

MAJOR PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL
INNOVATIONS BY FARMERS AS PERCEIVED BY STATE EXTENSION
DIRECTORS AND COUNTY AGENT ASSOCIATION PRESIDENTS

THESIS

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Chapter 1

INTRODUCTION

In the past half century, agriculture has undergone a metamorphosis in the United States. Several institutions have emerged which have led to the awakening of the farmer. One of the great motivating agencies in bringing about change in the adoption of practices by farmers is the Cooperative Extension Service which was established by the passage of the Smith-Lever Act in 1914. The system of joint USDA and Land-Grant University responsibility for cooperative extension work requires a cooperative determination of major policies and program direction for effective service to the public. The Smith-Lever Act specifically states that the work of cooperative extension be carried on in such a manner as may be mutually agreed upon between the Secretary of Agriculture and the State Land-Grant Universities.

The major function of the Cooperative Extension Service is to improve the quality of life through educational programs. Therefore, a prime need is to identify the general areas where quality of life can be improved; structure the areas of concern so that they may be improved; study the available resources for use; and arrive at self-defined desirable courses of action. Thus extension service is a vehicle to carry innovations from research to the farmers for bettering their well being at an economically possible level. In this

process there are problems which arise and hinder smooth diffusion of the intended message and thus retard development.

Agriculture is a risky undertaking which depends mostly on weather and other uncontrollable factors. Farmers, thus, can afford to take but very minimum chances in trying innovations. As professional change agents, extension personnel should examine the flow of information especially as it relates to the use of science and technology. In this regard, the National Academy of Sciences (1975), had this to say about disseminating technology:

It is generally accepted that the scientific and educational establishment has played a significant role in making possible our efficient agriculture. To what extent do current shortages and higher prices reflect a diminished ability of science? Has the flow of technology into the system been slackening? Has the flow been directed in the appropriate area?

The NAS continued to raise questions concerning the effect of future trends which are directly connected with dissemination of information. Can the past exponential curve of rising agricultural output be continued to the indefinite future? If so, at what rate? If not, at what level and when will leveling off occur and in response to what constraints? Are there technological discoveries in the offing that could dramatically boost production? In what ways is the future likely to be different and what dangers and what opportunities lie ahead? The extension service is compelled to look into such questions while considering strategies for disseminating knowledge to the farmer.

Land under tillage in the USA is declining in acreage year after year, while at the same time the farm units are growing larger,

i.e., fewer farmers feed more people each year. But how long will this continue? The number of persons supported per harvested acre will level off when the land reaches its maximum production potential. This reality is a clear warning to the extension service to look into new patterns of approach and consider alternatives to the proportions and types of farm inputs geared to agricultural production systems.

Statement of the Problem

Agricultural development in the USA has been revolutionized in the past century permitting higher production per unit area. Development of improved seed and livestock, mechanization and other time and labor saving operations have contributed. However, due to changing conditions in economic perspectives, such as inflation, cost of land, taxes, production costs vis-a-vis commodity prices, and political influences, difficulties have arisen in ready acceptance of innovations by many farmers. Rapid technological changes, scarcity of both research and extension personnel, and the natural human inclination to resist change, further add to constraining factors for adoption of new ideas.

Regarding the problem of adoption of new practices, Rasmussen (1975) addresses it thus:

Now, in less than a generation, we have seen changes a technological revolution has made in our agriculture. Farms have become bigger and fewer. . . . Farmers now produce primarily for the market and buy from the store much of their eggs and milk. Many wonder whether . . . farms are giving way to large-scale employer units. Some fear that "factories in the field", which separate management and labor, and accumulations of land in relatively few, large holdings may be a result of the revolution in farming. Others question whether the increasing investment

needed and the larger cash costs that are associated with modern, highly specialized, commercially oriented agriculture will make it possible for operators . . . to compete in the adoption of new techniques.

Agricultural development is a long, uphill struggle with limited breakthroughs. Momentum lost at one place or time in the process is difficult to regain. To avoid such a problem, the agricultural developmental components, i.e., research and extension, must be well organized to be effective.

Agricultural research takes considerable time to produce feasible results ready for consumption at field level. It (research) acts as an engine, which is the primary component of a machine, in agricultural development. Once the results are produced, they have to be conveyed to the farmer through either the extension service or other channels. Extension acts as a vehicle in disseminating research findings. Regarding importance and also problems facing the extension service, Heady, et. al., (1958) says,

. . . extension education can materially affect the adjustment process. As the major education arm of the United States Department of Agriculture and as one education arm of the colleges of agriculture and experiment stations of the land-grant colleges and universities, it holds a unique position. It supplied the discoveries of the laboratory, the test plot, and the researcher's analysis for interpretation to farm families. It is recognized as one of the most important forces for attaining orderly adjustments on farms. Through its leadership agricultural progress is guided by technical science. It also serves as a stabilizer by regulating the extent of adjustments. The problem . . . is primarily one of adjustment in resource utilization, For several reasons adjustments in agriculture have been slower than in industry. Agriculture is composed of a large number of small units in which management is an unspecialized function. Farmers are traditionally conservative. Too often they would rather bear their existing ills than take the risk of facing unknown hazards. Furthermore, agriculture is a biological business and nature sets the pace.

The extension service does face problems which either hinder information from reaching the farmer, or in cases when information reaches the farmer it is not adopted as expected. Thus a dilemma faces the extension agent in trying to improve agriculture by disseminating technical information to the farmer who may be relatively unresponsive because he has his own problems, some of which are not agricultural in nature.

The farmer is an independent person and may accept or reject innovations at will. New practices, intended to be adopted and fitted into existing operations, should be sufficiently convincing that they will produce reasonable returns in the foreseeable future. Otherwise, the farmer will ignore the new ideas and continue with methods which had existed before. Furthermore, the adoption process is constrained by the facts that (a) not all farmers have the will to invest in agriculture; (b) not all farmers have the ability to invest in agriculture due to low returns from their farms; and (c) not all factors are under the control of the farmer, such as weather, floods and pricing of farm inputs and produce.

Extension service personnel should realize and appreciate the range of problems confronting the farmer, such as low farm outputs relative to costs, lack of management competence, demand for high financial outlays, scarcity of land which affects economies of scale, limited educational background, uncontrollable weather, high living costs, lack of legislation which protects the farmer such as workman's compensation, and high percentage of impoverished families, in rural areas. Even with ready-made solutions at hand from extension

service, the farmer must be willing and able to accept and implement innovations.

Objective

This study was designed to determine major problems which affect the adoption of agricultural innovations by farmers as perceived by (a) State Directors of Cooperative Extension Service, and (b) State Presidents of County Extension Agent Associations.

Definition of Words and Terms

CEAA: County Extension Agent Association

CES: Cooperative Extension Service, established by the Smith-Lever Act of 1914 by which practical information could be taken from the land-grant colleges and United States Department of Agriculture to the people in their local environment.

Delphi Technique: Sachman (1975) explains the Delphi technique as follows:

An attempt to elicit expert opinion in a systematic manner for useful results. It usually involves iterative questionnaires administered to individual experts in a manner protecting the anonymity of their responses. Feedback of results accompanies each iteration of the questionnaire, which continues until a convergence of opinion, or a point of diminishing returns, is reached. The end result is the consensus of experts usually organized as a written report by the Delphi investigator.

Director of CES: one who directs the affairs of the cooperative extension service in a state and may also operate as "Dean" of CES, or both Dean and Director of CES. The director is a representative of the land-grant college, or state university, and the U.S. Department of Agriculture.

Q-sort committee: a panel of two or three people appointed, outside the respondents of the Delphi investigation, to scrutinize and refine information elicited from participants.

USA: United States of America

USDA: United States Department of Agriculture

Research Methods and Procedures

Method. Data for this study were obtained through the Delphi technique. Due to the vastness of the USA as a country, a survey conducted by personal interviews would not have been feasible for a study of this nature. The Delphi technique overcame this problem by use of selected extension personnel representing each state under the cooperative extension service.

The information was secured from state CES directors of the 50 states and CEAA presidents of 49 states (the state of Rhode Island had no association). These officials, through their strategic positions in extension service and accountability for effectiveness of the service to the farmer, were in an appropriate position to perceive problems pertaining to farming which, in turn, affect adoption of agricultural innovations.

Administration of the Instruments. The first phase instruments of the study (Appendix B) were administered by mail on January 21, 1980, to the study population consisting of 50 state directors of CES and 49 state presidents of CEAA (the state of Rhode Island had no association). A letter of introduction (Appendix A), signed by the writer and the chairman of the study committee, accompanied the instrument sent to

each participant by name and title; also a self-addressed stamped envelope was enclosed for ease and convenience of feedback. Each envelope was numbered against a corresponding file number for identification on return.

Participants were asked to list the five major problems which, in their opinions, most seriously affect the adoption of agricultural innovations by farmers. A followup memorandum (Appendix C), initialed by the writer and chairman of the study committee, was mailed to those who had not yet returned the instrument as of February 4, 1980.

By February 14, 1980, responses had been received from 64 percent of the population (Table 1). The Q-sort committee scrutinized and combined opinions received; and wherever necessary, modified statements without altering the original meanings. A list of 63 statements was obtained which formed the questionnaire for the second phase instruments (Appendix E).

The second phase instruments were mailed on March 3, 1980, to the original population with enclosure of a self-addressed stamped envelope. A cover letter (Appendix D) which acknowledged and thanked participants for responding to the initial request, signed by the writer and chairman of the study committee, accompanied each instrument.

The second phase questionnaire was divided into five categories--economic, technical and managerial, social, informational, and political. Each statement was weighted by numerical numbers: 1 - not a problem, 2 - a slight problem, 3 - a moderate problem, and 4 - a severe problem.

Participants were asked to circle one number for each statement corresponding to their perceptions regarding gravity of the problem.

On March 17, 1980, the date set for participants to return the instruments, a 55 percent response had been attained. A followup memorandum (Appendix F), initialed by the writer and chairman of the study committee, was mailed to those who had not yet returned the instrument. On the deadline set, April 8, 1980, a total of 84 (85 percent) (Table 1) responses were recorded and used in the study.

The high percentage of responses may be attributed to (a) the choice of this particular study which dealt with an important aspect of development--agricultural innovation, (b) anxiety of participants to know results of the study for possible solutions to pressing problems, and (c) the specificity and clarity of the instruments of the study. Some respondents sent their replies by registered mail to ensure delivery, while others telephoned to apologize for being late and to ask if they could still mail the instruments. Several others strongly requested a copy of the completed study.

Treatment of Data. Responses were recorded on IBM code sheets and keypunched on IBM 80-column computer cards. Cards were sorted for analysis using West Virginia University Computer Center facilities.

Overall means and standard deviations were determined for each statement. Group means and standard deviations were also determined pertaining to positions, regions and the category variables--economic, technical and managerial, social, informational, and political.

TABLE 1

RETURNS OF COMPLETED INSTRUMENTS BY RESPONDENT GROUP AND GEOGRAPHIC REGION:
 PHASE I AND II OF THE DELPHI TECHNIQUE

1.1 Phase I

Region	Directors		Presidents		Overall Total	
	Number Participants	Number Returns Percent	Number Participants	Number Returns Percent	Number Participants	Number Returns Percent
North central	12	9 75	12	6 50	24	15 63
Northeastern	12	10 83	11	6 55	23	16 70
Southern	13	9 69	13	6 46	26	15 58
Western	13	10 77	13	7 54	26	17 65
Total	50	38 76	49	25 51	99	63 64

1.2 Phase II

Region	Directors		Presidents		Overall Total	
	Number Participants	Number Returns Percent	Number Participants	Number Returns Percent	Number Participants	Number Returns Percent
North central	12	8 67	12	10 83	24	18 75
Northeastern	12	10 83	11	10 91	23	20 87
Southern	13	12 92	13	11 85	26	23 89
Western	13	12 92	13	11 85	26	23 89
Total	50	42 84	49	42 86	99	84 85

Means were derived from the total population constituting parameters. Thus, inferential statistical analysis was unnecessary.

Regions. Analysis of data by regions was based on existing regional administrative organization of the U.S. extension service as indicated in Figure 1. Regions and states included are shown in Table 2.

Use of the Findings

1. Data obtained will be submitted to the State Director, CES, West Virginia University. Directors of other states of the USA will also have access to the data for use. Opinions of CES directors and CEAA presidents, regarding the major problems which affect adoption of agricultural innovations by farmers, should be of value in setting priorities among agricultural development and production constraints to be overcome.

