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The Effect of the Agricultural Extension Service
on Farmers' Behaviour and Attitude Towards the
Recommendations on Production of Cotton and
Maize in Wadi Zabid Project, Yemen Arab Republic

presented by

Jasem M. Al-Shereeda

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of the requirements for

M.S. degree in Dairy Science

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**THE EFFECT OF THE AGRICULTURAL EXTENSION SERVICE
ON FARMERS' BEHAVIOUR AND ATTITUDE TOWARDS THE
RECOMMENDATIONS ON PRODUCTION OF COTTON AND
MAIZE IN WADI ZABID PROJECT, YEMEN ARAB REPUBLIC**

By

Jasem M. Al-Shereeda

A THESIS

**Submitted to
Michigan State University
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ABSTRACT

THE EFFECT OF THE AGRICULTURAL EXTENSION SERVICE ON FARMERS' BEHAVIOR AND ATTITUDE TOWARDS THE RECOMMENDATIONS ON PRODUCTION OF COTTON AND MAIZE IN WADI ZABID PROJECT, YEMEN ARAB REPUBLIC

By

Jasem Al-Shereeda

The present thesis is a study of farmers attitudes and adoption of agricultural innovations in a pilot project in Tihama Valley in the Yemen Arab Republic (North Yemen). The main problems investigated were:

1. Farmers attitudes towards the agricultural innovations;
2. Adoption of agricultural innovations;
3. The relationship between adoption and size of land holding.
4. The relationship between adoption of innovations and existing rental system.
5. Recognizing of rural leaders.
6. Factors affecting adoption of innovations which are considered to be constraints on adoption of the agricultural extension recommendations and the examining of alternative information delivery systems in reaching farmers.

This study revealed that, there is a high positive attitude and high adoption of agricultural extension recommendations.

The result of examining the researcher hypothesis were:

1. A farmer's attitude is related positively to the farmer's interaction with the agricultural extension service.
2. A farmer's adoption is related positively to:
 - a. A farmer's interaction with the agricultural extension service.
 - b. The land ownership.
 - c. The size of the land holding.
 - d. The age of the farmer.

It is most interesting that the researcher discovered that older farmers are more likely to adopt improved practices than younger farmers and that illiteracy is not an obstacle for the adoption of the Wadi Zabid Project which is contrary to all findings in the literature. These findings may be logically accepted, keeping in mind that most of land owners are older farmers and that the project was started 10 years ago, therefore making the sample of this study late adopters.

Finally, a number of recommendations and suggestions for other similar projects in Tihama are offered.

الى المرحوم الشيخ عبدالله السالم الصباح (١٩٥٠-١٩٦٥م) أبو الدستور ومؤسس
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أهدى هذه الدراسة

To:

The Late Shaik Abdulla Al-Salem Al-Sabah (1950-1965) the father of our Constitution and the founder of the modern State of Kuwait.

To:

Messrs: Mohammad Th. Al-Ghanem, Abdulla H. Al-Sager, Shaik Yousef Ibn Essa, Sayed A.S. Sulaiman, Mashaan Kh. Al-Khaled, Abdel Latif M. Al-Thnyan, Sulaiman Kh. Al-Adsani, Yousef M. Al-Marzok, Saleh O. Al-Rashed, Yousef S. Al-Humaydi, Mohammad D. Al-Marzok, Sultan A. Al-Kulaib, Meshari H. Al-Bader, and Khaled A. Al-Hamad honourable members of the first elected National Assembly of the State of Kuwait (June 1938 - December 1938).

I dedicate this work.

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CHAPTER I

INTRODUCTION

To fulfill the pre-determined objectives of Wadi-Zabid project as mentioned in the International Development Agency (IDA) appraisal report No. 73A, 1973, expatriate and Yemen agricultural specialists from the Ministry of Agriculture and in particular the departments of Research, Plant Protection and Extension and Training worked together towards starting the implementation of the agricultural development programs during August and September of 1974.

