# BUREAUCRACY AND ADOPTION OF AGRICULTURAL INNOVATIONS IN PAKISTAN

by

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# CHAPTER I

## INTRODUCTION

### Introduction

The role of bureaucratic authorities in the agricultural development process has drawn a lot of attention in the development literature (see Bennis, 1966; Owens and Shaw, 1972; Shultz, 1974; Jedlicka, 1977; Roling et al., 1976; Charturvedi, 1977; Roy, 1975; Korten and Alfonso, 1982; Thomas, 1982). Efforts to assess the role of bureaucratic officials in the agricultural development process are understandable, given the impetus and the consequences of government control in the design and the implementation of agricultural programs in the rural areas in many developing countries.

The so-called "committed bureaucracy", a phrase coined by Roy (1975:4), was a famous concept during the early years of post-colonial government in India, Pakistan and other third world countries. According to this view, bureaucratic

officials were responsible for initiating plans to increase agricultural productivity by means of newly introduced high yielding crop varieties. However, their attempts were only partially successful (Roy, 1975:15). It is believed that if the bureaucracy is to succeed as a major instrument of development, structural changes must be made, so as to encourage a genuine linkage between bureaucratic officials and farmers. Charturvedi (1977) describes the process as follows:

> the bureaucracy has to break away from its familiar attitudes and workways, immerse itself in the values of social change, reorient its attitude to the very people it has been in the habit of ruling and develop a partnership with them. In short, the success or failure of bureaucracy largely depends on the relationship bureaucrats establish with the people and their representatives (1977:23).

The argument that bureaucratic officials and farmers should establish a closer link is self-evident for the progress of agriculture. Bureaucratic officials in many developing countries control many resources that farmers require for their farming and thus their livelihood. These include agricultural fertilizers, seeds, information on new farming practices, loans, as well as a substantial service and support network. Adoption of agricultural innovations in this regard is not simply a process in which farmers adopt farm technologies such as high yielding varieties. It also involves a number of complementary elements. These include utilization of capital, obtaining credits, getting

information on cultural practices, and marketing and acquisition of needed inputs. These interrelated factors highlight the importance of contact with bureaucratic officials. In other words, contact with officials can be a mean by which farmers meet all the factors necessary for successful adoption of new farm technology.

Despite the importance given to the bureaucratic officials due to their control of the major agricultural resources and their dissemination to the farmers, the linkage between farmers and officials in the bureaucracy and its relationship with the adoption of agricultural innovations has not received serious attention. In fact, little empirical research has been conducted on the link between farmers and officials within the agricultural development context. This thesis addresses the linkage question by investigating two interrelated concepts on the farmer's adoption of agricultural innovations. They are farmers' awareness of officials and contact with officials. Awareness of the officials is conceptualized as indicating knowledge of institutional services provided by bureaucratic officials and contact is conceptualized as the use of those services.

It is widely acknowledged by researchers and development experts alike that a genuine linkage between farmers and the bureaucratic authorities can be better achieved by direct

contact without administrative barriers because it facilitates the flow of information and communication. Contact with authority is usually initiated for specific responses and needs, but it can also be a form of individual participation in the community and to a certain degree a means for farmers to use government institutional services. For example, Thomas (1982) argues that in democratic countries, citizen-initiated contacts with government agencies are now recognized as an increasingly important form of social participation. Awareness of officials describes a much broader linkage of the farmers to the bureaucracy as a provider of services essential for successful farming.

Unlike contact which requires face to face encounter, the level of awareness entails personal cognizance of government services and its support network. Farmers in developing countries are sometimes unaware of the bureaucracy and the agricultural programs it provides. In the early phases of adoption research the term "localite" was often used to indicate the farmer's seclusion from the outside world. Awareness of government programs and bureaucratic officials may be a factor influencing the farmers to take advantage of the agricultural innovations. It is important to add that both awareness of and contact with officials in the bureaucracy are conceived as parallel measures of the linkage between farmers and the bureaucracy.

## Statement of Purpose

The effect of farmers' contact with and awareness of bureaucratic officials on the diffusion and adoption of agricultural innovations has not been thoroughly examined in the past. Previous empirical research has mainly focused on the effect of farmers' contact with extension agents, which was conceptualized as an informational factor affecting the adoption of agricultural innovations through access to the information network. Findings indicate that contacts with extension agents have a significant positive effect on adoption of agricultural innovations (Fuguitt, 1965; Maulik et al., 1966; Rogers and Svenning, 1969; Taylor and Miller, 1978; Sandhu and Allen, 1979; Gartrell and Gartrell, 1979; Ashby, 1982; Nowak, 1987).

Despite a substantial amount of research conducted on extension agents and adoption of innovations, little research has examined the effect of contact with officials other than extension agents. The purpose of this thesis is to remedy the gap found in the literature by examining the relationship between contact with and awareness of officials and adoption of agricultural innovations in the Punjab and Sind Provinces of Pakistan.

In conceiving such a study, it is useful to confine our research to specific variables and to define parameters. Relations between officials in authority and farmers have a wide range of empirical implications. Apart from the environment under which the bureaucracy operates, be it coercive, humanistic or authoritarian, there are many significant points that should be considered. The most obvious ones are the willingness of officials to accept frequent visits from farmers, the farmers' village location vis-a-vis the different local authority and bureaucratic headquarters, and the farmers' attitude and perception of the bureaucratic authorities. All these are important and need to be studied. For the purpose of this thesis, however, we need to delimit the study. First, we shall confine ourselves to examining the number of contacts farmers have with officials as well as the awareness of the bureaucratic officials' names and their position. Secondly, the bureaucratic officials examined in this thesis are those who have some vital role to play in agriculture, such as officers whose responsibilities lie in the maintenance of the daily functions of agricultural services. The provinces of Sind and Punjab in Pakistan provide an adequate case study due to the intensive nature of the irrigation found in both provinces and the large network of officials responsible for the management of irrigation canals.

In more specific terms, this thesis attempts to focus on the extent of contact and awareness that farmers have with the officials and to investigate the effect of such interaction on the adoptive behavior of farmers in Pakistan when relevant variables are controlled for.

## Statement of Significance

The thesis attempts to shed light on one subject that has been neglected by researchers examining the adoption of agricultural innovations. By the inclusion of farmers' contact with extension agents as an alternative explanation, it enables a comparison between the effect of contact with other government officials and contact with extension agents on adoption of agricultural innovations.

Theoretical significance. This thesis provides the basis for assessing the validity of some hypotheses advanced in two research areas. One is the adoption of innovations research and the other is the frequency of contact with officials. The latter research subject has been a focus of many inquiries by political scientists (e.g. Thomas, 1982, Sharp, 1982; Jones et al., 1977; Verba and Nie, 1972). Both bodies of research suggest that socio-economic status plays an important role in predicting the adoption of agricultural innovations and frequency of contact with officials, respectively. Therefore, a possible relationship between

adoption and the degree of contact with officials remains to be empirically tested.

Policy significance. This thesis has several policy implications. The adoption of agricultural innovations by farmers remains the main objective of many agricultural development projects. Similarly, the impetus given to the role of the bureaucracy in carrying out diffusion of new farm technologies is extremely pertinent in terms of policy formulation as well as the planning of agricultural programs by many developing country governments.

## Summary and Overview

This chapter described the topic, purpose and significance of the thesis It began by addressing the importance of the role of the bureaucracy in the development process. It stresses the recent attention given to the bureaucratic institutions involved in the agricultural development research. In addition, the chapter concludes with a discussion of the major theoretical and policy implications of the thesis.

This thesis consists of four additional chapters. Chapter Two contains an overview of the major empirical research. Chapter Three contains a discussion of the data and methods used in the study. Chapter Four presents the

results of the study, and Chapter Five concludes with a discussion of the findings and major conclusions of the thesis.

