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PMENT OF PUERTO RICO

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ATE UNIVERSITY  
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AGRICULTURAL MARKETS  
IN THE ECONOMIC HISTORY  
OF PUERTO RICO

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## ABSTRACT

### AGRICULTURAL MARKET COORDINATION IN THE ECONOMIC DEVELOPMENT OF PUERTO RICO

by Kelly Max Harrison

Since World War II economic growth has become a major goal for most nations of the world. The literature abounds with research studies and proposals for accelerating economic development. Only in the past decade has there been any significant interest in appraising the role of marketing in the development process. The few studies which have attempted to evaluate the role of marketing in economic development have indicated that it can have a significant impact on growth rates.

In spite of the fact that many Latin American countries have made some progress in accumulating social overhead capital in preparation for a take-off into sustained growth, the breakthrough has been slow in coming for most of the countries in that area. Walter W. Rostow has suggested that a lack of integration between rural and urban sectors is a major reason why such nations have not experienced satisfactory economic growth. The solution he suggests is to create national markets whereby the two sectors are linked together through effectively coordinated marketing channels. This should produce a condition of self-reinforcing economic growth.



In June, 1965, an interdisciplinary team of researchers from Michigan State University began the first phase of a two and one-half year study to evaluate first in Puerto Rico and then in Northeast Brazil the validity of Rostow's national market concept and to determine the role that food marketing plays in economic growth. This thesis reports the findings of the research in the agricultural marketing portion of the Puerto Rican study.

A review of works by other social scientists and direct observation in Puerto Rico suggested the hypothesis that atomistic and imperfectly competitive markets in developing economies are generally accompanied by high risks, primitive production methods and ineffective transmission of consumer demand. Three commodity marketing studies in Puerto Rico provided support for this hypothesis.

These commodity studies indicated that effective vertical coordination in marketing channels between producers and consumers plays an important role in reducing uncertainties, eliminating unnecessary marketing effort and lowering waste and spoilage. Comparisons against specific market performance criteria indicated that the marketing channels for milk and eggs, which have undergone important coordination adjustments in the past fifteen years, have shown significant improvements in terms of production and marketing costs, technological progressiveness, and product quality. It was also found that government programs designed to lower

marketing risks and achieve better market coordination were important factors in improving market performance for milk and eggs.

An effort to relate innovativeness among agricultural producers to certain socio-economic characteristics yielded inconclusive results. Several indicators were explored for measuring such things as modern attitudes, communication exposure, market attitudes and risk perception. Several variables appeared to be related to innovativeness through the strength of the relationships in this study do not warrant definite conclusions.

An exploratory factor analysis provided possible guidelines for future research of factors affecting innovativeness and hampering market development.

These findings suggest the following conclusions:

1. The structure and performance of the marketing system may have significant effects on the total production of a given commodity, on consumer prices and on the adoption of improved production and marketing methods.
2. Government policies can be devised within the framework of social values and goals which will contribute to more effective market coordination and more rapid agricultural development. However, if such policies are to be successful they should be based on dynamic rather than static economic performance criteria.

3. Further research directed toward measuring innovativeness and willingness to change among entrepreneurs seems warranted. With such a tool change agents could make maximum use of government programs and resources in their efforts to achieve rapid economic development.

AGRICULTURAL MARKET COORDINATION  
IN THE ECONOMIC DEVELOPMENT OF  
PUERTO RICO

By

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## CHAPTER I

### INTRODUCTION

#### The Problem

Economic development literature indicates that prior to World War II economists placed emphasis on industrial expansion as the key to induced economic growth. After World War II, several development economists began to suggest that the agricultural sector should first be developed, then the industrial sector. During the past decade economists have turned to a doctrine of balanced growth between rural and urban areas.<sup>1</sup> While development economists now generally agree that productivity gains are important in both the industrial sector and the agricultural sector, there has been little serious consideration of the role of distribution or exchange in the development process. Emphasis has been placed on improving productivity in industries turning out tangible products as opposed to the intangible but critically important coordinating functions of the marketing system.

Walter W. Rostow is a notable exception. He has recently noted that the marketing system may play a critical

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<sup>1</sup>Lawrence W. Witt, "Role of Agriculture in Economic Development--A Review," Journal of Farm Economics, Vol. 47, No. 1 (February, 1965).



role in the "balanced" growth of rural and urban sectors in a developing country. Rostow has stated that many developing nations have passed beyond the development stage characterized by a build-up in social capital and are now at a point where significant structural distortions exist which hinder economic growth. These structural distortions are accompanied by the following conditions:

1. There is some industrial capacity, usually developed to substitute for the import of certain kinds of consumer goods.
2. The market for most of these manufactured good is narrow, textiles being an exception.
3. Although some agricultural development is taking place, the gap between rural and urban life is widening.
4. As a result of this imbalance, men and women flock from the rural areas to the cities where there is insufficient industrial momentum to provide full employment.<sup>2</sup>

Rostow suggests that the way to achieve a take-off into sustained growth for nations experiencing such conditions is to break down these structural distortions, to produce a self reinforcing agricultural and industrial expansion, and to create truly national markets. Improvements

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<sup>2</sup>Walter W. Rostow, View From the Seventh Floor (New York: Harper & Row, 1964), pp. 133-135.



in agricultural productivity, especially in food products, are a significant factor in the broader market integration process outlined by Rostow.

During the past decade there has been growing concern for the rapid expansion of world population and its pressure on food supplies. Special concern has been focused on the underdeveloped countries where agricultural production techniques are still basically primitive. Various population and food supply studies have indicated that many developing nations are barely holding their own in the production of food supplies for growing populations.

The critical role of food production was stressed by Lawrence W. Witt in his Presidential Address before the American Farm Economic Association in August, 1966.

Implicitly, everyone assumes that an agricultural revolution is needed, which draws on nonfarm produced inputs. The modern agriculture of tomorrow in developing countries requires a different size of farm, new combinations of resources, new pricing policies for agricultural inputs, different capital structures, and may well require substantial changes in the geographical distribution of farming and farm people.

He concludes:

The food problems posed by the population explosion can be solved. . . . There will be no greater challenge in your lifetime and mine.<sup>3</sup>

In a recent publication Robert D. Stevens has pointed out that developing nations may have to produce significantly larger amounts of food in order to supply the rising demand

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<sup>3</sup>Lawrence W. Witt, "Food," to be published in Journal of Farm Economics, December, 1967.

brought on by population growth and rising incomes. He uses an equation developed by Ohkawa to demonstrate the relationship:  $d = p + gn$ , where  $d$  = growth in food consumption,  $p$  = rate of growth in population,  $g$  = rate of growth in per capita income, and  $n$  = the elasticity of demand for food associated with changed in income.<sup>4</sup>

Food needs are determined by the rate of population growth, which is fairly high in most Latin American countries (Stevens uses 2 per cent as a representative figure for all developing nations), plus an additional increase in food consumption brought on by rising incomes, which is determined by income elasticity in the country. Higher per capita incomes are certainly a goal in all Latin American countries. If we assume a 2 per cent rate of population growth, a 2 per cent growth in per capita income, and an income elasticity of .7, food consumption increases at a rate of 3.4 per cent per year. A population increase of 3 per cent per year coupled with a growth in per capita income of 4 per cent and an income elasticity of .7 would yield a yearly increase in food consumption of 5.8 per cent.

This suggests that three factors altering consumer demands for food products are at work in developing nations. The first and perhaps most important in its impact is a

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<sup>4</sup>Robert D. Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries, Foreign Agricultural Economies Report No. 23, U.S.D.A., March, 1965, p. 4.

rapidly rising population. The second is rising per capita incomes. And the third and perhaps least obvious is the change in products and services required to fulfill changing consumer demands brought on by the first two factors mentioned above. The impact of these factors is focused first on the food distribution sector and then on the food production sector. Stevens points out that if either or both are unable to adjust adequately to changing consumer demands, rising food prices may create dangerous inflationary pressures in the developing nation.

Thus, food production increases are necessary if inflationary pressures are to be avoided. But it is also important that the marketing system be effectively organized and coordinated in order to insure that the food production is distributed efficiently. The structure and performance of the marketing system may significantly affect food prices, first through the addition of marketing costs and second through its effect on the willingness of producers to increase investments of labor and capital in expanding food production.

The adoption of new agricultural techniques is generally regarded as a necessary condition for significant improvements in food output. However, it is not a sufficient or independent condition for agricultural development. It should be recognized that productivity improvements cannot and will not take place if the proper incentives are not transmitted to producers or if producers are not adequately

informed of consumer demands for their products through the marketing system. This statement is deceiving. There are few people who would disagree that farmers must be made aware of market demands for their products. Yet in developing countries there appear to be few who really understand the importance of the market in communicating that demand to producers.

For instance, in talking with AID officials from Bolivia the author learned (in a personal interview with Dr. Edmund Faison, Marketing Advisor to the productivity center, USAID, La Paz, Bolivia, June 10, 1966) that until recently peasant farmers in the "altiplano" of Bolivia did not make a practice of shearing sheep each year because they perceived no market for the product and because they believed it would make the sheep sick. The AID mission there, in conjunction with a team from Utah State University, is currently helping farmers to develop both domestic and export markets for the products and providing technical assistance in teaching the Bolivian farmers how to properly harvest the wool. Dr. Milo Cox, Chief of the Rural Development Division in the Latin American Bureau of AID/Washington, in a personal interview listed several such examples of marketing problems among agricultural producers in the different countries of Latin America.

There appears to be a need for added emphasis on marketing as the focus of all production. And there is little doubt that economic development can only proceed through



specialization, exchange and resulting productivity gains. If producers are not aware of markets or if those markets are unstable and poorly coordinated, there is little likelihood that agricultural productivity gains will be achieved.

To summarize, this discussion suggests that in many developing nations a wide disparity exists between rural and urban areas. Industrial growth is thwarted by food shortages and high food prices, while at the same time agricultural development lags because farmers have uncertain markets for their products. Rostow has said that the solution to this dilemma is to link rural and urban areas together with an effective two-way flow of products--each sector providing the other with a market outlet.

But for this effective linkage to occur, the marketing system must provide adequately for the smooth flow of products and profit incentives both to agricultural and industrial producers. The structure and performance of these market channels therefore becomes an important factor in determining the success of developing nations in achieving the take-off into sustained economic growth.

### The Approach

This dissertation is the result of cooperation in a study of food marketing in Puerto Rico by a team of researchers from Michigan State University, the University of Puerto Rico, and the Puerto Rico Department of Commerce. The research was financed under contract number AID/csd 786



between the United States Department of State, Agency for International Development and Michigan State University. The Puerto Rican study is the first of two phases in a two and one-half year research program for the purpose of evaluating the role of food marketing in economic development in Latin America. The author was given the opportunity and responsibility of cooperating in a study of that portion of the food market channel directly relating to agricultural producers. The fifteen year period from 1950 - 1965 was chosen for intensive study, since the economy has experienced rapid economic growth during that period. The author spent a year in residence in San Juan, Puerto Rico, during the data collection phase.

After a brief orientation to the island, it was decided that the best approach to the analysis of the farm marketing system would be to select certain key commodities and perform a detailed analysis of the distribution developments since 1950. Accordingly, eggs, milk and fruits and vegetables were selected for detailed study. The reasons for the selection are discussed in Chapter V. These case studies are designed to provide information on a broad range of marketing developments. But the primary emphasis was on the sequence of events, e.g. government programs and individual marketing innovations, which resulted in the present marketing systems for these commodities. The commodity studies are presented in Chapter V.





While the case studies held the prospect of providing historical data on the development of agricultural markets of Puerto Rico, there was little hope of achieving much insight into the process by which individual values and actions interrelate with government policies and programs to produce a specific blend of agricultural coordination in a given commodity. Therefore, the research included a second phase for the collection of data to permit some exploration of these relationships. A number of hypotheses were formulated relating marketing behavior, attitudes, economic performance, communication and a number of demographic variables. The relationships are discussed and evaluated in Chapter VI of this thesis.

### The Objectives

The dissertation has five basic objectives:

1. To review the role of food production and marketing in the economic development of Puerto Rico.
2. To describe the role of effective agricultural market coordination in the improvement of agricultural productivity.
3. To develop a conceptual framework for the development of marketing policy within the context of dynamic economic performance criteria.

4. To utilize that framework in the evaluation of the economic impact of government marketing policies and private coordination developments in milk, egg, and fruit and vegetable production and distribution in Puerto Rico since 1950.
5. To explore, through farm survey data, the relationship between agricultural productivity, innovation, market structure, and a variety of specific farmer attitudes and attributes.

#### Methods of the Study

The research method required three specific types of data collection--secondary data collection, personal depth interviews and a farmer sample survey. The secondary data collection was the first phase of the research study. Data were examined and recorded from a variety of government agencies. In some cases where published data were not available, they were obtained through personal interviews with the appropriate government official.

The second phase of the research was a series of personal depth interviews. The interviews were designed to collect detailed information on the development of the marketing system for the three commodity groups under study. They included department of agriculture officials, agricultural extension agents, representatives of private and cooperative marketing firms, and farmers. These depth



interviews were valuable in tracing the historical development of the market channels and providing insights into the impact of market coordination on individual participants in the distribution system.

The sample survey of farmers was concentrated in the Mayaguez agricultural region. Depth interviews and other evidence of recent agricultural marketing developments in that area suggested the possibility of relating the impact of a particular type of marketing organization to agricultural development in general. In Chapter V these marketing organizations are described in detail. Basically, they are farmer cooperatives organized with the assistance of government agricultural agents for the purpose of promoting efficient marketing and production techniques. The case study for eggs indicates something of the impact of these associations on market coordination and productivity among the members in the region.

A random sample was chosen to obtain approximately equal representation between egg producer association members and non-members, and milk producer association members and non-members. In addition, a random sample of pineapple, papaya and orange association members was chosen. These samples were drawn from lists of all producers in the region supplied by the regional office of the Department of Agriculture. Since the regional agricultural office had no list of fruit and vegetable non-association members in the region, a sample of the Agricultural Statistics Division of the

Department of Agriculture was used for randomly obtaining the names and addresses of an appropriate number of these producers. Because of interviewing difficulties and limitations of the original population listings, the final N was 172--approximately 30 less than the desired sample size. However, the deficit was about equally divided among the various sub-samples so that no severe limitation occurred in analysis in any sub-group.

A group of agricultural extension agents contacted each of the 172 farmers personally and completed a questionnaire. The schedule was made up of four parts: (1) economic information about the farm (2) mass communication exposure (3) attitudes and (4) personal and demographic information. The information was punched on IBM cards which were returned to East Lansing for data analysis. Three basic statistical methods were utilized to test hypotheses and explore relationships in the data: (1) simple correlation, (2) multiple correlation and (3) factor analysis. A precise description of the application of these methods of analysis is given in Chapter VI.

#### Plan of the Thesis

Basically, Chapter II is a review of the literature dealing with some general theories of economic growth and the effect of agriculture and marketing on the economic development process.

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Chapter III provides a conceptualization of the impact of market coordination on economic growth. It explains one of the major hypotheses underlying the entire study and relates that to government policy and planning.

Chapter IV reviews the development of the Puerto Rican economy. It familiarizes the reader with some of the developments leading up to the rapid changes that are now taking place on the island, especially in food marketing.

Chapter V presents the three case studies of market development in Puerto Rico since 1950. A series of performance criteria suggested from Chapter III is utilized to evaluate the three commodity industries.

Chapter VI reports the results of the sample survey among farmers in the Mayaguez region. The chapter provides some early research explorations toward a method of obtaining information helpful to the government policy maker in devising adequate market programs. Moreover, several suggestions are given for further research.

Chapter VII includes a brief summary of the results of the research and presents a series of conclusions relating to market and agricultural development in Puerto Rico. It contains a brief discussion of the possibilities of applying the conclusions in Latin American nations and makes suggestions for further research.



## CHAPTER II

### REVIEW OF LITERATURE

#### Theories of Economic Growth

Since the days of Adam Smith economists have shown a great deal of interest in the study of the causes of economic growth. It is interesting, however, to note how little agreement exists among contemporary economists as to the causes and nature of the economic development process. The one point on which most economists agree is that development requires large amounts of capital. But even here opinions vary as to the level or rate of capital accumulation necessary for sustained growth. Other than capital accumulation there are few points on which development economists exhibit common agreement. The purpose of this chapter is to review briefly some of the major contributions to economic development literature. The latter part of this chapter places special emphasis on the recent interest in marketing in the development process.

#### Adam Smith

An early attempt at a systematic description of the economic growth process was made by Adam Smith in his famous work, An Inquiry into the Nature and Causes of the Wealth

of Nations. There Smith synthesized the works of previous political economists and laid down the basic framework which was expanded by Ricardo and others and which indeed has provided an important part of current economic theory.

Smith made several lasting contributions to the theory of development. Perhaps the most widely recognized in western societies is his rationalization of the economic system of free enterprise as a process in which individual economic action guided by enlightened self interest will lead to an efficient allocation of resources and equitable distribution of the economic gains based on each individual's factor contribution. The doctrine of laissez faire is the basis for the theory of perfect competition.

Smith believed that within a society organized around the laissez faire principle the key to increased productivity was division of labor. He illustrated that greater division of labor and specialization lead "(1) to an increase in dexterity among workers; (2) to a reduction in the time necessary to produce commodities; and (3) to the invention of better machines and equipment."<sup>5</sup>

Smith believed that the initial impetus toward specialization among men was a natural tendency "to truck, barter and exchange one thing for another."<sup>6</sup> However, a

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<sup>5</sup>Gerald M. Meier and Robert E. Baldwin, Economic Development Theory, History, Policy (New York: John Wiley and Sons, Inc., 1957), p. 21.

<sup>6</sup>Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, ed. Edwin Cannan (New York: The Modern Library, Random House, 1937), p. 13.



pre-condition to specialization was some minimum accumulation of capital. And Smith is not clear as to the method of this accumulation process. He does point out that an agricultural surplus is necessary to start the development process:

When by the improvement and cultivation of land the labor of one family can provide food for two, the labor of half the society becomes sufficient to provide food for the whole. The other half, therefore, or at least the greater part of them, can be employed in providing other things, or in satisfying the other wants and fancies of mankind.<sup>7</sup>

According to Smith accelerated development could come about only as capitalists were willing to save and invest in new and improved methods of production. The investment of capitalists thus provided jobs for the surplus workers from the agricultural sector. He emphasized that the propensity to save was an important determinant of development:

Parsimony, and not industry, is the immediate cause of the increase of capital. Industry, indeed provides the subject which parsimony accumulates. But whatever industry might acquire, if parsimony did not save and store up, the capital would never be greater.<sup>8</sup>

He warns that in addition to a slow rate of capital accumulation, economic development may be limited by the size of the market. If the market is very small the principle of division of labor cannot be carried to its fruition and productivity gains will be limited.

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<sup>7</sup>Ibid., p. 163

<sup>8</sup>Ibid., p. 321.



### Neo-Classical Modifications

Adam Smith and his followers thus emphasized the importance of economic specialization accompanied by increasing capital savings for investment in improved production techniques. In this system it was assumed that capitalists were the only group from which capital saving could be derived.

Alfred Marshall and others modified the theory of capital accumulation by including the possibility that investors and savers do not have to be the same people. The capital market was visualized as the institution facilitating the flow of savings from laborers, landlords, and capitalists into productive investment.

Under the neo-classical model, economic development was viewed as a gradual harmonious process whereby all groups would eventually reap the benefits of growth. Marshall's concept of "external" economies illustrates the ways in which investments by one entrepreneur may eventually benefit others.

### Schumpeter's Disharmonious Growth

In his book The Theory of Economic Development, J. A. Schumpeter rejects the classical and neo-classical belief that economic growth is a gradual harmonious process. He argues that, in fact, real economic advances come in leaps and spurts as a result of great innovations. Consequently, Schumpeter placed a great deal of emphasis on the entrepreneur as the central figure in the development process:



He is the innovator, the one who undertakes new combinations of the factors of production. Innovations may occur in the following forms: (1) the introduction of a new good; (2) the use of a new method of production; (3) the opening of a new market; (4) the conquest of a new source of raw material supply; and (5) the reorganization of any industry.<sup>9</sup>

Schumpeter argued that economic development does not take place gradually and smoothly in an environment where businessmen can evaluate the risk and readily compare the rate of return to the interest rate in order to make investment decisions. In Schumpeter's world "a high degree of risk and uncertainty exists."<sup>10</sup> The entrepreneur, then, is the particular type of individual who is willing to operate in an uncertain environment and make innovations successful. It is this kind of environment which leads Schumpeter to conclude that great spurts of development are centered around and ignited by significant economic innovations.

He recognized the importance of capital accumulation in the development process. But he did not feel that the neo-classical theory of capital accumulation was appropriate in a real world of high risk and disharmonious growth.

While some of his ideas have been supplanted by later economists, Schumpeter's emphasis on the entrepreneur as the agent of economic growth continues to receive a great deal of attention. Later chapters in this thesis will discuss the importance of innovation in the process of agricultural development.

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<sup>9</sup>Meier and Baldwin, p. 87.

<sup>10</sup>Ibid.





Keynesian and Post-Keynesian Contributions

In 1936 John Maynard Keynes published a book which stimulated a revolution in the economics of income and employment. His work was aimed toward explaining the causes and remedies for the great economic depression which gripped the developed nations.

Keynes pointed out that unemployment and economic stagnation could be an equilibrium condition in a capitalistic economy. There are two factors which can cause such a situation. (1) The investor's perception of the relationship between the cost of capital (interest rate) and the probable return to investment may make him unwilling to provide productive investments in an amount sufficient to insure full employment. (2) The demand for money for liquidity purposes is such that if the interest rate falls below some minimum level, people in the economy would rather hold cash balances than purchase securities at a low return (i.e. perceived return is too low). Either of these two conditions can create a shortage of investment capital which prevents full employment. A continuation of the low propensity to invest would lead to idle plant capacity, greater unemployment and less consumption. This was the situation that existed during the Great Depression. Therefore, a lack of effective demand was postulated as the main factor preventing full employment. Keynes argues that the only way to alleviate the problems was through heavy government spending with deficit financing. Such spending would provide additional employment.



and foster confidence in the economic future which would encourage private investment. This would lead to greater employment and greater income through the multiplier effect.

Most development economists argue that even though Keynes' analysis has considerable appeal in developing economies, his solution is not directly applicable. They argue that even though low income, low employment and low investment are the same conditions postulated by Keynes, his remedies do not apply in developing nations. They are inapplicable because

unemployment, though extensive, is usually confined to unskilled workers. In addition excess capacity prevails only in particular industries and sectors. Because of shortages and bottlenecks elsewhere, deficit financing is most likely to result in a rise in the price level without any increase in real output.<sup>11</sup>

However, some economists are now arguing that Keynesian analysis can and should be used to a much greater extent in diagnosing and treating the development problems of the poor nations.

Post-Keynesian analysis is generally an extension of Keynes' teaching, and its two main proponents are Ensey Dormar and R. F. Harrod. Working separately, these two economists came up with similar economic growth models based on Keynesian analysis. Their major contribution was in viewing capital accumulation in a dual role. Investment generates income and it also increases the productive

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<sup>11</sup>Ibid., p. 42.

capacity of the economy by increasing its capital stock. Thus, Harrod and Domar were concerned with determining the conditions required for smooth growth in real income. Even though their growth model was designed for developed economies, it has been widely used for forecasting growth rates and determining savings rates for income growth targets in developing nations.

The model specifies that the equilibrium condition for full employment growth is  $\frac{\Delta I}{S} = \frac{I}{K}$  where  $\Delta I$  represents a change in investment,  $S$  is the marginal propensity to save and  $I/K$  is the prevailing capital output ratio. Of course, the above equation can be rearranged into  $\frac{\Delta I}{I} = \frac{S}{K}$ . This relationship states that investment must grow at some constant rate  $S/K$  to assure full employment equilibrium.

Thus, while post-Keynesian analysis depends heavily upon Keynes' theories, it is much more oriented toward investment than his emphasis on aggregate demand.

### The Role of Agriculture

During the past several years there has been a resurgence of interest in the agricultural sector as it affects the development process.<sup>12</sup> This interest is probably due to the rising pressures of population on food supplies discussed in Chapter I.

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<sup>12</sup>See Lawrence W. Witt and Carl Eicher, (eds.), Agriculture in Economic Development (New York: McGraw Hill, 1964), for a number of related articles and a selected bibliography on the subject.

Johnston and Mellor have noted that the agricultural sector may contribute to economic growth in three ways.

(1) It must provide adequate food supplies to a rapidly expanding urban population. (2) It may serve as a source of labor and capital for industry. (3) A rapidly developing agriculture, with rising incomes, may serve as a source of capital savings and increased demand to stimulate other aspects of the economy.<sup>13</sup>

Lewis and others<sup>14</sup> have tried to show that the agricultural sector in many developing nations has unemployed or underemployed laborers who can be drawn off to industrial occupations without affecting total agricultural output. The argument contends that those remaining on the farm could then produce a surplus which might somehow be saved and invested in industrial projects to employ surplus farm labor. The process could be self-sustaining at least until the labor surplus is dissipated.

Yet Schultz has argued rather convincingly that it is highly unlikely that agricultural labor could be withdrawn in most developing nations without reducing agricultural production significantly.<sup>15</sup>

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<sup>13</sup>Bruce F. Johnston and John W. Mellor, "The Role of Agriculture in Economic Development," American Economic Review, Vol. 51 (September, 1961), pp. 566-593.

<sup>14</sup>See Arthur Lewis, "Development with Unlimited Supplies of Labor," The Manchester School, May, 1954; and John C. H. Feis and Gustav Ranis, Development of the Labor Surplus Economy (Homewood, Illinois: Richard D. Irwin, Inc., 1961).

<sup>15</sup>T. W. Schultz, Transforming Traditional Agriculture (New Haven: Yale University Press, 1964).



Moreover, other economists have questioned the reality of attempting to "force" saving of any agricultural surplus which might be produced. It is extremely difficult to persuade a farm family to maintain the same low quality diet and save any agricultural surplus for investment in urban areas.

There is a growing interest in the development of traditional agriculture as a major step toward economic growth. Recent development literature reflects this concern.<sup>16</sup> Most of the studies listed in footnote 16 suggest that a rapid increase in agricultural productivity is necessary early in the development process. Such an increase in productivity is largely dependent on the adoption of modern farming techniques.

### Marketing in Development

The development theories discussed earlier in this chapter make little reference to the role of marketing in the development process. Marketing is one of the sectors which implicitly adapts itself to the more important changes

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<sup>16</sup>The following publications and articles are a sampling of the literature suggesting the importance of rising agricultural production in the development process: Stephen Enke, Economics for Development (Englewood Cliffs, N.J.: Prentice Hall, 1963); Robert D. Stevens in the work cited in footnote 4; Joseph D. Coffey, "Transforming Peru's Traditional Agriculture" (unpublished Ph.D. dissertation, North Carolina State University, 1966); Lawrence W. Witt in the article cited in footnote 1; Raymond P. Christensen and Harold T. Yee, "The Mechanics of Agricultural Productivity and Economic Growth," Agricultural Economics Research, Vol. XVI, No. 3 (July, 1964), pp. 65-71.





taking place in the economy. It is assumed in such theories that marketing is a passive element of the economic system. There is little doubt that everything included in the prevailing development theories is important in the development process. But the question becomes, "Do such theories suffice to operationally define the critical factors contributing to the growth process?" Perhaps development economists have not gone far enough into the details of development in order to really understand the dynamic relationships affecting economic growth.

At the present time a good bit of interest is being given to the role of marketing in economic development (the AID contract supporting this thesis research is a manifestation of such interest). Yet until recently there was little concern for the possible effect of marketing in the growth process.

Richard Holton has given several reasons for this neglect by development economists and policy planners. One reason is that they are much more interested in increasing the production of physical goods (as opposed to intangible marketing services) which are much more easily associated with a rising real standard of living. The second reason is that inefficient marketing systems in developing countries afford a dole for the otherwise unemployed. This is a painless way to avoid the difficulty of facing up to high unemployment. A third reason is that developing nations frequently have difficulty in evaluating the proportion of



the work force absorbed by and net income originating in the marketing sector as a result of its characteristic structure. There is, then, some considerable difficulty in trying to "sort out" the effect of marketing in a developing economy. And finally, economists have been somehow predisposed to ignore the economics of marketing and the possibility of improving real incomes by improving the distribution system.<sup>17</sup>

Holton drew some of these observations from a study of the Puerto Rican food marketing system authored jointly with J. K. Galbraith. In that study, it was found that food marketing was being performed by highly inefficient methods and institutions in Puerto Rico. By comparing the food retailing and wholesaling system as it existed in 1950 to a reasonably efficient model, it was found that the yearly cost of food could be reduced by more than \$15 million<sup>18</sup> by improving retail and wholesale distribution techniques and institutions.

Peter Drucker and J. C. Abbott are two other individuals who have stressed the need for a more thorough study of the role of marketing in development. Drucker<sup>19</sup> has

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<sup>17</sup>Richard H. Holton, "Marketing Structure and Economic Development," Quarterly Journal of Economics, Vol. 67 (August, 1953), pp. 344-361.

<sup>18</sup>Richard H. Holton and John K. Galbraith, Marketing Efficiency in Puerto Rico (Cambridge, Mass.: Harvard University Press, 1955).

<sup>19</sup>Peter F. Drucker, "Marketing and Economic Development," Journal of Marketing, Vol. 22 (January, 1958), pp. 252-259.



asserted that marketing is the most effective engine of economic development. Among other things he emphasizes the importance of the distribution system in training and developing entrepreneurs and managers so important in the development process.

While Drucker concentrated on the importance of marketing in general, Abbott has been particularly concerned with agricultural marketing. In 1958 he published through FAO a marketing guide for developing nations in which he stressed the importance of effective marketing systems at all stages of development.<sup>20</sup> During 1962 he published an article in which he noted that the marketing system can have a significant impact on the transmission of incentives to agricultural producers. He listed three basic conditions essential for agricultural development. (1) Prices for agricultural products must be stable at a remunerative level. (i.e. farmers must be fairly certain that prices at harvest time will bear some reasonable relation to production costs.) (2) Adequate marketing facilities must be available. The market should be organized and coordinated in such a way as to reflect price incentives warranted by supply and demand conditions back to producers. (3) There should be a satisfactory system of land tenure.<sup>21</sup>

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<sup>20</sup>J. C. Abbott, Marketing Problems and Improvement Programs, Marketing Guide No. 1 (Rome: Food and Agricultural Organization, 1958).

<sup>21</sup>J. C. Abbott, "The Role of Marketing in the Development of Backward Agricultural Economies," Journal of Farm Economics, Vol. XLIV (May, 1962), pp. 349-362.



George Mehren in attempting to find out why in all economies the agricultural production and distribution system is last and least developed, noted many of the same difficulties mentioned by Abbott. He listed several other reasons for the slow development of the agricultural production and the marketing system. One important reason cited was that production and distribution firms are usually small, fragmented, and multiproduct enterprises. The implication is that such firms are not able to operate at sufficient scale to accumulate capital or achieve efficient levels of operation. A second reason is that there is little inducement or capacity for such firms to adopt modern financing, storage, transportation and communication facilities.<sup>22</sup>

Reed Moyer in an extensive review of the literature in the field has noted that marketing can contribute to development in a number of ways. The following list summarizes his conclusions on the function of marketing in economic development:

1. The marketing system can reduce risks by providing adequate information flows.
2. It can provide the organizational framework necessary in coordinating production and consumption and in rationing the supply of commodities to consumers in response to their expressed needs and wants.

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<sup>22</sup>George L. Mehren, "Market Organization and Economic Development," Journal of Farm Economics, Vol. 416 (December, 1959), pp. 1307-1315.



3. Marketing institutions can be a major source of entrepreneurial talent and capital for other sectors of the economy.
4. The marketing system may generate pecuniary and technological internal and external economies for producing firms as a result of the extension of their markets.
5. The marketing system may draw subsistence producers into the exchange economy.
6. Marketing institutions can increase the elasticities of supply and demand by making available new or improved products which buyers may find desirable.
7. Marketing institutions can lower consumer costs by improving distribution efficiency through technological innovation, more intensive resource use and less spoilage.
8. The marketing system can reduce transaction and exchange costs between producers and consumers.<sup>23</sup>

The literature discussed above suggests that marketing holds an important place in the economic development process. If one examines closely the conclusions of a number of writers with respect to marketing, he discovers that a

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<sup>23</sup>Reed Moyer, Marketing in Economic Development, Occasional Paper No. 1 (East Lansing: Institute for International Business Studies, Michigan State University, 1965), pp. 7-19.

common thread appears. Further research should be designed to define more clearly the specific ways in which marketing can be used as a lead element in economic development. Moreover, conclusions in the latest publications by Mehren, Abbott and Holton on the subject suggest that significant production improvements must be accompanied by marketing improvements and vice versa. It appears that improvements in the marketing sector at times can serve as a catalyst in bringing about improvements in other marketing firms and also in producing and consuming units.<sup>24</sup> Later chapters in this thesis discuss this possibility in the light of agricultural marketing developments in Puerto Rico.

#### The National Market

The conclusions mentioned above are basically consistent with those of Walter Rostow and Lauchlin Currie. Both of these economists have proposed a kind of development program which would permit a two pronged attack on production and marketing improvements.

Currie asserts that developing nations under the influence of economic development theorists have placed too much emphasis on GNP growth rates, production and investment. As a result consumption has lost its place as the goal of production. He therefore suggests a development

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<sup>24</sup>See George L. Mehren and J. C. Abbott in the works already cited. Also Norman R. Collins and Richard H. Holton, "Programming Changes in Marketing in Planned Economic Development," Kyklos, Vol. 16 (January, 1963), pp. 123-134.

plan which would place primary emphasis on increased consumption (particularly of the low income underemployed). He stresses the value of economic theory in his plan and is especially convinced that the Keynesian analysis of the lack of effective demand is useful. Basically, he argues that economic efficiency considerations and traditional development theory are necessary but not sufficient to break through the vicious circle of poverty in developing nations. The approach must also include considerations in income distribution or, as he prefers, relative consumption gains arising from income re-distribution.

Currie has suggested that those countries interested in real economic development should reformulate their development objectives, taking into consideration the importance of income distribution as well as aggregate gross income. He defines

a program designed to assure the elements of a minimum tolerable standard of living for, say, the poorer half of the population in terms of the basic necessities of food, clothing, housing, health, primary education, miscellaneous goods, and amusements.<sup>25</sup>

Currie argues that most Latin American nations fit in with the type of stagnation analysis that was applicable to Western Europe and the United States in the thirties, the Keynesian analysis of lack of effective demand, and un-used

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<sup>25</sup>Lauchlin Currie, Accelerating Development: The Necessity and the Means (New York: McGraw Hill, 1966), p. 20.



capacity. He contends that the World War II experience of great increases in output when all resources were bent toward common goals was quite a revolution. With little or no immediate addition to capital, output in the United States, stated in 1954 dollars, increased from \$186 billion in 1938 to over \$320 billion in 1944.<sup>26</sup> The increase in output came from intensive use of existing facilities and labor. Thus, he suggests mobilizing the citizenry as well as resources for a domestic war. Finally, he proposes that the experiences of European recovery after the Second World War teach useful lessons to developing nations on some effective ways to utilize injections of technical assistance and capital funds.

Of the many problems in developing nations, Currie suggests that the lack of effective demand is one of the biggest. He implies that efforts to improve the real incomes of low income families both rural and urban, coupled with the availability of basic consumer items, may permit developing nations to break out of the vicious circle of poverty and low effective demand.

Walter Rostow's national market concept is closely related to this idea. Fundamentally, Rostow views the development problem in most Latin American nations as depending on the terms of trade between their own industrial and agricultural sectors.

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<sup>26</sup>Ibid., p. 81

The prices paid in the countryside for manufactured goods in these developing nations are too high; while the prices paid by the cities for the output of rural areas and the total resources allocated from the cities for rural development are too low.<sup>27</sup>

He suggests that the operational task of development is "to break down these structural distortions; to produce a self-reinforcing agricultural and industrial expansion; and to create truly national markets."<sup>28</sup>

There are four basic tasks involved in creating such national markets: (1) A build up in agricultural productivity; (2) a revolution in the marketing of agricultural products; (3) a shift of industry to the production of simple agricultural equipment and consumer goods for the mass market and (4) a revolution in marketing methods for cheap manufactured goods, especially in rural areas.<sup>29</sup>

The implications of the conclusions of both Rostow and Currie are that the necessary build up in agricultural productivity is drastically affected by the availability and adoption of non-farm inputs and by the structure and performance of agricultural product markets. Poorly coordinated and inefficient marketing channels may therefore impede the agricultural development process. At the same time the capacity and willingness of farmers to buy non-farm inputs may be closely related to the profit incentives transmitted to the producer.

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<sup>27</sup>Walter W. Rostow, "How to Make a National Market," Department of State Press Release, No. 498, October 1, 1963, p. 4.

<sup>28</sup>Ibid.

<sup>29</sup>Ibid., p. 5.

Much of the discussion in Chapter VI is directed toward an examination of the characteristics of innovators. Consequently a brief review of the literature of innovation is included there. It should be made clear, however, that a study of the factors determining innovation cannot be divorced from a study of the causes of agricultural productivity improvements. In fact, as several authors in the preceding literature review have noted, the widespread adoption of production innovations is necessary before productivity can be significantly improved. The following chapter builds upon previous literature in order to establish a theoretical and conceptual framework for the remainder of the thesis. It also includes a discussion of a basic hypothesis underlying the research.

## CHAPTER III

### MARKET COORDINATION IN ECONOMIC DEVELOPMENT

#### Introduction

The preceding chapter provided a review of some of the existing theory and conclusions regarding economic development. The chapter included a review of some of the major economic theories of development beginning with Adam Smith together with recent contributions. The chapter also reviewed the literature concerned with the role of marketing in economic development.

The purpose of this chapter is to provide the conceptual framework which will relate the remainder of the thesis to economic development theory. In a sense it is a proposal for adding a new and somewhat different dimension to economic development theory and policy. The chapter embarks from the previously reviewed literature on development. It describes the role of exchange in the development process. The perfect market is then discussed as a possible performance norm for a bargained exchange economy. The next step is to examine the necessity of a dynamic set of performance norms since economic growth is a process involving a never ending series of approximate equilibria. Next, the discussion moves to an examination of evidence in several developing nations



which indicates poor economic performance (in a dynamic sense) in atomistically competitive markets. Finally, the chapter reviews a series of common general policy goals in developing nations, specific market performance goals, and potential marketing policy measures to achieve those goals.

### Prevailing Conditions in Developing Nations

A review of current economic data and research studies in developing nations suggests that underdevelopment may be generally characterized by the existence of several common conditions. The following discussion is not intended to be an exhaustive list of all such factors. Rather it is a list of some of the important conditions bearing on the marketing system.

Atomistic competition is present in most aspects of commodity production and marketing in developing nations. On the other hand, factor ownership is frequently concentrated in the hands of relatively few. And in some cases large land holdings create a feudalistic economic structure. A heavy concentration of capital holdings in the hands of a few wealthy families is also a common occurrence. Nevertheless, the domestic food production and distribution sector are usually made up of large numbers of business units competing atomistically.

Low per capita incomes are a characteristic of all developing nations by definition. In fact, the most frequently

expressed goal of economic growth is to increase per capita incomes.

Low nutritional levels in the face of rapid population growth and low levels of food production are a reality in today's developing nations. In many cases malnutrition and starvation already exist on a wide scale while in other nations the reality of food shortages is postponed only by nutritionally deficient but quantitatively sufficient diets.

Low-absolute levels of labor productivity are evident in virtually all underdeveloped nations. Some argue that the marginal productivity of some workers is zero, especially in the agriculture and trade sectors. If such were the case those workers could be withdrawn from their jobs without affecting total output. The issue of zero marginal productivity is currently unsettled, but most economists agree that low labor productivity is a widespread condition in underdevelopment.

Underemployment of economic resources is a frequently cited condition in developing nations. Here the reference is to all factors of production including land, labor, capital, and management. The argument states that for a variety of reasons entrepreneurs do not utilize an optimum combination of resources in production of goods and services, i.e. existing factors of production could be re-allocated

to increase total output. Schultz,<sup>30</sup> Welsch,<sup>31</sup> and Coffey<sup>32</sup> have argued (on the basis of research in various aspects of traditional agriculture in four different countries) that there was relatively little or no inefficiency in the allocation of available resources. Their explanation for low productivity was a lack of availability and use of more productive techniques. However, these studies were only meant to examine resource allocation within the agricultural sector. They did not consider the possibility of total resource allocation in the economy. The possibility still exists that certain resources (capital) should be transferred into agriculture with labor being removed to other, more productive uses.

Capital deficiencies are regarded by most economists as the single most critical problem in the underdeveloped world. Adam Smith stressed the importance of saving for investment in improved production techniques. And the emphasis on capital has continued through current writings on development economics. In Chapter 2 the review of economic development theory reflects the historical emphasis on capital formation. The reality of existing capital shortages in developing nations coupled with the existence of atomistic

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<sup>30</sup>Schultz, passim.

<sup>31</sup>Delane E. Welsch, "The Rice Industry in the Abakaliki Area of Eastern Nigeria, 1964" (unpublished Ph.D. dissertation, Dept. of Agricultural Economics, Michigan State University, 1964).

