the potato P-D system.

The government (IDEMA) is involved in potato storage at Chocontá and Tunja, North of Bogotá and at Fontibón, a suburb of Bogotá. These facilities have a total capacity of about 18,000 tons. The largest storage operation at Chocontá consists of 127 quanset-type

structures, each with a capacity of 100 tons. The quansets are ventilated naturally by opening ventilators at night to allow cool air (mean temperature is 11°centigrade) to circulate and then sealing the ventilators during the day.[80] This ventilation system may not prove sufficient to maintain potatoes in storage up to six months as desired by IDEMA. The facilities are difficult to empty and fill because the quansets and bins within each quanset are small. Sorting of the potatoes is performed in a central building on a large mechanical sorter.

Producers and wholesalers were asked about the governmental storage activities (Table 48). It is interesting to note that more

Table 48 : Producer and Wholesaler Reactions to Governmental Storage Operations

	Wholesalers	Producers		
		Boyacá	Cundinamarca	Nariño
			(percent)	
Are you aware of the governmental storage operations? (yes)	43.6	38.7	36.4	28.2
What is your opinion of this activity?				
Favorable	53.2	38.7	52.7	30.8
Uncertain	24.2	32.3	21.8	46.1
Unfavorable	22.6	29.0	25.5	23.1
Total	100.0	100.0	100.0	100.0
Did you buy from or sell to INA last year? (yes)	9.4	25.8	12.7	15.4

Source: ICA Potato Marketing Surveys of Producers and Wholesalers, 1968

[80] These observations are based upon a tour of the facilities in December 1967, following completion of construction in mid 1967.

wholesalers were in favor of governmental storage than producers which may indicate that wholesalers presently are not profiting by storing potatoes and see the government as no threat to their present activities.

Government facilities at present can store less than 2% of annual production in Colombia when they are operating at capacity. More storage of potatoes by private and/or public means is needed to assist in stabilizing seasonal price fluctuations. But spoilage of potatoes in storage is a major risk which inhibits expansion of storage operations. Adoption of improved practices in potato wholesaling and retailing has been slow. Some, but few, physical examples of progress are available. While 56.5% of the wholesalers said they were aware of chemical treatment to conserve potatoes in storage, only 4.8% said they occasionally applied a sprout inhibitor. Two of the three used Cloro IPC and one used Agermin. At present one large wholesaler has 1,200 cargas in storage and treated with Cloro IPC. IDEMA has applied Cloro IPC since 1958, but attempts by IDEMA to introduce the practice in the private sector have been limited.

Losses

Two types of losses occur within the distribution system. Complete physical destruction, implying that consumption is impossible, is quite low but some financial loss does occur for 15.1% of total production for commercial sales, (Figure 6 and Table 7). Based on survey results consumers losses are 2.6% of commercial sales while market system losses represent 12.5%. About three-fifths of the retailer losses or 6.0% of all commercial sales cannot be sold at any price. Thus, at least 8.6% of total potato production for

commercial sales are completely lost to either consumers or retailers. Wholesalers usually sell low quality potatoes at discounts. The exact monetary losses incurred by wholesalers and retailers are not known but the complete monetary loss on 8.6% of potato production for commercial sales includes about 43 thousand tons per year.

For the entire one million ton potato P-D system, complete monetary losses occur on at least 131,600 tons per year (61,000 tons at harvest, 27,600 tons of seed and 43,000 tons in distribution). Partial losses occur where discounts for low quality are granted which would raise monetary losses above the value of 131,600 tons. A well organized and managed P-D system could reduce these losses. The actual consumption loss to society is smaller than 131,600 tons because many very low income families will salvage some of the non-salable potatoes both on the farm and in the markets. This consumption loss is not known, and fluctuates depending upon the potato price level. When prices are high, actual consumption losses are low due to intensified salvaging by the poor. Of course, relative prices of close substitutes for potatoes will also affect use of low quality potatoes.

In summary, to evaluate the effect of losses on the general price level is even more difficult than to specify the loss itself. Producers as a group probably would not benefit by loss reduction because of an inelastic demand for potatoes. For on farm losses, the benefits of reducing losses can be measured by comparing marginal factor costs with the marginal value product for loss reducing methods. Individual producers and individual distributors would probably benefit from loss reduction and quality improvement

programs where retailers and consumers are willing to pay for the improved product.

Facilitative Exchange Processes

Numerous factors influence exchange of potatoes. Producers, processors and distributors provide time, form and space utilities sought by other potato market participants and ultimately the consumer. Behavioral characteristics in decision making relative to pricing and exchange of potatoes indicate buyer and seller reactions to the product. While this behavior is influenced by desires for product utility by consumers, the system also affects the type of product utility created.

Integration, Agreements and Cooperation

Formal vertical integration, while limited in the potato P-D system, centers upon the wholesaling function. The extent to which potato wholesaling is vertically integrated by percent of participants in each category is presented in Table 49.

Table 49 : Vertical Integration in Potato Distribution in Bogotá

Form of Integration	Plaza Wholesaling	Traditional Wholesaling	Weighted Wholesaling
		(percent)	
Wholesalers only	44	28	34
Producer-Wholesalers	-	13	8
Wholesaler-Retailers	50	39	46
Producer-Wholesaler-Retailer	6	20	12
Total	100	100	100

Source: ICA Potato Marketing Survey of Wholesalers, 1968

At least one of the large wholesalers owns potato farms in several departments and is a wholesaler of potatoes in several large cities. Carulla also buys direct from producers when possible and offers technical advice to producers about methods for obtaining best quality. When retailers were asked if direct buying by supermarkets from producers benefited consumers and the market system, 61.1% of the supermarket and cooperative, 36.2% of the tienda and 30.8% of the plaza interviewes responded affirmatively.

Purchase agreements as another mechanism of vertical coordination in purchasing and selling potatoes are not common. Only 1.1% of the truckers regularly hauled potatoes under forward purchase agreements, 8.6% responded with rarely and 90.3% said they never hauled contracted potatoes. Producer sales agreements for the year preceeding the interview were distributed as indicated in Table 50.

Table 50 : Producer Sales Agreements

Producers	Boyacá	Cundinamarca	Nariño
With successful agreements	1	5	10
With unsuccessful agreements	1	1	7
Without agreements	29	49	22
Total number interviewed	31	55	39

Source : ICA Potato Marketing Survey of Producers, 1968

Four of the producers sold in advance in order to obtain a loan, two received a better price and the other cited various reasons. Ten of the agreements included a price which was determined by the market price at the time of each agreement. All of the agreements were unwritten. Quality was not necessarily a condition in the agreements but the buyers indicated that they made agreements with producers that have a reputation of producing "good" quality potatoes.

Of the 62 wholesalers only 6 made potato purchase agreements with producers representing only 4.1% of all wholesale purchases. All of the 6 agreements were with producers, 2 of which were specified between planting and harvest and 4 during harvest. Only one agreement was written. Prices were specified at the time of the agreement based upon the current market price at that time.

Six wholesalers had sales agreements with retailers which accounted for only 2.4% of wholesaler sales. Two agreements were with tiendas, 3 with plaza retailers and one with a processor. Two of the 6 agreements were written and 2 were less than one week in duration while 4 were for a period of one to two weeks.

No retailers indicated having had purchase agreements with wholesalers. This inconsistency is not problematic because formality of sales agreements is difficult to differentiate. Many purchases and sales are made either because of friend and family relationships or a long term purchase and sale experience (Table 51). In many cases the reasons given for purchases

Table 51 : Affirmative Responses to Reasons for Purchasing from Specified Suppliers for Wholesalers and Retailers

Reasons	Wholesalers	Retailers		
		Supermarkets & Cooperatives	Tiendas	Plazas
	(percent with positive response)			
They are family or friends	53.2	-	11.7	30.8
They do favors for me	9.7	-	1.4	-
I have purchased from them for a long time	82.3	77.8	84.1	92.3
I advance money to them	24.2	-	2.9	11.5
I am their only alternative	4.9	-	-	-
I pay more	6.5	5.6	4.4	-
I pay in cash	45.2	11.1	50.7	69.2

Source : ICA Potato Marketing Survey of Wholesalers and Retailers, 1968

constitute long term informal, agreements as a means of reducing risk in a poorly coordinated potato market. When 4.9% of the wholesalers responded that they were the only alternative probably they were the only purchasers in a small isolated rural market.

All major potato market participant groups were asked why they did not undertake formal contracts for purchase and sale of potatoes (Table 52). Two major risks influence a general desire not to enter formal purchase and sale agreements. First, there is a high probability that prices will change dramatically and the market participants are sensitive to the unstable price situation. A good contract

Table 52 : Potato Market Participant Reasons for Not Participating in Formal Purchase and Sale Contracts

Reasons	Producer Sales	Wholesaler Purchases	Wholesaler Sales	Retailer Purchases
	(percent with positive response)			
High risk of price change	48.0	67.7	69.4	53.1
Cannot trust the other party	12.0	11.3	9.7	10.5
Other party does not want	24.0	-	1.6	0.6
It is not necessary	8.0	14.5	16.1	30.3
Other	8.0	6.5	3.2	5.5
	100.0	100.0	100.0	100.0

Source : ICA Potato Marketing Survey of Producers, Wholesalers and Retailers, 1968

system throughout the P-D system, however, could reduce the price instability. Second, mutual distrust between the potential parties to an agreement exists. Contracts, while cumbersome, are not "really" binding under most conditions that face market participants unless time and expense are devoted to obtaining all legal sanctions, and even then the contracts may be questioned. Thus, trust is a very important factor but it must extend beyond family and long term acquaintances. For family and long term friends, contracts are probably unnecessary.

Potato producers, wholesalers and retailers were asked if they cooperated with their competitors in business activities (Table 53). Informal cooperation at the farm, supermarket-cooperative and tienda levels is not common. However, for wholesalers and plaza retailers

Table 53 : Affirmative Responses to Cooperation by Potato Market Participants in Production and Distribution

Activities	Producers	Wholesalers	Retailers		
			Supermarket & Cooperatives	Tienda	Plaza
			(percent with positive response)		
In planting & harvesting	12.5	-	-	-	-
In buying inputs	12.0	-	-	-	-
In buying potatoes	-	62.9	11.1	34.6	11.6
In selling potatoes	7.2	61.3	-	-	-
In transporting potatoes	9.6	19.4	-	15.4	16.1

SOURCE : ICA Potato Marketing Survey of Producers, Wholesalers and Retailers, 1968

some of whom are also wholesalers, cooperation in buying and selling potatoes is common.

Credit Sales and Purchases

To specify what constitutes credit purchases and sales is difficult. When market participants discuss credit, they refer to a physical exchange of product without a concomitant monetary exchange until a later date or a deferred payment. Transactions are also made by post-dated checks that are not considered to be credit but under most definitions constitute deferred payment. Post dated checks are a form of short term credit and tie-up short term capital for the holder of the check. This factor was not apparent until

after termination of interviewing so the magnitude of credit by post dated checks is not well defined.

Only from about 28% to 36% of producer sales were on credit (Table 54). The distribution of credit purchasers from producers differed between departments. The greatest amount of credit purchases were by trucker-buyers in Boyacá, by wholesalers in Cundinamarca and by local buyers and assemblers in Nariño.

A counter flow of credit passes from wholesalers to producers. Of the 62 wholesalers interviewed, 11 advanced money to producers.

Table 54 : Cash and Credit Sales by Potato Producers

	Boyacá	Cundinamarca	Nariño
Percent of producers always selling for cash:	64.5	63.6	71.8
Credit or cash and credit sales to : (percent)			
Large producers	2.3	1.2	4.3
Local buyers & assemblers	-	4.7	19.5
Trucker-buyers	28.4	3.7	2.2
Wholesalers	4.8	25.6	-
Retailers	-	1.2	2.2
Total	100.0	100.0	100.0

Source : ICA Potato Marketing Survey of Producers, 1968

An average of 10 producers received credit from each of the 11 wholesalers with 9% of the advances agreed upon before planting, 27% agreed upon between planting and harvest, and 64% agreed upon

during harvest. Four of the 11 wholesalers determined price of the potatoes at the time of the credit advance and 7 were repaid with potatoes, 2 with both money and potatoes, and 2 with money only. One wholesaler charged an interest rate equivalent to 25% per year.

Fifty wholesalers sold potatoes on credit and their total credit sales averaged 32.3 cargas for the year previous to the interview. The average loan was for 24 days and the average number of credit sales per wholesaler was 29. None of the wholesalers charged interest on these sales, but some retailers indicated that they paid a price defferential to wholesalers when making credit purchases. This is defacto interest charge.

Credit sales and purchases for retailers are presented in Table 45. No retailers indicated having paid interest on credit purchases but there was a price differential, or higher price paid, per carga for some of the retailers purchasing on credit. This price differential ranged between 7% and 11% of the retail price paid, assuming an average retail price of 100 pesos per carga. These rates held for a range of 10 to 18 days depending upon the class of retailers. The annual interest rate equivalent for supermarkets and cooperatives would be 167%, for tiendas - 414%, and plazas - 266%.

Only 3.6% of the consumers said that they purchased potatoes and other food items on credit. Another 8.7% purchase food with personal checks which are often post dated.

Reasons why retailers and wholesalers placed confidence in those to whom they grant credit are presented in Table 56. Cooperatives and supermarkets grant customer credit primarily for

Table 55 : Credit Purchases and Sales of Potatoes by Retailers in Bogotá

	Supermarkets & Cooperatives	Tiendas	Plazas
Credit purchases:			
Purchasing on credit (percent)	66.7	26.1	46.2
Average period for repayment (days)	17.4	9.7	9.6
Total purchases on credit for those using credit (percent)	92.1	73.5	78.9
Credit purchasers paying a price differential (percent)	41.7	27.8	64.3
Price differential per carga (pesos)	$8.00	$11.00	$7.00
Credit sales:			
Selling on credit (percent)	39.8	49.3	61.5
Average period for repayment (days)	23.1	21.0	36.4
Average total credit sales (cargas/ year/retail outlet)	206.0	41.8	42.4
Average number of credit buyers (per year)	265.0	10.9	13.9

Source : ICA Potato Marketing Survey of Retailers, 1968

convenience and to promote sales while tienda and plaza retailers grant credit because of interpersonal trust and friendship.