# CHAPTER II

## LITERATURE REVIEW AND BACKGROUND

### Introduction

During the past few decades, researchers have thoroughly investigated many factors influencing the adoption of agricultural innovations. Much of the research carried out on adoption has generally viewed the process of adoption in terms of access to information and the communication process. It is within this perspective that the farmers' contact with extension agents was given serious attention by adoption researchers, while the relationship of farmers' contact with bureaucratic officials to adoption did not attract interest in empirical research.

It is important to note that, while the research on adoption of agricultural innovations investigated many possible factors affecting the adoption process, the topic of contact with government bureaucratic officials has been itself a subject of many inquiries. Studies carried out on contact with officials have generated models explaining the frequency of contacts people initiate with bureaucratic officials. Thus, contact with officials has been viewed as a variable to be explained (dependent variable), but not as

an independent variable, potentially explaining adoption of agricultural innovations.

Due to the diversified empirical research generated by both adoption of agricultural innovations and the frequency of contact with officials, this chapter outlines the relevant empirical findings in the research literature of both bodies of research. The chapter is divided into three sections. The first section centers exclusively on the relevant research on adoption of agricultural innovations. This section begins by a brief description of the history of adoption research, the second part outines the major theoretical and empirical findings of adoption research, then the section concludes with an outline of empirical findings pertaining to the relationship between adoption of innovations and extension agent's contact. The second section examines the empirical research findings on the subject of contact with officials. The chapter ends with a summary and conclusions.

## 1. Adoption of Agricultural Innovations

### 1.1. Historical Overview

Early agricultural adoption research in the United States and many developing countries was focused on the attributes of farmers, and the study of the various stages in the

adoption process. The process of adoption of agricultural innovations was usually categorized in four stages. The first stage is the knowledge or awareness of innovation. The second stage is the farmers' interest in an innovation, the third stage pertains to the farmers' persuasion to try the innovation, the fourth and last stage refers to the trial and adoption of innovation (Rogers and Shoemaker, 1971:102). Researchers then investigated the effect of many factors potentially influencing the various stages of the adoption process. Extension agent contact was one factor which was important in explaining adoption, specifically in differentiating early adopters of farm innovations from late adopters.

Concerning the attributes of farmers, Wilkening (1958) was among the first to identify a relationship between personality characteristics and adoption of innovations (Wilkening, 1958; cited in Rogers, 1962:36). The belief that all farmers strive for economic profit as the main personality characteristic was prevalent assumption during the early phase of the diffusion and adoption research (Griliches, 1957). Cross-cultural experiences have shown, however, that while personal characteristics and attitudes of farmers may explain some patterns of adoption they do not account for the underlying causes of lack of adoption by the majority of farmers. In fact, it was shown that the adoption model based on a psychological perspective tends to

ignore the system as a whole (Rogers, 1974:53); holds individuals responsible for their own social condition rather than the social structure (Caplan and Nelson, 1973); and does not consider the consequences of the different effects of the adoption process among high and low status farmers (Hogdon, 1975; Goss, 1979). In addition, cross-national studies of farmers' innovativeness found that system measures are better predictors than individual measures in developing countries (Saxena, 1971), because adoption is less a function of the individual's personal attributes than of the group or system of which the farmer is a part.

The criticism of misplaced emphasis on the individual farmer for explanation of adoption behavior was generally targeted against development projects and change agencies that were applying the diffusion of innovations model, and not against the adoption of innovation research per se. The reason was that development programs did not heed the contextual settings of different social systems, and accepted the rural stratification system as given (West, 1983). Some sociological research did address the role of social structure in the adoption process. These studies attributed the problem of lack of innovation on the part of the majority of farmers to the prevalence of indigenous authority structures within the rural communities. Indigenous authority structures have been the subject of

many investigations not particularly concerned with adoption and innovation. Rather, their concern has been with the assessement of power, conflict and inequality in the development process (Holmberg, 1960; Fathi, 1965; Bernard 1969; cited in Rogers, 1983; Schultz, 1974).

The following sub-sections summarize important research findings carried out on the adoption of agricultural innovations. The first sub-section relates to the general empirical results of research that are relevant to this thesis, the second sub-sectior deals specifically with the research findings on the relationship between adoption and farmers' contact with extension agents.

### 1.2. Previous Empirical Research

In the adoption of agricultural innovations research literature, local authority structure was initially interpreted in terms of its relevance to the communication process. For example, Rogers and Shoemaker (1971) have identified "opinion leadership", a phrase used to conceptualize the role of leaders in transmitting information and increasing the level of farmers' awareness about farm innovations. Rogers and Shoemaker (1971) showed that in some types of social systems, there is a relationship between communities' authority structure and adoption of innovation. They argue that opinion leaders

exert some influence on farmers to adopt some innovations. However, in certain cases the leaders tend to screen out information about innovations that threaten to alter their status vis-a-vis other farmers.

Another subject of empirical research carried out on adoption of agricultural innovations is the concentration of power. Rogers (1962) states that where power is more concentrated, agricultural innovations are adopted more rapidly and collectively because fewer individuals are involved in the decision-making process. Rogers' statement on the concentration of power and adoption of farm innovation stresses that the adoption rate of collective innovations is positively related to the degree of power concentration in a system. In contrast, Freeman et al. (1982) found in their study of the distribution of power and adoption of innovation in Pakistan, that villages in which power is distributed more equally tend to rank higher on the adoption scale. Other research findings, however, support Rogers's results and conclusions. A positive effect was found between village power concentration and innovation in Nigeria (Hursh et al., 1969), India (Fliegel, 1967) and Brazil (Whiting et al., 1968). Even though these studies reported positive relationships, they showed only weak correlations between adoption of agricultural innovations and concentration of power, which is often operationalized by a score measuring the leaders' ability to mobilize

farmers in various collective tasks within a given village or social unit. Eventhough research on the concentration of power emphasizes the importance of community and village leaders in the adoption process, the acquisition of power and authority could well be the effect of government bureaucracy outreach for individuals of high economic and social status in the villages in order to implement various agricultural programs.

While the topic of power concentration was given some attention, most of the empirical research on the diffusion and adoption of innovations that produced a substantial amount of generalizations concerns the relationship between socio-economic status of individual farmers and the rate of adoption of innovations. Rogers (1962), for example, found a positive and linear relationship between socio-economic status and the rate of adoption of innovations. One researcher, however, found that the relationship showed a curvilinear function instead of a linear one (Cancian, 1967), indicating that the upper-middle rank individuals scored higher on the adoption scale while lower-middle rank individuals scored lower. However, many subsequent studies did not find support for Cancian's innovation and class conservatism theory (Frey et al., 1979; Gartrell and Gartrell, 1979; Frey and Freeman, 1980; Gartrell, 1981). The overall reseach findings overwhelmingly substantiate the positive relationship between socio-economic status and

adoption of agricultural innovations.

### 1.3. Research on contact with extension agents

While most of these research contributions dealt exclusively with the structural makeup of rural communities, extraneous factors such as linkage with government bureaucracy, and contact with extension or private agencies were also investigated but with little emphasis. Contact with extension agencies was thoroughly investigated in the adoption research. Some early studies used contact with extension agents as the main explanatory variable (Slocum, 1957; Fuguitt, 1965; Maulik et al., 1966; Rogers et al., 1969, Sandhu and Allen, 1979). These studies found a relationship between the characteristics of farm families and frequency of contact with extension agents (Slocum, 1967) and career patterns of farmers with extension agents' contact (Fuguitt, 1979). Sandhu and Allen (1979) attributed the frequency of contact with extension agents to the level of education. Both showed a positive effect on adoption of innovations. In their elaborate study regarding the relationship of socio-economic status, knowledge and adoption of agricultural innovations in India, Gartrell and Gartrell (1979) found that even with knowledge of innovations, status and other variables controlled for, contact with government extension agents had a substantial

positive effect on the willingness to try innovations, but the effect of contact on the adoption stage did not have a significant effect. In addition, visits by the farmer to the community development block headquarters were found to have a small effect on adoption of innovation.