<sup>32</sup>Coffey, passim.

competition suggests that capital formation in the private sector is inhibited by a low level of equity capital prevailing in business units and the resultant low absolute returns to each individual firm. Capital accumulation for investment in productive innovations is difficult for such business units because of the necessity of using a high percentage of the low absolute returns for family survival. For the typical businessman capital savings for a specific investment is slow and seemingly hopeless.

Unused productive capacity is frequently a problem in spite of the previously mentioned shortage of equity capital in developing nations. The situation arises as a result of a basic malallocation of resources. Hence, if an inordinate amount of capital (in relation to other industries) has been allocated to the production of a given commodity, then the capital equipment will not be used to its capacity since consumer demand will not be sufficient. A preoccupation with large capital-intensive industrial development projects has often resulted in a poor allocation of productive resources in the light of effective consumer demand.

Low literacy levels are a common characteristic of developing nations. It should be noted that there are a few exceptions, like Argentina, but generally illiteracy is a major problem in underdeveloped nations. Consequently, educational improvement is usually a major thrust in development programs.

### The Vicious Circle of Low Productivity

Throughout the underdeveloped world, interest is currently focused on the necessity of bringing about greater productivity through a variety of development programs. Usually the primary goal (if one exists) is to bring about an increase in capital saving and encourage the investment of that capital in technological (or even organizational) innovations which will lead to a greater output per unit of inputs. Simply stated, the goal is greater efficiency of resource use through the application of modern techniques. Schultz has argued rather convincingly that there is relatively little hope of achieving productivity gains in traditional agriculture through more efficient combinations of existing resources.<sup>33</sup> He concludes: "The key to growth is in acquiring and using effectively some modern . . . factors of production."<sup>34</sup> But whether or not possibilities exist for a more efficient combination of existing resources, few development economists would disagree with Schultz concerning the necessity of effective utilization of modern techniques in developing nations.

Given the necessity of technological innovation and in view of existing conditions in developing nations as previously described, what are the critical factors inhibiting the diffusion of more productive techniques?

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<sup>33</sup>Schultz.

<sup>34</sup>Ibid., p. 176.

Thoughtful researchers have suggested a number of reasons. Some of those frequently mentioned in various combinations are: low level of education and training, poor communications, inadequate transportation, insufficient saving and low achievement motivation.<sup>35</sup> Undoubtedly each of these factors, in addition to many more, play some role in the prevention of technological innovation. It is, therefore, not the purpose here to disclaim the importance of these factors or to suggest entirely new ones. Rather the purpose is to explain within the framework of the marketing system the ways in which those factors interact to inhibit the process of innovation.

Basically the argument states that as a result of existing conditions (especially small scale atomistic competition, insufficient education and training and inadequate communications) businessmen find themselves trapped in a position of not being able to improve productivity through technological innovations. The difficulty is not an inherent

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<sup>35</sup>For a discussion of the importance of improved education and training, see Schultz, Chapter 12. The importance of communications is pointed out in Wilbur Schramm, Mass Media and National Development: The Role of Information in the Developing Countries (Stanford, California: Stanford University Press, 1964). The effect of transportation development on economic growth is emphasized in Charles P. Kindleberger, Economic Development, 2nd edition (New York: McGraw-Hill Book Co., 1958), Chapter 9. The critical importance of saving was noted by W. A. Lewis in "Economic Development with Unlimited Supplies of Labour," The Manchester School, May, 1954, pp. 139-191. Achievement motivation as a factor in economic development has been studied intensively by David McClelland. See The Achieving Society (Princeton, New Jersey: Van Nostrand Co., 1961).

lack of desire for improving productivity, but rather a low level of individual initiative attributable to low knowledge levels, small incomes, and an absence of effective economic incentives. The individual businessman is unable to see any practical or worthwhile way of improving his well-being through saving and investing in technological innovations.

The remainder of this thesis focuses on the role of an effectively coordinated, development oriented marketing system in providing direction and innovative stimulation to the developing economy. The thesis examines several possible effects of such a marketing system on the development process. The major ones are: (a) more efficient use of resources committed to distribution, (b) more effective communication of economic incentives, and (c) the market's effect as a catalyst in producing the kinds of innovation and change in production, distribution and consumption which are compatible with the goal of economic development.

In another sense, the thesis is an examination of the hypothesis that atomistic competition as it exists in most developing nations is a hindrance rather than a help in the development process. Specifically, the hypothesis states that atomistic competition does not automatically contribute to economic growth by encouraged productivity improvements and more effective market coordination. The atomistically competitive market price system without effective market exchange and property rules or without some external direction and control should not be expected to lead automatically

to rising productivity and better market coordination. The needed adjustments may be fostered through competitive changes or induced by government policy.

Chapter 5 examines data on agricultural market coordination in Puerto Rico in order to evaluate the above hypothesis and also to illustrate specific policy measures utilized in achieving improvements in food marketing.

Finally, Chapter 6 utilizes data from a farm survey to test a series of hypotheses related to the more general hypothesis listed above. The purpose is to consider the interaction of economic, demographic and attitudinal variables as they affect the market coordination process.

The remainder of this chapter examines the conceptual, theoretical and policy implications bearing on the market coordination process.

### The Role of Exchange in Society

In order to evaluate the effect of the market on economic development, it is first necessary to view economic exchange as a part of the larger social setting. One of the critical factors bearing upon exchange is the prevailing type of political and social organization in a country. The nature of customs, habits and mores are important determinants of exchange behavior. By the same token the type of political system may vary from dictatorship to socialism or capitalism with considerable effect on the nature and operation of the exchange system.



There are at least three ways of organizing for economic exchange in a society. They are: (1) bargained exchange, (2) status exchange, and (3) administrative exchange.<sup>36</sup> Any of the three may be utilized to some extent in combination with any form of political organization. In most societies all three types of exchange are employed at different points in the economy.

The bargained exchange system is one in which "transactions are governed primarily by a set of impersonal rules . . . within which exchange rates are established by bargaining processes."<sup>37</sup> In such a system individual enterprises are permitted freedom in bargaining for exchange of commodities among themselves. This type of system is most frequently associated with a democratic form of political organization but is used to some extent in practically all societies.

In the status exchange system, "transactions are governed primarily through the prescribed roles associated with social position. Exchange rates tend to be prescribed or fixed by custom."<sup>38</sup> In this type of exchange system social roles and customs become extremely important because they govern the exchange of economic goods. This type of

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<sup>36</sup>A. Allen Schmid and James D. Shaffer, "Marketing in Social Perspective," Agricultural Market Analysis, ed. A. Vernon L. Sorenson (East Lansing, Michigan: Michigan State University Business Studies, 1964).

<sup>37</sup>Ibid., p. 23.

<sup>38</sup>Ibid., p. 20.

exchange system is frequently associated with more primitive societies though variations of the principle operate in most societies today. "To each according to his need and from each according to his ability, if voluntarily accepted by the members of society rather than being enforced by authority, would be a system of status."<sup>39</sup>

An administrative exchange system is one in which transactions are governed by those with political authority. In this case political authority carries along with it the right to determine how resources and products should be distributed in an economy or some sub-part of an economy. Most frequently the dictatorship, socialism or some other form of centrally controlled political system is associated with this type of exchange system. But practically all societies have some transactions which are governed by administrative decree. This is true of so-called democratic societies as well as totalitarian.

Regardless of the combination of various types of exchange systems existing in a society, the efficient functioning of some kind of exchange system is necessary to allocate factors of production to alternative uses and to allocate final consumption goods in payment for those factors. The exchange system is therefore the allocating mechanism of all economic goods. Indeed, as Kenneth Boulding has said, the

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<sup>39</sup>Ibid., p. 21.

"study of exchange comprises nine tenths of the economists dominion."<sup>40</sup> The following sections will examine the role of market coordination and the relationship of market coordination to both static and dynamic economic theory. The basic type of exchange system is "bargained" since this is the assumption of traditional capitalistic economic theory.

#### Market Coordination in a Bargained Exchange System

The bargained exchange system was defined earlier as one in which exchange is accomplished through an impersonal set of rules where a bargaining process establishes exchange rates. The working of the price mechanism to coordinate production, marketing and consumption decisions is described below.

In any society basic decisions must be made regarding who will produce what products and where and in what form they will be consumed. Those decisions may be made by relatively few individuals in positions of political power (administrative exchange) or by a large number of individuals (bargained and status exchange). On the bargained and status exchange systems where large numbers of independent decisions are involved there must be some way of coordinating and integrating the decisions if confusion and chaos are to be avoided. In the status exchange system, social roles, customs and habits provide the necessary structure and coordination.

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<sup>40</sup> Kenneth Boulding, Economic Analysis (New York: Harper & Row, 1941), pp. 3-8.

In the bargained exchange system, individual decisions to produce, buy or sell are coordinated for all participants by the market price system. The marketing system brings together individual buyers and sellers to provide them the opportunity to bargain and exchange commodities while seeking the greatest possible returns. If an individual finds prices for his commodities so low that they place his returns below returns available in the production of alternative commodities, he will change over to the production of other items. If enough producers follow suit, the quantity of that product available in the market will decline, and buyers will gradually bid the price up in order to fill demands. But if prices go above a certain level, they will make alternative purchases. In this way supply and demand determine product prices in the market place which in turn determine the allocation of productive resources. The market, therefore, theoretically coordinates itself. Yet in a practical sense it is almost always necessary to have an outside force establish and enforce basic rules and regulations in the market in order to provide structure and minimize dishonesty among traders. The important fact is that the marketing system through flexible prices coordinates an immense number of independent decisions which ultimately determine how available resources will be utilized to satisfy the society's needs and wants at any point in time.

If the marketing and pricing mechanisms are not working effectively, then coordination of the system is inhibited,

and individuals depending on the system may make erroneous production decisions. The result will be a poor allocation of existing resources in the light of consumer demands. Problems frequently arise in this respect as a result of continuously changing attitudes, tastes and desires in a developing economy. The price system is frequently slow or ineffective in communicating those changes to individual producers, especially if there are time lags associated with long production cycles. Moreover, we are talking about an extremely complicated and continuous process in which interactions in the market are continually altering the attitudes and perceptions of both producers and consumers. The market price system may have some difficulty in transmitting the effect and magnitude of such changes.

In summary, market coordination may be defined as the process in an exchange system whereby producers, distributors and consumers interact to exchange relevant market information, establish conditions of exchange and accomplish physical and legal transfer of economic goods. Through this coordination of independent participants using the information provided by flexible product prices, basic resource allocation decisions are made independently by producers, distributors and consumers to determine what will be produced by whom plus where, when, and in what form the products will be delivered.

### Market Coordination in Economic Theory

A good part of conventional micro-economic theory is concerned with a framework for decision-making at the individual firm and family level in markets which are regulated by supply and demands. It is not the purpose of this chapter to review that part of micro-economic theory. This thesis is more concerned with the aggregative aspects of independent firm decisions as they affect coordination in the market. However, it is worthwhile to review some of the major aspects of the theory in order to demonstrate more clearly the relationship between a study of market coordination and economic theory.

Perfect competition, according to micro-economic theory, exists in an economy when the following conditions are fulfilled: (1) each buyer or seller in the economy is so small in relation to the entire market in which he operates that he is not able to influence the prices of products he buys or sells, (2) there are no artificial restrictions on demands, supplies or prices, (3) goods, services and resources are perfectly mobile in the economy, and (4) all economic units possess perfect knowledge of the economy.<sup>41</sup> Pure competition defines a situation where the fourth condition does not hold.

It can be shown that in a perfectly competitive economy where all firms seek to maximize their individual profits

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<sup>41</sup>Richard H. Leftwich, The Price System and Resource Allocation (New York: Holt, Rinehart and Winston, 1960), pp. 23-25.

using marginal analysis, the market will be perfectly coordinated and resources will be perfectly allocated to produce a maximum of economic goods with available resources.<sup>42</sup>

One should hasten to point out that economists (including Adam Smith and other classicals plus the current Chicago school) have never suggested that such an ideal situation could exist in reality. The concept of a perfect market has been used as an abstract ideal for heuristic purposes in demonstrating the workings and benefits of marginal analysis<sup>43</sup> in a market price economy. In teaching economic theory, the assumptions of perfect competition are gradually relaxed to demonstrate the use of economic analysis under less rigid assumptions. In fact, economists not particularly concerned about the total allocation of resources in society but with the inter-firm allocation of resources, frequently use less restrictive definitions for demonstrating micro-economic theory. The relaxation of the conditions of perfect competition to reflect a more realistic competitive system creates some difficulties in evaluating the efficiency of resource allocation. The problem has received quite a bit of interest through imperfect competition, workable competition and

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<sup>42</sup>A. P. Lerner has summarized the marginal conditions leading to such a perfect allocation. See Lerner, The Economics of Control (New York: The Macmillan Co., 1949), pp. 75-77.

<sup>43</sup>The term marginal analysis is used to describe an economic decision making process whereby an individual businessman continually seeks to equate returns and costs at the margin with respect to all factors of production.

performance studies. But there is still no generally accepted theory of resource allocation under imperfect competition.

Historically, the perfect competition model has been used by economists for teaching and even for policy considerations on an individual firm basis. However, in policy matters concerning the entire economy, economists have been careful to note that perfect competition does not exist but that conditions of pure competition are sufficient to provide a tendency toward optimum allocation of resources.<sup>44</sup> But even pure competition is difficult to achieve. The work of Chamberline and Robinson among others on monopolistic competition reflects the concern for this possibility. Nevertheless, many economists believe that the best interest of society will be served by making competition in the economy as near perfect as possible.

There is a difference of opinion regarding the historical evidence on this point. Peterson argues that the followers of Chamberlin "fell into the bad habit of equating competition with pure competition, of confusing theoretical benchmarks with policy norms . . ."<sup>45</sup> He cites evidence to support the conclusion that classical economists (especially

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<sup>44</sup>For an interesting discussion on the position of classical economists regarding this matter see Shorey Patterson, "Antitrust and the Classic Model," The American Economic Review, Vol. XLIII (March, 1957), pp. 60-78. Reprinted in Richard B. Heflebower and George W. Stacking, (eds), Readings in Industrial Organization and Public Policy (Homewood, Ill.: Richard G. Irwin, Inc., 1958), pp. 316-333.

<sup>45</sup>Ibid., p. 332.



Marshall and John B. Clark) were well aware of the shortcomings of perfect competition as a policy norm. He is convinced that Schumpeter, Chamberlin, Galbraith and others misconstrued history and criticized earlier economists for utilizing the static model of perfect competition as a policy norm when in fact the classicals held no such views. According to Peterson earlier economists did attempt to go beyond the static model to consider the importance of change and economic growth on competition. Regarding John M. Clark's concept of workable competition he says:

In a sense he bridged the periods by paralleling the exact modern idea of pure competition with an equally sophisticated conception of the realizable and acceptable working of markets, and thus formulated with added fullness and precision a basis of policy toward which his father and his father's contemporaries were moving.<sup>46</sup>

Nevertheless, it is difficult to dispute the point that the general feeling with respect to economic policy in the United States has been that more competition is usually better than less and that many policy programs have been sought to move us toward the perfectly competitive ideal. George Stigler implies that perfect competition in contrast to workable competition is still an effective policy norm.<sup>47</sup>

As a result there has been somewhat of a preoccupation with competition without sufficient concern for its effect

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<sup>46</sup>Ibid., p. 333.

<sup>47</sup>George J. Stigler, "Workable Competition, Comments," Reprinted from American Economic Review, May, 1956 in Harvey J. Levin, (ed.), Business Organization and Public Policy (New York: Holt, Rinehart, and Winston, 1963), pp. 24-26.

on the economic goals of society (especially the major goal of increasing output). The work of J. M. Clark, Bain, and others is an attempt to integrate earlier thoughts on the subject with current observations in order to bring into consideration the dynamic aspects of competition and their effect on the performance of the economic system.

The effort of contemporary economists to improve economic theory has centered around a desire to make the theory dynamic. J. M. Clark has characterized his work as an "effort to reduce or bridge the gap between theory and reality; and in particular the gap between theories of cost-price equilibrium and theories of production, growth, and development."<sup>48</sup> The concern of Clark and other recent economists has been on producing an acceptable alteration of static perfect competition theory and equally static monopolistic competition theory in order to consider for policy purposes the dynamic and "process" aspects of a growing economy.

Ackley has defined such a dynamic theory as consisting of three steps. The first step is "to put (the effects of change and uncertainty) back into static theory."<sup>49</sup> The second step is to understand and describe the sequence of

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<sup>48</sup>J. M. Clark, "Competition: Static Models and Dynamic Aspects," Heflebower and Stocking, p. 244.

<sup>49</sup>Gardner Ackley in a discussion of J. M. Clark, "Competition: Static Models and Dynamic Aspects," Ibid., p. 259.

events leading toward equilibrium and to take into account the fact that the economic system "never reaches one equilibrium before that equilibrium is replaced by another."<sup>50</sup> The third step in constructing a dynamic theory is the one with which Clark is most concerned. In fact, Clark probably would not deny that static theory, with certain modifications for taking into account the tendencies toward equilibrium, can be made dynamic in the definition implied in the first two steps. But the kind of dynamics with which traditional static theory cannot deal is where

processes of change are seen at least in part to be irreversible, self-generative, and self-determining. . . . Thus (dynamic theory) would attempt to explain, at least in part, such things as the state of technology, the number of sellers, the evolution of buyers tastes, the nature of the market institutions, . . . the attitudes of sellers, . . . etc."<sup>51</sup>

Real progress in formulating such a dynamic theory has been slow. More often than not, as critics point out, the results of such efforts have been the formulation of a set of conditions describing "workable competition" or "acceptable performance" for purposes of policy guidance in a given industry. Critics argue that such policy guides are simply the result of the application of static theory and personal judgment on the part of the researcher.

In spite of the shortcomings of the dynamic theory approach to economic policy, it appears that for developing nations such an approach is the most realistic and rewarding.

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<sup>50</sup>Ibid., p. 260

<sup>51</sup>Ibid.

This is due primarily to the fact that rapid changes in all aspects of life are occurring and must continue to occur at an accelerated pace if economic development is to be achieved. The static theory of perfect competition cannot be made to deal with such magnitudes of change. Developing economies cannot afford the luxury of falling back on the neat and completely determinate theory of static analysis for policy direction. They must learn to deal with the indeterminatedness of economic life as it really exists and formulate economic policy accordingly if they are to make adequate progress toward the goal of accelerating growth.

With this discussion relating economic theory, government policy, and market coordination, we turn to the examination of some examples of the impact of atomistically competitive markets on the development process.

#### Atomistic Competition and Economic Growth

Several years ago Sol Tax made an intensive study of an isolated village in Guatemala. Being an anthropologist, he examined several aspects of the lives of the people. He found that with respect to the economic system of the village and surrounding region, there was considerable specialization and exchange. He also found that the market place could be "characterized as perfectly competitive"<sup>52</sup> insofar as it tends to be (a) atomistic, (b) open, (c) free, and (d) based

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<sup>52</sup>A more accurate term might be "purely competitive," since there is no indication that perfect information was available to all traders and producers.

on rational behavior."<sup>53</sup> In this "purely competitive" system he found that living standards were extremely low. The people were only able to produce the basic necessities to maintain life. Moreover, he found that in spite of increasing specialization and exchange, the economy had been stagnant for some time at this low level of economic life. Tax was disturbed by what he saw. He asked the question: "Why does not the fact that everybody works hard for himself alone, and seeks to maximize his own rewards, have the effect of creating wealth for all?" Pure competition, which is frequently posited as a stimulus to efficient allocation of resources and economic growth, seemed to prevail in the economy, but there were no evidences of economic advancement. In answer to his own question, Tax concluded: "what seems to be lacking in Guatemala is the beginning of the accumulation of technical knowledge that eventually results in improvement in the material standards of life."<sup>55</sup> He was completely convinced that the absence of an expansion of technological knowledge was the primary factor preventing economic expansion. His conclusion on the topic is interesting.

If economists had been living in western Guatemala the past two hundred years, they could not have credited to free competition the glory that progress in technology has deserved.<sup>56</sup>

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<sup>53</sup>Sol Tax, Penny Capitalism (Chicago: The University of Chicago Press, 1963), p. 15.

<sup>54</sup>Ibid., p. 28

<sup>55</sup>Ibid.

<sup>56</sup>Ibid., p. 29.

Even though Tax's statement is somewhat strong, his point seems valid. Advancing technology is a critical factor if greater productivity and economic growth are to be achieved. An interesting point which he failed to consider is the possible adverse effect of atomistic competition on the spread of new techniques of production. An anthropological study in Southern Italy does give some indication that small scale atomistic competition tends to create pessimism and a complete lack of trust for the unknown and even for one's fellow man.

Edward Banfield spent nine months studying the culture and economy of Montegrano, an extremely impoverished village in Southern Italy. His description of the economy was not as thorough as the one given by Tax for his Guatemala village, but it is obvious that a considerable degree of specialization and exchange existed. He also made it clear that the people lived just at the level of subsistence. He too found that atomistic competition was the rule, and that it was accompanied by a very strong feeling of self-preservation. The rule prevailing in all social and economic relationships was to "maximize the material, short-run advantage of the nuclear family (the most prevalent form of business organization); assume that all others will do likewise."<sup>57</sup> He hypothesized that the keeping of this rule

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<sup>57</sup>Edward C. Banfield, The Moral Basis of a Backward Society (Chicago: The Free Press, 1958), p. 85.

leads to a complete lack of cooperation among the people in achieving social improvements. It was an extreme application of the hedonistic principle which in Montegrano seemed to result in a total absence of a spirit of cooperation for mutual improvement.

The probable factors leading to "amoral familism"<sup>58</sup> are not discussed by Banfield. However, his findings suggest that many generations of atomistic competition and poverty with little advance in technical knowledge resulted (perhaps justifiably so) in the destruction of any real hope for the individual to improve his position through new and risky methods or cooperative ventures. Banfield describes the peasant:

"Getting ahead" and "making a good figure" are two of the central themes of the peasant's existence. But he sees that no matter how hard he works he can never get ahead. Other people can use their labor to advantage, but not he.<sup>59</sup>

This conclusion was supported by the research results. Out of 320 peasants who were given thematic apperception tests, only sixteen described a situation where a family was able to "prosper by thrift or enterprise, and even in these cases the success was not great enough to raise it out of the peasant class."<sup>60</sup>

Banfield concluded that "amoral familism" was the primary factor preventing economic development in Montegrano.

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<sup>58</sup>This is the term Banfield uses to describe the previously mentioned social and economic behavior.

<sup>59</sup>Ibid., p. 65.

<sup>60</sup>Ibid., pp. 65-66.

He generalized to other developing nations:

Lack of such association (i.e. political and corporate) is a very important limiting factor in the way of economic development in most of the world. Except as people can create and maintain corporate organization, they cannot have a modern economy. To put the matter positively: the higher the level of living to be attained, the greater the need for organization.<sup>61</sup>

Cyril Belshaw observed peasant markets in Fiji and New Guinea and concluded that agricultural producers there were emerging on the foundation of specialized production with little reference to marketing. There were large numbers of traders competing atomistically:

The large numbers, the strength of the competition, the relative weakness of the prestatory links which should create monopolistic frictions, combine to keep capital accumulation to the minimum. This in turn limits the internal growth dynamic of the system.<sup>62</sup>

He noted that for the situation to improve, several conditions seemed to be necessary. "One would be for a reduction in numbers of traders relative to the volume of trade, giving a trader a chance to achieve economies of scale."<sup>63</sup> He mentions that "advantages to the alert can accrue through the sudden widening of the transportation network."<sup>64</sup> Finally, he points to a limitation of market activities due to the "absence or deficiency of communication institutions."<sup>65</sup>

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<sup>61</sup>Ibid., p. 7.

<sup>62</sup>Cyril S. Belshaw, Traditional Exchange and Modern Markets (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), p. 82.

<sup>63</sup>Ibid.

<sup>64</sup>Ibid.

<sup>65</sup>Ibid.



Thus Belshaw noted that in Fiji and New Guinea, the economic development process appeared to be hindered by excessive numbers of very small traders competing in a market with inadequate transportation services and poor communications. He diagnosed the difficulty as too much peasant competition in the face of extremely imperfect markets. A diagnosis similar to the ones noted by Tax in Guatemala and Banfield in Southern Italy.

A common thread runs through these research studies. Each points to a market exchange system where economic growth is directly inhibited by small scale atomistic competition or by factors directly related to atomistic competition. Conditions in the production and distribution of fruits and vegetables in Puerto Rico suggest that a similar situation has existed there for a number of years. Small scale competition and a lack of organization in the markets has resulted in little use of available technologies due to a high degree of uncertainty and a prevailing pessimistic attitude toward "getting ahead" through individual initiative. The analysis in Chapter 5 will further discuss the situation.

In light of the foregoing discussion regarding the necessity of dynamic policy norms and the possibility that atomistic competition in some cases may inhibit the development process, it is important to look now at the possible implications for economic policy goals and measures. The following section examines some general and specific policy

goals for developing nations and suggests several classes of market policy measures compatible with those goals.

#### Economic Policy--Values, Goals and Programs

It was pointed out earlier that a given society might utilize various combinations of political, social and economic organization. The particular combination in use is determined historically by a wide range of factors not the least of which are the values and beliefs held by the people of the society.

Within the framework of any political economy there are basic goals or objectives. Whether they are well defined and consistent or fragmentary and inconsistent, they compose the structure on which the political system depends. It is a well known fact that, regardless of the political and economic organization, 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 (through revolution or orderly political processes) to effect a change in leadership. On the other hand, the feasibility of achieving a re-direction of government policy goals is determined by the power (including political, economic and military power) of those in control. Moreover, "the determination of people's values is not an especially well-developed science . . ." <sup>66</sup> and because of

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<sup>66</sup>Dale E. Hathaway, Government and Agriculture (New York: The Macmillan Co., 1963), p. 11.



conflicts and confusion it is difficult even for a sensitive and well intentioned political administration to formulate acceptable policy goals and programs. This is especially true in a developing nation where values and beliefs may be undergoing rapid change and where the people are impatient for tangible results. The characteristic political instability in Latin America attests to the fact that formulating acceptable policy goals and measures to achieve those goals is a difficult undertaking in developing nations.

The following is a discussion of some of the general and specific goals relative to economic development and market coordination. In general, they are believed to be consistent with the current values and goals of the developing nations in Latin America. The chapter concludes with a brief discussion of the kinds of policy measures available for achieving these goals.

#### General Goals

Probably the most universal goal among the nations of Latin America is achieving a higher level of living. Evidence suggests that most of the people in Latin America hold values consistent with the goal of higher incomes. Again the historical political unrest frequently has developed because of impatience with slow economic advancement. This goal is most frequently expressed by economic planners as a desire to achieve a specific percentage growth in gross national product. Occasionally the goal is expressed in

terms of a specific monetary increase in per capita income. Because of the rate of population growth, a per capita income goal is a more accurate indicator of changes in levels of living, but even that does not provide an accurate measure of progress toward the basic goal of the people. When translated to the individual level in an economy, the goal states that each person should be provided with adequate income so that he is able each year to purchase and consume more economic goods than the year before. Evidence suggests that this goal dominates cultural, political and economic life in Latin America today.

The second general goal is closely related to the first, and in fact, is implied in the restatement of that goal at the individual level. The objective may be stated as a desire to achieve an equitable distribution of the benefits of economic growth. The growth in per capita income should be achieved in such a way that the increase is equitably distributed among the people in the economy. Achieving a 6% increase in per capita income may be a worthy achievement in one sense, but if the increase is concentrated in the hands of a small percentage of the population, it will have little impact on the level of living among the majority. The term "equitable" was used in stating this goal. Perhaps a better term would be "acceptable," since within each country social and political realities will determine the type of distribution of benefits deemed acceptable. In one country equal

distribution of the growth benefits may be the goal while in another the goal may tolerate considerable inequality.

The third general goal is concerned with equality of opportunity and individualism. The typical Latin American is quite anxious to protect his rights as an individual. And this individualism is accompanied by a desire to be given a fair opportunity to participate in the development process and to fully utilize his abilities for economic gain. A frequent, though not universal, corollary to this goal in Latin America is to maintain freedom of individual, political, social or economic action to the extent that such actions are not detrimental to others in the society.

The final general goal is the maintenance of an acceptable level of economic stability. This goal appears to lack the strong support of basic values among the people. But there is a feeling that real incomes should not be permitted to decline for any reason. In Latin America most individuals are little concerned that economic fluctuation may arise from inflation, natural disaster, speculation, international disturbances, or other semi-controllable factors. They are ill-equipped to withstand such fluctuations whether they are chronic or temporary. Hence, the strength of the economic stability goal is frequently the result of a realization on the part of those in political power that their constituents often have difficulty in distinguishing between "temporary setbacks" and permanent economic trends.

This is not an exhaustive list of all the economic goals existing in the nations of Latin American nations. It was not intended as such. Yet it does include those that are in general critical to economic growth and market coordination. The goals discussed are all centered on the necessity of generating and "equitably" distributing more and more economic goods since it is believed that these are dominant considerations in the minds of the majority of people in Latin America today.

#### Market Performance Goals

There are two broad market performance goals which are consistent with the economic goals discussed above. They are concerned with (1) improving resource allocation and (2) stimulation of technological progress. In the following section these goals are discussed individually. In addition, their relationship to market coordination is described, and finally, three specific market performance goals are suggested.

Resource Use.--It is difficult to formulate a specific goal with respect to efficiency of resource use. The difficulty arises because (as noted earlier in this chapter) economic theory gives no clearly defined efficiency norm for a dynamic and less than perfectly competitive economy. Dynamically modified<sup>67</sup> equilibrium analysis would suggest

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<sup>67</sup>This term is used to refer to static competitive theory modified to account for risk and uncertainty and to

that an optimum allocation of resources can be achieved under perfect competition (and in certain cases under pure competition). At various times economists point out, as did the Attorney General's Committee to study the Anti-trust Laws, that the concepts of pure and perfect competition are tools of theoretical analysis. They are not intended to and do not constitute a description of reality.<sup>68</sup> Moreover the committee emphasized at a later point in the report that "pure and perfect competition are wholly theoretical standards, in that they are not intended as such to be guides to public policy."<sup>69</sup> Nevertheless, we still find economists asserting that pure competition can and should be used as a norm for public policy. Witness the following statement by Richard Leftwich, in his popular intermediate theory text: ". . . economic models set up on the assumption of pure competition furnish us with a 'norm' or 'ideal' situation against which we can appraise the actual operation of the economic system."<sup>70</sup> Such a preoccupation with pure or atomistic competition may be leading developing nations

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describe the sequence of events leading to equilibrium, but not including provision for endogenous determination of variables previously considered exogenous in equilibrium analysis.

<sup>68</sup>Report of the Attorney General's National Committee to Study the Antitrust Laws (Washington, D. C.: U.S. Government Printing Office, 1955), pp. 337-338.

<sup>69</sup>Ibid., p. 338 (*italics in the original*).

<sup>70</sup>Leftwich, p. 26.



astray in their attempt to optimize resource allocation and economic growth.

Perhaps a more realistic, though somewhat more ambiguous and less satisfying, goal for developing nations with respect to resource use would be to continuously utilize existing resources in such a way as to result in rising productivity. The annual goal might be to achieve a specific increase in productivity in the economy. Sub-goals and policy measures would then be designed to achieve the over-all output objective. Admittedly, this kind of goal does not permit separation of the benefits of more efficient use of existing resources and the benefits of technological innovation. But the previously cited works of Schultz, Welsch, Coffey, Tax, Banfield and Belshaw suggest that the two concepts should not be separated anyway. They are dynamically interrelated in the marketing system and should be handled accordingly in formulating policy goals. This does not mean that economic theory is useless. It simply means that less attention should be given to achieving the "ideal" while more attention is directed toward evaluating the actual performance of the economic system.

Specific resource use performance goals in developing nations might be formulated around four different considerations: (1) are production and marketing costs being reduced and, if so, how are the benefits distributed and used to further economic growth objectives? (2) does the marketing system provide for effective transmission of incentives

throughout in order to encourage and reward efficiency and innovativeness? (3) does the marketing system function so as to transmit effective consumer demand to producers and facilitate production advancements? and (4) does the marketing system provide for dynamic interaction between producers and consumers in order to create and fulfill demands for new and better products?

Marketing performance goals formulated around these considerations should lead in a dynamic and developing economy to a realistic evaluation of resource efficiency in production and marketing and suggest specific government policies to cope with apparent deficiencies.

Technological Progress.---The second area of concern with respect to market performance goals is the stimulation of technological progress. The foregoing discussion pointed out that it is not desirable to separate for policy purposes the productivity effects of more efficient use of existing resources and technological innovations. This does not mean, however, that certain goals should not be utilized to encourage and facilitate the discovery and rapid adoption of technological innovations. The structure and conduct of the marketing system may have a significant impact on technological progressiveness among marketing firms as well as among producing and consuming units.

With respect to technological progressiveness as affected by the marketing system, there are two major factors



to consider in formulating policy goals and programs. They are: (1) Does the prevailing market structure and conduct slow down technological innovation among producing, distributing, processing, or consuming units? and (2) Does the prevailing market structure and conduct provide for adequate (public and/or private) basic and applied research with satisfactory communication of the research findings?

Market Coordination.--In judging the efficiency and progressiveness of any industry, it is important that the production-marketing system be evaluated realistically with respect to its effectiveness in coordinating production, distribution and consumption. Evidence suggests that proper communication through the marketing system between consumer wants and producers, coupled with the potential power of the producer and marketing agents to alter consumer wants, is a critical and dynamic process which must be operating in order to encourage greater efficiency in production and distribution and at the same time to improve the variety and quality of consumer goods. Such a process of dynamic interaction in vertical market channels appears to be universally present in rapidly developing economies.

Improvements in resource allocation and technological progressiveness seem to be important ingredients for all rapidly developing economies. These kinds of improvements must take place among individual firms at horizontal levels in the vertical market channel. To illustrate the effect

of market coordination on resource allocation and technological progressiveness, consider a situation where the vertical coordination process is improved to some minimum level whereby marketing risks and price fluctuations are significantly reduced at one particular point in the market channel--say at the producer level. The probable effects of such improved market stability may be some combination of lower costs and greater returns. Either of these results may provide a stimulus to the producer to make new investments in order to increase his scale of operation, adopt more efficient production techniques or in other ways improve the efficiency of his production operation. As noted earlier there are good indications that economies of scale associated with technological innovations are principle "movers" of economic development at the individual firm level. But technological innovation usually requires capital accumulation and investment which in turn is critically related to the process of market coordination that provides production incentives and determines the degree of market uncertainty at any point in the channel. Hence, performance improvements in any sector of an exchange economy are a function, at least to some extent, of the intangible and unmeasurable factor of market coordination in the product channel.

Specific Performance Goals.-- It is almost impossible to design a quantitative or even qualitative measure of "market coordination." However, the performance of the

marketing system with respect to certain factors is affected by market coordination. The following specific performance goals afford some opportunity for evaluation of the effectiveness of market coordination as well as resource use and technological progressiveness.

1. Costs of production and marketing--usually influenced heavily by economies of scale and management improvements.
2. Progressiveness--i.e., willingness to adopt new improved production and marketing techniques.
3. Produce variety and quality--a frequent and almost universally beneficial correlate of a dynamic process of demand creation and improved market coordination.

Economic development literature is becoming more and more concerned with the importance of technological change on the growth process. Nevertheless, to date there has been little attempt to integrate for policy purposes technological progress with market structure and conduct. The foregoing discussion is an attempt to bring the two together in a policy framework where economic growth is a high priority goal. The three performance criteria listed above are used in Chapter 5 of this thesis to evaluate the dynamic performance of the Puerto Rican production-marketing system for milk, eggs and fruits and vegetables for the period 1950-1965. This affords an opportunity for practical application of the conceptual scheme proposed in this chapter. The

present chapter is concluded with a discussion of the types of policy measures compatible with the general and specific policy goals discussed above.

### Policy Measures

There are six classes of government programs which might be utilized if the marketing system as evaluated by the above criteria is not performing acceptably. Each of the following will be discussed briefly below: (1) property rights laws, (2) facilitative regulations, (3) assistance to marketing organization, (4) market control programs, (5) market planning and assistance arrangements and (6) direct government investment.

In any exchange economy there must be some way of providing for orderly protection of the rights of individuals or business units with regard to property ownership. The problem is especially crucial in an economy based on bargained exchange. Procedures must be established for the orderly flow of products and property rights as goods change hands. Marketing performance may depend on the adequacy of government rules and regulations establishing procedures for protecting property rights and providing proper judicial proceedings for settling exchange disputes. These kinds of laws and regulations are quite basic and are usually formulated fairly early in the development process. However, they require frequent scrutiny to assure that they serve the needs of a changing economy.

Often, government marketing policy in private enterprise economies is concerned primarily with providing services and regulations that will facilitate competition and improve exchange efficiency. Such policies may be extremely beneficial in an over-all effort to improve marketing performance. Specific examples of helpful regulations include collection and dissemination of market information, provision for uniform grades, weights and standards, fair trade regulations, anti-trust legislation, credit assistance and research and assistance in the use of new techniques of production and distribution. In the U.S. these and similar methods have been utilized in a highly successful effort to improve marketing efficiency while facilitating competition.

Most developed nations have found that certain kinds of economic institutions are a valuable aid in the development process. Earlier, Banfield was quoted as saying that a lack of effective political and economic organizations can prevent economic development. It therefore may be necessary for government marketing policy to include provisions for facilitating and encouraging certain types of economic organizations and associations. Two of the most common are corporate and cooperative associations. Others might include trade associations, professional groups, research consortiums and other organizational forms which in a given situation might contribute to improved over-all marketing performance and economic growth.



The fourth type of governmental market policy program is market control programs. These are government policies planned specifically to alter the market coordination process. They are most frequently used in cases where the market for a given product is chronically unstable or out of balance with the rest of the industry or economy. They represent a more strenuous effort to improve production and marketing efficiency through manipulation and assistance in the market coordination process. Specific examples of market control programs are price supports, marketing boards, marketing agreements and orders and direct government allocation programs.

The first four types of marketing policy measures encompass most of the marketing programs utilized in the U.S. and other "private enterprise" economies trying to bring about better market performance. The last two policy measures suggest moving toward stronger government action.

There appear to be times in developing nations when, as a result of extreme uncertainty, small scale business, low technical knowledge or inertia, individual businessmen are slow to move ahead with production and marketing schemes necessary for economic development. In such cases it may be possible to devise government programs which can provide encouragement and assistance to interested parties. The government of Puerto Rico has utilized this technique for encouraging local as well as foreign firms to invest in certain productive enterprises. A special government agency

(Fomento) is charged with the responsibility of interesting and encouraging investors, making preliminary feasibility studies, obtaining loans, providing buildings and assisting in various other ways the operation of the enterprise. A second approach also being tried in Puerto Rico is regional agricultural planning. The island is divided into five regions. In each a regional director is responsible for coordinating all agricultural programs. The regional director in Mayaguez has used his authority to make intensive studies of agricultural production and marketing in the region. Using that knowledge he has launched specific plans for improving resource use through assistance to farmers in re-allocating resources and coordinating agricultural markets. Such programs afford the opportunity for the government to evaluate needs on a broad scale and concentrate efforts toward encouraging private enterprise to provide those needs. The two programs mentioned above are more fully discussed in Chapters 4 and 5.

Finally, a method for achieving marketing performance goals which is one step beyond the method just discussed would be for the government to directly finance and manage production and/or distribution units. There may be certain cases where private enterprise will not provide effective development even with encouragement and assistance. At other times it is necessary for the initial firm that is "breaking the ice" in an industry to lose money in the early years of operation. Food storage and processing facilities

are examples of marketing investments which may require direct government participation.

### Summary

There are several conditions which seem to prevail in all developing nations. These include atomistic competition, low incomes, poor nutrition, low productivity, capital deficiency and high levels of illiteracy. As a result of these conditions it frequently appears that individuals are trapped in a vicious circle of poverty, inefficiency and low achievement motivation. This chapter suggests that the structure and conduct of the marketing system may be a critical and causative factor in this vicious circle of low productivity.

The tendency of most economists to view the structural conditions of static competitive theory as a desirable policy goal has resulted in little attention being given to the possibility that the marketing system can play an active role in the economic development process. In order to begin to evaluate the role of the exchange system, it is necessary to recognize that the system is dynamic and self-generative, and that it determines endogeneously many of the variables commonly regarded as exogenous. Static competitive theory is inadequate either in evaluating or providing policy norms for such a system. In order to provide realistic policy formulation and planning in developing nations, one must recognize the dynamic interdependence between resource use efficiency, technological change and the exchange system.

There is evidence from several developing nations to suggest that the dynamic interrelationship described above is important enough to inhibit the development process. The conclusion, therefore, is that developing nations may need to formulate dynamic market performance goals (which are compatible with broader economic goals) and design effective policy programs to assist in fulfilling those objectives.

The following chapter provides a brief historical review of political and economic development in Puerto Rico. It also reviews more specifically a number of developments having special significance for market coordination in the past 15 years.