In summary, about 30% of the producers sold on credit. Eighteen percent of the wholesalers said they advanced money to producers. Of the wholesalers, 80% had credit sales to retailers while 26% of the

Table 56 : Reasons Given by Potato Retailers and Wholesalers for Making Credit Sales

	Wholesalers		Retailers to Consumers		
	To Suppliers	To Purchasers	Plazas	Tiendas	Cooperatives & Supermarkets
			(percent)		
They have good businesses	36.4	35.4	30.0	17.7	14.3
I trust them	27.2	25.5	33.4	38.8	7.1
They are long time friends	9.1	29.4	26.4	6.4	-
They need the money	9.1	7.8	6.7	17.7	28.6
They give collateral	18.2	1.9	-	-	-
For sale promotion and convenience	-	-	3.5	19.4	50.0
Total	100.0	100.0	100.0	100.0	100.0

Source : ICA Potato Marketing Surveys of Wholesalers and Retailers, 1968

tiendas, 46% of the plazas and 67% of the supermarkets and cooperatives said they purchased potatoes on credit. Again, 39% of the supermarkets and cooperatives, 49% of the tiendas and 62% of the plazas sold potatoes to consumers on credit. Interest charges were uncommon but price differentials paid by a few retailers for the privilege of making credit purchases were costly. Where the practice of paying price differentials for some retailers is common, costs could be reduced by obtaining other means of financing short term potato purchases.

Behavior in Pricing

Numerous behavioral characteristics of market participants could influence potato prices. Individuals can influence their price received as well as income by various potato holding practices but storage is sporatic throughout the system. Prices are sometimes influenced by price discounts and price differentials for credit sales but usually potato market participants accept the market price without question.

Potato prices for individual transactions in most all markets except supermarkets, cooperatives and some *tiendas* are bargained prices. If clients desired to bargain, 95.2% of the wholesalers, 5.6% of the supermarkets and cooperatives, 79.7% of the *tiendas* and 88.5% of the *plazas* said they were forced to lower their asking prices. Bargained potato prices, however, do follow a general price levels with differentials for quality and transportation.

Prices may fluctuate substantially from week-to-week in rural markets depending upon the number of buyers attending from the large markets. It is not uncommon for producers with access to transportation to move their potatoes to a second rural market before receiving an acceptable price.

Potato wholesalers and retailers were given a hypothetical sales situation to determine their attitudes about profits and volume of sales. The problem and responses for retailers were:

Problems

> What would you prefer: 1) to sell 10 *cargas* of potatoes at a net profit of 30 *pesos* per carga, or 2) to sell 20 *cargas* of potatoes at a net profit of 15 *pesos* per *carga*?

Responses

	Supermarkets & Cooperatives	Tiendas	Plazas
1. 10 cargas - $ 30/carga	16.7%	17.4%	11.5%
2. 20 cargas - $15/carga	72.1%	71.0%	73.1%
They are the same	5.6%	10.2%	15.4%
No response	5.6%	1.4%	-
	100.0%	100.0%	100.0%

In both options the total net return would be equal. If interpretations of total net returns included all costs such as direct costs, and returns to capital and labor, the retailers should have selected neither option one nor option two if net returns were their only consideration. Thus, it might be concluded that they prefer higher volume for other reasons than net profit such as sales promotion and for attracting customers. It could also be concluded that they have not considered net returns in this manner and did not recognize that both situations were equal.

The problem for wholesalers was different in that the net returns from the two options were not equal. The problem and responses follow:

Problem

> What would you prefer: 1) to sell 10 tons of potatoes at a net profit of 200 pesos per ton, or 2) to sell 20 tons at a net profit of 150 pesos per ton?

Responses

1. 10 tons - $200/ton	12.9%
2. 20 tons - $150/ton	87.1%
	100.0%

In option one total net returns are 2,000 pesos and in option two total net returns are 3,000 pesos. Probably wholesalers did recognize that, even though price was higher in option one, total net returns were higher in option two. However, given the interest in higher volume in the retail analysis, possibly a similar interest holds for wholesalers.

Another series of questions concerning actual price setting practices were administered to retailers and wholesalers. The responses and questions appear in Table 59. The wholesalers who sell at prices lower than their competitors do so to increase profits but retailers desire to increase sales which may or may not increase profits. This substantiates the hypothesis that retailers may have prefered option two in the hypothetical problem on sales preferences because it attracted more clients. The supermarket-cooperative analysis in Table 57 indicated that possibly supermarkets and cooperatives follow the pattern of Carulla of lowering potato prices to attract customers. Retailers did believe that lower prices will generate increased profits but wholesalers were not in agreement.

Thus, pricing of potatoes by market participants deviates little from the general price situation. Some retailers can lower potato prices slightly to attract customers but loss leadering with potatoes is uncommon. Cooperation in buying and selling of potatoes is common for wholesalers, and storage is most common at the wholesale level.

Communication and Price Information

Information flows within the market system for potatoes are primarily by interpersonal communication and not by mass communication

Table 57 : Pricing Behavior of Potato Wholesalers and Retailers

Questions and response options	Wholesalers	Retailers		
		Tiendas	Plazas	Cooperatives & Supermarkets
		(percent)		
How do your sales prices usually compare with those of your competitors?				
Higher	1.6	-	-	-
The same	83.9	73.9	53.8	22.2
Lower	14.5	21.7	38.5	72.2
No response	-	4.4	7.7	5.6
Total	100.0	100.0	100.0	100.0
Why are your prices lower? (only those with lower response above)		(percent)		
To increase profits	72.0	22.0	-	-
To increase sales	28.0	78.0	100.0	100.0
	100.0	100.0	100.0	100.0
If you would lower your prices would you increase your profit?		(percent)		
Yes	11.3	62.4	42.3	66.7
Don't know	20.9	22.7	23.1	22.2
No	67.8	15.9	34.6	11.1
	100.0	100.0	100.0	100.0
Why don't you lower price below your competitors more often?				
Purchase price is too high	11.3	55.1	42.3	22.2
Other competitors would not like it	11.3	4.4	7.7	-
Costs are too high	21.0	7.2	3.8	-
Prices are already too low	17.6	33.3	46.2	61.1
No response	33.8	-	-	16.7
	100.0	100.0	100.0	100.0

Source: ICA Potato Marketing Survey of Wholesalers and Retailers, 1968

methods. A recent study oriented to production and marketing problems for producers of 14 agricultural commodities including potatoes revealed that 70% of communication about market prices was interpersonal (Table 58).

In none of the interviews at any level within the potato marketing system did radio, newspapers or other forms of mass communication appear as important information sources (Table 59). IDEMA, the primary

Table 58 : Price Information Sources for 14 Commodities Produced by Colombian Campesinos

Sources	Percent
Interpersonal Communication:	
Other Producers	34.4
Truckers	19.6
Middlemen	9.6
Miscellaneous	6.3
Total	69.9
Mass Communication:	
Public and Private Institutions	9.4
Radio	7.3
Association Publications	7.1
Daily Newspapers	6.3
Total	30.1
Total	100.0

Source: Andrew, Heath, Mathews and Samper, Problemas de Producción y Mercadeo del Campesino Colombiano: Un Estudio Preliminar, ICA Departamento de Economía Agrícola, Septiembre de 1969.

Table 59 : Information Sources for Potato Market Participants (percent for each source)

Sources	Boyacá	Cundinamarca	Nariño
Producers - Price information:			
Personal visits	83.7	85.5	64.0
Neighbors	-	9.1	5.1
Buyers	-	3.6	10.3
Radio	-	-	-
Friends in the pueblo plaza	-	-	2.6
Truckers	-	-	2.6
There is not a reliable information source	3.2	-	2.6
No response	13.1	1.8	12.8
	100.0	100.0	100.0

Wholesalers -

Information for expanding business:		Information about prices:	
Consumer desires	37.9	Personal observation	76.1
Family and friends	30.3	Other wholesalers	19.5
Other wholesalers	19.6	Other	4.4
Mass media	10.6		100.0
Government agencies	1.6		
	100.0		

Retailers - Price information sources:			
Wholesalers	48.6	64.1	61.8
Personal observations	45.7	30.8	19.0
Other retailers	5.7	5.1	9.6
A price leader	-	-	4.8
Other	-	-	4.8
	100.0	100.0	100.0

Truckers - Price information:		**Consumers** - Market information:	
Friends in the plazas	47.6	Personal observations	98.0
Wholesalers	26.4	Other maids	1.0
Other truckers	21.8	Friends	0.5
IDEMA	0.1	Neighbors	0.5
Other	4.1		
	100.0		100.0

Source: ICA Potato Marketing Surveys of Producers, Wholesalers, Retailers and Consumers, 1968

governmental agency working with price information did not appear as a significant price information source. This is probably due to a very narrow distribution of the IDEMA price lists. Both potato truckers and retailers cited wholesalers as important sources of price information which emphasizes the key role of wholesalers in price communication.

Word-of-mouth communication is the primary means of distributing market information. Obtaining prices from several buyers and sellers is important in a system where no general price information is available.. Most producers have more than one alternative buyer but 4.9% of the wholesalers indicated that their suppliers sold to them because the specific wholesaler was their only buyer. Of the retailers, 75% obtain information from two or more suppliers before purchasing potatoes.

But there is no substitute for a functional market information system; 34% of the wholesalers and 76% of the retailers said that the lack of price information reduced their profits; and 89% of the consumers agreed that an improved information system for consumers and other market participants is needed. Lack of market information accompanies the poor system of grades and standards.

Grading and Standardization

Potato grading and specific standards are not well defined, or applied at any level in production and distribution of potatoes. However, 87% of the producers said that they field-graded potatoes before selling them. None of these producers employed mechanical

graders, instead, the workers graded the potatoes by removing damaged or spoiled tubers during harvest.

Grading is not common at the wholesale level. A small number of modern wholesalers (contrary to traditional wholesalers who only buy and sell potatoes) sort, wash and bag potatoes in several sizes of small bags which represent 12.3% of the commercial flow of potatoes (Figure 6). Only 17.7% of the traditional wholesalers sorted an average of 13.2% of their sales but only 1.7% of the commercial flow. Thus, a total of only 14% of the commercial potato flow is sorted at the wholesale level.

Most retailers, except the Carulla supermarket chain, do not sort potatoes. Consumers in their selection from produce counters, from stall shelves, and from bulto bags perform the sorting. Only 5% of the consumers indicated that they purchased potatoes that were previously washed, sorted and bagged.

Both retailers and wholesalers were asked if they had refused to buy low quality potatoes and how they disposed of low quality potatoes (Table 60). Wholesalers can sell almost all of their low quality potatoes either at normal prices or at a discount. Retailers however, usually cannot sell low quality potatoes at normal prices. Of the lower quality potatoes not sold at any price, three-fifths are thrown away, some of which are taken from the garbage to be consumed by the very poor families, one-fifth are used in the retailers home at an added expense for preparation, and one-fifth are given away.

Even though grading of potatoes is not a common practice within the distribution system, all potato market participants

Table 60 : Wholesaler and Retailer Purchase and Sale Practices Regarding Low Quality Potatoes

Questions	Responses	Wholesalers	Retailers
		(percent)	
Did you refuse to buy potatoes of low quality last year?	1. Yes	71.0	36.4
	2. Sometimes	8.0	6.3
	3. No	21.0	57.3
		100.0	100.0
What part of prospective purchases did you refuse for that reason?		27.9	22.1
Do you pay less for low quality potatoes?	1. Yes	95.2	32.6
	2. Sometimes	3.2	66.5
	3. No	1.6	0.9
		100.0	100.0
Do you sell low quality potatoes at normal prices?	1. Yes	62.9	28.3
	2. Sometimes	4.8	-
	3. No	32.3	71.7
		100.0	100.0

Source : ICA Potato Marketing Survey of Wholesalers and Retailers, 1968

differentiate quality in potato purchases and sales (Table 61).

Truckers and processors were asked only to indicate the most important quality considerations and those do not appear in Table 61. Processor purchases are based upon variety, size and cleanliness but not upon color. Five of eighteen interviewed used all three criteria s six used variety and size, three used only variety, one used only

Table 61 : Classification Practices of Potato Market Participants in Purchases and Sales Including the Percent Using Each Practice and the Relative Importance of Each Practice

Practice	Using	Rank[a]	Using	Rank	Using	Rank	Using	Rank	
Damage	95.2	26.5	79.0	21.0	83.2	33.7	99.5	51.1	33.1
Variety	89.6	20.3	80.6	22.6	77.9	22.6	88.8	21.1	21.6
Age and freshness	37.6	4.1	75.8	11.3	53.2	7.2	79.7	3.9	6.6
Form and roundness	49.6	6.8	74.2	12.9	43.4	5.2	77.7	1.0	6.5
Size	94.4	36.4	66.1	20.9	64.6	26.1	82.7	22.6	26.5
Color	43.2	5.9	75.8	11.3	48.6	5.2	26.9	0.3	5.7
Total		100.0		100.0		100.0		100.0	100.0

[a] Rank or importance of the practice refers to a combined percentage figure taken from the two most common practices used by any given participant.

Source: ICA Potato Marketing Survey of Producers, Wholesalers, Retailers and Consumers, 1968

cleanliness and two did not respond. Thus, variety was used as a buying characteristic by fourteen processors. For truckers 86.0% indicated size, 10.8% indicated variety and 1.7% indicated age as criteria for potato purchases.

Wholesalers are less interested in damaged potatoes as a purchase and sale criteria because they neither grade potatoes nor do they usually receive lower prices due to low quality (Table 60). Potatoes are usually not removed from the original bags at the wholesale level. Retailers and consumers show strong interest in damage. Of the total losses in the potato market system consumers absorb 17%, retailers 67%, and wholesalers 16%. The greatest amount of grading occurs at the time of the final exchange and the consumer is the grader. Retailers are residual bearers of damaged potatoes and where possible should be more demanding of wholesalers in regard to grading.