2. Such information may also be of value in formulating research activities to develop solutions to problems identified.

3. As basic principles of agricultural development may apply worldwide, the information so obtained should be of use to developing countries, including Tanzania.

Limitations of the Study

This study was limited to the (1) state directors of Cooperative Extension Service of all 50 states of the USA and (2) presidents of the County Extension Agent Associations of 49 states of the USA (Rhode Island had no association).

TABLE 2. REGIONS AND STATES INCLUDED IN THE STUDY

	<u>REGIONS</u>		
	North central	Northeastern	Southern
Illinois - IL	Connecticut - CT	Alabama - AL	Alaska - AK
Indiana - IN	Delaware - DE	Arkansas - AR	Arizona - AZ
Iowa - IA	Maine - ME	Florida - FL	California - CA
Kansas - KS	Maryland - MD	Georgia - GA	Colorado - CO
Michigan - MI	Massachusetts - MA	Kentucky - KY	Hawaii - HI
Minnesota - MN	New Hampshire - NH	Louisiana - LA	Idaho - ID
Missouri - MO	New Jersey - NJ	Mississippi - MS	Montana - MT
Nebraska - NE	New York - NY	North Carolina - NC	Nevada - NV
North Dakota - ND	Pennsylvania - PA	Oklahoma - OK	New Mexico - NM
Ohio - OH	Rhode Island - RI	South Carolina - SC	Oregon - OR
South Dakota - SD	Vermont - VT	Tennessee - TN	Utah - UT
Wisconsin - WI	West Virginia - WV	Texas - TX	Washington - WA
		Virginia - VA	Wyoming - WY

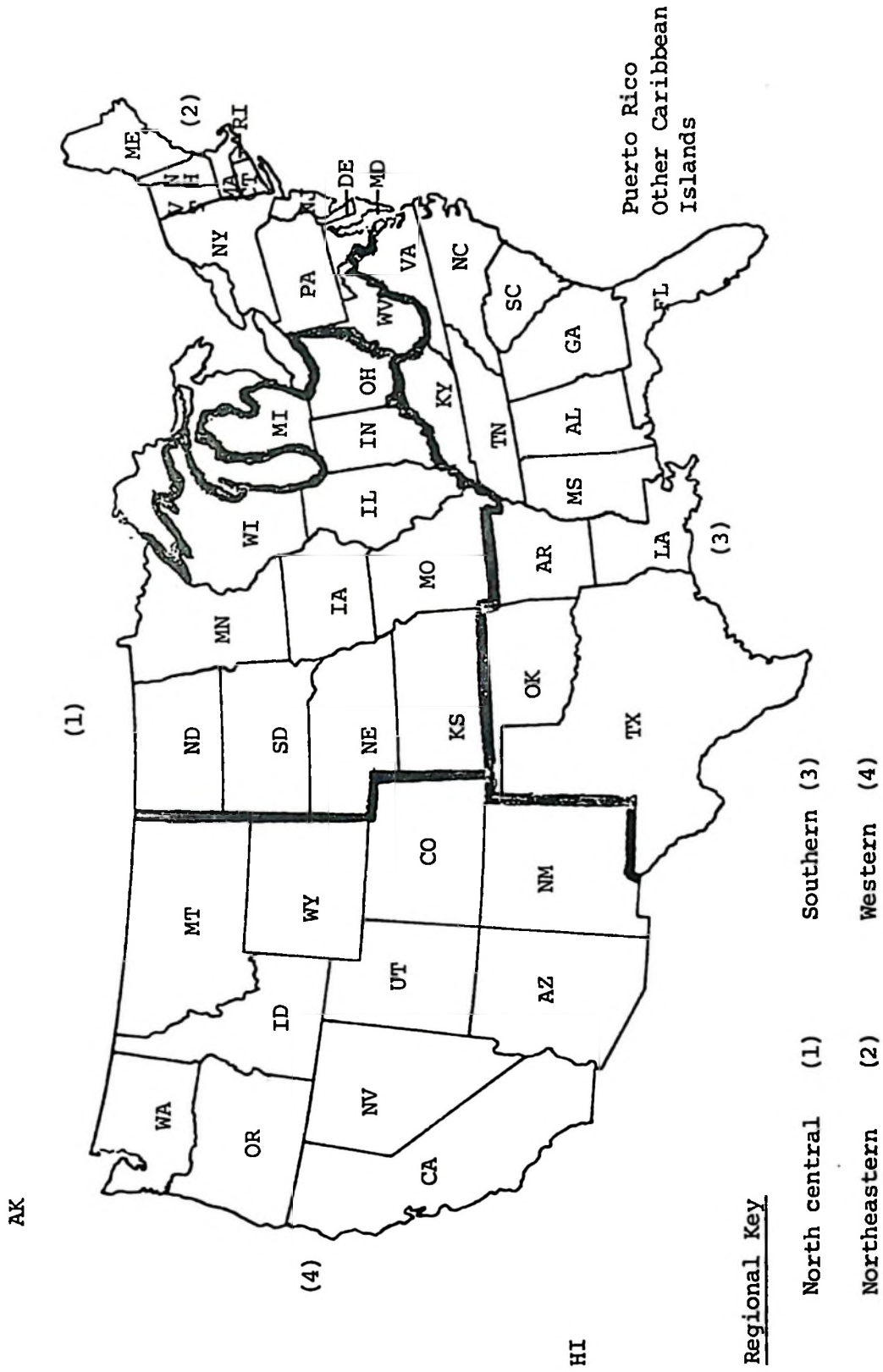


Figure 1. USA SCHEMATIC MAP SHOWING REGIONAL ORGANIZATION OF U.S. EXTENSION SERVICE

Chapter 2

REVIEW OF THE LITERATURE

The literature reviewed depicts the magnitude of problems encountered in farming and their effect on adoption of agricultural innovations, especially those calling for resource relocation such as high financial outlays, qualified human capital, and other resources.

The role and place of the extension service in the agricultural economy is revealed in the literature reviewed. Regarding the role of agricultural technology and economics of farming, Clawson (1968) says,

A larger total output from the same inputs, or a greater increase in output than the increase in inputs, suggests changes in basic technology Agriculture technology has increased in many ways. New crop varieties have been introduced, including hybrids, of which hybrid corn is the best known and perhaps most significant. Increases in output of perhaps 25 percent may arise from such new varieties, even when other factors remain unchanged. The new variety is a new form of productive input. A more important fact, however, is that the new varieties make possible for larger increases in output New ways of using fertilizers, and above all, fertilizer much cheaper in relation to prices of agricultural commodities, have underlain a greatly increased use of fertilizers. Farm machineries are vastly better today than a few decades ago. Improvement in metals, manufacturing processes, and in engineering generally, have had a major effect upon agricultural machines of all kinds.

Regarding these innovations in inputs and machinery, Clawson emphasizes that management is the determining factor,

In all these ways, and many others, "technology" has increased agricultural output from the same inputs. Thus the apparent, or

direct, or first hand "causers" of increased agricultural output are the instruments by which the productive factor of better management operates.

While improved agricultural technology has led to increased output from the same volume of inputs, and hence has helped increase the welfare of society as a whole, according to Clawson it would be a mistake to ignore the fact that it has worsened the position of many farmers and agricultural workers.

The man who lacks managerial competence, and has limited capital and land, may be able to earn a modest living under one set of agricultural conditions, but changing times may put new demands on him. These demands include perhaps the necessity to produce a better product at lower prices, and he may be unable to meet the demand . . . , many small farmers in all parts of the country have gradually been squeezed out, unable to meet the competition from more dynamic sections of agriculture. Technological progress has its victims as well as its rewards.

Other writers also contend that management, on the part of the farmer, is an outstanding factor towards success or failure of agriculture development. To the small producer especially, management is often a skill outside of his reach, given the level of education, farm size output and available tools. Drache (1978) in this regard, explains that:

Professional management, the very success in daily life or business, has not made a major impact on much of American agriculture. In the past it was not difficult to enter farming, which is probably the major reason for the neglect of using good management. There was also a fallacious opinion in the past that if one was not capable of doing anything else, one could always farm. Anyone who has a broad acquaintance in rural areas can recite cases in which the parents bought a farm for a problem child to "get him out of town" and out of trouble.

Drache continues to explain that in a North Dakota Survey, with a few exceptions, all the farms involved in the research were family owned and managed. Many of the farmers confessed that labor

management was specifically a limiting factor as far as future developments were concerned. Some of the farmers are off the farm for several days a week which makes supervision of labor more difficult if the enterprise is large. One farmer asserted that he was off the farm at least two days a week on civic activities and he could not handle two good full-time men but he could handle one man who in turn supervised five or six part-time men.

Regarding managerial ability of the family farm entrepreneurs, it is evident that management acumen is lacking. The National Academy of Sciences (1975) confirms this by reporting,

There is no doubt that efficient, modern agriculture demands high quality management. Increasingly complicated technology, greater capital inputs, larger farm inputs, increasing pressure to operate nearer the optimum combination of resources, and price uncertainty all point to the need for high quality management if U.S. agriculture is to be efficient and highly productive. The fact that much of contemporary agriculture is based on family-type farms, with these farms being controlled over the productive life time of individual family entrepreneurs, tends to maintain a given set of entrepreneurs in management positions over a long period of time . . . many of these farm operators tend to have relatively low formal education, be old, relatively traditional, and have low-risk preference. Though U.S. agriculture is held up as the prime example of rapid adoption of technology, there is much evidence to indicate that many farmers are relatively slow to adopt technology that has high potential for increasing agricultural production and efficiency.

The NAS explains that these and other institutional constraints, including the large amount of equity capital needed, may restrict the entry of higher quality managers into farming. Colleges of agriculture, according to NAS, are attempting to educate and train young people for modern farm management. However, many of the graduates do not enter farming because of institutional and financial constraints. The present

price and income picture, and the availability and quality of community services often makes alternative employment opportunities more attractive than farming. Alternative forms of farm organization and management are emerging--corporation farming, vertical integration, independent management services, and farm input company management services.

The success of these new forms may be successful for three main reasons, as described by the NAS, ". . . scale of operations and available capital, but most of all because of the management expertise provided." Thus the difficult entry into agriculture, the capital required and quality of life in rural America, and the possibility of low financial returns may all act as constraints on attracting a higher quality of entrepreneur into farming.

Labor efficiency and supervision pose additional problems in farming. In this regard, Rasmussen (1975) says,

A problem in farm management and one that has ordinarily been a limiting factor in the size of farm operations is the supervision of labor in a variety of different farm tasks. These tasks are usually dispersed both within and without the farm boundaries of the farm. They vary with the seasons as well as enterprises.

Mechanization has obviously not eliminated the problem of supervision. Rasmussen contends that:

Mechanization has not appreciably reduced the number of specific farm tasks to be performed. Thus it has not increased the capacity of management for supervision of more farm workers. Rather it has reduced the need for so many farm workers and enabled farmers to supervise a greater quantity of other farm resources Operators of the smaller farms have been faced with the reality that mechanization could not increase incomes unless it was accompanied either by increases in the size of farm or reorganization of the farm. There was no strong economic incentive to substitute machinery for labor as long as family

members remained at home Apparently a more serious problem than the threat of domination by large-scale farms exists in the failure of many small farmers to take full advantage of developments in mechanization and technology.

Farming, like other business, is governed by the principles of economics and the farmer's expenditures are determined by the total net return. Clawson (1968), in discussing living costs of the farmer relative to farm income, says,

The internal economics of most farms virtually force increases in output on each farmer through the use of new technology. Agriculture is an industry or economic activity of high, fixed costs. The farmer and his family have living costs that must be met. These are to a large extent socially rather than physically determined, yet are nonetheless real and demanding. To live "decently" the farmer must have some minimum income, and to earn this income becomes an imperative in his life. No matter what his income, his living costs remain more or less fixed. If income rises, he may spend part of the increase for better or at least more expensive living; if income falls, he can tighten his belt in various ways. But relatively fixed family living costs operate for the farmer like a manufacturer's or a merchant's large payroll of salaried people, whose salaries do not vary with volume of business In economist's language, marginal costs of operation and production are often below average costs; and prime or direct costs are relatively low compared with total costs, including an appropriate share of fixed or overhead costs. The individual farmer faces an infinitely elastic demand curve for his output, even when the demand for these products in total is highly inelastic.