In his study of adoption of agricultural conservation techniques, Novak (1987) found that contact with extension and USDA officials provided a statistically significant increase in the variance explained in adoption. Similarly, Taylor and Miller (1978) found that agency contact had a significant positive effect at the knowledge stage, while informal communication (interpersonal contact) had a positive effect on the persuasion stage but was not significant on the other stages. This supports the proposition of Rogers and Shoemaker (1971:10) that "formal contact could have its greatest impact on farmer's knowledge of the innovation and informal contact would have its effect on the farmer's persuasion toward innovation."

Similar to the previous results noted above, Wozniak (1984) emphasized the role of innovative ability on the adoption of interrelated agricultural innovations, and examined the effect of both contact with extension services and private agricultural firms. He found that the frequency of contact with extension services increases the probability of adoption. Although the frequency of contact with private

agro-industrial firms showed a positive relationship, it was not statistically significant.

As part of her study on the importance of the inclusion of ecological variables in predicting the adoption of agricultural innovation in Nepal, Ashby (1982) suggested that "differential integration into markets is related to access to infrastructure and particularly contacts with agricultural extension services." Using different types of farms as indicators of ecological and commercial variation, her results indicated that the commercial farms are significantly advantaged with respect to family connections with political office holders and direct extension contact. In the regression analysis used to explain the effect of extension agent contact on the earliness of adoption, she found that the extension contact variable is positively related to the early stage of the adoption process.

In general, the effect of contact with the extension agency on the adoption of agricultural innovations has been usually associated with the farmers' integration into the local information and assistance network that facilitate the adoption process (Rogers and Shoemaker, 1971; Rogers and Svenning; 1969; Rogers, 1983). For example, Lionberger and Gwin (1982:23) assert that

> the availability and characteristics of the networks, the extent and nature of contacts with representatives of change agencies and the position and credibility of these change agents in the local community can all

influence the farmer in the adoption decision.

This means that variation in adoption of agricultural practices among farmers depends on the access to information. It is at this point where the difference between contact with extension agents and bureaucratic officials becomes relevant particularly for developing countries. Contact with officials in the bureaucracy provide more genuine access of information specific to the farmer's need. The credibility of a government fertilizer agent, for example, is higher than an extension agent in questions concerning fertilizer application. In addition, some specific questions might arise about irrigation water requirement of crops for example, to which the extension agents might not know immediately. But the most important point of the difference is that extension agents compared to bureaucratic officials have a limited amount of power due to the fact that they themselves are under the control and supervision of other superior officials in the bureaucratic organization. Also, the major point of divergence might be that contact with bureaucratic officials is essentially a farmer-initiated contact which requires from the farmers an awareness of the officials and their services in the local bureaucracy if contacts are to be initiated. In contrast, extension agents' contact, particularly in the developing countries is usually started by the extension agents. Through the help of village leaders, extension agents

generally set up regular visits to villages and program field day demonstrations to interested farmers usually to promote new agricultural techniques (Sinha and Jain, 1972). However, research evidence suggests that extension agencies in developing countries are understaffed and plagued by the lack of resources to undertake the dissemination of various agricultural programs (Hunter, 1972; Jedlicka, 1977). Thus, diminishing the credibility of the extension worker vis-a-vis the farmers. Contacts with bureaucratic officials instead of extension agents reflect a different level of the communication process which require initially an awareness of the officials.

## 2. Contact with Officials: Previous Empirical Research

While the substantial research literature on the adoption of innovations did not include the farmers' contact with officials in bureaucracy as major factor in explaining adoption, some researchers during the past decades have focused their attention on the study of the individuals' frequency of contact with the officials, and examined possible factors influencing such contact (e.g. Verba and Nie, 1972; Thomas, 1982; Jones et al., 1977; Brown, 1982; Nowak et al., 1982; Sharp, 1982). One theoretical model suggested to explain the frequency of contact with officials views individuals of higher socio-economic status as having

more resources to invest in contact, and are more interested in the outcome of events due to their vested interest (Verba and Nie, 1972; Nowak et al., 1982). This model suggests a positive linear relationship between contact with officials and socio-economic status. Status is usually operationalized by individuals' income and education level. The second model differs from the first one by arguing that the relationship between contact and status is also a function of awareness of officials and the individuals' need of services (Jones et al., 1977). Specifically, this perspective argues that contact is positively related to awareness of government as provider of relevant services and negatively related to the need of those services. Jones et al. (1977:151) suggest that

> low socio-economic status individuals do not engage in contacting behavior because of low awareness, despite high need levels, whereas high socio-economic status individuals do not contact officials because of their low need, in spite of their relatively high awareness of officials and the services they provide.

Subsequent research did not substantiate this perspective. Some problems were found in the notion of people's needs, particularly in the difference between perceived needs and objective needs (Thomas, 1982). Nonetheless, other studies found awareness of officials to be equally important in predicting contact. A strong and positive correlation was reported between status and contact when awareness was statistically controlled (Sharp, 1982).

Individuals with high socio-economic status have been shown to have the material ability and power within their communities to initiate contact with bureaucratic officials (Gotsch, 1972). However, there was also support for a positive relationship between awareness of government services and socio-economic status.

## Summary and Conclusions

This chapter presented a summary of the relevant empirical research. The first section discussed the previous research carried out in the field of adoption of agricultural innovations, the second section summarized relevant theoretical and empirical findings in the research field of contact with authority.

Many conclusions could be drawn from the diverse research of both adoption of innovations and contact with officials. The findings of adoption of innovation research provide support for several hypotheses, such as the relationship between adoption and socio-economic status and the relationship of adoption and contact with extension agents. Results of the research carried out on contact with officials similarly support the relationship between contact and socio-economic status and the relationship of contact and awareness. There are two main hypotheses of this thesis. The first hypothesis argues that the adoption of

agricultural innovations is directly related to the number of contacts with officials in bureaucracy. Similar to the first, the second hypothesis is that the adoption of agricultural innovations is directly related to the level of awareness the farmers have of officials. These relationships will be assessed by controlling the effect of socio-economic status, contact with extension agents and and the farmers' land position on the irrigation canal. In the following chapter, I discuss the data and the methods used to empirically assess these hypotheses.

# CHAPTER III

## DATA AND METHOD

### Introduction

As noted in the previous chapters, many studies on adoption of agricultural innovations have been conducted. Several studies attempted to test possible relationships between the adoption of innovations among farmers and many social and economic factors, such as power distribution (Freeman et al., 1982; Holmberg, 1977; Jedlicka, 1977); socio-economic status and risk-taking (Rogers, 1979; Gartrell and Gartrell, 1979; Cancian, 1967 1981; Frey et al.,1979); and education and cosmopolitanism (Rogers and Shoemaker, 1976; Sandhu and Allen, 1979). Empirical research on the effect of farmers' knowledge of the bureaucracy and contact with bureaucratic officials on the adoption of agricultural innovations have never been fully investigated. However, there are numerous studies that have examined the effect of informational factors such as farmer's contact with governmental extension agents on the adoption of various agricultural innovations (Slocum, 1957;

Fuguitt, 1965; Rogers and Shoemaker, 1969; Taylor and Miller, 1978; Gartrell and Gartrell, 1979; Ashby, 1982; Novak, 1987). Such studies have neglected the farmers' awareness of officials and farmers' contacts with officials in the bureaucracy and its effects on the rate of adoption of farm innovations among farmers. This thesis remedies this shortcoming, first, by analyzing the relationship between the rate of adoption of innovations and the farmers' contact with officials in the bureaucracy, and second, by investigating the relationship between farmer's awareness of officials and the rate of adoption among farmers. In order to assess the strength of the relationships mentioned above, other alternative explanations are taken into account. Previous researchers have investigated many variables which are thought to explain patterns of adoption of innovation among farmers. This thesis uses several alternative explanations of adoption as control variables. Specifically, size of farm owned as a measure of socio-economic status, position of farmers' land within the irrigation canal system, and farmers' contact with extension agents are used as control variables.