## CHAPTER IV

### DEVELOPMENT OF THE PUERTO RICAN ECONOMY

#### Political and Economic Development

##### Early Development

Puerto Rico was discovered and claimed for Spain by Christopher Columbus in 1493. In the early 1500's the island was colonized. It soon became an important link in the defense and trade pattern of the Spanish Empire. The main natural resources of the island were agricultural land and a plentiful supply of water, and until the 19th century the primary products of the island were coffee, ginger, sugar, molasses and hides. The Spanish exported most of those products and thus drained most of the wealth from the island. In 1765 an island wide census indicated a population of 44,883 of whom 5,037 were slaves. Most of this population lived in extreme poverty and ignorance on farms controlled by absentee owners.<sup>71</sup>

In 1898, during the Spanish-American War, the United States took possession of Puerto Rico. The island was already heavily dependent upon external trade. Its main

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<sup>71</sup>Harvey S. Perloff, Puerto Rico's Economic Future (Chicago: The University of Chicago Press, 1950), p. 13.

exports were coffee and sugar, while food products made up the bulk of imports. Sugar production expanded rapidly after the American take-over and soon became the dominant economic product of the island. During the period from 1898 to 1927, there was a tremendous influx of American capital principally in the production and processing of sugar and tobacco. The economic stimulus provided by this flow of capital contributed to a rapid increase in the gross product of the island and precipitated a build-up in the island's economic infra-structure, but did little to alleviate the poverty of the average Puerto Rican.

#### Self Government

The appointment of Governor Rexford G. Tugwell in 1941 signalled a new era in Puerto Rico's struggle for economic and social advancement. The appointment of this reform-minded governor, coupled with the creation and popular support of a new political party headed by Luis Munoz-Marin, indicated a new concern both in Washington and Puerto Rico for economic and social reform. During the period from 1941-1948, Tugwell and Munoz moved rapidly to lay the legislative and administrative foundation for self-government on the island. In 1948 Munoz became the first popularly elected governor of Puerto Rico and swept his Popular Democratic Party into complete control of the legislature. Munoz accepted the election as a mandate to continue the program of economic reform which he had begun during his earlier

years in the legislature. He, therefore, moved ahead with a program which became known as "Operation Bootstrap." The reform program received additional impetus with the granting of Commonwealth status in 1952.<sup>72</sup>

The Economic Development Administration (EDA), the government agency which became the action center for operation bootstrap, was created in 1950. The administrator of the agency was given the responsibility "to direct and supervise all of the programs whose objectives are closely related with the economic promotion of Puerto Rico."<sup>73</sup>

The main thrust of the EDA has been toward promotion of industrial development and tourism. It provides assistance to firms or individuals interested in establishing new plants in Puerto Rico. It also does a great deal of general promotional work for the island through a number of branch offices in major cities of the United States. As of December 1965 the industrialization program had helped to promote some 1,211 plants with a total employment of 82,175.

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<sup>72</sup>Under the Commonwealth political status Puerto Rico was given complete local autonomy under a constitution ratified in a referendum of the people of Puerto Rico. Puerto Rico was thus granted the same rights and responsibilities as any state with two exceptions--Puerto Ricans do not have voting representation in Congress and they are not allowed to vote in the election of the United States President and Vice President. Also Puerto Ricans do not pay federal taxes.

<sup>73</sup>William H. Stead, Fomento--The Economic Development of Puerto Rico (Planning Pamphlet Number 103; Washington, D.C.: National Planning Association, 1958), p. 26.

### Measures of Economic Growth

The economy of Puerto Rico has experienced an amazing rate of growth since 1940. During the decade of the 1940's, gross domestic product increased from \$499 million to \$879 million stated in constant 1954 dollars. The average annual rate of growth in net real per capita income for the period from 1940 to 1950 was 4.2 per cent. That rate of growth was exceeded by only four nations in the world for the same period. By 1960 the gross domestic product had increased to \$1,484 million in constant 1954 dollars. The rate of growth of net real per capita income between 1950 and 1960 was 5.1 per cent which again was one of the highest rates of growth among the nations of the world. Table 4.1 shows the gross domestic product and per capita income for Puerto Rico in selected years between 1940 and 1964.

TABLE 4.1--Gross Domestic Product and Per Capita Income for Puerto Rico--Selected Years (1954 Dollars)

| Fiscal Years | GNP<br>(millions of<br>dollars) | Gross Income<br>Per Capita<br>(Dollars) |
|--------------|---------------------------------|---|
| 1940         | *                               | 269                                     |
| 1950         | 844.1                           | 399                                     |
| 1960         | 1,488.8                         | 639                                     |
| 1964         | 1,960                           | 776                                     |

\*Not available

Source: Ingreso y Producto, Junta de Planificacion de Puerto Rico.



During the period from 1940 to 1950, much of the growth in the economy took place in the agricultural (especially sugar cane) sector and also in commerce and services. On the other hand, by far the largest growth component between 1950 and 1960 was manufacturing. This reflects the tremendous emphasis placed on industrialization by the government after 1950. Table 4.2 shows that during the decade between 1950 and 1960 agricultural gross output increased by 32 per cent compared to a 76 per cent increase for the whole economy and a 212 per cent increase for the manufacturing sector.

TABLE 4.2--Gross Domestic Product, Agriculture and Manufacturing Gross Product and Percentage Increase From 1950 to 1960 for Puerto Rico (1954 Dollars)

|                        | Millions of Dollars |        | % Increase |
|------------------------|---------------------|--------|------------|
|                        | 1950                | 1960   |            |
| Gross Domestic Product | 844.1               | 1488.8 | 76         |
| Agriculture            | 132.1               | 173.8  | 32         |
| Manufacturing          | 110.2               | 343.34 | 212        |

Source: Ingreso y Producto, Junta de Planificacion de Puerto Rico.

Table 4.3 contains employment figures which reflect the changes which were taking place in the Puerto Rican labor force during the decade of the 1950's. In 1950 the total employment in Puerto Rico was 596,000 of which 36 per cent

was agricultural employment and 9 per cent manufacturing. By 1960 employment in agriculture had fallen to 24 per cent and manufacturing had risen to 16 per cent. Unemployment during that ten year period declined only slightly from 13 per cent to 12 per cent of the labor force.

TABLE 4.3--Employment in Puerto Rico by Industry-Selected Years

|                | 1950      |     | 1960      |     |
|----------------|-----------|-----|-----------|-----|
|                | Thousands | %   | Thousands | %   |
| Total Employed | 596       | 100 | 564       | 100 |
| Agriculture    | 216       | 36  | 133       | 24  |
| Manufacturing  | 55        | 9   | 93        | 16  |
| Other          | 325       | 55  | 338       | 60  |
| Unemployed     | 88        | 13  | 75        | 12  |

Source: Statistical Yearbook of Puerto Rico, Puerto Rico Planning Board.

The paragraphs above illustrate the magnitude of economic changes which occurred in Puerto Rico during the brief span of ten years. A large amount of investment funds were needed in order to accomplish the shift from an agricultural economy to an economy with considerable emphasis on manufacturing. Gross fixed domestic investment increased from \$111 million in 1950 to \$348 million in 1960, an increase of more than 200 per cent. A significant part of that investment came from external sources, largely mainland

private investors. About 43 per cent of all Puerto Rican investment funds came from external sources between 1947 and 1960. Undoubtedly a high proportion of that external investment was for new plant and equipment since most of the 57 per cent internal investment was for depreciation and public saving.

Puerto Rico experienced more than 300 years of colonial rule in which Spain drained off all the economic gains leaving little to be shared by the mass of citizens on the island. Then in the span of five decades the people of Puerto Rico established a flourishing agricultural economy based on sugar, tobacco and coffee production. But the masses still lived in poverty. Amid growing discontent a new political party was formed in 1938. Its leader, Luis Munoz-Marin, was completely dedicated to political, social and economic reform. Overwhelming political support for Munoz and the reforms he advocated led to a period of remarkable economic growth and social change. From 1950 to 1960 gross income practically doubled, manufacturing became a real economic factor, tourism blossomed and agriculture began a relative decline in importance. Puerto Rico's rapid growth was thus based on two factors: (1) a strong political unity centered around the single purpose of achieving better levels of living for all the people and (2) a well-planned industrial development program designed to make the most of Puerto Rico's unique relationship to the United States under Commonwealth status.

### Important Features of Commonwealth Status

Both of the factors mentioned above as critical in Puerto Rico's economic growth are closely related to the unique political relationship between the United States and the Commonwealth. The special features of Commonwealth status and their importance will be discussed briefly in this section.

One of the biggest hurdles which developing nations face is the achievement of political stability. Puerto Rico has not displayed the instability characteristic of other Latin American nations. One of the reasons may be that Puerto Rico has never been completely independent. In 1952, at a time when they appeared ready to accept it, the Puerto Ricans were given most of the advantages of independence without many of the disadvantages. This occurred after a period of territorial rule by the United States with a locally elected legislative assembly. During that period the people of Puerto Rico and their political leaders were given practical experience in the operation of a democratic society. When the Puerto Rican governor and his administrators took over, most government agencies were staffed by well trained individuals and organized for relatively efficient operation. Moreover, the continuing loose political tie to the United States seemed to lend a considerable degree of economic and social stability that encouraged rapid growth. In addition, private citizens of the United States

have been able to invest freely in Puerto Rico without fear of government confiscation.

Economists have often noted that economic growth can be drastically retarded by "limitations of the market." That is, if the market for a given product is quite small, it may be impossible to achieve all the economies of scale which exist in production and distribution of that product. It is therefore significant that Puerto Rico under territorial and Commonwealth status has had with few exceptions, the same trade status as any state in the union. Under this arrangement the United States has long purchased the bulk of Puerto Rico's primary product--sugar. In fact, Puerto Rican sugar producers operate under the same government price support and quota program as United States producers. In exchange the Puerto Ricans have historically purchased from 40 to 50 per cent of their food supply from United States producers and processors as well as significant proportions of other items ranging from consumer to producer goods. More recently the vast United States market has served as an outlet for the diverse products of manufacturing plants established under the assistance and encouragement of the Economic Development Administration. In many cases the free access to United States factor markets, cheap Puerto Rican labor, and access to the huge United States finished product market were critical factors in making manufacturing investments in Puerto Rico feasible for prospective investors.

A factor which is closely related to the free trade factor is the official use of United States currency. This means that Puerto Ricans do not have currency exchange problems when trading with the mainland. It also means that they are not bothered with balance of payments difficulties or currency devaluation decisions. Finally, it means that Puerto Rican entrepreneurs have greater access to United States capital markets.

Federal assistance and unilateral transfers have been extremely important to Puerto Rico in its rapid economic development. Practically all federal government programs available to state or municipal entities on the mainland are available in Puerto Rico. In agriculture this includes all the service agencies such as the agricultural extension service, experiment station research, soil conservation service, etc.; it includes credit agencies such as the Farmers Home Administration and certain federal price support programs such as the sugar program mentioned earlier. Other federal agencies such as the Small Businesses Administration, the Federal Housing Administration, the Urban Renewal Administration, the Federal Communications Commission, and the Federal Aeronautics Administration provide services to the people of Puerto Rico. The unilateral flow of funds from the United States into Puerto Rico through these federal programs (without a return flow of revenue since Puerto Ricans do not pay federal taxes) amounts to a significant portion of the gross product of the economy. In 1965 transfer payments from the

U. S. Treasury made up about 8 per cent of the gross domestic product for the island.

In summary there is little doubt that Puerto Rico's special relationship to the United States does provide significant economic advantages. Political stability, free trade, common currency and access to federal programs have undoubtedly contributed greatly to the rapid rate of economic growth which Puerto Rico has achieved in the past twenty years.

#### Agricultural Development

Because of the lack of mineral resources, the relative isolation and the high population density, the Puerto Rican economy has historically been highly dependent on its agriculture. Sugar cane has been especially important as a source of employment for the rural inhabitants and a source of export earnings to support the urban economy. In the past 15 years certain forces have been set in motion that appear to be very basic long run structural changes in the Puerto Rican agricultural sector. Those factors are discussed in the following section.

#### Topography and Resources

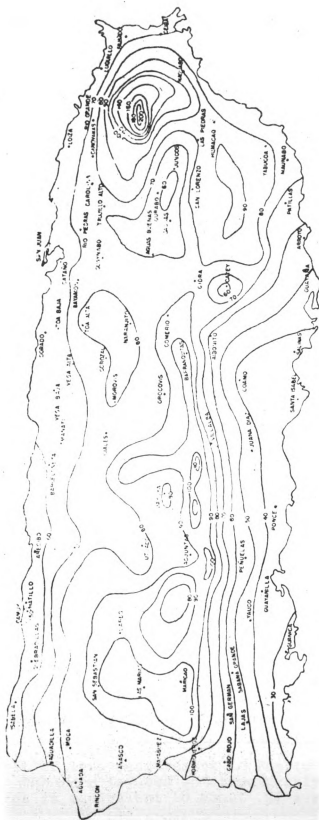
The island of Puerto Rico is located in the Greater Antilles chain which stretches from the southern coast of Florida to the Northern coast of Venezuela. It includes the islands of Cuba, Haiti-Dominican Republic, United States and English Virgin Islands, Jamaica, Trinidad and a number of

other islands. Puerto Rico is located about 1,000 miles southeast of Miami, Florida. The longest part of the island runs east and west facing the Atlantic Ocean on the North and the Caribbean Sea on the South. The maximum length of the island is 113 miles and the maximum width is 41 miles. The total land area is about 3,435 square miles. Extending all around the coast of the island is a narrow fertile plain which rises gradually to a mountainous interior. The mountainous and hilly terrain occupies a major portion of the land area of the island.

The climate of the island is almost ideal. The average temperature for the island as a whole ranges from 73 degrees Fahrenheit in January to 79 degrees in July. Temperatures, of course, are higher in the lowlands and lower in the mountainous areas but the two extreme temperatures on record are 39 and 104 degrees. And the tradewinds, blowing almost constantly from the Northeast, serve to moderate the temperatures of the island.

As a result of the central mountain range, rainfall varies tremendously from the northeastern part of the island to the southeast. Figure 4.1 shows the lines of average annual rainfall in Puerto Rico. Annual rainfall varies from a maximum of 200 inches on the mountain of El Yunque in the Northeast to a minimum of 30 inches along the southwestern coast. Generally, rainfall ranges from 30 to 80 inches in the fertile coastal plains and from 60 to 100 inches in the highlands. In most areas of the island, the rainfall is





**PUERTO RICO**  
 Figure 4.1--Average Annual Rainfall, Puerto Rico. Source: Rafael Pico, Geografía de Puerto Rico (Rio Predos: Editorial Universitaria, 1954), p. 135.

sufficient to support a wide variety of agricultural enterprises. Irrigation systems have been developed in the drier areas to the south and a small area in the Northwest where yearly rainfall is light or poorly distributed through the year.

The natural resources of Puerto Rico are limited primarily to agricultural land and water. There are few mineral deposits. Although there are small deposits of iron, nickel, copper, manganese, lead and zinc, none are large enough to warrant commercial exploitation at the present time. The only minerals currently being utilized on a commercial basis are those used primarily in the construction industry. Puerto Rico produces most of its own supplies of cement, marble and gravel. In addition there is some salt mining activity in the Southwestern part of the island.

Puerto Rico, with a total population of some 2.5 million on a total land area of 3,435 square miles, is one of the most densely populated areas of the world. Since natural resources are limited, the people have traditionally depended heavily upon the land for their livelihood. Therefore, many acres are in cultivation which under other circumstances would be left to forest or pasture. Even so, in 1964 it was estimated that the total agricultural land area of 1,850,000 cuerdas<sup>74</sup> was utilized as follows: croplands occupied about

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<sup>74</sup>The unit of land measurement in Puerto Rico is the cuerda. Often the term is used interchangeably with acres since one cuerda is equivalent to about .97 acres.

690,000 cuerdas, pastures about 800,000 cuerdas, forests and woodland about 300,000 cuerdas and non-productive farm land about 60,000 cuerdas.<sup>75</sup>

#### Dominance of Sugar Cane

Sugar cane has historically maintained a position of vast importance in the Puerto Rican economy. Except for pastures more land is used for sugar cane than for any other purpose. In 1965 about 290,000 cuerdas or almost one half of the island's cropland was devoted to the production of sugar cane. The dominance of sugar cane in the economy was even more pronounced prior to 1950. According to Harvey Perloff, the sugar based industries were the source of 20 per cent of the island's net income in 1940 and 14.4 per cent in 1946. In addition the sugar industry was by far the largest employer in the economy. Sugar cane acreage harvested and tons produced generally showed a gradual increase from 1938 to 1951. During that time the area harvested almost doubled from 216,502 cuerdas to 391,763 cuerdas. Since 1951, because of competition from other enterprises, especially dairy, acres of sugar land harvested has shown a continuous decline with total production remaining about the same though fluctuating from year to year. Much of the land taken out of sugar production was less productive marginal cropland. While sugar is still a major factor in

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<sup>75</sup>Facts and Figures on Puerto Rico's Agriculture, 1965 (Santurce, Puerto Rico: Puerto Rico Department of Agriculture, 1966), p. viii.

Puerto Rico's economy, its position has become less significant with the rapid expansion of other sectors of the economy.

#### Relative Stagnation in the Sugar Industry

Most people in Puerto Rico currently view the sugar industry as a sick industry. There is a great deal of concern over the decline in acreage and especially over the slow rate of improvement in land and labor productivity. Many people argue that Puerto Rico's economic future is closely tied to the sugar industry and that stagnation there may be disastrous for the economy in the long run. It appears that this is an exaggerated view. The sugar industry has been experiencing a period of rapid adjustment along with other sectors of the economy. However, there is no reason to believe that sugar production should maintain indefinitely a place of dominance in the Puerto Rican economy. The Puerto Rican sugar industry may well be entering a long period of adjustment like the one experienced by the cotton industry in the southern United States.

A number of factors appear to have contributed to the current situation in the sugar industry. First, prior to and during the Korean War, Puerto Rican sugar producers were in a relatively favorable position compared to other areas producing for the United States market. As a result production expanded and the industry experienced a kind of boom. By the end of the Korean War, Cuba and Hawaii were well on their way to mechanizing sugar production and

increasing productivity through fertilizer use, improved varieties and improved management. For some reason Puerto Rican producers never moved to adopt those technologies to any great extent. Under the government program established by the Jones-Costigan Act, the price of sugar for the United States is established by a price support plan. Since most sugar producing areas moved fairly rapidly to adopt the latest technologies, the cost of production per ton was held down. As a result sugar support prices did not increase as rapidly as the general price level. Since Puerto Rican producers had not moved to reduce costs of production by adopting new technologies, they were left in a comparatively unfavorable position.

A second factor affecting the sugar industry since 1950 has been the rising cost and shortage of labor. The government's thrust toward industrialization has brought an increase in the demand for labor in non agricultural employment. Higher wages, more steady work and better working conditions have lured many of the better cane workers into the urban areas. The unionization of sugar cane workers, which was supported by the administration of Governor Munoz, has been a factor in rising labor costs for cane producers.

A third factor affecting Puerto Rico's sugar industry is the land tenure arrangement and size of farms. The bulk of the sugar production in Puerto Rico comes from either very large or very small farms. There appear to be relatively few medium sized single-owner operator farms of

adequate scale to achieve maximum efficiency. In 1963-1964 almost 11,000 farms harvested something less than 25 cuerdas per farm. (See Table 4.4.) These farms accounted for about 19 per cent of the cane acreage harvested but only 15 per cent of the total production. The average production per cuerda was 26.4 tons. On the other hand, over half of the total production of cane came from the 192 farms harvesting more than 250 cuerdas per farm. Thus, technological adoptions and accompanying cost reductions may be thwarted by the size of cane producing units. The owner or tenant with an extremely small farm unit may not have the knowledge about new production technologies; he may not have the training to use them; or he may not be financially able to adopt them. On the other hand, the very large farms are often controlled by absentee owners who spend little time and effort on the farm, leaving it to hired managers who may be quite unprogressive.

TABLE 4.4--Production of Sugar Cane and Number of Farms  
According to Size of Area Harvested, 1963-1964

| Acres Harvested | No. Farms | Area<br>Harvested<br>Cuerdas | Cane<br>Produced<br>Tons | Cane<br>Prod. per<br>Cuerda Tons |
|-----------------|-----------|------------------------------|--------------------------|----------------------------------|
| All Farms       | 12,317    | 303,141                      | 9,801,584                |                                  |
| 0-25 cuerdas    | 10,757    | 58,208                       | 1,537,613                | 26.4                             |
| 26-250 cuerdas  | 1,368     | 97,108                       | 2,757,571                | 28.4                             |
| 251 or more     | 192       | 147,825                      | 5,506,400                | 37.2                             |

Source: Facts and Figures on Puerto Rico's Agriculture,  
Puerto Rico Department of Agriculture, p. 42.

### Shift Toward Livestock Production

The dominance of sugar production in the agricultural economy of Puerto Rico, with its emphasis on exports, has meant that a significant part of the island's food needs are imported. Puerto Ricans import about 50 per cent of the food consumed on the island. Sugar cane occupies the best land. Moreover, tobacco has traditionally been an important crop focused on the export market. At one time coffee was also a major export item. In 1951 about 63 per cent of Puerto Rico's gross farm income went to producers of coffee, tobacco and sugar.

As a result of the emphasis on export crops, relatively little emphasis has been placed on food production. Milk has been the most important food item produced in Puerto Rico. In 1951 milk sales accounted for approximately 10 per cent of Puerto Rico's gross farm income. Other major farm products in descending order of importance in 1951 were: poultry, beef, pork, starchy vegetables, fruits, eggs, and other vegetables.

The adjustments in sugar production discussed in the previous section have had some impact on the production of some of these food products. Table 4.5 shows the percentage change in the production of major agricultural products from 1951 to 1963. These figures reveal that the most significant increases in production occurred in milk, eggs, meats and coffee. If we look at gross farm income, we find that by 1963 sugar's contribution had declined to about 37 per cent

of the total income, while milk sales alone accounted for about 18 per cent of the total. Looking at all livestock products including meats, eggs and milk, we find that their farm value increased from 25 per cent of gross farm income in 1951 to 35 per cent in 1963.

TABLE 4.5--Percentage Change in the Production of Major Agricultural Products in Puerto Rico 1951 to 1963

| Product            | Percentage Change |
|--------------------|-------------------|
| Sugar              | -4                |
| Tobacco            | +34               |
| Coffee             | +130              |
| Milk               | +128              |
| Meats              | +55               |
| Starchy Vegetables | -12               |
| Fruit              | +20               |
| Eggs               | +128              |
| Other Vegetables   | +52               |

Source: Facts and Figures on Puerto Rico's Agriculture, 1965, Puerto Rico Department of Agriculture.

Probably the most important factor causing this shift toward livestock production in Puerto Rico has been the rising demand for protein foods in the Puerto Rican diet. Rapidly rising incomes have permitted consumers to eat more of the relatively expensive livestock products. Puerto Rican producers have observed the increasing demand and moved



to fill the need rather than allowing imports to absorb the increase. Another factor contributing to the increase has been the adjustment occurring in the sugar industry. Those producers finding it difficult to produce sugar cane profitably have found livestock production to be a feasible alternative. Much of the land which has been shifted out of sugar cane since 1951 was marginal land that is best suited for pasture production rather than cultivation. It has been estimated that between 1955 and 1965 some 55,000 cuerdas were shifted from sugar cane to pastureland.

#### Food Marketing Developments--1950-1965

Several significant changes have taken place in the food distribution system of Puerto Rico since 1950. Some of the more apparent changes have been (1) the introduction of high volume retailers (supermarkets) and related changes in their supplying firms, (2) the construction of central facilities for food wholesalers and importers and (3) the establishment of grain handling facilities at a central location.

Prior to 1956 there were no supermarkets on the island; most of the retail food sales were channeled through thousands of small neighborhood colmados who usually handled only a limited line of goods. Meats and fresh produce were most frequently purchased in specialty stores or in the market plaza.

A study of wholesale and retail food distribution in 1950 indicated that food marketing costs were high and

efficiency was low.<sup>76</sup> In 1953, as a result of that study, Governor Munoz appointed a commission to study food distribution in Puerto Rico. The main recommendations of the food commission were that the government should: (1) encourage supermarkets in urban areas, (2) encourage the organization of retail cooperatives, especially in rural areas, (3) provide government assistance to supermarkets in site selection and building construction, (4) provide tax incentives to food processors, (5) expand agricultural production and encourage import substitution and (6) establish retail employee training programs and consumer information services. Eventually, most of these recommendations were acted upon when a food distribution division in the Economic Development Administration was created.

In the meantime Harold Toppel, a private businessman from the mainland, had recognized the opportunities for large scale supermarkets in the San Juan metropolitan area. He opened his first store in the spring of 1956. It was a success from the beginning and he soon opened a second store. Expansion came rapidly, and by 1965 there were fifteen stores in the Pueblo chain located in three different cities on the island. Between 1955 and 1965 a number of independent and cooperative supermarkets and at least two other chains were established in addition to several superettes.

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<sup>76</sup>Holton and Galbraith.

The remarkable success of the supermarket in Puerto Rico can probably be attributed to the inefficiencies and inconvenience of the old distribution system and to rapidly rising incomes and accompanying changes in consumer tastes and demands.

Whatever the reasons for their success, retail supermarkets had and continue to have a tremendous impact on food production and distribution in Puerto Rico. Since there was practically no Puerto Rican production of most items needed to stock a supermarket, the stores were forced to develop sources of supply from the mainland. At the present time an estimated 75 per cent of all supermarket sales are imported. Nevertheless, local sources of supply for many products have been encouraged by the supermarkets. A number of food processors have been established and some producers have moved to produce, grade, and package products to supermarket specifications.<sup>77</sup>

The retail changes brought on by supermarkets resulted in significant pressures to improve market coordination for many food products. In cases where sufficient market coordination could not be achieved through local producers, supermarket buyers developed external sources of supply. The main requirements of supermarkets are for consistent quality, stable supply and attractive products. Large

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<sup>77</sup>See John R. Wish, "Food Retailing in Economic Development, Puerto Rico, 1950-1965" (unpublished Ph.D. Dissertation, Michigan State University, East Lansing, Michigan, 1967).

numbers of small, unorganized producers find it difficult to meet those requirements, especially where some processing is needed. Chapter 5 deals specifically with some of the developments in market coordination in Puerto Rico since 1950.

In 1949 the United States Department of Agriculture was asked to make a study of food handling facilities in the San Juan metropolitan area. The study recommended that a self-liquidating central market facility be constructed as soon as possible. It was suggested that the central market area should be located on 79 acres of land near San Juan Bay, and should include three different facilities: (1) wholesale food warehouses and handling space, (2) a livestock slaughtering and processing plant and (3) facilities for receiving, storing, handling, mixing and selling grain and extracting vegetable oil.<sup>78</sup>

No action was taken on these recommendations for several years. The recommendations were made to the Department of Agriculture which apparently did not have the resources nor the inclination to act on such a broad proposal. Eventually, Fomento took charge of the central market project. However, the integrated market facility recommended in 1951 has never become a reality. Instead, the recommended facilities have been developed piecemeal by various government agencies.

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<sup>78</sup>Marketing Facilities for Farm and Related Products at San Juan, Puerto Rico, Agriculture Information Bulletin No. 60, United States Dept. of Agriculture, Washington, D.C., 1951, p.1.

In the late 1950's the Puerto Rico Development Company financed the construction of a slaughter facility in Caguas. The plant was established at an initial cost of \$2.6 million and included the most modern facilities for handling a yearly capacity of 50,000 head of cattle, 50,000 head of hogs and over 3 million broilers. The plant has had difficulty in obtaining adequate supplies and is now operating at a loss with less than 25 per cent of its capacity being utilized.

In the last 5 to 10 years Fomento has been reasonably successful in encouraging and assisting in the establishment of several grain handling facilities. They have set aside land along the western side of San Juan Bay for the construction of such facilities. There are now two feed manufacturing plants and one rice importer operating out of facilities in that area.

Finally, Fomento had several different engineering studies made on the proper location and layout of the central food wholesaling facilities, but no action was taken. In 1962 the project was turned over to a new company created in the Department of Commerce--the Commercial Development Company. This agency did succeed in the establishment of two large warehouse buildings near the Sea Land operation on San Juan Bay. At the present time all space is being used to capacity and another building is under construction. In addition a produce wholesaling facility is in the final planning stages.

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### Agricultural Planning

In 1960 the Rockefeller Foundation sponsored a study by Mr. Guillermo Irizarry in which he proposed a new plan of organization and operation for the Puerto Rican Department of Agriculture and related agricultural agencies.<sup>79</sup> In that study he recommended that the Secretary of Agriculture divide the island into five regions. Each region would have a resident agricultural director who would be coordinator for all agricultural programs in that geographical region. Such decentralization, it was argued, would permit greater emphasis on coordinated efforts of all agricultural agencies in each region of the island toward the solution of relevant agricultural problems. The reorganization recommended by Irizarry was adopted by the government of Puerto Rico. An outline of the present organization of the Department of Agriculture is shown in Figure 4.2. In this plan of organization all island-wide services such as disease control, market regulations and crop insurance are either headed by an individual reporting directly to the secretary or by the Assistant Secretary of Services and Centralized Operations. All programs pertaining to agricultural development in a given geographical area are under the auspices of the specific regional director and the assistant Secretary of Operations.

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<sup>79</sup>Guillermo Irizarry, Las Operaciones y Relaciones de las Servicio Agrícolas en Puerto Rico (San Juan: Negociado del Presupuesto, 1961).



Figure 4.2--Organization Chart for the Puerto Rican Department of Agriculture





Under his supervision, the assistant Secretary of Operations has specialists in individual areas such as marketing and production. These specialists are asked to work closely with regional directors in developing programs that will contribute to the region's agricultural development.

The responsibility of each regional director is to coordinate the work of all agricultural agencies in his region (including semi-autonomous commonwealth agencies and autonomous federal agencies). The objective is to see that these agencies are working together without duplication and dissention toward more efficient agricultural production in the region. To accomplish the job, each director has a coordinating committee made up of the appropriate heads of all agricultural agencies in his region. And through this committee the regional director is theoretically able to mobilize, toward a common cause, the resources of the Department of Agriculture, the Agricultural Extension Service, the Agricultural Experiment Station, Vocational Agriculture workers, the Soil Conservation Service, the agricultural credit agencies, and any other agricultural agencies operating in his region. The logic of such an approach is that all of the agricultural agencies have contributions to make and that a coordination of their efforts will provide mutual help among the agencies, avoid duplication and increase the over-all efficiency and effectiveness of their agricultural development activities.



One of the first duties of each regional director after the department's reorganization was to make a comprehensive development plan for his region. In order to prepare such a plan, each regional director conducted an inventory of all farms in his region. That information was tabulated and used to indicate the existing structure and problems of the farmers. Employing that data, the director and his staff were able to move ahead with the identification of specific farm problems and the formulation of a broad regional plan for attacking these problems. At the present time two of the five regional plans have been completed.

The Mayaguez region was the first to complete a development plan and has generally served as the pilot region for the new approach. There work has now been completed in going beyond the broad long range development goals to establish shorter term objectives to be used in achieving the long range goals. In most cases objectives have been narrowed to such a degree that each agricultural agent in the region has certain objectives to be achieved in the coming year. The objective may be to work with a certain specific group of farmers to encourage them to improve drainage, to adopt a new sugar cane variety or to join a marketing cooperative. In this way each agricultural worker in the region, whether he be a Department of Agriculture employee, an extension agent, a vocational agriculture teacher, etc., is assigned certain specific objectives to be accomplished in the coming year. Thus, duplication of effort is avoided and a

direct line of responsibility is established toward the end of achieving certain regional goals aimed at improvement of agricultural productivity in the region.

### Cooperative Development

Cooperation among farmers and sugar cane workers existed in Puerto Rico before 1900. However, cooperatives did not become important in the economy until after 1920. In that year a law was approved in the legislature to facilitate the organization and operation of consumer and producer cooperatives. The usual tax exemptions were approved under the law provided the cooperative followed the rules of one member-one vote, return of profits to members on a patronage basis and less than 50 per cent of total business carried on with non-members.

Between 1920 and 1945 the cooperative movement expanded rapidly, especially among farmers. During the period several large cooperatives were organized which remain a potent force in the agricultural economy (e.g., a coffee marketing and supply cooperative, a tobacco marketing cooperative and two cooperative sugar mills). The Agricultural Extension Service was quite active during this period in assisting farmers to organize and operate cooperative enterprises.

A visit by Father Joseph McDonald, one of the cooperative leaders in Nova Scotia, to the Catholic University in Ponce started a move that completely altered the nature of cooperativism in Puerto Rico. His philosophy of

cooperativism was that it should serve not only as a tool of economic improvement but as a tool of social reform.<sup>80</sup> This philosophy was soon accepted by other cooperative leaders on the island, partially as a result of a series of seminars given by Father McDonald at the University of Puerto Rico in the summer of 1945. Moreover, the philosophy infiltrated political circles through a personal interview between Father McDonald and Louis Munoz Marin, then President of the Senate of Puerto Rico. As a result of that interview, a committee was appointed in the senate to travel to Nova Scotia and study their cooperative movement for the purpose of making recommendations to improve the laws and policies governing cooperatives in Puerto Rico.

The Committee recommended that the legislature approve a new law which would provide for: (1) the organization of credit cooperatives, (2) the creation of a Department of Cooperatives in charge of assisting in the organization of cooperatives and responsible for promoting cooperative education, (3) the development of a curriculum for cooperative education in the University of Puerto Rico and in public schools and (4) the creation of a credit agency for cooperatives.

This law reflected the new cooperative philosophy on the island. The Department of Cooperatives was given the

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<sup>80</sup>Victor M. Valcarcel, "El Movimient Cooperativo en Puerto Rico," Instituto de Cooperativismo, Universidad de Puerto Rico, unpublished manuscript, undated, p. 37.

task of fomenting cooperative development and providing cooperative education. There is little doubt that after 1947 (when the law was approved) there was a great deal more emphasis on the social objectives of cooperatives than had been evidenced before.

In 1957 Fomento Cooperativo was created as the high level government agency responsible for the intensification of the cooperative movement. The philosophy of social reform carried over to this new agency.

Significant growth has occurred since 1947 among credit, consumer and housing cooperatives. In 1962 there were 255 credit unions, 92 consumer cooperatives and 34 housing cooperatives on the island. Membership in these cooperatives had grown rapidly to over 100,000. On the other hand agricultural cooperatives experienced very little growth after 1945. In 1962 there were 29 agricultural cooperatives with about 42,000 members. This represents about 13 per cent of the island's rural population.<sup>81</sup>

Recently, there has been a new government emphasis on cooperative development. A new administrator was appointed for Fomento Cooperativo who has expressed a great deal of interest in boosting the number and quality of agricultural cooperatives. The Federal Agricultural Extension Service, Puerto Rico Agricultural Extension Service, Cooperative

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<sup>81</sup>Socio Economic Development of Cooperatives in Latin America, A report to the Government of the United States by the Cooperative League of the United States, San Juan, Puerto Rico, 1963, p. 281.

League of Puerto Rico and Fomento Cooperativo are currently cooperating in an intensive educational program for cooperative members and leaders. The emphasis is upon modern management techniques for effective cooperative business firms.

In general cooperatives have received a great deal of interest and political support in Puerto Rico. Since 1945 the prevailing philosophy has been that they should be designed to fulfill both economic and social needs of members.

This chapter has given the reader a brief historical review of political and economic development in Puerto Rico. It was designed to point up the important factors related to economic development and especially to improve market coordination. The following chapter provides an evaluation of the effect of market coordination upon market performance for three commodity groups.



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## CHAPTER V

### MARKET COORDINATION AND ITS EFFECTS ON MARKET PERFORMANCE IN PUERTO RICO-- THREE COMMODITY STUDIES

#### Introduction

Earlier chapters in this thesis have developed the conceptual framework for relating market coordination to economic development. The purpose of this chapter is to describe and analyze agricultural production and marketing developments in the Puerto Rican economy for the period 1950-1965 in order to evaluate the effects of certain changes in market performance.

Three groups of commodities were chosen for this analysis. They were selected partially because of their importance to the Puerto Rican economy and partially because they illustrate a broad range of coordination methods and effectiveness. The commodity groups are milk, eggs, and fruits and vegetables. Vertical coordination has improved rapidly for milk and eggs with the development of a variety of government programs and market institutions. On the other hand coordination arrangements have remained almost static for fruits and vegetables since 1950. The marketing system for

fruits and vegetables described by Nathan Koenig in 1950 as being "heavily burdened with inadequacies and an excess of intermediary handlers. . . . The heavy toll exacted by this sort of inefficient structure has long restricted consumption and retarded production."<sup>82</sup> The system remains much the same as he described it 15 years ago.

The obvious diversity between egg and milk markets on the one hand and fruit and vegetable markets on the other hand affords an opportunity to study the marketing developments since 1950 in order to find out what factors have contributed to the different degrees of market development. The analysis provides an opportunity to test (for these three commodities) the hypothesis that atomistic and poorly coordinated markets tend to inhibit the process of agricultural development.

The chapter is divided into four parts. Each of the first three parts are devoted to one commodity group. Within each part there will first be an introductory section discussing general commodity conditions during the period under study, i.e. 1950-65. Then there will be a section centering on market conditions existing prior to 1957.<sup>83</sup> The discussion will then turn to the analysis of the basic changes in

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<sup>82</sup>Nathan Koenig, A Comprehensive Agricultural Program for Puerto Rico (Washington, D. C.: United States Department of Agriculture, 1953), p. 219.

<sup>83</sup>This break was chosen because a concerted government effort to improve food distribution started to bring about coordination changes in the system at that time.



production and market coordination during the period from 1957 to the present. Finally, for each commodity group there will be an analysis of market performance changes since 1957. The fourth part of the chapter is a summary section, drawing together the results of the three commodity studies and suggesting conclusions from the analysis.

### Eggs

The island of Puerto Rico has experienced rapid economic growth since 1950. Table 4.1 shows that per capita income has almost doubled in real terms since that time. Needless to say, the impact of such growth on egg production and distribution has been significant.

Rising consumer incomes have been accompanied by a stronger demand for animal products. Per capita consumption of eggs has more than doubled since 1950. At the same time, retail marketing facilities have undergone rapid change. The expansion in sales of modern self-servide retail stores has greatly affected the quality of eggs required from producers. Moreover, production and marketing structures have undergone significant change during the period. Those changes are examined below.

#### Production and Marketing Conditions, 1950-57

In 1950 egg production in Puerto Rico was widely scattered among a large number of subsistence farms. Most of the farms on the island kept a small flock of hens to

supply family needs with occasional sales to local colmados<sup>84</sup> or neighbors. There were very few commercial egg farms.

The Census of Agriculture in 1950 indicated that there were 47,241 farms reporting hens in production. These farms made up 88.3 per cent of all farms in Puerto Rico in 1950. Thus, a large percentage of the farms were either producing eggs for home consumption or for both home consumption and sale. The average number of hens per farm reporting in 1950 was only 16.9.

The widely scattered nature of egg production made marketing both difficult and expensive. Eggs were marketed by individual producers through truckers, local colmados or directly to consumers. Eggs were sold through market plazas to a limited extent. In 1950 the five principal markets of Puerto Rico handled an estimated 287,416 dozen eggs with a total value of \$177,000. This represented only about 3 per cent of the domestic egg production. Eggs sold in the plazas were largely produced on very small farms and were assembled by truckers in relatively small quantities and marketed through retailers in the plazas.

Facilities for handling the eggs were poor and spoilage rates were high. Consumers purchasing the eggs did so with the risk that a high percentage might turn out to be spoiled. The Perkins' Study in 1956 stated:

There is no careful handling and storage by farmers and dealers; transportation and maintenance expenses

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<sup>84</sup>The term used in Puerto Rico to designate small retail food stores.

are high. Eggs are not refrigerated or graded, and the marketing may take well over a week. They are, therefore, usually of poor quality when they reach the consumer, especially in the large cities. In the smaller towns, people purchase eggs from peddlers who buy at the farms and therefore usually get fresher eggs.<sup>85</sup>

Perkins found that even under existing marketing conditions there was a decided consumer preference for locally produced eggs against imports. He found that in the five year period between 1950 and 1955 the average wholesale price for locally produced eggs was \$.57 a dozen, which was about \$.12 more per dozen than the average wholesale price of imported eggs. Nevertheless, egg imports made up a large percentage of the total egg consumption in Puerto Rico in the early 1950's. Table 5.1 shows the quantity of both imported and locally produced eggs in 1950.

It also indicates that 38.7 per cent of the eggs consumed in Puerto Rico in 1950 were imported. Perkins noted that the poorly coordinated and inefficient marketing system for domestically produced eggs would probably prevent the future substitution of Puerto Rican eggs for imports.<sup>86</sup>

In 1950 there were no government regulations to encourage grading or to establish the minimum requirements for the storage and handling of eggs. In the absence of such

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<sup>85</sup>Maurice F. Perkins, Agricultural Credit in Puerto Rico. (A special report published by the Department of Fomento and the Puerto Rican Development Bank, Commonwealth of Puerto Rico, 1958).

<sup>86</sup>Ibid., p. 256.

regulations, it was difficult even for progressive farmers to practice grading, refrigeration and efficient handling.