Clawson continues by explaining that changes in output by the small farmer are inconsequential. Each farmer's share of total output is normally so small that its effect upon price is infinitesimal. For instance, there are 700,000 wheat growers; even the largest one may more than double his output without measurable effect upon wheat prices in general. Under these circumstances, the individual farmer quite properly ignores the effects of his production program upon the prices of his products. If a given line of management decision promises to

return him more income, he is likely to take the necessary actions; but if all, or many, farmers take the same or similar actions the result may well be an increase in output which lowers prices to the point where the incomes of everyone are reduced. In this regard Clawson insists that:

Given the high overhead costs, unused productive capacity and infinitely elastic demand for individual farmer's output there is very heavy pressure on farmers to innovate and to adopt new technology wherever it becomes available. New technology has in practice nearly always worked out to be output-increasing rather than cost-decreasing for the same volume of outputs. It has as a result often been self-defeating over the longer run, as far as total farm incomes are concerned. The farmer typically reacts to a situation which promises him higher income; and when his fellow farmers in similar situations have all reacted in the same way, the group is not better off, but may be worse off.

. Most farmers require financial assistance in form of credits or loan. Drache (1978), discussing financial problems, says,

. . . Some of the farmers found financial limitations as the greatest restriction to future growth. These limitations appeared frequently as a problem of personal attitude, although it was obvious that a few individuals among them did have serious enough financial commitments to cause them sleepless nights.

Capital needs in farming are a very pressing issue in accepting technological changes. The NAS (1975), noted:

Rising labor costs in agriculture and elsewhere have induced one of the most dramatic changes in U.S. agriculture. They have substituted capital, and the things that capital will buy, for labor The ability of the present farm organization structure to obtain capital and the traditional financing institutions to provide the amount and kind of credit needed can be questioned Changes in structural arrangements in the agricultural sector, at least partially attributable to capital needs, can be observed; for example, large farm units, financial partnerships, farm family corporations, other forms of corporations, vertical integration, contract farming, farm input supplier credit, leasing of machinery, and changes in amount of and type of rental arrangements. Under some of these alternatives, the farmer may lose some of his control over decision making.

A majority of the farming community experience high costs of living for which farm income is often inadequate. Clawson (1968) confirms this by saying,

A satisfactory modern mode of living costs more in rural areas, especially in remote ones, than it does in town. If farm boys and girls are to have good schooling, if the whole family is to have adequate medical care, if cultural activities are to be available, then costs are higher rather than lower in rural areas. For most of the low income people in agriculture higher prices for agricultural commodities would not be a solution to their poverty problem. Because these people have such small acreage of land or such unproductive land, or so little capital or use their labor so poorly or are such poor managers, or have some combination of these deficiencies, they have such low volume of output that no conceivable price level for farm commodities would provide them with a satisfactory personal income The only solution to their personal problems is to find productive employment outside agriculture.

According to the views of Clawson, such farmers cannot readily adopt new technologies. High living costs may reduce the amount of money a farm family has to invest in some innovation or a practice which calls for more financial inputs which may yield greater returns.

The capacity of a farm to give relatively high returns, like any other economic undertaking, is determined by the economies of scale. There is a minimum acreage which must be reached, other things being equal, to enable the use of certain technology or machinery to be of economic return. Drache (1978) explains that:

Many American farmers have paid little or no income tax during their years of farming. Much of this results from the nature of farming as a business which shows a small cash profit after depreciation of the capital investments. On many of the smaller farms, the family income tax exemption is sufficient to absorb any net profit from farming, enabling the farmer to avoid any income tax payment. The ability to avoid income taxes is directly related to the farmer's inability to build cash reserve either for adverse years or expansion.

The NAS (1975) discusses the failure of legislation towards agricultural development as a priority area by saying that:

Traditionally, through legislative representation and pressure groups, the agricultural sector has been able to influence government policy in ways that are relatively favorable toward agricultural productivity. This influence has declined with the changing composition of U.S. population (now 95 percent non farm), with reapportionment of Congress and State legislatures according to the one man-one vote principle, and with some legislative reforms. The question of what priority a basically urban society will place on agricultural production and rural life has not yet been answered.

Dissemination of research information to the farmer is a reciprocal action of "give-and-take" between the extension service and the farmer; but the use of extension service expertise by the farmer is not as satisfactory as it might be. Clawson (1968) explains this problem by saying:

Agriculture has special educational programs. Agricultural Extension has been one major factor in the agricultural revolution It has been the means whereby research results have reached farmers and a good experience of one farmer spread to his neighbors. It seems highly probable . . . that consumers have been major beneficiaries of this program; as a result of it, their food supplies have been more generous and less expensive. Those farmers best able to take advantage of Extension teaching may well have benefited also, but many laggards have lost, relatively and absolutely. This is a good example of a public program open to everyone but practically much more usable by higher-income farmers than by lower-income ones.

Many farmers cannot afford the more efficient equipment needed to replace hand labor, or hire more qualified human capital to replace family labor, or purchase additional land to improve efficiency. Regarding this problem, Drache (1978) says:

It is not uncommon in rural America to hear the remark that a man cannot start farming because there is a shortage of labor, capital or land. It is especially the shortage of capital and land that concern him. Even farmers who are already farming say they cannot expand because there is so little land available,

and what is available is too highly priced. On the other hand, it is a historical fact that land is always too high-priced.

Efficiency in farming on the part of the American community is attributed to the inherent avoidance of land divisions among the families upon the death of the parents. Clawson (1968) explains that:

The land inheritance system of the United States has favored small but consolidated farms. Upon the death of the father the value or equity of the small farm might be divided among the heirs, but the farm itself as physical property has ordinarily been more valuable in one piece than in two or more pieces.

Clawson further stated that the United States has mostly been spared the fragmentation of farmland which has plagued several European and other countries. The farm settlement pattern in the United States has been predominantly the single farm. Settlement on the farm itself has dominated the United States so that many rural people conceive of no other pattern of rural settlement. For the world as a whole more farmers live in agricultural villages than in any other type of settlement.

Of all farm problems and calamities, the farmer can try to adjust towards certain norms to meet the requirements at least to a minimum level, but weather has haunted him each season. Higbee (1958), explains the influence of climate:

Among natural influences upon an area's suitability for agriculture, climate is primary. To a major extent man can improve the quality of soils if they are at all tillable. Against the impositions of climate and its daily variant, the weather, he is severely handicapped The average length of the first free season of any particular place on the earth's surface is beyond modification by man, although with smudge pots and green houses he can insulate small acreages. One basic feature of agriculture is the fact that it is conducted out-of-doors and thus is subject to all the vicissitudes of weather which may one year combine to produce a bumper harvest and the next year, by drought, flood, hail or unreasonable frost, usher

in calamity. Because it is impossible to predict what the weather will be during a coming season the planting of every crop is somewhat of a gamble Both the field work that the farmer must do and the time which he does it are determined as much by the weather as by the crop itself.

Higbee further stated that the farmer knows what the climate or average weather conditions in his region may be, but he also knows that those averages may be derived from sums of slight or very wide deviations from the norm. The greater the deviation both above and below the norm, the more likely that the harvest will vary in quantity and quality.

Some farmers fail to cope with the cropping season due to delay in undertaking certain operations. For instance, the occurrence of heavy storms hinder operations and at the same time farmers may lack the ability to acquire more efficient machinery to cope with the prevailing weather conditions. In such instances, the farmer cannot heed norms regarding proper land preparation and optimum time of planting. Drache (1978) notes that:

Anyone who has grown up on a farm or has lived amongst farmers soon becomes aware of the great concern many of them have about the weather. There is a common saying that goes 'Everyone talks about the weather, but no one does anything about it'.

Even though "weather affects the smaller farmer more than the large scale farmer," argues Drache, "the large farmers have very little downtime because of weather." They have machinery which can cope with different types of weather patterns as opposed to the small farmers. For instance, the 1,400 horse-power tractor units are able to finish the fall tillage a few hours after the self-propelled combines move out of each field. Such big four-wheeled drive tractors, together with

a reasonable workshop, make adaptation of certain technologies much easier.

Educational background of the farmer is a prominent factor in determining the readiness to accept and properly apply innovations. Acceptance is one thing; use and application of innovations is another. If the innovation is not properly utilized, acceptance becomes meaningless. Lack of capital is another prominent problem with farmers. Most of the poor families are in rural areas and the more highly impoverished are among the farm families. In such cases, improved technology, as well as services such as nutritional advice, cannot be easily utilized. Regarding the problem, Rasmussen (1975) says that:

The total number of rural poor would be even larger than 14 million had not so many of them moved to the city This nation has been largely oblivious to these 14 million impoverished people left behind in rural America. Our programs for rural America are woefully out of date Most rural programs still do not take the speed and consequences of technological change into account. Hunger, even among children, does exist among the rural poor, as a group of physicians discovered recently in a visit to the rural South. They found Negro children not getting enough food to sustain life and so disease ridden as to be beyond cure. Malnutrition is even more wide spread. The evidence appears in bad diets and in diseases which often are a product of bad diets.

Due to this tendency of impoverishment and ill health, youth in these rural communities have less access to good education, which may contribute to their perpetual poverty. Although many would disagree, Rasmussen continues:

The rural poor have gone and now go to poor schools. One result is that more than 3 million rural adults are classified as illiterates. Most of the rural poor live in atrocious houses. One in every 13 houses in rural America is officially classified as unfit to live in. Many of the rural poor live in chronically depressed poverty stricken rural communities. Most of the rural South is one vast poverty area. Indian reservations contain heavy concentrations of poverty. But there also are impoverished

rural communities in the Upper Great Lakes region, in New England, in Appalachia, in the South West, and in other sections. The community in the rural poverty areas has all but disappeared as an effective institution.

Most of the rural farming communities in the poverty threshold category have very little role to play in the market economy. Poor families have very little to sell and can purchase very little. The feelings of these people are quite negative as they have benefited little from recent economic growth of the nation. Rasmussen explains further:

In the past the rural community performed the services needed by farmers and other rural people As the communities ran downhill, they offered fewer and fewer opportunities for anyone to earn a living For all practical purposes, then, most of the 14 million people in our poverty areas are outside our market economy. So far as they are concerned, the dramatic economic growth of the United States might as well never have happened. It has brought them few rewards. They are on the outside looking in, and they need help.

The perpetual low marginal return and the inability to qualify for credit provided by lending institutions, lead to a cyclic problem of lack of basic capital for farm investment. Due to this phenomenon, low productivity ensues and poverty becomes a perennial aspect. Unless such farmers are given assistance, this trend will continue. Stewart, et. al., (1976) studying the potential for increasing net income on Kentucky farms, writes:

Poverty was more prevalent in the rural areas of the United States than in the metropolitan areas. In rural areas, on the other hand, poverty is more prevalent among the farm families than among non farms.

Orden and Smith (1977), in their survey of rural farming families in Virginia, concur that " . . . lack of operating capital was perceived as the major problem being faced by the farmers surveyed."

Farm legislation has contributed little toward alleviation of rural poverty. Rasmussen (1975) comments:

Congress and State Legislatures from time to time have enacted many laws and appropriated large sums of money to aid the poverty stricken and to help rural America. Very little legislation or the money has helped the rural poor. Major farm legislation directed at commercial farms has been successful in helping farmers adjust supply to demand, but it has not helped farmers whose production is very small. And because the major social welfare and labor legislation has discriminated against rural peoples, many of the rural poor farmers and farm workers particularly have been denied unemployment insurance, denied the right of collective bargaining, and denied the protection of workman's compensation laws.

Prosperity and well being of the rural people and the nation at large depends upon a prosperous agricultural economy. Blauch (1969) says that:

Agriculture is a basic factor in national economic growth and development, and remains a primary force in rural agriculture production areas. The health of a nation depends upon the availability of nourishing food in abundant quantities. The capacity of the nation to support its recreation, its arts and sciences and its technological development rests upon manpower freed from food and fiber production. A serious agricultural problem is a fair rate of return to the farmer for his investment in producing food and fiber. His inability to control or even to influence prices significantly has depressed the agricultural industry. Of urgent concern in the decade ahead will be the lower income, submarginal farms, and declining vigor and changing nature of farm communities. So called agricultural problems will involve human as well as production factors.

The importance of utilizing advisory services by farmers is imminent. Taylor (1963) argues that the government should assist the small holder to remain in the farming industry. He says that:

. . . farm families who desire to continue farming must gain and use necessary knowledge, skills, and resources for improving their level of living. Opportunities must be provided for those families who cannot acquire the necessary resources to continue farming.