This chapter outlines the data and methods employed for analyzing the effect of farmers' contacts with the officials in the bureaucracy, as well as farmers' awareness of officials on the rate of adoption of agricultural innovations in the Sind and Punjab Provinces of Pakistan.

The chapter is organized into four sections: 1) discussion of the data and sample; 2) description of the variables; 3) discussion of the method of analysis; and 4) summary of the chapter.

## Data and Sample

The data used in this thesis were taken from the Water Management Research Project carried out by the Colorado State University Engineering Research Center in the Sind and Punjab provinces of Pakistan. The data were collected in 1976 for a sample of 387 farmers. Because the project was initially focused on irrigation development, the sampling procedure started by the identification of watercourses existing in Pakistan. From a large number of watercourses, a sample of 40 watercourses in 16 villages in the Sind and Punjab Provinces were identified.

According to Freeman, Lowdermilk and Early (1978), the major criterion for the regional selection of village sites was the geographical coverage of major cropping zones and major command areas of the irrigation system. However other criteria were given consideration, as they explain:

> Four of the sites in Punjab were chosen for other reasons such as previous research-development activities. The survey of these four watercourses included an additional diagnostic exercise to determine farmer responses to an applied research and implementation program conducted by the Colorado State University-Pakistan Program. Six of the remaining 12

> village sites were chosen to have one or more watercourses in common with the studies of the Upper and Lower Indus reported in 1966. The remaining six villages were chosen to be representative of a geographical area with the additional requirement that there be no exceptionally large landlords present. The sample was intentionally biased toward the small farmer who ultimately was intended to be the target of a pilot implementation scheme to improve watercourse, level land and extend improved water management technologies. (Freeman et al., 1978:12).

The primary sample village selection criterion was the agro-climatic zone, which is the combination of environmental influence such as rainfall and the predominant agricultural cropping pattern. Other charateristics of the villages that played a role in the selection procedure included variation in irrigation water supply such as the presence of tubewells, persian wells or powered lift system, caste distribution, and the origin of the farmers (Freeman et al., 1978:7).

As noted above; there are obvious limitations associated with this sample. The weakness of the sample concerns its lack of representativeness of a large population of over 78,000 watercourses in the Sind and Punjab provinces. No sampling frame for types of watercourses was available to the researchers to determine the distribution of the watercourse population of the key parameters. However, efforts were made to reflect the major watercourse parameters within the sample (Freeman et al., 1978:11). Researchers who have used these data have expressed the

problematic nature of the sampling frame, and the difficulty of validly representing the population of farmers in Punjab and Sind (see Frey et al., 1979; Cancian, 1981; Frey and Freeman, 1981; Freeman et al., 1982). Therefore, no significance tests will be reported in the analysis which follows.

Within a given village a sample of farmers was chosen at random after being stratified according to their watercourse canal position. First, a census of all farmers on a watercourse was completed. Names were listed on pieces of paper, then drawn randomly to obtain a sample of farms and farmers. The farmers selected were then interviewed and evaluations of irrigation were conducted. However, some evaluations were not conducted because farmers were not found to be irrigating during their turn in a number of visits to the site. Some data were not gathered or were coded as missing. Cases with missing data on variables were dropped from the analysis. Also, the farmers who owned no land were discarded from the analysis, for reasons explained later. This left a subsample of 290 from the initial sample of 387 farmers with complete data on all relevant variables.

## Variables

Dependent variable. Farmers' adoption of agricultural innovations is often defined by the rate at which the farmer

accepts and uses new farming techniques, practices and inputs that are introduced into rural communities. Operationalization of adoption of innovations has been defined in many ways. Some researchers have measured adoption of innovations across time periods in order to differentiate early adopters and "laggards" (Rogers and Shoemaker, 1969). Others, for example, used the rate of adoption as a measure of economic risk taken by farmers (e.g. Cancian, 1967, 1981; Frey et al., 1979). However, the measurement of innovativeness has generally been constructed by an additive scale that include new farm practices and techniques as well as use of agricultural inputs such as newly introduced seed varieties, fertilizers and farm chemicals.

Farmer's adoption of innovation in this thesis is measured with an index based on the summation of 3 agricultural innovations (1).

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(1) This index was constructed initially to include as many new farm inputs as possible to ensure a reliable overall measure of farmer's innovativeness in the provinces of Sind and Punjab. The number of agricultural innovations identified by the Water Management Team Project were diverse. This thesis included those that had already passed the trial stage, but importantly those requiring a dichotomous response from the farmers (yes or no). The choice was made on the basis of avoiding cumbersome standardization of adoption of innovations that reflect farmers' investment capability, such as the amount of inputs applied; or the farmers' farming knowledge such as seeding depth. The more straightforward notion of farmers' acceptance or nonacceptance of innovations was utilized. The initial innovations considered were as follows: 1)

The adoption index includes the following innovations: 1) Chenaab 70 soft wheat variety, 2) Phosphorus fertilizer, and 3) hard wheat S.A 42 variety. In addition each innovation was measured on a two point nominal variable with 0 meaning "did not adopt" and 1 meaning "adopted the innovation".

The adoption index was tested for reliability by using a Guttman scaling procedure. This procedure provides the basis for analyzing the underlying operating characteristics of the items included in the scale and determine if their interrelationships meet the properties of unidimensionality and cumulativeness (Nie et al., 1975). Unidimensionality of a scale presupposes that all items in the scale must all measure a movement towards or away from the same single underlying object. The cumulativeness, however, implies that the items can be ordered by degree of difficulty or importance so that a positive score for an important item will mean a positive score on less important or difficult items (Nie et al., 1975:536). The Guttman scale provides

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adoption of Chenab 70 wheat seed, 2) adoption of SAA 42 wheat seed, 3) adoption of high yielding rice seed variety, 4) adoption of phosphorus, 5) adoption of split application of Nitrogen, and 6) adoption of proper seeding date. The results of the Guttman scale statistics of these 6 items were surprisingly low. The coefficients of reproducibility and scalibity were 0.76 and 0.25, respectively. In order to improve the coefficients, a set of procedures were initiated to find the best possible combination of items.

several statistics by which an evaluation of the scale is possible. A general guideline to the interpretation of the statistics is that a coefficient of reproducibility higher than 0.90 and a coefficient of scalibility higher that 0.50 are considered to indicate a valid scale (Nie et al., 1975; Bailey, 1982). The results of the Guttman scale procedure of the adoption index gave a coefficient of reproducibility of 0.90 and a coefficient of scalibility of 0.65 . The results suggest that the adoption scale is reliable. The scale ranges from 0 to 3.

Independent Variables. Two independent variables representing the farmers' relations with officials in authority are used in this thesis. The variables are contact and awareness of officials. Awareness is conceptualized in terms of farmers' knowledge of institutional services provided by the government, and contact is conceptualized by the use of those services through direct contact with bureaucratic officials. Farmers' use of institutional services is operationalized by the number of contacts the farmers initiated with government officials during the last 3 months before the interview took place. The second independent variable measuring the farmer's awareness of authority is operationally defined in terms of the farmers' knowledge of the names of officials in the bureaucracy during the last 3 months before the

interview took place.