Throughout the project period from 1974 to 1979 these three agricultural departments worked co-operatively in implementing their plans, though they worked separately. Tihama Development Authority helped greatly in the realization of such co-operation and co-ordination among these agricultural departments. Beside these departments, Agricultural Credit Fund (ACF) helped and played an important role in fulfilling the pre-determined objectives of Wadi Zabid Project.

The implementation of Wadi Zabid Development Project started after getting the approval of a feasibility study made by Tesco and Fap Group by the financial agents of World Bank and Kuwait Fund.

Wadi Zabid is one among the seven wadis and the first development project in Tihama coastal region. Only after realizing the educational and economic results and the ability of repaying the credit to the financial agents, were other projects approved and started by financial agents.

Objectives of Wadi Zabid Project: (1)

Wadi Zabid Development Project had several main objectives. Such objectives were approved by the Yemeneese Government and the Financial Agencies. Actions were undertaken through the last four years before realizing them. These main objectives could be summarized in the following points:

1. Improving the existing irrigation system by constructing 5 diversion weirs, improving the existing canals and extending and establishing some new canals to reach other new areas.
2. Constructing some new rural roads to aid communication between villages in the project area and new areas of construction.
3. Constructing houses and offices for expatriates and Yemenee personnel.
4. Establishing the TDA organizational structure with its various departments and sections.
5. Selecting and training Yemenee personnel needed for realizing the objectives of the various departments.

6. Developing the plant production in the project area through the following actions:

- a) Increasing the cultivable area through improving the existing irrigation system by building the 5 diversion weirs, improving and extending existing canals.
- b) Providing more irrigation water and for longer periods in some parts of the project area.
- c) Identification of the main production constraints in the area through an overall examination of the existing agricultural pattern.
- d) Carrying out a meaningful research plan, dealing primarily with production limiting factors in the region, to reach certain recommendations related to new high yielding varieties, new technology and agricultural practices, suitable pest and weed control under local conditions and effects of different pesticides on crops, soils, animals and human beings.
- e) Examining the research results implemented on the experiment station and the laboratories under farm conditions in farmers verification trials, with reference to different irrigation systems and economic merits as compared to existing farmers' practices.

- f) Formulation of definite work all recommendations based on both experimentations and verifications which are transferred to the extension service department.
 - g) Teaching farmers the new recommendations by the extension service department and convincing them with the recommendations application and adoption, utilizing all possible extension teaching methods and audio-visual aids. Starting first with the demonstration methods (fields, aggregates, farms and field days) then followed by other individual contact, group contact, and mass-media methods.
 - h) Providing farmers with needed inputs for development (selected seed, fertilizers, pesticides, herbicides, agricultural machineries and sprayers) at suitable times, with suitable prices and at suitable places.
7. Helping other agricultural projects in Yemen, official bodies and financial agencies in gathering the needed statistical information for developing the agricultural sector of the Yemenese economy.
8. Sending extension agents and other TDA personnel to attend training courses inside or outside Yemen in the various agricultural, financial and administrative fields to help in the realization of the desired developmental levels whether in Wadi Zabid Project area or in other potential areas of development.

The Problem

The Extension Service is considered an active and dynamic department, acting as a two way bridge and a liaison between farmers and their problems on one side and research department and their solutions and recommendations on the other side. Thus, through its active and dynamic role, it is the Extension Service that educates farmers about the agricultural innovations, application, and consequently plays an outstanding role in developing the agricultural production and rural life.

The agricultural Extension and Training Department of the Tihama Development Authority (T.D.A.) started its organized activities and efforts in Wadi Zabid project area in September 1974 based on pre-determined objectives, scientific teaching methods and organized and well-planned programs.

Evaluation of the agricultural extension in Wadi Zabid project will lead to improve extension which will lead to improve and also will lead to better understanding how extension operates.

Purposes (Objectives)

The purposes of this study are:

1. To measure the attitude of the farmer toward the Extension Services recommendations.
2. To measure the extend of adoption of the recommended field practices by the farmers.

3. To measure the extend of success that the Extension Service has achieved regarding the recognition of the local leaders.
4. To discover some of the factors affecting the adoption of the Agricultural Extension recommendations.
5. To examine alternative informational delivery systems that the Cooperative Extension could utilize in reaching farmers.