Socioeconomic factors which may affect part-time farmers was studied by Long (1969). He addresses the problem as follows:

Many part-time farmers refrain from going to a full-time operation because it is difficult to build up a farming operation which is sufficiently profitable and still hold a non-farm job. When this difficulty is overcome, it is not for economic reasons alone but for what might be concluded as a strong desire to farm.

Long found that "part-time farmers studied seemed to do as well as all farmers . . . in production of crops, but were less efficient than the commercial operator regarding use of tillable acres."

The literature cited reveals the nature of problems facing the farmer. However, most of the information presented was based solely on observations which are open to question and require further verification. This study was formulated to determine those problems hindering the adoption of agricultural innovations by farmers, and subsequently, enable formulation of educational programs to help overcome them.

Chapter 3

INTERPRETATION OF DATA AND PRESENTATION

Extension education assumes a very important role in the process of agricultural development. Through dissemination of agricultural information and innovations, extension education attempts to redirect efforts of farmers to accelerate social and economic growth.

This study was designed to determine major problems constraining the adoption of innovations by farmers as perceived by state directors of Cooperative Extension Services and state presidents of County Extension Agent Associations.

Data obtained from the study may be of value in formulating solutions and redesigning strategies for overcoming development and production constraints in agriculture. Results may also serve as a basis for formulating new research activities as a means of overcoming problems identified.

Agricultural extension education and the principles therein are applicable worldwide. It is, therefore, hoped that results of this study may be of use to similar services in other countries.

Data for this study were obtained from the population comprised of 50 state directors of CES and 49 presidents of CEAA (Rhode Island had no association). The methodology used to gather data was the Delphi technique. First phase instruments, which requested each

recipient to identify the five major problems perceived to be the most outstanding in constraining agricultural innovations by farmers, were mailed to the study population on January 21, 1980. A followup memorandum was mailed to the same population on February 4, 1980. A total of 64 percent of the population responded.

The phase two survey instrument was formulated by a Q-sort committee comprised of three members who scrutinized and sorted phase one returns into 63 rateable statements. On March 3, 1980, the second phase instruments were mailed to the same study population. The instruments were divided into five categories--economic, technical and managerial, social, informational, and political. The rating scale for each statement was as follows: 1--not a problem, 2--a slight problem, 3--a moderate problem, and 4--a severe problem. The recipient was asked to circle one number corresponding to the perceived gravity of the problem. A followup memorandum was mailed to the original population on March 18, 1980. A total of 84 (85 percent) were returned and used in the study.

Information from surveys was analysed with the aid of the West Virginia University Computer Center. Means and standard deviations were determined for each item by position and region. Results were recorded in tabular form and narrated for clarification.

Since the entire population was involved, need for statistical inference in interpretation of data was deemed unnecessary as data reported were parameters and no sampling was involved.

For description and interpretation of study data, consensus was considered to be: not a problem on mean values of 1.25 or below;

a slight problem between 1.25 and 2.24; a moderate problem between 2.25 and 3.24; and a severe problem at 3.25 or above.

Major Problems, Listed by Rank, with Mean Ratings of 3.0 or Above, Which Hinder the Adoption of Innovations by Farmers

Farming, like any other business, calls for operations to be cost-effective and provide returns over and above labor and input expenses. Aside from economics, available information and technology, managerial ability, and national and local politics influence decisions made by the nation's farmers.

To elicit perceptions concerning major problems which most seriously affect the adoption of agricultural innovations by farmers, 63 statements were listed on a survey instrument. Participants were asked to rate each statement by circling the number corresponding to their opinion regarding severity of the problem.

Data presented in Table 3 indicate the eight outstanding problems, those in which the overall mean rating exceeds 3.0 as perceived by CES directors and CEEA presidents. The four most serious problems identified by participants related to costs, all rated as severe (means of 3.32 and above). High interest rates and inflationary factors were perceived to be particularly serious problems (means above 3.50). Statements related to political factors--government interference and national economy--were ranked 5 and 6. The problem of government interference and regulation was also rated a severe problem (mean of 3.26) by respondents. Pressure for more remunerative use of land in high population areas and inadequacy of farm

TABLE 3

OVERALL MAJOR PROBLEMS RANKED, WITH MEAN RATINGS OF 3.0 OR ABOVE,
WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS
AS PERCEIVED BY CES DIRECTORS AND CEEA PRESIDENTS

Statement and Overall Rank	Mean (N=84)	S.D.
1. High interest rates seriously reduce long term investments	3.58	0.59
2. Inflation has raised production costs without a corresponding increase in commodity prices	3.55	0.70
3. High costs of land and equipment	3.47	0.75
4. High energy costs and uncertainty of future availability of petroleum based products	3.32	0.78
5. Increased government interference and regulation	3.26	0.78
6. Shaky national economy	3.14	0.82
7. Pressure for more remunerative use of land in high population areas	3.05	0.96
8. Inadequacy of farm records	3.04	0.80

Rating Scale:

- 1 - Not a problem
- 2 - A slight problem
- 3 - A moderate problem
- 4 - A severe problem

records were ranked seventh and eighth, respectively, by participants.

The unanimity of opinion on the severity of cost related factors can be verified on the basis that, of the entire 63 statements (Appendix G), the problem of high interest rates, ranked first, shows the lowest standard deviation (SD of 0.59). The problem related to land use in high population areas, although given a similar rating above 3.0, showed the least agreement among the top eight statements (SD of 0.96) and had the second highest standard deviation for the entire 63 statements rated.

Statements rated by the study participants were categorized into five problem areas--economic, technical and managerial, social, informational, and political. Of the eight statements which received overall mean ratings above 3.0, five were economic in nature, two were political and one was technical and managerial. No statement related to social or informational factors was reflected among the top eight.

Major Problems, With Mean Ratings of 3.0 or Above: Perceptions of State Directors of CES Versus Presidents of CEAA

Development of agriculture is fundamentally a process of change which involves the entire framework of the country--its economic, social, political, and physical structure, as well as the value system and way of life of the society. Some changes are pre-conditions to the development process, while others accompany it or follow in its wake. Various aspects of the concept of development

are so interrelated that it is difficult to single out one factor which should precede the other.

Data presented in Table 4 indicate the major problems, with mean ratings of 3.0 or above, which were perceived serious by state directors of CES and presidents of CEAA. Both directors and presidents ranked the statements related to interest rates, inflation and cost of land as number 1, 2 and 3 problems. Other common statements rated above a mean of 3.0 by both directors and presidents include those related to energy costs, government interference, national economy, pressure of land due to high population, and farm records. In general, presidents perceived the problems to be somewhat more serious than did directors. Apart from these eight common problems, directors also perceived the statement related to government policies to be serious (unstable government policies, prices, acreage allotment, environment, etc.).

Major Problems, With Mean Ratings of 3.0 Above, Which Hinder the Adoption of Agricultural Innovations by Farmers as Perceived by Directors of CES and Presidents of CEAA by Region of the USA

Basic factors affecting development of the agricultural sector are common across the country. However, differences among regions are inevitable due to geophysical position, climatic conditions, ecological location and adapted enterprises. The requirement levels of the developmental factors--economic and technical--will vary regionally, and present social and political factors will influence the regions differently. An agricultural development program will succeed when it is an outgrowth of the people in the

TABLE 4
 MAJOR PROBLEMS, WITH MEAN RATINGS OF 3.0 OR ABOVE: PERCEPTIONS OF
 STATE DIRECTORS OF CES VERSUS PRESIDENTS OF CEAA

<u>Directors of CES</u>		<u>Presidents of CEAA</u>	
Rank and Statement	Mean (n=42)		Mean (n=42)
1. High interest rates seriously reduce long-term investments	3.55	1. High interest rates seriously reduce long-term investments	3.62
2. Inflation has raised production costs without a corresponding increase in commodity prices	3.48	2. Inflation has raised production costs without a corresponding increase in commodity prices	3.62
3. High costs of land and equipment	3.38	3. High costs of land and equipment	3.56
4. High energy costs and uncertainty of future availability of petroleum based products	3.36	4. Increased government interference and regulation	3.36
5. Increased government interference and regulation	3.17	5. High energy costs and uncertainty of future availability of petroleum based products	3.29
6. Shaky national economy	3.14	6. Shaky national economy	3.14
7. Pressure for more remunerative use of land in high population areas	3.05	7. Inadequacy of farm records	3.05
8. Inadequacy of farm records	3.02	8. Pressure for more remunerative use of land in high population areas	3.05
9. Unstable government policies, prices, acreage allotment, environment, etc.	3.00		

Rating Scale:
 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

region for which it was designed and when it enjoys their full cooperation and support. However, all factors should be examined within the context of the economic, social, organizational, and political conditions prevailing in the area.

As can be observed in Table 5, five statements out of the 17 listed are problems common to all regions and seven statements were problems perceived serious (means of 3.0 or above) by participants of a single region. The five common problems include statements related to inflation, high interest rates, high energy costs, increased government interference, and high costs of land and equipment.

Variations among regions included those statements related to fluctuating agricultural commodity prices, fear that increasing the debt load may cause insolvency, and uncertainty of the world situation, all perceived serious by participants from the southern region. Lack of an efficient transportation system was among the serious problems noted by north central region respondents. Returns from an innovation which may not be sufficiently attractive to justify the bother was rated among the major problems by northeastern region participants. Insufficient capital to implement new technologies and zoning and antifarming sentiments were among the serious problems noted only by western region participants.

TABLE 5

MAJOR PROBLEMS, WITH MEAN RATINGS OF 3.0 OR ABOVE, WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS AS PERCEIVED BY DIRECTORS OF CES AND PRESIDENTS OF CEAA BY REGION OF THE U.S.A.

Southern		Western		Northeastern		North Central	
Rank and Statement	Mean (n=23)	Rank and Statement	Mean (n=23)	Rank and Statement	Mean (n=20)	Rank and Statement	Mean (n=18)
1. High interest rates seriously reduce long-term investments	3.83	1. High interest rates seriously reduce long-term investments	3.74	1. High costs of land and equipment	3.50	1. Inflation has raised production costs without a corresponding increase in commodity prices	3.61
2. High costs of land and equipment	3.65	2. High costs of land and equipment	3.61	2. Inflation has raised production costs with corresponding increase in commodity prices	3.50	2. High interest rates seriously reduce long-term investments	3.50
3. Inflation has raised production costs without a corresponding increase in commodity prices	3.57	3. Inflation has raised production costs without a corresponding increase in commodity prices	3.52	3. Pressure for more remunerative use of land in high population areas	3.30	3. High energy costs and uncertainty of future availability of petroleum based products	3.17
4. High energy costs and uncertainty of future availability of petroleum based products	3.48	4. High energy costs and uncertainty of future availability of petroleum based products	3.39	4. High interest rates seriously reduce long-term investments	3.20	4. Increased government interference and regulation	3.11
5. Shaky national economy	3.39	5. Increased government interference and regulation	3.39	5. High energy costs and uncertainty of future availability of petroleum based products	3.20	5. Lack of efficient transportation system (rail, barge, highways, air) farm to market	3.11
6. Increased government interference and regulation	3.39	6. Pressure for more remunerative use of land in high population areas	3.35	6. Returns may not be sufficiently attractive to justify the bother	3.10	6. Lack of research and extension staff, time, and support to show operators that new practices do work	3.00
7. Fluctuating, unstable agricultural commodity prices resulting in severe marketing problems	3.22	7. Shaky national economy	3.22	7. Increased government interference and regulation	3.10	7. High costs of land and equipment	3.00
8. Unstable government policies regarding prices, acreage allotment, environment, etc.	3.17	8. Insufficient available capital to implement new technologies	3.09	8. Inadequacy of farm records	3.05		
9. Fear that increasing the debt load may cause insolvency	3.13	9. Zoning and anti-farming sentiments	3.09				
10. Inadequacy of farm records	3.13	10. Unstable government policies regarding prices, acreage allotments, environment, etc.	3.04				
11. Lack of research and extension staff, time, and support to show operators that new practices do work	3.13	11. Inadequacy of farm records	3.00				
12. Uncertainty of world situation	3.13						

Rating Scale:
 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

Economic Problems Which Hinder the Adoption of Agricultural Innovation by Farmers

High investment costs and low prices of farm products are generally regarded as the most effective deterrents in development of the agricultural sector. The situation can be further aggravated by farm credit difficulties. Inability of finance firms to provide credit needed for capital investments, coupled with high interest rates and uncertainty of commodity markets, also hamper agricultural progress.

