

FACTORS ASSOCIATED WITH THE USE OF MODERN
AGRICULTURAL INPUTS IN EIGHT MUNICIPIOS OF THE
STATE OF SAO PAULO, BRAZIL, 1970-1972

THESIS

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Chapter I

Introduction

Purpose of the Study

According to Gerhard Lenski, "In every field of study there are three basic questions which must be answered. First, what is the nature of the phenomenon in question? Second, what are the sources of its uniformities and variations? Third, what are the consequences of its existence or action?"¹ In this study the process of development in the Third World nations, specifically agricultural development, is the phenomenon to be considered.

Agricultural development is essential to economic development in the Third World countries where over fifty percent of the population reside and work in the rural areas. The problem of central concern for the present examination is not the development process as a macro event affecting an entire national or sectoral economy, but its impact on the individual farmer. How does the farmer, particularly the small farmer, increase not only his output but his understanding of technically efficient and economically beneficent practices? Technological growth is promulgated on the macro level through continually intensified research efforts. Methodological understanding and application of this growth by the individual farmer is promoted by diffusion agents. The latter is the focal point of this study. The nature of the development, as contrasted with the growth, phenomenon will be discussed in the second part of this section.

J. Paul Leagans remarks that

Agricultural development is not merely making two blades of grass grow where there was only one before. Agricultural development... requires an extremely complicated strategy in which an

optimum form of the interrelation and use of facilities, status roles, and application of power is attained. 2

Agricultural development must include the process of growth in technological advancement and methodological understanding among all types of farm operators. Essential to the growth process is the effective diffusion of new technology and efficient farming practices. Change can be accomplished via the mass media, by members of agricultural service agencies, by friends neighbors or relatives or through manipulation of the market. Each method has been used to affect change in developing societies. The extent to which each has proven effective and under what particular circumstances will be considered in Part II -- the Review of Literature -- providing an opportunity to view the sources of the "uniformities and variations" in the international development process.

Frequently the consequences of development are measured in terms of a higher Gross National Product, a more favorable balance of trade or per capita income. Such statistics are indicative of development conditions on the macro level but may demonstrate little about the condition of the individual farmer. The policy decisions which ultimately direct a nation's economic and social development are, of course, macro in scope. But if macro level policies are to succeed, they cannot be oblivious to or divorced from the most common needs and wants of a nation's people.

The leaders who shape national policy need always to be aware of how a program will fulfill the expectations and answer the felt needs of individuals in each social and economic sector. Too often it seems, macro level decisions are based on the political, economic or social aspirations of only a society's elite. Not always is this a result of

purely selfish motives or ambitions. Development studies, especially in economics, tend to focus on situations manifest at the macro level to the neglect, if not total omission, of development problems peculiar to particular sectors or individual groups. Such data orientated specifically to the process of growth and development as a macro phenomenon furnish policy planners with scant information by which to predict the consequences of development for all sectors of the society.

Considering this problem to be particularly important in its ramifications for agricultural development, this study will examine the process of growth and development among two hundred eighty-five individual farm operators in the state of Sao Paulo, Brazil. Central to the analysis will be an examination of how effectively various members of the government and private agricultural service agencies are interpreting the felt needs and agricultural conditions of the farmers whom they represent. Crucial also to the study will be an examination of the various methods of agricultural diffusion and their relative merits for operators of small, medium and large farms.

The goal of the present study is to provide additional awareness from a micro perspective of the needs and perception of needs of large and small farm operators. Hopefully this awareness will encourage the persons who possess the power and ability to form and enact macro level development programs to do so with increased sensitivity to the needs of all members of the agricultural sector.

A Differentiation Between Growth and Development

Evolution, growth, development and revolution, the major forms of social change received considerable attention in various writings of nineteenth century social theorists (Durkheim, Morgan, Weber, Spencer, Marx etc.), though rarely were the four terms differentiated explicitly. Herbert Spencer did recognize and provide a vital distinction between the processes of growth and development. Acknowledging that "In ordinary speech, Development is often used as synonymous with growth," Spencer cautioned his readers that "Development as here and hereafter used, means increase of structure, and not increase of bulk."³ Spencer's differentiation can be elaborated by examining the works of several twentieth century scholars of social change.

The Caribbean economist, George L. Beckford stresses in Persistent Poverty that "underdevelopment is a process rather than a stage or condition;" that this process often accompanies growth, indeed is even a part of the growth cycle.⁴ Beckford asserts that growth in a country's economy as signified by a higher Gross National Product or per capita income⁵ does not indicate the presence of the development process. Frequently it proves only that the elite are reaping higher financial returns on the world market. The small farmer, craftsman or urban factory worker is most likely no better educated, no more technically adept and financially in no more advantageous position than before the signs of economic growth for his country were manifest. Beckford's thesis is the practical application of Spencer's distinction between "increase in structure and increase in bulk."

The distinction is illustrated by the manner in which areas of Brazil were economically exploited in the last century and earlier part of this century only to be deserted when drained of resources with exportive value. William L. Flinn states that in Brazil today "the rural sector is not a cause of slow development, but the consequence of previous exploitative economic activities."⁶ Economic growth boomed without provisions for development. Rural Brazil exemplifies sociologist Eugene Haven's contention that "...even if economic growth becomes more or less self-sustaining in a country, the society is not necessarily 'developed'."⁷

The social dimensions of economic growth and development are expounded by former Canadian Prime Minister, Lester Pearson.

Development implies more than an increase in economic productivity and efficiency (growth). It means that people are given the option, the opportunity to determine the direction of their lives and their environment. 8

Pearson optimistically suggests that development is a form of social change which can be determined (unlike evolution), distributed (unlike growth), and directed (unlike most revolutions). An economy can grow without the full knowledge and participation of all its sectors. A society cannot develop without the awareness and involvement of all its members.

Economic growth is vital to the development of the Third World nations. But the growth cannot be confined only to certain sectors, entrepreneurs, cosmopolitan merchants or agri-business concerns. Growth often fails to benefit the members of society who do not necessarily possess the personal financial resources or professional contacts to capitalize on the increased advantages offered by technological

innovations or expanded market opportunities. Because the former class of people generally control and profit to the greatest degree by economic growth, the growth process tends to leap ahead of the development process which must necessarily wait until the less advantaged classes can be included.

If economic growth is to take roots and flourish, then development-- the erecting of sound, servicable structures with active interest in the needs and aspirations of all the constituents of society -- must accompany the growth process. Growth and development while bearing Spencer's distinction (bulk vs structure) can and should take place as simultaneous, complementary events rather than as mutually exclusive, competitive occurrences.

The Process of Socio-Economic Change

Social scientists concerned with the development process in Third World nations usually examine the phenomenon of social change from a micro (individual) or a macro (structural) theoretical position. The former emphasizes the psychological patterns and cultural values inculcated within individuals of a society. The suggestion is that individual attitudes toward life, social structures and political organization must alter before social, technological and economic changes can occur. Representative of this approach is sociologist David McClelland who contends that "Certain psychological changes must occur before there is likely to be self-sustained rapid economic growth."⁹ (vide: Rosen, 1962; Hagen, 1962; McClelland, 1961; Brewster, 1967).

Social scientists subscribing to a macro-structural orientation assert that change (growth, development) can occur most effectively through the manipulation or alteration of society's social, economic and political structures. The two basic theses of this position are: (1) "Underdevelopment is primarily a consequence of institutional underdevelopment, and (2) the new social and economic goals to which emerging nations aspire cannot take place under indigenous institutional arrangements."¹⁰ According to McClelland's approach, an economy will not grow or develop (or remain underdeveloped and not grow) because of inbred cultural traits among individuals.

According to the macro theorists, change originates at a structural level and then encompasses all individuals regardless of their characteristics or whims. An example of this position is economist Theodore Shultz who contends, when discussing the impetus for change, that "since differences in profitability are a strong explanatory variable, it is not necessary to appeal to differences in personality, education and social environment."¹¹ Alterations in the market or credit system will produce change without having to deal with adoption, production or retail inhibitions on the part of individual craftsmen, merchants or farmers.

The theoretical positions presented in this discussion assume that social change is a phenomenon which can be predicted, instigated and directed. Eugene Havens in a paper entitled, "Methodological Issues in the Study of Development," has classified both approaches discussed in this study as subdivisions of an Equilibrium Model for development. Against this model he juxtaposes a Conflict Model. Havens views the

latter model as more structurally orientated. The authors considered in the present study as representative of researchers with orientation toward structural situations, as opposed to individual variables, Havens classifies as "Diffusionists" and designates as Equilibrium Model adherents. The authors used in the present study to illustrate the micro-individual position, Havens also attaches to the Equilibrium Model and classifies their views as "Psychodynamic."¹² (vide: Table 1)

According to Havens' categories the present study is concerned with the process of social change as it takes place in a society under equilibrium or "normal" as opposed to "revolutionary" or conflict conditions. The challenge is between the Psychodynamic approach to development (Hagen, McClelland, Rosen and Brewster) and the Diffusionist approach (Rostow, Hirschman, Rogers, Hoselitz, Katz and Taylor).

An important question is: must individual attitudes which are supportative of authoritarian governments and family structures, submissive to Divine Will and nature and suspicious of deviance or innovation be altered before the development process can thrive? (Hagen, Brewster) Or can development planners create policies and implement programs which work around, with or through attitudinal positions seemingly unfavorable to change? Albert Hirschman contends that not only can this sort of planning occur it must. He suggests that social scientists involved in Third World development projects cease compiling cumbersome lists detailing why development cannot occur, and begin applying the principles of Dr. Carl Roger's client-centered therapy to discover how development can be induced in various circumstances.¹³

Table 1. Major approaches to the Study of Development with Attendant Assumptions and Concepts.

Types of Approaches to the Study of Development	Major Assumptions	Frequent Concepts
I. EQUILIBRIUM MODELS		
A. Behavioral Kunkel (1970) Lipset (1967) Homans (1961) Parsons (1960) Erasmus (1961) Eisenstadt (1966)	Individuals suffer deprivations that are contextually determined. Behavior can be changed at any time, development will occur through new learning experiences.	Modernization, learning curves, internalization deprivation, attitudes, values, rationality, adult socialization, intra-generational change.
B. Psychodynamic Brewster (1967)* Hagen (1962) McClelland (1961) Rosen (1962)*	Early childhood socialization largely pre-determines future behavior which may impede innovativeness, cleavage between individual behavior and current social environment; development occurs through new socialization patterns.	Personality, backwardness, childhood experiences, status withdrawal, inter-generational change, modernization.
C. Diffusionist Rostow (1971) Hirschman (1958) Barnett (1953) Rogers (1969) Hoselits (1960) Levy (1960) Katz (1967)* Taylor (1962)*	Simplistic dualism-societal cleavage based on degree of use of modern technology, development occurs through new capital and technological inputs.	Diffusion curves, rates of change for ecological units, lagging sectors, productivity, technological growth, modernization.

CONT'D.

Table 1 (con't).

Types of Approaches to the Study of Development	Major Assumptions	Frequent Concepts
II. CONFLICT MODELS		
A. Structuralist-Non Marxist Dahrendorf (1959) Heilbroner (1963) Aron (1962) Prebisch (1970)	Impossible to predict historical outcomes; no revolutionary upheavals necessary for development, parties represent class interests to seek new equilibriums under better solutions; moving equilibriums, class formation not related to mode of production; rate of change dependent on intensity and violence of class conflict.	Pluralism, conflict, conflict-management, strata, means ends, institutional reform, power, structural dualisms, structural change.
B. Marxist Szentes (1971) Mafeje (1970) Baran (1957) Dos Santos (1970) Sunkel (1970)	Mode of production underlies economic actions and class structure; at level of social formation various classes may be present depending on group's relationships to means of production, if tendency to move to a two-class structure occurs at level of social relationships, there will be a change in the mode of production. Changes related to inter-societal historical relationships in the development of the mode of production.	Imperialism, ownership of the means of production, concentration of resources proletarianization, pauperization, class formation, class consciousness, class struggle development.

* Not included in the Haven's paper; added for the present study.

Source: A. Eugene Haven, "Methodological Issues in the Study of Development," pages 11 and 12.

The process of social change (under equilibrium conditions) can best unfold through work, on the micro level, educating (re-educating) individuals according to the psychodynamists. According to the diffusionists the same goals can be accomplished as effectively and more rapidly on a micro scale where new technical practices and institutional opportunities are made available to all individuals for observation, trial and, hopefully, eventual adoption.

Dr. Carl Taylor hypothesizes that:

so-called traditional peasants will not be inhibited by their sanctions and traditions [value systems] if they are approached with alternative ways of doing things which they are already doing, and the doing of which yields them immediate, obvious results.¹⁴

The task of change agents within developing societies is first to recognize what the economic growth and social development needs are and then to devise appropriate strategies which can be diffused to individuals in terms they can comprehend and accept. This task requires the awareness of personal and cultural values and their origin possessed by the psychodynamics scholars coupled with the aggressive demands and plans for innovation of the diffusionists.

The third approach to change -- the structural -- also has a vital place in equilibrium conditions, although Havens sees it as possible only in conflict circumstances. Economist Arthur Mosher emphasizes that agricultural development must involve changes among more people than just farmers. The agricultural infrastructure and agri-climate (social values, forms, organizations of the area) must also change, grow, develop.¹⁵

Participants at a conference on small farm development which was held at The Ohio State University in September, 1971 reached a similar conclusion

regarding development problems.

It was generally agreed that the uniqueness of the small farmer (cultural or personal characteristics) is not the problem; rather it is the adverse workings of the system within which he sits, his lack of profitable investments, and lack of small farmer organizations which cause his difficulties. 16

The ultimate questions seem to be: what must come first, individual change in values and attitudes or structural change in opportunities open to individuals? Can programs for change best be introduced by change agents to individuals on a personal communications level or by structural stimuli? Is social change, development an individual or a societal process, or is it both?

Charles Wolf, Jr. argues in "Institutions and Economic Development," that too much emphasis has been placed in sociological literature on individual and cultural values determining institutions. Too much credulity has been given to the belief that the former must change before the latter may be modified. His thesis is that the converse can also be true. That institutions can cause change in motivations and values. In a very telling footnote, though, he sums up, or depending on one's viewpoint, reopens the entire social change process quagmire. Wolf concedes that "generally speaking it is more accurate to describe the relationship between institutions and values as interactive rather than as causal in one direction or the other."¹⁷

Definition of Terms

Adopter Categories: The grouping of individuals on the basis of their innovativeness. As originally designed and applied by Everett Rogers, the grouping consists of five categories (innovator, early adopter, early majority, late majority, laggard) and is based on the time at which an innovation is adopted.¹⁸ Rogers' devised his adoption scale (curve) for use in developed countries where full adoption could be ascertained. In rapidly developing Third World nations, full adoption, as opposed to trial, is more difficult to determine and measure. The present study will group farmers into six categories based on the year the particular innovation was first used. The sixth category will designate farmers who have not yet tried the specific innovation.

Adoption: Rogers defines adoption as the "decision to continue full use of an innovation ... it implies that the adopter is satisfied with the innovation."¹⁹

Agricultural Service Agencies (Organizations): The agencies responsible for the dissemination of agricultural information and/or the provision of agricultural inputs to the farm operator. In the present study these agencies are specifically banks, commercial agricultural businesses and extension offices.

Change Agent: According to Rogers, "a change agent is a professional person who attempts to influence adoption decisions in a direction that he feels is desirable."²⁰ The present study concentrates on bankers, commercial dealers and extension agents as potential change agents. Twenty-nine bankers, sixteen fertilizer dealers and eight extension agents have been interviewed for the study.

Diffusion: Diffusion, Rogers' terms, "is the process by which an innovation spreads. The diffusion process is the spread of a new idea from its source of invention or creation to its ultimate adopters."²¹ As used in the present study the diffusion process refers specifically to the spread of an idea or practice new to a given area, from its source of introduction in the area to its ultimate users or adopters.

DIRA (Divisoes Integreis Regionis Agricolas): The DIRA is a regional administrative division of agriculture in Brazil. The DIRA of Ribeiro Preto provided the setting for this study. Of the nine DIRA in the State of Sao Paulo Ribeiro Preto is one of the most productive of the principal crops.

Farm Size: Farm size refers to land area. A small farm, as classified in this study, is between ten and thirty hectares; a medium farm from thirty-one to two hundred hectares and a large farm contains two hundred one to three thousand hectares.

Farm Operator: By the stipulations of the present survey, a person must own and operate more than fifty percent of the land he utilizes to be called a farm operator. This eliminated landless tenants and absentee owners from consideration.