Both retailers and wholesalers emphasized age while producers and consumers did not because the former group holds potatoes longer and can realize storage losses. Contrary to some opinions, form and color are not important to consumers but variety does account for both form and color. Variety is important to all potato market participants when buying and selling. This factor indicates strong ties to traditional potato consumption habits in Colombia. Of course variety can be an indication of quality. Producers considered size important because their field grading primarily involves sizing and removal of excessively damaged potatoes. Producers also are aware of the lower price prevailing for large potatoes. Purace is large while Colombian consumers presently desire a medium sized or

participants when buying and selling. This factor indicates strong [illegible] preferences in Victoria. Of course both form and color. Variety is important to all potato market and consumers did not because the former group holds potatoes longer and can realize storage losses. Contrary to some opinions, form and color are not important to consumers but variety does account for

Both retailers and wholesalers emphasized age while producers in regard to grading.

potatoes and where possible should be more demanding of wholesalers demand. Of the retail stores in the Ontario market system consumers absorb 17%, retailers 81%, and wholesalers 18%. The greatest amount of grading occurs at the time of the final exchange and the consumer is the grader. Retailers are residual bearers of damaged

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indicated size, 10.8% indicated variety and 1.7% indicated age as buying characteristic by fertilizer processors. For truckers 86.0% did mailings and two did not respond. Thus, variety was used as a

small potato because most preparation techniques include boiling whole potatoes which is difficult with a large potato.

Summary

Price instability was the major marketing problem for nearly all potato market participants. Both seasonal and cyclical price fluctuations contribute to the problem. Storage while most common at the wholesale level is not of sufficient capacity to substantially dampen seasonal price fluctuations. Major problems influencing private decisions about storage, particularly for wholesalers, include spoilage, lack of credit, price instability and the anti-speculation law.

Potato distributors and processors have not had access to sufficient credit and liquid capital to improve their businesses and augment their income earning capacities. Interest rates are high, averaging between 20% and 30% on the open market, and the supply of credit is limited for distributors and processors.

Credit sales and purchases of potatoes were common at all levels within the exchange system. Potato prices are sometimes influenced by price discounts and price differentials for credit sales. While interest was not charged on credit sales, the price differentials were quite costly.

Coordination in the potato distribution system is not as effective as it might be. The price spread between producers and consumers is about 40% of the consumer price. This wide price spread is influenced by: high losses created throughout

the system but absorbed at the retail level; excessive handling and backhauling of potatoes; a general lack of market communication, grading systems and standards; and a lack of vertical coordination by forward purchase and sale agreements.

CHAPTER VI

POLICY CONSIDERATIONS AND PERFORMANCE IN THE POTATO PRODUCTION - DISTRIBUTION SYSTEM

> "An understanding of a public economic policy must begin with an understanding of the basic values that people hold regarding the issue . . . By comparing where we are with where people want to be, we can get some idea of the distance involved in getting there . . ."[81]

A discussion of Colombian agricultural policy as it affects or is affected by the potato P-D system must commence with some basic considerations. General goals for Colombia's economic development and specific goals for the potato P-D system will be stated, performance will be discussed and recommendations for improved performance will be made. Basic to these goals, however, are desires of individuals, families, communities, interest groups and the public.

To differentiate among the values and beliefs underlying goals, the goals themselves, and the means to goal attainment is difficult but critical to formulating successful agricultural programs. Most Colombians value a "better life" including more consumer durables prestige, power and numerous other somewhat intangible but important "wants". The goals for economic development such as per capita income growth may implicitly reflect these values. How well the political

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[81] Dale E. Hathaway, Government and Agriculture, Public Policy in a Democratic Society, The MacMillan Co., New York; Collier - MacMillan Ltd., London 1963, p xiii.

economy approaches goal achievement is a judgement or belief that differs as widely among individuals and groups as the specific values themselves.

General economic development goals for Colombia including gross product growth, full employment of labor, rising levels of productivity and less concentration in distribution of income, must be considered in evaluating the performance of the potato P-D system and related policy considerations. More specific potato P-D system goals include: improved resource use at the firm, industry and national levels; technological progress to augment potato production; equity of income distribution; reduction of price instability; and improved coordination of the P-D system to facilitate transmission of consumer demands through the distribution system to producers.

The means to achieving these goals are numerous and sometimes conflicting. The following questions illustrate this issue: What improved methods of production and market coordination can better allocate resources and reduce seasonal price fluctuations? How may vertical coordination be improved by sales agreements, improved market information systems, improved grades and standards, and storage programs? Can the economic goal for higher productivity and realization of cost efficiencies be attained along with the desire for full employment of labor and equity of income distribution?

The problem at hand is to identify means or policies to achieve these goals most effectively and to contemplate the consequences of over-emphasizing some goals at the expense of others. Fletcher and Merrill illustrate this problem by stating:

> . . . the way in which a goal is achieved can easily affect the degree to which other goals can be achieved . . . Unfortunately, it is always difficult and sometimes impossible to choose policy instruments which contribute simultaneously to specified national objectives and to agricultural development.[82]

The following discussion attempts to explain how credit policies, price and storage policies, communication policies, and programs of research and development can best coordinate and stimulate improved performance in the potato P-D system as an important subsector of the agricultural sector and the national economy.

The Supply and Demand Situation for Potatoes

Potatoes are an important staple in the diets of many Colombians. Reluctance by many consumers to change to new potato varieties and preparation techniques is partly due to habit. But this reluctance also indicates a strong desire of many Colombians to maintain potatoes in their diets. As per capita incomes rise, consumption of potatoes will change. For those consumers with extremely low incomes who now consume substitutes of inferior quality to potatoes, consumption will rise. Later as per capita incomes rise further, this group may substitute foods that are superior to potatoes.

Potatoes in Colombia must compete with several good consumer substitutes such as yuca and plátano. The future demand for potatoes

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[82] Lehman B. Fletcher and William C. Merrill, "Prospects for Agricultural Development: Objectives, Policies and Priorities", in Latin American Agricultural Development Policies, by Lehman B. Fletcher and William C. Merrill, International Studies in Economics, Monograph No. 8, Department of Economics, Iowa State University, Ames Iowa, September 1968, p. 87.

may also be affected by more competition from corn and possibly rice because these starchy substitutes may be nearing a production breakthrough due to increased emphasis upon use of improved and internationally proven varieties.

Potato chips also have to compete with close substitutes. Chipping of plátano and yuca is comparable to potato chipping and often one firm chips all three products. Unless potato chip quality can be improved significantly and prices maintained or lowered, potato chips probably will not absorb an increased share of the "chip" market.[83] Potato processing, other than chipping, has not been developed mainly due to a low demand for processed foods. Until incomes improve and food habits change, this market will not expand significantly. Preparation for a modern processed potato market however, should be considered by ICA production specialists. The Monserrate variety developed by ICA is excellent for potato chipping but at present production is very limited.

Projected demand requirements for potatoes presented in Table 62 are higher than those calculated by INCORA.[84] The demand estimates

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[83] Kellogg's is now planning to enter potato chip processing in Bogotá where they plan to produce a chip with U.S. quality. They do not feel that prices can be lowered significantly but there is a market for improved quality at current prices.

[84] INCORA "Informe de Actividades en 1963" Annex B, No. 8 1963. An annual 3.15% rate of population growth and an accumulated annual rates of income change at 2.75% in the 1960's and 3% in the 1970's were used. Total population would be 28 million by 1980. This study indicated that consumption was 653 thousand tons in 1960 (based on IDEMA data), that consumption would require 986 thousand tons in 1970 and 1.47 million tons in 1980. Based on these estimates the average annual rate of growth demanded of potato production is about 5%. This estimation technique was based upon data previously explained as the potatoes for urban consumption. The estimate may not be accurate because 1) the estimated rate of population growth may be low, and 2) the rate of growth in urban population should be used if the basis for demand estimates only includes urban consumption in 1960.

in Table 62 only include consumption requirements. To these, seed

Table 62 : Demand Projections for Potatoes in Colombia in 1970, 1975 and 1980[a]

Year	Urban Demand	Rural Demand	Total Demand
	(thousands of tons)		
Base (1964-66)	796	330	1126
1967	897 - 902	345 - 347	1242 - 1249
1968	952 - 960	353 - 356	1305 - 1316
1969	1010 - 1022	361 - 365	1371 - 1387
1970	1072 - 1088	369 - 374	1441 - 1462
1971	1138 - 1150	377 - 384	1515 - 1534
1972	1208 - 1224	385 - 394	1593 - 1618
1973	1282 - 1303	394 - 404	1676 - 1707
1974	1360 - 1387	403 - 414	1763 - 1801
1975	1443 - 1477	412 - 424	1855 - 1901
1976	1625 - 1674	430 - 446	2055 - 2120
1978	1725 - 1782	440 - 457	2165 - 2239
1979	1831 - 1897	450 - 469	2281 - 2366
1980	1943 - 2019	460 - 481	2403 - 2500

Source : This analysis is based on the equation discussed in Chapter I page 10 where : $D = P_r + E_i (N)$ is the rate of increase in demand; Population growth rate (P_r) = 5.8% (urban) and 1.9% (rural) based on the discussion of rates of population growth in Chapter I, page 4. Income elasticity of demand for potatoes (E_i) = .33 based on DANE data used in the INCORA study (This elasticity may increse slightly as incomes rise and then fall latter as discussed on page 67 so it is assumed to be constant because those changes cannot be projected with assurance); Rate of change in incomes per capita (N) = 1.0 to 2.0 because estimates vary between these ranges. The latter is optimistic while the former most closely represents the growth rate since the early 1950's. It was assumed that IDEMA data include the urban consumption estimate (Appendix II, Table II-1) and the average for 1964, 1965 and 1966 was used as the base because the 1967 and 1968 figures were estimates. Then from Table 12 rural consumption is 41.5% of urban consumption which provided the rural consumption base. From that point urban and rural consumption estimates diverge because of the population variable.

requirements should be added. Thus, to meet demand at the same real price for potatoes, production for rural and urban consumption in 1980 must be from 113% to 122% greater than the 1964-1966 base level. Production passing through commercial channels to urban areas must be from 144% to 154% greater in 1980 than the 1964-1966 base, placing more stress on the distribution system than on production.

Should these demands be met without extending land areas planted, per hectare yields must rise substantially. If 174,000 hectares are harvested in 1980, or equal to the 1964-1966 average, national yields per hectare must rise from 7.2 tons to at least 13.8 tons in order to meet the demand projections. This required change in yields per hectare is 55% of the 25 ton yields indicated as possible by the ICA experiment station for improved Parda Pastusa seed. If Purace were used, with ICA yields of 40 tons per hectare, the goal might be more easily met but this would require improved seeding practices adoption of the variety by producers, and acceptance of the new potatoes by consumers. At present yields, hectares planted would need to more than double to meet projected demands for 1980.

Reduction of losses in the production and marketing system can assist in meeting demand requirements. If production and distribution losses are reduced by one half, total supply will increase by nearly 7%. Too, irrigation and effective use of pesticides could reduce losses between planting and harvest.

Economic and Social Considerations

Augmenting gross product, food production per capita and incomes per capita, while difficult for Colombia, are an easier task than achieving full employment of labor and equity of income distribution.

Food P-D system efficiency goals conflict with the equity and employment goals. A relative decline in potato prices will result from improved yields, greater production efficiencies and greater distribution efficiencies. These economic efficiencies lower costs and raise production per capita, resulting in lowered consumer prices. If these efficiencies cannot be accomplished by small campesino producers and small urban distributors, they will need to find a position elsewhere in the economy. This raises a very difficult problem where surplus, unskilled labor prevails. Rising unemployment probably does not help achieve the goal of equity in income distribution.

Volume of Employment

If displacement of the small firms who produce and distribute potatoes is forthcoming, what magnitudes of unemployment or displacement to other employment opportunities are at stake? Some quick estimates of employment in potato production and distribution as only one commodity example, indicate that the problem should not be overlooked. It is not small. It will not go away. The essence of successful economic development necessarily requires successful programs to provide opportunities for the "people left behind".

Based upon the methodology presented in Appendix IV, an estimate of employment in potato production and distribution is presented in Table 63. About 370,000 or 3.7% of the population over age 15, are involved either part-time or full-time in potato production and distribution. The total farm employment statistic, while a minimum because it is based upon the 1960 census, is the most accurate of the data presented in Table 63. It however, does not represent full-time

Table 63 : Employment in Potato Production and Distribution in Colombia

Production (part to full-time employees):		
Producers	108,000	
Family employees	151,200	
Non family employees	101,500	
Total		360,700
Wholesaling (full time employees):		
Wholesalers	500	
Employees	715	
Total		1,265
Processing (full time employees):		
Transfer (man years) :		
Transportation	1,538	
Carriers (urban and rural)	1,154	
Plus 20% underemployment[a]	536	
Total		3,218
Retailing (man years) :		
Plaza	1,535	
Tiendas	2,404	
Cooperatives and Supermarkets	148	
Plus 20% underemployment[a]	817	
Total		4,904
TOTAL		370,417

[a]Since man year estimates are used and full employment for any given worker is uncommon an average underemployment estimate of 20% based upon Table IV-1 in Appendix IV is used.

Source : ICA Potato Marketing Survey, 1968 and 1969

employment in potato production because most of the farmers are also engaged in other farm enterprises.

The employment estimates for potato wholesaling, plaza retailing and to some extent tienda retailing may be significantly under-estimated. Disguised unemployment, yet financial dependence upon the food wholesaling and retailing function, is common. Usually these people are carriers or street venders but are not fully employed. The 20% underemployment figure and the man year estimate both may be low.

Some possible decreases in employment by the potato P-D system in a commercialized subsector capable of attaining the desired levels of efficiency and progress, can be estimated. Let us assume that the change is immediate; we need not assume complete commercialization. Possibly 75% of the present farms would not produce potatoes under commercial conditions.[85]

Also, due to commercialization family and non-family employees in potato production could decline by 75%. Based upon the present data this would leave about 27,000 farmers and 63,200 employees in potato production and about 270,500 displaced potato farmers or laborers with reduced incomes. Assume that improved coordination in the distribution system absorbs all present employees in a more efficient and expanded processing, grading and general quality and service improvement system.

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85 This is an estimate based upon the number of farms with less than one hectare who will find mechanization difficult and may or may not be able to compete with the cost efficiencies of modern potato farming. About 88% of the farms probably would find tractor mechanization difficult (Chapter IV). Mechanization alone, however, probably does not imply significant decreases in production costs but when mechanization is combined with improved seed and production practices, costs may decline. Thus displacement is assumed to be less than 88% and 75% is used.

The problem is one of employment for the unskilled, low income rural potato farmers who may seek improved incomes in urban areas because of limited alternatives to potato production. He may be a near-subsistence producer but he still depends upon the sale of a few potatoes to provide cash for purchasing some essentials from the market economy. And for potato production, he must at least purchase pesticides or his chances of complete crop failure are substantial. He is not and cannot be isolated from the market economy.