TABLE 5.1--Total Egg Consumption in Puerto Rico: Volume Imported and Volume Produced in Puerto Rico, 1950-51

|                     | Imported<br>(dozen) | Produced on<br>Puerto Rican<br>Farms (dozen) | Total<br>(dozen) | Imports as a<br>Per Cent of<br>Total Consumption |
|---------------------|---------------------|--|------------------|--|
| Eggs in<br>shell    | 4,139,847           | 9,123,768                                    | 13,263,615       | -  |
| Dried <sup>1</sup>  | 1,180,942           | -  | 1,180,942        | -  |
| Frozen <sup>1</sup> | 444,369             | -  | 444,369          | -  |
| Total               | 5,765,158           | 9,123,768                                    | 14,888,926       | 38.7   |

<sup>1</sup>Shell egg equivalent for eggs imported as dried or frozen.

Source: Statistical Yearbook - Puerto Rico, 1950-51.

In general, egg production and marketing in Puerto Rico in 1950 was characterized by a large number of producers and small egg dealers working on a part time basis. The result was an ineffectively coordinated marketing system which involved a high degree of risk for all concerned. The producer, in addition to bearing the risks associated with disease and weather, was constantly faced with price uncertainties and demand fluctuations. Even the few existing commercial producers remained small and were faced with considerable uncertainty in the marketing of their production. Most were unable to achieve the necessary economies of



scale either in the production or marketing of their eggs. Because of the lack of large scale commercial egg producers, there were large numbers of egg dealers who collected eggs and either retailed them directly to consumers or passed them along to other retailers to sell. These dealers added their margins to the price of eggs and often contributed to the uncertainties and risks associated with marketing eggs.

As a result of the risk and inefficiencies mentioned above, Puerto Rican consumers continued to purchase large quantities of imported eggs which were also of low quality owing to the length of time required in shipment. The waste and spoilage in the handling both of imported and locally produced eggs helped to maintain high prices and discourage consumers from increasing consumption. Thus, in 1950 there was a definite need for improvements in egg marketing methods and coordination in Puerto Rico. The consumer preference for local eggs in spite of poor handling, refrigeration and high prices, indicated that consumption of locally produced eggs could be readily expanded if producers were willing to adopt improvements in the production, classification, transportation and storage of their eggs. The system was ready for improvements which could benefit all parties concerned, especially the Puerto Rican consumer.

#### Market Coordination, 1957-65

Perhaps one can attribute some of the rapid egg production and marketing changes from 1957-65 to the introduction

of modern self-service retail stores in Puerto Rico. These modern, well-managed supermarkets require a stable supply of consistently high quality products. They tend to seek out and encourage those suppliers who can meet their quality standards with large supplies in order to lower transaction and exchange costs. These factors have undoubtedly been significant in Puerto Rico. But it should be recognized that conditions were ripe in the imperfectly competitive egg markets for basic changes that would improve the coordination of the system and lead to better performance of the market. Some of the resulting market institutions are discussed below.

It was noted earlier that prior to 1956 there were very few well organized and large scale egg producers on the island. Two reasonably large producers (around 5,000 hens) began operation in the San Juan area in the early 1950's. These producers were able to develop their own marketing program with delivery to larger colmados and direct farm sales to consumers.<sup>87</sup>

Vertically Integrated Private Producers.--The rapid expansion in supermarket numbers as well as sales since 1956 has been accompanied by a similar increase in large-scale integrated egg production and/or marketing firms. By 1965

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<sup>87</sup>Information obtained in personal interviews with Manuel Santana, Extension Poultry Marketing Specialist, University of Puerto Rico, Manuel Rodriguez, Dairy Supervisor of Pueblo Supermarkets, and Edwin Betancourt, Manager, Granja Country Club Egg Farm.

there were at least six (including two cooperatives) large scale producer-distributors catering especially to supermarkets and other large retailers under their own brand names or with private label sales. The two privately owned producer-distributors had expanded to 15,000 and 25,000 hens and had been joined by a third producer in 1958 which had 80,000 hens in production by 1965. The latter firm is now the largest single producer on the island and is the only one vertically integrated (either by ownership or contract) from the feed manufacturing stage through egg marketing. A fourth privately owned firm is primarily a marketing organization. The operation purchases eggs from small scale producers on the basis of a simple written or verbal agreement. The eggs are then graded and packaged for distribution through supermarkets under the firm's own brand name.

In order to meet the special quantity and quality demands of large retailers, these privately owned firms, along with other smaller scale units, have broken from the traditional pattern of egg production and distribution in Puerto Rico. Their market contacts are directly with retailers, providing more effective market information and lowering market instability arising from uncertainty and erroneous market intelligence.

Cooperatives.--A second major development in egg marketing has been the organization of several marketing cooperatives. Many of these have experienced some difficulty

in maintaining good member relations and in stabilizing supplies and sales. As a result most of them have either ceased operations or remained quite small. However, one marketing cooperative remains as a major producer-distributor. This is the egg marketing cooperative organized as a separate arm of Cafeteros de Puerto Rico. (A very large coffee market cooperative which has become quite diversified.) The cooperative was originally organized to assemble, grade, package and distribute eggs for its small scale egg producer members in the South Central part of the island. Initial interest and patronage in the cooperative was high, and it was necessary for the cooperative to purchase a large amount of grading, packaging, storing and distributing equipment. Contract prices to producers had to be reduced in order to pay for the new equipment. Also, in order to market a consistent quality product, it was necessary for the cooperative to include quality control clauses in producer contracts, e.g. requiring farm refrigeration and specifying certain management practices. In protest against these cooperative requirements and due to growing alternative sales outlets, many producers withdrew their support from the cooperative. Consequently, the cooperative found itself with insufficient and unstable egg supplies. In order to stabilize its supply and utilize existing equipment, the cooperative entered into egg production operations. At the present time the cooperative maintains about 23,000 hens in production and continued to provide marketing services for its members.

Egg marketing cooperatives have been somewhat successful in Puerto Rico as a means of bringing together small scale producers for the purpose of grading, packaging, and distribution of eggs at an economical level of operation. They have also permitted producers to enjoy more accurate marketing and technical information and more stable relations with retailers.

Non-profit Producer Associations.--A third type of marketing institution arising in response to the changing retail structure in Puerto Rico since 1956 are producer owned non-profit egg marketing corporations. The purposes and advantages of these associations are basically the same as those listed above for cooperatives.<sup>88</sup> They are discussed separately, however, because of the unique conditions which preceded the organization of the first such association and because the whole approach of planning and implementing production and market coordinating institutions may have some applicability for certain pragmatically oriented developing nations.

The Lajas Valley Egg Producers Association was the first of three such associations to be organized. It grew out of a plan by the Lajas Valley Development Office (a

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<sup>88</sup>These associations were incorporated as non-profit corporations rather than cooperatives only because the cooperative law in Puerto Rico requires that certain conditions be fulfilled before the government can grant a cooperative charter. Among the conditions are cooperative education for all members and leaders. The process usually requires 6-12 months. The association members were not in a position to accept such delays.

government agency) to encourage egg production in the Lajas Valley. That office hired a full time poultry specialist and gave him the responsibility of interesting farmers in egg production and then helping them to start production. He was fairly successful and soon had farmers producing and marketing eggs in Lajas and surrounding towns. As these commercial producers gradually expanded their flocks, they experienced greater difficulties in finding market outlets. The government agent began to consider a marketing cooperative. At that time the owner of the largest supermarket chain on the island (Pueblo Supermarkets) made a \$5,000 grant to the Agricultural Experiment Station for the purpose of encouraging agricultural production. The Lajas Valley Development Office requested that the money be loaned to local egg producers for the purpose of organizing an egg marketing cooperative and buying necessary grading equipment. The request was granted and Pueblo Supermarkets agreed to purchase eggs from the association to be marketed under the Pueblo label. At this point two other government agencies stepped in to provide assistance. The Economic Development Administration (Fomento) provided a building rent free for six months, and the Agricultural Extension Service provided management training and guidance to the members of the association.

The association has been quite successful. Production has increased from 311,000 dozen in 1963 to 546,00 dozen in 1965. The association, through its Pueblo supply contract,

has given its members a stable and steadily expanding outlet for their production. Records of the association show that prices paid to producers have not changed since 1963. The policy of the association is to maintain a stable price to producers and handle any resulting deficits or surpluses through feed sales and patronage refunds. In this way, the policy has permitted producers to make long run expansion plans on the basis of stable expected prices. Each producer has a full supply contract so all his production goes to the association. Moreover, the contract states that expansion of flock size by an individual producer will only be approved if a profitable market outlet can be obtained for the added supply. Yet the association has been quite successful at marketing added quantities of eggs as indicated by the rapid growth in volume. As a result the average flock size of its member has increased from about 2,000 birds in 1963 to 2,857 birds in 1965.

The marketing margin for the association has remained fairly stable. The following example is illustrative of recent prices. In May, 1966, association members were receiving 51 cents per dozen for Grade A large eggs at the farm. The eggs were collected by the association, candled, graded, cartoned and delivered to retail stores at a price of 64 cents per dozen. This provided the association with a margin of 13 cents per dozen. Retail prices during the same month were about 77 cents per dozen for Grade A large eggs in Pueblo Supermarkets. Though the 13 cent retail

margin appears high, it may be partially justified by the fact that Pueblo provides a very large and stable outlet and gives special promotion to its private label eggs purchased from the association.

Basically, the exchange price on private label eggs between the association and Pueblo is determined by subtracting 3 cents from the prevailing price of other major brands. Then Pueblo usually prices its private brand at 1 to 3 cents less than the major brands depending on supply and demand conditions. Occasionally, the associations and Pueblo cooperate to lower prices even more in order to clear a surplus through the market. One of the most unique features of this association is the degree of cooperation which occurred between the farmers, the Lajas Valley Development Office, the Extension Service, Pueblo Supermarkets and Fomento. Each played a vital role in this market coordination effort. But perhaps the most significant feature in the development of this marketing institution is the active planning, organizing and coordinating role taken by the Lajas Valley Development Office. This government agency was charged with the responsibility of fomenting agricultural development in the Lajas Valley. The encouragement and assistance in egg production and marketing is but one phase of the over-all agricultural program of the development office. Other aspects of the agency's program were equally as successful in the egg production-marketing phase described above.





In 1965 the director of the Lajas Valley Development Office published an experiment station bulletin describing the program and accomplishments of the agency. In that bulletin he concluded among other things: "The direct and indirect benefits now derived, or which may be derived from the Lajas Valley Development Program in a relatively short time in the future, fully justify government investments."<sup>89</sup> He also noted: "The procedures followed in planning and implementing an agricultural development program for the Lajas Valley are also applicable to other areas of Puerto Rico."<sup>90</sup>

When the Department of Agriculture was reorganized along the lines described in Chapter IV, Mr. Gonzalez was appointed regional director for the Mayaguez region. He began to apply the basic procedures developed in the Lajas Valley Development Program to the entire Mayaguez region. Two other egg marketing associations have been organized in the region. The three producer groups have been federated for the purpose of carrying out a joint marketing program and purchasing supplies jointly. Moreover, the procedure is being used in the promotion of coordinated production-marketing associations for other agricultural products such as milk, oranges, sugar, papaya and pineapple. Early

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<sup>89</sup>Antonio Gonzalez Chapel, Planificacion e Implementacion de un Programa de Desarrollo Agricola en el Valle de Lajas, Boletin 192 (Estacion Experimental Agricola, Universidad de P.R., Rio Piedras, 1965), p. 32.

<sup>90</sup>Ibid., p. 33.

indications suggest that the integrated government planning and marketing approach will yield significant results in the next few years.

Before moving to the discussion of other government egg marketing programs, two general observations are offered concerning the benefits of the production-marketing regional planning approach described above:

1. It helps government agricultural workers and farmers alike to recognize the important relationship between agricultural production and marketing. That is, production and marketing can be more effectively coordinated to the benefit of farmers and the economy in general. Specific benefits of the producer associations are:
  - a. It permits small producers to cooperate in lowering production and marketing costs.
  - b. It gives each producer a stable market outlet.
  - c. It provides retail buyers with a stable supply of consistent quality products.
  - d. It reduces risk and uncertainty which arise in a situation where producers and distributors have limited knowledge of technical and marketing developments and where factors of production are highly immobile due to poor communications.

2. The regional planning approach provided one centralized agency with at least a basic knowledge of farm units and farmers in a given region for the purpose of guiding long-range agricultural development through planning and technical assistance to individual farmers.

The regional agricultural planning approach being pioneered in the Mayaguez Region in Puerto Rico is a good example of a practically designed government program oriented toward the improvement of resource productivity in agricultural production and distribution.

Grading regulations.--The effectiveness of the egg marketing institutions just described has been enhanced by the passage of several market regulations since 1956. Marketing literature abounds with examples of the benefits of effective market grades and standards. The first government egg regulation was approved in 1956.<sup>100</sup> It provided for the creation within the Department of Agriculture of a continuously supervised egg grading and inspection service. The grading system adopted was identical to the grading system of the United States Department of Agriculture. The market regulation also made provisions for container labeling and on-farm refrigeration requirements for all graded eggs.

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<sup>100</sup>"Standards on Services for Continuous Supervised Grading and Inspection of Shell Eggs for Human Consumption," Department of Agriculture and Commerce, Santurce, Puerto Rico, August 9, 1956. Amended September 30, 1959.

In 1958 a second egg marketing regulation was approved by the Secretary of Agriculture.<sup>101</sup> The intended purpose of this regulation was basically to protect Puerto Rican egg producers from unfair and harmful competitive practices such as "dumping" by U.S. competitors. It was also designed to upgrade the quality of imported eggs as a protection to consumers. A third purpose of the regulation was to provide specific requirements for refrigerating and storing eggs during the marketing process.

The most recent egg market regulation was approved in 1964. The purpose of the law was to prevent the practice whereby "eggs from foreign countries have been and are being sold as if they were from Puerto Rico."<sup>102</sup>

The Act states that "this is a bad practice, prejudicial to the Puerto Rican consumer."<sup>103</sup> It therefore provides for the labeling of each egg before sale in Puerto Rico. Eggs must be stamped indicating the place of origin--Del Pais (locally produced), U.S. or imported (foreign country). The Act does not apply to eggs

produced in Puerto Rico and packed in one-dozen containers, or eggs produced in Puerto Rico and supplied in containers of any type, capacity or size to private institutions, and to government . . . institutions; nor to eggs produced at home, when directly sold to the consumer.<sup>104</sup>

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<sup>101</sup>"Market Regulation Number 3A," Department of Agriculture and Commerce, Santurce, Puerto Rico, June 26, 1958.

<sup>102</sup>Commonwealth of Puerto Rico, Act. No. 118, San Juan, Puerto Rico. Approved June 29, 1964, p. 1.

<sup>103</sup>Ibid.

<sup>104</sup>Ibid.

By and large these government regulations represent an attempt to enhance competition in egg markets and improve the quality of eggs available to the Puerto Rican consumer while holding egg prices constant. The survey (discussed in Chapter I) among farmers in the Mayaguez Region and other project surveys have shown that farmers, retailers, wholesalers and consumers generally believe that these regulations have been beneficial. From 60 to 90 per cent of the individuals in these various groups expressed the belief that egg grading regulations have proven helpful to producers and consumers.

#### Production and Marketing Performance

The changes described above in egg marketing institutions since 1950 have been accompanied by some significant improvements in production and marketing performance. These changes will be discussed below under the headings of (1) costs of production and marketing, (2) progressiveness and (3) product quality.

Costs of Production and Marketing.--The most significant performance changes in egg production and marketing have taken place in the realm of production efficiency. It appears that costs of production have been reduced substantially since 1950. Table 5.2 summarizes a study by the Experiment Station on the costs of production of six commercial egg producers in 1951. These farms were selected from a

TABLE 5.2--Production and Cost Comparisons From a Study of Six Commercial Egg Producers in Puerto Rico, 1951

|  | Individual Producer |      |      |      |       |       |
|--|---------------------|------|------|------|-------|-------|
|  | A                   | B    | C    | D    | E     | F     |
| Average # of hens in production        | 1392                | 835  | 402  | 178  | 132   | 85    |
| Average annual production/hens         | 226                 | 116  | 135  | 153  | 123   | 67    |
| Average production cost/dozen          | 60.0                | 76.3 | 78.8 | 76.1 | 104.1 | 102.4 |
| Average marketing cost 1 dozen         | 5.9                 | -    | 6.3  | 10.1 | -     | -     |
| Average total cost per dozen           | 65.9                | 76.3 | 85.1 | 86.2 | 104.1 | 102.4 |
| Feed cost as % of total cost           | 48                  | 61   | 60   | 67   | 55    | 58    |
| Labor cost as % of total cost          | 5.3                 | 10.9 | 13.0 | 7.1  | 16.8  | 21.9  |
| Pounds of feed consumed per dozen eggs | 5.5                 | 8.7  | 9.8  | 10.5 | 9.8   | 10.6  |
| Average monthly mortality per 100 hens | 1.7                 | 3.0  | 1.9  | 2.3  | 3.7   | 2.5   |

Source: Manuel Pinero and Hector Bayron Montalvo, Estudio Sobre los Costos para Producir Huevos en Puerto Rico, 1951 Boletín 122, Río Piedras, Puerto Rico: Estación Experimental Agrícola, Universidad de Puerto Rico, September, 1954.

census of farms with annual egg sales of more than \$200.00. The table indicates that the average number of hens per farm ranged from 85 to 1,392. It also shows that average cost of production per dozen ranged from about .66 for the largest producer to \$1.02 and \$1.04 for the smallest and next to the smallest producers respectively. The raw data indicates that larger producers had lower costs of production. This may have been due to economies of scale and/or to improved production techniques on the larger farms. Perhaps the latter was a more important reason since the data in Table 5.2 reveals that the larger producers had greater output per hen and more efficient feed conversion ratios than smaller producers. These production costs included marketing costs ranging from about six to ten cents per dozen for three of the six farms studied. The three which reported no marketing costs apparently sold directly to consumers.

Data are not available on current costs of production for commercial egg producers, but some general comparisons can be drawn using prices paid to members of the Lajas Valley Egg Producers Association in 1965. Such a comparison shows that even after excluding the marketing costs of the most efficient producer in the 1951 study, costs of production were \$.60 per dozen while members of the Lajas Association were paid prices ranging from \$.41 for Grade A small to \$.57 for size Grade A jumbo in 1965. For the most efficient producer the cost of production in the 1951 study exceeds by 3 cents per dozen the price received for jumbo eggs by



association members in 1965. This difference appears even more significant when one considers the fact that the consumer price index for Puerto Rico, based on 1957-59 = 100, went from 79.6 in 1950-51 to 116.1 in 1964-65. Thus, if egg prices had risen in step with the general price level, the farm price of jumbo eggs in 1965 would have been about \$.86, rather than \$.57.

This analysis suggests that real per-unit production costs of commercial egg producers have been reduced considerably since 1951.

Several additional comparisons support the conclusion that egg production costs have been lowered in Puerto Rico since 1950. Table 5.3 summarizes those comparisons. Column 1 in that table shows that the number of commercial egg producers had increased from an estimated 38 in 1950-51 to 195 in 1963-64. This indicates greater specialization in production which, according to Department of Agriculture personnel and Agricultural Extension workers, has resulted in improved production practices and greater efficiency of resource use. Columns 2 and 3 indicate that while the number of hens held on commercial egg farms has only slightly more than doubled since 1956-57, the quantity of eggs produced on commercial farms has almost quadrupled. Column 4 then shows that average yearly production per hen on commercial farms increased from 168 in 1956-57 to 232 in 1964-65.

TABLE 5.3--Production Characteristics of Commercial Egg Farms in Puerto Rico for Selected Years

| Year    | Number of Commercial Farms <sup>a</sup> | Total Number of Hens on Commercial Farms | Annual Production Commercial Farms (1000 dozen) | Yearly Production per Hen Produced on Commercial Farm (eggs) | Per Cent of All Eggs Produced on Commercial Farm |
|---------|---|--|---|--|--|
| 1950-51 | 38 <sup>b</sup>                         |  |   |  |  |
| 1956-57 | 60-65                                   | 180,000                                  | 2,500   | 168  | 20.7   |
| 1957-58 | 79                                      | -  | -   | -  | -  |
| 1958-59 | 108                                     | -  | -   | -  | -  |
| 1959-60 | 121                                     | 285,997                                  | -   | -  | -  |
| 1960-61 | 136                                     | 278,000                                  | 4,704   | 203  | 32.3   |
| 1961-62 | 178                                     | 394,494                                  | 6,758   | 205  | 41.1   |
| 1962-63 | 192                                     | -  | 8,818   | -  | 46.9   |
| 1963-64 | 195                                     | 482,831                                  | 8,844   | 220  | 45.6   |
| 1964-65 | -                                       | 448,330                                  | 8,682   | 232  | 46.5   |

<sup>a</sup>Commercial egg farms are defined by the Puerto Rico Department of Agriculture as those farms having more than 200 producing hens.

<sup>b</sup>The 1951 cost study by Pinero and Bayron (See Table 5.2 p.129) indicated that a Department of Economics and Rural Sociology census of commercial egg producers in Puerto Rico found 38 farmers with annual egg sales of more than \$200.00. It would seem more likely that there were 38 farms having more than 200 hens in production.

Source: Puerto Rico Department of Agriculture and estimates by Nathan Koenig, A Comprehensive Agricultural Program for Puerto Rico (Washington, D.C.: U.S. Dept. of Agriculture, 1953); and Maurice Perkins, Agricultural Credit in Puerto Rico (A Special Report published by the Dept. of Fomento and the Puerto Rican Development Bank, Commonwealth of Puerto Rico, 1958).

In summary the limited data available for comparing egg production efficiency for 1950 with 1965 suggest the following: (1) the size of producing units has been increasing, (2) the growth of specialized commercial producers has been accompanied by better management practices and greater production per hen, and (3) real production costs have been reduced significantly.

Very little data is available for evaluating changes in the cost of marketing eggs in Puerto Rico. One of the reasons is that significant changes have taken place over the past 15 years with respect to the marketing and coordination arrangements. Currently available data are not comparable to earlier data because the production and marketing phases have been vertically integrated through private firms and cooperative associations. The importance of truckers and other middlemen in the exchange process has declined. The farmer survey in the Mayaguez region pointed out that none of the eggs produced by farmers in the sample (which included about 71 per cent of all commercial producers in the region) were marketed through truckers. About 20 per cent were sold directly to retailers and 75 per cent to cooperatives or marketing associations. Egg marketing specialists in Puerto Rico argue that this vertical integration has lowered exchange costs by (1) eliminating excessive transaction costs and (2) duplication of marketing services, by reducing market information gathering costs, by lowering uncertainty and by permitting more accurate scheduling of

production, grading and distribution to the satisfaction of consumer demand. The atomistic and imperfectly competitive markets of the early 1950's, in comparison to the present marketing structure appears to have fostered higher exchange costs.

Progressiveness.--This measure of performance is based on the degree to which available innovations have been adopted. Egg producers in Puerto Rico by and large were quite slow to adopt available innovations prior to 1957. One innovation example which stands out is the enterprise of commercial egg production itself. In spite of the fact that a few commercial producers did exist, the adoption of the innovation came fairly slowly and only after other marketing coordination changes. From 1957 to 1964 the number of commercial egg producers more than doubled (see Table 5.3).

Another important egg production innovation, which was slow to be adopted, was improved breeds of laying hens. The value of baby chick imports (for both broiler and laying stock) was \$249,188 in 1950, \$505,420 in 1957 and \$951,843 in 1965. Indications are that most of the imports in earlier years were dual purpose breeds rather than the more specialized and efficient strains of layers and broilers. The farm survey in the Mayaguez agricultural region, which included 57 commercial egg producers, indicated that of all those farmers now using improved laying breeds, only 20 per cent had begun doing so prior to 1957. As a result of the slow

adoption of improved and specialized strains from the U.S., production per hen remained fairly low until 1957. At that time the adoption process speeded up, and average production per hen moved from 168 on commercial farms to 232 in 1964-65.

Similarly, the innovation of scientifically mixed and controlled feed rations, after having limited acceptance in the early 1950's, has been rapidly adopted since 1957. Total commercial poultry feed sales (including broiler feeds) almost doubled from 1958 to 1964.

The fact that at least 25 per cent of all domestically produced eggs are candled, graded, cartoned and delivered in refrigerated trucks to retailers shows the rapid improvements in marketing methods. In 1950 all eggs were marketed without such quality control and effective handling methods. All of these innovations are closely related to the first innovation--organization for efficient commercial production. Adoption and improvement with respect to that innovation is still very much in process in Puerto Rico. But indications are that the adoption process is moving ahead rapidly.

It is significant that almost half of the commercial egg producers on the island are members of some kind of economic organization for the encouragement of egg production. The types of organizations include a highly integrated corporate firm, a marketing firm using producer contracts and a non-profit marketing and supply corporation owned by producers. Since members of these groups are generally believed to be the most progressive on the island, it appears that

for egg production in Puerto Rico the displacement of atomistic competition in egg production and distribution by the various institutional forms mentioned above has stimulated production and encouraged technological innovation.

Product Quality.--As noted earlier in this chapter, the quality of eggs available to the Puerto Rican consumer was low and quite variable before 1957. Since there were no government grading regulations, consumers could not be sure that they were buying a consistent quality and size of egg from one purchase to the next.

In contrast to this situation, it is estimated by the author that about 25 per cent<sup>105</sup> of all eggs produced in Puerto Rico in 1965 were graded, packaged, and distributed under quality regulations specified and enforced by the Department of Agriculture. This means that the eggs were candled, graded, sized and placed in one dozen cartons with the date of packaging indicated and the inspection seal of the Department of Agriculture applied. The bulk of these eggs were distributed through supermarkets, superettes and large colmados. However, the competitive effect of better quality eggs in supermarkets and larger colmados has improved the quality of eggs sold directly to consumers and distributed through various combinations of producers, truckers and small

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<sup>105</sup>This figure was obtained by estimating, from personal interviews, the yearly production of the six major egg producers who grade and package virtually all their production; summing that figure and dividing by the total domestic production.

retailers. Distributors of eggs through these channels have been forced to deliver better quality eggs in order to compete with the larger retailers handling only consistently fresh graded eggs. The length of time from production to consumption has been significantly reduced. Finally, the quality of imported eggs has been improved as a result of changes in domestic production and marketing practices and government regulations. At one time Puerto Rico was used as a dumping ground for surplus and low quality U.S. eggs. More effective coordination and improved handling methods of local producers, in conjunction with government import regulations, has brought a marked improvement in the overall quality of imported eggs.

### Milk

#### Production and Marketing Conditions, 1950-57

By 1950 dairying had developed as one of the major agricultural enterprises in Puerto Rico. In fiscal year 1950 the total value of milk production was 21.8 million dollars--second only to sugar cane in the value of farm output. Thus, milk production accounted for more than 10% of the gross value of agricultural output in 1949-50. Koenig points out that from 1940 to 1950 considerable progress was made toward improving the production methods and sanitation requirements of dairy farms in Puerto Rico.<sup>106</sup> Moreover,

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<sup>106</sup>Koenig, pp. 230-233.

Perkins notes that during the years between World War I and World War II, outstanding progress was achieved in the control of cattle diseases such as Texas fever, brucellosis and bovine tuberculosis.<sup>107</sup> The immediate impact of effective control of these diseases was to improve dairy profits and increase milk production on the island.

Perkins classified dairy farms in 1950 into three broad categories: (1) commercial dairy farms--medium to large land owners milking 50 cows or more, (2) family farms--a comparatively small group where the family provides all or most of the labor, (3) subsistence farms--a large number of unspecialized mixed farms maintaining a very few animals: these farms do not generally market their milk.<sup>108</sup> The third category mentioned above apparently accounted for the largest number of milk producers, but by far the smallest amount of milk was produced on such farms. The second category, family farms, apparently also included a relatively small number of commercial milk producers. Most of the farms in these two categories who reported having dairy cows in 1950 used the cattle only to produce milk for home consumption and were not producing for sale. Table 5.4 illustrates the relative importance of the different size farms in milk production during 1950.

As shown in Table 5.4 the farms with less than 30 cuerdas, which would include the majority of family

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<sup>107</sup>Perkins, p. 308.

<sup>108</sup>Ibid., p. 310.



subsistence farms, made up 72 per cent of all farms reporting cows milked during 1949. Yet they produced only 14 per cent of all milk sold in that year. At the other extreme farms with more than 260 cuerdas made up a total of only 3 per cent of all the farms reporting cows milked in 1949, but they produced a total of 47 per cent of all milk marketed. If we combine the two largest size categories and the two smallest, it is found that almost 75 per cent of the milk was produced on farms of seventy or more cuerdas. The farms accounted for less than 12 per cent of all farms reporting cows milked. The statistics indicate that most of the milk produced for sale in 1950 was marketed on relatively large farms.

TABLE 5.4--Milk Production by Farm Size, 1949

| Size of Farm   | Farms Reporting<br>Cows Milked | Expressed as a<br>Per Cent of all<br>Farms Reporting<br>Cows Milked | Quarts of Milk<br>Sold Millions | Per Cent of<br>Total Production<br>of Different<br>Size Farms |
|----------------|--------------------------------|---|---------------------------------|---|
| 3-29 cuerdas   | 19,890                         | 72.4%   | 7.85                            | 13.6  |
| 30-69 cuerdas  | 4,290                          | 15.7%   | 6.61                            | 11.6  |
| 70-259 cuerdas | 2,454                          | 8.9%  | 15.92                           | 27.7  |
| 260 or more    | 836                            | 3.0%  | 27.10                           | 47.1  |

Source: U. S. Census of Agriculture - 1950. Puerto Rico, Vol. 1, Part 34, Chapter 5, U.S. Dept. of Commerce, 1951.

Koenig estimated that "considerably less than one-half of all the milk produced actually enters into the marketing system that is governed by the sanitary regulations of the Department of Health."<sup>109</sup> It is therefore apparent that many of the 27,470 farms reporting cows milked were either marketing their production through distribution methods other than normal commercial firms or were producing only for home consumption.

In spite of the fact that many improvements were made in the ten years prior to 1950, milk processing and distributing still lagged behind developments in production. Koenig estimated that about one-fourth of the milk produced in 1949-50 was handled by relatively modern marketing techniques. The other three-fourths was produced for home consumption or distribution by producers under relatively uncontrolled conditions as unpasteurized raw milk.<sup>110</sup> The Department of Health had developed certain sanitary regulations by which they classified dairy farms as first class or second class. A first class dairy was defined as one that, "among other things, has the necessary facilities to sterilize the containers, to cool the milk, to store and to bottle it in accordance with the conditions required by the Secretary of Health."<sup>111</sup> A second class dairy was one which had been exempted from any of the requirements which, in the Secretary's opinion, were not absolutely necessary for the protection of public health. The Department of Health reported

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<sup>109</sup>Koenig, p. 231.      <sup>110</sup>Ibid., p. 230      <sup>111</sup>Ibid.

that in 1951 there were 296 first class dairies which produced the 46 million quarts of milk processed by pasteurizing plants on the island. Of that total only 35 million quarts were sold as pasteurized milk. There were 660 second class dairy farms selling milk to some 22 raw milk bottling plants and 402 Grade D raw milk dealers selling milk to a large number of milk stands over the island and delivering directly to consumers.

Since, as Koenig noted, only about one-fourth of all milk produced in Puerto Rico was handled by modern marketing techniques, there were certain inefficiencies in the production and processing of milk in Puerto Rico. At that time, there was no milk market regulation to establish a classified pricing plan for assuring smooth coordination of supply and demand both in the surplus season and in the season of production deficiency. Producers and their buyers were completely free to bargain and establish milk prices throughout the year. As a result, milk dealers were careful not to purchase more milk than they were absolutely sure they could sell, since any surplus milk would have to be sold at a loss. Therefore, to reduce risks, milk dealers bargained with producers for an even supply of milk throughout the year, based primarily upon milk production during the season of lowest output. Since most of the milk was produced and sold on this basis, much of the excess production in the flush season was left for the farmer to sell at whatever price he could obtain or feed to livestock.

Aside from a small amount of chocolate milk, the only other outlet of any significance for surplus milk was in the production of native cheese. However, this outlet was not sufficient to handle the ups and downs of milk surplus disposal in Puerto Rico.

Under such a system neither the processor nor the producer could be free of considerable risks in his business. The producer was faced with the possibility that production increases might be difficult to market either to his normal buyers or to others in the market. He might be forced to accept an extremely low price, or he might not find a buyer at any price. In addition he was exposed to the possibility that his buyer might even refuse to take delivery of his normal production. On the other hand, the milk dealer or processor faced a similar type of risk. He was forced to estimate his sales from day to day and make purchases on the basis of a fluid milk price in order to fulfill those demands. If he purchased more milk than he was able to sell, then he was forced to take a loss on the surplus. The risk and uncertainty characterizing the marketing system was a major factor limiting the expansion of the dairy industry in spite of low per capita consumption in 1950.

Another factor which gives an indication of the ineffectiveness of the milk production and marketing complex is the quantity of milk and milk products imported. In 1950 Puerto Rico imported about 29.5 million quarts of evaporated, dry and condensed milk (converted to fluid milk equivalents).

Hence, in that year Puerto Ricans imported and consumed almost as much milk in the form of evaporated and dry milk products as was produced and pasteurized for local consumption. It is entirely possible that during the surplus production season of 1950, Puerto Rican producers were forced to use their milk for livestock feed while consumers were importing at considerable expense milk products from the United States and other foreign countries. The production-marketing system was not able to meet the needs of Puerto Rican consumers for fresh milk at competitive prices. As a result consumers turned to the nearest substitute. The fact is, however, that fluid milk prices were higher than they might have been under a more orderly marketing system. It appears that market uncertainty and poor coordination helped to keep local production at low levels by keeping marketing costs high, by inhibiting technological innovations and by distorting the consumer demand signals of the price system. The possibilities will be examined later in this chapter.

Evolution of a Market Control Scheme.--As stated above, the distribution system for milk was highly disorganized and quite risky for producers, distributors and processors. There were no government regulations outside of health regulations. Producers and processors occasionally used contracts, but these were frequently disregarded by one party or the other when it appeared advantageous. Coordination

problems became particularly acute as the quantity of milk entering the marketing system began to increase rapidly during the first few years of the decade between 1950 and 1960.

A rapid shift from second class dairies to first class dairies contributed to the difficulties. It meant that more producers were competing for stable processor outlets and were willing to make deals or arrangements with processors in order to obtain a buyer for their milk. The number of first class producers increased from 296 in 1951-52 to 400 in 1954-55. By 1957-58 there were 465 first class dairy farms in Puerto Rico.

In 1954 several processors made an attempt to stabilize their milk supplies by establishing an arbitrary production quota system with their producers. This base quota system consisted of an arbitrary determination by the milk dealer of the amount of milk that he would be able to take from each producer at fresh milk prices. The producer was then notified that the balance of his milk would be purchased at surplus milk prices. The surplus milk was used in price wars between dealers during the periods of excess supply, and producers became quite disenchanted with this arbitrary and in their view unfair system of price determination.<sup>112</sup>

Therefore, in August 1954 a group of dairy farmers petitioned the Economic Stabilization Administration of the

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<sup>112</sup>George E. Pringle, "The Puerto Rico Milk Industry" (unpublished manuscript dated January 19, 1959).

Commonwealth Government requesting that the administration establish and enforce a production quota system for the milk industry including minimum producer prices for fluid and surplus milk. The petition was denied at that time because the government believed that pricing methods were satisfactory under competitive market forces.

The market relations among producers, processors and distributors continued to deteriorate. And it became apparent that something would have to be done to stabilize the market. To that end several meetings were held in the early part of 1955 between producer representatives, milk dealers and processors. The result of those meetings was an agreement between milk dealers and producers to establish a milk processing plant for converting surplus milk into dairy products. Furthermore, Fomento agreed to grant a loan toward the financing of the plant. The final agreement was that producers and dealers would provide \$146,000 and Fomento would loan \$250,000. This would furnish the \$396,000 required to build the size of plant deemed necessary to handle expected milk surpluses for the island.

The plant was constructed and agreement was reached between producers and dealers whereby each producer would be assigned a quota based on his average daily production during the months of August through November. The farmer was to be paid the fluid milk price for all milk within the quota and would be paid the surplus milk price on any output above that quota. Apparently the arrangement was a pragmatic

and effective solution to market coordination problems in the dairy industry of Puerto Rico.

But basic weaknesses in the arrangement and other problems resulted in continuing difficulties in the industry. To begin with, only about one-half of the milk distributors finally agreed to go along with the plan. This left the manufacturing plant with a heavy debt and only limited working capital when it opened in December, 1955. To make matters worse the volume of surplus milk had been seriously underestimated, and the size of the plant erected was not large enough to handle the volume of surplus delivered in the first few weeks of operation. The fact that the plant was not fully completed when it began operations compounded the difficulty. When the plant was first opened, milk receipts were over three times its rated capacity. As a result large quantities of skim milk were destroyed or sold as hog feed.<sup>113</sup> Additional problems arose as a result of efforts by noncooperating milk processors to bid producers away from cooperating processors by offering fluid milk prices for their total output. These difficulties occasioned a great deal of animosity among producers, processors and distributors. The net effect was a serious deterioration of market relations by 1956.<sup>114</sup>

In 1956 a group of producers, processors and milk dealers asked the Senate of Puerto Rico to conduct a study

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<sup>113</sup>Ibid., p. 9.

<sup>114</sup>Ibid.



of the dairy industry for the purpose of determining the need for a milk regulation. A Special Senate Committee was appointed to study the situation, and they held four public hearings during April and May of that year. The testimony in the hearings by producers, processors and dealers alike favored a milk industry regulation. At the end of the study the commission concluded that the dairy industry was indeed in a chaotic situation and that direct government action was necessary to bring about an improvement in relations between milk producers and distributors. They recommended that a regulatory agency be created to: (1) implement such regulations as will permit the disposing of the surplus milk, (2) launch educational drives directed to increase fresh milk consumption, (3) organize the processing and distribution of fresh milk while taking into account the most effective method of lowering costs.<sup>115</sup>

On June 28, 1956, the Legislature of Puerto Rico approved a law providing for the regulation of the milk industry and creating an Office of Milk Regulation. The law empowered the Secretary of Agriculture and Commerce to appoint an administrator for that office. The administrator of the Office of Milk Regulation was authorized to: (1) fix minimum fluid and surplus milk prices to producers and maximize prices at other distribution levels, (2) hold public

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<sup>115</sup>Act No. 34, Legislative Assembly, Commonwealth of Puerto Rico, Approved June 11, 1957, English Translation, p. 2.

hearings, (3) grant operating licenses to producers, dealers and processors, (4) carry out such other actions as are necessary to assure compliance with the law. This included such things as cancellation of license, auditing of the records of producers and milk dealers, requiring regular reports from processors and/or producers and subpoena power. An administrator was immediately appointed who supervised the preparation of a specific dairy industry regulation. On June 11, 1957, the Legislature approved the regulation and it became Public Law #34. The expressed purpose of the law was to insure that

all endeavors should be directed towards having the public interest adequately served through the production of enough pasteurized milk by a strong industry, operating efficiently, which can supply the consumer with milk and its products at just and reasonable prices.<sup>116</sup>

The major provisions of the regulation were: (1) a base-surplus pricing plan, (2) maximum and minimum prices at various levels of distribution, (3) a milk promotion fund, (4) operation of the surplus milk processing plant previously established by producers and distributors and (5) establish conditions governing producer, processor and distributor relations.

The regulation provided that each producer would be paid 16-1/2 cents per quart for fluid milk and 10 cents per

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<sup>116</sup>Office of Milk Regulation, Milk Industry Regulation No. 1 (Department of Agriculture, Commonwealth of Puerto Rico, as amended July 26, 1962).

quart for all milk designated as surplus. In order to define "surplus" milk, the regulation required that each producer should establish a milk production base during the months from August to November. The regulation offered a specific means of calculation so that each farmer would share equally in the fluid milk market according to his base production.

The second major provision of the regulation was that prices were to be fixed at a specific level for all channels of distribution. For example the maximum sale price for all home delivered fresh milk in glass containers was set at 25 cents per quart and for cardboard containers at 27 cents per quart. This was a maximum price which could not be exceeded for any reason. Similar prices were established for other outlets such as milk agents, restaurants, retail stores, etc. In addition the law provided that no discriminatory price reduction could be made at any level of distribution. Any price reduction on milk made to one purchaser had to extend to all customers.

The third major provision of the regulation was for a milk industry promotion fund. The purpose of this fund was to maintain a source of support for advertising of fresh milk in Puerto Rico. The regulation required that producers and processors each contribute one-fourth of a cent per quart on all milk produced and processes as non-surplus milk. That money was to be used to promote the sale of fresh milk and milk products on the island.

The fourth major provision of the regulation dealt with the milk products factory. It established the rules under which surplus milk would be transferred from processor to the milk products factory and provided for the payment of transportation subsidies in some cases.

The final provision contained basic rules for the conduct of business between various participants in the milk marketing system. It made certain provisions for coordination of the exchange system. For instance it provided that once an agreement was established between a producer and a processor, neither the producer nor the processor could abstain from fulfilling the terms of that agreement without the consent of the Administrator. It also created similar provisions for processor-distributor contracts.