As noted in Chapter One, officials in the bureaucracy consist of persons who have some vital role to play in agriculture such as bureaucrats whose responsibilities lie in the maintenance of the daily functions of agricultural services, and institutional support to farmers in the Sind and Punjab Provinces of Pakistan. The country's four provinces are divided into divisions, the division into districts, and the districts into subdistricts or blocks called tehsils. According to Nyrop (1975:214) each division is headed by a commissioner, a senior civil servant who coordinates the activities of the various federal and provincial ministries and departments. The commissioner also supervises the deputy commissioners, each known as the DC, who are in administrative control of the districts. The districts remain, as they were under the British civil service, the most vital level of government as far as most citizens are concerned. It is at this level that plans are formulated, implemented, budget allocations made, policies adapted and law and order maintained (Nyrop, 1975; Charturvedi, 1977).

Secondly, the district also has a wide network of development and welfare institutions, such as development banks, credit banks, agricultural and forestry department, cooperatives department and education authorities. Farmers'

contact with and awareness of officials at the district level concerns only three officials at the district level. They are: 1) District Agricultural Assistant (D.A.A), an Agricultural Graduate whose responsibilities lie in the coordination of various agricultural programs; 2) Agricultural Bank Official (A.B.O) (This official is credited with the process of examining bank loan requests and other credit and their eventual approval); and 3) Agricultural Field Assistant (A.F.A), an official with two years training in agriculture, his main objective is the coordination of agronomic research and helping farmers in matters pertaining to crop failures and problems.

In addition to the district, the block (subdistrict) has a considerable significance as an administrative unit (Charturvedi, 1977). The block level bureaucracy is also a level at which significant decisions are made. These include the utilization of budgetary allocations, agricultural production quotas, and distribution of agricultural inputs such as fertilizer and seed. The block level bureaucracy also includes agricultural extension offices, cooperative extension offices, and land tax collectors. It is important to note that within irrigation water districts, the block level comprises several officials responsible for the supervision and management of water canals. The bureaucratic officials identified in the agricultural department at the block level are 1) Fertilizer

agent (F.A), a government official responsible for the marketing, distribution and the sale of fertilizers to farmers; 2) Irrigation Canal Administrator (I.C.A) whose main responsibility is to program, supervise and plan the distribution of water; 3) Irrigation Canal Officer (I.C.O), whose duties are the maintenance and functioning of irrigation canals; and 4) Irrigation Canal Assistant Officer (I.C.A.O), a village level assistant to the block irrigation officer. In sum, the contact and awareness with officials variables concern only seven officials, three at the district level and four at the block level identified above. The approximate hierarchical position of the seven officials in the bureaucracy is shown in Figure 1.

Farmers' contact with officials was measured by an index based on the summation of seven different contact items. Each item refers to the existence of contact the farmer initiated with a particular official. The scores are equally weighted from 0 to 1 as follows: 0 = no contact with officials was initiated, and 1 = one or more contacts. The range of the scale is from 0 to 7 (2). The coefficient of

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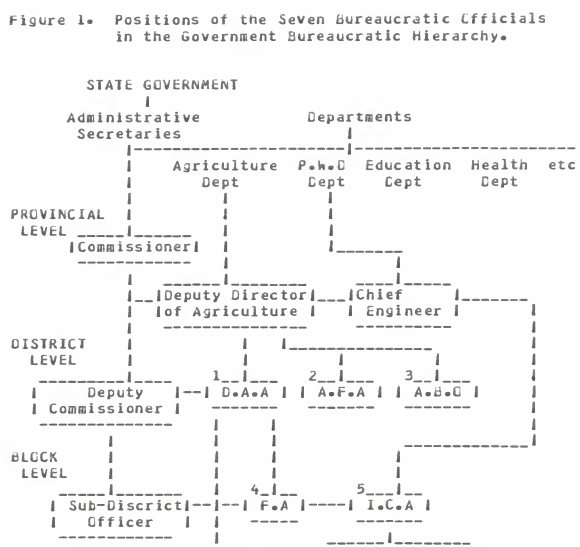
(2) In the original data set, contact scores were weighted as follows: 0 = no contact; 1 = 1 to 2 contacts; 2 = 3 to 4 contacts; and 3 = 5 or more contact. A reliability test of the contact index showed very weak correlation among the items. Bivariate correlation coefficients range from 0.02 to 0.75 , suggesting some problem of unidimensionality. A recoding procedure was carried out to ensure high level of association among variables.

Figure 1. Positions of the Seven Bureaucratic Officials in the Government Bureaucratic Hierarchy.




Source: Kahlon, A.S, A.C Sharma and P.C Deb. 1972.

Note: P.W.D = Public Works Department: (Irrigation Canals)
D.A.A = District Agricultural Assistant
A.F.A = Agricultural Field Assistant
A.B.O = Agricultural Bank Official; F.A = Fertilizer Agent
I.C.A = Irrigation Canal Administrator; I.C.O = Irrigation Canal Officer;I.C.O.A = Irrigation Canal Assistant Officer.

reproducibility is 0.92 and the coefficient of scalibility is 0.45, suggesting that the scale is reliable. In addition, the Yule's Q coefficients correlations range form 0.71 to 0.95 ; indicating that items in the scale are highly correlated.

The awareness of authority in this study was measured with a Guttman index consisting of the sum of 7 items of awareness that farmers have of officials previously identified. The index represents the score of farmers' knowledge of the names of officials in the bureaucracy. Individual measures were coded as a dummy variable with a score of 0 meaning "does not know the name" and a score of 1 meaning "knows the name". The Guttman scale procedure reveals a coefficient of reproducibility of 0.93, and a coefficient of scalibility of 0.44 , which indicates that the scale is fairly reliable.

Control Variables. Past researchers have reported the effect of a wide variety of explanatory variables on the adoption of innovations. In order to control for possible spurious relationships, three control variables were included in the analysis. These are farmland ownership, farmer's land position on the irrigation canal and extension agent contact. Farmland ownership is used as an indicator of socio-economic status, and land position on the the irrigation canal is an ecological measure of the location of

one's farm field within a water distribution system. Contact with extension agents is used as control variable because of the large amount of research accumulated in the subject and generally strong positive relationship found between extension agent contact and adoption of innovations.

A large number of studies have substantiated the positive relationship between socio-economic status as operationalized by the amount of land owned and adoption of agricultural innovations (Fliegel, 1967; Rogers and Shoemaker, 1971; Cancian, 1969; Gartrell, 1977; Frey et al., 1979; Gartrell and Gartrell, 1979; Sandhu and Allen, 1979). The socio-economic status variable in this thesis is operationaly defined in terms of acres of land owned (3).

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(3) The issue of the inclusion or exclusion of peasants who owned no land demanded a special attention. In the Indian-subcontinent landless peasants represent a large portion of farm labourers, tenants and sharecroppers on basis of contract with medium and large land owners. In the original subsample (N=356), peasants who own no land represented 18.5 % of the total numbers of farmers. This raises a grave problem of approximating the socio-economic status for farmers who do not own land. This category was dropped from the analysis. The justifications for deleting landless peasants are twofold. First, after an examination of the original sample farmer distribution on the amount of land cultivated, there was no indication in the data about the difference between sharecroppers and tenants who rent land in cash. In addition, a close view of cases who own land reveals no major difference between the amount of land owned and land cultivated. The second most important reason for the exclusion of landless peasants is the problem that could be raised vis-a-vis the adoption of innovations. Under sharecropping basis, for example, tenants are usually told what crops to plant and what inputs to use by landlords who essentially provide the land, or perhaps some inputs depending on the

A scale was constructed by dividing the sample distribution of the variable into 4 point rank scale having approximately equal numbers of farmers in each rank. The division of the sample distribution of acres of land owned into equal quarters was used by other researchers (Frey et al., 1979). Employing the same percentage breakdown used by Frey et al. (1979), the division reveals an approximate proportions of 28.3/23.8/24.5/23.4 . This particular breakdown provides two distinct rank categories falling above and below the subsistence level. An eleven acre farm is considered to be a subsistence farming unit in Pakistan (Naseem, 1980:73). The four point rank scale in acres is as follows: 1 = 1 to 6 acres; 2 = 7 to 11 acres; 3 = 12 to 19 acres; and 4 = 19 or more.