Table 6 ranks the economic problems which hinder the adoption of agricultural innovations by farmers as perceived by state directors of CES and presidents of CEAA. Economic statements related to farm credit and debt ranked 1, 7, 9, 10 and 12, cost-price squeeze ranked 2, 3, 4 and 5, economic uncertainty ranked 5, 8 and 11, and infrastructure ranked 13 and 14.

Current high interest rates which seriously reduce long-term investments was considered by participants to be the most serious economic factor hampering adoption of agricultural innovations by farmers, and was rated a severe problem with an overall mean of 3.58. Cost-price squeeze factors (high production costs, low commodity prices) were also perceived to be serious problems. The four statements dealing with cost-price relationships were ranked 2, 3, 4 and 5 among economic problems, all with overall means above 3.00. The remaining statements relating to credit and debt and those dealing with economic uncertainty, were considered to be moderate problems by respondents, whereas the statements concerning infrastructures were rated as slight problems.

TABLE 6
ECONOMIC PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS

Economic Statement and Rank	Position		Region				Overall	
	D (n=42)	P (n=42)	NC (n=18)	NE (n=20)	S (n=23)	W (n=23)	Mean (N=84)	S.D.
1. High interest rates seriously reduce long-term investments	3.55	3.62	3.50	3.20	3.83	3.74	3.58	0.59
2. Inflation has raised production costs without a corresponding increase in commodity prices	3.48	3.62	3.61	3.50	3.57	3.52	3.55	0.70
3. High costs of land and equipment	3.38	3.56	3.00	3.50	3.65	3.61	3.47	0.75
4. High energy costs and uncertainty of future availability of petroleum based products	3.36	3.29	3.17	3.20	3.48	3.39	3.32	0.78
5. Pressure for more remunerative use of land in high population areas	3.05	3.05	2.50	3.30	2.96	3.35	3.05	0.96
6. Returns may not be sufficiently attractive to justify the bother	2.98	2.90	2.89	3.10	2.82	2.95	2.94	0.78
7. Fear that increasing the debt load may cause insolvency	2.88	2.90	2.59	2.85	3.13	2.91	2.89	0.77
8. Fluctuating, unstable agricultural commodity prices resulting in severe marketing problems	2.94	2.86	2.78	2.65	3.22	2.83	2.88	0.84
9. Insufficient available capital to implement new technologies	2.74	2.86	2.44	2.70	2.87	3.09	2.80	0.69
10. Farmers lack understanding how to use credit effectively	2.69	2.40	2.56	2.40	2.78	2.43	2.55	0.77
11. Inadequate economic analysis of research results to justify investments or changes in practices	2.55	2.45	2.17	2.60	2.52	2.65	2.50	0.75
12. Finance firms unaware of benefits, thus not willing to make loans	2.36	2.22	2.11	2.25	2.36	2.39	2.29	0.86
13. Absence of supporting infrastructures in the agricultural system to assist in developing the innovations	2.26	2.19	1.71	2.11	2.78	2.32	2.23	0.82
14. Failure of supporting infrastructures in the agricultural system to assist in developing the innovation	2.12	2.16	1.69	2.22	2.41	2.14	2.14	0.78

Rating Scale:
1 - Not a problem
2 - A slight problem
3 - A moderate problem
4 - A severe problem

Strong agreement can be noted between responses of directors and presidents. The only difference which might be considered major was found in the statement "farmers lack understanding of how to use credit efficiently." Directors considered this problem to be somewhat more disturbing (mean of 2.69) than did presidents (mean of 2.40).

Due to the geophysical position, climatic conditions and enterprise variations which exist among regions (states), one would expect regional differences to occur. In general, credit and debt problems (statements 1, 7 and 9) were perceived to be more acute by respondents from the southern and western regions. Cost-price squeeze factors (statements 3 and 5) were rated lowest by those in the north central region and highest (statement 5) by respondents in the northeast and western regions. One might speculate that the greatest pressure from urbanization occurs in those two regions. Infrastructure problems (statements 13 and 14) were rated highest by southern region respondents and lowest by north central region participants. Statements mentioned above are those in which mean rating differences exceed 0.50 among regions.

Technical and Managerial Problems Which Hinder the Adoption of Agricultural Innovations by Farmers

Technical revolution has been the order of business in agriculture for the past century. Productivity measured in terms of output per acre, per animal unit, and per man hour has prevailed. Proper use of land, water, crops and livestock, has led to high yields and quality products. Improved crop varieties, superior

breeding stock, protection against diseases and parasites, and mechanization, are part of effective technology and management systems.

Overall mean data presented in Table 7 indicate that of technical and managerial problems identified by participants, managerial abilities of farmers ranked 1, 3, 7, 12 and 17, availability of skilled labor ranked second, items related to transportation and equipment ranked 4, 5 and 15, whereas those connected with limitations imposed by farm size and existing systems were ranked 6 and 8. Timely availability of research results ranked ninth, and uncertainty of weather as a factor which hinders innovations was ranked tenth. Constraints imposed by part-time farming were ranked 11 and 16, and those related to farmers' priorities were ranked 13 and 14. Although none of the technical and managerial problems identified were considered severe, adequacy of farm records (the only problem with overall mean rating above 3.0) was considered most outstanding.

There was considerable agreement between directors and presidents concerning the problems identified. Some difference in perceptions between the two groups could be noted in statements concerning lack of management skills (statement 3), transportation (statement 4) and research lagging behind progressive farmers (statement 9) with differences in means of over 0.30.

Regional disparities were noted in many of the technical and managerial problems identified. The problem of part-time farming (statement 11) was perceived moderate (mean of 2.87) by western region

TABLE 7
 TECHNICAL AND MANAGERIAL PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS

Technical and Managerial Statement and Rank	Position		Region				Overall Mean (N=84)	S.D.
	D (n=42)	P (n=42)	NC (n=18)	NE (n=20)	S (n=23)	W (n=23)		
1. Inadequacy of farm records	3.02	3.05	2.94	3.05	3.13	3.00	3.04	0.80
2. Availability and dependability of skilled labor	2.90	2.83	2.72	2.85	2.96	2.91	2.87	0.80
3. Lack of management skills	2.83	2.50	2.41	2.65	2.91	2.64	2.67	0.74
4. Lack of efficient transportation system (rail, barge, highway, air) farm to market	2.79	2.45	3.11	2.35	2.70	2.39	2.62	0.92
5. Farmers locked into enterprises by particular equipment, loans etc.	2.63	2.55	2.39	2.55	2.59	2.78	2.59	0.64
6. Fitting new technology into the existing farm system	2.52	2.50	2.39	2.50	2.52	2.61	2.51	0.63
7. Complexity of innovations make outcome difficult to predict	2.57	2.44	2.61	2.45	2.57	2.41	2.51	0.71
8. Limited size of farm operation to accommodate innovation	2.49	2.52	2.00	2.70	2.43	2.78	2.51	0.81
9. Research sometimes lags behind progressive farmers and is obsolete by the time results are released	2.24	2.69	2.22	2.55	2.35	2.70	2.46	0.77
10. Uncertainty of weather	2.45	2.39	2.39	2.15	2.77	2.35	2.42	0.93
11. Part-time farming prevents adoption of innovations	2.43	2.33	1.83	2.35	2.35	2.87	2.38	0.93
12. Fear that innovation will cause unexpected problems	2.24	2.26	2.33	2.10	2.39	2.17	2.25	0.62
13. Unwilling to devote extra time to innovation	2.24	2.19	2.29	2.05	2.39	2.13	2.22	0.75
14. Priorities do not include innovation	2.12	2.21	2.00	2.20	2.30	2.13	2.17	0.74
15. Availability of equipment to implement new practices	2.10	2.17	1.83	2.10	2.14	2.39	2.13	0.78
16. Farming as a hobby or tax hedge	1.93	2.02	1.50	1.85	2.13	2.30	1.98	0.93
17. Bad experiences with previous innovation	1.90	1.88	1.78	1.70	1.96	2.61	1.89	0.60

Rating Scale:
 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

and a slight problem (mean of 1.83) by north central participants, a difference in mean ratings of 1.04. Seven other statements (3, 4, 8, 10, 15, 16 and 17) showed disagreements with differences in mean ratings exceeding 0.50. These statements included those dealing with management skills, transportation, farm size and systems, weather, farming as a hobby, previous experiences, and availability of equipment. Those specifically with major variations included experiences with previous innovations (statement 17) perceived moderate (mean of 2.61) by western participants and a slight problem (mean of 1.70) by northeastern respondents, and farming as a hobby (statement 16) perceived moderate (mean of 2.30) by western and a slight problem (mean of 1.50) by north central participants.

Other variations among regions included statements related to farm size (statement 8), perceived as a moderate problem (mean of 2.78) by western respondents and a slight problem (mean of 2.0) by north central participants; and lack of efficient transportation system (statement 4), perceived to be a moderate problem by north central participants (mean of 3.11) while western and northeastern respondents considered it less serious (means of 2.39 and 2.35, respectively).

These observations lead one to hypothesize that technological and managerial support needed by north central, northeastern, southern, and western regions are not necessarily identical. Geophysical differences, ecological location and climatical variations are obviously important factors in managerial and technical requirements of the farming enterprises.

Social Problems Which Hinder the Adoption of Agricultural Innovations by Farmers

A major objective of agricultural development is to assure the farmer and his family an acceptable standard of living. However, promise of material satisfaction alone may not compel farmers to adopt innovations. Culture, tradition, peer group pressure, reactions of the neighbor, self esteem and personal satisfaction are among social factors which influence individual farmers.

Social problems relating to behavior and attitudes of farmers which hinder adoption of innovations, as observed in data presented in Table 8, were ranked 1, 2, 3, 6 and 8; those dealing with business operation (arrangements and goals) ranked 4 and 7, while those connected with age and education of farmers were ranked 5 and 9 by participants. All statements were rated as slight and moderate problems by directors and presidents.

Among social problems, conservatism of the farmer was considered most outstanding, but perceived a moderate problem (overall mean of 2.56). Tradition (statement 2) and lack of confidence (statement 3) were also perceived to be moderate problems (means of 2.48 and 2.42, respectively).

Business arrangements can lead to conflict between partners, thus influencing adoption of innovations. As a hinderance to innovation, it was perceived a moderate problem (mean of 2.38), as was the high average age of farmers (mean of 2.31). The statement "goals of farmers are not always profit or innovative oriented" and the educational level of farmers were considered slight problems by respondents.

TABLE 8
SOCIAL PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS

Social Statement and Rank	Position		Region				Overall	
	D (n=42)	P (n=42)	NC (n=18)	NE (n=20)	S (n=23)	W (n=23)	Mean (N=84)	S.D.
1. Conservatism. Satisfied with present operations (easier to continue to do things which they are accustomed to)	2.50	2.62	2.39	2.35	2.65	2.78	2.56	0.75
2. Tradition. Natural inclination to resist change	2.45	2.50	2.44	2.50	2.52	2.43	2.48	0.80
3. Lack of confidence in making innovations succeed (fear of failure)	2.52	2.31	2.39	2.35	2.39	2.52	2.42	0.64
4. Business arrangements resulting in conflicting goals (father-son; landlord-tenant, etc.)	2.31	2.45	2.44	2.15	2.52	2.39	2.38	0.77
5. High average age of farmers and limited physical stamina	2.19	2.44	1.94	2.45	2.43	2.36	2.31	0.81
6. Apathy. No initiative or motivation on part of farmer	2.10	2.02	1.83	2.05	2.22	2.09	2.06	0.70
7. Goals of farmers are not always profit or innovative oriented	2.00	2.05	1.94	2.30	2.17	1.70	2.02	0.69
8. Peer pressure. Fear of ridicule and criticism by neighbors	2.00	1.98	1.94	1.80	2.13	2.04	1.99	0.80
9. Limited educational level of farmers	2.02	1.80	1.44	2.05	2.35	1.74	1.92	0.70

Rating Scale:
1 - Not a problem
2 - A slight problem
3 - A moderate problem
4 - A severe problem

In all statements there was strong agreement between directors and presidents. Slight variations can be noted only with respect to problems regarding confidence, age and educational level (statements 3, 5 and 9). Presidents rated age of farmers a more serious hinderance than directors, whereas directors viewed lack of confidence and educational level of farmers to be more serious deterrents to innovations than did presidents.

According to data in Table 8, perceptions of social cleavages among the regions of the USA exist. Statements 5, 7 and 9 show variations among regions with differences in mean ratings of 0.50 and above. The widest variation in perceptions occurred in statement 9, related to educational level of farmers, which was perceived a moderate problem (mean of 2.35) by southern region respondents but only a slight problem (mean of 1.44) by north central region participants. Other differences included statements concerning orientation of farmers and age of farmers which were considered more serious problems by northeast and southern participants than by others.