#### Market Coordination, 1957-65

Milk Industry Developments.--Since 1951 there have been some very significant changes in the dairy industry in Puerto Rico, one of the most striking of which is the rapid growth in output. Since fiscal year 1951-52 total milk production in Puerto Rico has more than doubled. Table 5.5 shows total production for selected years. And since 1951 domestic output has gone from 150 million quarts to more than 358 million quarts. A high percentage of that production is consumed as fresh milk. Thus, per capita consumption has increased rapidly in the past 15 years.

TABLE 5.5--Milk Production in Puerto Rico by Type of Producing Unit, Fiscal Years 1952-1965

| Year    | Total Production | Production on First Class Dairies | Production on Second Class and Non-Commercial Dairies | First Class Milk Production as a Per Cent of Total Production |
|---------|------------------|-----------------------------------|---|---|
| 1951-52 | 150,998          | 45,638                            | 105,360   | 30.22   |
| 1952-53 | 163,960          | 56,542                            | 107,418   | 34.48   |
| 1953-54 | 180,493          | 70,974                            | 109,519   | 38.37   |
| 1954-55 | 191,717          | 80,051                            | 111,666   | 41.75   |
| 1955-56 | 207,077          | 93,239                            | 113,838   | 45.02   |
| 1956-57 | 220,405          | 104,344                           | 116,061   | 47.34   |
| 1957-58 | 232,797          | 114,471                           | 118,326   | 49.17   |
| 1958-59 | 249,525          | 128,916                           | 120,609   | 51.66   |
| 1959-60 | 280,976          | 151,556                           | 129,420   | 53.94   |
| 1960-61 | 289,219          | 165,018                           | 124,201   | 57.05   |
| 1961-62 | 311,020          | 183,354                           | 127,666   | 58.95   |
| 1962-63 | 332,781          | 206,504                           | 126,277   | 62.05   |
| 1963-64 | 353,018          | 285,269                           | 127,749   | 63.81   |
| 1964-65 | 358,286          | 251,794                           | 106,492   | 70.3  |

Source: Office of Milk Regulation.

A second surprising feature of the dairy industry in Puerto Rico has been the rapid rise in the production of milk for pasteurization. Since the Department of Health requires that only those farms possessing a first class license may sell milk to pasteurizing plants, the increase in production of first class dairies illustrates the increase in pasteurization. Table 5.5 shows that production on first class dairies has increased from a total of 45 million quarts in 1951-52 to more than 251 million quarts in 1964-65. Milk production on second class and non-commercial dairy farms increased only slightly to 127 million in 1963-64 and then fell back to 106 million quarts in 1964-65. Stated in percentage terms first class milk production has grown from 30 per cent of the total domestic supply to over 70 per cent. Thus, virtually all of the increase in milk production on the island has taken place on first class dairies producing milk primarily for pasteurization and fresh consumption.

The rapid increase in milk production has moved the dairy industry into a place of special importance in the agricultural economy of the island. Table 5.6 indicates that in 1951-52 sugar cane supplied more than 50 per cent of the gross farm income of the island while milk production made up only 9.9 per cent. By 1964 the percentage of gross farm income derived from sugar cane production had declined to 30.1 while the percentage derived from milk production increased to 20.7 per cent. In a period of less than 15 years, milk production had risen to seriously challenge the

dominance of sugar cane on the island. This has been accomplished largely as a result of direct substitution of dairy pasture for sugar cane fields. The shift out of sugar cane production has been especially obvious in the North central part of the island around Arecibo. Within that area much of the flat and fertile sugar cane land of medium-sized farms has been shifted to the production of grass and other products necessary for the operation of dairy farms.

TABLE 5.6--Percentage of Gross Farm Income Derived from Cane, Milk and All Other Products in Selected Years.

| Year    | Per Cent of Gross Farm Income Derived From: |      |           |
|---------|---|------|-----------|
|         | Sugar Cane                                  | Milk | All Other |
| 1951-52 | 50.1  | 9.9  | 40.0      |
| 1955-56 | 44.3  | 14.6 | 41.1      |
| 1960-61 | 38.6  | 17.9 | 43.5      |
| 1963-64 | 33.9  | 20.1 | 46.0      |
| 1964-65 | 30.1  | 20.7 | 49.2      |

Source: Ingreso Agrícola de Puerto Rico, 1950-51--1963-64, Facts and Figures on Puerto Rico's Agriculture, 1965, Puerto Rico Department of Agriculture, Office of Agricultural Statistics.

Total milk production, in addition to being increased through the use of additional land and other resources, has been bolstered by improvements in production techniques.

The Puerto Rican Department of Agriculture has developed an incentive program for improving pasture lands. Commercial dairy farmers on the island have responded quite readily. The sample of first class dairymen in the western agricultural region of the island indicated that about 93 per cent of the farmers in the sample had established new or improved pasture under the program. Moreover, commercial dairymen on the island appear to have rapidly adopted high output rations and improved methods for handling feed products in order to achieve greater efficiency in the number of acres available for feed production. In the survey mentioned above, 76 per cent of the dairymen reported that they were using green chop as a part of their ration. While the above survey was applied only among farmers in the western part of the island, there is no reason to believe that dairymen there are any more progressive than milk producers in the rest of the island. This indicates that Puerto Rican dairymen in general have been willing to adopt sound production practices.

Processing.--In 1951 more than two-thirds of all the milk produced in Puerto Rico was sold in raw form or consumed at the farm level without further processing. In 1947 there were nine pasteurizing plants on the island, seven of which were in the San Juan Metropolitan area. These nine plants handled all of the 45 million quarts of milk produced by first class dairies. By 1965 there were



thirteen pasteurizing plants on the island who handled the 251 million quarts of first class milk produced domestically. There was only a slight increase in the number of pasteurizing plants on the island, and most of the new ones were set up in cities other than San Juan. There was, however, a striking increase in the capacities of pasteurizing plants on the island. Rising consumer incomes along with stable price and supply situations encouraged dairy processors in Puerto Rico to invest in pasteurizing facilities. Since processing margins are fixed by the milk regulation, processors have been encouraged to adopt the most efficient methods of operation in order to reduce costs and thereby raise profit margins. A survey conducted among milk pasteurizers on the island shows that a high percentage have adopted the same milk processing practices that are used by progressive stateside pasteurizers.

Price competition among fresh milk processors has not been a significant factor even though it would be permitted under the industry regulation if the processor were willing to grant a lower price to all customers. It is apparently because of this latter qualification and the oligopolistic nature of the industry that processors have not chosen to practice price competition. Each processor realizes that any price reduction would simply mean that others would quickly follow suit and none would be better off. Neither is there a significant amount of advertising competition. Because the fresh milk produced by all

pasteurizing plants is quite homogeneous, there seems to be little advantage in advertising other than institutional promotion. Competition among processors has been limited to competition on the basis of service to the customer. There is apparently a significant amount of competition among consumer route salesmen for home delivery customers. In general the milk processors on the island have shared in the tremendous rise in milk consumption on the island. They have contributed to the milk industry promotion fund and have received the benefits of that industry-wide advertising as well as the benefits accruing individually from the rapid rise in consumption.

Processor gross margins under the milk regulation are quite low in comparison to farm to retail spreads on the mainland. A study in California states that the average wholesale price spread was 13.6 cents per quart in the twenty largest metropolitan areas of the United States.<sup>117</sup> In comparison the spread in Puerto Rico is seven cents per quart. This illustrates the low gross margins decreed under the regulation for milk processors on the island.

In spite of the fact that gross margins have been quite low since 1957, milk processors have evinced a fairly steady gain in profits as a percent of gross sales. In 1958 net profits as a percent of sale ranged from -2.4 to 3.0 among

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<sup>117</sup>D. A. Clarke, Jr., Economic Aspects of Milk Price Regulations, Agricultural Experiment Station, Information Series in Agricultural Economics No. 63-64, November 1963, p. 21.

the island fluid milk processors. By 1963 all but three of eleven processors had made an increase in profits and six indicated profits of more than three per cent of gross sales (see Table 5.7). The fact that prices and supplies are stable and that the processor does not have to handle surplus milk seems to permit pasteurizing plants to operate fairly efficiently.

TABLE 5.7--Net Return as a Per Cent of Gross Sales for Milk Pasteurizing Plants in Puerto Rico, Selected Years.

| Processing Firm | Net Return on Sales (Per Cent) |        |        |      |      |
|-----------------|--------------------------------|--------|--------|------|------|
|                 | 1963                           | 1962   | 1960   | 1959 | 1958 |
| A               | -(0.9)                         | -(0.2) | 0.6    | 2.8  | 3.0  |
| B               | 6.6                            | 4.2    | 2.5    | 3.0  | 0.3  |
| C               | 1.1                            | 1.3    | -(1.0) | 3.0  | 2.1  |
| D               | 0.1                            | 0.9    | 1.1    | *    | 1.0  |
| E               | 5.2                            | 5.3    | -      | -    | -    |
| F               | 6.2                            | 4.8    | 1.8    | 4.7  | 4.6  |
| G               | 3.4                            | 2.9    | 3.0    | 3.1  | 2.6  |
| H               | 3.3                            | 1.0    | 1.6    | 3.3  | -2.4 |
| I               | 2.0                            | -0.2   | 2.3    | 2.3  | 0.1  |
| J               | -1.9                           | -5.5   | -4.5   | -3.6 | 1.2  |
| K               | 4.2                            | 3.5    | 1.5    | 2.3  | 1.2  |
| L               | 2.8                            | 2.8    | 1.2    | 0.4  | 1.1  |
| Average         | 2.3                            | 1.8    | 1.4    | 2.8  | 2.0  |

\*Data not available

Source: La Industria de la Leche y de la Ganaderia, Junta de Salario Minimo, Department del Trabajo, Estado Libre Asociado de Puerto Rico, December, 1964.

Effects of the Regulation.--Dairy industry development in the past fifteen years is one of the bright spots in the agricultural sector of Puerto Rico. Producers and processors

during that short span of time have accomplished a change-over from a system of production and distribution characterized by small farms, unsanitary conditions and disorganized distribution to one utilizing modern production and processing methods. They have requested and received a government regulation which has contributed greatly to the stability of the industry. While it is impossible to determine the specific effect of the milk regulation upon total consumption, dairy farm productivity and processor efficiency, one can speculate that the dairy industry regulation, which was established in 1957, contributed to the improvement of the dairy industry in at least five different ways:

- (1) It provided a guaranteed price for producers and an equitable payment plan so that producers could share equally in the fluid milk market. With a guaranteed price, producers have been willing to make long range investments and to expand production facilities and improve production efficiency.
- (2) It offered an incentive for the improvement of sanitation practices. The guaranteed farm price for milk produced on first class dairies and marketed as fluid milk was 16.5 cents per quart. This encouraged second class dairymen to upgrade sanitation equipment and practices in order to obtain a first class license. The net effect of the regulation was to improve significantly the quality of milk available to the Puerto Rican consumer.
- (3) The milk regulation stabilized supply arrangements between producers and processors by requiring a producer to sell all his output to a single

pasteurizing plant. Hence producers had guaranteed outlets and processors had guaranteed supplies. (4) The regulation provided for the processing of and fair payment for surplus milk. (5) The dairy industry regulation made provision for advertising and promotion of fresh milk consumption on the island. Through a united effort producers and processors were able to encourage consumers to substitute fresh milk for imported dry or evaporated milk and to increase consumption of fresh milk. That the milk regulation has been regarded as a significant improvement in the industry is illustrated by the fact that 86 per cent of the farmers, 80 per cent of the consumers and 75 per cent of the processors in the surveys mentioned earlier indicated a belief that the milk regulation had benefited producers, processors and consumers alike.

Although the dairy industry regulation has significantly improved milk marketing in Puerto Rico, it has several characteristics which may cause long-run difficulties in the milk marketing structure of the island. The most important of these are the structural rigidities brought on by the regulation. One of the difficult features of an administered price system is that the price established must be realistically related to production and distribution costs and to consumer demand. To avoid the difficulty, prices should be set only after production cost studies and demand studies indicate proper prices.

A second factor is the rigidities imposed by fixed maximum prices at various types of retail outlets. Several processors argue that as a result of the homogeneity of the product and the restraints imposed by the regulation, the only area of competition is in home delivery sales. Because of the same intensive competition, all processors in Puerto Rico make home deliveries six days a week. Conclusions from research studies in the United States have suggested that home deliveries on a three day basis permit more efficient use of resources without significantly reducing sales volume. The consumer survey of this food marketing project revealed that about 98 per cent of the homes in San Juan and Mayaguez samples had refrigerators. Thus, refrigeration is no longer a barrier to three-day delivery in Puerto Rico as it once was.

A third rigidity caused by the regulation arises from the requirement that a given producer or processor can break supply agreements only with the permission of the market administrator. The policy of the administrator has been to grant such changes infrequently and only under very urgent circumstances. As a result both producers and processors are deprived of the opportunity to seek more satisfactory agreements. Because the regulation specifies a processor pool payment plan, the producer who is bound to a processor whose milk sales are declining will receive a lower blend price as a result of the processor's higher surplus designations. To date, the process of switching processors

(which would provide a competitive solution to the problem) has been difficult enough, so that it has created certain inequities in payments to producers and inhibited over-all processor marketing efficiency.

A second major weakness of the Puerto Rican regulation is its omission of any quality incentives. The pricing scheme does not include a method of paying for milk on the basis of total milk solids. This fosters indifference among producers toward the quality of milk produced, and opens the door to possible adulteration practices. The pricing scheme also penalizes those producers who incur the extra costs of producing milk high in butter fat. One may argue that since a significant percentage of Puerto Rican production is utilized for fluid consumption (which even the U.S. is usually standardized to fairly low butterfat levels), the omission of an incentive payment for butterfat content does not create significant problems. Encouragement of production of milk with lower butterfat content may lead to the best allocation of resources anyway. Still, there are certain advantages that could be achieved with at least a minimum incentive plan without fostering any resource allocation problems. Moreover, provisions are needed for controlling bacteria count and foreign material in the milk delivered to processors.

Finally, the milk regulation permits no quantity discounts. Even in those cases where a distributor can demonstrate cost justifications, he is required to maintain one

price for all buyers. Distribution costs are seldom the same for all outlets and all sales quantities. The inflexible pricing structure produced under the current regulation lowers the effectiveness of the competitive price system in allocating milk supplies to consumers through the most efficient market channel. Admittedly, this difficulty, in conjunction with the problem of setting price levels that are "in harmony" with the rest of the economy, is to be expected when prices are determined administratively by a political entity rather than through the impersonal competitive price mechanism. But, the administered price system should be able to utilize certain aspects of the competitive price system where they encourage greater productivity and lower consumer prices. There is no reason why a more flexible pricing policy could not be devised which would permit price discounts adjusted to reflect differences in distribution costs. Such a plan would incorporate some of the benefits of the competitive price system while eliminating the disadvantages discussed earlier.

#### Production and Marketing Performance

Costs of Production and Marketing.--The foregoing discussion has described some drastic changes in the dairy industry since 1950, both in competitive structure and in overall coordination of the marketing system. These changes have been accompanied by some significant improvements in



production efficiency. Puerto Rican dairy farmers have been fairly successful in lowering real costs of production over the fifteen years since 1950. Several indicators of the improvements in production efficiency are discussed below.

Data from an unpublished manuscript by Placido Acevedo can be used to demonstrate the change in the real cost of milk production on first class dairy farms between 1953 and 1963.<sup>118</sup> He utilized cost studies of the Puerto Rico Minimum Wage Board. Mr. Acevedo found that production costs were 13.60 cents per quart in 1953 and 16.50 cents per quart in 1963 as determined by the minimum wage studies. Net returns per quart were 2.4 cents in 1953 and 1.3 cents in 1963. His analysis thus indicates that the absolute cost of producing milk on first class dairy farms in Puerto Rico increased by 2.9 cents per quart from 1953 to 1963 while net returns declined from 2.4 cents to 1.3 cents per quart. If the 1953 cost of production per quart is inflated by the consumer price index, the cost of production for that year stated in 1963 dollar values is 18.25 cents per quart. Hence, the real costs of production in 1963 were 1.75 cents per quart less than in 1953-54.

It should be emphasized that the foregoing discussion was concerned only with first class dairies. No attempt is made here to evaluate the production efficiency of second

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<sup>118</sup>From an unpublished manuscript by the Administrator of the Office of Milk Regulation, Placido Acevedo, undated.

class or non-commercial producers. Their production generally remained constant over the period under consideration while first class production increased by over 500 per cent. This in itself is somewhat of an indication of improvements in production efficiency. The shift from a second class license or from a non-commercial producer usually involves an investment in additional sanitation equipment. Frequently, the farmer realizes that to make the changeover to first class production profitable, he must increase the scale of output and adopt more efficient production techniques. Hence, the producer who obtains a new first class license is likely to invest some additional capital in up-grading or increasing the size of his herd, purchasing milking machines or other equipment and improving feed production or handling facilities. These kinds of improvements have been shown to be cost reducing or output increasing innovations among dairy farmers in the U.S. and in Puerto Rico. Thus, one may argue intuitively that the rapid changeover to commercial first class production has probably been a positive factor toward greater over-all production efficiency.

Table 5.8 contains four series of statistics on first class production of milk in Puerto Rico. These statistics give some indication of possible changes in production efficiency since 1950. The first column shows the number of first class dairy farms in operation at the end of fiscal years 1952 through 1965. The number increased from 296 in 1953 to 747 in 1965. The percentage increase in first class

TABLE 5.8--Statistics of First Class Dairy Farms in Puerto Rico, 1951-65

| Year    | Number<br>of First<br>Class<br>Dairy<br>Farms | Average<br>Number<br>of Cows<br>Per Farm | Total<br>Production<br>(Thousand<br>Quarts) | Average<br>Daily<br>Production<br>per Cow in<br>Production<br>(Quarts) |
|---------|---|--|---|--|
| 1951-52 | 296*  | 73                                       | 45,635                                      |  |
| 1952-53 | 330*  | 71*                                      | 56,542                                      |  |
| 1953-54 | 360*  | 72*                                      | 70,974                                      | 8.10   |
| 1954-55 | 400   | 73                                       | 80,051                                      |  |
| 1955-56 | 400*  | 82*                                      | 93,239                                      |  |
| 1956-57 | 410   | 90                                       | 104,344                                     |  |
| 1957-58 | 465   | 89                                       | 114,471                                     | 8.98   |
| 1958-59 | 521   | 89                                       | 129,916                                     |  |
| 1959-60 | 566   | 93                                       | 151,556                                     |  |
| 1960-61 | 588   | 100                                      | 165,018                                     |  |
| 1961-62 | 639   | 99                                       | 183,354                                     | 10.53  |
| 1962-63 | 691   | 97                                       | 206,504                                     | 10.49  |
| 1963-64 | 718   | 103                                      | 225,269                                     | 10.68  |
| 1964-65 | 747   | 107                                      | 251,794                                     | 11.20  |

\*Estimated

Source: Office of Milk Regulation and Bureau of Agricultural Statistics, Department of Agriculture, Commonwealth of Puerto Rico.

dairy farms was 38 per cent during the five year period from 1952 to 1957. But during the first five years that the milk regulation was in effect (1957-62), the number of first class dairy farms increased by 56 per cent.

It was mentioned earlier that most dairy specialists in Puerto Rico are convinced that first class milk producers make more efficient use of their resources than second class or non-commercial producers. During 1953-54 Perkins made a comparison between the average production of cows on first class dairy farms and average production for all other dairy cows. He found that the average production per cow on first class dairies was more than twice the average production of all other dairy cows.<sup>119</sup>

Column 4 in Table 5.8 indicates that average daily production per cow on first class dairy farms has increased from 8.10 quarts in 1953-54 to 11.20 quarts in 1964-65. Going back to 1949-50 the average daily production was only 7.07. It is evident that first class dairy farms have made significant improvements in productivity per cow since 1950.

Finally, column 2 in Table 5.8 shows the average number of cows per first class dairy farm for fiscal years 1952 through 1965. The number has increased almost yearly from 73 in 1951-52 to 107 in 1965. This figure may or may not be an indicator of improvements in production efficiency. The relevant average cost curves for different size dairy farms

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<sup>119</sup>Perkins, p. 311.

have not been determined by research studies in Puerto Rico. While the average number of cows per farm has been high throughout the period under consideration, this might be due to the fact that economies of scale do in fact exist, or it might be caused by the fact that first class milk producers in Puerto Rico have historically been large landowners who may not have known much about cost at various herd sizes but who did have an abundance of capital and land to invest in dairying. It is probably more likely that some economies of large scale production do exist since the trend toward larger herds has been quite pronounced and steady.

The data summarized in this section suggest that production efficiency in the dairy industry has increased significantly. Production costs in real terms were about 1.75 cents less per quart in 1963 than in 1953-54. Factors contributing to this improvement appear to have been increasing numbers and production of first class dairy farms, higher average production per cow and increasing herd size.

Prior to the passage of the milk regulation in 1957, the dairy industry was completely dependent on a bargained price system for allocating available supplies in the market place. Producers were free to sell their milk to the highest bidder, and processor-dealers were also able to bargain for the best deals. In such a system daily supplies and demands established the price of milk.

Exchange costs in a competitive price system are frequently somewhat high, especially for perishable commodities.

There are several reasons for this. Supply agreements between buyers and sellers are often quite unstable. There is always the possibility that either the buyer or seller will find a more attractive offer and terminate the arrangement. This means that the other party has to find and come to terms with another buyer or seller. In such a search process, the individual must incur certain costs associated with gathering and evaluating information, bargaining with possible buyers or sellers and making the final decision. In the event that a buyer is not immediately available, the seller may incur financial losses due to spoilage of the product. Finally, indirect costs may be present in a competitive exchange system on account of the necessity of financial hedging against risks and the abandonment of business investment opportunities because of price or supply uncertainty.

These factors, in addition to a pronounced seasonal production pattern, combined to make exchange costs fairly high in the milk industry prior to 1957. There is no data available to indicate the magnitude of such costs, but undoubtedly they were regarded by producers, distributors and processors alike as being too great to tolerate since a government regulation was requested and supported by the industry.

The result of that request was a regulation which provided for a marketing system in which most exchange relations were administered by a government agency. Exchange costs under such a stable arrangement were probably reduced

significantly. Moreover, price and supply arrangements became completely stable under the regulation. The administered price system almost completely eliminated information gathering, bargaining and market risks. Of course, the elimination of these costs would have done producers and distributors little good if the administered prices had not been sufficiently high to cover production and distribution costs with an acceptable margin of profit. It appears that the industry has been satisfied with the operation of the regulatory system since, as noted earlier, a high percentage of farmers and processors surveyed in this research project indicated a belief that the regulation had been beneficial to producers, distributors, processors and consumers.

Progressiveness.--The review in Chapter III of research findings in several different countries by Tax, Banfield, Belshaw, Schultz and others suggested that technological progressiveness is one of the critically important factors for improving agricultural productivity. The rate at which proven technological innovations can be diffused among agricultural producers is a critical variable in determining the rate of agricultural output of a given commodity. Of the writers mentioned above, Tax, Banfield and Belshaw imply that the structure and coordination of the marketing system may have a significant effect on technological progressiveness among agricultural producers. Data on the Puerto Rican dairy industry indicate first of all that producers have

readily adopted improvements in production techniques since 1950 and secondly that market stabilization through government administration has been a positive factor in the adoption process.

The contrast between the two following statements points up the magnitude of technological changes on dairy farms in Puerto Rico since 1950.

This industry is only slightly mechanized. As a result, the man-hours needed to produce 100 pounds of milk is from 3 to 4 times as great as the number required on the mainland. Only a few dairies in Puerto Rico use milking machines. Few use power mowers or cutters. Still fewer have silos. Farm and barn layouts are poor. Production is low. There can be little doubt as to the important role that mechanization and related technology could play in the improvement of dairying on the island.<sup>120</sup>

In this dramatic development (rapid change-over to first class dairy farms and rapid increase in output since 1953), the adoption of new technology has played an important role. At the present time such innovations as artificial breeding, pasture improvement, better feeding methods, better breeds, farm records, mechanization, and disease and parasite control are widespread. It is apparent that the rapid growth of the dairy industry has been influenced by favorable farmer predisposition toward the adoption of new technology.<sup>121</sup>

The first statement was excerpted from Koenig's study of the Puerto Rican agricultural economy in 1950, and the second was drawn from a doctoral dissertation on adoption of innovations among first class dairy farmers in 1965.

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<sup>120</sup> Koenig, p. 180

<sup>121</sup> Otis Oliver Padilla, "The Role of Values and Channel Orientations in the Diffusion and Adoption of New Ideas and Practices, A Puerto Rican Dairy Farmers Study" (unpublished Ph.D. dissertation, Michigan State University, 1964), p. 57.



Koenig's statement makes it clear that the adoption of improved production techniques in the dairy industry as a whole had been slow and inadequate prior to 1950. But Oliver found that in 1964 first class dairy farmers were quite progressive in terms of innovations adopted.

In his study Oliver gave farmers a list of specific innovations and asked them, among other things, if they had ever used the practice and if they were now using it. Table 5.9 includes a list of the innovations he used and the percentage of the 233 farmers in the sample who had (1) used the practice and (2) permanently adopted it. At least a majority of producers had permanently adopted six out of the ten innovations suggested by Oliver. The percentage of adoption among farmers samples for such important innovations as fertilizers, use of artificial breeding and pasture improvement was over 70 per cent. The survey discussed in chapter VI of this thesis included a set of questions on technological innovations. The sample of 54 included a high percentage of all first class dairy farmers in the Department of Agriculture's Mayaguez region. Of the 54, 99 per cent had permanently adopted fertilizers, and 89 per cent had permanently adopted insecticides. In addition officials at the Office of Milk Regulations have indicated<sup>122</sup> that virtually all first class milk producers now have bulk

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<sup>122</sup>Personal interview with Mr. Placido Acevedo, Administrator of the Office of Milk Regulation and his economic assistant Felix Roman on July 30, 1965.

storage tanks (since all pasteurizing plants use bulk tank pick-ups) and milking machines. And Oliver noted that an estimated 95 per cent of all first class dairy farms now have milking machines. It is evident that Puerto Rican producers have made great improvements in production methods over the past fifteen years.

TABLE 5.9--Per Cent of First Class Milk Producers in a Sample of 233 Who Used and Permanently Adopted Specific Innovations, 1964

| Innovations               | Per Cent of Sample Who Had Used The Practice | Per Cent of Sample Who Had Permanently Adopted the Practice |
|---------------------------|--|---|
| Fertilizers               | 99.1   | 98.7  |
| Internal Parasite Control | 92.7   | 90.9  |
| Artificial Breeding       | 84.1   | 68.2  |
| Pasture Rotation          | 80.7   | 78.5  |
| Pasture Renewal           | 77.2   | 71.2  |
| Herbicides                | 57.5   | 50.6  |
| Insecticide               | 48.1   | 40.8  |
| Salt Stations             | 44.6   | 35.6  |
| Record Keeping            | 18.0   | 14.6  |
| Silage                    | 8.6  | 6.4   |

Source: Otis Oliver Padilla, "The Role of Values and Channel Orientations in the Diffusion and Adoption of New Ideas and Practices, A Puerto Rican Dairy Farmers Study" (unpublished Ph.D. dissertation, Michigan State University, 1964).

The impact of government market regulations on the rate of adoption of innovations is demonstrated by the data in Table 5.10. Here the rate of adoption of certain innovations is indicated. Perhaps one of the most important innovations in dairy production has been the changeover to mechanical milking. Puerto Rican farmers purchased only \$62,529 worth of new dairy farm equipment in fiscal year 1951 (the bulk of which was for milking machines). While the amount purchased increased each year through 1957 when purchases amounted to \$222,931, purchases dropped off in 1958 only to rise again in 1959. A second type of production innovation which has been important in improving productivity is pasture improvement. The number of cuerdas of pasture established as well as the number of cuerdas improved increased steadily from 1954 through 1959--reaching a combined total of 50,800 cuerdas in the latter year. Both dropped off a bit in 1960 but remained fairly high through 1964. Finally, government incentive payments to producers for the purchase or construction of new equipment or facilities followed the same pattern. Payments rose steadily through 1956 with a sizeable decline in 1957 followed by a jump upward in 1958. And payments fluctuated between \$40,000 and \$140,000 per year after 1958.

The general pattern for the innovations mentioned above seems to be a rapid increase during the years prior to 1959 and followed by either continued less significant expansion or relative stability. The milk regulation was

TABLE 5.10--Value of Dairy Equipment Imports, New and Improved Pasture, and Incentive Payments to Dairy Farmers in Puerto Rico, 1951-64

| Year    | Import Value<br>of Dairy<br>Farm Equip-<br>ment<br>(dollars) | New<br>Pasture<br>Estab-<br>lished <sup>a</sup><br>(cuerdas) | Pasture<br>Improved <sup>a</sup><br>(cuerdas) | Cash Payments<br>to Producers<br>for New Equip-<br>ment and<br>Facilities <sup>b</sup><br>(dollars) |
|---------|--|--|---|---|
| 1950-51 | 62,529   | -  | -   | -   |
| 1951-52 | 23,847   | -  | -   | -   |
| 1952-53 | 29,644   | -  | -   | -   |
| 1953-54 | 73,653   | 5,300  | 4,700   | 4,500   |
| 1954-55 | 162,582  | 12,000   | 5,500   | 23,965  |
| 1955-56 | 213,899  | 14,800   | 4,900   | 39,596  |
| 1956-57 | 222,931  | 22,300   | 5,300   | 18,722  |
| 1957-58 | 63,792   | 19,200   | 16,200  | 22,815  |
| 1958-59 | 124,988  | 32,200   | 18,600  | 40,871  |
| 1959-60 | 126,174  | 18,900   | 6,900   | 84,978  |
| 1960-61 | 164,689  | 23,500   | 7,100   | 108,691   |
| 1961-62 | 201,584  | 27,287   | 9,656   | 139,830   |
| 1962-63 | 307,287  | 30,000   | 8,200   | 120,357   |
| 1963-64 | 228,365  | -  | -   | 91,424  |

<sup>a</sup>Refers to the amount of new pasture established and cuerdas improved with assistance from the Commonwealth government's pasture improvement program.

<sup>b</sup>Refers to government incentive payments to producers for purchasing new equipment or facilities, e.g. silos, molasses tanks, stables, milk rooms, etc.

Source: External Trade Statistics, Puerto Rico Planning Board and La Industria de al Leche y de la Ganaderia, Junta de Salario Minimo, Departamento del Trabajo, Estado Libre Asociado de Puerto Rico, December, 1964.

first passed in 1956 and became effective in 1957. The market stability created by the law may have been a factor in the decisions of producers to make capital investments in modern production techniques at a rapid rate after 1955. There are, of course, any number of other factors which undoubtedly affected those decisions. One can only speculate as to the positive effect of the market regulation and the possible negative effect of poor market coordination had it not been granted by the Puerto Rican government.

In summary Puerto Rican dairy farmers have made significant improvements in the use of modern production techniques over the past fifteen years. The passage of a government regulation for the dairy industry appears to have stabilized market relations and reduced investment uncertainties sufficiently to provide some impetus to the technological adoption process among dairy farmers.

Product Quality.--Previous discussion has established the fact that the quantity of milk produced and sold to pasteurizing plants increased rapidly after 1950. This is probably the best indication of quality improvements in milk production. To review, in 1950 only 35 million quarts out of a total production of 146 million quarts were pasteurized (about 25 per cent) as compared to pasteurization of 225 million out of a total production of 358 million quarts in 1964-65 (about 63 per cent). The Department of Health requirements on sanitation practices and refrigeration in

producing, transporting, processing and distributing pasteurized milk have been sufficiently strong to assure adequate quality. Sanitation regulations earlier in the period were somewhat inadequate but significant improvements have been made. Some problems of enforcement of sanitary regulations among producers still exist but, in general, the quality of processed milk in Puerto Rico is quite satisfactory. There can be little doubt that since 1950 consumers have benefited by a substantial improvement in the quality of milk available to them.

### Fruits and Vegetables

#### Production and Marketing Conditions, 1950-57

Production of fruits and vegetables in Puerto Rico in 1950 was dispersed over a large number of small subsistence type farms. In most cases fruit or vegetable production was not the main enterprise of the farm. Puerto Rican farmers have traditionally regarded fruit and vegetable production as secondary to major crops. The bulk of the production came from farms where the major enterprise was sugar cane, coffee, or tobacco or from part-time or subsistence farms.

Banana production illustrates the inter-relationship between coffee production and other tree crops. In the 1950 census of agriculture, more than 31,000 farms reported production of bananas. On virtually all of those farms, bananas were produced as a by-product of coffee production. The trees were planted to provide shade for the coffee trees, and

the bananas produced were considered as supplementary to the principal cash enterprise of coffee. The situation was the same for several other tree crops (e.g. plantains and oranges).

The same type of complementary production arrangements existed for such starchy root crops as yams, taniers, potatoes and casava. These crops were planted under the coffee trees or on small vacant plots on the coffee plantation. They were mainly produced for home consumption, but the excess was marketed when buyers were available. There were a few producers who specialized only in the production of starchy vegetables in certain parts of the island, but such specialized producers most commonly used small plots on hillsides where little else could be produced and followed primitive production practices.

The situation was much the same in the production of other vegetables mentioned above. In the 1950 census, 2,294 farms reported having produced tomatoes, while 1,535 reported the production of peppers. Included in the census were only those farm units having 3 or more cuerdas, so additional production of these products could have been accomplished on smaller garden-type plots. Very little of the production of such plots was marketed, however. Of the farms reporting tomato or pepper production in the census, the average number of cuerdas harvested per farm was .69 and .41 respectively. While tomato production was generally regarded as the most commercialized of all vegetable production, there were

several pockets of specialized commercial producers of scattered subsistence or part-time farms.

Table 5.11 reveals the value of production of fruits and vegetables for Puerto Rico in 1950-51. The group labeled starchy vegetables made up more than one-half of the total value of \$17,539,000 for all fruit and vegetables. Fruit production was valued at \$4.6 million and other vegetables \$3.0 million. It is interesting to compare the total value of local production with the value of imports of fruits and vegetables. Most of the production mentioned above and listed in Table 5.11 was consumed as fresh produce. In 1950 Puerto Rico imported large quantities of fresh, frozen, canned and dried fruits and vegetables, and a significant percentage of Puerto Rico's consumption of processed fruits and vegetables was supplied by imports. Moreover, as indicated in Table 5.14 Puerto Rico imported a large amount of fresh fruits and vegetables. The total value of all fruit and vegetable imports in 1950-51 was over \$14 million. Thus, in 1950 some 40-45 per cent of the total consumption of fruits and vegetables on the island was imported.

In 1950 virtually all the fruits and vegetables marketed in Puerto Rico were purchased by merchant truckers buying at farms or at concentration points in rural areas. These merchant truckers then transported the products to consuming centers where sales were most often made to retailers in the market plazas or occasionally to consumers. Truckers seldom had an established place of business, for



TABLE 5.11--Value of Fruit and Vegetable Production and Number of Farms Reporting Sales in 1950-51

| Description                   | \$ Value of<br>Production<br>\$000 | Number of Farms<br>Reporting Sales |
|-------------------------------|------------------------------------|------------------------------------|
| Starchy Vegetables            | 9,917                              | -                                  |
| Sweet Potatoes                | 1,377                              | 25,552                             |
| Bananas                       | 4,101                              | 12,214                             |
| Plantains                     | 1,717                              | 7,804                              |
| Dasheens                      | 190                                | 12,499                             |
| Yams                          | 500                                | 12,506                             |
| Breadfruit                    | 908                                | 553                                |
| Taniers                       | 992                                | 21,009                             |
| Casava                        | 132                                | 8,069                              |
| Other Vegetables              | 3,007                              | -                                  |
| Pumpkins                      | 398                                | 2,158                              |
| Peppers                       | 364                                | 1,535                              |
| Cabbage                       | 370                                | 992                                |
| Tomatoes                      | 893                                | 2,294                              |
| Others                        | 973                                | -                                  |
| Fruit                         | 4,615                              | -                                  |
| Avocados                      | 638                                | 10,200                             |
| Oranges                       | 631                                | 9,618                              |
| Coconut                       | 1,380                              | 3,578                              |
| Mangos                        | 167                                | 1,173                              |
| Pineapple                     | 1,290                              | 140                                |
| Grapefruit                    | 210                                | 1,135                              |
| Others                        | 299                                | -                                  |
| Total Fruit and<br>Vegetables | 17,539                             | --                                 |

Source: U.S. Census of Agriculture for Puerto Rico - 1950.



their truck bed served as a grading, packing and storage warehouse. Yet these truckers performed (though frequently inefficiently) the important marketing function of assembling food products from large numbers of small producers, transporting the products to urban areas and distributing them to other middlemen or to consumers. They provided the necessary link between small geographically scattered producing units and small retailing, wholesaling or consuming units. The service provided by merchant truckers was a necessary part of the coordinating mechanism of the highly competitive bargained exchange system for fruits and vegetables. Unfortunately, their handling methods had significant influence on the marketing methods of their buyers and on the practices of farmers as well.

Neither producers nor merchant truckers were able to understand the nature of consumer demand sufficiently to perceive the need or profitability of washing, grading and carefully handling perishable commodities. Nor was there a clear understanding of the importance of such practices on marketing efficiency and hence industry profits.

As a result, there was little protection of fruit from the tropical heat, and products were ordinarily transported in bulk. Nathan Koenig observed that

the movement of products from the farms to the marketing centers of Puerto Rico is a costly process. This is due to the inefficient methods that are employed. All the fruits and many others products that move in the market are sold by count. Although some of the products are placed in sacks, their

handling is as costly as handling bulk shipments. Since there is no grading to promote buyer confidence, the practice of the trade is to inspect each item that is received.<sup>123</sup>

He also observed that the bulk transportation of fruits led to a great deal of spoilage and waste as a result of bruising and mashing and due to the lack of protection while in transit.

A high percentage of locally produced fruits and vegetables were marketed through Municipal Market Plazas. A study in the San Juan Metropolitan Area by the Puerto Rico Department of Agriculture noted that during a sampling period in 1952-53 the destination of about 39 per cent of the fruits, 78 per cent of the starchy vegetables and 93 per cent of the other vegetables were market plazas. Table 5.12 summarizes the results of that study. Since the market plazas consisted of individual stalls provided to retailers for displaying their products, they had no facilities whatsoever for grading, storing or efficiently handling produce. Perkins noted that parking around market plazas was generally limited and that there were no unloading platforms or areas provided for sorting or grading products. Both wholesale and retail operations were carried on in the market plazas, often by the same individual.

The most prevalent type of market price and supply information was market observation or word of mouth reporting. Merchant truckers obtained price information by direct

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<sup>123</sup> Koenig, p. 221.

TABLE 5.12--Percentage of Various Products Delivered to Specific Destinations in Metropolitan San Juan--1952-53 (Per Cent of Total Dollar Value)

| Description                              | Market<br>Plazas | Colmados | Consumer<br>Sales | Wholesaler | Processor | Restaurants<br>and<br>Institutions | Other |
|--|------------------|----------|-------------------|------------|-----------|------------------------------------|-------|
| Green, Yellow<br>and Leafy<br>Vegetables | 93.07            | 1.86     | 1.55              | .90        | .34       | 2.16                               | .12   |
| Fruit                                    | 39.07            | .86      | 54.21             | 1.50       | 1.59      | 2.44                               | .33   |
| Starchy<br>Vegetables                    | 78.00            | 2.93     | 11.45             | 2.20       | 1.08      | 3.39                               | .95   |

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Source: Louis Nazario, Bartolome Morrell, Carlos Jimenez de la Rosa, and Guillermo Gonzalez, Estudio de los Abastos de Productos Agrícolas de Puerto Rico a la Zona de San Juan, Departamento de Agricultura y Comercio, San Juan, 1956, pp. 98-99.

observation in the various market plazas where they visited. Since most of the trucker purchases were at small concentration markets where farmers most frequently delivered products by hand or on mules, trucker-buyers were in a somewhat favorable bargaining position. The poorly educated farmer with small amounts of produce, poor market information and few if any alternative buyers was unable to bargain for "fair" prices. As a result producers were given little incentive to invest additional inputs (i.e., labor, capital or land) to attempt increasing output or improving quality.

The absence of a dynamic and orderly marketing system had the effect of maintaining the status quo of small scale production, atomistic and unbalanced competition (in the relationships between buyers and producers) and low levels of productivity. Koenig's recognition of the important effect that the poorly coordinated marketing system was having on farm management decisions and resource allocation is illustrated in the following statement:

Farmers have had to plant, not the type of crops for which their soils are best suited, but a crop such as sugar cane that can be marketed with some certainty of a return for the investment and labor. . . . As a result, (of the inadequacies of the marketing system), farmers are inclined to follow extensive production practices whereas virtually all farming should be on an intensive basis.<sup>124</sup>

Basic marketing inefficiencies such as selling by count, packaging in odd containers, poor handling methods and lack

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<sup>124</sup>Ibid.

of refrigeration add to distribution costs. Eventually, these added costs must be borne by the consumer either through higher prices or through lower quality or partially satisfying products. In 1950 Puerto Ricans were spending over 40 per cent of their low incomes for food. The poorly coordinated marketing system for fruits and vegetables placed additional burdens on food budgets by adding the costs of marketing inefficiency to consumer prices. Moreover, there is evidence that even at high prices consumer tastes and preferences were largely ignored. Koenig pointed out that the ways in which fruits and vegetables were produced and marketed satisfied neither high income nor low income consumers.