The second control variable used in this thesis is the relative position of the farmer's fields vis-a-vis the irrigation canal. The importance of the micro-environment under which different farmers operate has drawn some attention in the adoption research literature. For example, Ashby (1982) argues that the failure of adoption of innovations can be attributed sometimes to the different physical and environmental factors such rainfall, soil type

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agreement. Therefore, the farmer's decision to adopt or not to adopt innovations may be influenced by the sharecropping contract. It is less likely for farmers to invest on others people's land than their own.

and micro climates. A farmer, for example, may be both adopter and non-adopter with respect to different types of soil (Gladwin, 1979; cited in Ashby, 1982). Similarly, the importance of the position on the irrigation canal at the head, middle or the tail of the canal is that the relative location of the farm field can determine one's allocation of irrigation water. In addition, as described earlier, the sample was initially stratified according to farmers' land position on the irrigation canal. The watercourse was measured and demarcated into three equal sections. The "head" is the one-third area beginning at the canal outlet and the "tail" is the one-third portion farthest from the outlet. The "middle" section lies in between the two extreme sections (Freeman et al., 1978:32). The tail position on the watercourse canal might be a disadvantaged in terms of the lesser amount of water allocated when compared with a head position in the canal where water is readily available. The measurement of farm canal position was on a scale of 1 to 3 as follows: 1 = tail, 2 = middle and 3 = head.

The third control variable used in the thesis is contact with extension agents. Several studies have indicated that extension agent contact has a positive effect on farmers' adoption ((Slocum, 1957; Fuguitt, 1965; Maulik et al., 1966; Rogers et al., 1969, Sandhu and Allen, 1979; Novak, 1987; Taylor and Miller, 1978; Wozniak, 1984). Studies generated

from developing countries suggest that farmers' contact with extension agents has a positive impact on adoption, but more so on the early stage of adoption (Sandhu and Allen, 1979; Gartrell and Gartrell, 1979; Ashby, 1982). The inclusion of extension agent contact enables one's to make a distinction between the effects of extension agent's contact and the farmers' contact with officials on the adoption of innovations (3). While extension agents are supposed to have a direct effect on adoption, i.e by recommanding the practices to be adopted, the other officials have only an indirect, although important effect in terms of providing credit, fertilizer, seed, or facilitating acquisition of irrigation water.

Farmers' contact with extension agent was measured on an ordinal scale varying from 0 to 4, with 0 = no contacts; 1 = 1 to 3 contacts; 2 = 4 to 6 contacts; and 3 = 7 or more contacts.

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(3) Extension agents can sometimes be regarded as government officials. This may raise a question as to their difference from other bureaucratic officials. As stated in Chapter Two, extension agents are usually under the supervision of superior officials, but more importantly their control of resources such as farm inputs, new varieties of seed and other factors is minimal in comparison with the bureaucratic officials. In fact, extension agents' objectiive remain restricted to the spread of information about new farm technologies. In addition, contact with extension agent is generally an agent-initiated contact, while contact with officials must be a farmer-initiated contact.

A summary table of all the variables used in this research including the description and the coding is reported in Table 1.

Method of Analysis

In trying to examine the effect of contact and awareness of authority on the rate adoption of innovation by the inclusion in the analysis of several explanatory variables, a multiple regression analysis would be appropriate. However, the nature of the data does not allow one to use the multiple regression since it requires at least an interval level data measurement (Ott et al., 1983). All variables in this thesis are measured at the ordinal level. In addition, the distribution of cases on the variables depart from the normal curve, also the variances are fairly unequal.

Therefore, the inclusion of all variables simultaneously would cause inflated estimates and would hamper the interpretation of the results. Nonparametric statistics can treat data which are at least ordinal level, as well as data whose numerical scores have the strength of ranks (Siegel, 1956:33). In addition, nonparametric correlation statistics have no prior assumptions about the distribution of cases on the variables (Nie et al., 1975:277). Therefore, two nonparametric correlation techniques - Spearman's rho and Kendall's tau - were used to examine the zero order

bivariate relationships between the variables. In order to investigate the strength of the adoption-contact and adoption-awarenss relationships the Kendall's partial rank correlation statistic was usec. This statistic enables one to examine the strength of a given relationship when the effects of other variables are statistically partialled out (Siegel, 1956:223-29).

## Summary

This chapter summarized tha data and method employed in the assessment of the effects of contact with and awareness of officials on the adoption of agricultural innovations in the Sind and Punjab provinces of Pakistan. First, the chapter started with a discussion of the data and the sample. It was followed by a definition and description of variables and a discussion of the method of analysis employed in this thesis.

Table 1. Description of Variables

| Variables | Description and codes |
|---|---|
| Adoption of innovation (ADOPSCAL) | Additive scale comprising three dichotomous innovations. 1= adopted; 0 = did not adopt. |
| Awareness of officials (AWARSCAL) | Summative index of seven dichotomous variables representing 3 district and 4 block level agricultural positions. 1= know name; 0= do no know |
| Contact with officials (CONTACT) | Summative Index of seven dummy variables representing 3 discrict and 4 block level agricultural positions. 0= no contact 1= 1 or more |
| Acres of Land Owned (AREAOWND) | Four point-rank scale based on 28.5/23.8/24.5/23.4 proportion of the variable distribution. 1= 1-6 acres 3= 11-19 acres 2= 6-11 acres 4= 19 or more |
| Land Position in Canal (CANALPOS) | Ordinal variable with three categories 1= tail of canal irrigation 2= middle " " 3= head " " |
| Contact with Extension Agents (CONTAGEX) | Ordinal variable with four categories 0= no contact 1= 1-3 contacts 2= 4-6 contacts 3= 7 or more |

# CHAPTER IV

## RESULTS OF THE ANALYSIS

### Introduction

This chapter presents the results and findings of the analysis of the effects of both contact with officials and awareness of officials on adoption of agricultural innovations. The chapter is divided into four sections. First, the zero-order rank correlation matrix is presented. Second, the first rank order partial correlations are discussed. The third section contains a discussion of the findings. The final section contains a summary and conclusion.

### Bivariate Results

The zero-order bivariate coefficients for all variables are reported in Table 2. The zero order rank correlation coefficient between the dependent variable, adoption of innovations (ADOPSCAL), and one of the two principal independent variables; contact with officials (CONTACT), is positive but extremely weak (rho = 0.17; tau = 0.15). The relationship between the other indepedent variable, awareness of officials (AWARSCAL) and the dependent variable, adoption of agricultural innovations (ADOPSCAL) is positive and fairly high (rho = 0.44; tau = 0.37).