Farm Type: Farms are classified according to the crop which the farmer stated to be his principal crop on which he used "advanced technological practices." Farm types represented in the present study are: Cotton (45 farms), Rice (49 farms), Sugar Cane (63 farms), Corn (66 farms), and Soybeans (14 farms).

Município: A município corresponds roughly to a county in the United States. The DIRA of Ribeiro Preto has eighty municípios, eight

of which are represented in the present survey. They are: Altinópolis (30 farm interviews), Barretos (27 farm interviews), Batáis (38 farm interviews), Colombia (8 farm interviews), Guaira (72 farm interviews), Jardinópolis (47 farm interviews), Pontal (22 farm interviews) and Serataozinho (41 farm interviews).

Needs: "Anything that is requisite to the maintenance of a desired state of affairs is a need. ...needs represent an imbalance or lack of adjustment between the present situation...and a new or changed set of conditions assumed to be more desirable. Specifically, needs may be defined as the differences between what is, and what ought to be and, hence, always imply a gap between these two conditions."²²

Values: Two quotations define value quite well. The first is by a sociologist, the second by an economist. "A value is an individual's socially acquired judgement of the degree to which a particular stimulus is desirable or undesirable. An attitude is an individual's learned inclination to respond to a specific stimulus in a particular way."²³
 "Values may be defined as individual and collective judgements concerning what is desirable. In 'rational' human behavior, values provide the motivations which impel men to choose or avoid particular types of voluntary action. Where motives differ among individuals or groups, differing action will result under otherwise identical circumstances."²⁴

Objectives of the Present Study

The ultimate goal of this research project is to understand more thoroughly the role agricultural service agencies can play in encouraging and assisting all types of farm operators in becoming involved in the process of agricultural development. The focus is on methods of disseminating agricultural information to farmers; special attention will be given to an analysis to determine which methods are most effective with operators of small farms as contrasted with operators of larger farms. Of particular interest will be an examination of how aware members of the agricultural service agencies are of the differing needs and conditions experienced by operators of various size farms. The specific objectives of the study are:

1. To compare the influence of personal sources of information diffusion, the mass media and economic factors among farmers according to farm size.
2. To determine which diffusion practices are most likely to be effective among individual farmers according to farm size.
3. To analyze the perception of the present (1971) agricultural service personnel in Ribeirao Preto of the conditions of farm operators by farm size category.
4. To suggest how agricultural service agencies might communicate more effectively through their personnel and policy implementations with small farm operators.

NOTES

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Chapter II

Background

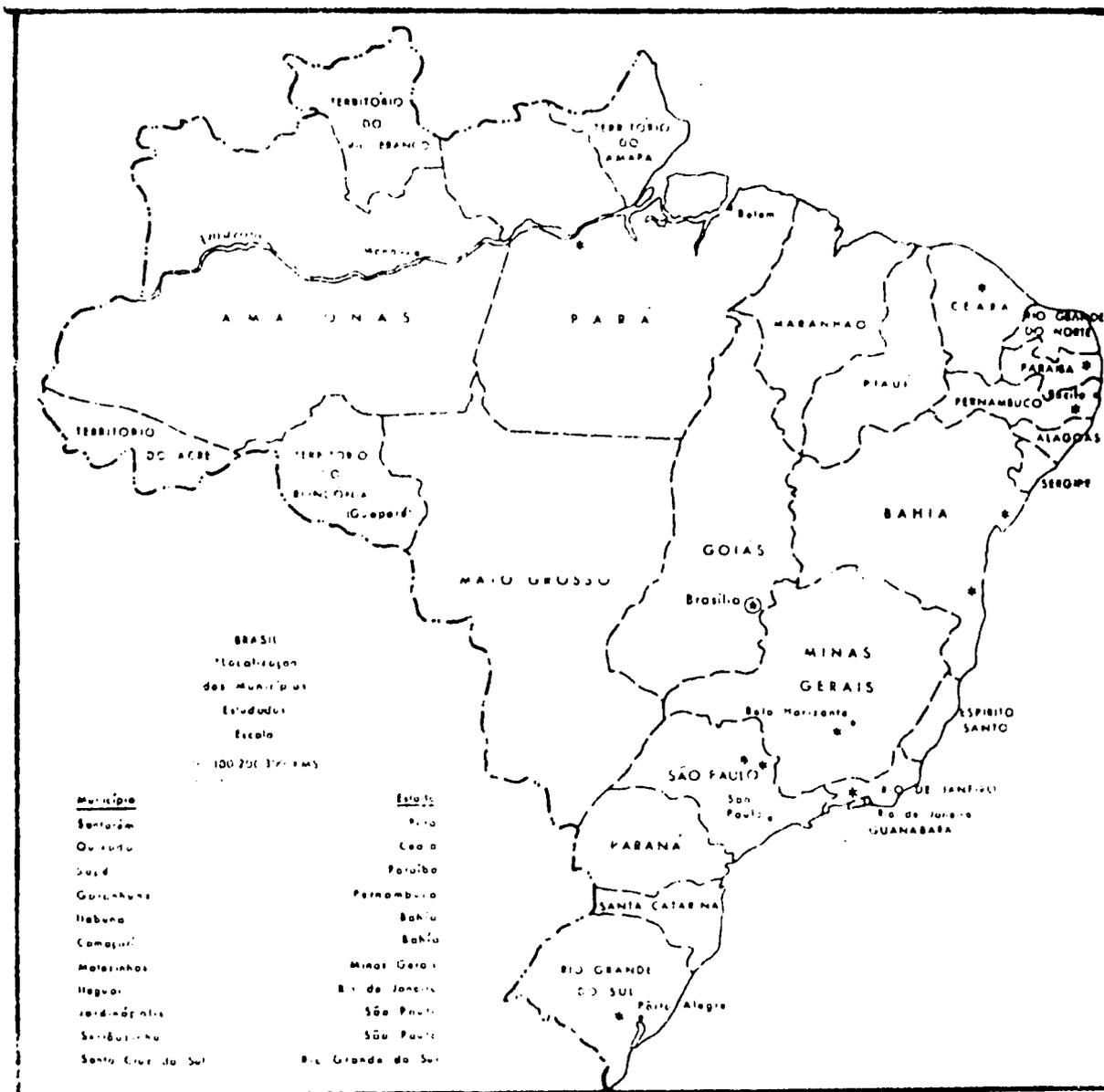
The Area Studied

The present study is part of a larger research effort pertaining to "Rural Capital Formation and Technological Change" which is being conducted in Brazil by The Ohio State University through a contract with the United States Agency for International Development (USAID). The states of Rio Grande do Sul, Santa Catarina, Minas Gerais and Sao Paulo have provided data for the research project.

Sao Paulo is the state on which the present study focuses. Data for the economic and sociological aspects of the research have been collected by faculty and graduate students of Ohio State in cooperation with the faculty and graduate students at the Escola Superior de Agricultura (ESALQ), University of Sao Paulo at Piracicaba. Within the state of Sao Paulo, one agricultural region, the Divisao Integral Regional Agricola (DIRA) of Ribeirao Preto, has been isolated for study.

South America's largest country, Brazil, stretches from the temperate zone of the southern hemisphere to the tropical zone of the equator. (Map 1). More than one hundred million people populate the nation which, in land area, is the fifth largest country in the world.

Sao Paulo, the most populous state in Brazil, is located in the south central part of the country. The Atlantic Ocean forms the state's eastern boundary; bordering states are Minas Gerais, Matto Grosso, Parana and Guanabara. (Map 2). While its eighteen million inhabitants (one quarter of Brazil's total population) mark the state as Brazil's most populous, Sao Paulo in terms of land area (247,896 sq. km.—24.7 million hectares)



Map 1. States and Territories of Brazil

Map 2



ÁREAS :

DIRA RIBEIRÃO PRETO 3.611.252 HA.

EST. DE SÃO PAULO 24.700.000HA.

**As DIVISÕES REGIONAIS AGRÍCOLAS
do Estado de São Paulo**

is not the largest state in Brazil.

Situated in the midst of both the agricultural and industrial complex of the nation, the state is Brazil's most industrialized and the most technologically advanced in agriculture. The cosmopolitan city of Sao Paulo with its seven million citizens serves the state as an example of modernization and economic development. Although highly industrialized, the state still derives one-eighth of its income from agriculture. Sao Paulo is Brazil's leading producer of peanuts, sugar cane and cotton. It ranks second nationally in coffee production, third in corn and fourth in rice.

The state of Sao Paulo is divided into nine agricultural regions known as DERA. Ribeirao Preto, the DERA providing data for the present study, is located in the northeastern corner of Sao Paulo. Approximately one-eighth of the state's land area is accounted for in Ribeirao Preto's 3.6 million hectares. The region, bordered on the east and north by the state of Minas Gerais (Map 2) is adequately linked by transportation and communication facilities to the principal marketing and political centers of the nation.

Ribeirao Preto lies in a sub-tropical climatic zone. The winters are dry and the summers wet. Yearly rainfall ranges from 1,100 to 1,700 mm. Temperatures range from sixteen to twenty-two degrees centigrade. July is the coldest month; January the wettest. The topography of the region is both flat and hilly with altitudes of from three hundred to one thousand meters above sea level. Significant to agriculture is the area's soil composition which is fifty percent terra roxa legitima - a soil famous for production of coffee and sugar cane.

The DERA of Ribeirao Preto is sub-divided into eighty municipios,

eight of which are examined in the present study. Like the entire state of Sao Paulo, these eight municipios are heavily populated by foreign born, or descendants of, immigrants. The 1950 census data showed 57.1 percent of Brazil's immigrant population to be residing in the state of Sao Paulo. These immigrants accounted for 7.6 percent of the nation's total population.

T. Lynn Smith writes, "Brazil is one of the richest panoramas of natural contrasts, human types and cultural forms to be found in the world."¹ Portuguese, Africans, and Brazilian Indians provided the initial cultural flavors of Brazil. While these groups still are the dominant influence, eight additional groups of immigrants have made and are still making their presence felt in Brazil's cultural mosaic. In order of importance these groups are the: Portuguese, Italians, Spaniards, Japanese, Germans, Poles, Russians and Lebanese.

Within the state of Sao Paulo the Italians and Japanese are the most prominent of the immigrant groups. The Italians began arriving in large numbers in Brazil during the early to mid-nineteenth century. When Sao Paulo began searching for labor sources to replace her slaves, in the 1880's, Italians flocked to the state. 132,326 Italians entered the state's labour force in the year of peak immigration, 1891.² Rumors of ill-treatment of the immigrants soon filtered back to the Italian government and in 1902 Rome prohibited the recruiting of Italian immigrants by Sao Paulo agents.

To meet the constant need for farm hands, Sao Paulo was forced to search for immigrants outside of Italy. Japan became a ready supplier of labour and in 1908 the first group of Japanese arrived in Sao Paulo. In the DIRA of Ribeirao Preto the Japanese and Italians today are the two culturally prominent immigrant groups. Population studies usually reveal im-

migrants to be urban oriented city dwellers. Contrary to this norm, both the Italians and Japanese in Ribeirao Preto are primarily rural residents and agriculturalists.

The farmers of Ribeirao Preto are not, for the most part, isolated from urban influences. Those residing in the municipios of Barretos, Columbia and Guaira are subject to the impact of the city of Barratos. The municipios of Altinopolis, Batatais, Jardinapolis, Pontal and Sera-taozinho are influenced by their regional urban center, the cosmopolitan city of Ribeirao Preto. The two cities expose their area farmers to urban styles of life, modes of dress, patterns of thought and expression; they demonstrate the achievements of industrial technology and provide the agriculturalists access to the mass media.

The three municipios surrounding the city of Barratos are mainly cattle raising areas and their culture is still stamped with the gaucho image and its distinctive dress. The other five municipios were and are still principally producers of coffee and sugar cane. They have suffered strong economic and social set-backs in recent years because of the decreasing prices of coffee on the world market. Presently cattle raising and industry are being introduced to compensate for the losses incurred by the international coffee surplus.

While industrialization and urbanization are becoming increasingly dominant forces economically and socially in Sao Paulo, the DIRA of Ribeirao Preto remains strongly influenced by rural life and is the most important source of agricultural production in the state.

Related Studies on The Process and Communication of Change

The success or failure of Brazil's bid for a place among the world's great powers probably will be determined largely by the rapidity with which the mass of her agriculturalists learn to farm.

T. Lynn Smith, 1972³

Agricultural development implies change - structural and individual. Change which produces development necessitates the learning and experiencing of new ideas, new approaches, new methods. The studies reviewed in this section examine the learning process, its implementations and implications among individual farmers. The questions implicit in this approach are: how are existing structures in equilibrium societies assisting and encouraging individual farmers to adopt more efficient and profitable agricultural technology, and which approaches are most effective in obtaining results from individual farmers of different backgrounds?

Three "internal factors" which may effect individual adoption attitudes will be examined. Three "external factors" which may be manipulated to influence individual change practices will be discussed in relation to the internal factors and to each other.

1. Internal Factors to the Individual Adoption Process: Age, Education, Farm Size

Age, education and farm size are classified as "internal factors" to the adoption process because they virtually cannot easily be altered from an outside source - the adoption process must account for their presence, acknowledge the conditions they imply and proceed accordingly.

Age

In his earliest book on adoption of new ideas and practices, Diffusion of Innovations, Everett Rogers contends that younger people are generally earlier adopters, or acceptors of new ideas, than are older people.²⁸ In addition to citing studies which document this claim, Rogers substantiates his position on the theoretical grounds that,

The socialization of personality occurs mainly in very early life. In a rapidly changing culture, this means that younger people learn a more modern set of cultural values than do older people, who were socialized in an earlier era. The young are less conditioned by the older culture; hence, they are more innovative.⁵

Roger's contention changes in his most recent book, Communication of Innovations. There he states "earlier adopters are no different from later adopters in age." The altered position is the result of a content analysis of 228 studies on the subject from the Diffusion Documents Center at Michigan State University. Almost half of the studies demonstrate no relationship between age and adoption practice; twenty percent show earlier adopters to be younger, and thirty percent find earlier adopters to be older.⁶

Two recent studies conducted among farmers in Latin America show no significant relationship between age and adoption (Havens, Flinn, 1966 and Sturm, Riedl, 1970). A 1962 study by Wilkening, Tully and Presser of farm practice adoption in Northern Victoria, Australia, found strong evidence of younger farmers adopting more readily and frequently than older farmers.⁷ In the same year a study among North Dakota Farmers bore the same results.⁸

Roger's quite adequately interprets the situation: "There is inconsistent evidence about the relationship of age and innovativeness."⁹

Clearly, age is a significant variable only under some conditions and for

certain people. It may provide additional knowledge about adoption trends, by practice or area, but alone, age does not prove to be a reliable indicator of a person's propensity to accept a new mode of thought or behavior.

Education

Like age, education is an indicative rather than a definitive variable for predicting adoption. Education, as measured by years in school, does not seem to be often significantly related to adoption of practices. (Fliegel, 1966; Fett, 1971; Havens, Flinn, 1966; Sturm, Riedl, 1972; Photiades, 1962; Wilkening, Tully, Presser, 1962) Everett Rogers (1971) argues that years in school do influence adoption decisions. Fliegel's study could confirm Roger's argument if Rogers accounted for or qualified the type of education being administered in the schools.

Fliegel, Wilkening, et. al. take care to qualify their findings with the admonishment that not years spent in school, but the kind of orientation of the school determines a farmer's attitude toward new ideas. Economist Arthur T. Mosher suggests that,

Probably any form of education that results in verbal and mathematical literacy and that expands the horizons of students is an asset to rural development. But obviously some types of education and some methods of teaching are better for the purpose than others. ¹⁰

Literacy, as distinguished from years spent in school, may be a significant variable in the prediction of adoption of new practices. Fett found that "for the literate, high use of the mass media was quite obviously accompanied by higher adoption in nearly all cases."¹¹ But he concluded that even illiteracy need not be a major stumbling block to the change process: "neither illiteracy nor lack of education make it impossible to reach farmers via the mass media."¹² Fliegel's study among small

farmers in Brazil supports Fett's conclusions.¹³

A similar study by Frey in rural Turkey even shows the mass media to have a stronger impact on illiterate than literate males.¹⁴ In other words, a development oriented mass media may negate any differences in adoption proneness between the more educated and the less educated; the literate and the illiterate. As Frey observes, "the mass media may happily have their greatest impact on the group that is most critical for rural development - the male illiterates."¹⁵

For researchers, narrowing of the often suspected gap between literates and illiterates is particularly important. While number of years in school is not a difficult variable to operationalize (although the quality and type of educational orientation is virtually impossible to ascertain), an adequate measurement of literacy which can be applied in the interview field is not easy to develop. Often studies merely resort to an equation of literacy with a given number of years in school!