Distribution of Income

While the previous section was hypothetical and less than definitive, it presents the major macro socio-economic problem when a program of agricultural commercialization is promoted. Displacement of rural people, where urban society is neither able nor ready to absorb them and where the people are incapable of entering a skilled worker economy, suppresses economic growth. It is true that lower food prices stimulate the urban economy. But someone must have money to buy increased supplies of food or insufficient effective demand will force prices too low to sustain agricultural development. It is also true that a growing urban economy needs the potential effective demand stimulus of both the urban and rural poor.

Potato farmers are not unique in their plight. The estimates of possible displacement in the previous section were very conservative. Lauchlin Currie suggested that in 1960, to produce 653,800 tons of potatoes only 242 farms with an "optimal" size of 50 hectares would

have been needed.[86] Adjusted to total production of one million tons the number of farms required would be only 375 which is substantially less than the estimate of 27,000 in the previous section. Currie, by indicating "optimal" sized farms, suggests that the number of farms in Colombia could be reduced, from 786,000 to 105,000 without cutting total food production. The optimal unit is not well explained and is not realistic except as an extreme example of the impact of modern farming. He goes on to say that "the purpose of these calculations is to call forcibly to the attention of the reader the magnitude of the shifts desirable if the benefits of modern technology in agriculture are to be obtained" ... and "that any policy of restraining movement out of agriculture is self-defeating".[87]

A policy of restraining movement out of agriculture, however, is not self-defeating if it is properly developed. It would be self-defeating if all the displaced rural families can find comparable or better employment, incomes, housing and educational opportunities in urban centers. Just the traditional semi-unemployed, extremely low income jobs will not provide the necessary funds to educate and train children for gainful employment in a developing economy. Migrant families must attain income levels sufficiently above subsistance levels to purchase goods from the modernizing industrial and agricultural complex and to educate their children if the movement out of agriculture is to be beneficial to economic development. Employment

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86 Op. Cit., p. 180.

87 Ibid., p. 181.

opportunities in Colombia's urban centers are very limited for the unskilled rural migrants. Where jobs are available, salaries are extremely low.

Rural population, which is now just less than 50% of the total Colombian population, could decline to 35% by 1980. This release of population to urban centers, where unemployment rates average 20% (Table IV-1, Appendix IV), disguised unemployment is also high, and incomes are exceedingly low for at least 50% of the urban population will not be condusive to development. In 1966, Enrique Peñalosa, now Minister of Agriculture, said that one million new jobs were needed for displaced rural workers and that the figure would be two million by 1970.[88] Probably his projection is not unreasonable. By 1980, the figure will possibly rise to five million and at the same time more urban people will be searching for work.

Thus, developments within the food P-D system that create cost efficiences and augment total production may also displace rural laborers. A result is rural-to-urban migration and job opportunities are nearly nonexistant for the unskilled and poorly educated migrant. He faces severe income problems making the goal of equity of income distribution very difficult to attain. Equity is not simply a humanitarian goal; income distribution can either stimulate or hamper economic development. If the urban and rural poor can receive some of the income benefits of gross product growth they will buy more food, clothing, housing and consumer durables from the agricultural

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88 Ibid.

industrial and service sectors. When the impoverished can present an effective demand for products of the developing economy, a stimulus for further economic development can be harnassed. But when employment opportunites are lacking and skilled human resources must be trained, the goal of increased production by means of economic efficiencies that displace labor needs careful consideration. The goal is important but the means to achievement must also consider other goals.

Credit Policy

The supply of loanable funds made available to agricultural producers by the Colombian government has grown rapidly. A major problem is not in availability but in allocation of these funds to competing uses. Credit can be a stimulus to increased production and coordinated distribution systems for food. Considerations necessary for promoting wise resource use and economic growth include credit allocations among and within regions, economic sectors, subsectors (commodity classes) and firms.

In Nariño, the supply of Caja Agraria credit for potato producers has risen rapidly along with total potato production (Table 64). The rapid increase in output cannot be attributed to credit alone but without credit it would have been considerably retarded. It appears that credit policy has helped achieve the goal of increased total potato production by extending land areas planted and by use of purchased inputs.

Until recently, little thought had been given to providing credit for farm supply industry development and for improved food

Table 64 : Changes in Caja Agraria Potato Loans to Potato Producers and Changes in Total Production for Nariño, Cundinamarca and Boyacá

	Boyacá & Cundinamarca	Nariño
	1960-63 to 1964-66	1960-63 to 1964-66
	(percent)	
Change in average deflated loan value	54.8	98.7
Change in number of loans	64.4	247.5
Potatoes as proportion of loans	37.7 to 35.5	19.4 to 29.3
Change in total production	6.3[a] 21.3[b]	16.8[a] 77.1[b]

[a] Caja Agraria, Appendix II, Table II-2.

[b] IDEMA, Appendix II, Table II-5.

Source: Caja Agraria, Appendix V

distribution and processing. No loans from the subsidized credit programs have been granted to potato distributors and processors. Annual interest rates on the open market range from 20% to 30% while Caja Agraria usually charges about 12%. Caja Agraria and its funding sources are now planning a credit program for small rural industry development to begin in 1970.[89] This could include

[89] "Carta Agraria" op.cit., p. 32.

both farm supply industries and small processing firms.

Loans to potato producers have assumed an increasing share of all loans to agricultural producers. Credit to crops that are substitutes in consumption (beans, corn, rice, plátano, and yuca) expanded more rapidly than for potatoes but credit to crops that are substitutes in production (wheat and barley) expanded less rapidly (Table 30, p. 117). There may be reason to question this policy from the potato subsector point of view. If the loans to substitutes for potatoes in consumption augment yields and lower prices, potato prices may also decline. Yet credit for potato producers to move into production of substitute crops has declined as a proportion of all loans.

The Caja Agraria supervised credit program for potato producers has emphasized use of some purchased inputs, particularly fertilizer and pesticides. The availability of credit to a particular producer has not been stringently tied to use of improved practices.

Attempts have been made to reduce major cyclical price swings by adjusting aggregate loans granted to the potato producers. This important task is difficult because 1) total production is dictated by both economic and natural factors and 2) Caja Agraria can only suggest changes in producer practices while using credit as an influential factor but this does not necessarily force change in producer plantings. Little thought has been given to using credit policy to reduce seasonal production fluctuations. At present, credit policy provides one of the most important potential means of reducing price instability.

Price and Storage Policies

There are no price supports for the potato subsector. As a part of this study, potato producers were asked to specify a price that, if supported by IDEMA, would cover costs plus a "fair" return. Then they were asked if they would participate in the program and if so how many more hectares would they plant (Table 65). The ideal prices desired were very high, averaging about 60 pesos per carga above average 1968 prices. But the average expected increase in hectares planted under

Table 65 : Producer Desires to Participate in a Price Support Program

	Boyacá	Cundinamarca	Nariño
Desired price per carga (pesos)	112.75	109.83	86.92
Average price for 1968 per carga (pesos)	52.73[a]	52.73[a]	27.38[b]
Desire to participate (percent)	67.7	87.3	76.9
Increase in fanegadas planted if price were supported (percent)	12.5	24.4	21.0

[a] Bogotá price

[b] Pasto price

Source: ICA Potato Marketing Survey of Producers, 1968

a price support program probably represents a minimum estimate. This level of across-the-board increases in plantings, however, would result in lower prices and raise costs to the government. A government storage program would not be so costly except where storage losses are

excessive. Contrary to stockpiling grains, potatoes have a short storage life so a price support program requiring long term storage would be impossible except for processed potatoes. Producers however, said they would participate even though they did not show enthusiasm for the present storage activities of the government.

Some argue that more government potato storage will solve the price instability problem. Several feasibility studies call for large storage facilities without regard to alternative or complementary solutions.[90] [91] The present government storage facilities probably operate at less than 50% of capacity. They are relatively new and due to ventilation problems, maintenance of quality is difficult.

Possible alternatives to storage such as processing and irrigation to reduce seasonality of production have not been thoroughly investigated. To accept the statement that "because of the stability of consumer tastes, it seems unlikely that processed potatoes would ever represent more than a small fraction of total potato consumption,"[92] seems premature.

Often the feasibility studies calling for more large governmentally operated potato warehouses have not investigated other means

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90 Weitz-Hettelsater, Marketing and Storage Facilities for Grain and Tubers Crops, Weitz-Hettelsater Engineers, A division of the Weitz Co. Inc., Kansas City, Missouri, August 1965, pp. 137-166.

91 The University of Southern California, A Systems Analysis of Farm-to-Market Food Losses in the Area of Bogotá, Colombia, A Report of the Interdisciplinary Seminar for International Development, January 1968.

92 Ibid. p. 80.

of storing potatoes. Possibly the more efficient method is to promote private storage among producers and wholesalers where private incentives may be brought to bear on reduction of in-storage losses. If longer term credit were extended to producers they might leave the potatoes in the ground up to two months longer before harvesting where climatic conditions would permit. Limited on-farm storage does not require elaborate facilities for up to one month after harvest except in warm climates.

Information Responsibilities and Policies

Improved systems of technical production information and assistance, price information, and grades and standards are potential means to improving performance in the potato P-D system. The price collection work now underway by IDEMA is a beginning for a market information program. ICA and IDEMA are cooperating in an evaluation of the present collection methods to formulate a program for improved collection and timely dissemination of price information. A major problem in this evaluation is one of determining effective product classifications and grades on which to base price information.

Dissemination of technical information to the potato P-D system has been limited to a small group of producers. Caja Agraria is a major institutional source of information for producers (Table 23) but often its rural offices do not have good access to the available supply of technical knowledge. An ICA extension program is being developed to provide an information source for producers. Within manpower limitations, the National Potato Program at ICA has worked in extension.

Given the ICA extension structure and the well developed and widely distributed offices of Caja Agraria, the problems related to disseminating information may be solved.[93] Still to be solved, however, are the problems related to content of information flows. Adaptability of ICA research to applied producer problems needs further attention. Those practices best suited to stimulating modernization and improved producer incomes probably differ between regions, areas within regions and sizes of farms. Maximum producer returns will be achieved by different input combinations for different producers.

Technical assistance for potato distributors is less developed than are programs for producers. Organized marketing by producers is uncommon. No formal attempts have been made to introduce improved storage practices in wholesaling. Use of sprout inhibitors, while available for over ten years, is not common and nearly 50% of the wholesalers were not aware of this method of reducing storage losses. Technical assistance for potato chip processors is also nearly non-existant.

The lack of well organized extension programs for agricultural producers and the lack of comprehensive market research and extension programs for both producers and distributors of farms supplies and food contribute to two problems. First, higher yields, loss reductions and improved quality have not attained potentials within the food P-D system even when some research information has been available. The channels for disseminating knowledge either have not existed or have

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93 See Chapter III for a review of activities of ICA and the Caja Agraria.

functioned poorly. Second, technical research scientists and governmental policy makers have not been able to understand management and marketing problems of firms and individuals. There have been no formal channels for relating consumer, distributor and producer desires to public research and action agencies. Informality in the feed-back of information has not been conducive to adoption of new varieties and improved planting practices because too often research and action programs have not considered socio-economic phenomena.

A lengthy and interesting debate began in the late 1950's and early 1960's between Rural Sociologists and Agricultural Economists over the causes of hybrid seed corn and hybrid sorghum adoption in the United States. Both groups were discussing an interdependent problem, not an either-or issue.[94] Adoption or discontinuance of improved varieties and practices in potato production in Colombia probably involves both congruence (a social interaction effect where adoption follows an opinion leader or successful farmer without economic considerations) and profitability of the adopted practice or variety. Purace potatoes will yield more cargas per hectare

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[94] See, Bruce Ryan and Neal C. Gross, "The Diffusion of Hybrid Seed Corn in Two Iowa Communities", Rural Sociology. Vol. 8, No. 1 March 1943; Lowell Brandner, and Morray A. Straus, "Congruence Versus Profitability in the Diffusion of Hybrid Sorgum", Rural Sociology, Vol 25, No. 4 December 1959, Zvi Griliches, "Research Costs and Social Return: Hybrid Corn and Related Innovation", Journal of Political Economy, Vol LXVI No. 5 October 1958 and "Hybrid Corn: An Exploration in the Economics of Technological Change", Econometrica Journal of the Econometric Society. Vol 25, No. 4 October 1957; and Eugene A. Havens and Everett M. Rogers, "Adoption of Hybrid Corn: Profitability and the Interaction Effect", Rural Sociology, Vol 26 No. 4, December 1961.

than other improved and unimproved varieties in Colombia. Prices for Purace, however, average 20% to 30% less than Parda Pastusa prices. Based upon the survey not all producers can attain sufficiently higher yields to offset the lower price.

Thus, price and returns, along with tradition-oriented practices, limit adoption of improved varieties. In potato production and distribution, where formal market information is unavailable, social interaction and interpersonal communication are major forms of information with price and profitability providing a basis for communication. These are the information feed back mechanisms needing attention by research and action agencies.

Finally, a critical but misunderstood and unstudied area in the science of communication is that of inter-institutional communication. Administrators of agriculturally related agencies and institutions have meetings and communicate their problems but the professionals with basic research, extension and development assignments do not communicate effectively. A program of credit includes adoption of only some improved practices and those supervising loans may not know about the research results at the experiment stations. The institutions working with market problems also are not coordinated with the credit and research agencies. Any attempt to resolve problems for a commodity gropp such as potato producers and distributors calls for coordination of efforts by public and private institutions.

Research and Development

A research and development program to improve coordination and performance of the potato production-distribution system in Colombia must begin with an understanding of goals for the system, the agricultural economy and the country. The interpretation of goals will differ between commodity groups. In potato production, characterized by many small campesino producers, the impact of a policy seeking rapid commercialization will cause greater displacement than in a subsector such as barley where small producers are fewer in number. Hence, the allocation of technical assistance and credit among commodity groups, producers, distributors and processors requires further research.

To maintain economic growth, achieve higher levels of employment and less concentration in income distribution, Colombia must develop policies to deal with displacement by commercialized food production and distribution. These poeple must be incorporated into the economy to keep socio-economic stresses from becoming unmanagable. Research is needed to determine how best to utilize the displaced labor force either in rural or urban areas. The migration process is not well understood. One study indicates that migration is often a step-by-step process whereby campesinos move to small towns before finally reaching large urban centers.[95]

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[95] William Flinn, "The Process of Migration to a Shantytown in Bogotá, Colombia", LTC No. 53, The Land Tenure Center, University of Wisconsin, Madison, July 1968.