The low income consumers cannot get a satisfactory second-grade product to meet their needs with the limited purchasing power available to them. On the other hand, the high-income consumers are unable to find the first-class products they can afford to buy.<sup>125</sup>

Perhaps such a situation was caused by an inability of producers, distributors and even consumers to understand their proper roles in relation to others in the marketing system. Koenig comments that producers "tend to regard production and marketing as being widely separated functions."<sup>126</sup> This suggests that Puerto Rican farmers had not yet "learned" that the whole purpose of production is to fill the needs and wants of people. It thus becomes important

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<sup>125</sup>Ibid.

<sup>126</sup>Ibid., p. 222.

to know something about the preferences of the people for whom one is producing. The problem is less critical in a subsistence economy where producers and consumers are the same people, but in an economy where exchange is necessary the matter becomes quite important. The same applies to distributors. They too may overlook the importance of gearing their marketing services to the real needs and wants of consumers. Maybe their oversight is even less understandable than the farmer's. Marketing middlemen are at least one step closer to the consumer, and of course retailers are in contact with consumers daily. It would seem that one of the critical roles of such middlemen, in addition to facilitating the flow of goods and services to consumers, should be to provide a flow of accurate consumer preference signals or messages back to producers. In a bargained exchange system where producers, middlemen, and consumers understand these relationships and act accordingly, independent decisions at all levels will have a central purpose resulting in an effectively coordinated and efficient production and distribution system. The Puerto Rican fruit and vegetable marketing system in 1950 apparently lacked this basic orientation.

In summary fruit and vegetable market organization in 1950 was detrimental to the Puerto Rican economy in several respects. The marketing system with accompanying risks and uncertainties prevented producers from expanding and diversifying fruit and vegetable production enterprises. Koenig and Perkins imply that consumer prices were kept high through



inefficient handling methods, excessive wastes and unnecessary instabilities and uncertainties. Finally, consumers were deprived of the opportunity to purchase food supplies at "reasonable" prices (relative to other goods) and were unable to adequately satisfy their needs and wants for specific types and qualities of products.

#### Market Coordination, 1957-65

The impact of a rapid rise in per capita incomes has already been observed with respect to milk and eggs. Table 5.13 summarizes the changes in per capita consumption of several major food items since 1950. The table indicates that green and leafy vegetables have shown a sizable percentage increase since 1950. Even though fruit consumption is not included in the table, it is quite likely that consumption has increased significantly. It should also be noted that per capita consumption of starchy vegetables decreased by 21 per cent--from an extremely high total per capita consumption of 316.7 pounds to 261.7 pounds.

The changes in eating habits reflected in Table 5.13 are typical of the changes which have normally occurred in developing countries with rising incomes. Higher incomes in Puerto Rico have thus been accompanied by greater consumer demand for animal products, fruits and green and leafy vegetables (both fresh and processed), with lower demand for the less expensive starchy products. This change in

consumer demand has created special problems for traditional fruit and vegetable producers.

TABLE 5.13--Per Capita Consumption and Percentage Change Since 1950 of Selected Food Commodity Groups in Puerto Rico

| Product                       | 1950<br>(pounds) | 1964<br>(pounds) | Per Cent<br>Change<br>1950-1964 |
|-------------------------------|------------------|------------------|---------------------------------|
| Dairy Products                | 161.5            | 342.4            | +112                            |
| Meats                         | 47.1             | 99.0             | +110                            |
| Eggs                          | 8.3              | 16.4             | + 98                            |
| Fish                          | 19.3             | 35.9             | + 86                            |
| Green and Leafy<br>Vegetables | 28.3             | 50.9             | + 80                            |
| Coffee                        | 9.2              | 6.5              | - 41                            |
| Starchy Vegetables            | 316.7            | 261.7            | - 21                            |
| Sugar                         | 69.7             | 61.7             | - 13                            |

In the first place Puerto Rican farmers have traditionally emphasized the production of starchy fruit and vegetable products. Historically, Puerto Rican consumer incomes have been such as to require large quantities of those items. Prior to 1950 producers saw little demand for such items as lettuce, tomatoes and cucumbers. Though most urban consumers could not afford to purchase such products, as incomes began to accelerate, there was a growing demand for products not normally produced by Puerto Rican farmers. At

the same time consumer demand for starchy vegetables was declining. Puerto Rican fruit and vegetable producers have had difficulty in understanding and adjusting to these changes in consumer demand.

Secondly, the nature of fruit and vegetable production and distribution as described above made it difficult for producers and distributors to fully account for changing consumer wants. Production (as a secondary enterprise) on widely dispersed sugar, coffee or tobacco farms with few specialized commercial producers has resulted in limited interest in changing consumption among fruit and vegetable producers. Then too, the conditions in the distribution system for traditional fruits and vegetables were such that adjustments were also difficult to effect there.

These two factors combined to result in a production and distribution system for fruits and vegetables showing little change and improvement from 1950 to 1965. Virtually all production continued to be derived from sugar, coffee or tobacco farms or from part-time or subsistence units. There was only a slight change in the composition of fruit and vegetable output, i.e., green and leafy vegetables or fruits vs. starchy products. The marketing system continued to center around merchant truckers.<sup>127</sup> Marketing methods and practices remained virtually the same.

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<sup>127</sup>The farmer survey mentioned elsewhere in this thesis indicated that for the Mayaguez Region farmers making up the sample about 42% of all fruit and vegetable sales were made to truckers. Produce wholesalers purchased only 19%, retailers 14%, cooperatives 11%, processors 7% and "others" 7%.

While conditions in domestic fruit and vegetable production largely remained static, significant changes were taking place in food retailing on the island. The introduction of the first supermarket on the island in 1956 and the growing acceptance of the marketing institution since that time has already been discussed. In 1965 supermarket sales accounted for about 22 per cent of retail food sales on the island and the percentage has been increasing rapidly.<sup>128</sup>

Because the kind of marketing system prevailing for fruits and vegetables in Puerto Rico does not satisfy the demands of well managed supermarkets, the new supermarkets and many larger scale self-service grocery stores competing with them have turned to the mainland for a stable supply of consistent quality produce. It has remained necessary for them to purchase many speciality items locally. These have mostly been the starchy vegetables in largest supply on the island, such as bananas, plantains, yams, taniers, casava, etc. Table 5.14 indicates the farm value of domestic fruits and vegetables in comparison to the value of imported fruits and vegetables alongside ship at the port of embarkation in the U.S. While value of imports have remained equal or slightly larger than domestic production throughout the past 15 years,<sup>129</sup> the most recent trend has

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<sup>128</sup>For a more thorough discussion of the changes in food retailing in Puerto Rico, see Wish.

<sup>129</sup>Since these are total value figures, imports undoubtedly do reflect somewhat higher values than domestic production because they include some processing and inland transportation charges on the mainland. These differences

TABLE 5.14--Value of Domestic and Imported Fruits and Vegetables, Puerto Rico Fiscal Year 1951-1965.

| Year    | Domestic <sup>a</sup><br>Production<br>\$1,000 | Imports <sup>b</sup><br>\$1,000 |
|---------|--|---------------------------------|
| 1950-51 | 19,986   | 14,294                          |
| 1951-52 | 24,082   | 19,895                          |
| 1952-53 | 22,397   | 22,487                          |
| 1953-54 | 23,543   | 20,849                          |
| 1954-55 | 23,190   | 23,199                          |
| 1955-56 | 23,749   | 23,697                          |
| 1956-57 | 20,577   | 24,697                          |
| 1957-58 | 23,929   | 27,270                          |
| 1958-59 | 22,806   | 25,889                          |
| 1959-60 | 26,975   | 27,166                          |
| 1961-62 | 30,193   |                                 |
| 1962-63 | 31,852   | 33,499                          |
| 1963-64 | 33,967   | 34,999                          |
| 1964-65 | 36,034   | 39,582                          |

<sup>a</sup>The value figures represent farm value of starchy vegetables, green and leafy vegetables, legumes and fruits.

<sup>b</sup>These figures represent only imports from the U.S. (since foreign shipments are quite small) and reflect values of products "free alongside ship" at the port of embarkation on the mainland. These import values include processed fruits and vegetables as well as fresh.

Source: External Trade Statistics, Puerto Rico Planning Board and Foreign Trade Reports, U. S. Department of Commerce.

been for imports to capture a slightly larger proportion of total supplies.

Reasons for Slow Improvement.--The conclusions from the foregoing discussion are that production and marketing of the bulk of fruits and vegetables produced in Puerto Rico has changed very little over the past 15 years. As a result rapidly expanding supermarkets and other self-service retailers have continued to depend heavily on U.S. shipments. Several significant factors have accompanied and may have contributed to this situation.

First, production continued to be carried out on extremely small specialized farms or as a secondary enterprise. Table 5.15 shows some of the characteristics of farms classified as minor crop and fruit and nut farms in the Census of Agriculture. These are farms having gross farm sales of more than \$150 during the year for which more than 50 per cent of all sales were in products classified as minor (e.g., rice, pigeon peas, dry beans, sweet potatoes, yams, taniers, etc.) or fruit and nuts (all tree fruits, nuts and pineapples). The table illustrates that there were relatively few such specialty farms although there was a slight increase in their number between 1950 and 1959. It also indicates that the average number of cuerdas in cropland on minor crop farms was 9.5 in 1950 and declined to 7.0 in 1959. Similarly, the average number of cuerdas in cropland on fruit

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are not significant enough to alter the conclusions regarding trends over the period from 1950-65.

TABLE 5.15--Characteristics of Minor Crop and Fruit and Nut Farms in Puerto Rico, 1950 and 1959

|                                      | Minor Crop |        | Fruit and Nut |         |
|--------------------------------------|------------|--------|---------------|---------|
|                                      | 1950       | 1959*  | 1950          | 1959*   |
| Number of Farms                      | 961        | 1,082  | 1,651         | 3,547   |
| Cropland in Farms<br>(cuerdas)       | 9,132      | 7,588  | 23,914        | 33,763  |
| Average Cropland<br>Acreage per Farm | 9.5        | 7.0    | 14.5          | 9.5     |
| Number of Farms by<br>Size:          |            |        |               |         |
| 1 - 9 Cuerdas                        | -          | 875    | -             | 2,955   |
| 10-29 Cuerdas                        | -          | 197    | -             | 430     |
| 30-99 Cuerdas                        | -          | 7      | -             | 130     |
| 100 or more Cuerdas                  | -          | 3      | -             | 32      |
| Fertilizer Purchased<br>(dollars)    | 39,800     | 39,137 | 339,130       | 437,538 |
| Tractors                             | -          | 1      | -             | 74      |
| Trucks                               | -          | 34     | -             | 136     |
| Irrigated Land in<br>Farms (Cuerdas) | -          | 4      | -             | 110     |

\*The 1959 data were derived from a sample of producers on the island, and they may include sampling errors.

Source: Census of Agriculture, 1950 and 1959.

and nut farms declined from 14.5 to 9.5. While data were not available to classify these farms on the basis of size (total acreage in farms including cropland and pasture) in 1950, such a classification for 1959 reveals that the majority of both minor crop and fruit and nut farms has less than nine acres per farm. Thus, during the ten year period from 1949 to 1959 census data give no indication of a trend toward the development of specialized fruit and/or vegetable producers.

Second, there was no significant improvement in production methods. Table 5.15 also gives the value of fertilizers purchased by minor crop and fruit and nut farms in 1958 and 1959. Fertilizer purchases were extremely low for minor crop producers in 1950 (\$39,800) and declined slightly in 1959 to \$39,137. Fertilizer purchases by fruit and nut farms sizably increased from \$339,138 in 1950 to \$437,538 in 1959. This increase may be due to a few new specialized pineapple and papaya producers who started commercial production during the period. Moreover, Table 5.15 indicates that in 1959 tractors and trucks were practically nonexistent on minor crop farms while fruit and nut farms had a total of only 74 tractors and 136 trucks. Admittedly, these census data do not completely reflect the production situation for fruits and vegetables since some progressive, efficient producers could be classified elsewhere because they have over 50 per cent of their sales in some other commodity. But they should suggest that those who glean the



majority of their income from fruit and vegetable production have made relatively few production improvements.

Third, fresh produce wholesaling and processing has shown little improvement since 1950. Assembly of products is still largely performed by merchant truckers buying at concentration points or more often directly at the farm. The products are then transported to one of the municipal markets on the island or occasionally directly to retailers or even consumers. The municipal markets, however, remain as the single most important marketing institution for fruits and vegetables. In 1964 about 34 per cent (in terms of value) of all starchy vegetables produced on the island were marketed through one of the seven largest market plazas. Similarly, about 30 per cent of all fruits and 43 per cent of all green and leafy vegetables passed through those markets. These high percentages in and of themselves give no cause for alarm since it is common even in the U.S. for large municipal markets to serve as a meeting place for buyers and sellers of fruits and vegetables. But the conditions and facilities of most municipal markets (and especially the larger ones) are far from satisfactory. They are generally the same kinds of markets that existed in 1950 since they provide no unloading wharfs, no sorting areas, no cleaning facilities and generally no area for the operation of wholesalers or brokers. There is usually only a limited amount of parking for trucks. About all they do provide are small cubicles for the operation of retail businesses.

There are only a few (four to eight) specialized fruit and vegetable wholesalers on the island, and there are no wholesalers who handle a wide variety of fresh produce. A few firms have been organized in the last few years to specialize in a narrow range of commodities (e.g. a potato wholesaler and a wholesaler handling only tomatoes, peppers and cucumbers). But individual truckers still provide the bulk of produce wholesaling services. Similarly, fruit and vegetable processing facilities on the island have expanded slowly. A high percentage of the canned and frozen fruits and vegetables consumed on the island are imported. There are three fairly large canning plants on the island--one was established in 1949 and the other two about 1955 and 1961--whose main products are pigeon peas, tomato paste and beans. In addition there are several smaller processing plants specializing in fruit juice, nectar and paste. Because of their limited number and size, these processing plants have had only a small effect on the total production and distribution system for fruits and vegetables in Puerto Rico.

Finally, the Puerto Rican government has had little success in improving the condition and efficiency of fruit and vegetable production and distribution on the island. In 1955 the commonwealth Department of Agriculture hired a mainland consultant to study the marketing of fresh fruits and vegetables and make recommendations for improving its efficiency. He found the marketing system to be poorly coordinated and highly inefficient with little progress being

made toward improvement. He recommended that the government should take immediate action to fill the following needs, using whatever programs and incentives necessary. (1) Establish at the grower level, through individual producers, cooperatives or specialized firms, organizations for receiving, grading, washing, packaging and delivering fresh produce to retailers or produce wholesalers in urban areas. These organizations would replace to some extent merchant truckers.

(2):

Organize and establish a sufficient number of privately owned and operated service wholesalers who would secure their supplies of Puerto Rican grown produce from shippers described in (1) above and would supplement the supply of these products with others needed from the states.<sup>130</sup>

(3) Encourage the development of supermarkets and other improved retail food stores in the island. (4) Prepare simple and practical grading regulations and provide adequate education and encouragement to assure their use among marketing firms. (5) Adopt standard containers adaptable to specific commodities and require their use in packing for local markets. (6) Provide intensive training programs for produce handlers, demonstrating efficient marketing methods. (7) Improve marketing information and communication methods (especially telephone service). (8) Provide loans and

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<sup>130</sup>Harry W. Day, "Study and Recommendations for Organization of Channels of Distribution of Fruits and Vegetables Produced in Puerto Rico" (Unpublished consultant's report, Department of Agriculture and Commerce, June 30, 1955, p. 16).

technical assistance for produce handlers interested in improving marketing facilities and methods.

These recommendations undoubtedly were broad and would have required an ambitious program indeed to implement immediately. Day recognized this and suggested that the program should be a long range (10-15 year) effort. He did feel, however, that the government should start immediately with a fairly intensive effort.

The government of Puerto Rico has enacted programs designed to accomplish at least four of the recommended improvements. Yet, the programs have generally had only a limited effect on the fruit and vegetable marketing system. The Department of Agriculture tried to encourage grading, washing and packaging by constructing facilities in Naranjito to be used by farmers and wholesalers as a rural collection point, but the market has never been used to any extent for the intended purpose.

A second effort to encourage grading and improved handling of fruits and vegetables was the establishment of a government owned and operated wholesaling facility established to supply produce for public institutions. The facility was to serve as a demonstration of the beneficial effects of improved handling methods and facilities on product quality and efficiency. Unfortunately, the business was never well managed and never made any significant improvements over the handling methods of truckers and other middlemen.

Recently, the assets of this government produce wholesaling facility have been turned over to a central produce cooperative being organized by Fomento Cooperativa. This cooperative plans to collect produce from its members at a central packing facility in San Juan where grading, washing and packaging will be performed. Then the cooperative would deliver produce orders directly to retailers. Results from a short period of operation suggest that the cooperative is having the same management problems as the previous government wholesaling facility.

Other government fruit and vegetable marketing programs include a market news service and educational programs in produce handling by the Agricultural Extension Service. The market news service collects price information daily in the municipal markets and disseminates it through a radio program. The lack of consistent grades coupled with the combining of retailing and wholesaling operations in the same market seriously reduces the value of the government's price information to producers and distributors. Even though the training programs of the Extension Service have been helpful in some cases, in general they have not attracted the interest of the people most needing the assistance. Limited success has therefore been achieved in four of the eight areas mentioned by Day.

The Department of Agriculture has been interested in the fruit and vegetable marketing system but has not attacked the more critical problems relating to actual changes in marketing institutions and practices. For example little

has been accomplished toward creating effective cooperative or private farm receiving and packing facilities, creating efficient service wholesalers, establishing useable grades or standardizing containers. As a result the marketing system remains basically the same as observed by Day in 1955.

Isolated Marketing Improvements.--In spite of the fact that the marketing of fruits and vegetables has remained largely the same since 1950, there have been some recent individual developments that suggest accelerated future improvements. Some of these will be discussed briefly below.

Bananas have traditionally been produced by coffee growers for shade and supplementary income. They were sold to independent truckers who in turn sold them in municipal markets. In 1957 a banana marketing cooperative was organized with government assistance among eleven banana producers. Though the first four years were extremely difficult, and little progress was made toward improving incomes or services to members, by 1961 the cooperative had begun to increase its volume considerably. Between 1961 to 1965 gross annual sales increased from \$241,000 to \$526,000 and during that same period significant marketing improvements were made. The cooperative established a ripening plant in San Juan. They started to assemble, wash, grade and pack bananas at a rural shipping station in Adjuntas. Finally, a well organized merchandising and delivery system was implemented. The effect has been to improve markedly the quality of products

marketed while stabilizing prices and incomes for producers. The two large chain supermarkets on the island now make all banana purchases from the cooperative as do many smaller retail stores on the island. Until last year all the cooperative's supply of bananas came from trees interplanted with coffee. But in 1965 several producers began specializing in the production of bananas. It is expected that others will rapidly follow suit.

Tomato paste is a staple in the Puerto Rican diet. Until recently most canned tomato paste was imported from the U.S. Tomato production has (like other fruit and vegetable crops) been relegated primarily to hilly and less productive agricultural land with small family plots of native varieties supplying tomatoes for fresh consumption only. About three or four years ago Libbys, one of the island's major importers of tomato paste, decided to establish a tomato processing plant in Puerto Rico. Since there were few commercial producers available and even fewer who were capable or interested in producing the kinds of tomatoes needed for processing at a price considered realistic by the processor, the decision was made by the plant's management to lease good quality land and produce their own supply. The operation has been quite successful. In addition to producing processing varieties, the firm has expanded to the production of varieties suitable for fresh consumption. The poorly organized market and low quality of other local tomatoes has created a need for a well organized firm

producing consistent and high quality fresh tomatoes, especially for sales to supermarkets and other large retailers. The firm started out producing 75 acres, mostly processing varieties, but has now expanded to 150 acres with a significant proportion planted to table varieties. Their success has caused other firms to examine the possibility of producing and processing tomatoes (either through complete vertical integration or producer contracts) on the island.

Since local produce has generally been available only through the market plazas or through independent truckers, the supermarket chains on the island have had great difficulty in efficiently filling their needs. As noted earlier they have often turned to the mainland for supplies. However, many products either are not available from the states or are much more expensive than local products. In those cases the supermarkets have been forced to deal with local suppliers. Until recently the chains made local produce purchases in the municipal markets or from independent truckers. The products were delivered to the individual store where they were washed, graded and pre-packaged. Product quality and handling methods of such product supplier were inadequate to the needs of such retail stores. In an effort to overcome these cost and quality disadvantages, all three major chains have begun programs of direct buying. The purpose is to fill the void created by a complete lack of service wholesalers. The method of procurement varies by product and among retailers, but the main objective is to discover and



encourage suppliers who will furnish (at premium prices in some cases) stable supplies of high quality produce. The results have been encouraging. A sampling of such suppliers for the various chains includes: (1) a single producer under exclusive agreement supplying graded, washed and sacked yams and potatoes, (2) a loose knit group of producers supplying specified quality and quantities of leaf lettuce, (3) a marketing cooperative supplying graded, washed, and crated oranges and (4) a trucker specializing in the distribution of consistent quality, graded and crated pineapples. Further efforts by supermarkets to overcome the inefficiencies and poor coordination of the present produce marketing system may lead to other significant improvements in the near future.

Efforts to improve agricultural productivity through regional planning were mentioned earlier. As a result of such efforts in the Mayaguez region, several producer associations have been organized. Egg marketing associations in Lajas, Mayaguez and Isabela were previous described. And a similar association has been organized for orange producers at Maricao whose members are primarily coffee producers who use native orange trees for shade. The purpose of the association was to organize producers in order to establish an orange processing plant. Organizing methods were similar to those used in the egg marketing associations. Personnel from the regional office of the Department of Agriculture generated interest among producers, initiated a feasibility study with Fomento, made arrangements with the Agricultural

Development Bank for loans of \$1,000 to each member for investment in the cooperative, later obtained a loan from Fomento and generally coordinated the efforts of several interested governmental and private agencies. The plant was completed early in 1966 at about the middle of the orange harvesting season. It began operations immediately, producing canned orange juice for export to the mainland. Producers were receiving an average of \$35 per ton for their oranges as compared to \$25 per ton the previous year. If satisfactory markets (both external and internal) can be obtained, the plant will contribute significantly to the agricultural economy of the region. It will provide a stable market outlet for native oranges, a commodity frequently left unharvested by coffee producers or sold at ridiculously low prices because of overabundance (for fresh consumption) during the short harvest season.

A development which is closely related to the kind of institution just described is the recent organization of a joint committee between Department of Agriculture representatives, Fomento's Division of Puerto Rican Industries, and the Food Processing Laboratory of the Agricultural Experiment Station. The purpose of the committee is to study and recommend possible food processing opportunities on the island. Fomento carries out feasibility studies including market opportunities, supply dependability and technical feasibility. The other agencies represented on the committee are able to bring special abilities to assist in particular

aspects of the preliminary study. Once the study is complete, prospective investors are able to evaluate more accurately the investment potential. Then Fomento can offer the usual variety of incentives such as tax reduction, site procurement assistance, loans, etc. The interagency approach is relatively new, but it appears to have advantages because a wide variety of talents can be brought to bear on a given project while evaluating all aspects of the proposed plant, including supply procurement financing and marketing.

#### Production and Marketing Performance

It is clear from earlier discussion that production of fruits and vegetables has been regarded and continues to be regarded largely as a secondary or even tertiary enterprise. The psychological impact of long years of such thinking coupled with the limitations of the antiquated marketing structure have operated together for so long that they have come to be accepted as normal conditions to which the economy has had to adjust itself.<sup>131</sup> This slightly altered quotation from Koenig's 1950 study describes the production and distribution system for fruits and vegetables in 1965. When evaluated by most of the performance criteria used in this study, the industry has shown little improvement. In a few cases minor improvements are developing as noted in the previous section. Their impact on various performance criteria will be discussed.

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<sup>131</sup>Koenig, p. 221.

Costs of Production and Marketing.--Few improvements have been made in production efficiency as a result of a poorly coordinated marketing system and the prevailing belief that fruit and vegetable production should only be supplemental to more important farm enterprises. Though data are not available to indicate the efficiency of present resource use in fruit and vegetable production, it appears that committed resources are being combined relatively efficiently. As Schultz et al. noted in other countries, the difficulty does not appear to lie with inefficient management or lack of a profit motive, but rather with insufficient utilization of improved production techniques. Basically, the land, labor and capital resources committed to fruits and vegetables are insufficient and inferior. Puerto Ricans have not yet "recognized" the opportunity for reaping significant profits by specializing in the commercial production of these food crops using advanced techniques. To illustrate, one of the few produce wholesalers in Puerto Rico was asked by the author why he did not purchase more of his supply from local producers. The answer was that due to perceived market risks and uncertainties "producers are not even interested in vegetable production." This same reason was given time and again in depth interviews with producers, processors and retailers--excessive risk and uncertainty retard producer interest. Results of a question on our farmer survey indicated that 38 per cent of the farmers in the sample had never considered tomato production, and 36 per cent had never considered

producing other fruits and vegetables because of the market risks involved. A few commercial fruit and vegetable producers are making production improvements (e.g. the integrated tomato producing firm, an integrated private producer of starchy vegetables, a papaya producers' association and scattered individual farmers), but the bulk of production is carried out under the same procedures used in 1950.

Since the market structure has shown little change over the past fifteen years, there has consequently been little improvement in marketing costs. The system is still characterized by small scale producers, truckers and retailers competing atomistically. Because of this, information gathering costs, transaction costs and market uncertainty costs are still relatively high. Again the organization of certain marketing institutions (e.g. corporate supermarkets, wholesalers and cooperatives) is just beginning to have an impact on exchange efficiency in fruit and vegetable production and distribution in Puerto Rico.

Progressiveness.--Technological change in fruit and vegetable production and distribution has come slowly. The bulk of total production still comes from farms using the same methods used in 1950. The survey among farmers in the Mayaguez region indicated that fruit and vegetable producers had adopted much fewer of the technological innovations listed than either milk or egg producers. The per cent that makes use of various production and marketing innovations varied

from a high of 98.5 per cent for fertilizers to a low of 18.4 per cent for packing products into some kind of protective container.

Only 51 per cent had adopted improved varieties of crops. Similarly, only 85 per cent had adopted insecticides. When compared to milk and egg producers, fruit and vegetable producers were considerably less innovative. The median percentage of usable innovations which had been adopted by fruit and vegetable producers in the sample was 50 per cent while the median for egg producers was 86 per cent and for milk producers 81.5 per cent. It should be emphasized that the sample included only farmers in the Mayaguez Region. The results can be used as an indicator of the progressiveness of producers in other parts of the island since their production characteristics are quite similar.

By the same token marketing firms have been slow to improve distribution methods. The earlier description of prevailing marketing methods suggests that relatively few technological changes have been made among marketing firms.

Product Quality.--While the general quality level of Puerto Rican produce is basically the same today as it was in 1950, pressure from expanding supermarkets has caused some improvements in refrigeration and handling, but these have been limited to a few products and primarily to supermarket sales. An experiment station survey in 1964 in the major tomato producing areas suggested that practices in the

harvesting, handling, packing, storing and transporting of tomatoes resulted in an extremely high level of waste and spoilage.<sup>132</sup> Isolated quality improvements have been achieved by the banana marketing cooperative, an orange marketing cooperative, the integrated tomato producer, and a few independent producers.

### Summary

Three commodity groups were chosen for detailed study. The basic purpose of the commodity studies was to describe and analyze, for the period from 1950 to 1965, the important changes in market organizations and relate them to specific performance criteria reflecting the basic societal goal of economic growth. A second purpose of the commodity studies was to provide a description of the evolution of certain types of government marketing policies and institutional forms (as described conceptually in Chapter III) and to evaluate their contribution to more orderly and efficient markets and greater farm output. The final purpose of the commodity studies was to provide evidence for testing the hypothesis that a production and marketing system characterized by a small scale, unorganized and atomistic business units will lead to a set of conditions inhibiting the development of more efficient techniques and will result in high production and distribution costs and low product quality.

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<sup>132</sup>Forthcoming Experiment Station Bulletin by Edgardo Gonzalez Villafane entitled Costos y Practicas en el Mercadeo de Tomates al Nivel del Productor, Puerto Rico, 1963-64.

The particular commodity groups were chosen primarily because of the diversity represented by the three in terms of market institutions, government regulations and assistance, structural characteristics, behavior of competitors and performance of the industries. Marketing developments in the three commodity groups provide an excellent opportunity to examine the economic impact of various degrees of government marketing assistance and the effect on economic performance in the industry. It should be obvious to the reader by now that government programs assisting producers and/or distributors in the three industries reflect three different strategies. The marketing program developed for milk producers and distributors has regulated practically every phase of the industry including pricing. Government egg marketing assistance has been less intensive, centering on facilitative regulations and technical assistance to cooperative groups. With respect to fruits and vegetables, government policy has reflected less urgency and more emphasis on programs to inform producers and improve the competitive structure of the market (i.e. "perfect" the market).

The conclusions arising from these commodity studies with respect to the three objectives states above are discussed below.

1. In the production and distribution of eggs and milk, performance has been satisfactory as measured by the three criteria used in this study. Generally, production and marketing costs have been reduced, and the two



industries have exhibited significant progress in the adoption of improved production and distribution techniques. Product quality has improved significantly both in milk and egg markets. On the other hand the production-distribution system for fruits and vegetables has shown little change since 1950 (with the exception of isolated cases). When measured by any of the three criteria, industry performance has been below a desirable level. Probably, the difficulty is due to the decline in demand for traditional Puerto Rican fruit and vegetables, coupled with a high degree of marketing risk and ineffective traditional marketing procedures.

2. Production and marketing performance data for the milk and egg industries definitely suggest that rapid industry improvements have coincided closely with market coordination changes. The trend toward improved performance was closely correlated (chronologically) with such developments as government market regulations, cooperative development and private marketing institutional change. But the analysis does not show causality. Impinging variables are far too numerous and complex and data far too scarce to accomplish such an analysis. However, the performance changes accompanying government market programs and private marketing developments in the milk and egg industries, together with the lack of performance change in the relatively unregulated, unassisted and atomistically competitive fruit and vegetable industry, suggest that positive efforts to foster market development may yield significant results in developing countries.

3. Performance results in these three industries support the hypothesis that excessive atomistic competition hampers productivity improvements by stifling technological innovations and inhibits the agricultural and marketing development process by fostering market uncertainty, high transaction costs and excessive market wastes and by preventing the effective transmission of incentives to firms in the production-marketing system. This hypothesis is supported by the fact that marketing developments in the egg and milk industry have revealed a definite trend toward fewer firms and/or cooperation among existing firms for the purpose of improving market coordination. As noted above these two industries have shown rapid performance improvements since 1950. On the other hand the competitive structure of the fruit and vegetable industry has remained atomistic with relatively few efforts to organize large scale private firms, cooperatives or institutional forms for the purpose of improving market coordination. Taken as a whole, performance in this industry has not improved significantly since 1950. It is significant, however, that the major performance improvements have come in segments of the industry where specific market organizations have been created to cope with the market coordination problems evident in the atomistically competitive industry.

## CHAPTER VI

### THE RELATIONSHIP OF ATTITUDES AND SOCIO-ECONOMIC CHARACTERISTICS TO ASSOCIATION MEMBERSHIP AND INNOVATIVENESS

#### Introduction

This chapter will attempt to examine some of the relationships between socio-economic variables and association membership and innovativeness among farmers in the sample survey. The overall objective is to explore relationships among a variety of variables in order to better understand their affect upon market coordination and economic growth. The research can be characterized as exploratory since it brings together relationships and variables which have not been extensively researched previously.

In the first three chapters of this thesis, the current literature relating to agriculture and marketing in economic development was discussed. It was found that many current writers believe that sustained economic growth in developing nations depends upon rising agricultural productivity which in turn depends upon rapid adoption of improved farming methods (innovation). The three case studies in Puerto Rico have supported this conclusion.

The purpose of this chapter is to go one step beyond in order to ascertain some of the underlying variables correlating with and perhaps causing innovativeness. The analysis begins with the assumption that a number of different kinds of variables may significantly affect the willingness of an individual to adopt a new pattern of action or a new production or marketing technique. The variables used in this study may be classified as economic, communication, demographic and attitudinal.

The fact that economic growth is a process involving rapid social and individual change in which a whole complex of variables impinge upon the thoughts, attitudes and actions of each individual, makes the problem under consideration extremely complex. It is believed, however, that there is a general flow of causality from the individual's values and beliefs to attitudes and predispositions and finally to actions. But one must hasten to point out that this line of causality is not pure. That is, an individual may have a number of factors affecting any one belief or value. Hence, conflicts may exist between different values, between different beliefs or between different values and beliefs. Similar difficulties affect attitudes and actions. In addition the line of causality is clouded by the fact that the individual is continually confronted with new information and experiences which alter the relationships between values, beliefs, attitudes and actions.

The foregoing discussion should make it clear to the reader that this chapter is designed to explore the relationships among variables in this line of causality. It should also make it clear that the complexity of the relationships are somewhat overwhelming. While the static cross-sectional analysis attempted here abstracts from these complexities, the effort will be justified if, as a result of the attempt, certain relationships are uncovered which clarify and extend the base of knowledge relating innovation and economic change to provide information which can help development policy planners and programmers to "sort out" the factors (both social and economic) impinging on the innovation process.

There are three general assumptions which are implied in this chapter. (1) It is assumed that acceleration of economic growth is a high priority goal in developing countries. (2) It is assumed that increasing agricultural productivity is a necessary part of sustained economic growth. (3) The conclusions of Tax, Belshaw and others in addition to the evidence from Puerto Rico reviewed in Chapter III warrant at least a tentative assumption that market organization and coordination do have a significant role in the process of innovation adoption. The discussion in Chapter III drew on previous research in order to establish the critical role of the marketing system either as a catalyst for technological change or in certain cases as an obstacle to that change. Research from several different countries suggests that the structure and conduct of the marketing

system may be such as to make it difficult for businessmen to improve productivity through technological innovations. This, then, illustrates that a major factor preventing rural-urban integration and improved agricultural productivity may be that people (farmers and other businessmen as well as consumers) are not willing and/or able to change to new and better ways of doing things. There are two facets to this dilemma. First, individuals may not be able to change as a result of their being caught in the "low productivity trap" as described in Chapter III. Secondly, they may not be willing to change because of prevailing beliefs and attitudes which color their perceptions of the reality and possibility of change.

These assumptions point to the need for additional study of the relationships between socio-economic variables and innovation for two basic reasons. First, as noted above the additional knowledge may be helpful in better understanding the overall process of economic development and specifically the role of innovation and market organization in that process. Second, the additional knowledge may eventually be useful to policy-planners in designing effective development programs. The agricultural development programs found necessary may be aimed at encouraging production improvements through research, technical assistance and loans or at encouraging market improvements using the full range of policy methods discussed at the end of Chapter III. Many of these kinds of government programs depend for maximum success upon the

cooperation of change oriented producers or businessmen. Hence, the government program may require selecting promising individuals for loans, selecting potential leaders for group activities, selecting individuals for special production or marketing assistance or selecting individuals as "demonstrators" of new methods. To make appropriate selections in such cases, the government agent needs a good understanding of the kinds of characteristics most frequently associated with a willingness to change or innovate.

To the extent that basic marketing improvements are deemed necessary in developing countries, the individual planners must have information to help them decide what kinds of programs can contribute most to marketing improvements, how to accomplish the necessary tasks and in some cases what kinds of individuals to select for assistance or cooperation. In Puerto Rico the Lajas Valley Development "change agent" who first started to work with egg producers had a particular set of criteria for evaluating farmers to decide whether or not they should be encouraged and assisted in establishing poultry farms. His criteria were based largely on economic data and intuitive judgment. As noted earlier the associations growing out of his work have had a significant effect on market coordination. The outcome has been favorable and the same basic approach is being used among other producers in the region. These developments prompt the following question: Could such market planning and development programs as are evolving in the Mayaguez agricultural region be more

successful with added information and understanding of the things which make up a highly receptive, change oriented and economically promising individual?

In the following section a number of relationships are hypothesized between innovativeness and association membership and a number of socio-economic, communication and attitudinal variables using data collected in the farm survey described in Chapter I. Simple correlations were utilized in testing a number of hypothesized relationships in order to determine with what variables association membership and innovativeness are statistically correlated. A one-tailed test was used since the direction of the relationship was predicted in the hypothesis.

There is presently a great deal of interest in finding out what can be done to encourage the adoption of new production techniques. Currently, most efforts are being made in the field of rural sociology and communication where the most common conclusion is that the level and type of mass communication exposure are critical variables as well as the level and type of interpersonal communication. Earlier parts of this thesis have stated that market coordination may play a significant role in the adoption process. And this conclusion is consistent with the conclusion of rural sociologists and diffusion researchers because in reality the communication flow provides the mechanism by which market coordination is made possible. Market coordination and communications are, therefore, closely related in the



diffusion process. Now this suggests that there is a need to relate communication (including market coordination) variables to demographic, attitudinal and economic variables in an effort to explain more adequately the innovation process. Thus, a multiple correlation analysis was performed using innovativeness as a dependent variable and using as explanatory variables those which in the simple correlation matrix were most highly correlated with innovativeness. The purpose was to find out how much of the variation in innovativeness for Puerto Rican farmers could be "explained" by certain key variables. To devise an equation which can be used to predict innovativeness is the eventual goal. The purpose of this analysis is to examine the possibility of devising such predictive equations and to obtain suggestions for further research in the field.

Finally, given the lack of previous research relating the kinds of variables under study here, it was decided to perform an exploratory factor analysis in order to see if new relationships between the variables might be discovered. The term "exploratory" is used because no hypotheses had been formulated on the exact nature of the "structure" underlying the economic, marketing, communication, demographic and attitudinal variables investigated in this study. The purpose of the factor analysis was to determine the basic concepts being measured by a large number of variables in order to obtain suggestions for further research in relating innovation to measurable characteristics.

### Description of Variables

In Chapter I the survey instrument and sampling procedures were commented upon briefly. This section will discuss and define in more detail the kinds of variables included in the present analysis. First, association membership and innovativeness are explained since several hypotheses have been defined relating these to other variables. After that the other variables appearing in the hypotheses are discussed briefly under the four major headings of economic, demographic, communication and attitudes.

#### Association Membership

At various points this thesis has mentioned the producer associations in the Mayaguez region as a successful effort involving farmers, government agricultural agents, private businessmen and other government workers to bring about improvements in market coordination and lower production-marketing costs. It is believed that such cooperative efforts could yield similar results in other developing countries of Latin America. It was, therefore, decided that the farmer sample should be designed in such a way as to include approximately equal numbers of association members and non-members in the Mayaguez agricultural region. The objective was to find out what characteristics, if any, differentiate those who were either selected by government agents for encouragement and assistance or who were personally motivated to seek out and join the new organization. The inference is

that those individuals who were chosen or who volunteered to cooperate in these associations had certain socio-economic attributes which qualified them for cooperation in the institutional innovation of a producer association. It should be noted that it may also be possible that the association members experienced changes in their characteristics as a result of membership in the association. The following is a brief description of the economic characteristics of the 172 farmers included in the sample.

By far the largest farms in the sample were milk and egg producers. While thirteen milk producers each had gross farm sales of more than \$180,000 in 1964, nine more had gross farm sales between \$50,000 and \$100,000. There were three egg producers who had gross farm sales over \$50,000. Moreover, several of these large farms showed up in the sample as producers of other products. There were a few fruit and vegetable producers in the sample other than the large farmers mentioned above who had gross sales of over \$25,000. But most of the fruit and vegetable producers had gross farm sales of less than \$10,000 per year.

This same size ranking appears in the yearly farm sales for individual commodities by farms in the sample. Table 6.1 shows the average and median sales for each commodity group studies in the sample. It points out that milk producers generally had the highest product sales followed by egg producers, and then starchy vegetable, other vegetable and fruit producers. It is also interesting to note that in

all cases except average milk sales, association members have higher average and median product sales than non-members.

TABLE 6.1--Summary of 1964 Sales Data for Farms in a Farmer Sample in the Mayaguez Region (N = 172)

|                             | Association<br>Members | Non-Members |
|-----------------------------|------------------------|-------------|
| Egg Producers               |                        |             |
| Number of Producers         | 29                     | 26          |
| Average Gross Sales         | \$11,068.97            | \$ 8,780.77 |
| Median Sales                | 8,200.00               | 4,300.00    |
| Milk Producers              |                        |             |
| Number of Producers         | 33                     | 24          |
| Average Gross Sales         | \$35,666.67            | \$36,616.67 |
| Median Sales                | 26,200.00              | 21,650.00   |
| Starchy Vegetable Producers |                        |             |
| Number of Producers         | 22                     | 24          |
| Average Gross Sales         | \$ 1,622.73            | \$ 591.67   |
| Median Gross Sales          | 550.00                 | 400.00      |
| Other Vegetable Producers   |                        |             |
| Number of Producers         | 4                      | 4           |
| Average Gross Sales         | \$ 725.00              | \$ 450.00   |
| Median Sales                | 550.00                 | 350.00      |
| Fruit Producers             |                        |             |
| Number of Producers         | 23                     | 10          |
| Average Gross Sales         | \$ 1,547.83            | \$ 630.00   |
| Median Sales                | 500.00                 | 400.00      |

It is apparent from Table 6.1 that except for milk, association members generally have larger scale production enterprises. Later on in this chapter we will examine the relationships between some of these economic variables and some non-economic variables for members and non-members. Tests of simple correlation will indicate whether or not being an association member is likely to correlate significantly with other variables (such as having more years of schooling, etc.).