Education-- years in school, literacy-- may provide insight into the likelihood of a farmer's adoption proneness or it may be a useful guide to the change agent to indicate possible levels of approach to certain types of individuals. Alone, however, education does not appear to be a trustworthy measurement of adoption propensity.

Farm Size

Economists Kenneth Bachman and Raymond Christensen assert in "The Economics of Farm Size", "Agricultural progress seems to be related to a wide complex of conditions rather than to the pattern of farm size per se."¹⁶ While this assertion is no doubt valid as a macro-economic view of develop-

ment, it becomes less applicable on the micro level. Of the three internal factors to individual farm development discussed, farm size is the most significantly related to adoption practices. (Havens, Flinn; Rogers, Svenning; Sturm, Riedl) As Bachman and Christensen contend, farm size per se is not the determinant factor. Its importance lies in the way it determines which and to what degree other external factors (change agent contact, literacy, mass media exposure, credit opportunities, etc.) may reach and influence the individual farm operator.

Havens and Flinn found in their study of Columbian farmers that "size of holding is one of the key variables in determining who is likely to employ new agricultural innovations. The larger the holding, the greater is the level of adoption of innovations."¹⁷ Jose Fraga Fachel reached the same conclusion in his study of farm adoption practices in Rio Grande do Sul, Brazil. Fachel notes,

The use of agricultural technology as indicated by the number of improved practices used, increases substantially with size of farm and is particularly higher for the very large farms. ¹⁸

Farm size appears to have the greatest bearing on the adoption propensity among large farm operators and very small farm operators; farmers with medium sized holdings are less affected by farm size per se. Havens and Flinn discovered that when dealing with middle-sized, commercial farming units in Columbia, size of operation had relatively little to do with adoption practices, given the presence of two structurally controlled variables, market availability and land tenure arrangements. But, they learned "farm size becomes a rather important variable when land tenure arrangements consist largely of mini-fundia and subsistence farming."¹⁹

Apart from individual differences, the difference in farm adoption propensity between large farm operators and small operators could be accounted for in three ways: new technology may not be profitable or suitable for small farms, the knowledge of its existence might be more prevalent among large farm operators, or the means by which to obtain technological benefits might be less accessible to small farms.

Bachman and Christensen disagree with the first possibility.

According to their research,

The relevant variables in transforming traditional agriculture in most less developed countries, such as new varieties, increased use of fertilizer, improved water and crop practices, involve no direct economies of scale and are suitable for use on both large and small farms.²⁰

Several studies support the second possibility - that farm size could affect the knowledge about new practices. Moulik, in a survey on the adoption of nitrogenous fertilizers by farmers in North India, found that knowledge about the fertilizer and its proper usage were highly related to the level of adoption.²¹

Evidence suggests that change agents, a prime source for the dissemination of agricultural knowledge, tend to communicate to a greater extent with large than small farm operators (Rogers, 1972, 1962; Rogers, Svenning, 1969; Deutschmann et al, 1968; Photiadis, 1962; Havens, Flinn, 1970).

Deutschmann and Rogers both found in their studies in Latin America that change agents have a higher degree of contact and communicate most frequently with farmers of social status similar to their own who generally operate the larger farms. Communication is least with farmers on small farms and those of lower social status than the change agent.²²

Sturm reinforces the implied relationship between high status and large farm holdings. He notes that, "one of the most important indicators of social status in agricultural societies is the amount of land owned which was found to be positively related with income in many studies. (Risk, Johnson and Buss, Converse)"²³ Farm size per se does not directly affect adoption but it may facilitate or hinder the acquisition of knowledge about adoption opportunities.

Economist Theodore Schultz cites lack of knowledge coupled with lack of resources as hurdles to adoption for small farm operators. Schultz acknowledges that in the United States there are frequent cases of small farm owners who actively follow agricultural research to ascertain what innovations might be profitable for them. But he states,

It is highly improbable that any small farmer situated in a typical poor community would engage in such a search Even if he were of a mind to search for such information, to do it on his own . . . would become prohibitively expensive for him.²⁴

Absence of personal savings, inavailability of institutional credit and limited contact with change agents may all function to retard the adoption process of small farm operators. It is in this sense that farm size becomes an important internal factor when considering the adoption process.

2. External Factors to the Individual Adoption Process: Personal Contacts, Impersonal Influences, Economic Institutions

Personal contacts, impersonal sources of influence and economic institutions are categorized as external factors to the adoption process. Unlike the internal factors, age, literacy and farm size, which are often difficult or impossible to alter, the external factors can be manipulated

CHART 1

A Composite Picture of the Characteristics of Individuals in the Five Adopter Categories

<u>Adopter Category</u>	<u>Salient Values</u>	<u>Personal Characteristics</u>	<u>Communication Behavior</u>	<u>Social Relationships</u>
Innovators	"Venturesome"; willing to accept risks.	Youngest age; highest social status; largest and most specialized operations; wealthy	Closest contact with scientific information sources; interaction with other innovators; relatively greatest use of impersonal sources	Some opinion leadership; very cosmopolitan
Early adopters	"Respect"; regarded by many others in the social system as a role-model.	High social status; large and specialized operations	Greatest contact with change agents	Greatest opinion leadership of any category in most social systems; very localite
Early majority	"Deliberate"; willing to consider innovations only after peers have adopted	Above average social status; average-sized operation	Considerable contact with change agents and early adopters	Some opinion leadership
Late majority	"Skeptical"; overwhelming pressure from peers needed before adoption occurs	Below average social status; small operation; little specialization; small income	Secure ideas from peers who are mainly late majority or early majority; less use of mass media	Little opinion leadership
Laggards	"Tradition"; oriented to the past	Little specialization; lowest social status; smallest operation; lowest income	Neighbors, friends, and relatives with similar views are main information source	Very little opinion leadership; semi-isolated

Source: Everett M. Rogers, Diffusion of Innovations, page 185

to accelerate development. The challenge is to understand which external forces function with greatest expediency under the specific conditions imposed by the internal factors and to devise development strategies which make optimum use of each external source of influence.

Studies of the adoption process demonstrate that individuals pass through several stages of consideration before the process is completed.²⁵ The stages are labeled: awareness (initial exposure); information (motivated search for information about practice's merits); application (mental weighing of practice's pro's and con's); trial (test application); adoption (decision to continue or discontinue practice).²⁶ On the basis of the time, relative to the time of others under similar conditions, a person adopts the new idea or practice, researchers assign him to one of five adopter categories: innovator, early adopter, early majority, late majority, laggard.

At each stage of consideration, each category of person is influenced in his decision process by certain external factors. These factors can be grouped as Personal Contacts and Impersonal Influences.²⁷ Personal Contacts are face-to-face encounters between the individual considering adoption and other people - specifically in this study, friends, neighbors, relatives, extension agents, bankers and commercial dealers. Impersonal Influences are such sources of information as radio, television, newspapers, magazines and pamphlets. An individual's awareness of economic conditions (land prices, input costs, market stimuli, etc.) may also be relevant to his adoption practices.

Rogers suggests in Modernization Among Peasants that a more precise dichotomy than personal/impersonal might be localite/cosmopolite sources

of information (Table 2). The latter refers to the place from which the information source originates (inside or outside of the local community). Most studies continue to use the former classification. Each source of information, personal/impersonal, localite/cosmopolite, is influential to the adoption process. The degree of influence it exercises depends largely on the type of person considering adoption and his particular stage of consideration.

Personal Contacts

The people who influence a farmer through personal contact to change or not to change his attitudes and practices are classified by him into one of two groups - peer or professional. Members of the professional group are called change agents and are usually, by nature of their employment with a change agency, removed from the farmer's peer group (friends, neighbors, relatives). The change agent's training and employment can serve to increase his technical credibility in the eyes of the farmer. However, his distance, social, economic and often geographic, from the farmer may create serious blocks to effective, influential communication. Several studies show less cosmopolite farmers (who tend to be operators of smaller farms, later adopters) rely more on their peer group for advice and sanctions than on the professional group (Asher, 1962; Havens, 1970; Leagans and Lormis, 1971; Lerner, 1958; Lionberger, 1960; Rogers, 1958, 1962, 1969, 1971).

Havens and Rogers both found in their studies of Columbian peasants that localite sources of information (neighbors, friends) were more important at each stage of the adoption process than were cosmopolite sources (dealers, agents). Earlier adopters did gain technical information from

TABLE 2

**Categorization of Illustrative Channels as Localite/Cosmopolite and
Interpersonal/Mass Media**

Nature of Channel	Point of Origin	
	Localite	Cosmopolite
Interpersonal	Neighbor Village council Relative	Extension agent Wandering storytellers Salesman
Mass Media	Village newspaper Wall posters	Radio Television Cinema City newspaper

Source: Evertt M. Rogers and Lynne Svenning, Modernization Among Peasants, page, 128.

cosmopolitan sources at the awareness and trial stages. Since their peer group had no practical "how-to" knowledge to share, the earlier users were forced to consult salesmen or extension agents. From this observation Roger's generalizes that,

Interpersonal cosmopolite channels are more important in creating technical knowledge about an innovation than in forming favorable attitudes toward the new idea; . . . cosmopolite communication channels are more important at each stage in the innovation decision process for earlier than for later adopters. . . 28

Havens and Flinn discovered in their Columbian study that of seven variables measured the information-seeking patterns of the farmer had the highest significance in relationship to his adoption time. Happily for development strategists, Havens notes that of the seven variables, information-seeking patterns are most "subject to manipulation by change agents."²⁹ If the professional group can communicate in a meaningful way with the farmer and can demonstrate its credibility, Havens observes, then farmers "are more willing to use new farm innovations."³⁰ (Table 3)

The problem of communication between farmers and professional change agents is particularly acute in developing societies. As Havens found, professional communication and guidance is vital; yet as other researchers have discovered, such communication is most difficult to achieve in many instances, particularly with small farm operators and later adopters.

Researchers such as J. M. Brewster, who view traditionalism among peasants as the principal impediment to development would argue that professionals cannot communicate frequently or effectively with farmers until rural attitudes and values become less tradition bound. Rosen and McClelland too would no doubt contend that the problem of communication between peasant and professional is intrinsic to the peasant's psychological perspective.

TABLE 3

The Relationship Between the Time of Adoption of Innovations and
Seven Selected Variables

Variable	Relationship of variable to Time of Adoption
1. Age	. 188
2. Education	. 178
3. Farm Size	. 199 ^a
4. Communication sources employed	. 292 ^b
5. General knowledge	. 310 ^b
6. Information-seeking patterns	. 472 ^b
7. Participation in voluntary associations	. 323 ^b

N = 100

^aSignificant at the 5 percent level.

^bSignificant at the 1 percent level.

Source: A. Eugene Havens and William L. Flinn, Internal Colonialism and Structural Change in Colombia, page 37.

According to them the peasant must acquire a new outlook before substantive communication leading to change can occur.

Other researchers hold the professionals responsible for their inability to gain the respect, trust and attention of the farmer in developing societies. Carl Taylor writes,

The vast majority of people who work with village people do not really communicate with them at all, and I think it is more than a hypothesis to say that the reason they do not is because they do not understand the images and precepts of villagers . . . I am so convinced that practically no communication takes place that I am sure there is no other topic that is more important to study than this.³¹

Roger's asserts that "change agents must have knowledge of their clients' needs, attitudes, and beliefs, their social norms and leadership structure if programs of change are to be tailored to fit the clients."³² Such an assertion accentuates Taylor's cause for concern.

Participants in the Small Farm Development conference (Ohio State, September, 1971) concluded that,

A major factor in the success of Small Farm Development programs is the presence of a trained and motivated cadre of technicians who identify with rural poor and appreciate their potentials. It often takes a significant change in technicians attitudes toward small farmers to successfully carry out Small Farm Development. This attitudinal change may be more difficult to effect than changes in attitudes of peasants toward change.³³

Research conducted by Deutschmann et al. among Latin American professional change agents substantiates the conferee's conclusion that technicians themselves need to undergo a change of perspective.

Deutschmann found that the majority of change agents perceived their peers, or those farmers possessing characteristics of the agent's peer group, to be most receptive to change. The agents felt that people of low social status were least receptive. An examination of these findings showed

that "perception of receptivity of persons...was...strongly associated with frequency of communication with them," by the change agent.³⁴ In other words, just as the peasant places greatest confidence in those people with whom he associates most, neighbors, friends, and relatives, so too the professional feels most akin to the people whom he encounters most frequently.

Frequency of contact between farmer and change agent appears to be vitally linked to the agent's own feelings about the particular farmer and the farmer's attitude toward the process of development which the agent represents. A study of adoption of nitrogenous fertilizers among North Indian farmers (Moulik, Hrabouszky and Rao, 1966) showed that:

the more favorable a man's attitude toward fertilizers, the more he knows about them, the more he exhibits a general tendency towards accepting innovations, and the closer he feels to extension agents, the higher will be his adoption score.³⁵

Extent of change agent and client contact is no doubt one of the crucial determinants of the adoption process.

Unfortunately peasants and professionals tend to seek out their peers for practical information and psychological re-enforcement. Change agents do appear to communicate most with persons of their status--who generally happen also to be the larger farmers and earlier adopters. Fortunately professional sources of information are people who can be educated to understand other people's situations and can accept new approaches to old problems. As an external, human variable, rather than an internal structural variable, personal sources of influence could possibly be manipulated to fulfill the goals of the development process.

Impersonal Influences

"The modernization process," writes Daniel Lerner in The Passing of

Traditional Society, "begins with new public communication--the diffusion of new ideas and new information which stimulate people to want to behave in new ways." ³⁶ The mass media, specifically radio, television, newspapers, magazines, are fast infiltrating even the remotest hamlets in developing societies. In earlier eras (as late as the mid-60's) the local coffee house functioned as the center of evening card games and conversation for village males. Today it hosts the village radio and in frequent cases, T.V. Personal and localite sources of communication have been supplemented by the impersonal, cosmopolite channels of radio and television. For developers the important questions may be: to what degree can the mass media supplant interpersonal communication, or how can one source best complement the other?

Studies thus far suggest that the mass media's role is both supplemental and complementary, to interpersonal communications, but the farmer cannot truly be said to replace the need for the latter in the development process (Deutschmann, 1968; Havens, 1970; McNelly, 1966; Lerner, 1958; Rogers, 1969, 1971). Rogers and Deutschmann both found in their work in Latin America that the mass media are quite useful for establishing an atmosphere or environment favorable to change, but that most actual decisions to change are based on personal communication encounters. Both also discovered that of the people who first heard of an innovation via the mass media, rather than by personal sources, the majority were early adopters. Fett reached the same conclusion-- that among farmers in Southern Brazil, the most innovative persons (earliest adopters) were the most attuned to frequent use of the mass media. This is true also in the United States where farmers often first hear of a new practice through the mass media.³⁷

Havens and Flinn found among middle-sized farmers (15 hectares average) in Columbia, the major source of information about innovations was friends and neighbors. The Latin American change agents interviewed by Deutschmann et al. reflected Havens' findings. The professional respondents "rated radio and T.V. equally--and not very highly--as sources of information useful for introducing technical change. The mean rating fell between 'little' and 'some' usefulness" in effectiveness for disseminating change information.³⁸

Rogers suggests a primary problem of mass media in developing countries is one of programming or reporting which is geared to urbanites rather than the rural sectors. Supportive of Roger's suggestion are McNelly's findings which show that "among the twenty Latin American countries, we find newspaper circulation per capita correlated .89 with urbanization, .182 with literacy, .80 with per capita income, and -.88 with percentage of population employed in agriculture."³⁹ Farmers, regardless of educational attainment, social status or land holdings appear to be least touched by newspapers.

Radio programs, while extending into the hinterland, usually originate in the urban centers. To help overcome the communication and consequent credibility gap between broadcasting media and farmers, Arthur Mosher proposes the use of locally known extension agents as broadcasters for programs aimed at villagers since the suggestions of a "known" person are most likely to be given attention and consideration.⁴⁰ This assumes that the suggestions offered will be geared to the needs and level of comprehension of the village audience. Clearly the mass media may be a vital tool for change programs in developing countries. However, as Roger's concludes, "it appears

that the modernization effects of mass media communications among peasants in less developed countries are greater when these media are coupled with interpersonal communication.⁴¹

Economic Institutions

Economic institutions--market stimuli, land tenure, credit and banking facilities, price information and product grading organizations, transportation and input factor provisions--may, like the mass media, function as impersonal sources of change information and influence. As in the case of the mass media, the messages transmitted by the economic institutions may be expected to be received and understood differently by the various types of farm operators.