Research and development programs should investigate alternatives for small rural producers at the farm level, in small rural towns and finally in Bogotá. An improved small industry program in rural areas might absorb part of the migration flow before it reaches major cities where unemployment rates are at least 20%. The small industry credit program by Caja Agraria for rural areas is a step in this direction.[96]

Resettlement of campesinos has been one means of reducing displacement difficulties. Of all farms in Colombia in 1960, 3.8% were settlement farms and they occupied 12.1% of the total farm land.[97] Some of the colonos or "squatters" are now receiving land titles and where resettlement is directed by INCORA, the settlers are receiving land titles. Most of the settlers have moved because they did not have enough land or were tenants and share croppers who did not own land. Some moved between 1948 and 1960 because of rural violence. The INCORA supervised resettlement program, which began in 1961, is one solution to the displacement problem. It must be incorporated with other programs for small producers because it cannot absorb all of the displaced producers. While comprehensive, the INCORA program cannot move rapidly because providing supervised credit, developing extension programs, granting land titles, constructing roads and providing for general community development

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96 "Carta Agraria", op.cit., p. 32.

97 See Karl Wierrer, Economics of Improving Marketing Organization and Facilities to Accelerate Agricultural Development in Land Settlement Projects, Instituto Lationamericano de Mercadeo Agrícola, Bogotá, Colombia, September, 1967, pp. 13 & 20.

needs, are resource and time exhausting processes.

Research and development programs must adequately assess the potential displacement problem and consider numerous alternative or complementary policies to deal with the problem. Possible means include programs to retain campesinos on their present farms, programs of resettlement to other farming areas, programs of off-farm rural employment, training programs to prepare potential migrants for urban employment, and programs to expand urban employment.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A major goal of this research has been to illustrate the way in which market coordination influences economic growth and development in the Colombian potato production-distribution (P-D) system. Identifying general performance criteria and evaluating performance of the P-D system for potatoes, provide a basis for conclusions and recommendations to improve the system. Operational objectives of the research included a description of the potato subsector, a diagnostic investigation of interdependent problems in modernizing production and improving market coordination, and identification of methods for improving performance of the P-D system.

The research methodology included studies of market participants at all levels of activity between production and consumption. Personal interviews were taken from 1611 potato producer, distributors and consumers. The potato market participants included in the research were producers in Nariño, Cundinamarca and Boyacá, truckers entering and leaving Bogotá and Cali, wholesalers in Bogotá, potato chip processors in Bogotá and Cali, retailers (supermarkets, tiendas and plaza stalls) in Bogotá and consumers in Bogotá.

General Summary

A food P-D system includes the physical production system, the physical distribution system and the exchange system. By market coordination, the set of institutions forming the exchange system determine who produces, what products are produced, what resources are used, where products are produced and who consumes the products.

Market coordination thus includes the dynamic processes by which producers, distributors and consumers interact. The effectiveness of the food P-D system depends in part upon market coordination and the capacity of the exchange system to facilitate growth and development.

The role of agricultural distribution systems for inputs and products in economic development was an important concern throughout the research. The basis for the research program was that agricultural marketing systems are both facilitating and coordinating mechanisms and are necessary but not sufficient for agricultural development. The problem of development causality is one of interdependence. Numerous sets of inter-dependent growth mechanisms encompass agriculture and industry and the market system links those mechanisms and sectors.

The Potato P-D System:

1) Geographic conditions related to potato production and distribution have created regions of concentration in Colombian production and consumption. Transportation and communication systems have developed slowly because of extreme geographic diversities.

2) Farm production data from secondary sources to describe the P-D system vary substantially between sources. Probably Caja Agraria estimates include total production for rural consumption, urban consumption and seed supplies. The IDEMA data include primarily production for commercial sales. When Caja Agraria data are used and a reduction is made for seed requirements, average

annual per capita potato consumption for Colombia is about 56 kilograms. In Bogotá, 121 kilograms of potatoes are consumed annually per capita.

3) Potato farms are usually small with over 70% having less than one hectare and producing only 25% of total output, most of which is consumed in rural areas. Only 1.1% of the farms having no more than 10 hectares, produce 20% of total output.

4) Boyacá, Cundinamarca and Nariño, the departments included in this research, account for 32.9%, 36.7% and 7.7% respectively (77.3% in total) of total potato production in Colombia. The Bogotá market area including Boyacá and Cundinamarca, accounts for about 52% of national potato consumption. Of the potatoes entering the Bogotá market 29% are exported to consumers in warm climates indicating that Boyacá and Cundinamarca are surplus areas for potato production.

5) The distribution of total potato production is as follows: 40.2% urban consumption, 20.8% rural consumption, 17.0% seed, 12.1% harvest losses, 7.9% market system losses and 2.0% potato chip processing.

6) Seasonal price fluctuations are common due to two major harvest periods; the Año Grande (June through August) includes 60% of total production, and the Mitaca (January and February) includes 30% of total production and 10% of production is dispersed between these two harvests. Seasonal production is caused by dry season and frost conditions interrelated with a short seed supply problem for the Mitaca. Due to favorable prices, producers often sell seed for consumption that would have been planted for the Mitaca harvest.

7) Interdepartmental potato price differentials have changed

since 1955. Cali prices were higher than Bogotá prices but now are lower with Pasto prices always lowest. Since 1954 Bogotá prices have fluctuated significantly but relatively constant real average prices indicate no measurable increasing or decreasing price trend. Average real prices in Pasto and Cali have declined due to significant production increases in Nariño.

8) Based upon the consumer survey work, as annual incomes rise to about 14,000 pesos per capita, annual per capita potato consumption will rise and then decline as incomes rise beyond 14,000 pesos. Price change responses by consumers are affected by numerous close substitutes for potatoes. A hypothesis resulting from the research is that the short run demand curve is an "S" curve. Consumption responses to high prices are relatively inelastic then elastic over a range of prices at a medium level where susbstitutes in consumption are common, and finally at low prices the response is again inelastic. Thus, above a normal or average price, consumption will fluctuate substantially as price changes but at some minimum consumption level, price has little effect. For price decreases below the normal price consumption of potatoes increases only slightly.

9) Potatoes are usually prepared by boiling without peeling. Medium sized potatoes (3 to 6 centimeters in diameter) are desired which presently limits demand for large potatoes. Consumers prefer red or dark skinned potatoes even when specific white skinned varieties may be of better quality. Consumption of commercial potato chips is not common because consumers fry chips at home and either dislike commercial chips or consider the price to be excessive.

10) Most all firms in the potato subsector are small and atomistic competition is common in production and retailing. There are fewer wholesalers but large wholesalers are not common.

11) Several major institutions have responsibilities related to the potato P-D system: The Caja Agraria makes loans to producers and operates farm supply stores, the Instituto Colombiano Agropecuario performs production research and limited extension, the Instituto de Mercadeo Agrícola works primarily with pricing and storage, and the Asociación Colombiana de Cultivadores de Papa is a producer association designed to stimulate improved yields.

Problems in Modernizing Production:

1) Yields per hectare have changed very little over the past fifteen years. Production increases have been accomplished primarily by planting more hectares except for a few large farms that have applied improved seed. Adoption of modern inputs, except for improved seed and proper spacing of plants, however, has been fairly common. Availability of improved varieties and information about their use is a limiting factor. Most producers prefer high yields to amount of seed planted instead of high yields per hectare evidenced by low seeding rates per hectare and pride in a high seed: yield ratio. Larger farms use more improved seed and farms with 20 or more hectares of potatoes had yields exceeding the farms with less than 20 hectares by about one to two tons (about 10 to 20%) per hectare.

2) Mechanization of potato production is uncommon. Harvest losses due to hand harvesting average about 12.1%. Probably mechanized harvesting on lands where it would be possible would cut these losses

to about 5% for varieties that produce large tubers.

3) Lack of credit is not considered to be a major problem by producers. Loan numbers and average size of loans (based on real peso values) have increased in Boyacá, Cundinamarca and Nariño since 1960. Nariño's credit for potato producers has increased most rapidly which has helped to augment total potato production in Nariño.

4) Loans by Caja Agraria to producers of crops (plátano, yuca, rice, corn and beans) that substitute for potatoes in consumption have grown more rapidly than loans to potato producers. But loans to producers of wheat and barley which substitute for potatoes in production have grown less rapidly than loans to potato producers.

5) Potato producers used new practices because they believed that these practices would improve their profits. Profitability and social interaction probably both contributed to adoption but few producers adopted new practices without assurance of improved profits. Nearly all producers in the sample used fertilizer and pesticides. Use of improved seed, however, was highest on large farms.

6) Seed supply difficulties contribute to two major problems in the potato P-D system: a) The seasonal price and production instability results partly from an inadequate seed supply for the small Mitaca harvest. b) Use of improved seed is reduced because of an insufficient supply. Storage problems for seed and the desire by producers of both improved and unimproved varieties to sell in the consumer market are major obstacles to reducing the seed shortage problems.

7) Potato producers emphasize returns to seed instead of per

hectare yields. The producers place more emphasis on seed use efficiency (a seed: yield ratio) requiring wider spacing of plants than ICA where high per hectare yields are sought. In general seed is a more costly input compared to the remaining factors in the input package for producers than for ICA. The ICA recommendations possibly exceed the production potentials for some producers. ICA can allocate more resources to obtaining maximum yields and is less concerned about costs than individual producers.

8) Many potato producers cannot benefit from tractor mechanization. If the subsector were mechanized with tractor power, 88% of the producers and 46% of the planted hectares probably would not be included except possibly on a cooperative use basis or by hiring custom operators. Many questions remain to be answered about costs and benefits of mechanization for the potato subsector and the agricultural sector.

Problems in Coordinating Distribution:

1) Price instability was the major marketing problem for nearly all potato market participants. Seasonal price instability is due to wet and dry seasons, frosts and a seed supply shortage for the small Mitaca harvest. Besides seasonal fluctuatuations, cyclical price fluctuations have been pronounced since 1960. Potato price variations are greater in Nariño than in Cundinamarca and Boyacá.

2) Potato distributors and processors have not had access to the Caja Agraria subsidized credit program that is available to potato producers. Interest rates are high and the supply of

credit is limited for distributors and processors. Retailers and wholesalers indicated that lack of credit and liquid capital are limiting factors in augmenting their income earning capacities.

3) Of 100 pesos spent on potatoes by consumers, the producer receives 59; wholesalers, truckers and buyers receive 17; retailers receive 24. The retail spread is high because retailers absorb most of the market system losses. These losses average 13.3% of retailer purchases.

4) Potato market system losses are of two types. Complete physical destruction, where consumption is impossible, is low but financial losses due to reduced quality occur on 15.1% of total production.

5) The potato transportation and assembly functions usually involve numerous handlers and product exchanges. Potato transportation includes the following methods: 1) pack animals, 2) manual-, horse-, and tractor - drawn carts and wagons, 3) taxis, 4) trucks, 5) boats and 6) aerial cable. Potatoes entering the Bogotá market may have changed owners up to ten times before the final consumer purchase. Bogotá acts as both a terminal and assembly market for potatoes and potatoes reexported (22.2% of total shipments through the Bogotá market) to other markets may change owners more than ten times. The excessive handling is a major cause of quality deterioration before the bags are opened in the retail outlets.

6) The greatest amount of storage in the potato marketing system is at the wholesale level. Major problems or risks inhibiting storage are potato spoilage, lack of credit and liquid capital, price instability and the law against speculation. Use of sprout

inhibitors to increase storage life is uncommon. At present, government facilities (IDEMA) can store less than 2% of annual production and these facilities are not operated at capacity.

7) Vertical coordination by vertical integration and forward purchase and sale agreements centers upon the wholesaling function. Sixty-six percent of the wholesalers were integrated into retailing, production or in both retailing and production. Agreements are uncommon except on a very informal and personal basis.

8) Credit sales and purchases of potatoes were common at all levels within the exchange system. Interest charges were not common but, for some retailers, price differentials allowed to wholesalers for the privilege of purchasing on credit were costly.

9) Potato prices are sometimes influenced by price discounts and price differentials for credit sales but usually market participants accept the market price without question. Some supermarkets and cooperatives lower prices slightly to attract customers but loss leadering with potatoes is uncommon.

10) Potato market information flows are primarily by interpersonal communication and not by mass communication methods. Wholesalers are an important price information source for the system. Lack of market information was considered to be a problem by all potato market participants.

11) Explicit potato grades and standards are not in use. Sorting within the market system is uncommon except for a few modern wholesalers, supermarkets and cooperatives. Damage, size and variety are the most commonly used creteria in purchase and sale of potatoes while age, form and color are of less importance.

Conclusions About Performance of the Potato P-D System

A comprehensive assessment of performance in the potato P-D system requires careful consideration of personal values, public and private goals, and beliefs about the status of goal attainment in the system. To specify adequacy of or satisfaction with the changes realized toward achieving the major goals of economic development and goals for the potato P-D system depends upon the relative importance assigned to the goals. The weighting of development goals, however, goes beyond the scope of this research.

Some conclusions about performance problems can be presented. Adoption of recommended seeding rates and improved varieties to augment per hectare potato yields have lagged significantly behind production research. Thus, yields per hectare have risen very slowly and production increases have resulted primarily from using more land except for a few large farms which have raised their per hectare yields. The goal of price stability has moved farther from reality since 1960. For producers, this goal is very important. Market coordination needs improvement particularly in the areas of market information, storage, rural assembly, grading and standardization. Losses throughout the P-D system are high due to excessive handling and unnecessary backhauls. To present, little has been accomplished toward improving income distribution problems and planning the role for peasant producers in the process of rural and urban development. Some specific programs for a limited number of people have been successful but the problem is massive.

Potato production must more than double the 1964-1966 level by 1980. This demand can be fulfilled by either doubling per hectare yields or land areas planted or, more probably, by a combination of both. It is technically possible to more than double yields with ICA improved varieties. Some unanswered questions are whether this production should be attained on large commercial farms or on small relatively uncommercial farms and what combinations of inputs are best suited to fulfilling the demand.

Commercializing the potato P-D system to allow attainment of economic efficiencies probably will result in some displacement of small firms. If these displaced individuals can obtain either urban or rural employment at improved incomes, they will be a stimulus to the developing economy. If they cannot achieve this status, at best they will be an economic detriment and, at worst, a social concern that could become a revolutionary force. At present, the alternative employment opportunities for displaced farmers are limited and improved work skills for this potential labor force are necessary.