Motivation for this Research

This study was carried out because of many reasons. Primarily it is because of the changing structure of agriculture and the questionable consequences of the Tihama Agricultural Project in Yemen Arab Republic. It is motivated in part by the author's background, which includes being familiar with the project of Wadi Zabid through official missions, and by a special concern for Yemen and the Yemenese who have had, historically, a significant impact in the Middle East and still have the potential to continue affecting the progress of the Arab World. It is also motivated by the fact that the author is a staff member of the Kuwait Fund for Arab Economic Development, which supports many projects in Yemen Arab Republic as technical assistant and loans, and interest that this project will contribute recommendations and suggestions to other projects in the future.

Importance

Wadi Zabid project is a pilot one. This project reflects the Kuwait Fund and the International Development Agent Strategy to develop the Tihama Valley gradually. There has been a significant change in Wadi Zabid as a consequence of the project in that area and it is very important to find out the effect of the Agricultural Extension Service as a change agent and its impact on the development of Wadi Zabid. This kind of evaluation is essential for improving the agricultural extension in introducing the agricultural message to farmers.

Generalization

Wadi Zabid is one of the seven major Wadis, entering the Tihama in Yemen from the mountains to east. The other six Wadis are from north to south; Wadi Maur, Wadi Surdud, Wadi Siham, Wadi Rima, Wadi Rasyan, And Wadi Mauza.

Wadi Zabid was selected to be developed first, as it appeared to be of the Wadis showing the best developmental potential and pre-investment studies by the United Nations Development Program (UNDP) had identified the project as having good developmental potential. The outcome experience of the Wadi Zabid project would contribute to the other six major Wadis. The limitations of this study are that felling and thinning were considered as one recommendation; they should be separated into two different ones. Some bias may occur since the data is collected by the extension agents

1. Factorial ANOVA

* Design

* Assumptions

* Multiple Comparisons

1/1/2020

ANOVA: Analysis of Variance

ANOVA

ANOVA

ANOVA

ANOVA

ANOVA

themselves, although they were oriented to collect data from other zones than their own.

Hypothesis 1

Farmers who have interacted with the agricultural Extension Service will have more positive attitudes toward the recommendations of the service than those who have not.

Since we are an extension service we can expect that farmers who have interacted with us will have more positive attitudes towards our recommendations. This will also help them to adopt

Extrem - Minus - Alpha

H2: those who have positive attitudes adopt more

Hypothesis 2: Adoption of Improved Practices

- a) Farmers who use more improved practices receive more information and help from the Agricultural Extension Service.
- b) When the size of holding increases, adoption of improvements increase.
- c) Farmers who own their land are more likely to adopt improved practices than those who rent.
- d) Younger farmers are more likely to adopt improved practices than older farmers.
- e) Higher educated farmers are more likely to adopt improved practices than less educated farmers.

Being able to have which brings in more and more people who are more positive

Production in Zabid Project

The study carried out in March 1980 in Zabid Project shows that following recommendation of Research Stations, extension and plant protection sections, offering agricultural credits and lessens using irrigation water, increased the total output of the cereal crops in Wadi Zabid

from 22,280 tons in 1975 before beginning of the Project to 37,160 tons in 1980, as shown in Table No. 1. This table shows the crop area, the yield per hectare and the total production in 1975, before the beginning of Wadi Zabid Project, corresponding with the year 1980, after 5 years of the beginning of the Project. This represents 66.79% increase in total output during the 5 years form the beginning of the Project.

The results of the study show that the total output expected at the end of the Development Plan in 1987 may increase to 68,210 tons in comparison with original planned target of the Project for 1987 which was expected to be 62,560 tons. This represents a 206.15% increase in the total output. The study shows that the income from the total production in local markets increased dramatically.

Before the beginning of the Project the total income was 101,996,000 Yemeni Rials (compared with 1980 market price), by the end of the Development Plan, it will be 239,445,000 Yemeni Rials.