When planning extension programs aimed to influence change, economist Arthur Mosher cautions developers to remember,

Purposeful efforts to bring about behavioral change are superimposed on . . . ongoing 'autonomous' behavioral changes . . . farmers within limits set by cultural values, respond to price changes. They learn from each other.⁴²

Programs devised by economic institutions to change the production practices of farmers may only be effective when they are planned to complement rather than to compete with existing psychological and sociological conditions.

Theodore Shultz repudiates this suggestion and contends, "the rate of acceptance of a new agricultural factor by farmers in a poor community is best explained by the profitability of adopting and using the factor."⁴³ Baldwin agrees with Shultz that the provision of economic incentives is vital but he adds:

. . . merely providing economic opportunity is (not) enough to achieve development. This is another simple view that is being

discredited by recent experience. At one time many thought land reform to be the key to agricultural development . . . Now it is realized that land reform can be disastrous without concurrent programs to train farmers to direct their own agricultural operations, to provide credit facilities for new land owners, to furnish these farmers with appropriate market and technical information, etc. Likewise juggling a few marketing board prices may be an important part of a rural development effort, but by no means should it be all there is to the program.⁴⁴

Baldwin's contention is not that farmers in developing societies will not respond to incentives presented by economic institutions, as has been claimed particularly by colonial administrators. His point is, farmers may not know how to respond or have available the resources to allow a response to altered economic policies and new technology. If adequate product price information for all area markets is not diffused to all types of farmers, market stimuli may benefit only farmers with cosmopolite connections. New technology, improved seeds, fertilizers, etc. will have little chance of being tried by small farmers lacking personal savings or credit resources. Farmers in relatively isolated areas may be unable to afford the expense of transporting improved input factors to their farms or transporting their products to higher paying distant markets. Economic institutions may need to do more than offer incentives, they may be required to demonstrate the effectiveness and provide means for reducing the additional costs of their incentives for change.

In an article, "The Sequence from Invention to Innovation and Its Relation to Economic Growth", W. Rupert MacLaurin stresses, "careful study is needed of the institutional arrangements which are most conducive to the flourishing of all major elements of economic growth" if economic

development is to occur.⁴⁵ The same study of how institutions operate to help or hinder the economic growth of individuals may be imperative also. The manner in which agricultural institutions and their representatives relate to the individual farmer may determine the farmer's response to suggested change and his capacity for action.

Bert Hoselitz emphasizes that the presence of a "banking system or its equivalent . . . is required," before an economy can leap into Rostow's "take-off" stage of development. On the micro level, the same type of facility must be available to the farmer before he can commence his personal economic "take-off" out of a subsistence existence into a state of surplus production.

Economic institutions, particularly market stimuli, may be vital ingredients in the development process. But it appears that they cannot be used to their fullest potential if isolated from other change prompting forces. Nor will economic factors be extremely effective if they are created for and applied to all types of farm situations in the same form.

3. Summary of Related Studies on The Process and Communication of Change

Six factors which may be influential to the process of agricultural development for the individual farmer have been discussed. Three, age, literacy and farm size are designated "internal factors" because they determine the situation from which the farmer commences any change process. The first two factors, age (unalterable) and literacy (difficult to alter) do not seem greatly to affect the propensity to change. The latter, farm size (difficult to alter) may have considerable impact on the farmer's change practices, primarily because size of farm is related to social status which in turn influences communicational opportunities and access to

agricultural institutions (banks, credit sources extension agencies, etc.) This implies that farm size may be quite influential, although not necessarily causal to adoption.

Three "external factors" (manipulable forces) discussed are personal contacts, impersonal influences and economic considerations. Extent and type of personal contacts appears to be the most relevant factor at all stages of the adoption process. Operators of large farms have more frequent contact with professional agents of change than do smaller farm operators who seem to rely heavily on peer group contacts. Large, medium and small farm operators use the mass media (impersonal influence source) ... a source which like economic factors may have more effect in establishing an environment conducive to change than in inducing change itself. Manipulations of the mass media and economy appear to be most effective when accompanied by a strong cadre of sensitive, well-trained professional change agents amiable to providing technical information and encouragement to all types of farm operators.

Hypotheses

The preceding discussion suggests three statements which may be descriptive of the agricultural development process:

- 1) The propensity to try new technological practices is more highly related to size of farm than to the farm operator's age or level of education.
- 2) Farm size is related to the farm operator's use of the mass media, economic institutions, and personal sources of agricultural information.

- 3) Personnel of the agricultural service agencies have more frequent contact with and exhibit a greater perception of the agricultural problems and attitudes of operators of large and medium than small size farms.

Test hypotheses used to measure the accuracy of these statements are listed in Appendix 4.

NOTES

1

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2

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3

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4

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5

Everett M. Rogers, and Floyd F. Shoemaker, Communication of Innovations, A Cross-Cultural Approach (New York: The Free Press, 1971), p. 186.

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E.A. Wilkening, Joan Tully, and Hartley Presser, "Communications and Acceptance of Recommended Farm Practices Among Dairy Farmers of Northern Victoria," Rural Sociology (No. 27, June, 1962), pp. 116-197.

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John Photiades, "Motivation, Contacts and Technological Change," Rural Sociology (No. 27, September, 1962), p. 326.

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9

Robert Asher, Development of the Emerging Countries (Washington, D.C.: The Brookings Institute, 1962), p. 86.

10

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11

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12

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Chapter III

Methodology and Procedure

The Sample

The present study is one part of a large research effort pertaining to "Rural Capital Formation and Technological Change" which is being conducted in Brazil by the Ohio State University through a contract with the United States Agency for International Development (USAID). The initial research sample and design were developed and implemented by agriculturalists of the Ohio State University Department of Agricultural Economics and Rural Sociology. During 1971, in cooperation with faculty and graduate students of the Escola Superior de Agricultura (ESALQ), University of Sao Paulo at Piracicaba, Ohio State researchers conducted a study oriented toward the economic factors influencing Farm Level Capital Formation in the state of Sao Paulo, Brazil.

In 1972 rural sociologists from Ohio State University worked with the ESALQ faculty and graduate students in conducting a sociological study of the same area covered in 1971 by the economic survey. With a few modifications, the sociological study used the research sample defined by the economist's survey. The present study is based on data collected during the 1971 and 1972 research efforts. While the research sample has been adapted to this study, the methodology is, of course, essentially inherited from the two larger previous field studies.

The methodology and procedure for the 1971 study will be enumerated. The 1972 modifications will be described and the adaptations for the present study will then be explained. For a more complete discussion of

the sampling technique determined by the initial economic research on which the sociological studies are based, see Wessel and Nelson.¹

1. Selection of Sample Area

Agriculture is crucial to the economic and social development of Brazil. In an attempt to understand the process of agricultural development in Southern Brazil, two southern states, Santa Catarina and Rio Grande do Sul have been studied as part of the Ohio State Capital Formation research project. The state of Sao Paulo, also located in the south, clearly manifests the importance of agriculture. Its agricultural importance and southern location determined the selection of the state of Sao Paulo as the third area to be examined by the project.

The state of Sao Paulo is divided into nine DIRA. Ribeirao Preto, located geographically and economically in the heartland of the state's and country's agriculture, is the DIRA from which project data have been collected. Ten of Ribeirao Preto's eighty municipios provided the sampling population for the initial research: Altinopolis, Barretos, Batatais, Colombia, Guaira, Jardinopolis, Pontal, Ribeirao Preto, Sertaozinho, and Sales de Oliveira (Map 3).

The ten municipios were chosen because they displayed several characteristics vital to the research project:

- 1) Each municipio contains farms specializing in one or a few enterprises: Altinopolis and Batatais -- coffee and dairy; Barretos and Colombia -- beef cattle; Guaira, Jardinopolis, Ribeirao Preto, and Sales de Oliveira -- one or more annual crops; Pontal and Sertaozinho -- sugar cane.

REGIONAL AGRICULTURAL DIVISIONS of RIBEIRAO PRETO

Agricultural Sub-regions

ARARAQUARA

BARRETOS

BEBEDOURO

FRANCA

ORLÂNDIA

RIBEIRÃO PRETO

SÃO CARLOS

TAQUARITINGA



area 3.611.252 hectares

Map 2

- 2) Farms cultivating the other major crops of Sao Paulo also are present within the municipios (i.e. cotton, rice, potatoes, etc.).
- 3) Farms of the same enterprise group are relatively homogeneous in terms of soil type, soil quality, and topography.
- 4) An active agricultural field agent resides and works within each of the ten municipios -- a situation present in only fifty of the eighty municipios. These agents expressed an interest in participating in the research project.
- 5) The interview team could locate in three different towns and could reach most of the farmers in these municipios without extensive travel.

2. Drawing of Observations

To allow for stratification by farming enterprise and size of farm operation, the sampling procedure was based on six criteria:

- 1) The farm sample was randomly selected without bias toward progressive or traditional farm operators.
- 2) The sample was stratified according to size of farm. Farms of less than ten hectares were discarded because researchers suspected they were not indicative of viable farming operations. Farms larger than 3,000 hectares were excluded because they were felt to be inclusive of most of the non-farming enterprises and absentee ownership.
- 3) The sample was stratified according to farm enterprise.
- 4) The farms had to be owner-operated as opposed to renter-operated.
- 5) More than fifty percent of the land had to be utilized in some

productive enterprise. This eliminated land held for speculative purposes.

- 6) The sampling procedure was to facilitate making precontacts and the interviewing.

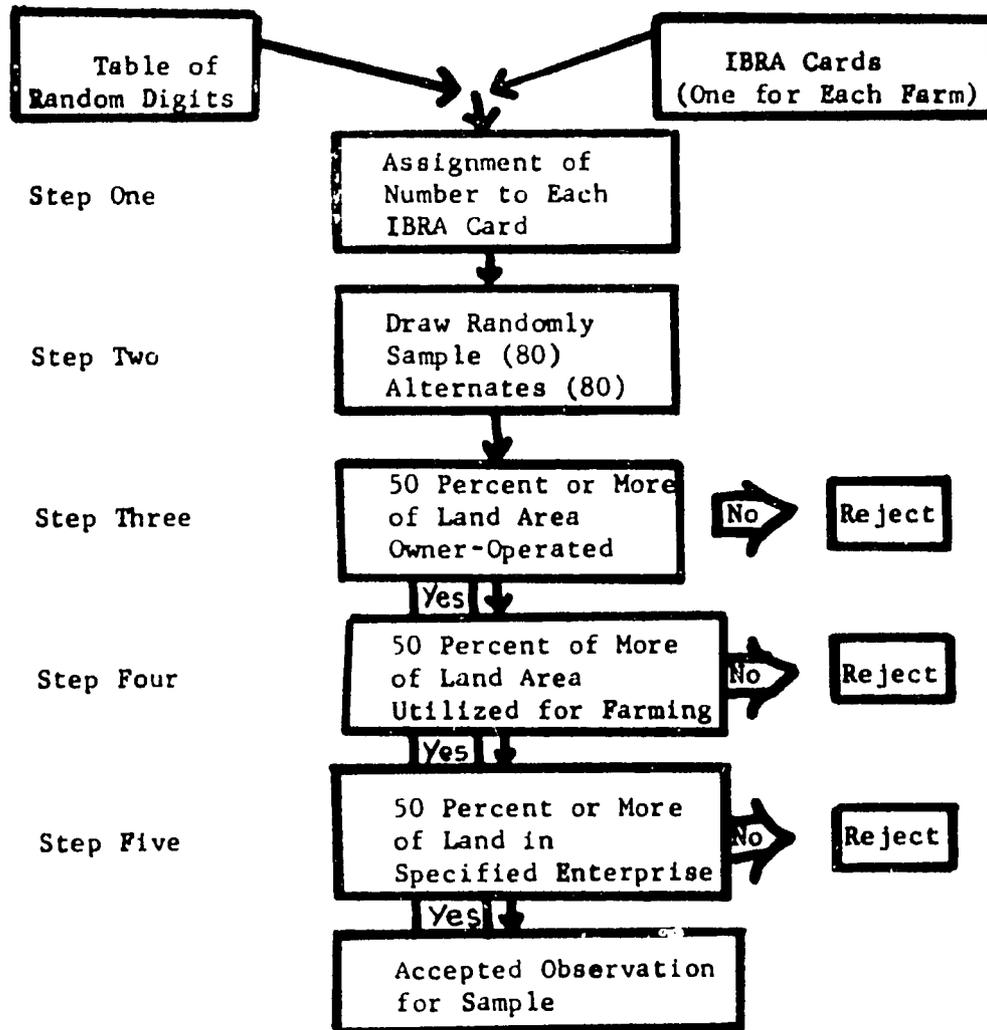
The list of the total farm population was obtained from the files of IBRA (Instituto Brasileiro de Reforma). These files register data on every individual property in Brazil and include location of farm, owner's address, type of ownership, educational level of owner, family size, labor force, land use, value of crops and credit use. Unfortunately, the most recent IBRA survey was in 1966 and despite a law requiring farmers to register any change in farm operation or family or property status, the IBRA files are not always complete or current. However, the project coordinators felt these files provided the most reliable data from which to draw a two way stratified (by size and enterprise) sample of farms in Ribeirao Preto.

The sampling technique, for selecting from the IBRA files the farmers to be interviewed, involved five steps (figure 1):

- 1) Every farm within each of the three size strata (small, medium, large) was assigned a number on its IBRA card.
- 2) A random table of numbers was used to select eighty farms and eighty alternates from each size stratum.
- 3) Landowners not operating fifty percent or more of their land were rejected and a replacement was drawn.
- 4) If fifty percent or more of the land area was not cultivated, the farm was rejected and a replacement drawn.

Figure 1

DIAGRAMATIC PRESENTATION OF SAMPLING TECHNIQUE



Wessel and Nelson, "Methodology and General Data Description: Farm Level Capital Formation in Sao Paulo, Brazil," December, 1971.

- 5) If less than fifty percent of the utilized land was not devoted to a specified enterprise, the farm was rejected and a replacement was substituted.

This process was used to obtain a total of 549 farm observations which were stratified by enterprise (as listed on the IBRA card) as well as by size. Forty-nine of the observations were eliminated to allow more even distribution among enterprises. Of the five hundred remaining farms, approximately one hundred specialized in sugar cane, one hundred in coffee, one hundred in pasture, and two hundred in annual crops. In each of these enterprise groups, the observations were divided approximately the same among the three size strata.

The five hundred sample farms were expected to yield about four hundred acceptable interview schedules. For reasons detailed by Wessel and Nelson,² only 205 observations yielded valid schedules. Therefore, "another 178 interview schedules had to be completed from outside the original predetermined sample. These replacements were drawn in the field, but did not always adhere to the same strict criteria as for the original sample."³

The present study examines a second group of observations, agricultural service agency personnel in addition to the farm sample selected for the entire project. The former group represents the total population of agricultural service personnel present in the ten municipios during 1969-1970. Twenty-nine bankers, eight extension agents, and sixteen fertilizer dealers comprise the population. It may be argued that these particular personnel are really a sample of all personnel who have or

will serve in these areas. The present study will, however, consider them not as a sample, but as a population, since it is to their specific agencies and current practices (1970) that this study wishes to apply the descriptive results.

3. Modifications In Sample Data for the Sociological Studies

The 383 farm observations drawn for the capital formation sample in 1971 were to be re-interviewed for the sociological study in 1972. For the following reasons, only 311 farmers were interviewed: ⁴

- 1) The farmer was not found after two or more visits.
- 2) The farmer had changed residence, moving to a distant city.
- 3) The farmer had sold his land and left the municipio.
- 4) Some names were not recorded on the 383 economic schedules.
- 5) Seven farmers refused to be re-interviewed.
- 6) The farmers in the municipio of Sales de Oliveira were not included in the second sample since there were only nine.

The present study further narrows the sample field to 285 farmers. (Table 4) Twenty-six observations were eliminated during the process of assigning farm operators to one of six adoption categories (process will be described later). The twenty-six farm operators were omitted because:

- 1) Five farmers had no responses coded for the data used to determine adoption category.
- 2) Twenty farmers belonged to enterprise groups whose total sample was too small to use for an adoption score calculation.
(Enterprises and number of observations omitted were: oranges,

Table 4: Distribution of 285 Sample Farms by Município and Principal Crop (crop planted on more than 50% of cultivated land per farm), Sao Paulo, 1972.