Table 2. Zero Order Rank Associations among Variables (N = 290)

| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | rho | tau | rho | tau | rho | tau | rho | tau | rho | tau | rho | tau |
| 1.ADOPSCAL | - | | .17 | .15 | .44 | .37 | .18 | .15 | .12 | .10 | .17 | .15 |
| 2.CONTACT | | | - | | .44 | .39 | .21 | .18 | .07 | .06 | .58 | .54 |
| 3.AWARSCAL | | | | | - | | .16 | .14 | .18 | .16 | .43 | .39 |
| 4.AREAOWND | | | | | | | - | | .01 | .01 | .22 | .20 |
| 5.CANALPOS | | | | | | | | | - | | .02 | .02 |
| 6.CONTAGEX | | | | | | | | | | | - | |
| Mean | 1.34 | | 0.83 | | 1.44 | | 1.43 | | 1.76 | | 0.20 | |
| S.D | 1.04 | | 1.33 | | 1.47 | | 1.13 | | 0.63 | | 0.53 | |
| Variance | 1.08 | | 1.77 | | 2.18 | | 1.28 | | 0.40 | | 0.28 | |
| Range | 3.00 | | 7.00 | | 7.00 | | 3.00 | | 2.00 | | 3.00 | |
| Skewness | 0.27 | | 2.03 | | 1.35 | | 0.07 | | 0.25 | | 2.80 | |

ADOPSCAL = Adoption of Agricultural Innovations

CONTACT = Contact with Officials

AWARSCAL = Awareness of Officials

AREAOWND = Acres of Land Owned

CANALPOS = Land Position in the Irrigation Canal

CONTAGEX = Contact with extension agents

The rank order coefficients among the explanatory variables range from -0.01 to 0.58 for Spearman's rho coefficients and from -0.01 to 0.54 for Kendall's tau coefficients. These estimates indicate no serious problem of multicollinearity. The bivariate rank order correlation results seem to indicate that the control variables are all related with adoption of innovations in the predicted direction. Adoption of innovations (ADOPSCAL) is positively associated with extention agent contact (rho = 0.17; tau = 0.15); socio-economic status (rho = 0.18; tau = 0.15) and the canal land position (rho = 0.12; tau = 0.10). Although these relationships are consistent with the expectations, they are weak.

Partial Rank Correlation Results

While the zero-order bivariate coefficients summarize the degree of association between variables in general, the first order partial rank coefficients enable us to estimate the strength of the relationship between two variables when the effect of another explanatory variable is statistically partialled out. To investigate the possibility of spurious interpretations, the three other explanatory (control) variables were introduced into the analysis one at a time. Table 3 reports the results of Kendall's partial rank correlation coefficients (tau xy.z) for

Table 3. First Order Rank Correlation between Adoption and Contact and between Adoption and Awareness, Employing Kendall's Partial Rank Correlation (tau xy.z) (N = 290)

| Control Variables | Adoption/Contact | Adoption/Awareness |
|---|---|---|
| Acres of land owned | 0.13 | 0.36 |
| Land canal position | 0.14 | 0.36 |
| Extension agents contact | 0.08 | 0.34 |
| Zero order (tau xy) | 0.15 | 0.37 |

adoption of innovations and contact with officials, and the partial correlation coefficients for adoption of innovations and awareness of officials.

As noted earlier, the zero order rank correlation coefficient between adoption of innovations and contact with bureaucratic officials is positive but small and is consistent with the hypothesis. Similarly, the zero order rank correlation coefficient between adoption and awareness is positive and fairly substantial, and is also consistent with the hypothesis. However, there is a chance that these relationships are the spurious product of other variables.

Socio-economic status is often expected to affect the adoption behavior of farmers. In fact one might assume that the apparent contact-adoption and awareness-adoption relationships are spurious functions of socio-economic status, measured here by the amount of land owned. The zero-order rank correlation matrix reveals a positive but weak relationship (rho = 0.18; tau = 0.15) between adoption and acres of land owned. But when the effects of the amount of land owned are partialled out, the relationship between contact with officials and adoption is decreased by a trivial amount (tau xy.z = 0.13), as is the awareness-adoption relationship (tau xy.z = 0.36).

Similarly, farmland position in the irrigation canal was expected to affect adoption. When the effects of farm

position within the irrigation canal were partialled out, the relationship between contact with officials and adoption of agricultural innovations did not change (tau xy.z = 0.14). The relationship between awareness and adoption was also diminished by a trivial amount (tau xy.z = 0.36).

Farmers' contact with extension agents has often been found to have an effect on adoption of innovations. One might argue that the difference in adoption among farmers is associated with extension agent contact, more than with contact with officials in the bureaucracy. In order to examine the possibility of a spurious artifact of extension contact, the effects of the variable were controlled for, the relationship between contact with officials and adoption diminished by a fairly substantial amount (tau xy.z = 0.08), however, the relationship between awareness and adoption is not altered by the same magnitude (tau xy.z = 0.34). Given the high correlation between contact with extension agents and contact with other officials (rho = 0.58; tau = 0.54), the lowered first order correlation between adoption and contact (controlling on extension agent contact) is not surprising and suggests that the two contact variables may be part of a single dimension.

## Discussion of Findings

The results of the analysis clearly suggest that farmers' contact with officials and their awareness of officials have

positive effects on the adoption of agricultural innovations. However, the effect of awareness of officials on adoption was much stronger than the effect of contact. This is not only substantiated by the bivariate rank order correlations but also when the effects of other explanatory variables are serially partialled out one at a time.

The major result obtained in this analysis is that awareness of officials appears to have a greater impact on adoption of innovations than contact with those officials. The overall findings of the analysis partially support our main hypothesis that contact with officials is related to the farmers' adoption of agricultural innovations, but the effect of awareness of officials on adoption finds much greater support.

Summary and Conclusion

The results of nonparametric correlations estimates used to examine the effects of contact with and awareness of officials on adoption were presented in this chapter. First, we presented the bivariate rank order coefficients. The results showed that the correlates of the dependent variable are all positively related with adoption of agricultural innovations. All estimates were in the predicted direction, though the relationships were quite weak. Second, we presented the partial rank order correlations for adoption and contact, and adoption and

awareness relationship. The results obtained indicate that the relationship between adoption and awareness was not altered when the effects of each control variable were partialled out separately. However, the adoption and contact with officials relationship showed a sharp drop when the effect of farmers' contact with extension agents was controlled for. The other two control variables (land area owned and the farmers' canal position) did not change the correlation when each was controlled for. In sum, the results suggest a modest support for the two hypotheses. Unlike the contact/adoption relationship, the awareness/adoption relationship was not significantly diminished when contact with extension agents was included as a control variable.

# CHAPTER V

## SUMMARY AND CONCLUSIONS

### Introduction

In this thesis I have attempted to investigate the effect of farmers' contact with bureaucratic officials, as well as their awareness of officials, on the adoption of agricultural innovations using data for the Sind and Punjab provinces of Pakistan. The main aim of this thesis was to draw attention to one aspect which has not been fully examined by previous researchers. This is the role played by government officials in the decision of farmers to adopt agricultural innovations.

This chapter consists of a discussion of the implications of results. The first section discusses major findings and implications in relation to the significance statements presented in Chapter One. The second section contains suggestions for future research.

### Implications

As stated in Chapter One, the adoption of agricultural innovations research has previously examined the effect of farmers' contact with extension agents on adoption but

neglected farmers's contact with other government officials. Also, independent of the research on adoption, researchers attempted to investigate many factors affecting the frequency with which individuals initiated contact with bureaucratic officials. This thesis was primarly concerned with assessing the effect of contact with officials as well as awareness of officials on the adoption of agricultural innovations.

Results suggest that while farmers' contact with officials was not strongly associated with the farmers' adoption of innovations, awareness of officials showed a much higher relationship with adoption. These associations did not change substantially when the effects of others explanatory variables were partialled out. In this regard, the research results suggest that awareness of officials, conceptualized by the farmers' knowledge of institutional services is positively related to adoption, while contact with officials conceptualized by the use of institutional services, is weakly related to adoption of agricultural innovations. Awareness of officials appears to have a stronger positive effect on adoption than contact. It was expected that the more aware the farmers are of officials, the higher the tendency for them to adopt, but this relationship is relatively weak. However, the relationship is in the predicted direction.

The weak relationship between contact with officials and adoption may indicate the importance of the farmers' access to information and communication on innovations through informal channels instead of through officials. Thus, awareness of officials is expected to be correlated with the general awareness and knowledge which leads to the adoption of high-technology agricultural innovations. Informal channels of communication deserve special attention in this regard; specifically how is general awareness or knowledge gained. It appears that it can be gained independent of the farmers' social status (if indeed landownership is a good measure of socio-economic status) and independent of contact with extension agents, or indeed contact with the bureaucracy in general. Another possibility is that awareness of government officials is the result of a long term contacts with government officials, which was not fully measured by the contact with bureaucratic officials measure used in this thesis.