Allocation of credit between alternative uses within the food P-D system calls for more research to specify priorities more exactly. Credit for distributors, processors and manufacturers of farm supplies and food is a limitation to expansion and modernization. Improved credit allocations will augment potato production and improve market coordination for the potato subsector. Caja Agraria has proven that credit to potato producers along with some technical assistance can augment output, Credit for rural based assemblers and distributors could reduce distribution inefficiencies and improve quality before

the potatoes reach retailers and consumers.

Potato producers do not receive direct price supports from the government but would participate in a price support program that established prices at 87 pesos to 113 pesos per carga, about 60 pesos above 1968 prices. This would be a costly program for the government.

Not enough consideration has been given to alternatives to storage as a price stabilizer and to various alternative means of approaching the storage problem. Storage of seed and of potatoes for consumption are both important factors that need careful consideration as a means to price stability.

Both market information systems and technical assistance programs are being developed for the agricultural sector. The content of these information flows should be carefully considered to provide useful and adaptable information to the P-D system. More technical assistance should be directed to the potato distributors. Three major communication problems needing further attention are: a) dissimination of reseach results, b) the feed-back of information from the potato subsector to research and action agencies, and c) inter-institutional coordination particularly at the professional level in providing technical assistance to the potato subsector.

Recommendations

Solutions to the problems associated with improving coordination and performance of the potato P-D system in Colombia are not simple. It has been recognized that some goals and means to goal achievement are conflicting. Probably if one factor is most needed, it would be

a better understanding by policy markers of the important role one agricultural subsector, such as the potato P-D system, can play in the agricultural development process and the economy. No group of producers can be forgotten if the development processes are to be continuous and successful. Another essential consideration for policy makers is the role that a well coordinated distribution system can play in the development process. Goals to improve production without regard to distribution systems for farm supplies and farm products are not likely to be successful. The following recommendations, while difficult to fulfill, are addressed to major issues and problem areas identified in the research program.

1) Considering Small Potato Farms - Campesinos on small potato farms should be included in the process of modernizing agriculture by: a) improving specific production practices and market conditions that can better allocate resources and improve incomes for each type of small farm where possible, b) commercializing those that have a potential for growth and expansion, c) exploiting opportunities for production of alternative crops, d) providing rural employment (in constructing social overhead facilities such as feeder roads and schools as well as in small industry) for those lacking the requirements to remain in potato production, e) developing strong programs of rural primary education and vocational training to prepare rural youth for employment in the industrial or modern farm economies, and f) improving urban employment opportunities to absorb more of the displaced rural labor force.

A price support program to improve potato producer incomes is

not advisable because it will fail to improve equity of income distribution. Training programs and other means of improving quality of the rural human resource base, however, should be given careful consideration.

2) Establishing Production Priorities - Potato producers on the sabanas might be encouraged by credit to increase wheat and barley production which allows room for expansion by the smaller hill farmers. Although it may be costly to subsidize wheat production, it does reduce imports and can lessen pressures of commercial agriculture on small potato producers. This is a transitional recommendation that can be altered as the small potato farmers are absorbed into the modern economy. The transition period could be at least 15 years in duration.

Further research is needed to determine various types of technical assistance and credit programs best suited to the needs of specific types of potato producers. Possibly small producers that cannot be mechanized should be encouraged to produce Papa Criolla, (the small variety) which cannot be mechanized, while large varieties in the class of Papa de Año should be produced on larger farms capable of mechanization. To some extent, this allocation occurs now but it implies different technical assistance programs and may be only a short run measure dictated by future changes in consumption patterns.

3) Adapting and Applying Production Technology - Potato production research and extension specialists must give more emphasis to producer production conditions and problems. Production costs and risks need to be assessed adequately before

production recommendations are formulated. Extension activities must then be given full support by ICA in both direct educational endeavors for producers and in providing information to other extension-oriented institutions such as Caja Agraria and INCORA. Supply markets for purchased inputs should be more fully developed to complement the extension activity. This issue is particularly critical for improved varieties of potato seed.

4) Allocating Credit- The subsidized credit program for potato producers should be carefully reviewed. Possibly large potato producers should not receive a credit subsidy. The commercialized portion of the potato subsector should be economically competitive for credit that has alternative uses within the food P-D system. A good supply of credit at competitive rates is necessary for large producers but it should be allocated in a way as to stimulate use of both modern inputs and improved production practices.

Credit for small producers should be tied not only to improving production methods but also to improving the quality of the human resources involved. For example, the credit might be subsidized for a small producer who agrees to apply production efficiencies that will free his children from farm employment to permit school attendance. Likewise credit availability could require that the producers attend adult education classes that both improve their farm management ability and provide skills that are needed for off-farm employment.

Further research is needed on allocation of credit among farm enterprizes that are substitutes in production and/or substitutes in consumption. The present policy of augmenting loans to products

that substitute for potatoes in consumption while reducing loans to products that substitute for potatoes in production should be reviewed.

More credit should be allocated to improving coordination in potato distribution by: a) supporting private storage of potatoes which requires longer term loans at the farm level to cover the holding period, and b) providing loans to assemblers and wholesalers so that they can store potatoes for longer periods and improve their handling practices to reduce unnecessary distribution losses and quality deterioration.

5) Storing Potatoes and Reducing Production Instability - A potato storage program must consider the seed supply problems for the small Mitaca harvest as well as for improved varieties for both harvests, and the price instability problem. Before launching an extensive government-supported storage program to reduce price instability, several alternatives need investigation:

a) The costs and returns for irrigation where possible;

b) The costs and returns of promoting increased plantings for the Mitaca;

c) The costs and returns for public storage programs versus private storage programs for both seed potatoes and potatoes for consumption.

Credit policy could stimulate these changes where the alternatives are economically feasible. Irrigation, stimulated by credit, along with increased emphasis on the Mitaca harvest could reduce seasonality of production. The supply of production loans for the large Año Grande harvest could be reduced while the supply of production loans for the small Mitaca harvest could be expanded. Loans

may also be necessary for producers who desire to store seed for both personal use and sale for the Mitaca harvest.

6) Storing Potatoes and Reducing Price Instability - Reducing seasonality in production alone will not eliminate price instability. An adequate assessment of the potato market supply and demand conditions following either of the two major harvest, calls for dependable market information for both public institutions and private market participants. Before they can periodically plan their storage activities, the amount of production and potato price conditions should be understood. Top priority must be given to a comprehensive market information system.

Given this information, both public and private groups can estimate the amount of potatoes they will store and how long they should be held before sale. Given estimates of storage losses, storage costs and price projections, they should attempt to equate the marginal cost of the storage program with it's marginal return. If the public and private storage programs are successful, the optimum conditions would dictate that prices might only fluctuate on a seasonal basis by the amount of storage costs.

IDEMA needs to assess the alternative costs of stimulating a storage program along with a production stability program that will come closest to achieving price stability. Private and/or public storage costs and returns must be considered. The law against speculation should be either rewritten or rescinded and attempts made to reduce the adverse attitude that it has created against speculation and storage as a means of encouraging distributors to develop longer term storage programs. Spoilage is a major problem for potatoes in storage calling for wider use of sprout inhibitors

which can be promoted by ICA and IDEMA.

7) Storing Potato Seed - The final concern in storage is to improve seed supplies for producers. The government should either buy and sell seed on a large scale and/or stimulate private producers and distributors to enter the seed business. Seed to be planted for the Mitaca harvest should be held from the consumer market as a means of augmenting the small harvest. Similarly, improved seed should be purchased and sold by public and/or private seed agencies that can withstand in-storage losses and do not need to sell immediately in the consumer market.

8) Assessing Consumer Desires - Inter-disciplinary activity (cooperative research and development among departments and national programs) within ICA is needed to evaluate consumer acceptance of new varieties and develop educational programs that will inform consumers about new varieties. Presently ICA is doing some research on processing characteristics of potatoes. Along with the Instituto de Investigaciones Tecnológicas (IIT) further research on desired characteristics for processing and storage should be stimulated by ICA as production research proceeds. Consumer acceptance research should accompany this program. Research is needed to determine consumer response to potato price changes and the effective demand for better quality and lower cost potato chips. More information is needed about income consumption responses for potatoes by consumers.

9) Informing Potato P-D System Participants - Continued emphasis should be given to a market information program with a timely dissemination system that will be useful to producers and distributors in their market decision making processes. Where Caja Agraria has offices

in areas of potato production, cooperation with ICA in formulating package programs including technical production and marketing assistance, credit, and farm supplies for potato producers would be desirable. This input package could then be adapted to specific regions and farm sizes where income maximization criteria may differ. Where resources for establishing on-going extension programs are limited, it appears to be desirable to combine the extension efforts of institutions such as ICA and Caja Agraria particularly on a commodity basis where trained commodity specialists could service the needs of several Caja Agraria offices. These commodity specialists could then refer to marketing and farm management specialists at ICA.

10) Exporting Potatoes - Given the national goal to export agricultural commodities and recent discussions in IDEMA about exporting potatoes, the potential for export should be considered including: price relationships, the type of product most suited to export, transport costs, and demand characteristics in potential import countries, particularly in Latin America.

11) Improving Vertical Coordination in the Potato P-D System - IDEMA, ASCOLPA, ICA, Caja Agraria and the Ministry of Agriculture can cooperate in research and development efforts to foment improved vertical coordination in the potato P-D system. Part of the stimulus for improved vertical coordination will result from activity in the private sector by modern retailers who desire improved product quality and purchase and sale agreements. But an organized distribution system, based upon sound market information and product standardization systems, should be stimulated by IDEMA and ASCOLPA.

Distribution system losses and unnecessary handling of potatoes can be reduced by developing a stronger rural assembly system. Rural assemblers should be induced by credit, improved market information, and well instituted grades and standards to store and sort potatoes. They might then assess the various market alternatives to avoid unnecessary backhauling and excessive exchanges of potatoes. A rural based program of quality improvement should be emphasized both to reduce the need for transporting low quality potatoes to the point of consumption and to provide a quality of potatoes that can be stored for longer intervals at various points in the market channel.

Use of forward purchase and sale agreements should be encouraged to reduce those risks associated with unstable market prices. The validity of contracts should be enforced to reduce skepticism that has developed because of bad experiences where "contracts" or verbal agreements have not been fulfilled. Wholesalers, supermarkets, cooperatives and processors should be encouraged to seek more forward agreements with individual producers, groups of producers and rural assemblers as a stimulus to improved vertical coordination.

It is very important to recognize that the functions of distributors or "intermediaries" are essential to the process of augmenting potato production. Distributors are the primary link in the food P-D system between producers and consumers. To downgrade or disregard the distribution process or any interdependent activity in the potato P-D system reduces the opportunity for improving performance of the entire system and particularly the production process.

This research program was intended to be a broad diagnostic study of the entire potato production-distribution system. It was not, however, designed to provide all of the answers or exhaust the opportunities for further research on potato production and distribution. Instead, this research can serve as a basis for further investigation. Finally, a continuing research and development program is needed to answer specific questions that have been introduced and to keep pace with continued changes expected in the future.

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APPENDIX I

Aggregate Farm Size Data

and

Potato Farm Size Data

Table I-1 : Number and Percentage Distribution of Farms and Hectares by Various Farm Size Classifications[a]

Size of the farms (units in hectares)	Farms		Land in the farms	
	Number	Percent	Hectares (1000's)	Percent
0 - 1.0	298,071	24.7	132	.5
1.0 - 2.9	308,352	25.5	546	2.0
3.0 - 4.9	150,182	12.4	561	2.0
5.0 - 9.9	169,145	14.0	1,165	4.3
10.0 - 49.9	201,020	16.6	4,211	15.4
50.0 - 99.9	39,990	3.3	2,680	9.8
100.0 - 499.9	36,010	3.0	6,990	25.6
500.0 - 999.9	4,141	.3	2,731	10.0
1000.0 or more	2,761	.2	8,322	30.4
Totals	1,209,672	100.0	27,338	100.0

[a] Does not include the Department of Choco nor the National territories.

Source: DANE, Departamento Administrativo Nacional de Estadística: Directorio Nacional de Explotaciones Agropecuarias (Censo Agropecuario) 1960 Resumén Nacional (Second part) Bogota, Febrero 1964, p. 39

Table I-2 : Number and Percentage Distribution of Potato Farms and Hectares in Potatoes by Various Farm Size Classifications

Size of Farm	Number of Producers	Area Harvested	Average Harvested per farm	Percent of Producers	Percent of Area Harvested
0 - 1	76,702	31,635	.4	70.75	25.59
1 - 1.9	18,939	25,458	1.3	17.47	20.59
2 - 2.9	5,244	12,203	2.3	4.84	9.87
3 - 4.9	3,910	14,009	3.6	3.61	11.33
5 - 9.9	2,397	15,490	6.5	2.21	12.53
10 - 19.9	842	11,134	13.2	.78	9.00
20 - 49.9	303	8,549	28.2	.28	6.91
50 - 99.9	55	3,270	59.4	.05	2.64
100 or more	12	1,904	158.7	.01	1.54
Totals	108,404	123,652	1.1	100.00	100.00

Source: DANE, Directorio Nacional de Explotaciones Agropecuarias (Censo Agropecuario) 1960, Colombia, Bogotá, D.E. 1960

Table I-3: Distribution of All Farms in Colombia, All Potato Farms in Colombia, and Potato Farms in Cundinamarca, Boyacá and Nariño

Size of Farms (hectares)	All Farms in Colombia		Potato Farms in Colombia		% Colombian Potato Farms of Total Farms		Potato Farms in Cundinamarca		Potato Farms in Boyacá		Potato Farms in Nariño	
	I[a]	II[b]	I	II	I	II	I	II	I	II	I	II
0 - 1.0	24.7	.5	70.8	25.6	25.7	23.9	20.2	4.8	24.7	8.4	13.4	3.7
1.0 - 2.9	25.5	2.0	22.3	30.6	7.8	6.9	25.6	11.0	33.6	22.6	33.8	21.7
3.0 - 4.9	12.4	2.0	3.6	11.3	2.6	2.5	14.9	8.7	16.2	16.2	18.5	17.3
5.0 - 9.9	14.0	4.3	2.2	12.5	1.4	1.3	18.4	15.8	15.9	23.4	18.6	22.4
10.0 - 49.9	16.6	15.4	1.1	15.9	.6	.5	17.2	30.9	8.8	22.6	13.8	24.3
50.0 - 99.9	3.3	9.8	*c	2.6	.1	.1	2.1	10.4	.6	3.0	1.2	4.9
100.0 or more	3.5	66.0	*c	1.5	c	c	1.6	18.4	.2	3.8	.7	5.7
Total	100.0	100.0	100.0	100.0	8.9	4.5	100.0	100.0	100.0	100.0	100.0	100.0

[a] I - Percent of farms in each class

[b] II - Percent of land in each class

[c] - Less than 0.05%

Source : Tables I-1 & I-2, and DANE, Directorio Nacional de Explotaciones Agropecuarias (Censo Agropecuario) 1960, Departamentos de Boyacá, Cundinamarca and Nariño, Bogotá D.E., 1960.