Município	Principal Crop						Total
	Cotton	Rice	Coffee	Sugar Cane	Corn	Soybeans	
Altinópolis	0	1	29	0	0	0	30
Barretos	1	20	1	0	5	0	27
Batatais	0	12	18	0	8	0	38
Colombia	0	6	0	0	2	0	8
Guaira	26	6	0	0	26	14	72
Jardinópolis	17	4	0	2	24	0	47
Pontal	0	0	0	22	0	0	22
Serataozinho	<u>1</u>	<u>0</u>	<u>0</u>	<u>39</u>	<u>1</u>	<u>0</u>	<u>41</u>
Total	45	49	48	63	66	14	285

two; lemons, four; mangos, three; other fruit, two; pasture, nine).

3) One observation had missing data cards.

The final sample used for the present study does not approximate the stratification according to size and enterprise desired by the original capital formation project. It does, however, provide adequate data for the descriptive purposes of the present study.

Data Organization

1. The Data Bank

Interviewing schedules for the capital formation study were completed during July, 1970, at the termination of the harvest season for all crops except coffee and sugar cane. Production data for these two crops correspond to the 1969 harvest rather than the 1970. The interviewing schedules for the sociological study were completed during February, 1972. Data contained in these schedules refer to 1971 situations.

Both the economic and sociological studies used employed Brazilian residents of the state of Sao Paulo to interview the farm operators. All responses were checked in the field for internal consistency, error and clarity. After the responses were coded on IBM cards and magnetic tapes, the data were again checked for consistency and accuracy against the original questionnaires.

Each farm observation was assigned an identification number permitting its classification by type of land tenure arrangement (ten types), land area (three strata sizes), type of farming (nine different enterprise specialities), and municipios (ten).

The agricultural service personnel were interviewed by Brazilian and Ohio State interviewers. These responses too were checked carefully in the field before being coded and recorded on IBM cards and magnetic tapes. Data are representative of the personnel employed by the agencies in 1970.

2. Assignment of Adopter Categories

Every farm observation has been assigned to one of six adopter categories for the present study. As was explained in the Introduction (page 13) this study uses a modified form of the adoption classifications established by Everett M. Rogers. The adoption scores (trial series would be a more precise designation) have been calculated from the farm operator responses to a series of questions administered during the 1970 capital formation survey. Each farm operator was asked the year he first tried the following technical practices for his major crop: having the soil analyzed, applying lime, applying organic fertilizer, using improved seed, applying insecticide, herbicide, formicide and fungicide. The coding permitted years 1901 through 1970 to be represented on the IBM farm data card. If a practice had never been tried, 99 was coded. Five farmers who had the score zero (missing data) or 99 for every practice were omitted from the study. The remaining 285 observations were separated into six adopter categories based on their major crop.

To ascertain the range of trial years for every technical practice, a print-out of farm responses was obtained. By technical practice, the years for each trial range were divided into nine groups, the maximum allowed by the program used to compute frequency distributions. A frequency distribution of farmers, by major crop, was obtained for each

of the nine "trial year one" groups (table 5). For some crops, certain practices were shown to be obviously inapplicable (such as use of organic fertilizer for all six crops) and were omitted for that particular crop. The print-out showing the frequency distributions also gave the mean score and standard deviation for the nine "trial year one" groups.

Using the mean and standard deviation scores, an adoption score (one through five) was assigned to each "trial year one" group -- the scores were figured individually for each of the six crop divisions. The year division containing the mean score received the adoption score of three. The year division one standard deviation to the left of the mean received a two, and any divisions beyond one standard deviation to left of the mean were given scores of one. The adoption score, four, was assigned to the groups one standard deviation to the right of the mean; the score, five, was given to groups two standard deviations to the right of the mean (table 6).

The adoption scores for each "trial year one" group were read into the computer which substituted the appropriate scores for the "year one scores" on each farm observation. A print-out then listed each farm observation and gave the farmer's adoption score for each technological practice. Observations were listed by enterprise groups. If no trial had ever occurred, a score of six was listed. The scores for each farmer were totaled and the sum divided by the number of practices appropriate to his particular enterprise. Using a calculator, this process yielded an adoption score for each of the 285 farm observations (tables 7, 8). The entire process is illustrated by Figure 2.

Table 5: Crosstab of Major Farm Crop by Year Farmer First Used Improved Seed

(Example of Computer Print-Out Obtained for all Practices)

First Year Improved Seed Used and Number of Users											
	2	3	4	5	6	7	8	9	Totals	Mean	S.D.
Crops:	1945	1950	1955	1958	1961	1964	1967	1970			
1 Cotton	2 ①**		4 ②	4 ②	7 ③	6 ④	8 ④	9 ⑤	40	6.7250	1.9610
2 Rice			2 ①	1 ①	7 ②	1 ③	8 ④	7 ⑤	26	7.2692	1.5889
3 Coffee			5 ②		5 ③	3 ④	7 ④	5 ⑤	25	6.8800	1.7870
4 Sugar cane		1	1	2	4	4	8	10	30	7.4333	1.6543
5 Corn		1 ①	6 ①	4 ②	12 ③	11 ④	19 ⑤	7 ⑤	60	6.8500	1.5604
6 Soybeans		1 ①			2 ②	1 ②	3 ④	7 ⑤	14	7.7857	1.7619

* Typed information given by computer. Handwritten material added by author.

** Adoption Category

Table 6: Technological Practice: First Year Used, Score Received by Users for Each Year. (Figured for all Six Crops)

CROP:						
SOYBEANS: 14 total users						
Soils Analyzed: 10 yes, 4 no: number in parenthesis is number of users, number beneath is adoption score.						
Yr.	50/51 (1) *	64/65 (1)	66/67 (1)	68/69 (3)	70 (4)	99 (4)
X	1 **	2	3	4	5	6
Lime App: 10 yes, 4 no						
Yr.	55/56 (1)	60/61 (1)	64/65 (1)	66/67 (1)	68/69 (5)	70 (1)
X	1	2	3	3	4	5
Impseed Used: 14 yes						
Yr.	50/51/52/53/54 (1)	61/62/63 (2)	64/65/66 (1)	67/68/69 (3)	70 (7)	
X	1	2	3	4	5	
Insecticide: 14 yes						
Yr.	55/56/57/58/59 (1)	60/61/62 (1)	66/67/68/69 (2)	70 (10)		
X	1	1	3	4		

* Number of farm operators in category

** Adoption Score for farm operators in category

TABLE 7: FARM I.D. NUMBER AND ADOPTION SCORE FOR EACH PRACTICE TRIED (EXAMPLE OF COMPUTER PRINT-OUT DONE FOR ALL SIX CROPS)

POSITION	LABEL		CROP	SOILS	LIME	IMPSEED	INSECT	
		<u>Score</u>						
1	L4502	4	10.	5.	6.	4.	4.	
2	L4503	2	10.	2.	1.	3.	3.	<u>Score Key</u>
3	L4512	5	10.	6.	6.	5.	4.	1.0 - 1.9 = 1
4	L4528	3	10.	5.	3.	4.	3.	2.0 - 2.9 = 2
5	L4535	5	10.	6.	5.	5.	4.	3.0 - 3.9 = 3
6	L4537	4	10.	3.	4.	5.	4.	4.0 - 4.9 = 4
7	L4542	4	10.	5.	4.	4.	4.	5.0 - 5.9 = 5
8	L4543	3	10.	4.	4.	1.	4.	Add variables 2,3,
9	L4548	5	10.	6.	6.	5.	4.	4,5 and divide sum of
10	L4549	2	10.	4.	3.	2.	1.	each row by 4 to obtain
11	L4554	5	10.	6.	6.	5.	4.	adoption score.
12	L4562	4	10.	5.	4.	5.	4.	
13	L4569	1	10.	1.	2.	2.	1.	
14	L4573	4	10.	4.	4.	5.	4.	

*Typewritten data produced by the computer. Handwritten material figured by the author.

Table 8: Distribution of 285 Sample Farms by Farmer's Adoption Scores and Principal Crop, Sao Paulo, 1972

Principal Crop	Adoption Score						Total
	1	2	3	4	5	6	
Cotton	1	4	12	19	9	0	45
Rice	1	2	1	12	23	10	49
Coffee	0	1	7	20	20	0	48
Sugar Cane	0	2	12	19	30	0	63
Corn	1	2	16	29	18	0	66
Soybeans	1	2	2	5	4	0	14
Total	4	13	50	104	104	10	285

Figure 2

DIAGRAMATIC PRESENTATION OF ADOPTION SCORE ASSIGNMENT

1. Questionnaire responses selected
2. Print-out of selected responses
3. Elimination of farmers with no responses to selected questions (26)
4. Range of trial years for each practice determined
5. Farm observations divided into six enterprise groups
6. Print-out of frequency distributions for first year each practice used
7. Omission of inapplicable practices for certain groups
8. \bar{X} and SD from frequency distribution used to assign adoption scores to year groups
9. Scores read into computer; print-out for each farm observation with farmer's score for each practice by year first used
10. Scores for each observation totaled and divided by applicable number of practices used.
11. Final result = farm operator's adoption score

Instrumentation

Three questionnaires provide the operational basis for the variables examined in the present study. All data were obtained through field interviews conducted during the capital formation project (Wessei, Nelson) in 1970 and the sociological study (Kayayan) in 1971. The questionnaires administered in 1970 to the farm sample and the agricultural service personnel were designed by economists of the Ohio State University Department of Agricultural Economics and Rural Sociology. (appendices 1 and 2) The questionnaire administered to the farm sample in 1971 was created by rural sociologists, including the author of the present study, of the same department at Ohio State. (appendix 3) Both farm sample questionnaires were pre-tested in the field (Sao Paulo state) as part of the interviewers' training. Farmers participating in the pre-test were not members of the sample group.

Eight interviewers, of sixteen applicants, were selected after a two day training program. The program included the following:

- 1) Introduction of the research team and an explanation of the research goals;
- 2) Explanation of the nature of a sociological study;
- 3) Explanation of the role of the interviewer;
- 4) Interviewing techniques and team work;
- 5) Possible problem situations to be expected;
- 6) The importance of the research to the area and to Brazil.

After the training sessions, the eight interviewers were selected on the basis of five criteria:

- 1) Availability throughout the interviewing period;
- 2) Educational level;
- 3) Age;
- 4) Performance during training "public" and "private" interviews;
- 5) Team work spirit.

With the exception of farm size and adoption score, all variables were quantified by the responses of the interviewee as recorded by the interviewer. Farm size was obtained from the IBRA files as part of the basis for the sample selection. As explained previously, farms were stratified into three size groups on the basis of a priori knowledge. Procedure used to determine the adoption scores was outlined in the previous section.

In order to quantify the perception of farmer's problems and attitudes by the agricultural service personnel, identical questions regarding agricultural problems and practices were given to both groups. A comparison of the respective responses is used to ascertain their agreement with each other. Perception is measured by the extent to which the service personnel show agreement with the farmers' responses.

Analytical Procedure

The analytical procedure used to determine the association of the dependent variable, (farm size) with the independent variables (listed in appendix 4) involves two methods: the Kendall Rank Correlation Coefficient (τ), and the Chi-Square. The conditions under which each method is applied are presented, accompanied by an example, in this section.

1) The Kendall Rank Correlation Coefficient (t)

The Kendall "tau" coefficient of correlation indicates the degree of association between two variables. This coefficient "t" was computed for twenty-one variables against each other for three different combinations of the farm observations. The first computation was for all 285 observations which included small, medium and large size farms. The second computation involved the 140 large and small farms and the third used the 240 large and medium farm size groups.

Three sets of correlations were computed to differentiate the responses among the farm size groups. Because it is hypothesized that there is a higher degree of association between certain variables (see appendix 4) as farm size increases, it was believed that obtaining three separate sets of correlations would emphasize any differences in responses due to the size variable.

For example, the "t" value for Set 1 (the 285 observations) between farm size and adoption score was computed as 0.1839 (significant at .001). The "t" values between the same variables as above for Set 2 (small and large farms) and for Set 3 (medium and large farms) was computed to be .2521 (significant at .001) and .1588 (significant at .001) respectively. The "t" values for Set 2, large and small farms, were found generally to be larger than those of Sets 1 and 3 between all variables as shown in appendix 4.

3) The Chi-Square

The chi-square (χ^2) determines the significance of differences

among independent groups. In the present study these independent groups are the three farm size categories. The X^2 was computed for eight variables by the three categories. The purpose was to ascertain if the operator's responses to questions about agricultural problems were significantly related to the farm size. In no case was any significance demonstrated.

The X^2 was calculated for the variables of farm size and problems obtaining lime for the farmer's major enterprise. The X^2 was .9379 with two degrees of freedom. On the basis of this particular statistical method, the test hypothesis that, "Size of farm will correlate negatively with input problems," would have to be rejected. As shown in appendix 4, the hypothesis was actually accepted on the strength of the findings observed in the percentage distribution.

4) Observation of Percentage Distribution

No statistical methods of analysis per se were applied to test hypotheses 'q' through 'y' of Hypothesis II, nor to test hypothesis 'c' of Hypothesis III. For these hypotheses as well as for test-hypothesis 'b' under Hypothesis III, tables showing the responses of farm operators to particular questions were constructed by the computer on a frequency distribution program. The tables categorized the responses by the three farm sizes (small, medium and large) and gave the data in terms of percent of farm operators in each size group who responded in a given manner (table 9).

While no statement can be made about the statistical significance

TABLE 9: Farm Operator Responses by Farm Size Category to the Question: "Do you have difficulty obtaining lime?"

Responses	Farm Size			Total
	Small *	Medium **	Large ***	
Yes	21 46.7	46 31.7	27 28.4	94
No	24 53.3	99 68.3	68 71.6	191
Total	45	145	95	285

*10-30 hectares

**31-200 hectares

***201-3,000 hectares

of differences among respondents in different groups, the fact that differences do occur and the patterns of their occurrence can be observed. Comments suggesting trends implied by these patterns would seem to be appropriate even in the absence of a statistical analysis.

The percentage observations serve two functions: 1) to point out any variations in the farm operator responses by farm size and 2) to illustrate which category of operators, by farm size, are giving responses most closely resembling those of the agricultural service personnel. For example, all farm operators were asked if farmers in their municipio had any problems obtaining lime for their enterprises. The extension agents (8) for each municipio were asked the same question. One hundred percent of the agents reported there were no problems obtaining lime in their municipio. Farm operator responses were: large-- 71.6 percent said, "no problem"; medium-- 68.3 percent agreed, "no problem"; small -- 53.3 percent reported "no problems." The hypothesis for this example was that farm size would be positively related to agreement, regarding problems with input purchases, between the farmer and extension agent. The observed percentage distribution of responses confirms the trend suggested by the hypothesis.

Limitations

The present study is plagued by a problem which is common to almost all survey research: the survey is extensive rather than intensive; the scope of information has been emphasized at the expense of depth.⁵ Because the Capital Formation Project is a "group project" both the economic and sociological surveys, on which the present study is based,

sought to obtain a great amount of data for a large number of people who did not always share the same research interests. As a result, the questionnaires for both surveys are long, questions tend to be un-related, and interviews were necessarily lengthy often lasting two hours. These factors may have influenced the degree to which respondents gave careful consideration to all questions posed to them.

The sampling criteria designated by the researchers in the 1970 survey precluded any possibility of generalizing the results of that particular survey, or any study based on it, to the total population of farm operators in Southern Brazil or even Sao Paulo. While this may not impose limitations on the economic study, a target population to which the sociological studies could generalize would have been more desirable.

Fortunately, the results of the present study are intended to be important as descriptors of specific situations rather than as predictors for generalization. The relationship existing between the population of agricultural service personnel and the sample of farm operators can be described, analyzed and evaluated in spite of the limiting factors of the total project's sampling procedure. (i.e. only forty percent of the original sample was accepted, the rest of the interviews were drawn in the field, as described in the "Sample Section" of the present study). Recommendations for improvement, re-organization or change in emphasis within the service agencies can still be suggested on the merits of descriptive data.

Likewise, while the present findings cannot be generalized to the population of farmers in Sao Paulo state, they can be used effectively

to describe trends and situations possibly present among most farm areas of similar socio-economic background to the ones discussed in the present study.

A final limitation of the present study may be the failure to include economic variables with the sociological variables. Since development is a socio-economic process, it is difficult to study one aspect, sociological or economic, in isolation. A stronger analysis of the farm situation would no doubt have been possible had economic factors been integrated with the sociological data.