There is no simple implication that can be drawn from these results. One might argue that adoption of improved agricultural technologies may be diffused more rapidly in a given social system by agricultural policies stressing the increase in farmers' awareness about bureaucratic officials and their services. But we must also recognize that awareness of officials does not exist in a vaccum. Instead awareness of officials in the bureaucracy is influenced by

many socio-economic factors such as education/literacy, cosmopolitanism, age and many others. These factors can also exert some influence on the tendency of farmers to initiate contacts with bureaucratic officials. It seems clear that any attempt to understand the role of contact with and awareness of officials on the adoptive behavior of farmers, cannot ignore the implications of socio-economic factors.

There is also a much broader and perhaps more relevant implication that can be drawn from this thesis. This pertains to the nature and type of bureaucratic institutions responsible for agricultural development in many developing countries. Many developing countries' agricultural bureaucracies are part of organizations that are inefficient and unreliable in terms of providing adequate supplies of inputs and new technologies. Observations have shown that the Agricultural Departments in the Indian subcontinent have simply not been up to the task of providing information and inputs to farmers. Nicholson and Ali Khan (1974) put it very bluntly:

> Government control of fertilizer and other inputs permits not only an opportunity to mitigate the welfare effects of scarcity but also an opprortunity to put the farmer in direct touch with extension agents. This, in turn, assists the extension workers in promoting their "package" of inputs and practices. To put it less subtly, the seeds and fertilizer are the "come on" or the "quid pro quo" for cooperation with government extension workers in new programs, institutions, or ideas. For both ideological and practical reasons, therefore, the administration has an interest in

superseding the trade in services to the farmer (1974:72).

Thus perhaps the weak relationship between contact with government officials (including extension agents) and adoption of innovations may be a reflection of the poor advice and coercive action emanating from the bureaucracy. Furthermore, awareness of bureaucracy may be a prerequisite for knowing how to avoid negative contacts with the bureaucracy. Thus, perhaps farmers who are aware of the bureaucratic structure and how it works are also more aware of the advantages of high yielding varieties and the inputs which are necessary to make them profitable and need not contact the officials in the bureaucracy in order to adopt these new technologies.

According to South Asian experts in agriculture, the spread of high yielding varieties and new fertilizers in the 1960's in Pakistan was not attributed to goverment at all, but to the profitability of the innovations, and to the interpersonal communications among the adopters. These farm inputs were mainly distributed by the private sector (Lowdermilk, 1972; cited in Nicholson and Ali Khan, 1974). Access to the local bureaucracy appears to have a little effect on the farmer's economic activities (Nicholson and Ali Khan, 1974:87). More importantly, access to the bureaucracy might entail a "hidden cost" to the farmers in the form of various gratuities to the bureaucrats. Such

exchange seems to favor the large land owners, since the latter possess more material resources for bargaining than do the small farmers. This state of affairs was also found to be widespread in Bangladesh during the expansion of the Comilla project (Blair, 1982). The important point to be made here is what Nicholson and Ali Khan (1974:88) refer to when they argue that

> Pakistan shares with India an "administrative tradition" and both countries have discovered that whenever critical elements of the development are controlled by the civil service or tied up in the hierarchies of the provincial secretariate, that bureaucracy is likely itself to be one of the key constraints or limits on development.

The debate over the need for structural, managerial and attitudinal changes in the government bureaucratic institutions particularly in the Third World has been given some attention recently (see Korten and Alfonso, 1982; Owens and Shaw, 1972; Jedlicka, 1977; Bennis, 1966). Efforts aimed at addressing the problem of authoritarian and nonparticipative bureaucracy focuses on exposing the disparities and the inequalities among farmers in terms of access to governmental services. Many researchers and development experts suggest reforming bureaucratic institutions. This is carried out by improving management and organizational behavior by adopting an organizational structure that is more amenable to serving farmers through initiating change and promoting adoption of technology. However, these transformations have proven to be difficult

to implement. Without a strong commitment from the head of goverment and political leaders, such measures will have a limited chance of implementation.

It becomes clear that any attempts made to investigate the link between bureaucratic officials and farmers in explaining adoption of agricultural innovations and rural development in general must not only take into account the socio-economic factors but also the broader interactive nature of the bureaucracy and its authority system.

## Suggestions for Future Research

Research on the relation of government officials' contact with farmers to adoption of agricultural innovations is still severely hampered by the lack of adequate data. As data become available, researchers should assess the effect of the farmers' contact with officials as well as their awareness on adoption of innovations in particular and the develpment process in general. In this regard, future researchers should develop different measures of the use and knowledge of institutional services provided by the government and the private sector to take into account the shortcomings of the indices of contact and awareness used in this thesis. This is very important because the role of government bureaucracy in the context of the development process in the developing countries has not been empirically examined. Empirical research is needed to remedy the

shortcomings characterized by the usual research carried out on government organizations through the emphasis of the internal mechanisms and interrelationships among the members.

An objective of future research on this topic should concentrate on the development of an empirical model that takes into account the specific aspects of government bureaucratic institutions found in many developing countries, rather than refering to the conventional Weberian theory of bureaucracy which ultimately has a little usefulness in dealing with the problems of public bureaucracy in the developing countries. In other words, the empirical model should measure the authoritarian, coercive and restrictive aspects of government bureaucracy in the developing countries.

In addition, future research must also investigate the effect of contact with officials on awareness of officials and vice versa. In this thesis both contact and awareness were conceived as parallel measures of the linkage between farmers and the bureaucracy. In addition, our secondary analysis performed by controlling the effect of one on the other variable indicate that the awareness of officials/adoption of innovations relationship remained unaltered when the effect of contact with officials was statistically partialled out. In contrast, the

adoption/contact relationship simply faded away when awareness was controlled for. The results were surprising because of the large difference between the two partial rank correlation coefficients. This requires further investigation by including other alternative variables such as the degree of cosmopolitanism, a general awareness scale of government services, and perhaps some variables describing the attitudes and opinions of farmers toward the officials. This may perhaps elucidate the nature of the relationship between contact and awareness. Additional research on the subject is needed, especially in developing a causal model linking adoption, contact and awareness.

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# BUREAUCRACY AND ADOPTION OF AGRICULTURAL INNOVATIONS IN PAKISTAN

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AN ABSTRACT OF A MASTER'S THESIS

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ABSTRACT

During the past several decades a considerable amount of research has been conducted on the adoption of agricultural innovations. Differences in innovativeness among farmers were attributed to many factors. The research on adoption and diffusion of innovations as a process of communication and access to information was solely focused on the effect of farmers' contact with extension agents and the role of community leaders in the dissemination of agricultural innovations. Despite the substantial contributions, no research has examined the effect of farmers' contact with non-extension agents, particularly with bureaucratic officials those responsabilities lie in the implementation of various agricultural programs.

This thesis examined the relationship between the farmers' contact with and awareness of officials and the adoption of agricultural innovations in the Punjab and Sind Provinces of Pakistan. A sub-sample of 290 farmers was used. Nonparametric coefficients estimates were employed to assess the effect of farmers' contact with and awareness of officials by the inclusion of several control variables (land area owned, farmer's contact with extension agents, land position in the canal irrigation).

The analysis revealed a small positive association between contact with officials and adoption on one hand, and a much larger positive association between awareness of officials and adoption on the other hand. Rank order partial correlation estimate was employed to assess the strength of the relationships when the effects of the control variables were individually partialled out. Results showed that the adoption and awareness relationship remain the same when the three control variables were partialled out in sequence. The relationship of adoption and contact did not change substantially except when extension agent contact effect was controlled for. The findings suggest the relative importance of awareness of officials in predicting adoption of innovations in comparison with contact with officials.