Revelations emanating from perceptions of participants in this study lead to the assumption that conservatism of the farmer is the major social factor influencing adoption of innovations. Tradition and lack of confidence in making innovations succeed are also contributing social factors.

Informational Problems Which Hinder the Adoption of Agricultural Innovations by Farmers

Methodology, the art of making the target group aware of an idea, precedes adoption of an innovation. Acceptance or rejection of a new idea largely depends on how the information was relayed from its source to recipients. Accuracy, clarity and timeliness of information are major aspects determining adoption of new activities.

Data exhibited in Table 9 indicate that factors related to staff availability and credibility ranked 1, 5, 11 and 15. Those dealing with methodology ranked 2, 4, 6, 7, 9, 10, 12, 14, 16 and 17, whereas research oriented statements ranked 3, 8 and 13. Lack of staff for research and extension services was considered by respondents as the most serious informational problem (mean of 2.95). Other problems rated moderate included those concerning a segmented approach, insufficient research, personalized assistance, confidence in advertisements, lack of critical information, conflicting information, and translation of research findings in practical terms. Problems noted in remaining statements were perceived slight by participants.

There was considerable agreement between directors and presidents regarding informational factors constraining new practices. Statements in which the greatest variation of perceptions can be noted included the segmented approach, viewed a more serious problem by directors (mean of 2.76) than by presidents (mean of 2.52), and insufficient research from land-grant universities which was

TABLE 9
INFORMATIONAL PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS

Informational Statement and Rank	Position		Region				Overall Mean (N=84)	S.D.
	D (n=42)	P (n=42)	NC (n=18)	NE (n=20)	S (n=23)	W (n=23)		
1. Lack of research and extension staff, time and support to show operators that new practices do work	2.98	2.93	3.00	2.85	3.13	2.83	2.95	0.79
2. A segmented rather than a systems approach	2.76	2.52	2.44	2.80	2.70	2.61	2.64	0.74
3. Insufficient research from land grant universities	2.44	2.71	2.47	2.90	2.48	2.48	2.58	0.81
4. Lack of personalized assistance in going through a new process and followup	2.46	2.43	2.35	2.20	2.65	2.52	2.45	0.77
5. Lack of confidence in advertisements or people selling products	2.31	2.50	2.22	2.35	2.65	2.35	2.40	0.64
6. Lack of critical information and meaningful contrasts between new and old systems	2.49	2.32	2.18	2.65	2.45	2.30	2.40	0.63
7. Conflicting information received from different sources (confusing)	2.24	2.40	2.28	2.16	2.61	2.22	2.33	0.66
8. Available research findings not defined in practical terms	2.26	2.29	2.06	2.40	2.26	2.36	2.28	0.82
9. Timely dissemination of information	2.19	2.12	2.00	2.05	2.35	2.17	2.15	0.65
10. Inadequate results demonstrations, field days, and other visual evidence of value of recommended practices	2.12	2.07	1.78	2.45	2.22	1.91	2.10	0.74
11. Lack of credibility of source from which information developed	1.86	2.02	1.72	1.95	2.00	2.04	1.94	0.73
12. Change agents unaware how adults learn	1.98	1.90	1.72	1.58	2.22	2.13	1.94	0.73
13. Lack of faith in realism of research/extension system	1.81	2.03	1.83	1.55	2.00	2.23	1.91	0.72
14. Recommendations too complex for farmers' comprehension	1.90	1.90	1.72	1.80	2.13	1.91	1.90	0.72
15. Lack of practical agricultural knowledge and experience by extension personnel	1.86	1.95	1.94	1.55	2.04	2.04	1.90	0.74
16. Innovation not communicated to farmers via extension programs	1.83	1.83	1.78	1.55	1.83	2.13	1.83	0.60
17. Attitudes of extension staff not helpful in discovering or promoting innovations	1.62	1.55	1.67	1.40	1.74	1.52	1.58	0.64

Rating Scale:
1 - Not a problem
2 - A slight problem
3 - A moderate problem
4 - A severe problem

perceived a less serious problem by directors (mean of 2.44) than by presidents (mean of 2.71). Although both directors and presidents viewed lack of faith in realism of research and extension system as a slight problem, presidents rated it somewhat more serious than did directors.

Regional variations were noted for several informational factors. Those problems with variations in mean ratings exceeding 0.50 included inadequate result demonstrations, rated moderate (mean of 2.45) by northeastern and a slight problem (mean of 1.78) by north central participants. Change agents lacking awareness of how adults learn was perceived a more serious problem by southern participants (mean of 2.22) than by northeastern respondents (mean of 1.58) and lack of faith in realism of research and extension systems was rated more severely by western participants (mean of 2.23) than by northeastern participants (mean of 1.55). Innovations not communicated through extension programs, although viewed by respondents as a slight problem, was considered more serious by western than by other participants.

Political Problems Which Hinder the Adoption of Agricultural Innovations by Farmers

Government regulation and manipulation has grown at an unprecedented rate during the past two decades. Safety and environmental regulations, land use policies, taxation changes and commodity and price control practices have had severely unsettling effects on the nation's farmers. Influence of political factors constraining

adoption of agricultural innovations can be observed in Table 10, which indicates that all six statements were perceived as severe or moderate problems (means of 2.63 and above). Factors connected with government policies were ranked 1, 3, 5 and 6, internal economy ranked second, uncertainty of the world situation ranked fourth.

Increased government interference and regulation was considered the most outstanding political problem and was rated severe (mean of 3.26), while shaky national economy was ranked second overall by participants (mean of 3.14). Unstable government policies regarding prices, acreage allotment and environment was considered a moderate problem (mean of 2.99), as were the remaining statements, regarding uncertainty, zoning and taxation.

Close agreement between perceptions of directors and presidents was noted in all statements. In general, presidents considered political problems to be slightly more serious than did directors.

Only in statements regarding land taxation and zoning and antifarming sentiments were major differences among regional respondents noted. In both cases, participants from the western and northeastern regions rated these items to be considerably more serious problems than did those from the other regions, particularly the north central.

TABLE 10
POLITICAL PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL INNOVATIONS BY FARMERS

Political Statement and Rank	Position		Region				Overall Mean (N=84)	S.D.
	D (n=42)	P (n=42)	NC (n=18)	NE (n=20)	S (n=23)	W (n=23)		
1. Increased government interference and regulation	3.17	3.36	3.11	3.10	3.39	3.39	3.26	0.78
2. Shaky national economy	3.14	3.14	2.94	2.95	3.39	3.22	3.14	0.82
3. Unstable government policies regarding prices, acreage allotments, environment, etc.	3.00	2.98	2.78	2.90	3.17	3.04	2.99	0.80
4. Uncertainty of world situation	2.76	2.95	2.78	2.75	3.13	2.74	2.86	0.82
5. Zoning and anti-farming sentiments	2.62	2.83	2.39	2.90	2.48	3.09	2.73	0.99
6. Unstable and increasing land taxation leading to uneasiness about continuance in agriculture	2.60	2.67	2.06	2.75	2.70	2.91	2.63	0.94

Rating Scale:
1 - Not a problem
2 - A slight problem
3 - A moderate problem
4 - A severe problem

Chapter 4

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

This study was conducted with the prime objective of determining major problems constraining adoption of new agricultural practices by farmers as perceived by state directors of CES and presidents of CEAA. The method used was the Delphi technique which involved eliciting expert opinions from the study population through administration of two instruments to participants.

Opinions reported were the consensus of the total population. Data were processed through the West Virginia University Computer Center and means and standard deviations were determined for each statement. Group means and standard deviations were also determined for positions and regions. There was no need for inferential statistics as perceptions of the total population were studied.

Economic Factors

1. Participants viewed problems connected with interest rates which affect long-term investment, cost-price squeeze which relates to inflation, costs of land and equipment, energy costs, and pressure on land use in highly populated areas, as outstanding economic factors. Aspects related to credit and debt, aside from interest rates and

those dealing with economic uncertainty, were considered serious as well by respondents.

2. Strong agreement was noted between directors and presidents concerning economic factors hampering new farming practices. A notable difference, however, was found in the statement "farmers lack understanding of credit use," which was more seriously viewed by directors than presidents.

3. Regional variations, which may be attributed to geographical position, climatic conditions and enterprise variations, were observed. Credit and debt related factors were considered relatively more serious by southern and western respondents than by north central and northeastern participants. Cost-price squeeze factors related to land costs and value in highly populated areas were rated highest by northeastern and western participants and lowest by those in the north central region. Urban pressure by expanding metropolitan areas in these regions could be postulated as the contributory factor. Infrastructure related problems were rated somewhat higher by southern respondents than by north central respondents.

Technical and Managerial Factors

1. Inadequacy of farm records was singled out by participants as the outstanding problem. Availability of skilled labor and management skills of farmers were also perceived as major bottlenecks toward adoption of new agricultural practices. Transportation of farm inputs and produce were as well viewed as acute problems by respondents.

2. Participants also considered those problems connected with farmers being locked into enterprises due to loans or equipment, difficulties in fitting new technologies into existing operations, farm size, and influence of weather in farming, as major concerns affecting adoption of innovations.

3. Directors and presidents agreed strongly in all statements except three. These statements included management skills, transportation facilities and progressive farmers preceding research recommendations.

4. Regional variations were observed in all statements rated. Part-time farming was considered more serious by western region participants and a lesser concern by participants in the north central region. Other statements which showed considerable differences included those related to labor, transport, farm size, weather, and farming as a hobby. Factors related to farm size and farming as a hobby were rated highest by western region participants and lowest by north central respondents. Transportation of farm inputs and produce was viewed as a more serious problem by north central respondents than by northeastern and western region respondents.

Social Factors

1. Farmers' behavior and attitudes toward change were considered by respondents to be the most outstanding social problems constraining adoption of new practices. The conservative farmer was perceived to be the foremost problem. Tradition and lack of confidence in making innovations succeed were other factors considered major problems.

2. Directors and presidents strongly agreed on social factors constraining new agricultural practices except with problems related to age and education of farmers. Presidents considered age of farmers relatively more serious than did directors while the problem related to educational level of farms was weighted higher by directors than presidents.

3. Regional variations, which may be assumed to emanate from cultural heritage, tradition and environmental exposure, were observed. Three out of the nine statements showed considerable variations among regions. These statements included those related to lack of profit oriented goals which was rated highest by northeast region respondents and lowest by western participants; and age of farmers which was viewed as least important by north central respondents. Educational level of farmers was rated considerably higher by southern region participants than by those from north central region.

Informational Factors

1. Lack of extension and research personnel, time and support to show farmers how new practices work was considered by participants the most serious problem connected with informational factors. A segmented rather than a systems approach, insufficient research, and lack of personalized assistance were other informational problems noted by participants.

2. Directors and presidents strongly agreed that lack of research and extension staff, time and support was the informational problem of major concern.

3. Regional differences were noted in several informational factors constraining new agricultural practices. Inadequate result demonstration and field days was rated more serious by northeast and southern participants than by those in the north central and western regions. Considerable differences were also noted among regions on statements related to lack of faith in research and extension systems, psychological approach by change agents, and communication of innovations by extension personnel.

Political Factors

1. Political factors which influence the adoption of new agricultural practices by farmers were considered serious impediments by participants. Government interference and regulation was singled out as the most serious problem. Condition of the national economy was also considered a major constraining factor.

2. Directors and presidents strongly agreed on the seriousness of political factors hampering adoption of new agricultural practices. However, presidents rated the statements related to government interference, world situation, zoning, and land taxation higher than did directors.

3. Regional differences concerning influence of political factors affecting adoption of new farming practices were noted. Increasing land taxation was rated serious by all except north central participants. Zoning was considered an acute problem by participants in northeastern and western regions, whereas north central and southern respondents were less concerned.

Conclusions

From analysis of information received from directors of CES and presidents of CEAA across the USA, the following conclusions were drawn:

1. Economic factors most seriously constrain adoption of agricultural innovations. High interest rates, costs of land, equipment and energy, and pressure on land in highly populated areas are serious problems.
2. Government interference and regulation is the most outstanding political bottleneck in adoption of agricultural innovations. Other acute political problems include those connected with national economy, government policies and the world situation.
3. Inadequacy of farm records is the most serious technical and managerial problem hampering adoption of innovations. Dependability and availability of skilled labor is also a serious problem.
4. There is a need for more research and extension staff to disseminate new ideas efficiently and for effective followup. Segmented rather than a systems approach is also a serious problem in dissemination of information.
5. Conservatism, tradition and fear of failure are the major social factors hampering the adoption of new technologies in farming.