NOTES

1

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Chapter IV

Analysis

The analytic framework of this chapter will be a two-part discussion of the three major hypotheses: (H_I) The propensity to try new technological practices is more highly related to the size of farm operation than to the farmer's age or educational level; (H_{II}) Farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information; and (H_{III}) Personnel of the agricultural service agencies have more frequent contact with and exhibit a greater perception of the agricultural problems and attitudes of operators of large and medium than small size farms.

The first part of the discussion will examine farm size and adopter categories as they relate to each other and to the farm operators' use of information sources. The twenty-nine test hypotheses of major hypotheses one and two will provide the data for this part. Hypothesis III and its ten test hypotheses will be used in the second part of the discussion which will explore the effect exercised by farm size on the relationship of the farm operator with the agricultural service agency personnel.

1. Descriptive Analysis of Farm Size, Adopter Categories and Information Sources.

As hypothesized, the present study shows that a farm operator's propensity to try new technological practices is not correlated with his age or level of education. These findings substantiate those of Havens and Flinn; Sturm and Riedl; Fliegel, Fett, Photiades, Wilkening, Tully, and Presser (referred to in Chapter 2, pages 26-28). Propensity to try new practices is related to the size of farm operation (appendix 4, H_I:1-4).

The relationship could be accounted for in three ways. New technology may lose its profitability or suitability as farm size decreases -- economies of scale may prohibit operators of small holdings from trial or adoption of technological advancements. This would not seem to be a likely explanation for the present findings since the technological practices employed to measure adoption propensity are all equally applicable and adaptable for use on any size of farm operation.

A second explanation might be that as farm size increases, farm operators acquire more access to the means (financial and technological) by which to obtain new practices for trial and adoption. Although no statistically analyzed data in the present study speaks directly to the possibility, based on a priori knowledge of the area surveyed and the percentage observation cited below, it seems highly probable that as farm size increases, so do the availability of institutional sources of financial assistance, personal funds and the ability to arrange for informal types of financial aid.

The present study found that when farm operators were asked if they could obtain institutional credit the responses were:

	Large Operators	Medium Operators	Small Operators
<u>yes</u>	<u>85.3%</u>	<u>85.5%</u>	<u>71.1%</u>
no	14.7%	13.8%	26.7%

The accuracy of these findings is questionable for the small operators since it is quite likely that many of the 71.1 percent who said they could obtain credit never have tried. The crux of explanation two remains -- operators of large and medium farms may be capable of securing the capital necessary to try new technological practices more

readily than operators of small farms.

One finding of the present study suggests that farm size does correlate with the practice of seeking economic information as a basis for making agricultural decisions (appendix 4, H_{II}:13). The hypothesis tested was that size of farm operation would correlate with the farm operator's practice of inquiring about the price paid for a product before selling. While not much difference is shown to exist between the practices of the large and medium farm operators, a significant difference is demonstrated between the large and small farm operators. From this it could be suggested that larger farm operators are more acquainted with the importance and procedures of securing such information.

Knowledge of the sources used to obtain price information is also vital to understanding the possible relationship between farm size and the financial capacity to try new practices. Table 10 gives a percentage breakdown, by farm size, of the sources used. "The firm" buying the product is the source most used by the farm operators reporting from all three groups. "Friends" are the second most frequently consulted source by large and medium operators ("Friends" rank third along with an "agent of the firm" for the small farmer); "the Cooperative" is of second importance to the small farm operator. These findings must be interpreted in terms of the social as well as economic structure of communicational relationships in the area surveyed.

When all three farm size groups report that "the firm" is the most important source of price information, this probably does not indicate that the particular firm provides the same kinds of information with the same frequency, intensity and concern to operators in all three farm

Table 10: Sources of Information about Prices Paid for Farm Products by Farm Size, Sao Paulo, 1972

<u>Information Source</u>	<u>Size of Farm</u>		
	<u>Small</u> (10-30)	<u>Medium</u> (31-200)	<u>Large</u> (201-3,000)
	<u>(Percentages)</u>		
1. Agent of Firm	11.1	9.0	13.8
2. From the Firm	30.6	32.1	21.8
3. Friends	11.1	11.2	17.2
4. Radio	0	8.2	3.4
5. Newspapers	8.3	9.7	12.6
6. Stock Exchange	2.8	1.5	4.6
7. Other Farmers	5.6	1.5	2.3
8. Market	0	9.7	8.0
9. Packer	0	0.7	2.3
10. Speculates Price	8.3	3.0	4.6
11. Extension Agent	0	0	1.1
12. Cooperative	13.9	7.5	3.4
13. I.A.A.	<u>8.3</u>	<u>3.0</u>	<u>3.4</u>
Total Percentages out of 100%	100.0	100.0	100.0
Number of Respondents:	45	145	95

size groups. Formal contact may not vary significantly by size of operation, although the Kendall's tau matrix for large and small farm operators shows a positive correlation between size of farm and frequency of contact with private firm fieldmen (appendix 4, HII: 3). Informal contact, however, for which this study has no measurement, may vary considerably when farm size increases.

As Deutschmann found in his Latin American study, professional change agents are usually members of the same peer group as large farm operators and consider those operators to be most receptive to new ideas.¹ The large farm operator need not seek out formal contact or information from agents of private or government agencies: he moves daily in their social and professional spheres and readily gains business information through his informal associations. The "friends" whom the medium and large size farm operators list as second in importance for providing price information are no doubt such professional people. For the small farm operator, the cooperative is the only non-commercial, professional source of price information available. His friends, whom he lists in third priority, probably have little basis for knowing anymore about product prices and optimum sales time than does he.

It could be suggested from this discussion that larger farm operators inquire more frequently than smaller farm operators about product prices for two reasons: 1) they make use of professional advice frequently for business decisions -- financial and technological -- and are aware of its value; 2) they have greater informal, daily access to the sources of such information than do operators of small farms.

The third explanation of the demonstrated relationship between farm

size and adopter category is that the knowledge of a new practice's existence, benefits and efficient use might become more prevalent among farm operators as farm size increases. The two channels by which such information is transmitted, in the area examined for the present study, are the mass media and personal information sources -- professional and non-professional.

As shown in appendix 4 (H_{II} : 1,3,5,7,9) the use of all mass media is positively correlated with farm size. This is especially emphasized by matrix two -- the correlation run with only the large and small farm operators. Between operators of medium and large farms (matrix 3), the differences in media access are not so pronounced. The most likely explanation for the gap between small operators' access and that of the two other groups is a financial one. Mass media are costly -- particularly T. V. and magazines which have the highest usage correlations with farm size. Small farm operators simply cannot afford to purchase magazines or own a T.V., or do not have electricity in the home.

Ironically, the importance attached to T. V. and radio as sources of agricultural information decreases as farm size increases. Two factors may account for this. Radio ownership has the lowest media usage correlation with farm size. Small farm operators apparently are able to obtain a greater volume of their agricultural information from the radio than any other media, therefore they rank it highest in importance. Secondly, the larger farm operators who own T.V. sets, own them for entertainment not for informational purposes. They rely on other channels for agricultural information. Smaller farm operators have limited access to T. V., but they have limited access to most insti-

titutional and structural sources of information. Therefore, they may be forced to place relatively high value on any source with which they do come into contact.

Importance assigned to information supplied by the printed media increases as farm size increases (table 11). Again this is most probably a function of availability -- not only financial (larger operators can afford magazines) but technological (smaller operators are more often isolated without transportation to centers where printed media are published and purchased).

In other words, mass media usage and farm size are positively correlated because larger farm operators are financially and technologically capable of higher exposure to all forms of the media than are the smaller operators. Importance assigned to information provided by the various forms of media does not necessarily correlate with availability of the particular medium because larger farm operators have access to many more sources of information than do smaller operators. Even though large operators have greater exposure to a certain type of medium, for example T.V., than do small operators, the former are not restricted to face-value acceptance of the medium's message. Large operators can consult several sources and compare the information. Small operators have less opportunity to explore the relative merits of one information source over another and are forced to accept without much examination the limited messages they receive.

Personal contacts may function as sources of agricultural information to supplement the mass media. The present study has grouped personal sources of information into two categories, professional and non-

Table 11: Farm Operators' Rankings of Mass Media Channels According to Their Provision of Agricultural Information in Sao Paulo, 1972

Source	Rank	Size of Operation		
		Small (10-30ha)	Medium (31-200ha) (Percentages)	Large (201-3,000ha)
Radio	1	4.4	1.4	0
	2	0	1.4	0
	3	6.7	4.8	0
	Total	11.1	7.6	0
T. V.	1	0	0	0
	2	2.2	1.4	2.1
	3	4.4	6.2	2.1
	Total	6.6	7.6	4.2
Newspapers	1	2.2	3.5	1.1
	2	2.2	3.5	3.2
	3	2.2	4.2	8.4
	Total	6.6	11.2	12.7
Pamphlets & Brochures	1	2.2	0.7	0
	2	4.4	1.4	4.2
	3	0	5.6	4.2
	Total	6.6	7.7	8.4
Magazines	1	0	1.4	2.1
	2	2.2	9.0	10.6
	3	17.8	17.2	23.4
	Total	20.0	27.6	36.1

professional (table 12). As in the cases of opportunities for professional advice (formal and informal) about product prices and exposure to a wide range of mass media, the use of professional contacts for information increases as farm size increases (table 13).

The explanation for this phenomenon is the same as was discussed earlier in this section: larger farm operators belong to higher social class and experience the related benefits of having peers in important places from which to provide market predictions, technical information and general agricultural advice. Table 12 indicates the formal patterns of communication reported by farm operators. With the exception of one practice, the consultation of a professional person increases with farm size. Table 12 does not provide a basis for discussing the informal patterns of advice-seeking, but it is quite likely that many of the non-professionals belong to the former's peer group and are therefore mentioned as friends. In terms of formal and informal personal information channels, the larger farm operator appears to have greater access to more highly qualified sources of advice than does the less socially mobile small farm operator.

As indicated by table 13, the smaller farm operators, even though they consult professional sources less than larger operators, still place high value on the information provided by these sources. Small farm operators rank "private individuals" as third in importance for supplying agricultural information. Yet small operators use this source more than either the media or professional advisors. That professional sources are preferred, but non-professional frequently used, would suggest that

Table 12: Confidants Farm Operators Used As Sources of Information Pertaining to Operational Decisions, Sao Paulo, 1972

Topic	Source	Size of Farm Operation					
		Small (10-30ha)		Medium(31-200 ha)		Large(201-3,000 ha)	
(Percentages Who Used Source)							
Important Business Decisions	<u>Non-professional</u>						
	Friends	55.6		44.8		37.9	
	Parents	11.1	62.2	5.5	64.1	13.8	61.2
	Wife or Children	6.7		13.8		9.5	
	<u>Professional</u>						
	Regional Agronomist	2.2	2.2	9.7	9.7	12.6	12.6
Trying a new agricultural practice	<u>Non-professional</u>						
	Friends	4.4	4.4	0	0	15.8	15.8
	<u>Professional</u>						
	Technician	53.3	53.3	51.1	51.1	47.4	47.4
Discussion of successes or failures of new agricultural practices	<u>Non-professional</u>						
	Friend	31.1		28.3		25.3	
	Other farmers	11.1	53.2	16.6	53.3	16.8	52.7
	Relatives	11.0		8.4		10.6	
	<u>Professional</u>						
	Agricultural engineer	24.4		32.4		36.8	
	Employee of cooperative	2.2	26.6	.7	35.9	1.1	37.9
Employee of bank	0		2.8		0		

Table 13: Percentage Observation -- Farm Operators Rankings of Organizational Channels of Information for Importance in Supplying Agricultural Information, in Sao Paulo, 1972.

Source	Rank	Size of Operation		
		Small(10-30 ha)	Medium (31-200 ha)	Large (201-3,000 ha)
(Percentages)				
Extension	1	46.7	76.6	67.4
Agent of a	2	11.1	6.2	7.4
Private Firm Total		57.8	82.8	74.8
Cooperative	1	33.3	4.8	7.4
	2	6.7	11.7	15.8
	Total	40.0	16.5	23.2
Banks	1	2.2	8.3	5.3
	2	0	9.0	4.2
	Total	2.2	17.3	9.5
Private	1	11.1	4.1	3.2
Individuals	2	4.4	3.4	2.1
	Total	15.5	7.5	5.3
Commercial	1	0	0	2.1
Institutions	2	0	.7	1.1
	Total	0	.7	3.2

small farmers may confer with non-professionals as much from necessity as from choice. Unfortunately too for the small farmer, his "non-professional" sources (friends, relatives) are most likely truly non-professionals -- they are small farmers like himself. Unlike the larger farmer, the small operator's peer group does not include bankers, commercial dealers and extension agents.

As farm size increases, so do social and structural latitude. The propensity to try new agricultural practices increases because the awareness of their potential profitability and knowledge of their effective application become more accessible. As farm size increases so do financial opportunities for credit and investment; exposure to a wide range of mass media and contacts with professional people capable of encouraging and guiding innovative decision practices. While Hypotheses I and II are not supported by all of their test hypotheses (Appendix 4), the present study does accept as valid the statements that "the propensity to try new technological practices is more highly related to the size of farm operation than to the farmer's age or educational level" and "farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

2. Descriptive Analysis of the Relationship of Agricultural Service Personnel with Operators of Small, Medium and Large Size Farms.

Based on a priori knowledge and research examined for the Review of Literature (Havens, Deutschmann, Moulik, Rogers), the present study hypothesized that size of farm operation would be positively related to

the frequency of contact between farm operators and agricultural service agency personnel. Based on the statistical analysis of data from Sao Paulo state, the hypothesis must be rejected as inapplicable to the particular area studied. As shown in appendix 4, there is no significant relationship or correlation between farm size and the farm operator's frequency of contact with extension agents, cooperative fieldmen, private firm fieldmen or bank advisors.

The hypothesis cannot be dismissed as totally inappropriate to the present study without one cautioning statement. The data reflect only frequency of formal contact between the farm operator and agency personnel. No evidence of degree or intensity of informal, day-to-day associations was pointed out in the first part of this discussion and should not be overlooked now.

The second part of Hypothesis III predicts that agricultural service personnel will perceive as most troublesome the same problems as do larger farm operators; that these personnel will identify as most important the same sources of agricultural information as large farm operators; and that large operators will share the same opinions as agricultural service personnel regarding factors most vital to increasing production and managing a farm with maximum profit. In other words, as farm size increases, so does the empathy between farm operator and agricultural service personnel.

The suggested relationship is confirmed by only one of the four hypotheses (appendix 4, H_{III}: 7-10). Perception of input-purchase difficulties is closest between operators of large farms and service personnel (table 14). Particularly indicative of a gap in awareness on the

Table 14: Comparison of Major Problems as Reported by Farmers and Extension Agents with Purchase of Farm Inputs in Sao Paulo, 1972

Input and Problem	Farm Size			Extension Agent
	Small *	Medium **	Large ***	
(Percentage of Respondents)				
Fertilizer				
1. no problem	66.7	66.9	69.5	100.0
2. non-applicable	2.2	0.0	3.2	
3. price too high	26.7	18.6	21.1	
4. takes too long to obtain	4.4	6.2	2.1	
5. not accessible	0.0	0.0	0.0	
Total Number Respondants	<u>45</u>	<u>137</u>	<u>91</u>	<u>8</u>
Out of Total Questioned	45	145	95	8
Lime				
1. no problem	53.3	68.3	71.6	100.0
2. non-applicable	31.1	19.3	8.4	
3. price too high	11.1	5.5	9.5	
4. takes too long to obtain	2.2	3.4	1.1	
5. not accessible	0.0	0.0	0.0	
Total Number Respondants	<u>44</u>	<u>140</u>	<u>86</u>	<u>8</u>
Out of Total Questioned	45	145	95	8
Seeds				
1. no problem	68.9	72.4	70.5	62.5
2. non-applicable	6.7	2.1	4.2	12.5
3. price too high	17.8	11.0	10.5	25.0
4. takes too long to obtain	2.2	.7	0.0	0.0
5. not accessible	4.4	1.4	1.1	0.0
Total Number Respondants	<u>45</u>	<u>127</u>	<u>86</u>	<u>8</u>
Out of Total Questioned	45	145	95	8
Gasoline				
1. no problem	55.6	74.5	74.7	100.0
2. non-applicable	22.2	9.0	1.1	
3. price too high	22.2	15.2	21.1	
4. takes too long to obtain	0.0	0.0	0.0	
5. not accessible	0.0	0.0	1.1	
Total Number Respondants	<u>45</u>	<u>143</u>	<u>92</u>	<u>8</u>
Out of Total Questioned	45	145	95	8

cont'd

cont'd

Table 14 : Major Problems with Purchases of Inputs

Input and Problem	Farm Size			Extension Agent
	Small	Medium	Large	
Machinery				
1. no problem	40.0	56.6	63.2	37.5
2. non-applicable	33.3	11.7	3.2	37.5
3. price too high	20.0	21.4	26.3	12.5
4. takes too long to obtain	0.0	0.0	1.1	12.5
5. not accessible	0.0	1.4	1.1	0.0
Total Number Respondants	<u>42</u>	<u>132</u>	<u>90</u>	<u>8</u>
Out of Total Questioned	45	145	95	8

Repairs

1. no problem	53.3	68.3	73.7	37.5
2. non-applicable	28.9	7.6	3.2	37.5
3. price too high	11.1	17.2	13.7	12.5
4. takes too long to obtain	0.0	0.0	1.1	12.5
5. not accessible	0.0	1.4	2.1	0.0
Total Number Respondants	<u>42</u>	<u>138</u>	<u>89</u>	<u>8</u>
Out of Total Questioned	45	145	95	8

*10-30 hectares

**31-200 hectares

***201-3,000 hectares

part of extension agents of problems encountered by smaller farm operators are the questions pertaining to purchases of fertilizer and gasoline. All eight agents claim that farmers in their municipios have "no problem" purchasing these two items. Yet "high price" ranks as a second answer ("no problem" is first) for both small and medium sized operators. While the majority of farmers may have no problems, clearly a sizable minority experiences financial difficulty. Admittedly these difficulties may be related to factors other than simply farm size. Table 15 shows that the Chi-square tests found no significant relationship between farm size and rankings of input purchase problems. Further data analysis would be needed to demonstrate what specific factors do determine input purchase problems.