APPENDIX II

Total Production, Hectares Planted, and Yields per Hectare of Potatoes in Colombia Based Upon Caja Agraria Data and IDEMA Data

The difference between the Caja Agraria[a] statistics and those of IDEMA (Table II-1) can be explained in part by collection methods both planted areas and total production statistics for potatoes of Caja Agraria are consistently greater than those of IDEMA. Caja Agraria, a governmental loan agency for agriculture, bases its production statistics on loans granted to potato producers. It is likely, therefore, that a slight over estimation occurs due to producers not planting as many hectares as they planned at the time of borrowing or because of crop losses due to frosts, diseases or droughts. More importantly however, the Caja Agraria statistics represent total production including commercial sales, home consumption, and rural consumption not passing through major commercial channels.

IDEMA gathers production data from each of it's regional representatives following harvest. This methods probably accounts for all production for commercial sales but does not include local, non commercial sales for rural consumption and home consumption particularly of small farmers. For the period from 1952 through 1968, the IDEMA total production statistics are 67% of the Caja Agraria statistics. If 24% of total production is consumed on the farm or in the immediate area (previously stated from secondary material and justified in the present study in Figure 13) without passing though major markets, 91% of the difference between the two sources is accounted for. Both the over estimation error and the greater amount of seed appearing in the Caja Agraria estimates probably account for the remaining 8%.

[a] Caja de Crédito Agrario, "Carta Agraria Anexos No. 165, Julio de 1965, No. 193, Octubre de 1966, and unpublished data for 1967 and 1968.

[b] The IDEMA - Atkinson series includes : 1948-52 from "Serie Histórica de Producción y Superficie" by Guillermo Palacio del Valle; 1953-54 from "La Carta Agraria" No. 165; 1955-65 from "Area y Producción" by Francisco Morazan Escocia (IDEMA); and 1966-68 adjustments by the Economic Research Service, USDA and the Ministery of Agriculture, Colombia.

Table II-1: Aggregate Potato Production Statistics for Colombia

Year	Caja Agraria[a]			IDEMA - Atkinson[b]			Value in 1958 prices (millions of pesos)	Current Peso Value	
	Ha. 1000's	Pdn. Met.Tons 1000's	Yield Tons/Ha	Ha. 1000's	Pdn. Met-Tons 1000's	Yield Tons/Ha		Of IDEMA Production (Millions)	Of CAJA AGRARIA Production (Millions)
1948	--	--	--	52	486	9.3	180		
1949	--	--	--	58	538	9.3	199		
1950	--	--	--	39	360	9.2	133		
1951	--	--	--	56	550	9.8	204		
1952	110	600	5.4	61	600	9.8	222	127	127
1953	115	610	5.3	58	610	10.5	225	170	170
1954	117	620	5.3	62	650	10.5	240	207	197
1955	127	674	5.3	56	580	10.3	215	122	142
1956	128	680	5.3	55	623	11.3	230	194	212
1957	156	1073	6.9	61	682	11.2	252	212	334
1958	175	1197	6.8	43	566	13.2	209	209	443
1959	183	1306	7.1	62	785	12.6	290	239	397
1960	143	988	6.9	54	653	12.1	242	229	345
1961	172	1183	6.9	48	551	11.5	204	278	596
1962	192	1403	7.3	75	872	11.6	322	253	408
1963	149	1048	7.0	69	572	8.3	212	418	765
1964	192	1376	7.2	76	867	11.4	321	759	1450
1965	171	1225	7.2	66	763	11.5	282	467	750
1966	159	1144	7.2	67	760	11.3	281		
1967	154	857	6.2	79	800	10.1	296		
1968	160	1200	7.5	85	900	10.6	333		

Source : See footnotes a & b on previous page.

Table II-2 : Areas Seeded to Potatoes and production Obtained by Departments in Colombia 1960-1966

		1960	1961	1962	1963	1964	1965	1966
Antioquía	Has.	13,324	15,170	16,710	14,210	16,385	13,115	13,245
	Tons	86,606	100,122	111,121	92,365	106,502	93,812	96,123
Boyacá	Has.	38,403	42,480	51,430	39,200	53,808	49,700	44,690
	Tons	292,822	318,600	403,725	299,880	419,702	375,506	337,856
Caldas	Has.	10,890	11,280	11,580	10,140	15,800	13,250	10,280
	Tons	43,214	56,400	60,216	50,700	79,000	85,714	66,820
Cauca	Has.	4,888	6,450	5,400	4,750	5,000	4,870	5,150
	Tons	27,495	34,830	30,240	26,600	28,000	33,511	35,483
Cundinamarca	Has.	35,990	45,340	52,850	38,720	47,807	43,690	39,595
	Tons	296,917	361,720	451,867	321,376	406,359	338,903	311,216
Huila	Has.	--	--	--	--	--	77	100
	Tons	--	--	--	--	--	442	574
Meta	Has.	--	--	--	--	--	80	120
	Tons						480	732
Nariño	Has.	15,690	21,050	22,350	16,390	23,920	22,500	19,145
	Tons	119,636	153,665	175,447	124,564	186,576	167,148	148,373
Norte de Santander	Has.	7,285	9,450	9,650	7,310	8,060	5,960	5,830
	Tons	36,425	47,250	50,180	36,550	40,300	32,182	31,482
Quindío	Has.	--	--	--	--	--	--	820
	Tons	--	--	--	--	--	--	5,304

(Table II-2 continued)

		1960	1961	1962	1963	1964	1965	1966
Risaralda	Has.	--	--	--	--	--	--	2,260
	Tons.	--	--	--	--	--	--	14,351
Santander	Has.	9,170	11,030	11,460	9,660	11,990	9,810	9,680
	Tons.	45,850	55,150	60,738	49,266	61,149	51,503	50,839
Tolima	Has.	6,320	8,400	8,600	7,450	8,000	6,280	6,050
	Tons	31,600	46,200	48,590	39,485	43,200	34,392	35,577
Valle	Has.	1,498	1,500	1,650	1,150	880	1,560	1,580
	Tons	7,490	7,350	8,415	5,520	4,312	10,715	10,854
Putumayo	Has.	--	300	350	250	200	50	70
	Tons	--	1,950	2,275	1,625	1,300	250	364
Total	Has.	143,458	172,450	192,030	149,230	191,850	170,942	158,795
	Tons	988,055	1.183,237	1,402,814	1,047,931	1,376,400	1,224,558	1,143,948

Source: Caja Agraria, Departamento de Investigaciones

Table II-3 : Potato Yields by Colombian Departments (Metric tons per hectare).

Department	Year							Average
	1960	1961	1962	1963	1964	1965	1966	
Antioquía	6.5	6.6	6.6	6.5	6.5	7.2	7.2	6.7
Boyacá	7.6	7.5	7.8	7.6	8.0	7,6	7.6	7.8
Caldas	3.4	5.0	5.2	5.0	5.0	6.5	6.5	5.2
Cauca	5.6	5.4	5.6	5.6	5.6	6.9	6.9	5.9
Cundinamarca	8.2	8.0	8.5	8.3	8.5	7.8	7.8	8.2
Nariño	7.6	7.3	7.8	7.6	7.8	7.4	7.7	7.6
N. Santander	5.0	5.0	5.2	5.0	5.0	5.4	5.4	5.1
Santander	5.0	5.0	5.3	5.1	5.1	5.2	5.3	5.1
Tolima	5.0	5.5	5.6	5.3	5.4	5.5	5.5	5.4
Valle	5.0	4.9	5.1	4.8	4.9	6.9	6.9	5.5
Weighted average	6.9	6.8	7.3	7.0	7.2	7.2	7.2	7.1

Source : Calculated from - Caja Agraria, Manual de Costos, 1967, p. 88

Table II-4 : Potato Production by Colombian Departments (1000's of metric tons)

Department	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966[a]	1967[a]	Average percent of Pdn.
Antioquía	45	60	65	45	50	45	51	78	53	35	31	72	23	7.3
Boyacá	180	200	220	190	283	240	147	252	153	360	335	163	172	32.9
Caldas	20	17	22	19	20	20	19	20	19	23	37	72	59	4.1
Cauca	8	8	9	8	6	6	24	25	25	6	9	36	13	2.1
Cundinamarca	238	248	270	220	233	250	200	365	208	344	276	243	133	36.7
Nariño	39	37	35	30	30	27	50	58	52	45	77	126	68	7.7
N. Santander	11	10	17	10	16	16	15	18	15	12	29	11	19	2.3
Santander	17	20	20	20	23	24	21	25	22	21	39	17	13	3.2
Tolima	13	14	15	16	16	18	18	22	18	14	37	17	9	2.6
Valle	9	10	9	8	8	8	6	8	7	7	7[b]	6	3	1.1

[a] DANE, Encuesta Agrícola Nacional 1966 and Primer Semestre 1967

[b] Estimate

Source: María Helena Silva Perdomo "Colombia Estadisticas Agropecuarias", Proyecto Cooperativo Sección de Economía Agrícola, Universidad del Valle, and Instituto Colombiano Agropecuario, ICA, Cali Febrero de 1968, p. 68.

Table II-5 : Potato Yields by Colombian Departements (Metric tons per Hectare)

Department	Year											Average
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	
Antioquía	9.0	10.0	10.0	10.0	10.0	10.0	11.6	9.8	6.3	8.1	6.2	9.2
Boyacá	10.0	10.0	10.0	11.9	12.3	12.3	13.9	10.5	8.7	11.5	8.8	10.8
Caldas	10.0	9.0	9.2	9.0	9.1	10.1	10.0	10.0	8.1	8.1	7.0	9.0
Cauca	8.9	9.4	9.0	8.8	8.6	8.6	8.7	8.8	-	-	6.2	9.6
Cundinamarca	12.0	15.0	15.0	20.0	15.0	13.8	14.5	17.7	11.2	15.0	9.0	14.4
Nariño	10.0	10.0	10.0	12.0	12.0	12.0	5.9	6.4	6.0	8.1	8.1	9.1
N. Santander	7.9	8.3	8.1	10.0	10.0	10.0	10.0	9.0	7.5	8.0	6.9	8.7
Santander	8.1	10.0	10.0	10.0	10.0	10.0	10.0	10.5	7.5	7.5	6.8	9.1
Tolima	7.2	8.2	8.0	8.0	8.0	8.0	8.0	7.3	6.0	6.0	6.1	7.3
Valle	6.9	7.1	6.9	8.0	8.0	8.0	8.0	9.0	5.5	5.5	-	6.6
Weighted Average	10.3	11.3	11.2	13.1	12.5	12.5	10.5	11.7	8.3	11.5	11.4	11.3

Source : IDEMA,Departamento de Investigaciones Económicas.

APPENDIX III

Potato Price Statistics

in

Bogotá, Cali and Pasto

Table III-1 : Bogotá Potato Prices Deflated By the Consumer Price Index for Workers in Bogotá (Base: From July 1954 to June 1955 = 100)

Months	Years													
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
January	38	48	43	43	41	34	46	42	35	65	33	53	43	48
February	39	47	41	43	39	33	46	39	33	60	33	50	42	47
March	41	53	46	42	40	36	46	38	37	61	35	57	46	45
April	42	58	48	46	43	39	53	41	43	68	38	57	48	46
May	42	58	53	46	46	37	62	40	43	81	38	61	49	43
June	41	54	39	49	46	38	65	39	47	81	43	62	51	46
July	39	47	36	45	39	38	55	37	46	66	41	56	42	42
August	35	42	34	42	35	35	47	35	45	48	39	49	41	39
September	34	41	36	41	34	35	45	31	47	43	38	45	39	35
October	37	43	42	43	33	39	46	30	59	39	40	45	41	36
November	40	44	43	42	32	46	44	30	69	33	40	44	43	37
December	47	49	43	40	32	47	44	31	67	32	50	45	46	43

Source: Departamento Administrativo Nacional de Estadísticas.

Table III-2: Cali Potato Prices Deflated by the Consumer Price Index for Workers in Cali (Base: July 1954 to June 1955 = 100)

Month	Year													
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
January	48	54	57	49	38	35	45	41	36	59	26	35	35	37
February	51	49	53	46	37	35	45	39	35	55	23	34	35	32
March	58	54	55	48	37	35	45	39	37	54	24	46	37	31
April	67	61	62	48	42	40	54	40	43	63	28	49	39	32
May	71	70	63	50	42	39	61	39	43	79	30	47	42	30
June	70	59	57	52	47	45	65	37	46	79	36	48	40	28
July	67	56	54	49	45	41	52	35	44	53	31	45	35	27
August	55	48	53	45	42	38	43	31	45	42	29	38	33	28
September	53	[illegible]	51	43	40	38	41	31	47	39	28	35	32	28
October	55	51	51	41	38	39	42	30	60	34	32	34	32	28
November	55	60	51	39	36	46	42	31	70	29	32	34	34	29
December	51	68	48	38	35	46	40	32	64	27	37	38	32	31

Source : Departamento Administrativo Nacional de Estadística

Table III-3 : Pasto Potato Prices Deflated by the Consumer Price Index for Workers in Pasto
(Base : July 1954 to June 1955 = 100)

Months	Year													
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
January	28	37	34	37	29	26	33	31	28	39	19	26	26	27
February	33	38	34	34	28	26	32	39	27	36	17	31	28	25
March	36	39	39	33	28	28	38	41	26	40	18	40	33	23
April	37	47	42	35	26	30	46	41	30	46	22	45	35	23
May	37	47	43	31	26	34	49	37	28	60	22	43	36	20
June	38	45	31	32	26	35	43	37	33	51	27	38	33	21
July	37	43	33	35	28	36	38	39	31	41	23	35	30	17
August	37	40	33	39	27	36	36	40	35	35	23	32	27	18
September	38	38	38	39	29	36	35	43	46	32	26	32	24	20
October	40	37	43	41	29	36	31	47	49	27	26	28	25	23
November	38	36	40	34	27	33	29	48	47	21	27	27	26	24
December	36	33	40	29	26	34	30	46	40	23	26	28	24	24

APPENDIX IV

Methods Used to Calculate Employment in Potato Production and Distribution

Based upon the 1960 census 108,000 farmers were potato producers. This number has not declined but serves as a conservative estimate. The producer interviews indicated that an average of 9.4 non-family employees worked on the farms, and an average of 1.4 family members worked on the farm. This average of non-family employees is high for all potato farms because the sample tended to include only commercial producers. If it is assumed that the family figure holds for all farms and only 10% of the farms employ outside labor, then the number of family and non-family laborers on potato farms is 252,700.