### Innovativeness

Rogers defines an innovation as "an idea which is perceived to be new by the individual."<sup>133</sup> He points out that under this definition innovations might include social movements, clothing fads, the twist, compact cars and the steel ax.<sup>134</sup> In the context of this thesis, innovations may include the adoption of new production methods, new marketing methods or new organizational forms for accomplishing either production or marketing. In the past innovation and diffusion research has focused primarily on new production methods. Particularly, emphasis has been placed upon the diffusion process for new agricultural production techniques as it is affected by other variables.

Rogers and Lionberger have been leaders in the study of the adoption of agricultural production methods. In his

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<sup>133</sup>Everett M. Rogers, Diffusion of Innovations (New York: The Free Press, 1962), p. 13.

<sup>134</sup>Ibid.

latest bibliography Rogers cites 708 empirical reports of innovation studies. Wish has noted that only 25 of those are concerned with marketing or general economics.<sup>135</sup> The balance are studies of agricultural innovations.

One of the characteristics of innovators noted by Rogers is that they are frequently deviates from the society in which they live. But he points out that deviation is a matter of degree and is closely related to the subsector of society in which one lives.<sup>136</sup>

Rogers suggests that there may be a possibility of predicting innovativeness. He indicates that one method of some promise is multiple correlation, and he cites ten research studies where multiple correlation methods were used in relating innovativeness as a dependent variable to various types of independent variables.<sup>137</sup> Explained variance in the ten studies ranged from 17 to 56 per cent. In all cases where the explained variance was greater than 30 per cent, both economic and sociological factors were used as independent variables.<sup>138</sup>

A combination of production and marketing innovations were chosen for study. Table 6.2 lists the innovations used and the questions asked each farmer with respect to those innovations. Using the information collected from the

<sup>135</sup>Wish.

<sup>136</sup>Rogers, p. 288.

<sup>137</sup>Wish has summarized these studies showing the coefficient of multiple correlation and principle independent variables. See Wish, Appendix G.

<sup>138</sup>Rogers, p. 288.

TABLE 6.2--Production and Marketing Practices Used in Making  
Up the Index of Innovativeness and Questions Asked Each  
Respondent

|  | (a) Is the practice applicable on your farm? | (b) In what year did you begin using the practice, if at all? | (c) Are you using the practice now? | (d) If adopted but not in use, why did you stop using it? |
|--|--|---|-------------------------------------|---|
|--|--|---|-------------------------------------|---|

Innovations:

1. Fertilizers
2. Insecticides
3. Classifying and grading products
4. Special handling and packaging to prevent quality damage and product loss
5. New varieties or breeds in your principal farm enterprise
6. Buying group
7. Contracts with buyers
8. Marketing group

questions in Table 6.2, two innovation scales were constructed.

Innovation scale #1 was computed by taking the number of applicable practices adopted and dividing by the total number of applicable practices for each respondent. This scale simply shows the percentage of innovations adopted by the farmer out of all those perceived by him as applicable on his farm.

Innovation scale #2 is an indicator of the earliness of adoption of innovations in the study by individual farmers. The year of adoption was converted into a percentile scale for each innovation. Applicable innovations were then employed to compute an average percentile score for time of adoption for each respondent.

It was decided after careful examination of the relationships between the two scales and other variables that innovation scale #1 for purposes of this study gives a more accurate indication of innovativeness than the second scale. Innovation scale #2 has the advantage of taking into consideration the time of adoption as well as the act itself. But it also introduces the possibility that a younger farmer who began using all the innovations six years ago when he first started farming may receive a lower score than the older farmer who adopted relatively few innovations 25 years ago. Studies have shown (and it is supported in this study) that younger farmers do tend to be more innovative. The simpler percentage of applicable innovations adopted thus gives a



better indication of the act of adoption which is the relevant concept for this study.

### Independent Variables

The other variables used in the following analysis cover a wide range of socio-economic factors. The Economic variables include such things as gross farm sales, value of farm holdings, farm sales growth over the past five years and size of the farm.

Demographic variables are those having to do with the physical and educational characteristics of the respondent and his family. Examples of these variables are age, education, size of family, place of residence and religion.

Communication variables are those providing information describing the channels, sources and nature of information received by the respondent. Illustrations are newspapers read, membership in farm organizations, source of market news, etc.

The Attitude variables are made up of a series of statements with which the respondents were asked to indicate their agreement or disagreement on a five point scale. Then the individual's response was taken as an indicator of his attitude with respect to such things as luck, scientific inquiry, product grading, cooperatives, etc.

### Simple Correlation Tests

Hypotheses were formulated to predict that association membership and innovativeness would be significantly

correlated (either positively or negatively) with certain of the other variables. In the section below the results are discussed.

#### Association Membership

Included in Table 6.3 is a list of the variables which were predicted to be significantly correlated with association membership. Also, the sign of the relationship is predicted in column three of that table. The reader will notice that in general the correlations were fairly low. Only three variables were found to be significantly related to association membership at the .01 level. Two of those, member of coop (.16) and member of other agricultural organizations (.18), suggest that the individual's participation in other organizations would make him a more likely candidate for participation in a producer association. The other significant variable is education (.21). Association members tend to have more years of schooling than nonmembers.

There were several other variables which, though not statistically significant had a simple correlation of at least +.13 with association membership. They include the attitude statement suggesting that to be lucky is the best way to get ahead in life (-.13), an index of the respondent's knowledge of political leaders (.15), the number of farm magazines read (.14), use of insurance (.14), gross farm sales (.13), acres in farm (.14), family income (.13) and educational aspirations for the eldest son (.13).

TABLE 6.3--Hypothesized Relationships Between Association Membership<sup>a</sup> and Other Socio-Economic Variables, Correlations Obtained and Statistical Significances of Each.

| Variable Name                                      |  |   |      |
|--|--|---|------|
| Modernities  |  |   |      |
| Modernity index                                    | (Range = 0-40; Lower values indicate modernity and Higher values traditionalism) | - | -.12 |
| New customs better than old ones                   | (1=strongly disagree, 5=strongly agree)  | + | .03  |
| Children should exactly follow traditional customs | (1=strongly disagree, 5=strongly agree)  | - | .13  |
| Ways of past better                                | (1=strongly disagree, 5=strongly agree)  | - | -.11 |
| Scientists leave things alone                      | (1=strongly disagree, 5=strongly agree)  | - | -.04 |
| Get ahead--be lucky                                | (1=strongly disagree, 5=strongly agree)  | - | -.13 |
| Farmers can't do much to change things             | (1=strongly disagree, 5=strongly agree)  | - | .01  |
| Can only confide in family                         | (1=strongly disagree, 5=strongly agree)  | - | -.05 |
| Prefer to work alone                               | (1=strongly disagree, 5=strongly agree)  | + | -.02 |
| Attitude Toward Government                         |  |   |      |
| Egg grading regulation good                        | (1=strongly disagree, 5=strongly agree)  | + | .04  |
| Milk regulation beneficial                         | (1=strongly disagree, 5=strongly agree)  | + | .01  |
| Count on government help                           | (1=strongly disagree, 5=strongly agree)  | + | .04  |
| Government program help politically influential    | (1=strongly disagree, 5=strongly agree)  | - | .07  |

TABLE 6.3--Continued.

| Variable Name                             | Coding Used In<br>Correlation<br>Matrix | Hypothesized<br>Relationship | Simple<br>Correlation |
|---|---|------------------------------|-----------------------|
| Marketing                                 |   |                              |                       |
| Farmers should let others do marketing    | (1=strongly disagree, 5=strongly agree) | -                            | .05                   |
| Not wise to deal directly with retailers  | (1=strongly disagree, 5=strongly agree) | -                            | -.01                  |
| Grading waste of time                     | (1=strongly disagree, 5=strongly agree) | -                            | .03                   |
| Increase use of contract                  | (1=strongly disagree, 5=strongly agree) | +                            | .12                   |
| Communication                             |   |                              |                       |
| Index mass media exposure                 | (0=no exposure, 12=high exposure)       | +                            | .09                   |
| Index political knowledge                 | (0=low, 7=high)                         | +                            | .15                   |
| Number farm magazines read                |   | +                            | .14                   |
| Talk to friends of new techniques         | (0=no, 1=yes)                           | +                            | .10                   |
| Members of coop                           | (0=no, 1=yes)                           | +                            | .16**                 |
| Member other agricultural organization    | (0=no, 1=yes)                           | +                            | .18**                 |
| Do friends think you adopt first          | (0=no, 1=don't know, 2=yes)             | +                            | .05                   |
| Cooperatives                              |   |                              |                       |
| Would you share equipment with a neighbor | (0=no, 1=yes)                           | +                            | .03                   |
| Would you help with community improvement | (0=no, 1=yes)                           | +                            | .04                   |

TABLE 6.3--Continued.

| Variable Name   | Coding Used in<br>Correlation<br>Matrix                                | Hypothesized<br>Relationship | Simple<br>Correlation |
|---|--|------------------------------|-----------------------|
| Risk  |  |                              |                       |
| Effect of 50% output reduction due to technological improvement | (Range from 1=have to borrow money to 6=sell out and move to the city) | -                            | -.11                  |
| Investment risk   | (1="safe" low return<br>2=slightly risky high return)                  | +                            | .14                   |
| Use insurance   | (0=no, 1=yes)  | +                            | .14                   |
| Farm Business   |  |                              |                       |
| Gross farm sales 1964   | (dollars)  | +                            | .13                   |
| Index of sales growth   | (per cent increase)  | +                            | .02                   |
| Acres in farm 1964  |  | +                            | .14                   |
| Farm and equipment value  | (dollars)  | +                            | .03                   |
| Family income   | (dollars)  | +                            | .13                   |
| Age and Education   |  |                              |                       |
| Age (years)   |  | -                            | -.10                  |
| Education   | (years of schooling)   | +                            | .21**                 |
| Education for son index   | (0=low aspiration,<br>5=high aspiration)                               | +                            | .13                   |

<sup>a</sup>The range of the variable "association membership" is 0-1 where 0 denotes nonmembership and 1 denotes membership in one or more of the producer associations.

\*\*Statistically significant at the .01 level.

In retrospect these results imply that the factors most often held in common by those joining the producer associations are membership in other organizations, ability to accept the risk of innovation and more education. Though not statistically significant in this study, other factors which may be important are a greater exposure to new ideas and experiences through communication, current farm sales and income.<sup>139</sup> The variables which show the highest correlation in this study are those which one would intuitively expect to be characteristic of individuals participating in such an organization. In fact these are the kinds of characteristics which might be possessed by the individual who is alert and interested in finding ways to improve his well being. They are also the ones that would most likely dominate the judgment of a government agent who was charged with the responsibility of investing time and perhaps money in assisting a limited number of farmers for the purpose of obtaining maximum return (through greater agricultural productivity) on a given government investment.

To summarize, simple correlations were generally low for all variables correlated with association membership. The most highly correlated variable with simple correlation of  $-.21$  explained only 4.4 per cent of the variance in

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<sup>139</sup>The correlation between these variables and association membership may exist because of the impact of the association on the individual's farm business. It cannot be interpreted, therefore, as being a relationship which existed prior to the joining of an association.

association membership. The bivariate analysis of association membership suggests three possible conclusions. (1) There is little "difference" between association members and non-members. (2) The main differences appear in the "intuitive" success criteria. (3) The procedures used in measuring the variables in the study lacked the sensitivity to measure the more subtle differences hypothesized.

### Innovativeness

Innovation scale #1 was correlated across all 172 respondents with many of the same variables mentioned above in addition to others. In Table 6.4 the results are given along with the name of the variable and hypothesized relationships. A double asterisk denotes the statistically significant (at the .01 level) correlations.

For ease of presentation the variables are listed under general headings. Each heading and its significant variables will be discussed briefly below.

To indicate the world view of the respondent, the group of variables listed under modernity were designed. The conceptual basis and some of the questions were derived from earlier work by Kluckhohn and Strodtbeck<sup>140</sup> and by Otis Oliver.<sup>141</sup> The earlier work had pointed out that

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<sup>140</sup>Florence Rockwood Kluckhohn and Fred L. Strodtbeck, Variations in Value Orientations (Evanston, Illinois: Row Peterson and Company, 1961).

<sup>141</sup>Oliver.

TABLE 6.4--Hypothesized Relationships Between Innovativeness<sup>a</sup> and Other Socio-Economic Variables, Correlations Obtained and Statistical Significance of Each

| Variable Name                          | Coding Used in<br>Correlation<br>Matrix   | Hypothesized<br>Relationship | Simple<br>Correlation |
|--|---|------------------------------|-----------------------|
| Modernity                              |   |                              |                       |
| Modernity index                        | (Range = 0-4, Lower values indicate modernity and Higher values traditionalism) | -                            | -.20**                |
| New customs better than old ones       | (1=strongly disagree, 5=strongly agree)   | +                            | .04                   |
| Let leaders solve problems             | (1=strongly disagree, 5=strongly agree)   | -                            | -.22**                |
| Scientists leave things alone          | (1=strongly disagree, 5=strongly agree)   | -                            | -.11                  |
| To get ahead--be lucky                 | (1=strongly disagree, 5=strongly agree)   | -                            | -.13                  |
| Farmers can't do much to change things | (1=strongly disagree, 5=strongly agree)   | -                            | .19                   |
| Ways of past better                    | (1=strongly disagree, 5=strongly agree)   | -                            | -.08                  |
| Eat, drink and be merry                | (1=strongly disagree, 5=strongly agree)   | -                            | -.12                  |
| Familism                               |   |                              |                       |
| Can only confide in family             | (1=strongly disagree, 5=strongly agree)   | -                            | -.27**                |
| Prefer to work alone                   | (1=strongly disagree, 5=strongly agree)   | +                            | .02                   |
| Attitude Toward Government             |   |                              |                       |
| Egg grading regulations good           | (1=strongly disagree, 5=strongly agree)   | +                            | .23**                 |



TABLE 6.4--Continued.

| Variable Name                                      | Coding Used in<br>Correlation<br>Matrix    | Hypothesized<br>Relationship | Simple<br>Correlation |
|--|--|------------------------------|-----------------------|
| Milk regulations<br>beneficial                     | (1=strongly disagree,<br>5=strongly agree) | +                            | .09                   |
| Count on government help                           | (1=strongly disagree<br>5=strongly agree)  | +                            | .13                   |
| Government program help<br>politically influential | (1=strongly disagree<br>5=strongly agree)  | -                            | .09                   |
| Marketing  |  |                              |                       |
| Farmers should let others<br>do marketing          | (1=strongly disagree,<br>5=strongly agree) | -                            | .14                   |
| Not wise to deal directly<br>with retailers        | (1=strongly disagree,<br>5=strongly agree) | -                            | .07                   |
| Communications                                     |  |                              |                       |
| Index mass media exposure                          | (0=exposure, 12=high<br>exposure)          | +                            | .28**                 |
| Index political knowledge                          | (0=low, 7=high)                            | +                            | .34**                 |
| Number farm magazines read                         |  | +                            | .13                   |
| Talk to friends of new<br>techniques               | (0=no, 1=yes)                              | +                            | .01                   |
| Member coop  | (0=no, 1=yes)                              | +                            | .14                   |
| Member other agricultural<br>organizations         | (0=no, 1=yes)                              | +                            | .23**                 |
| Member other organization                          | (0=no, 1=yes)                              | +                            | .20**                 |
| Index economic isolation                           | (0=most isolated,<br>12=least isolated)    | +                            | .30**                 |

TABLE 6.4--Continued.

| Variable Name  | Coding Used in<br>Correlation<br>Matrix                 | Hypothesized<br>Relationship | Simple<br>Correlation |
|--|---|------------------------------|-----------------------|
| Self Perception of Innovativeness                              |   |                              |                       |
| Do friends think you adopt first                               | (0=no, 1=don't know, 2=yes)                             | +                            | .03                   |
| Cooperativism  |   |                              |                       |
| Would you share equipment                                      | (0=no, 1=yes)   | +                            | -.09                  |
| Would you help with community project                          | (0=no, 1=yes)   | +                            | -.12                  |
| Risk   |   |                              |                       |
| Effect of 50% output reduction due to technological innovation | (1=borrow money .11, 6=quit farming--move to city)      | -                            | -.10                  |
| Investment risk  | (0=low risk, low profit, 1=somewhat risky, high profit) | +                            | .14                   |
| Use insurance  | (0=no, 1=yes)   | +                            | .12                   |
| Farm Business  |   |                              |                       |
| Gross farm sales 1964  | (Dollars)   | +                            | .07                   |
| Index of sales growth  | (% growth 1959-64)                                      | +                            | .31**                 |
| Acres in farm 1964   |   | +                            | .06                   |
| Farm and equipment value                                       | (Dollars)   | +                            | -.04                  |
| Family income  | (Dollars)   | +                            | .15                   |
| Additional non-farm income                                     | (Dollars)   | -                            | .08                   |
| Age and Education  |   |                              |                       |
| Age  | (Years)   | -                            | -.29**                |

TABLE 6.4--Continued.

| Variable Name               | Coding Used in<br>Correlation<br>Matrix                             | Hypothesized<br>Relationship | Simple<br>Correlation |
|-----------------------------|---|------------------------------|-----------------------|
| Education (years)           |   | +                            | .28**                 |
| Education for son index     | (0=low aspiration for son, 5=high aspiration)+                      |                              | .18**                 |
| Investment                  |   |                              |                       |
| Invest in farm improvement  | (Choice of 8 alternatives to invest \$500)                          | +                            | -.18                  |
| Invest in non-farm business | (Choice of 8 alternatives to invest \$500)<br>(0=no, 1=yes)         | -                            | .20                   |
| Invest in family education  | (Choice of 8 alternatives to invest \$500)<br>(0=no, 1=yes)         | +                            | .21**                 |
| Hide money                  | (Choice of 7 alternatives to invest amount equal to annual salary)- | -                            | -.18**                |

<sup>a</sup>The range of the variable innovativeness in 0-100 where larger numbers indicate a greater tendency to innovate.

\*\*Statistically significant at the .01 level.

modernism might be indicated by the values and attitudes held by an individual. Kluckhohn and Strodtbeck commented that values held with respect to the following "orientations" suggest the degree to which an individual will be receptive

to new ideas and a changing environment. They are (1) human nature orientation, (2) man-nature orientation, (3) time orientation, (4) activity orientation and (5) relational orientation. Part of these orientations were tapped in a series of seven agree-disagree statements. The results of those responses were combined to yield an index of the degree to which each individual's attitudes indicate "modernism." The modernity index was significantly correlated with innovativeness with an  $r$  of  $-.20$ . The only one of the individual items making up the index which revealed a significant correlation was a statement suggesting that people should depend upon community leaders to solve common problems.

Two other variables which were included in the modernity index are listed under familism in Table 6.4. It was hypothesized that the more innovative individuals would be those who depended less on extended family support and more on the self. A feeling that people other than family members can be trusted was found to be significantly correlated ( $-.27$ ) with innovativeness.

It was hypothesized that a favorable attitude toward government assistance would correlate with innovativeness. But only one of the four attitudes toward government variables was statistically significant. The simple correlation between an agree-disagree statement suggesting that the government egg grading regulation had proven to be beneficial was  $+.23$ .

None of the hypotheses relating marketing attitudes to innovativeness could be accepted. Since five of the eight innovations used in the innovation index were marketing practices, this was somewhat surprising. This supports earlier conclusions that Puerto Rican farmers do not completely understand the vital interrelationships between production and marketing.

The set of variables showing the highest general correlations with innovativeness were those labeled communications. The first of those is an index computed for each individual by combining in index form his regular weekly exposure to various mass media (radios, newspapers, television and magazines). That index of mass media exposure was significantly correlated with innovativeness ( $r = +.28$ ). The correlation of  $+.34$  for an index of knowledge about political leaders is also a reflection of the amount of communication exposure and its effect on innovativeness. It is interesting to note that "talking to other farmers about new farming techniques" did not show a statistically significant correlation to innovativeness. The correlations for belonging to cooperatives ( $+.14$ ) and other organizations ( $+.23$ ) were statistically significant. The index of economic isolation was prepared by considering the distance of the farmer from a village, the number of visits per week to the village, the type of road and whether or not the farmer lived on his farm. Economic isolation was significantly correlated with innovativeness ( $+.30$ ).

suggesting that the ability of the farmer to get off his farm and into a city or village is importantly related to innovativeness.

The discussion in earlier chapters frequently referred to the importance of perceived risks and uncertainties in the marketing system. It was not possible to derive a satisfactory method of measuring the impact of such uncertainties in this study. But three statements were used in an attempt to get some notions about the effect of business risks in general on the individual farm business. Though the correlations of these three variables with innovativeness were in the direction hypothesized, they were not large enough to be statistically significant at the .01 level. The first was a question asking the respondent to indicate what he would have to do if the adoption of an innovation causes a 50 per cent decrease in total output. The alternatives ranged from the least damaging "borrow money" to the most serious "sell out and move to the city." The simple correlation between this variable and innovativeness was  $-.10$ . The second risk question asked the respondent to state how he would invest \$10,000 giving a highly lucrative but somewhat risky alternative and a low yielding but completely safe alternative. The simple correlation with innovativeness was  $+.14$ . Finally, respondents were asked if they had farm, home, crop or livestock insurance ( $r = +.12$ ). Perhaps these kinds of risk measures can be improved through

further research in order to get a better indication of attitudes toward and the effects of risks.

Under the farm business heading, the group of variables include a number of variables relating to the size and success of the farm unit in economic terms. Only sales growth showed a statistically significant correlation with innovativeness. But the relation there was quite strong (+.31) suggesting that indeed those farmers who are using new techniques have shown farm sales increases over the past five years. It is somewhat surprising that the simple correlation between innovativeness and gross sales for 1964 was only .07 and that the relationship between value of farm holdings and innovativeness was negative. This might be due to several very large estates included in the sample where there is absentee ownership and where managers are regarded as somewhat conservative and disinterested about production improvements.

As other innovation studies have shown, age and education were highly correlated with innovativeness. Moreover, the respondents were asked to indicate what level of education they would like their eldest son to have and whether they thought it possible to achieve. An index was devised using the two questions, and it correlated significantly with innovativeness (+.18). This gives an indication of the respondent's achievement motivation as reflected through educational aspirations for his son.

Finally, the investment variables indicate the relationships between the predispositions for investment alternatives and innovativeness. It was found, contrary to the hypothesis, that there was a strong negative relationship of  $-.18$  between "invest in farm business" and innovativeness and a positive relationship of  $.20$  between "invest in non-farm business" and innovativeness. Perhaps this only reflects the ability of innovative producers to perceive the many profitable non-farm investments available in the booming Puerto Rican economy in comparison to the sluggish agricultural sector.

In summary there is a significant relationship between certain kinds of socio-economic variables and innovativeness. The correlations suggest that some kind of modernity test may be useful for predicting innovativeness when used in conjunction with other variables such as age, communications, business growth variables, investment preferences and perhaps some other variables such as risk perception, cooperativism and marketing attitudes if they can be better operationalized for quantitative research methods. To explore the possibilities, a multiple correlation analysis was performed using as the dependent variable innovativeness and as the independent variables a combination of socio-economic variables which had shown greatest correlation to innovativeness in the simple correlation matrix of all factors. The results are examined in the following section.



### Multiple Correlation

The simple correlation analysis implied that there might be some possibility of predicting association membership and especially innovativeness with certain independent variables. To explore that possibility, the variables correlating most highly with association membership and innovativeness were used as independent variables in multiple correlation equations. For association membership the 29 most highly correlated variables were used in a least squares delete program on the CDC 3600. The innovativeness analysis started with 34 independent variables. The least squares delete program is designed to first perform a least squares analysis using the initial 34 variables. Then the variable making the least contribution to the variance of the dependent variable is deleted and a new least squares analysis is performed. This process is continued until sufficient variables have been deleted to produce a least squares result corresponding to the objective criteria formulated by the researcher and included in the computer program. This permits the researcher to determine which variables make the least contribution to the variance of the dependent variable and omit them, while selecting the least squares equation deemed most appropriate for predicting variability in the dependent variable. In deciding what number of independent variables should be included in the reported equation, the following criteria were used. (1) The co-efficient of multiple correlation ( $R^2$ ) should be as large as possible.

(2) At the same time the co-efficient of multiple correlation corrected for degrees of freedom ( $R^2$ ) should also be as high as possible (this permits the researcher to observe "explained variance" after spurious correlations due to large numbers of independent variables which have been removed). (3) The standard error of the estimate should be as low as possible. (4) The independent variables should have logical theoretical relationships to the dependent variable. The multiple correlation results are discussed below.

#### Association Membership

The conclusions in the section on simple correlations between association membership and other variables suggested that there appeared to be little detectable difference between association members and non-members. To further test that conclusion, the multiple correlation analysis was performed.

Using the previously discussed criteria, it was decided that a multiple correlation equation containing 16 independent variables best "explained" association membership. Table 6.5 summarizes the results of that analysis.

The variation in association membership explained by the 16 independent variables was 18 per cent. Yet when spurious correlations were removed by correcting for degrees of freedom ( $\bar{R}^2$ ) the "explained" variation was only 9 per cent. Just three of the independent variables had regression coefficients that were significantly different from zero at

TABLE 6.5--Summary of Association Membership--Multiple Correlation

| Independent Variables   | Dependent Variables<br>% of applicable in-<br>novations adopted<br>$R^2=.18$ ; $\bar{R}^2=.09$ |              |
|---|--|--------------|
| Name  | Regression<br>Coefficient  | Significance |
| Communication   |  |              |
| Listen to radio yesterday   | -.059  | .04*         |
| Number magazines read regularly   | -.011  | .40          |
| Farmers principal source of price<br>information in selling livestock       | .104   | .19          |
| Visits to market principal source of<br>price information in selling fruits | .247   | .11          |
| Member of coop  | .122   | .03*         |
| Member other agricultural<br>organization                                   | .097   | .08          |
| Self perception of innovativeness   | -.020  | .37          |
| Demographic   |  |              |
| Age   | -.031  | .17          |
| Education   | .022   | .24          |
| Education for son index   | -.039  | .12          |
| Value Orientations  |  |              |
| Modernity index   | .010   | .22          |
| Children should follow traditional<br>customs exactly                       | -.019  | .39          |
| Get ahead--be lucky   | -.048  | .08          |
| Farmers will increase use of<br>contracts                                   | .072   | .04*         |
| Too much foreign competition  | .074   | .32          |
| Farm Business   |  |              |
| More than \$200 fruit sales in 1964   | .054   | .49          |

\*Denotes those variables significant at the .05 level or better.

the .05 level. They were "listen to radio yesterday," "member of coop" and "farmers will increase use of contracts."

In general the analysis supports the earlier conclusion that variables have not been properly measured to detect differences between association members and non-members, if any such differences do exist.

### Innovativeness

The multiple regression equation containing the 34 variables with the highest simple correlation with innovativeness had an  $R^2$  of .45. But  $\bar{R}^2$  was only .32. By deleting 14 variables which made little contribution to the explained variance, a least squares equation was obtained with an  $R^2$  of .44 and an  $\bar{R}^2$  of .36. This means that the 20 independent variables shown in Table 6.6 accounted for about 44 per cent of the variance in innovativeness among farmers in the sample.

Table 6.6 presents the results of the multiple correlation analysis. Seven of the twenty regression coefficients are significantly different from zero at the .05 level. The independent variables are grouped under four major headings: communication, demographic, value orientations and farm business. The reader should note that many of the variables contributing to the explanation of innovativeness in the multiple correlation are the same as those found significantly related in the simple correlation tests. On the

TABLE 6.6--Summary of Innovativeness--Multiple Correlation

| Independent Variables                                    | Dependent Variables<br>% of applicable innovations adopted<br>$R^2=.44$ ; $\bar{R}^2=.36$ |              |
|--|---|--------------|
| Name   | Regression Coefficient  | Significance |
| Communication  |   |              |
| Mass media exposure                                      | -.865   | .19          |
| Listen to radio yesterday                                | 1.951   | .30          |
| Read a newspaper yesterday                               | 1.351   | .16          |
| Index of market news use                                 | -5.694  | .01*         |
| Help from Department of Agriculture radio program        | 4.445   | .09          |
| Personal contacts principal source of local news         | -12.649   | .02*         |
| Member of non-agricultural organizations                 | 5.188   | .08          |
| Demographic  |   |              |
| Live on farm all year                                    | -1.369  | .30          |
| Age  | -1.335  | .19          |
| Value Orientations                                       |   |              |
| Modernity index  | .915  | .01*         |
| Can only confide in relatives                            | -4.022  | .00*         |
| Let leaders solve problems                               | -1.630  | .19          |
| Consumers spend more on plantanos in periods of scarcity | -1.522  | .25          |
| Index of consumer demand knowledge                       | -1.502  | .09          |
| Egg grading regulation good                              | 1.558   | .33          |
| Supermarkets have all the business they can get          | -1.154  | .33          |
| Too much foreign competition                             | 7.481   | .05*         |
| Invest in business other than farm                       | .019  | .08          |
| Hide money in a safe place                               | -14.086   | .05*         |
| Farm Business  |   |              |
| Index of sales growth                                    | .077  | .03*         |

\*Denotes those variables significant at the .05 level or better.

other hand there are several new variables appearing in the analysis.

In conclusion there is evidence that multiple correlation methods using communication, demographic, attitudinal and economic concepts as independent variables can be utilized to predict innovativeness. An  $R^2$  of .44 was obtained using 20 such independent variables. However, in order to improve "explained variance," there is a definite need to define more explicitly variables related to innovativeness and to improve the measurement of variables used in this study. As a step toward that goal, a factor analysis was performed with the results discussed in the following section.

### Factor Analysis

#### Introduction

The two preceding sections have examined the results of bivariate analysis and multiple correlation analysis. The conclusions in the two sections indicated that there is a possibility that innovativeness can be predicted using certain independent variables. But further research is needed to verify and improve on this study. This additional research should be directed toward uncovering other significant independent variables and improving the measurement of those used in this research. To that end an exploratory factor analysis was performed using 90 of the 201 variables tapped in the survey questionnaire. The author

selected those variables judged most useful in describing and differentiating farmers in the sample in terms of willingness to change and innovate. These variables again represented various aspects of economic and marketing behavior, demographic characteristics, communication behavior, demographic characteristics, communication behavior, and individual attitudes. The following section reviews the results.

Kerlinger defines factor analysis as "a method for determining the number and nature of the underlying variables among large numbers of measures."<sup>142</sup> In this study the purpose of the factor analysis is to explore the relationships existing among the variables in order to determine the number and nature of the factors underlying the 90 items used in the field survey. Kerlinger points out that factor analysis serves the cause of scientific parsimony. That is, it helps the researcher to find out if he can achieve the same measurement of a factor with fewer variables. Factor analysis may provide the researcher with additional information about the "real" factors underlying his variables and the relationships existing between those factors and between the variables that make them up. The next section examines the purpose of factor analysis in relation to the results and conclusions of the computations performed for the farmer survey.

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<sup>142</sup>Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1964), p. 650.

Appendix A 6-1 gives the rotated factor loadings and communalities for an eight factor solution performed on 90 variables from the farmer survey. The table shown there is the result of computations performed by Michigan State University's CDC 3600 computer using a varimax solution with orthogonal rotation. The starting point was a simple correlation matrix for the 90 variables. Using those simple correlations the computer first produced a two-factor solution by assuming the 90 variables measured two factors and attempting to group the variables in such a way as to "explain" as much of the total variance as possible. The two factor solution explained 18 per cent of the variance in the variables. The computer was programmed to perform additional factor solutions until a point was reached where (among other objective criteria) the last factor had no more than three variables loading most heavily on it. This produced a factor analysis print-out showing factor solutions ranging from two through ten.

In order to decide which of the ten solutions most nearly described the constructs underlying the 90 variables, the author utilized the following decision criteria. The ideal solution should: (1) explain a high percent of the variance of the variables in the study, and each factor should contribute a significant per cent to that explained variability (this refers to variance in the factor columns), (2) indicate "pure" factor loadings: (i.e. a variable correlating highly with one factor should not have particularly



high correlations with other factors), (3) have a high level of communality (i.e. all factors together should account for a high percentage of the variability in a single variable--this, then, refers to row variance), (4) have a logical explanation in theory and practice as judged subjectively by the researcher. On the basis of these criteria, an eight factor solution was chosen. The proportion of variance of all the variables explained by the eight factors was 41 per cent. Each of the factors will be discussed briefly.

### Results

Table 6.7 lists the variables and factor loadings for the first factor. It reveals that this factor explained 9.15 per cent of the variance in all the variables included in the analysis. It is the most important factor in the solution. The table also shows the factor number and intensity of other loadings of more than .25 for the variable which gives an indication of the degree to which a variable measures or correlates with more than one factor. For each of the eight factors, names were devised to indicate the concepts believed to be underlying the related variables. The first factor is labeled modernism.

The high loading on the political knowledge index (+.75) and mass media exposure variables (+.76, +.75, +.65 and +.62) suggests that these kinds of indices can offer an indication of the communication aspect of modernism.

TABLE 6.7--Factor I: Modernism (Variance Explained = 9.15%)

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 4               | Read newspaper yesterday<br>(0=no, 1=yes)                                      | .76                     | -                         |                  |
| 48              | Highest grade reached in school (years)  | .75                     | -                         |                  |
| 10              | Political knowledge index (0=low knowledge, 7=high knowledge)                  | .75                     | -.30                      | II               |
| 5               | Newspapers read regularly  | .75                     | -.35                      | II               |
| 66              | Newspapers major source of local news<br>(0=no, 1=yes)                         | .65                     | -                         |                  |
| 7               | Number magazines read regularly  | .62                     | -.48                      | II               |
| 70              | Index of economic isolation (0=most isolated, 12=least isolated)               | .54                     | -.36                      | VII              |
| 49              | Total family income in 1964 (dollars)  | .55                     | -.36                      | II               |
| 89              | Index of educational aspiration (0=low achievement aspiration for son, 5=high) | .56                     | .31                       | III              |
| 16              | Additional non-farm income (dollars)   | .47                     | -                         |                  |
| 23              | One can only confide in relatives (1=strongly disagree, 5=strongly agree)      | -.47                    | .53                       | VI               |
| 90              | Mobility index (0=least mobile, 4=most mobile)                                 | .47                     | -                         |                  |

TABLE 6.7--Continued.

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 21              | Most important thing in life to succeed is luck (1=strongly disagree, 5=strongly agree)   | -.47                    | .29                       | VI               |
| 68              | Radio major source of local news (0=no, 1=yes)  | -.43                    | -.37<br>.26               | III<br>VII       |
| 20              | Better if scientists left things alone (1=strongly disagree, 5=strongly agree)            | -.45                    | -.46                      | V                |
| 47              | Age (years)   | -.41                    | -.41                      | II               |
| 6               | Read any magazine yesterday (0=no, 1=yes)   | .44                     | .26                       | V                |
| 17              | Children be instructed follow ways of past (1=strongly disagree, 5=strongly agree)        | -.39                    | -                         |                  |
| 8               | Watched TV yesterday (0=no, 1=yes)  | .39                     | -.63                      | VII              |
| 22              | Things of past are better, changes bring problems (1=strongly disagree, 5=strongly agree) | -.37                    | -.25<br>.29               | VI               |
| 50              | Number dependent on family income   | -.36                    | -                         |                  |
| 64              | Would dedicate 50 hours to community improvement (0=no, 1=yes)                            | -.35                    | -                         |                  |
| 24              | Eat, drink, and be merry, for tomorrow we may die (1=strongly disagree, 5=strongly agree) | -.33                    | .43                       | VI               |

TABLE 6.7--Continued.

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 33              | Farmers can not do much to change things (1=strongly disagree, 5=strongly agree)    | .32                     | .40                       | VIII             |
| 59              | Total sales value of farm (dollars)   | .31                     | -.45                      | II               |
| 77              | Mass media principal information source in selling starchy vegetables (0=no, 1=yes) | -.34                    | -                         |                  |

For purposes of detecting modernity, three communication variables might be sufficient. They might include the political knowledge index and questions to determine the number of magazines and newspapers read regularly.

In addition to the high loading (+.75) of years in school on the modernism factor, an index of education aspiration for a son loaded +.56 on the factor. Hence, education and educational achievement appear to be important variables in measuring modernism.

Total family income had a factor loading of +.55, and the index of economic isolation correlated with the modernism factor at +.54. This suggests that the degree of personal exposure to other individuals and economic well-being are correlated with modernity. The factor loadings of other

similar variables in Table 6.7 support this conclusion. There is a strong indication, however, that one or two well designed economic well-being variables would be sufficient to indicate that aspect of modernity.

A third group of variables load fairly highly on this factor. These are the attitude questions. Six of the nine attitude variables designed originally to measure modernity show factor loadings of  $+0.25$  or more with this factor. This signifies that for future research the three not loading significantly on this factor should either be improved or replaced with variables tapping different aspects of the modernity factor.

Secondary loadings of the variables making up factor I were most commonly on factor II--anti-innovation (economic) or on factor VI--traditional individualism.

Factor II is illustrated in Table 6.8. It is quite clearly a factor reflecting innovation. Since negative loadings are most prevalent, it is labeled anti-innovative. Because factor IV is also an anti-innovation factor, it is further designated as anti-innovation (economic).

However, the two have quite different variables loading on them. Factor II includes only production innovations (i.e. fertilizer, insecticides and improved breeds or varieties) in addition to several variables loading significantly on this factor which were indicators of farm size, sales and other economic characteristics. Factor IV includes primarily marketing innovations. Factor II is relatively

TABLE 6.8--Factor II: Anti-Innovation (Economic) (Variance Explained = 6.13%)

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 15              | Acres farmed   | -.75                    | .34                       | III              |
| 51              | Fertilizer in use now (0=no, 1=yes)  | -.62                    | -                         |                  |
| 73              | Radio, newspapers trucks and non-farmers main source of information in selling livestock (0=no, 1=yes) | .60                     | -                         |                  |
| 72              | Farmer's main source of information in selling cattle (0=no, 1=yes)                                    | -.55                    | -                         |                  |
| 14              | Monthly food expenditure for family (dollars)  | -.51                    | -                         |                  |
| 58              | Using selling groups now (0=no, 1=yes)   | -.49                    | -.41                      | IV               |
| 11              | Index of innovation influence (0=low influence, 4=high influence)                                      | -.47                    | -                         |                  |
| 7               | Number magazines read regularly  | -.48                    | .62                       | I                |
| 59              | Total sales value of farm (dollars)  | -.45                    | .31                       | I                |
| 52              | Insecticides in use now (0=no, 1=yes)  | -.42                    | -                         |                  |
| 47              | Age (years)  | -.42                    | -.41                      | I                |
| 55              | Using improved varieties or breed in principal farm enterprise (0=no, 1=yes)                           | -.39                    | .29                       | I                |
| 49              | Total family income in 1964 (dollars)  | -.36                    | .55                       | I                |

TABLE 6.8--Continued.

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 5               | Number of newspapers read regularly  | -.35                    | .75                       | I                |
| 39              | Prices determined mostly by big processors and retailers (1=strongly disagree, 5=strongly agree) | -.35                    | -                         |                  |
| 30              | As family income rises, smaller proportion spent on food (1=strongly disagree, 5=strongly agree) | -.31                    | -.39<br>.34               | III<br>V         |
| 63              | Use insurance (0=no, 1=yes)  | -.30                    | -                         |                  |

pure. Secondary loadings are primarily on factor I and factor III. The factor explains 6 per cent of the variance among the 90 variables.

Table 6.9 gives factor loadings for the third factor which was designated as transitional non-mass communications. It was somewhat difficult to understand and label this factor since the loadings were low and primarily negative and secondary loadings were numerous. The negative correlations between the factor and three radio variables suggest low mass media orientation as do loadings for variables 82 and 78, but the positive correlations between the factor and variables 18, 45, 15 and 89 suggest a more modern leaning. Thus, this

TABLE 6.9--Factor III: Transitional (Non-Mass Communication)  
(Variance Explained = 4.36%)

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 83              | Non-farmers, truckers, and coops main source of information in selling fruits (0=no, 1=yes)          | -.58                    | -                         |                  |
| 2               | Listened to radio yesterday (0=no, 1=yes)  | -.58                    | .28                       | I                |
| 3               | Hours listened to radio per week   | -.49                    | -                         |                  |
| 28              | When dealers reduce prices, less profit for everyone (1=strongly disagree, 5=strongly agree)         | .45                     | -                         |                  |
| 78              | Market visit principal source of information in selling starchy vegetables (0=no, 1=yes)             | .44                     | .40                       | VI               |
| 30              | As family income increases, smaller proportion spent on food (1=strongly disagree, 5=strongly agree) | -.39                    | -.31<br>-.34              | II<br>V          |
| 18              | New customs usually better than old ones (1=strongly disagree, 5=strongly agree)                     | .39                     | -                         |                  |
| 45              | Close relative asked you to cosign loan what would you do (0=no, 1=yes by obligation, 2=yes)         | .38                     | .27                       | V                |
| 68              | Radio major source of local news (0=no, 1=yes)   | -.37                    | -.43                      | I                |



TABLE 6.9--Continued.