The findings illustrated in table 16, representing the ranking of information sources for relative importance by farm operators and agricultural personnel, are particularly interesting and surprising in three respects. On the basis of the data shown, the hypothesis that service personnel would share the opinions of large farm operators about which information sources were most vital must be rejected. In fact, the information source (newspapers) ranked most frequently as most crucial by large and medium operators is not even mentioned by extension agents and bankers. Newspapers are third in the frequency listing by bankers.

Government extension agents rank first in importance among bankers and dealers but merit no mention from any of the farm operators. In only one case does a farm size response relate to a personnel response: both small farm operators and extension agents list extension agents of

Table 15: χ^2 Calculations to Determine if There Is Significant Difference Based on Farm Size in Obtaining Farm Inputs in Sao Paulo, 1972.

INPUT	FARM SIZE			
FERTILIZER	201-3,000 ha.	31-200 ha.	10-30 ha.	
yes	15	93	14	72
no	66	97	30	195
total	81	140	44	267
				$\chi^2 = 4.4592$
				no difference
LIME				
yes	15	18	7	40
no	68	99	24	191
total	83	117	31	231
				$\chi^2 = .9379$
				no difference
SEEDS				
yes	22	37	11	70
no	67	105	31	203
total	89	142	42	273
				$\chi^2 = .0588$
				no difference
GAS				
yes	21	24	10	55
no	71	108	25	204
total	92	132	35	259
				$\chi^2 = 2.0$
				no difference
MACHINERY				
yes	30	46	12	88
no	60	82	18	160
total	90	128	30	248
				$\chi^2 = .4603$
				no difference
REPAIRS				
yes	20	35	7	62
no	70	99	24	193
total	90	134	31	255
				$\chi^2 = .5018$
				no difference

Table 16: Agricultural Information Sources Ranked as Most Important to Farmer by Farmers and Agricultural Service Personnel in Sao Paulo, 1972

Source	Farm Size (in hectares)			Agricultural Service Personnel		
	Small (10-30)	Medium (31-200)	Large (201-3,000)	Agents	Bankers	Dealers
	Percentages					
Newspapers	0.0	76.6	67.4	0.0	0.0	12.5
Extention Agents of Private Firms	46.7	4.8	7.4	100.0	6.7	25.0
Radio	33.3	8.3	5.3	0.0	20.0	6.3
Agents of Banks	2.2	4.1	3.2	0.0	0.0	0.0
Demonstration Plots and Experiment Stations	11.1	0.0	2.1	0.0	6.7	6.3
Expositions, Fairs	0.0	2.1	9.5	0.0	0.0	0.0
Govt. Extension Agents	0.0	0.0	0.0	0.0	66.7	43.8
Agricultural Magazines	0.0	0.0	0.0	0.0	0.0	0.0
Extension Agents of Cooperatives	0.0	0.0	0.0	0.0	0.0	0.0
Television	0.0	0.0	0.0	0.0	0.0	0.0
Pamphlets and Ag. Communications	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL RESPONDANTS	<u>41</u>	<u>139</u>	<u>90</u>	<u>8</u>	<u>15</u>	<u>16</u>
TOTAL QUESTIONED	45	145	95	8	29	16

private firms as the most important source of agricultural information for the farmer. Ironically, this finding is the opposite of what the test hypothesis predicted.

The most significant fact to emerge from this table is that the overall similarity in patterns of response is not between certain farm size groups and types of agricultural service personnel, but among the service personnel groups and among the farm size categories themselves. In other words, agricultural service personnel as a group may be relatively unaware of the methods of communication most influential for disseminating information among all farm operators -- large, medium and small.

The hypothesis that service personnel would view as most important the same factors for increasing production as viewed by larger, rather than smaller, farm operators also must be rejected. Chemical fertilizer is the number one choice for production increase among all three farm size groups and for agents and dealers. Bankers site improved seeds as most important, although chemical fertilizer is the second most frequently mentioned factor. (table 17) An interesting finding is the high frequency with which small farm operators rank mechanization as most important. It is second in frequency mentioned by both small operators and dealers. Perhaps dealers are quite actively trying to convince small farm operators to increase their low levels of mechanization. The more highly mechanized medium and large farmers do not appear to attach much importance to mechanization as a key to production increase.

The final test hypothesis under Hypothesis III also must be rejected. Responses of the service personnel do not correspond to those of the

Table 17: Factors ranked as Most Important to Increasing Production by Farmers and Agricultural Service Personnel in Sao Paulo, 1972.

Factor	Farm Size			Agricultural Service Personnel		
	Small (10-30 ha)	Medium (31-200 ha)	Large (201-3,000 ha)	Agents	Bankers	Dealers
Fungicide	0.0	0.7	0.0	0.0	0.0	0.0
Improved seeds	2.2	12.4	16.8	0.0	40.0	12.5
Lime	6.7	5.5	5.3	0.0	6.7	31.3
Insecticide	0.0	1.4	0.0	0.0	0.0	0.0
Formicide	0.0	1.4	2.1	0.0	0.0	0.0
Chemical Fertilizer	51.1	38.6	47.4	66.7	33.3	43.8
Organic Fertilizer	11.1	13.1	10.5	33.3	0.0	0.0
Herbicide	0.0	1.4	0.0	0.0	0.0	0.0
Mechanization	15.6	7.6	7.4	0.0	0.0	12.5
TOTAL RESPONSES	39	119	93	3	15	16
NUMBER QUESTIONED	45	145	95	8	29	16

Table 18: Factors Most Frequently Listed by Farmers and Agricultural Service Personnel When Asked, "What is Most Important to Managing the Farm with Maximum Profit?" in Sao Paulo, 1972.

Factor	Farm Size			Agricultural Service Personnel		
	Small (10-30 ha)	Medium (31-200 ha)	Large (201-3,000 ha)	Agents	Bankers	Dealers
	(Percentages of Respondents)					
<u>Years of Experience</u>	28.9	22.9	31.9	33.3	26.7	31.3
Level of Education	2.2	6.9	4.3	33.3	53.3	31.3
Use of Insurance	4.4	3.5	0.0	0.0	0.0	0.0
Written Records	0.0	0.7	3.2	0.0	0.0	6.3
Membership in an Ag. Organization	4.4	7.6	14.9	0.0	0.0	6.3
Accessibility to Ag. Information	6.7	4.2	8.5	33.3	0.0	6.3
Use of Credit	2.2	8.3	7.4	0.0	13.3	0.0
Soil Analysis	44.4	31.9	19.1	0.0	0.0	18.8
<u>TOTAL RESPONSES</u>	45	144	94	3	15	16
<u>NUMBER QUESTIONED</u>	45	145	95	8	29	16

large farm operators regarding the factors most important to managing a farm with maximum profit (table 18). All three groups of personnel cite level of education most frequently -- none of the farm size categories mention this factor. The large operators give years of experience; the small and medium give soil analysis (which is listed second by large operators).

These three test hypotheses (appendix 4, H_{III}: 8-10) must be rejected. Their rejection is a vital aspect of the present study because it demonstrates two major points:

- 1) agricultural service personnel may not be discriminatory by farm size in their perception of farm situations;
- 2) the agricultural service personnel may be rather unaware of the general farm situation for all sizes of farm operation.

NOTES

1

Paul J. Deutschmann, Communication and Social Change in Latin America (New York: Frederick A. Praeger, 1968)

Chapter V

Conclusions

Two goals shaped the present study: 1) to provide a summary of theoretical background on the processes of growth and development in the Third World countries; 2) to analyze briefly a few specific structural factors which might be inhibiting or encouraging these processes in one particular area, the state of Sao Paulo, Brazil.

Discussions concerning the differentiation between growth and development, the process of socio-economic change, and literature related to the methods of instituting and guiding the kinds of change which lead to national growth without the sacrifice of individual development, are presented in Chapters I and II. The thesis of each discussion is that economic growth for one sector of a nation's society does not necessarily forecast economic benefits for other sectors. Economic growth may appear to raise the G. N. P. or per capita income, but the rise may be very selective: the rich become richer, the poor, much poorer. Growth must be accompanied by development -- the erecting of sound, serviceable structures with active interest in the needs and aspirations of all the constituents of society. Only when change is social as well as economic, in motivation and completion, can a society be lauded for undertaking the process of development rather than simply taking advantage of the tides of growth.

Socio-economic change (development) does not imply that the traditional philosophical foundations of a culture must be razed in favor of imported, twentieth century pre-fabricated products alien to even their own creators. Development requires that each strand of society adapt

its traditional roles and values to become sensitive to and inclusive of the needs of all other strata. The educated should not campaign to send all peasants to University so that rural traditionalism may be vanquished. Rather the educated must use their skills to diffuse to the peasant the technology and understanding of its use which he so desperately needs. The process of development, buoyed by socio-economic change, requires the committed interaction of all levels of society.

The research goal of the present study was, through analysis of data from Sao Paulo state, to understand better the part agricultural service agencies could play in encouraging and assisting all types of farm operators in becoming involved in the process of agricultural development. Four specific objectives were set forth -- the results of the analysis pertaining to each of the objectives are summarized briefly.

1) To compare the influence of personal sources of information diffusion, the mass media, and economic factors among farm operators according to farm size classification.

Newspapers are the most influential source of information for operators of large and medium size farms; extension agents of private firms are most important to operators of small farms. Radio ranks second among small and medium operators, while fairs and expositions are of second importance for large operators. These conclusions are the result of a ranking by farm operators of all sources of information (personal and mass media) for importance (table 16). Among mass media sources only, radio ranked first for small operators, newspapers for medium farmers and magazines for large operators (table 11). Interestingly, these rankings are in order of most accessible and least costly (radio) through

least accessible and most costly (magazines).

For personal sources of information (ranked separately), all three farm size groups make most frequent use of non-professional contacts. This conclusion is based on responses to three questions regarding farm operators' consultation practices (table 12). As farm size increases, a notable increase in use of professional sources occurs. Whether this is because larger farm operators have more access to professional sources than smaller operators cannot be determined for certain, although this seems quite probable.

The influence of economic factors has not been adequately quantified in the present study to make any conclusive statements about its effects.

2) To determine which diffusion practices are most likely to be effective among individual farmers according to farm size.

Of the personal professional sources for diffusion, the private firm extension agent appears to be reaching the widest range of farmers. All three size groups report him as their most important supplier of agricultural information. The cooperatives rank second among large and small operators; banks are second for medium operators (table 13). Obviously the private firm agents have a vested interest in contacting as many farmers as possible. If the information they offer about new practices is correct and profitable for individual farmer development, as well as the represented firm's growth, then they may be a source of diffusion to be trained for even more intensive use in developing societies.

Since radio is the most available form of mass media and apparently already respected as a source of agricultural information, its potentials

as a source of diffusing material about new technology and effective farming practices should be further explored. Assuming that the larger farmers who rank printed material first also do have access to radio, it would seem that concentration should be devoted to up-grading the quality and perhaps quantity of information supplied by radio since it can reach all groups of farmers, large or small, wealthy or poor, literate or illiterate.

3) To analyze the perception of the present (1971) farm service personnel in Ribeirao Preto of the conditions of farm operators by farm size.

Based on only four questions, this analysis is weak and in need of further investigation. The present findings do suggest that farm service personnel are not extremely aware of the ideas held by their farm constituents. Least aware of the three agency groups are the bankers. Most aware are the extension agents who have an obvious advantage of more frequent day-to-day field contact with farmers. Bankers seem in closer agreement with large operators (with whom they no doubt have more informal contact), but even here their responses to those of the large farmer do not correlate closely (tables 14, 16, 17, 18). Bankers and dealers are both sadly unaware of the information sources vital to all three farm size groups (table 16).

4) To suggest how agricultural service agencies might communicate more effectively through their personnel and policy implementation with small farm operators.

When this objective was formulated, it was hypothesized that communication with large and medium size operators would be significantly

greater than with small. Since this has not proven to be the case, the present study sees recommendations as important in terms of a total increase in farm communications.

Service agencies, particularly the government extension service, might profit from the apparent popular acceptance of the private firm extension agent. Personnel in the field talking and working directly with the farm operator would seem to be the most effective method for communicating the benefits of new practices or modifications in old practices. If this procedure is too demanding financially, which is likely, to enact on an individual level, perhaps agents could visit on a frequent and regular basis specific farms (small as well as large) in each area and work simultaneously with groups of homogeneous farm operators.

Extension agents, bankers and dealers could each profit from a close examination of media usage practices and devise creative methods for disseminating information as part of entertainment via the broadcast media.

Three major hypotheses were set forth to provide an analytic framework by which to obtain the information necessary to fulfill the objectives of the present study. The test hypotheses are enumerated, with their results, in appendix 4. On the basis of their results, the major hypotheses, listed below, are rejected or accepted.

H_1 : The propensity to try new technological practices is more highly related to the size of farm operation than to the farmer's age or educational level.

Hypothesis I is accepted because four hypotheses were accepted.

H_{II}: Farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

Hypothesis II is accepted. Fifteen of its twenty-five test hypotheses were accepted.

H_{III}: Personnel of the agricultural service agencies have more frequent contact with and exhibit a greater perception of the agricultural problems and attitudes of operators of large and medium than small size farms.

Hypothesis III is rejected as six of its ten test hypotheses proved to be false. As stated in the Analysis, the data for the present study measured only formal contacts between service personnel and farmers. This researcher suspects that further investigation of Hypothesis III using some sort of measurement for informal contact would allow the hypothesis to stand as valid.

The major variable examined throughout the entire study has been farm size. The major contention set forth has been that farm size does significantly affect the individual farm operator's participation in the process of agricultural development. The acceptance of Hypotheses I and II warrants the affirmation of this assertion. The point to be made by this affirmation is: policy programs created to implement new technologies, advertising campaigns organized to promote these technologies and personnel contact approaches designed to demonstrate the use of new practices cannot be of one pattern or formed on knowledge of only one type model.

Farm operators cannot be considered to be homogeneous in their receptivity to development simply on the basis of geographic location or enterprise. Farm size must be accounted for. Many, many other

factors also need to be considered -- national origin, world-view (traditional/modern), cosmopolitanism -- are a few. Further research in the area of Sao Paulo will provide the data and analysis of its importance for these other factors. Hopefully, these studies will assist the agricultural service agencies in creating programs designed to speak to the problems of all types of farm operators in terms each operator can understand and accept.

Appendix 1

The questions which provided the economic data about the farm operators are given in Appendix 1. These questions were taken from the Farm Questionnaire prepared by William Nelson and Kelso Wessel and administered in the State of Sao Paulo, Brazil from June - July, 1970. The complete questionnaire is on file in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

III. LAND AND IMPROVEMENTS

6. Have you considered the possibility of renting or buying more land?

Why haven't you bought more land?*

No land available

The price is too high

Do not have money

Other (indicate) _____

13. Have you considered the possibility of increasing your level of mechanization?

Why haven't you increased it?*

Machinery is not available

The price is too high

Money is not available

It is not economical

Other (indicate) _____

* Indicate the order if there is more than one reason.