Recommendations

This investigation was conducted to determine major problems which hinder the adoption of new agricultural practices by farmers.

Results of the investigation emanate from perceptions of CES directors and CEAA presidents of the USA. The review of related literature, cited in Chapter 2, supports data presented in the study. Based on the review of literature and data reported in this study, the following recommendations are made:

1. Viability of agricultural production calls for long-term investments. High interest rates increase risks and reduce incentives, thus discouraging farmers from further investments. There is need to regularize interest rates payable on those goods and services geared for farming purposes.

2. Cost-price squeeze, implying high production costs with no corresponding rise in commodity prices, is a major problem in agricultural development. Government policies designed to maintain cheap food prices for consumers at the expense of farmers should be revised if a viable and prosperous agricultural industry is to be maintained.

3. Availability of credit can act as an incentive for agricultural development. Extension personnel, particularly in the southern region, should consider "credit management and use" as one of the priority areas for clientele education. Finance firms should also be involved in this educational endeavor.

4. Development and stabilization of supportive infra-structures should be looked into more critically by those concerned. Particular attention should be paid to the southern region which is perceived to be most seriously affected.

5. Research services should pay particular attention to high value farming enterprises and more intensive use of land in the densely populated areas, particularly in the northeastern and western regions which tend to be affected by urban pressure.

6. Continued government interference coupled with restrictive regulations do influence investments by farmers. Farming is a risky undertaking. Government actions should be well planned to avoid disruption of operations in any one season. Initial capital investment in agriculture is very high and reasonable profits are essential for maintaining an economically viable agricultural sector of the US economy.

7. The policy of land use zoning is perceived to be a burden to northeastern and western farmers. Any move to convert arable land into uses other than farming should consider the future needs for food and fiber production required by the growing population and world demand.

8. Laws and regulations which govern land taxation should be stabilized. The current trend of increasing land taxation tends to discourage farming.

9. Farm records, an essential part of farm management, is an important aspect of successful farming. Extension personnel should include record keeping in their program priorities.

10. Complex research recommendations may leave farmers baffled and unable to utilize them. Clear interpretation of research findings for use by clientele is essential.

11. Farming is comprised of small, intermediate and large scale producers. Large scale producers often have the ability to develop faster than the pace of research recommendations. Research activities should be orientated to benefit all categories of producers.

12. Farming cannot be profitable when transportation of inputs and farm produce cannot be effected economically. Transportation systems need to be improved, particularly railways and barges which are economical for heavy and bulky products.

13. Part-time farmers are somewhat hesitant in adopting new practices. Extension workers should develop programs designed to assist part-time farmers to become more proficient.

14. Labor availability and dependability is a major problem for producers. Current anti-employment inducements paid to able-to-work people, such as food stamps and guaranteed minimum wages for the unemployed, discourage potential agricultural workers. The ability of an economy to absorb new practices and introduce alternatives in production techniques will depend to a large extent upon availability of skilled labor. Cooperative efforts among personnel in the various agricultural agencies and services might be initiated to recruit, train and place skilled agricultural workers.

15. Proprietary business management is important in determining success or failure of operations. Clearly stated goals, agreeable to each party concerned, is required for success. Conflicting goals in business arrangements should be alleviated by educating farmers and landlords on mutually beneficial business agreements.

16. The major role of extension education is to impart knowledge and change attitudes and behavior of clientele. Conservatism of farmers and inclination to resist change are attitudes which can be countered only through education. Demonstrations, field days and other effective methods should be used extensively if farmers are to accept and adopt new policies.

17. Adequate staff devoted to agricultural research activities and extension services should be made available for maximum agricultural development to occur.

18. A coordinated and integrated systems approach is an essential strategy for effective extension education. The current segmented approach has no place in modern agriculture.

Implications for Further Research

As a result of this investigation, the writer feels that additional research is needed concerning problems hindering the adoption of innovations in agriculture. There is need for research on the following:

1. Perceptions of farmers concerning effectiveness of extension service toward promoting agricultural development.
2. Major problems encountered by the extension service in disseminating information to farmers.
3. Effectiveness of research from land-grant and state universities in promoting the agricultural sector.
4. The influence of government regulations and policies on agricultural development.

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APPENDICES

APPENDIX A

Agricultural Education
304 293-3431

Division of Resource Management
College of Agriculture and Forestry
Morgantown, West Virginia
26506



West Virginia
University

January 21, 1980

Dear :

Because of your contacts with large numbers of farmers and agricultural extension agents, you are in a favorable position to assess program development and farmers' problems. Your participation is being requested in identifying those constraints which most seriously impede adoption of innovations by farmers. Such information may be useful in strengthening agricultural extension programs, and may reveal fruitful areas for useful research.

Participation in the study will take only a few minutes of your time. On the enclosed form, please list the five major problems which, in your opinion, most seriously affect the adoption of agricultural innovations by farmers. Your statements will be combined with those of deans/directors of cooperative extension service and presidents of county extension agent associations across the nation. The national list will then be sent to you for your evaluation and rating of each problem mentioned.

Your participation, and return of your list by February 5, 1980, will be greatly appreciated.

Sincerely,

Joas E. Mannento
Graduate Student

Layle D. Lawrence
Associate Professor

JEM/LDL/cms

APPENDIX B

MAJOR PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL
INNOVATIONS BY FARMERS AS PERCEIVED BY STATE EXTENSION
DIRECTORS AND COUNTY AGENT ASSOCIATION PRESIDENTS

Please list below the five major problems which, in your opinion, most seriously affect the adoption of agricultural innovations by farmers.

1.

2.

3.

4.

5.

Please return this form in the enclosed self-addressed postage paid envelope by February 5. Thanks for your cooperation.

Agricultural Education
304 293-3431

APPENDIX C

Division of Resource Management
College of Agriculture and Forestry
Morgantown, West Virginia
26506

February 4, 1980



M E M O R A N D U M

TO: Deans/Directors of Cooperative Extension Service
State Presidents, County Extension Agent Associations

FROM: Joas E. Mannento
Graduate Student, Agricultural Education

Layle D. Lawrence
Associate Professor, Agricultural Education

Several days ago, you should have received our request to identify the five major problems which, in your opinion, most seriously affect the adoption of agricultural innovations by farmers.

If you have not already done so, we urge you to complete the form and return it at your earliest convenience.

Thank you once again for your cooperation.

Agricultural Education
304 293-3431

APPENDIX D

Division of Resource Management
College of Agriculture and Forestry
Morgantown, West Virginia
26506



West Virginia University
March 3, 1980

Dear :

Several weeks ago, deans/directors of state cooperative extension service and presidents of county extension agent associations were requested to identify problems which, in their opinions, most seriously affect the adoption of agricultural innovations by farmers. Response to the request was outstanding.

Items listed on the original request have been combined and condensed into the statements appearing on the enclosed survey form. We are now asking you to evaluate and rate each statement as it pertains to the situation in your state. Responses will be analyzed by position and region, and will hopefully provide information that will be useful in program improvement. Your individual responses will remain completely confidential.

Thanks so much for your participation. If possible, please return the completed form by March 17.

Sincerely,

Joas E. Mannento
Graduate Student

Layle D. Lawrence
Associate Professor

JEM/LDL/cms

APPENDIX E

MAJOR PROBLEMS WHICH HINDER THE ADOPTION OF AGRICULTURAL
 INNOVATIONS BY FARMERS AS PERCEIVED BY STATE EXTENSION
 DIRECTORS AND COUNTY AGENT ASSOCIATION PRESIDENTS

Please circle the number which most nearly corresponds to your opinion regarding severity of problems which hinder the adoption of agricultural innovations by farmers.

- 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

Economic Problems

Inflation has raised production costs without a corresponding increase in commodity prices	1	2	3	4
High interest rates seriously reduce long term investments	1	2	3	4
Fluctuating, unstable agricultural commodity prices resulting in severe marketing problems	1	2	3	4
High energy costs and uncertainty of future availability of petroleum based products	1	2	3	4
Absence of supporting infrastructures in the agricultural system to assist in developing the innovation	1	2	3	4
Failure of supporting infrastructures in the agricultural system to assist in developing the innovation	1	2	3	4
Insufficient available capital to implement new technologies	1	2	3	4
High costs of land and equipment	1	2	3	4

- 1 - Not a problem
- 2 - A slight problem
- 3 - A moderate problem
- 4 - A severe problem

Inadequate economic analysis of research results to justify investments or changes in practices	1	2	3	4
Returns may not be sufficiently attractive to justify the bother	1	2	3	4
Pressure for more remunerative use of land in high population areas	1	2	3	4
Fear that increasing the debt load may cause insolvency	1	2	3	4
Farmers lack understanding of how to use credit effectively	1	2	3	4
Finance firms unaware of benefits, thus not willing to make loans	1	2	3	4
<u>Technical and Managerial Problems</u>				
Fitting new technology into the existing farm system	1	2	3	4
Bad experiences with previous innovations	1	2	3	4
Lack of management skills	1	2	3	4
Availability and dependability of skilled labor	1	2	3	4
Part-time farming prevents adoption of innovations	1	2	3	4
Farming as a hobby or tax hedge	1	2	3	4
Farmers locked into enterprises by particular equipment, loans, etc.	1	2	3	4
Complexity of innovations make outcome difficult to predict	1	2	3	4
Priorities do not include innovation	1	2	3	4

- 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

Research sometimes lags behind progressive farmers and is obsolete by the time results are released	1	2	3	4
Limited size of farm operation to accommodate innovation	1	2	3	4
Inadequacy of farm records	1	2	3	4
Availability of equipment to implement new practices	1	2	3	4
Uncertainty of weather	1	2	3	4
Lack of efficient transportation system (rail, barge, highways, air) farm to market	1	2	3	4
Fear that innovation will cause unexpected problems	1	2	3	4
Unwilling to devote extra time to innovation	1	2	3	4
<u>Social Problems</u>				
Apathy. No initiative or motivation on part of farmer	1	2	3	4
Tradition. Natural inclination to resist change	1	2	3	4
Conservatism. Satisfied with present operations (easier to continue to do things which they are accustomed to)	1	2	3	4
Peer pressure. Fear of ridicule and criticism by neighbors	1	2	3	4
Goals of farmers are not always profit or innovative oriented	1	2	3	4
Business arrangements resulting in conflicting goals (father-son; landlord-tenant, etc.)	1	2	3	4

- 1 - Not a problem
 2 - A slight problem
 3 - A moderate problem
 4 - A severe problem

Lack of confidence in making innovations succeed (fear of failure)	1	2	3	4
Limited educational level of farmers	1	2	3	4
High average age of farmers and limited physical stamina	1	2	3	4
<u>Informational Problems</u>				
Conflicting information received from different sources (confusion)	1	2	3	4
Lack of critical information and meaningful contrasts between new and old systems	1	2	3	4
Timely dissemination of information	1	2	3	4
Inadequate result demonstrations, field days, and other visual evidence of value of recommended practices	1	2	3	4
A segmented rather than a systems approach	1	2	3	4
Change agents unaware of how adults learn	1	2	3	4
Recommendations too complex for farmers' comprehension	1	2	3	4
Available research findings not defined in practical terms	1	2	3	4
Lack of credibility of source from which information developed	1	2	3	4
Lack of personalized assistance in going through a new process and follow-up	1	2	3	4
Lack of confidence in advertisements or people selling products	1	2	3	4
Lack of research and extension staff, time, and support to show operators that new practices do work	1	2	3	4

- 1 - Not a problem
- 2 - A slight problem
- 3 - A moderate problem
- 4 - A severe problem

Lack of practical agricultural knowledge and experience by extension personnel	1	2	3	4
Insufficient research from land grant universities	1	2	3	4
Lack of faith in realism of research/extension system	1	2	3	4
Innovation not communicated to farmers via extension program	1	2	3	4
Attitudes of extension staff not helpful in discovering or promoting innovations	1	2	3	4
<u>Political Problems</u>				
Increased government interference and regulation	1	2	3	4
Zoning and antifarming sentiments	1	2	3	4
Unstable and increasing land taxation leading to uneasiness about continuance in agriculture	1	2	3	4
Unstable government policies regarding prices, acreage allotments, environment, etc.	1	2	3	4
Shaky national economy	1	2	3	4
Uncertainty of world situation	1	2	3	4

APPENDIX F

Agricultural Education
304 293-3431

Division of Resource Management
College of Agriculture and Forestry
Morgantown, West Virginia
26506



March 18, 1980

M E M O R A N D U M

TO: State Extension Directors
Presidents, State County Agent Associations

FROM: Joas E. Mannento
Graduate Student

Layle D. Lawrence
Associate Professor

Approximately two weeks ago, you were mailed a survey form concerning problems which affect adoption of agricultural innovations by farmers. We want to express our thanks to you for completing and returning the form. The information you have supplied may be useful in strengthening extension and extension education programs.