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 82              | Farmer's main source of information in selling fruits (0=no, 1=yes)                      | -.35                    | -.02                      | VIII             |
| 15              | Acres famred   | .34                     | -.75                      | II               |
| 84              | Index of perceived crop risk (0=low perceived risk, 6=high)                              | -.33                    | -.56                      | VIII             |
| 46              | If friend asked you to cosign loan, what would you do (0=no, 1=yes by obligation, 2=yes) | .33                     | .49                       | V                |
| 89              | Index of educational aspirations (0=low achievement aspirations for son, 5=high)         | .31                     | .56                       | I                |

factor seems either to measure several things or indicates some state of transition.

Factor IV is the second anti-innovation factor, sub-headed marketing. The loadings are given in Table 6.10. Like factor II this one is relatively pure with fairly high primary factor loadings. However, here all but three of the variables are innovation measures and specifically marketing innovations. As one would expect, the secondary correlations are primarily with modernism and anti-innovation (economic).

TABLE 6.10--Factor IV: Anti-Innovation (Marketing) (Explained Variance = 4.65%)

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 87              | Innovation index number 5 (% of innovations perceived applicable, range = 0-100)                  | -.71                    | -.31                      | II               |
| 85              | Innovation index number 1 (% applicable innovations adopted, range = 0-100%)                      | -.68                    | -                         |                  |
| 54              | Packing in use now (0=no, 1=yes)  | -.64                    | -                         |                  |
| 53              | Selection and classification in use now (0=no, 1=yes)   | -.58                    | -.26                      | II               |
| 75              | Farmers main source of information in selling poultry (0=no, 1=yes)                               | -.49                    | .27                       | II               |
| 57              | Contracting with buyers now (0=no, 1=yes)   | -.43                    | .25                       | III              |
| 65              | Association membership (0=non-member, 1=member)   | -.43                    | -                         |                  |
| 55              | Using improved varieties or breed in principal farm enterprise now (0=no, 1=yes)                  | -.39                    | .29                       | I                |
|                 |   |                         | -.39                      | II               |
|                 |   |                         | -.25                      | III              |
| 34              | Big supermarkets, use buying power to maintain low prices (1=strongly disagree, 5=strongly agree) | -.39                    | .31                       | V                |

TABLE 6.10--Continued.

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 56              | Using buying group<br>(0=no, 1=yes)  | -.37                    | -.25                      | I                |
| 86              | Innovation index<br>#2 (average percentile rank of farmer based on innovation use and time of adoption, range = 0-100. | -.36                    | .30                       | VIII             |

Factor V has been labeled cooperativism (See Table 6.11). But this factor should not be interpreted as measuring only participation in cooperative businesses. It appears to be a broader concept including significant loadings on attitudes toward government, relatives, friends and retailers, as well as cooperative marketing and value orientations. The negative correlation (-.35) with "effects of a 50 per cent output reduction" implies that cooperativism may be related to the individual's perceptions of his financial ability to remain solvent in the face of economic catastrophes.

Factor VI has been named traditional individualism (see Table 6.12). Again, it was somewhat difficult to logically sort out the variables loading on this factor in order to ascertain the underlying concept being tapped. There are several loadings which point to traditionalism (variables 25, 23, 24 and 78). On the other hand there are

TABLE 6.11--Factor V: Cooperativism (Variance Explained = 4.75%)

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 27              | Grading and refrigeration of eggs is wise regulation (1=strongly disagree, 5=strongly agree)            | .62                     | -                         |                  |
| 44              | Believe future buyers will increase use of contracts (1=strongly disagree, 5=strongly agree)            | .59                     | .36                       | VI               |
| 43              | Figures of Agriculture Dept. on prices are reasonable (1=strongly disagree, 5=strongly agree)           | .52                     | -                         |                  |
| 42              | Government programs beneficial only for select group of dealers (1=strongly disagree, 5=strongly agree) | .51                     | -                         |                  |
| 46              | If friend asked you to cosign loan, what would you do (0=no, 1=yes by obligation, 2=yes)                | .49                     | -.06                      | VII              |
| 36              | Farmers should be organized in groups to bargain (1=strongly disagree, 5=strongly agree)                | .47                     | -.33                      | VIII             |
| 31              | Milk regulations benefited the industry and consumers (1=strongly disagree, 5=strongly agree)           | .46                     | -.32                      | VII              |
| 20              | Better if scientists left things alone (1=strongly disagree, 5=strongly agree)                          | -.46                    | -.43                      | I                |

TABLE 6.11--Continued.

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 1               | Farm tenure (1=owner, 2=renter, 3=manager, 4=share-cropper)  | -.38                    | .28                       | I                |
| 40              | Can count on government to resolve marketing and price problems (1=strongly disagree, 5=strongly agree)  | .36                     | -.26                      | IV               |
| 29              | Organization of groups of coops can be beneficial (1=strongly disagree, 5=strongly agree)                | .35                     | -.28                      | II               |
| 61              | Effects of 50 per cent output reduction due to innovation (1=borrow money, 5=quit farming, move to city) | -.35                    | -                         |                  |
| 37              | Not wise for farmer to bargain directly with retailers (1=strongly disagree, 5=strongly agree)           | -.31                    | -                         |                  |

TABLE 6.12--Factor VI: Traditional Individualism (Variance Explained = 3.97%)

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 25              | Prefer to work alone than be tied to family (1=strongly disagree, 5=strongly agree) | -.62                    | -                         |                  |

TABLE 6.12--Continued.

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 23              | One can only confide in relatives (1=strongly disagree, 5=strongly agree)                                       | .53                     | -.47<br>-.26              | I<br>VIII        |
| 35              | Farmers should let others take care of marketing problems (1=strongly disagree, 5=strongly agree)               | -.51                    | .25                       | III              |
| 38              | Grading and packaging are waste of time for farmers (1=strongly disagree, 5=strongly agree)                     | -.50                    | -                         |                  |
| 24              | Eat, drink and be merry, for tomorrow we may die (1=strongly disagree, 5=strongly agree)                        | .43                     | .33                       | I                |
| 41              | Risk and insecurity in produce market much less today than 10 years ago (1=strongly disagree, 5=strongly agree) | .42                     | .37                       | V                |
| 78              | Market visits principal source of information in selling starchy vegetables (0=no, 1=yes)                       | .40                     | .44                       | III              |
| 44              | Believe future buyers will increase use of contracts (1=strongly disagree, 5=strongly agree)                    | .36                     | .59                       | V                |
| 82              | Farmers principal source of information in selling fruit (0=no, 1=yes)  | -.30                    | .35                       | III              |

three variables with correlations indicating progressive marketing attributes (variables 35, 38 and 44). Future research should be directed toward operationally improving some of the variables in order to purify the factor.

Factor VII (Table 6.13) has been titled isolated individualism. The two highest loadings are on television exposure and are negative. This, in addition to the negative correlation on economic isolation, implied a measure of low communication exposure. Moreover, other loadings (e.g. variable 12, 13, 74 and 31) suggest measures of individualism.

Factor VIII appears to be primarily related to fatalism (see Table 6.14). The two most highly loaded variables hint at low credit availability and perceptions of high risks in certain farm enterprises. "Farmers can't do much to change things," shows a loading of .40. Loadings on variables like "big supermarkets use buying power to hold prices down" and "farmers should be organized in bargaining groups" imply a likelihood of resignation to accept and even "over-emphasize" bad farming conditions. The positive correlation to the innovation index including a time of adoption dimension may show a relationship between fatalism and earlier innovators who had bad innovation experiences. Again, secondary factor loadings suggest that several of these variables were multi-dimensional. Further research should include other more appropriate variables for tapping this factor. For instance previous research by Rogers indicates that "fatalism" is importantly related to innovation.

TABLE 6.13--Factor VII: Isolated Individualism (Variance Explained = 4.01%)

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 9               | Hours TV watched per week  | -.76                    | -                         |                  |
| 8               | Watched TV yesterday (0=no, 1=yes)   | -.63                    | .39                       | I                |
| 12              | Asked more often for information than others (0=les, 1=don't know, 2=more)   | -.48                    | -                         |                  |
| 79              | Truckers, farmers, non-farmers and coops principal source of information in selling starchy vegetables (0=no, 1=yes) | .44                     | -.29                      | VI               |
| 13              | Member of any coop (0=no, 1=yes)   | -.43                    | -.32                      | II               |
| 67              | Television major source of local news (0=no, 1=yes)  | -.42                    | -.03                      | II               |
| 74              | Market visits principal source of information in selling poultry (0=no, 1=yes)                                       | -.39                    | .29                       | II               |
| 34              | Big supermarkets use buying power to maintain low prices (1=strongly disagree, 5=strongly agree)                     | .38                     | -.39                      | IV               |
|                 |  |                         | .31                       | V                |
|                 |  |                         | -.35                      | VIII             |
| 70              | Index of economic isolation (0=most isolated, 1=least isolated)  | -.36                    | .54                       | I                |
| 31              | Milk regulations benefited business and consumers (1=strongly disagree, 5=strongly agree)                            | -.32                    | .46                       | V                |



TABLE 6.14--Factor VIII: Fatalism (Variance Explained = 3.87%)

| Variable Number | Variable Name  | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|--|-------------------------|---------------------------|------------------|
| 60              | Get credit from dealer from whom buy major part of farm supplies (0=no, 1=yes)                   | -.61                    | -                         |                  |
| 84              | Index of perceived crop risk (0=low perceived risk, 6=high)                                      | .56                     | -.33                      | III              |
| 88              | Index of perception of main farm problems (problems perceived range = 0-11)                      | -.48                    | -.27                      | II               |
| 26              | Consumers spend more on plantanos during scarcity (1=strongly disagree, 5=strongly agree)        | -.46                    | -                         |                  |
| 32              | Supermarkets have all the business they will get (1=strongly disagree, 5=strongly agree)         | -.45                    | -.27                      | I                |
| 62              | Share equipment with neighbors (0=no, 1=yes)   | .45                     | .26                       | VII              |
| 33              | Farmers cannot do much to change things (1=strongly disagree, 5=strongly agree)                  | .40                     | .32                       | I                |
| 34              | Big supermarkets use buying power to maintain low prices (1=strongly disagree, 5=strongly agree) | -.35                    | -.39                      | IV               |
| 36              | Farmers should be organized in groups to bargain (1=strongly disagree, 5=strongly agree)         | -.33                    | .47                       | V                |

TABLE 6.14--Continued.

| Variable Number | Variable Name   | Primary Factor Loadings | Secondary Factor Loadings | Secondary Factor |
|-----------------|---|-------------------------|---------------------------|------------------|
| 86              | Innovation index number 2 (average percentile rank of farmer based on innovation use and time of adoption, range = 0-100) | .30                     | -.36                      | IV               |

In general the results signify that factors I, II, IV, V, VII and VIII, though somewhat interrelated, were measuring specific underlying factors which could be fairly easily identified. The strength of factor loadings for individual variables in each factor and between factors gives some indications for further research in operationalizing variables to more accurately measure those concepts for eventual predictive purposes. Factors III and VI do not present clearly identifiable underlying characteristics. Secondary correlations with other factors in addition to conflicting variable loadings within the factor may mean that several concepts are being tapped. It would appear that these two factors are "catch all" categories for variables not correlated sufficiently with other factors to be absorbed elsewhere, yet not intercorrelating sufficiently with each other to tap a truly independent factor. There

is, of course, also the possibility that the researcher has not properly interpreted these factors to discover the basic underlying characteristic tapped by the factors.

### Conclusions

The exploratory factor analysis may signify that the research to be carried out in the second phase of the food marketing study should consider the following:

1. Identify the major factors believed critical for explaining innovation. This should include modernism, transitionalism, traditionalism, innovation-economic, innovation-marketing, cooperativism, individualism, fatalism and possibly other factors deemed important by previous researchers.
2. Variables should be designed to tap various aspects of these factors using the results of this study to suggest possible operational improvements.
3. In measuring modernism the cause of scientific parsimony may be served by including only variables determining political knowledge plus regular exposure to the various mass media. Indices of economic isolation and mobility appear useful in denoting modernity as are age, education, educational aspirations for a son, farm sales, farm value and the seven

attitude variables appearing in factor I of this study. Moreover, variables should be added to make sure that all aspects of value orientations identified by Kluckhohn and Stradtbeck are included (i.e. relational, activity, man-nature, time and human nature orientations).

4. Production and marketing innovations should be approximately equally represented in the questionnaire.
5. To measure and identify transitionalism, specific variables should be designed. Oliver's research in Puerto Rico included variables identifying transitional individuals. It may be that his results will provide some assistance in preparing questions to specifically tap this factor (see conclusion number 8).
6. Efforts should be made to operationally improve the variables measuring cooperativism. Again, this term should be used to include a broad range of cooperating including corporate business organization, personal willingness to submit self to group control, attitude toward government control as well as cooperative business organization. The factor analysis suggested that the individual's

capacity to withstand financial losses is correlated with cooperativism, and this hypothesis should be submitted to further testing.

7. Two of the eight factors in this analysis indicated some relationship to individualism (isolated individualism and traditional individualism). Perhaps specific variables could be designed which would more accurately tap an individualism factor. This factor should not necessarily be considered as the antithesis of cooperativism since it measures a slightly different concept in which an individual might possibly be consistent and still score fairly high on both factors.
8. If one examines the traditional individualism factor (VI) carefully, it appears that the factor taps an underlying concept closely relating to modernism. It may, therefore, be necessary to direct future research toward isolating a single modernism factor which would subsume both traditionalism and transitionalism since these appear to simply be stages in the process of individual modernization.
9. The variables which disclosed some degree of fatalism through loadings with factor VIII

were not specifically designed to measure that concept. They should therefore be improved to more adequately measure that factor. Furthermore, additional questions should be devised to tap fatalism.

10. Though other factors did not appear in the exploratory factor analysis of the 90 selected variables, there may be others significantly related to economic change which should be tapped in the future. Consideration should be given to including variables designed to measure empathy and achievement orientation. Rogers has shown that these deserve attention in order to predict innovation and economic change.
11. Many of the 90 variables included in this exploratory factor analysis made no significant contribution to the measurement of any of the factors. These should be pinpointed and excluded in future research.

## CHAPTER VII

### SUMMARY AND CONCLUSIONS

Since World War II a great deal of attention has been focused on the study of the economic development process. Opinions regarding sectoral emphasis have ranged from industrial to agricultural and then to a balance between agriculture and industry. Most economists now regard economic development as a complicated process involving social, political and economic variables.

Recently, Walter W. Rostow has commented that many Latin American nations have achieved some build-up in economic infrastructure, yet they have not been able to move into take-off for sustained economic growth. He believes that this difficulty arises primarily from a wide disparity between rural and urban areas within the countries. Industrial growth is inhibited by food shortages and high food prices while agricultural productivity lags because farmers perceive no stable and remunerative markets for their products. In short the urban-industrial and the rural-agricultural sectors are not effectively integrated. The solution proposed by Rostow is to break down these structural distortions through more effective marketing channels and to create an integrated national market.

According to Rostow there are four basic tasks involved in creating national markets. Of special interest in this thesis are the first two since they deal with the agricultural sector. (1) Accomplish a build-up in agricultural productivity. (2) Improve the marketing system for agricultural products. This thesis deals with both tasks in addition to pointing to strong interrelationships between the two. Other economists (most notably Theodore W. Schultz) have emphasized the importance of a build-up in agricultural productivity. But most development economists have shown little interest either in the importance of improved marketing channels as an active force in the development process or of the effect of agricultural market structure and performance on productivity. The purpose of this thesis is to explore the role of the agricultural marketing system in the economic development process.

A review of the literature in economic development reveals a great deal of emphasis on capital formation. Most economists agree that developing nations must find a way to accumulate capital for investment in new and improved production enterprises. There has been relatively little interest in the effect of the exchange system on economic growth. Generally, primary emphasis is focused on output improvements in agricultural and/or industrial production sectors. It is implicitly assumed that the performance of the distribution system for those products either has little effect on economic growth or will be improved "automatically" (through



competition) as output goes up. Recent studies on the role of marketing in economic development indicate that neither of these assumptions are universally valid. The marketing system for either agricultural or industrial products may affect economic growth rates in several ways. (1) It can reduce risks through adequate information flows. (2) It provides the mechanism to effectively or ineffectively coordinate the production and distribution of economic goods according to expressed needs and wants. (3) Marketing institutions may be a major source of entrepreneurial talent and capital for other sectors of the economy. (4) The marketing system may generate pecuniary and technical internal and external economies for producing firms by extending their markets. (5) The marketing system may pull subsistence producers into the exchange economy. (6) Marketing institutions can increase elasticities of supply and demand by making available new or improved products which consumers may find desirable. (7) Marketing institutions can lower consumer costs by improving distribution efficiency and reducing spoilage. (8) The marketing system can reduce transaction and exchange costs.<sup>143</sup> Thus a review of the limited literature on the subject suggests that the performance of the distribution sector may have a significant effect on the rate of economic growth in a developed country.

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<sup>143</sup>Moyer.

There are a number of conditions which seem to prevail in most developing nations. These include atomistic competition, low incomes, poor nutrition, low productivity, capital deficiency and high levels of illiteracy. As a result of these conditions, individuals within developing nations are frequently trapped in a vicious circle of poverty, inefficiency and low achievement motivation. The dilemma appears to hinge not on a lack of individual desire for productivity improvements but on a belief that such changes are unrealistic and hopeless given the small scale of business units, the large number of competitive units, low income and low knowledge levels. Research studies in Guatamala, Southern Italy, Fiji and New Guinea, as well as the study of Puerto Rico, reported in this thesis have affirmed that strong atomistic competition may act as an impediment to productivity gains rather than as a stimulus as is generally assumed in economic theory.

Perhaps this tentative conclusion implies that the traditional policy norms relating pure competition and "efficient" resource allocation should be re-examined to determine their application to developing nations. While it can be shown that under conditions of perfect competition resources will be allocated optimally, the point is irrelevant for developing nations because the conditions are seldom in fact fulfilled. This point, in combination with the evidence that small scale atomistic competition dampens initiative and inhibits productivity gains, shows that policy

norms for developing nations should go beyond the static theory of perfect competition to a dynamic view of the economic process. This dynamic view of economic theory would be one where

processes of change are seen at least in part to be irreversible, self-generative, and self-determining. . . . Thus (dynamic theory) would attempt to explain, at least in part, such things as the state of technology, the number of sellers, the evolution of buyers tastes, the nature of the market institutions, . . . the attitudes of sellers, . . . etc.<sup>144</sup>

Progress in formulating such a theory has been extremely slow. Attempts have generally produced nothing more than a set of conditions applicable for policy guidance in a particular industry. This does not necessarily mean that developing nations should fall back on static economic theory which makes no provisions for uncertainties, technological change, sequential business decisions based on information feedback, endogenous determination of crucial variables, etc. Perhaps the most realistic alternative is for developing nations to formulate dynamic performance goals. Thus, efforts would be focused on achieving gains in productivity rather than on static economic efficiency. For the agricultural marketing sector specific policy goals might be grouped under (1) those aimed at achieving better usage of available marketing methods and resources and (2) those aimed at encouraging the adoption of new techniques.

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<sup>144</sup>Ackley, p. 260.

The appraisal of marketing performance utilizing a dynamic model affords a flexible and pragmatic approach to market policy formulation to encourage greater productivity. There are at least six different types of policy measures which may be able to contribute to the goal of rising productivity in particular market situations. They include property rights laws, facilitative regulations, direct assistance to marketing organizations, market control programs, market planning and technical assistance and direct government investment.

For this thesis, the background research was performed as a part of AID contract csd/786 which is a two and one-half year study of the role of marketing in economic development. The research contract calls for two distinct phases. The first phase (which has just been completed) was an evaluation of the role of food marketing in the economic development of Puerto Rico. This location was chosen for the first phase of the research for several reasons. (1) The island has experienced rapid economic growth since 1950. (2) Good benchmark studies had been done in the early 1950's on the marketing system. (3) Relatively good secondary data are available. (4) The culture of the island is quite similar to those of Latin American nations.

The first phase was designed to develop the theoretical and conceptual framework for evaluating marketing in economic development and to provide a testing ground for the methodological tools to be used the second phase of the research.

At the present time the second phase of the research is being carried forward in the Northeast of Brazil. The principal findings of this thesis as summarized below should provide some guidance in the design and execution of the second phase research in Brazil.

1. Atomistic and imperfectly competitive market channels are characterized by high risk, primitive production methods and ineffective transmission of consumer demand to producers. In Puerto Rico the three commodity studies indicated that where government and private efforts to improve market coordination arrangements have altered atomistic market conditions, there have been rapid productivity improvements.

2. Several dynamic performance criteria were used to evaluate the progress in milk, egg and fruit and vegetable markets since 1950. The criteria were (1) costs of production and marketing (2) progressiveness and (3) product quality.

- a. With respect to these criteria, performance in egg production and marketing in Puerto Rico has been satisfactory. The system has performed especially well in lowering production and marketing costs and enhancing product quality.
- b. Similarly, market performance has been satisfactory for milk producers, processors and distributors in Puerto Rico.

Significant improvements were observed in all of the criteria.

- c. Performance in fruit and vegetable production and marketing has been much less satisfactory than in the two commodities mentioned above. Evidence reveals that very little widespread improvement has taken place in any of the three performance criteria.

A few isolated producers or organizations are progressing in some of the criteria.

3. In Puerto Rico evidence suggests that special efforts in milk and egg markets to improve the coordination between various stages of production processing and distribution have been associated with lower product costs, improved product quality and greater market stability. Simultaneous and joint action by participants at various stages in the production-marketing process was required to bring about coordination improvements. In the case of eggs, there is some indication that large scale retailers played an especially critical roll by providing a strong and stable demand for higher quality eggs. Similarly, the stabilization of retail milk prices through government regulation was critical in the dairy industry.

4. In fruit and vegetable production and distribution, competition has remained atomistically competitive. There are relatively few examples of vertical integration or

effective coordination. Generally, marketing methods are the same as in 1950.

5. Intensive government programs and assistance have frequently preceded performance improvements in milk and egg production and marketing. Egg grading and handling regulations in 1956 and 1958 gave impetus to commercial egg production as did government encouragement and assistance in the organization of producer marketing groups. Government assistance in milk production and marketing included disease and insect control, pasture improvement, artificial insemination, new facilities or equipment subsidies and a marketing regulation.

6. Though government programs have been enacted for fruit and vegetable producers, they have not effectively encouraged changes in the production and marketing structure or coordination.

7. The three Puerto Rican case studies lend support to the hypothesis that atomistic competition is associated with extensive marketing uncertainties and slow adoption of new production and marketing methods. This conclusion must be considered tentative because it depends on the divergence summarized above between conditions in the milk and egg markets as opposed to fruit and vegetable markets in only one developing area. Additional evidence is needed before stronger conclusions will be warranted.

8. Also, the case studies point out that certain kinds of government programs and planning assistance in marketing

may have a significant impact on market coordination and adoption of new and improved techniques. The agricultural planning program being piloted in the Mayaguez agricultural region, with a strong emphasis on government assistance to farmers in organizing production and marketing groups, appears to hold some promise as a way of accelerating agricultural development in other areas of Latin American.

9. A special sample of farmers was drawn in the Mayaguez agricultural region to facilitate comparisons between production-marketing association members and non-members. Simple correlations between association membership and a number of other variables produced the following conclusions. (a) Only four out of thirty-five hypothesized differences were statistically significant using simple correlation. Association members were found to be more likely to do business with cooperatives, belong to other agricultural organizations and have more education. In addition association members appeared to be better able to withstand financial loss resulting from a drastic reduction in annual production. But the data suggest little measurable difference between association members and non-members. (b) Differences which were measurable were primarily in the "intuitive" success criteria.

10. Using the same survey data, correlations between innovativeness and several other variables were found to be significantly different from zero at the .01 level of significance. Those correlations imply that more





innovative farmers in the study had more "modern" attitudes, had greater mass and interpersonal communication exposure, had experienced a more rapid increase in farm sales in the past five years, were younger and better educated and preferred to invest in nonfarm business or education for the family.

11. A multiple correlation equation using 16 independent variables explained only 18% of the variation in the dependent variable-association membership. This supports the conclusion of the simple correlations that little measurable difference exists between association members and non-members in the Mayaguez agricultural region.

12. A multiple correlation equation containing 20 independent variables "explained" 45% of the variance in the dependent variable-innovativeness. Regression coefficients having significance at the .05 level or below show that explanatory variables for innovativeness must be drawn from a wide range of socio-economic characteristics and value orientations. There may be a possibility that further research will lead to a method of "predicting innovativeness" among farmers in developing nations.

13. An exploratory factor analysis using 90 out of some 200 variables measured in the study indicated that 8 factors were being tapped. They were modernism, anti-innovation (economic), anti-innovation (marketing), transitionalism, traditionalism, individualism, isolated individualism, cooperativism and fatalism. Specific conclusions

for future research involving these concepts are given at the end of Chapter VI.

The principle findings summarized above offer the following conclusions with respect to the role of marketing in agricultural development. (1) The structure and performance of the marketing system may have significant effects on the total production of a given commodity, on consumer prices and on the adoption of improved production methods (innovation). The coordination of the agricultural exchange system affects significantly the production decisions of producers and therefore the agricultural development process. (2) Within the framework of societal values and goals, government policies can be devised which will contribute to more effective market coordination and more rapid agricultural development. But if such policies are to be effective, they should be based on dynamic rather than static economic performance criteria.

The second phase of the Latin American Food Marketing Study project will be carried forward in Recife, Brazil. The author will be in residence there as a part of the field research staff. The following are suggestions for possible implementation in the Brazil study.

1. The research design should permit further verification of the tentative conclusions of this thesis.

- 2 . Special efforts should be directed toward identifying more explicitly alternative government marketing policies aimed at improving market coordination and evaluating their

specific effect on agricultural productivity and development.

3. Specific marketing costs (including waste and spoilage) should be determined for a few commodities in order to permit intercountry comparisons as well as commodity channel comparisons.

4. There is evidence that additional variables should be operationalized to more adequately explain innovativeness. In the factor analysis the findings indicated that the 90 variables considered from the Puerto Rican survey tapped at least eight factors. Most of those factors appear to be correlated with innovativeness. Furthermore, the measurement of some of the variables making up those factors should be improved for the second phase.

5. There is a special need for devising improved methods for measuring market risk perceptions of individual farmers. The Puerto Rican evidence suggests that perceived market risks may be a significant variable in the adoption process.

6. The individual's perceptions of marketing risks should be related to their business performance, achievement motivation, demographic characteristics and value orientations. This will give an indication of the effect of these variables on the individual's perception of market risk intensity which in turn affects his business decisions.

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APPENDIX A

FACTOR ANALYSIS

Rotated Factor Loadings and Communalities for an Eight Factor Solution

| Variable No. | Variable Name  | Rotated Factor Loadings |       |       |      |       |       |       |       | Communalities |
|--------------|--|-------------------------|-------|-------|------|-------|-------|-------|-------|---------------|
|              |  | I                       | II    | III   | IV   | V     | VI    | VII   | VIII  |               |
| 1            | Farm Tenure  | .28                     | .13   | .22   | -.07 | -.38* | -.16  | -.04  | .13   | .33           |
| 2            | Listened to radio yesterday                          | .28                     | .19   | -.58* | -.05 | .13   | -.13  | .02   | -.26  | .55           |
| 3            | Hours listened per week                              | -.13                    | .17   | -.49* | -.09 | .11   | -.09  | .20   | .14   | .37           |
| 4            | Read newspaper yesterday                             | .76*                    | -.11  | .06   | -.10 | .13   | -.00  | -.18  | -.02  | .65           |
| 5            | Newspapers read regularly                            | .75*                    | -.35  | -.02  | -.05 | .03   | .05   | -.04  | .01   | .69           |
| 6            | Read any magazine yesterday                          | .44*                    | -.21  | -.05  | -.15 | .26   | -.23  | -.06  | .12   | .40           |
| 7            | Magazines read regularly                             | .62*                    | -.48  | -.04  | -.09 | .10   | -.05  | .02   | .03   | .63           |
| 8            | Watched TV yesterday                                 | .33                     | -.07  | -.03  | -.07 | .01   | -.13  | -.63* | .04   | .58           |
| 9            | Hours watched per week                               | .19                     | .02   | -.10  | -.02 | .06   | -.00  | -.76* | .11   | .63           |
| 10           | Political Knowledge Index                            | .75*                    | -.30  | -.04  | -.23 | .13   | -.14  | -.16  | .04   | .77           |
| 11           | Index of Innovative Influence                        | .15                     | -.47* | -.05  | -.03 | .15   | -.03  | -.19  | -.08  | .31           |
| 12           | Asked more often for information than others         | .22                     | -.23  | .04   | .07  | .15   | -.02  | -.48* | -.16  | .38           |
| 13           | Member of any cooperative                            | .19                     | -.32  | -.18  | -.11 | .01   | -.18  | -.43* | -.04  | .40           |
| 14           | Monthly food expenditures per family                 | .14                     | -.51* | .07   | -.01 | .15   | -.05  | -.13  | -.14  | .34           |
| 15           | Acres farmed   | .22                     | -.75* | .34   | .09  | .05   | -.10  | .05   | .10   | .75           |
| 16           | Additional nonfarm income                            | .47*                    | .05   | -.21  | .07  | .17   | .02   | -.05  | .10   | .32           |
| 17           | Children be instructed follow ways of past           | -.39*                   | -.22  | -.22  | .18  | -.08  | .19   | .23   | .19   | .41           |
| 18           | New customs usually better than old ones             | .19                     | -.03  | .39*  | -.08 | -.07  | .15   | .22   | -.19  | .31           |
| 19           | When problem arises, depend on leaders               | -.21                    | -.05  | .13   | .14  | -.19  | .19   | .07   | -.26* | .23           |
| 20           | Better if scientists left things alone               | -.43                    | -.11  | .00   | .08  | -.46* | .20   | -.13  | .20   | .51           |
| 21           | Most important thing to succeed in life is luck      | -.47*                   | .17   | .16   | -.13 | -.11  | .29   | .12   | -.24  | .45           |
| 22           | Things of past are better, changes bring problems    | -.37*                   | .01   | -.17  | .05  | -.25  | .29   | .14   | .13   | .36           |
| 23           | One can only confide in relatives                    | -.47                    | .13   | .13   | -.03 | -.13  | .53*  | -.23  | -.26  | .68           |
| 24           | Eat, drink and be merry, for tomorrow we may die     | -.33                    | .14   | .12   | -.12 | -.21  | .43*  | .07   | -.04  | .39           |
| 25           | Prefer to work alone than to tied to family          | -.14                    | -.04  | .02   | .04  | .24   | -.62* | .10   | .14   | .50           |
| 26           | Consumers spend more on pianos and radio sets        | -.23                    | -.08  | .06   | .17  | -.01  | -.17  | -.05  | -.46* | .33           |
| 27           | Grading and refrigeration of eggs is a regulation    | .10                     | .11   | .06   | -.08 | .62*  | .01   | -.19  | .19   | .49           |
| 28           | When dealer reduces prices, less profit for everyone | .12                     | .02   | .45*  | .01  | .09   | .08   | -.01  | -.17  | .26           |
| 29           | Organization of groups or coops can be beneficial    | .12                     | -.22  | -.27  | .05  | .35*  | -.02  | -.06  | .01   | .29           |

| Variable No. | Variable Name  | Rotated Factor Loadings |       |       |       |       |       |      |       | Communalities |
|--------------|--|-------------------------|-------|-------|-------|-------|-------|------|-------|---------------|
|              |  | I                       | II    | III   | IV    | V     | VI    | VII  | VIII  |               |
| 30           | As family income rises, smaller proportion spent on food           | .06                     | -.31  | -.39* | .14   | .34   | .06   | .13  | .04   | .41           |
| 31           | Milk regulations benefited business and consumers                  | .10                     | -.23  | -.07  | -.01  | .46*  | .00   | -.32 | .19   | .42           |
| 32           | Supermarkets have all business they will get                       | -.27                    | -.19  | -.01  | .04   | .04   | .22   | .06  | -.45* | .37           |
| 33           | Farmers cannot do much to change things                            | .32                     | .11   | .23   | -.09  | -.17  | -.20  | .10  | .40*  | .41           |
| 34           | Big supermarkets use buying power to maintain low prices           | .03                     | -.10  | -.00  | -.39* | .31   | .23   | .38  | -.35  | .58           |
| 35           | Farmers should let others take care of marketing problems          | .03                     | .05   | .25   | -.09  | -.14  | -.51* | -.12 | -.21  | .41           |
| 36           | Farmers should be organized in groups to bargain                   | .11                     | .02   | -.20  | -.14  | .47*  | -.03  | .08  | -.33  | .41           |
| 37           | Not wise for farmer to bargain directly with retailer              | -.07                    | .09   | .02   | -.15  | -.31* | .12   | -.16 | .10   | .18           |
| 38           | Grading and packaging are waste of time for farmer                 | .18                     | .20   | -.03  | -.17  | .06   | -.50* | -.06 | -.08  | .37           |
| 39           | Prices determined mostly by big processors and retailers           | -.07                    | -.35* | -.14  | .07   | -.15  | .23   | .13  | -.21  | .29           |
| 40           | Can count on government to resolve marketing and price problems    | .03                     | .07   | .02   | -.26  | .36*  | .09   | .20  | .27   | .33           |
| 41           | Risk and insecurity on fruits much less today than 10 years ago    | -.03                    | -.04  | .10   | -.05  | .37   | .42*  | -.10 | .16   | .36           |
| 42           | Government programs beneficial only for select group of dealers    | .22                     | .15   | .13   | -.14  | .51*  | -.17  | -.11 | -.10  | .42           |
| 43           | Figures of agriculture department on prices are reasonable         | .06                     | .12   | .20   | .12   | .52*  | -.15  | .00  | -.04  | .36           |
| 44           | Believe future buyers will increase use of contracts               | .22                     | -.06  | .16   | -.18  | .59*  | .36   | .01  | -.10  | .59           |
| 45           | If close relative asked you to cosign loan, what would you do      | -.01                    | .02   | .38*  | -.18  | .27   | -.16  | -.08 | .13   | .30           |
| 46           | If friend asked you cosign loan, what would you do                 | -.01                    | -.06  | .33   | .01   | .49*  | -.16  | -.06 | .22   | .42           |
| 47           | Age  | -.41*                   | -.41  | -.11  | .23   | .05   | .10   | .09  | .23   | .47           |
| 48           | Highest grade reached in school                                    | .75*                    | .02   | .10   | -.12  | .16   | -.17  | -.13 | .10   | .67           |
| 49           | Total family income in 1964  | .55*                    | -.36  | .16   | .01   | .08   | .00   | -.08 | .05   | .48           |
| 50           | Number dependent on this income                                    | -.36*                   | -.15  | .07   | .12   | -.12  | .15   | -.04 | -.18  | .23           |
| 51           | Fertilizers, in use now  | -.28                    | -.62* | .09   | .14   | -.05  | -.17  | .10  | .04   | .54           |
| 52           | Insecticides, in use now   | .02                     | -.42* | -.10  | -.13  | -.10  | .05   | -.06 | -.12  | .24           |
| 53           | Selection and classification, in use now                           | .22                     | -.26  | -.11  | -.58  | .11   | -.04  | .03  | -.24  | .54           |
| 54           | Packing, in use now  | .15                     | .24   | .16   | -.64* | .01   | .06   | .15  | -.09  | .55           |
| 55           | Using improved varieties or breed in principal farm enterprise now | .29                     | -.39  | -.25  | -.39* | .18   | .05   | .01  | .05   | .49           |
| 56           | Using buying groups  | -.25                    | -.20  | .10   | -.37* | .13   | -.16  | -.19 | .06   | .33           |
| 57           | Contracting with buyers now  | .10                     | .04   | .25   | -.43* | .01   | -.17  | -.13 | .00   | .31           |
| 58           | Using selling groups now   | -.01                    | -.49* | -.02  | -.41  | -.04  | -.16  | -.18 | -.14  | .49           |
| 59           | Total sales value of farm  | .31                     | -.45* | .06   | .02   | -.02  | .04   | .01  | -.06  | .31           |

| Variable No. | Variable Name   | Rotated Factor Loadings |       |       |       |       |      |       |       | Communalities |
|--------------|---|-------------------------|-------|-------|-------|-------|------|-------|-------|---------------|
|              |   | I                       | II    | III   | IV    | V     | VI   | VII   | VIII  |               |
| 60           | Get credit from dealer from whom buy major part of farm supplies            | -.12                    | -.04  | .23   | -.18  | -.03  | -.01 | .21   | -.61* | .52           |
| 61           | Effects of 50% output reduction due to innovation                           | -.24                    | .17   | .19   | .00   | -.35* | .18  | .09   | -.12  | .30           |
| 62           | Share equipment with neighbor   | -.13                    | .01   | -.05  | -.09  | .23   | .05  | .26   | .45*  | .35           |
| 63           | Use insurance   | .20                     | -.30* | .22   | -.17  | .11   | -.24 | -.04  | .03   | .28           |
| 64           | Would dedicate 50 hours to community improvements                           | -.35*                   | -.17  | .14   | .04   | .23   | .11  | .34   | -.10  | .25           |
| 65           | Association membership  | .01                     | -.19  | .19   | -.43* | .00   | -.06 | -.08  | .04   | .27           |
| 66           | Newspapers major source local news  | .65*                    | -.23  | .18   | .07   | -.13  | -.17 | -.05  | .18   | .59           |
| 67           | Television major source of local news                                       | -.14                    | -.03  | .05   | -.21  | .31   | .15  | -.42* | -.62  | .36           |
| 68           | Radio major source of local news  | -.43*                   | .20   | -.37  | -.01  | -.14  | -.07 | .26   | -.09  | .47           |
| 69           | Interpersonal channels major source local news                              | -.14                    | .05   | .25*  | .16   | -.00  | .19  | .22   | -.14  | .21           |
| 70           | Index of economic isolation   | .54*                    | -.07  | -.05  | -.23  | -.04  | -.05 | -.36  | .03   | .49           |
| 71           | Market visits main information source in selling cattle                     | -.01                    | -.24* | .19   | .03   | .10   | .12  | .03   | -.16  | .15           |
| 72           | Farmers main source of information in selling cattle                        | .22                     | -.55* | .04   | -.12  | -.08  | .08  | .03   | .10   | .39           |
| 73           | Others main source of information in selling cattle                         | -.17                    | .60*  | -.17  | .07   | -.01  | -.15 | -.05  | .04   | .46           |
| 74           | Market visits principal information source in selling poultry               | .09                     | .29   | -.04  | .08   | .14   | .01  | -.39* | -.21  | .31           |
| 75           | Farmers main source of information in selling poultry                       | .15                     | .27   | -.10  | -.49* | -.11  | .13  | .05   | -.13  | .40           |
| 76           | Coop or producer assn. main source of information for poultry               | -.01                    | .02   | .03   | -.24* | .04   | .06  | -.07  | -.01  | .07           |
| 77           | Mass media principal information source in selling poultry                  | -.34*                   | .08   | -.10  | .19   | -.17  | -.12 | -.01  | -.01  | .21           |
| 78           | Market visits principal source of information in selling starchy vegetables | -.25                    | .01   | .44*  | .23   | .12   | .40  | -.07  | .02   | .48           |
| 79           | Others sources of information in selling starchy vegetables                 | -.22                    | -.02  | -.06  | .11   | .11   | -.29 | .44*  | -.10  | .37           |
| 80           | Mass media main information source for prices and supplies                  | -.01                    | -.01  | .14*  | .00   | .03   | -.06 | .11   | -.02  | .04           |
| 81           | Market visits main information source for prices and supplies               | .03                     | -.01  | .29*  | .11   | .07   | .26  | .29   | -.05  | .25           |
| 82           | Farmers main information source for prices and supplies                     | .10                     | -.14  | .35*  | -.03  | .07   | -.30 | .08   | -.02  | .26           |
| 83           | Other main source of information for prices and supplies                    | -.04                    | .13   | -.58* | -.10  | -.08  | .06  | -.24  | -.07  | .44           |
| 84           | Index of perceived crop risk  | .17                     | -.14  | -.33  | .05   | .06   | .20  | .13   | .56*  | .53           |
| 85           | Innovation index number 1   | .21                     | .06   | -.19  | -.63* | -.02  | -.17 | -.09  | .23   | .63           |
| 86           | Innovation index number 2   | .01                     | -.13  | -.14  | -.36* | -.02  | -.23 | -.13  | .30   | .32           |
| 87           | Innovation index number 5   | .01                     | -.31  | -.13  | -.71* | -.05  | -.14 | .09   | .15   | .67           |
| 88           | Index of perception of main farm problems                                   | .16                     | -.27  | -.09  | -.16  | .14   | -.03 | .23   | -.48* | .44           |
| 89           | Index of educational aspirations  | .56*                    | -.17  | .31   | -.09  | .10   | .20  | -.23  | .08   | .56           |
| 90           | Mobility index  | .47*                    | -.01  | .00   | .01   | -.08  | -.00 | -.02  | -.14  | .24           |

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