20. Agricultural practices used on the three principle (in area) crops.

a) Have you analyzed your soils?

% of area

Number of years done

b) Have you applied lime?

Number of years in the last five

1st year used

c) Have you used organic manure?

Number of years in the last five

1st year used

d) Have you used improved seed?

Number of years during the last five

1st year used

e) Have you used insecticides?

Number of years in the last five

1st year used

f) Have you used herbicides?

Number of years in the last five

1st year used

g) Have you used formicide?

Number of years during the last five

1st year used

- h) Have you used fungicide?
 Number of years during the last five
 1st year used

IX. MARKETING INFORMATION

38. Contact with sources of information.

Institution, person, or organization	Heard of	Had Contact	Frequency of contact in 1969/70	Nature of Contact
Extension agent	_____	_____	_____/yr.	_____
Co-op technicians	_____	_____	_____/yr.	_____
Private firm tech- nicians (fertilizer, insecticides, etc.)	_____	_____	_____/yr.	_____
Bankers	_____	_____	_____/yr.	_____
Field demonstrations	_____	_____	_____/yr.	_____
Experiment stations	_____	_____	_____/yr.	_____
Others	_____	_____	_____/yr.	_____

40. Marketing of the principle products

- f) Do you try to find out the price paid for products before they
 are sold in a given place?

If yes, how do you obtain this information?

Appendix 2

The questions which provided the data about extension agents, bankers and fertilizer dealers are given in Appendix 2. These questions were taken from the Infrastructure Questionnaire prepared by William Nelson and administered in the State of Sao Paulo, Brazil during December, 1970. The complete questionnaire is on file in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

Extension Agents.

4. From the point of view of the farmer, what are the major problems with respect to supplying the following services? (There are no problems, high prices, much delay, do not exist, etc.)

Sale of Inputs:

1. Fertilizer: _____
2. Lime: _____
3. Seed & Defensives: _____
4. Gasoline, oil, etc.: _____
5. Salt, mineral, etc. for cattle: _____
6. Machinery: _____
7. Machinery repair & parts: _____

b. Purchase of Products:

1. Cotton: _____
2. Rice: _____
3. Coffee: _____
4. Sugar Cane: _____
5. Beans: _____
6. Corn: _____
7. Soybeans: _____
8. Cattle & Swine: _____

c. Processing of Products:

1. _____
2. _____
3. _____
4. _____

d. Transportation:

- 1. Inputs: _____
- 2. Products: _____

6. Information:

- a. What are the most important sources for agricultural information for farmers in the municipio?
 - 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
 - 5. _____

7. Technology

- a. Fungicide
- b. Improved Seed
- c. Lime
- d. Insecticide
- e. Formicide
- f. Chemical Fertilizer
- g. Organic Fertilizer
- h. Herbicides
- i. Mechanization

- 1. Among the 9 items above, what do you consider the most important with respect to the process of increasing production per alqueire? _____ Least important? _____
- Of the remaining 7, which is the most important? _____
- Least Important? _____
- Of the remaining 5, which is the most important? _____
- Least Important? _____
- Of the remaining 3, which is the most important? _____
- Least Important? _____

26. Administration

- a. Years of Experience
- b. Level of Education
- c. Insurance
- d. Written Records
- e. Member of an Agric. Organ.
- f. Access to Agricultural Inform.
- g. Use of Credit
- h. Soil Analysis

- 1. Among the 8 items above, which do you consider to be most important in order that a farmer can manage his farm with maximum profits? _____ Least important? _____
- Of the remaining 6, which the most important? _____
- Least important? _____
- Of the remaining 4, which is the most important? _____
- Least important? _____
- Of the remaining 2, which is the most important? _____
- Least important? _____

27. Information

- | | |
|--|--|
| a. Newspapers | f. Meetings & Expositions |
| b. Technicians of private firms | g. Extension agents |
| c. Radio | h. Agricultural magazines |
| d. Bankers | i. Technicians of Cooperatives |
| e. Demonstration plots & Experiment stations | j. Television |
| | k. Pamphlets and Agricultural Communications |

1. Among the above items, which do you consider to be the most important source of agricultural information for the farmer?

Least important? _____

Of the remaining 9, which is the most important? _____

Least important? _____

Of the remaining 7, which is the most important? _____

Least important? _____

Of the remaining 5, which is the most important? _____

Least Important? _____

Of the remaining 3, which is the most important? _____

Least important? _____

Fertilizer dealers and bankers were asked all the preceding questions except question 4: "From the point of view of the farmer, what are the major problems with respect to supplying the following services?"

Appendix 3

The questions which provided the sociological data about the farm operators are given in Appendix 3. These questions were taken from the Farm Questionnaire prepared by members of the Department of Rural Sociology at Ohio State University and administered in the State of Sao Paulo, Brazil from October, 1971 through January, 1972. The complete questionnaire is on file in the Department of Agricultural Economic Rural Sociology at Ohio State University.

XII. - ADOPTION

1. Why do you use fertilizer?
2. Are all fertilizers basically the same, that is, equally effective?
3. What do the numbers on the fertilizer bag indicate?
4. What is the meaning of the number 3 in the formula 3-15-15?
5. Will you use, this year, the same fertilizer that you used last year?
Yes _____ No _____ If not, why are you going to change?
(If the answer is: "Because they contain more", ask: "Contain more what?")
6. Why do some fertilizers cost more than others, even when bought from the same dealer:
7. In your opinion, what are the major problems related to the acquisition of the following products? (There are no problems, high prices, too much delay, they are non-existent, etc = possible answers)
 - a. Purchases of inputs:
 - Fertilizer:
 - Lime:
 - Seeds and defensives:
 - Gasoline, oil, etc.
 - Mineral salt, etc. for the cattle:
 - Machinery:
 - Repair of machines and parts:
 - b. Sale of products:
 - Cotton:
 - Rice:
 - Coffee:
 - Sugar cane:
 - Beans:
 - Corn:
 - Cattle and swine:
 - Dairy products, meat, eggs and other animal products:
 - c. Processing of products:
 - d. Transportation:
 - Inputs:
 - Products:
- 8.a. Do you normally obtain the amount of credit that you need?
Yes _____ No _____
If not, why not?

- b. What type of credit is most difficult to obtain? What is the easiest?

Operational:

Purchase of machines and equipment:

Purchase of land:

Livestock:

Improvements:

- c. Is it easier to obtain agricultural credit now than it was five years ago?

_____ Yes _____ No.

In your opinion, what is the reason for this?

- d. What banks are the most important for the agricultural sector in this municipio?

1)

2)

3)

4)

9. What are the most important sources of agricultural information for the farmers of this municipio?
- 1)
- 2)
- 3)
- 4)
10. What type of information do you get before trying a new agricultural practice?
11. Scientific information on new ideas and new agricultural practices do not get to us.
12. With whom do you discuss the success or failure of a new agricultural practice after you have tried it?
13. What type of information does the Casa da Agricultura provide you and in what form is this information given?
14. What were your two major crops last year? (1970/71)
- 1)
- 2)

15. What was the price per unit for each of the two major crops (mention unit - kilo or arroba [15 kilos])
 1)
 2)
16. When you make a loan to buy fertilizer, do you use a bank?
 Yes _____ No _____
 a. If you don't borrow from the bank, who do you borrow from?
 b. Why do you use this source of a loan instead of a bank?
17. Of the 9 items mentioned below, which do you consider the most important to increase production, per "alqueire"? _____
 And the least important? _____
- | | |
|-----------------------------|-------------------------|
| a. Fungicide | f. Chemical fertilizers |
| b. Improved seed | g. Organic fertilizer |
| c. Lime | h. Herbicides |
| d. Insecticide | i. Mechanization |
| e. Ant-killer (insecticide) | |
18. Of the eight items mentioned below, which do you consider the most important for the farmer to operate his own farm with maximum profit?
 And the least important? _____
- | | |
|------------------------|---|
| a. Years of experience | e. Being a member of agricultural organizations |
| b. Level of education | f. Access to agricultural information |
| c. Insurance | g. Use of credit |
| d. Farm records | h. Soil analysis |
19. How would you rank the items below, in order of importance, as sources of agricultural information for the farmer?

NoSource of Information

Newspapers
 Private firm technicians
 Radio
 Bank employees
 Demonstration fields and experiment stations
 Meetings and exhibits
 Agronomist of the Casa da Lavoura
 Farm magazines
 Cooperative technicians
 Television
 Agricultural publications

Appendix 4

Appendix 4 lists each of the three major hypotheses and all test hypotheses. The latter are presented informally as directional statements rather than in the "null" or test form. Statistical methods applied to each hypothesis are summarized with the results. Where no statistical method was used, the chart refers to the table within the text which summarizes the hypothesis' quantification.

Two scores are given for each of the three Kendall's tau matrices: the score (t) and the level of significance (sig.). The tau scores are listed whether or not there is a correlation to aid the reader in ascertaining why a hypothesis was accepted or rejected.

HYPOTHESIS I: The propensity to try new technological practices is more highly related to the size of farm operation than to the farmer's age or educational level.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1(N=285)*		#2(N=140)**		#3(N=240)***	
		r	sig.	r	sig.	r	sig.
1. Size of farm will correlate positively with adoption score.	Accept	.1839	.001	.2521	.001	.1588	.001
2. Operators of large farms will have adoption scores significantly lower than small farm operators.	Accept	.1839	.001	.2521	.001	.1588	.001
3. The farm operator's age will not be significantly correlated to the adoption score.	Accept	.063	.054	.038	.248	.076	.039
4. The farm operator's education level will not be significantly correlated to the adoption score.	Accept	.0164	.340	.0556	.340	.054	.106

* Correlation for all 285 farm operators (small, medium and large)
 ** Correlation for the 140 large and small farm operators
 *** Correlation for the 240 large and medium farm operators

HYPOTHESIS 11: farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

Test Hypotheses	Reject or accept	Kendall's tau Matrix					
		#1 (N=285)		#2 (N=140)		#3 (N=240)	
		t	sig.	t	sig.	t	sig.
1. Size of farm will correlate positively with radio ownership.	Accept	.0703	.038	.1127	.024	.038	.166
2. Size of farm will be negatively related to value attached to agricultural information supplied by the radio.	Accept	Percentage Observation.		See: Table 11			
3. Size of farm will correlate positively with T.V. ownership.	Accept	.3149	.001	.4846	.001	.2270	.001
4. Size of farm will be negatively related to value attached to agricultural information supplied by TV.	Accept	Percentage Observation.		See: Table 11			
5. Size of farm will correlate positively with newspaper readership.	Accept	.2461	.001	.3687	.001	.1922	.001
6. Size of farm will be positively related to value attached to agricultural information supplied by newspapers.	Reject	Percentage Observation.		See: Table 11			
7. Size of farm will correlate positively with subscriptions to agricultural pamphlets and brochures.	Accept	.1706	.001	.2622	.001	.1700	.006

HYPOTHESIS II: Farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1(N=285)		#2(N=140)		#3(N=240)	
		t	sig.	t	sig.	t	sig.
8. Size of farm will be positively related to value attached to agricultural information supplied by pamphlets and brochures.	Reject	Percentage Observation.		See: Table 11			
9. Size of farm will correlate positively with magazine readership	Accept	.1315	.001	.3587	.001	.2639	.001
10. Size of farm will be positively related to value attached to agricultural information supplied by magazines.	Accept	Percentage Observation.		See: Table 11			
11. Size of farm will correlate positively with the farm operator's attitude toward buying more land.	Reject	.0335	.200	.0925	.052	.0423	.164
12. Size of farm will correlate positively with the farm operator's attitude toward increasing his level of mechanization.	Reject	.0168	.336	.0633	.133	.0527	.112
13. Size of farm will correlate positively with the farm operator's practice of inquiring about the price paid for a product before selling it.	Accept	.1190	.001	.2099	.001	.0449	.336

HYPOTRESIS II: Farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1(N=285)		#2(N=140)		#3(n=240)	
		t	sig.	t	sig.	t	sig.
14. Size of farm will correlate positively with the farm operator's membership in agricultural organizations.	Reject	.0526	.093	.0785	.084	.0375	.194
15. Size of farm will correlate positively with the farm operator's participation in meetings and expositions.	Accept	.2169	.001	.3237	.001	.1520	.001
16. Size of farm will correlate positively with the farm operator's membership in a cooperative.	Reject	.0053	.447	.0052	.464	.0244	.287
17. Size of farm will be positively related to importance given to the extension agency as a source of agricultural information.	Reject	Percentage Observation.		See: Table	13		
18. Size of farm will be negatively related to importance given to the cooperative as a source of agricultural information.	Reject	Percentage Observation.		See: Table	13		
19. Size of farm will be positively related to importance given to the banks as a source of agricultural information.	Reject	Percentage Observation.		See: Table	13		

HYPOTHESIS II: Farm Size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1(N=285)		#2(N=140)		#3(N=240)	
		t	sig.	t	sig.	t	sig.
20. Size of farm will be negatively related to importance given to private individuals as a source of agricultural information.	Accept	Percentage Observation		See: Table 12			
21. Size of farm will be positively related to importance given to commercial institutions as a source of agricultural information.	Accept	Percentage Observation		See: Table 13			
22. Size of farm will be negatively related to the farm operator's practice of consulting a friend or family member about important business decisions.	Reject	Percentage Observation		See: Table 12			
23. Size of farm will be positively related to the farm operator's practice of consulting a regional agronomist about important business decisions.	Accept	Percentage Observation		See: Table 12			

HYPOTHESIS II: Farm size is related to the farm operator's use of the mass media, economic stimuli and personal sources of information.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1 (N=285)		#2 (N=140)		#3 (N=240)	
		t	sig.	t	sig.	t	sig.
24. Size of farm will be negatively related to the farm operator's consultation of a friend with experience rather than technicians before trying a new agricultural practice.	Reject			Percentage Observation.	See:	Table 12	
25. Size of farm will be negatively related to the farm operator's practice of discussing his successes or failures with new agricultural methods with friends, other farmers or family rather than professional agricultural personnel.	Accept			Percentage Observation.	See:	Table 12	

HYPOTHESIS III: Personnel of the agricultural service agencies have more frequent contact with and exhibit a greater perception of the agricultural problems and attitudes of operators of large and medium than small size farms.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1 (N=285)		#2 (N=140)		#3 (N=240)	
		t	sig.	t	sig.	t	sig.
1. Size of farm will correlate positively with the farm operator's frequency of contact with extension agents.	Reject	.0356	.260	.0333	.279	.0270	.267
2. Size of farm will correlate positively with the farm operator's frequency of contact with cooperative fieldmen.	Reject	.0328	.205	.0804	.079	.0191	.330
3. Size of farm will correlate positively with the farm operator's frequency of contact with private firm fieldmen.	Accept	.0810	.021	.1698	.001	.0049	.455
4. Size of farm will correlate positively with the farm operator's frequency of contact with bank advisors.	Reject	.0121	.380	.0019	.96	.0354	.207
5. Size of farm will correlate positively with the farm operator's frequency of contact with demonstration plots.	Accept	.1520	.001	.2464	.001	.0731	.046
6. Size of farm will correlate positively with the farm operator's frequency of contact with experiment stations.	Accept	.1609	.001	.2328	.001	.1057	.007

HYPOTHESIS III: Personnel of the agricultural service agencies have more frequent contact with and exhibit a greater perception of the agricultural problems and attitudes of operators of large and medium than small size farms.

Test Hypotheses	Reject or Accept	Kendall's tau Matrix					
		#1(N=285)		#2(N=140)		#3(N=240)	
		t	sig.	t	sig.	t	sig.
7. Size of farm will be positively related to agreement between the farm operator and agricultural service personnel regarding major problems with input purchases.	Accept	Percentage Observation. See: Table 14					
8. Size of farm will be positively related to agreement between the farm operator and agricultural service personnel regarding sources of agricultural information most useful.	Reject	Percentage Observation. See: Table 16					
9. Size of farm will be positively related to agreement between the farm operator and agricultural service personnel about what factors are most important to increasing production.	Accept	Percentage Observation. See: Table 17					
10. Size of farm will be positively related to agreement between the farm operator and agricultural service personnel about what factors are most vital to managing the farm with maximum profit.	Reject	Percentage Observation. See: Table 18					

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