NOTE: If you have not returned the survey, please complete it and put it in the mail today. Thanks.

JEM:LDL/gll

APPENDIX G

PROBLEMS, LISTED BY RANK, WHICH HINDER THE ADOPTION OF AGRICULTURAL
 INNOVATIONS BY FARMERS, AS PERCEIVED BY CES DIRECTORS AND CEAA
 PRESIDENTS

Statement and Overall Rank	Mean (N=84)	S.D.
1. High interest rates seriously reduce long term investments	3.58	0.59
2. Inflation has raised production costs without a corresponding increase in commodity prices	3.55	0.70
3. High costs of land and equipment	3.47	0.75
4. High energy costs and uncertainty of future availability of petroleum based products	3.32	0.78
5. Increased government interference and regulation	3.26	0.78
6. Shaky national economy	3.14	0.82
7. Pressure for more remunerative use of land in high population areas	3.05	0.96
8. Inadequacy of farm records	3.04	0.80
9. Unstable government policies regarding prices, acreage allotments, environment, etc.	2.99	0.80
10. Lack of research and extension staff, time, and support to show operators that new practices do work	2.95	0.79
11. Returns may not be sufficiently attractive to justify the bother	2.94	0.78

APPENDIX G (Cont'd)

Statement and Overall Rank	Mean (N=84)	S.D.
12. Fear that increasing the debt load may cause insolvency	2.89	0.77
13. Fluctuating, unstable agricultural commodity prices resulting in severe marketing problems	2.88	0.84
14. Availability and dependability of skilled labor	2.87	0.80
15. Uncertainty of world situation	2.86	0.82
16. Insufficient available capital to implement new technologies	2.80	0.69
17. Zoning and anti-farming sentiments	2.73	0.99
18. Lack of management skill	2.67	0.74
19. A segmented rather than systems approach	2.64	0.74
20. Unstable and increasing land taxation leading to uneasiness about continuance in agriculture	2.63	0.94
21. Lack of efficient transportation system (rail, barge, highways, air) farm to market	2.62	0.92
22. Farmers locked in enterprises by particular equipment, loans, etc.	2.59	0.64
23. Insufficient research from land grant universities	2.58	0.81
24. Conservatism. Satisfied with present operations (easier to continue to do things which they are accustomed to)	2.56	0.75

APPENDIX G (Cont'd)

Statement and Overall Rank	Mean (N=84)	S.D.
25. Farmers lack understanding of how to use credit effectively	2.55	0.77
26. Fitting new technology into the existing farm system	2.51	0.63
27. Complexity of innovations make outcome difficult to predict	2.51	0.71
28. Limited size of farm operation to accommodate innovation	2.51	0.80
29. Inadequate economic analysis of research results to justify investments or changes in practices	2.50	0.75
30. Tradition. Natural inclination to resist change	2.48	0.80
31. Research sometimes lags behind progressive farmers and is obsolete by the time results are released	2.46	0.77
32. Lack of personalized assistance in going through a new process and followup	2.45	0.77
33. Uncertainty of weather	2.42	0.93
34. Lack of confidence in making innovations succeed (fear of failure)	2.42	0.64
35. Lack of confidence in advertisements or people selling products	2.40	0.64
36. Lack of critical information and meaningful contrasts between new and old systems	2.40	0.63

APPENDIX G (Cont'd)

Statement and Overall Rank	Mean (N=84)	S.D.
37. Business arrangements resulting in conflicting goals (father-son; landlord-tenant, etc.)	2.38	0.77
38. Part-time farming prevents adoption of innovations	2.38	0.93
39. Conflicting information received from different sources (confusing)	2.33	0.66
40. High average age of farmers and limited physical stamina	2.31	0.81
41. Finance firms unaware of benefits, thus not willing to make loans	2.29	0.86
42. Available research findings not defined in practical terms	2.28	0.82
43. Fear that innovation will cause unexpected problems	2.25	0.62
44. Absence of supporting infra-structures in the agricultural system to assist in developing the innovation	2.23	0.82
45. Unwilling to devote extra time to innovation	2.22	0.75
46. Priorities do not include innovation	2.17	0.74
47. Timely dissemination of information	2.15	0.65
48. Failure of supporting infra-structures in the agricultural system to assist in developing the innovation	2.14	0.78

APPENDIX G (Cont'd)

Statement and Overall Rank	Mean (N=84)	S.D.
49. Availability of equipment to implement new practices	2.13	0.78
50. Inadequate result demonstrations, field days, and other visual evidence of value of recommended practices	2.10	0.74
51. Apathy. No initiative or motivation on part of farmer	2.06	0.70
52. Goals of farmers are not always profit or innovative oriented	2.02	0.69
53. Peer pressure. Fear of ridicule and criticism by neighbors	1.99	0.80
54. Farming as a hobby or tax hedge	1.98	0.93
55. Lack of credibility of source from which information developed	1.94	0.73
56. Change agents unaware of how adults learn	1.94	0.74
57. Limited educational level of farmers	1.92	0.70
58. Lack of faith in realism of research/extension system	1.91	0.72
59. Recommendations too complex for farmers' comprehension	1.90	0.72
60. Lack of practical agricultural knowledge and experience by extension personnel	1.90	0.74
61. Bad experience with previous innovations	1.89	0.60

APPENDIX G (Cont'd)

Statement and Overall Rank	Mean (N=84)	S.D.
62. Innovation not recommended via extension programs	1.83	0.60
63. Attitudes of extension staff not helpful in discovering or promoting innovations	1.58	0.64

Rating Scale:

- 1 - Not a problem
 - 2 - A slight problem
 - 3 - A moderate problem
 - 4 - A severe problem
-

APPENDIX H

COMMENTS MADE BY RESPONDENTS TAKEN FROM THE SECOND PHASE INSTRUMENTS

1. "Economics is the number one problem. Farmers with money will improve and buy almost anything. Practice may not be an innovation, many bandwagons have been abandoned."

2. "Other limitations to adoption of innovations include soil problems."

3. The inadequacy of result demonstrations and field days-- "is not a problem per se, rather the problem is poor participation on the part of the farmer."

4. The problems of lack of research and extension staff, and insufficient research from land-grant universities, emanated from budget cuts every year.

5. The problem "government interference and regulation" could be rated 10 if there was provision in the instrument of the study due to its gravity.

6. A respondent who had 20 years experience in extension confessed having biased responses on questions related to lack of agricultural experience and practical knowledge on the part of the change agent. Rating them not a problem.

7. "Government interference and regulations and zoning and anti-farming sentiments are EXTREME problems."

8. "The finance firms are inclined and ready to invest only in less risky ventures."

9. "I think we are," responded a participant regarding the question that change agents are not aware how adults learn.

10. "Cost-squeeze problem did not affect milk."

11. "The trend of economic, political and social changes take place so rapidly that even farmers have to take different perspectives weekly. Cost of water has risen due to price of electricity to pump it from deep wells. Thousands of cotton acres which were planned to be put into the crop will no longer be done."

ABSTRACT

Objective

The primary objective of this study was to determine major problems which hinder the adoption of agriculture innovations by farmers as perceived by directors of Cooperative Extension Services and presidents of County Extension Agent Associations.

Methods and Procedures

Data for the study were obtained through the Delphi technique. The study population included 50 state directors of CES and 49 presidents of CEAA (Rhode Island had no association) of the USA.

The Delphi technique consisted of questionnaires administered in two phases. First phase instruments were mailed on January 21, 1980. Participants were asked to list five major problems which, in their opinion most seriously affect the adoption of agricultural innovation by farmers. Responses (from 64 percent of the population) were used by the Q-sort committee to formulate questionnaire statements for the second phase survey.

On March 3, 1980, the second phase instruments comprising 63 statements, were mailed to the original population. The statements were categorized into five areas--economic, technical and managerial, social, informational, and political. Each statement was weighted by numerical numbers as follows: 1 - not a problem, 2 - a slight problem, 3 - a moderate problem, and 4 - a severe problem. Participants were

asked to circle one number against each statement corresponding to their perceptions regarding gravity of the problem. By the deadline set, April 8, 1980, a total of 84 responses (85 percent) were recorded and used in the study.

Data were analysed using West Virginia University Computer Center facilities. Means and standard deviations were determined for each statement by position and region. Statistical inferences were deemed unnecessary as means represented the total population.

Findings

Participants viewed economic factors to be the greatest hinderance in adoption of new agricultural practices. Aspects related to interest rates, cost of land and equipment, energy costs, and value of land in densely populated areas, were singled out as major problems.

Government interference was considered the most serious political problem constraining adoption of new ideas in farming. Technical and managerial factors particularly those related to adequacy of farm records and dependability and availability of labor, and the informational problems of staff for both research and extension and methodology, were also rated as bottlenecks.

There were strong agreements between directors and presidents in most of the categories and statements, while regional differences were more vivid in most categories and statements. The regional variations may be attributed to geophysical position, climatic conditions, enterprise differences, and ecological location.

Factors related to credit and debt were considered more pressing by southern and western respondents than by north central

and northeastern participants. High land values and urban pressure were perceived greater problems in the northeastern and western regions than in the north central and southern region.

Adoption of innovations by part-time farmers, farm size, experience with previous innovations, farming as a hobby and availability of equipment were perceived more pressing by western participants than by others. Business goals, age of farmers, and educational level of the farmer were also among the major problems revealing regional disparities, rated highest by northeast and southern participants.

Adequacy of staff was a problem viewed more acute by southern and north central than by northeastern and western participants. Zoning problems and land taxation were considered to be more serious by participants from the western and northeast regions than by others.

In general terms, southern and western participants viewed all factors influencing farming more acute than did north central and northeastern region participants.

VITA

The writer, Joas Elinazi Mannento, was born on May 25, 1942, and is the fifth son of Mr. and Mrs. Elinazi Koti Kabialo of Myombo Village, Gonja-South Pare in Kilimanjaro region, Tanzania.

He received primary education at Mtii Primary School in 1951 and joined Dindimo Middle School in 1955. He completed standard VIII in 1958 and was among the first to sit for the Common Entrance Examination.

In 1959, he joined Tanga School and was among the last to sit for the Territorial Standard X examination in 1960. He briefly worked with the Ministry of Health (in 1961-63) before joining the Ministry of Agriculture as a pre-institute student.

He trained to certificate level at Tengeru, Arusha Institute among the first preservice students and graduated in 1965 with first class honors setting a record since the inauguration of the institute in 1953.

He worked as an extension officer at Iringa before joining Morogoro College among the first candidates. He graduated in 1967 and was posted to Arusha as an extension officer. In 1968 he received a diploma in agriculture from the University of East Africa.

He joined the Haile Sellassie I University in August, 1968, among the first candidates under the Inter African Universities Program, and graduated in July, 1970.

He worked as a Farm Manager in 1970/71 and as an advisor to the Director of Production on Seed/Mixed Farming State Farm in 1972. He was among the first Regional Agricultural Development Officers named immediately after decentralization of government business in July, 1972, and was posted to Mbeya.

In December, 1973, he married Navone William Mngara, a secondary school teacher at Mbeya Secondary School, who has given him three children, Koti Elinazi Joas, age 6, Naziel Komzungu Joas, age 4 and Christina Mamsapo Joas, age 2 years.

In 1979, he was offered a scholarship under the Senator Hubert H. Humphrey North-South Fellowship, as first participants, at West Virginia University where he later enrolled for an MSc in Agricultural Education candidacy in the 1979-80 academic year.

APPROVAL OF EXAMINING COMMITTEE

Warren G. Kelly
Warren G. Kelly, Ed. D.
Professor of Agricultural Education

Kenneth J. Hock
Kenneth J. Hock, Ph.D.
Associate Professor of Agricultural
Economics

July 22, 1980
Date

Layle Lawrence
Layle Lawrence, Ph.D.
Associate Professor of Agricultural
Education - Chairman