Potato transportation in an average year involves movement of 50 percent of annual production (or about 500,000 tons) to urban consumption centers. From the trucker interviews it was estimated that movement of 1.25 tons of potatoes required one man day. Thus, 400,000 man days or 1,538 man years (at 260 days per man year) were necessary for transporting potatoes. This estimate is conservative because it does not include back-hauling and does not completely account for underemployment.

There are approximately 550 full-time potato wholesalers who employ managers and assistants (1.3 per wholesaler based on Bogotá sample). Probably wholesalers hire more part-time workers as carriers and truck loaders than either retailers or producers. A total estimate of this group employed by wholesalers and others assumes that potatoes are moved on 3 different trucks between production and consumption. It requires about two hours for two men to load or unload 60 bultos of potatoes so each ton requires 3.2 man hours or 0.4 man days of carrier labor. Thus, for 750,000 tons (both rural and urban consumption) about 300,000 man days or 1154 man years of carrier labor is required. Again, the estimate does not account for underemployment.

Employment in potato retailing is even more difficult to estimate than employment at other levels in the potato production and marketing system. The analysis will be based upon the Bogotá survey. Plaza retailers sell about 12 bultos per week (39 tons per year) and account for about 27.4 percent of commercial sales (assumed to be 500,000 tons) or 137,000 tons of potatoes per year. One full time employee is involved in plaza retailing and 43.7 percent of his sales are potatoes. Thus 3,513 plaza retailers are selling potatoes but on a full time basis the equivalent is 1,535. Tiendas sell 21.4 percent of commercial potato sales or 107,000 tons per year. They sell an average of 4.5 bultos per week (14.6 tons per year) involving 7,329 tiendas. An average of two people operate a tienda and average potato sales are 16.4 percent of total sales. Thus, the average employment in potato retailing by tiendas is the equivalent of 2,404 individuals full time. Supermarkets and cooperatives sell 13,500 tons of potatoes per year or 27 percent of commercial sales. Weekly potatoes sales average 80 bultos (260 tons per year) and average employment is about 20 persons per supermarket. Only 14.3 percent of supermarket and cooperative sales are for potatoes so the full-time employment figure is 148 employees. At present potato processing is not a large employer at an estimate of 330 persons.

Table IV-1 : Rate of Employment in Colombia by Sectors of the Economy

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10*
Total Employed in Thousands	5,134	2,427	220	192	81	656	13	440	926	178
less than 1 mo.	2.6	1.4	3.5	2.3	2.0	2.3	1.9	2.2	3.6	17.4
1 to 2 months	1.3	0.8	2.4	1.4	1.4	1.4	1.5	1.3	2.3	1.8
2 to 3 months	1.8	1.3	3.6	1.9	1.9	1.9	1.7	1.6	2.7	2.3
3 to 4 months	3.8	4.7	4.2	2.4	2.9	2.6	2.0	2.1	3.2	3.3
4 to 5 months	2.4	2.5	3.5	2.2	2.0	2.0	1.8	1.8	2.6	2.1
5 to 6 months	12.8	12.6	14.8	13.7	12.4	12.5	12.8	11.8	13.2	13.8
6 to 7 months	3.3	2.6	4.5	4.3	3.3	3.8	3.6	3.8	3.7	4.0
7 to 8 months	4.5	5.9	5.1	3.0	4.0	3.5	2.1	3.5	2.5	2.8
8 to 9 months	1.4	1.7	2.0	1.2	1.5	1.1	1.1	0.8	1.1	1.0
9 to 10 months	5.6	8.2	4.6	3.0	4.7	3.5	2.3	2.7	3.0	2.5
10 to 11 months	6.7	9.1	5.0	4.8	6.3	4.6	6.6	4.5	4.5	3.1
11 to 12 months	53.8	49.2	46.8	59.8	57.6	60.8	62.6	63.9	57.6	45.9
	100.0	100.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Employed	79.3	79.7	73.5	80.8	81.1	81.2	82.8	82.9	78.1	65.5

* No. 1 ---- Colombia
No. 2 ---- Agriculture etc.
No. 3 ---- Construction
No. 4 ---- Transportation
No. 5 ---- Extraction Industries
No. 6 ---- Transformation Industries
No. 7 ---- Utilities
No. 8 ---- Commerce
No. 9 ---- Services
No.10 ---- Other

Source : DANE, XIII Censo Nacional de Población, Resúmen General, Julio 15 de 1964, pp 140 & 141.

APPENDIX V

Caja Agraria

Loan Data

Table V-1 : Annual Loans by Caja de Crédito Agrario, 1960-1968

	1960	1961	1962	1963	1964	1965	1966	1967	1968[b]
Cundinamarca									
1. Value (1000's pesos)	7,213.0	12,719.6	12,782.6	12,915.1	22,369.0	21,480.6	28,669.5	40,513.4	23,991.7
2. Number of loans	3,601.	4,812	4,328	3,956	5,183	5,140	5,609	5,971	3,748
3. Average loan size[a]	2,003	2,644	2,954	3,265	4,316	4,179	5,111	6,785	6,401
4. Value per hectare	200	280	242	334	468	492	724		
5. 1. deflated	7,451.0	12,326.5	12,070.4	9,653.7	14,231.7	12,621.8	14,356.3	19,228.0	10,910.3
6. 3. deflated	2,071	2,564	2,792	2,464	2,749	2,455	2,559	3,220	2,911
7. 4. deflated	207	271	229	250	298	289	362		
Boyacá									
1. Value (1000's pesos)	4,465.8	6,502.6	7,363.9	7,196.6	11,946.3	13,720.2	18,353.1	24,194.6	17,805.3
2. Number of loans	4,731	5,612	6,125	5,009	6,123	6,292	7,356	7,732	5,496
3. Average loan size	944	1,159	1,202	1,437	1,915	2,180	2,495	3,129	3,239
4. Value per hectare	116	153	143	184	222	276	411		
5. 1. deflated	4,613.4	6,301.0	6,953.6	5,378.6	7,599.4	8,062.3	9,190.3	11,483.0	8,097.0
6. 3. deflated	975	1,123	1,135	1,074	1,241	1,281	1,249	1,485	1,473
7. 4. deflated	120	148	135	137	141	162	206		
Nariño									
1. Value (1000's pesos)	1,189.1	2,192.9	1,949.2	3,205.4	5,313.7	7,017.8	11,577.6	17,870.4	8,876.9
2. Number of loans	1,114	1,491	1,553	1,822	2,166	2,737	3,212	3,872	1,919
3. Average loan size	1,067	1,471	1,255	1,759	2,453	2,564	3,604	4,615	4,626
4. Value per hectare	76	104	27	196	222	312	604		
5. 1. deflated	1,228.4	2,124.9	1,840.6	2,395.7	3,380.2	4,123.3	5,797.5	8,481.4	4,036.8
6. 3. deflated	1,102	1,425	1,185	1,315	1,560	1,506	1,805	2,190	1,836
7. 4. deflated	78	101	82	146	141	183			

(Table V-1 continued)

	1960	1961	1962	1963	1964	1965	1966	1967	1968[b]
[c] Colombia									
1. Value (1000's pesos)	16,709.5	27,637.7	27,819.3	29,346.7	49,076.9	53,325.1	74,180.9		
2. Number of loans	12,900	16,338	16,301	14,510	17,933	19,254	21,805		
3. Average loan size[a]	1,295	1,692	1,767	2,022	2,737	2,770	3,402		
4. Value per hectare	116	160	145	197	256	312	477		
5. 1. deflated	17,261.9	26,780.7	26,269.4	21,933.2	31,219.4	31,330.8	37,146.2		
6. 3. deflated	1,338	1,640	1,669	1,511	1,741	1,627	1,704		
7. 4. deflated	120	156	137	147	163	184	239		

Table V-2 : Caja Agraria Loans to Agricultural Producers by Commodities in Colombia

Colombia		1960	1961	1962	1963	1964	1965	1966
Sesame	No. of Loans [a]	6,533	7,339	7,738	10,863	10,482	8,968	10,623
	Value of Loans	7,803.6	7,945.5	12,095.6	21,928.9	24,461.9	28,854.6	32,415.4
	Deflated Value	8,061.5	7,699.1	11,421.7	16,389.3	15,561.0	14,015.6	16,232.0
	Ave. Deflated Value	1,234	1,049	1,476	1,509	1,484	1,563	1,528
Cotton	No. of Loans	3,772	5,047	4,922	5,212	4,780	5,249	4,637
	Value of Loans	19,243.8	26,921.7	30,921.4	40,120.8	50,271.1	75,570.9	99,287.8
	Deflated Value	19,880.0	26,086.9	29,188.7	29,985.6	31,979.1	44,401.2	49,718.5
	Ave. Deflated Value	5,299	5,169	5,932	5,753	6,690	8,459	10,702
Rice	No. of Loans	12,342	17,877	20,861	18,767	22,915	25,672	25,088
	Value of Loans	22,451.7	35,766.3	44,513.6	52,255.3	70,948.5	113,248.7	124,218.4
	Deflated Value	23,193.9	34,657.3	42,336.2	39,054.8	45,132.6	66,538.6	61,183.7
	Ave. Deflated Value	1,882	1,939	2,015	2,081	1,970	2,592	2,439
Sugar Cane	No. of Loans	20,859	20,491	20,559	24,297	28,663	31,942	33,187
	Value of Loans	13,415.2	17,831.1	14,644.4	22,500.3	35,499.0	42,442.2	48,275.4
	Deflated Value	13,858.7	17,278.2	13,828.5	16,816.4	22,582.1	24,936.7	24,174.0
	Ave. Deflated Value	664	843	673	692	788	781	728
Barley	No. of Loans	2,174	2,152	2,591	2,740	2,307	3,196	3,252
	Value of Loans	5,482.4	4,810.3	5,127.7	8,401.8	6,530.5	8,645.8	11,492.2
	Deflated Value	5,663.6	4,661.1	4,842.0	6,279.4	4,154.3	5,079.8	5,723.2
	Ave. Deflated Value	2,605	2,166	1,869	2,291	1,801	1,589	1,760
Beans	No. of Loans	4,178	5,484	5,391	5,036	6,568	8,756	9,524
	Value of Loans	1,866.8	2,924.3	3,617.0	2,753.6	6,679.1	13,669.6	13,121.8
	Deflated Value	1,928.5	2,833.6	3,415.5	2,058.0	4,248.8	8,031.5	6,570.8
	Ave. Deflated Value	462	517	634	409	647	917	690

(Table V-2 continued)

Colombia		1960	1961	1962	1963	1964	1965	1966
Corn	No. of Loans	31,308	40,341	42,228	44,207	58,536	54,132	58,444
	Value of Loans[a]	15,667.8	24,860.1	27,080.7	37,147.2	75,099.3	98,714.6	117,197.1
	Deflated Value	16,185.7	24,089.2	25,572.0	27,763.2	47,773.1	57,999.2	58,686.6
	Ave. Deflated Value	517	597	606	628	816	1,071	1,004
Potato	No. of Loans	12,927	16,349	16,335	14,552	18,006	19,357	21,887
	Value of Loans	16,721.7	27,644.5	27,842.2	29,378.3	49,170.1	53,424.8	74,260.5
	Deflated Value	17,274.5	26,787.3	26,291.0	21,956.9	31,278.7	31,389.4	37,186.0
	Ave. Deflated Value	1,336	1,638	1,609	1,508	1,737	1,621.6	1,699
Plátano	No. of Loans						22,802	24,408
	Value of Loans						19,470.9	23,006.1
	Deflated Value						11,440.0	11,520.3
	Ave. Deflated Value						502	472
Wheat	No. of Loans	11,823	11,919	11,774	11,707	11,418	14,657	13,610
	Value of Loans	16,285.6	16,638.5	17,347.3	20,341.5	21,531.7	36,837.1	38,860.9
	Deflated Value	16,824.0	16,122.6	16,380.8	15,202.9	13,697.0	25,132.7	19,459.6
	Ave. Deflated Value	1,423	1,353	1,391	1,299	1,200	1,715	1,430
Yuca	No. of Loans	19,352	26,023	28,418	28,436	37,443	39,138	40,933
	Value of Loans	4,854.1	8,171.5	10,247.7	11,965.0	21,010.9	29,885.4	35,455.4
	Deflated Value	5,014.6	7,918.1	9,846.7	8,942.4	13,365.7	17,559.0	17,754.3
	Ave. Deflated Value	259	304	346	314	357	449	434
Coffe	No. of Loans	75,300	78,059	76,649	77,127	74,014	72,013	76,244
	Value of Loans	88,857.9	95,122.5	98,529.9	109,861.8	125,322.0	136,857.6	166,673.1
	Deflated Value	91,795.4	92,173.0	93,040.5	82,109.0	79,721.4	80,409.9	83,461.7
	Ave. Deflated Value	1,219	1,180	1,214	1,064	1,077	1,116	1,094
Total	No. of Loans	200,613	231,081	237,466	242,944	275,132	305,882	321,837
	Value of Loans	212,650.6	268,636.3	292,147.5	356,654.5	486,524.1	652,622.2	784,201.1
	Deflated Value	219,680.4	260,306.5	275,871.1	266,557.9	285,854.3	383,444.3	392,689.6
	Ave. Deflated Value	1,095	1,126	1,162	1,097	1,039	1,254	1,220

[a] In thousand of pesos