Activities and Achievements of TDA in the Field of Agriculture

First: Agricultural Research

The agricultural research activities of TDA at Girba of Wadi Zabid and Surdud represents the scientific base for solving the problems which are faced by the farmers of Tihama Plan. Owing to the fact that experiments and

TABLE 1

Crop Areas, Yields and Production as of 1975/1980

| Crop | Area | Yield | Total |
|----------------------------------|------------|-----------|----------------------------|
| | (1,000 ha) | (tons/ha) | Production (1,000 tons) |
| | (1) | (2) | (3) |
| Before Project (1975) (2) | | | |
| Cotton | 4.2 | 1.10 | 4.62 |
| Sorghum, grain | 10.4 | 0.85 | 8.84 |
| stalks | | 5.00 | 52.00 |
| Millet, grain | 5.5 | 0.55 | 3.02 |
| stalks | | 4.00 | 22.00 |
| Maize | 1.5 | 1.20 | 1.80 |
| Oilseeds | 0.8 | 0.50 | 0.40 |
| Vegetables | 0.4 | 9.00 | 3.60 |
| Totals | 22.8 | | 22.28(3) |
| (1980)-With Project (4) | | | |
| Cotton | 3.70 | 1.49 | 5.51 |
| Sorghum, grain | 11.25 | 1.10 | 12.38 |
| stalks | | 5.00 | 56.25 |
| Millet, grain | 4.35 | 0.75 | 3.26 |
| stalks | | 4.00 | 17.40 |
| Maize | 2.05 | 1.97 | 4.04 |
| Oilseeds | 1.05 | 0.69 | 0.72 |
| Vegetables | 0.90 | 12.50 | 11.25 |
| Totals | 22.30 | | 37.16(3) |

(1) Sources: Appraisal Report, March 27, 1983;

Re-Appraisal Report, October 1975; and Dr. Rafie

(2) Total production excluding stalks

(3) Sources: March 1980 survey conducted by Dr. Rafie

researches are made over many different agricultural products like cotton, sorghum, maize, millet, oil seeds and vegetables, the aim is to introduce highly productive varieties which are resistant to decreases and respond to fertilizers better than the local varieties.

A study comparing between the improved and local varieties gave answers to the following:

1. Most suitable period for seeding crops in different irrigation areas (wells - wadi).
2. Suitable way of land preparation for different irrigation conditions.
3. Suitable plant intensity per area unit for different crops.
4. Best period and method of irrigation for agricultural seasons.
5. Best fertilizer quantity averages corresponding to type of crop and irrigation method.

Resulting in the many experiments about this aspect showed the necessity of applying the production means in a complete manner to achieve the best results.

TDA researchers introduced varieties of crops suitable for Tihama and other areas of Yemen as (Tihama-1) for Maize, (Dukhn Tihama) for Millet. They proved to be highly productive. Improved seeds were spread by many tons of seeds being produced by the extension fields and Surdud Farm.

Due to the importance of cotton to the national economy, researchers introduced hundreds of tons from the seeds of the new (Coker 310) to cover an area of 5000 hectares at the 1st stage instead of the Acala 1715, while research is still going on to introduce newly improved varieties.

The TDA succeeded in establishing the 1st and 2nd only technology lab in Yemen for testing cotton properties.

All research recommendations, concerning different crops, were passed to the farmers, through the extension agents, to improve the agricultural productivity.

Second: Agricultural Extension

1. The TDA held five training courses, out of which 141 extension agents were qualified to resume their activities in different sections and extension offices to help farmers. Some of the trainees also work for Hodeidah Agricultural Office and the ACP.
2. Forty-nine extension agents and five graduate agricultural engineers were sent for further training in other Arab countries.
3. Four hundred eighty-four extension field units were executed to convince the farmers on a practical basis to accept their recommendation and improved seeds through comparison with other fields. TDA provides seeds and plant protection insecticides as well as mechanical preparation of the land, free of charge to the farmers

as an incentive to encourage them to accept the recommendation.

4. Three hundred rural leaders among the farmers were trained by TDA in Wadi Zabid and Wadi Rima'.
5. Many photographers, colored slides, posters, printed circulars, etc. were prepared by the TDA to be used as visual aids to convey the recommendation in a simply way to the farmers.
6. Morning and evening meetings were held between farmers and extension agents in different parts of the project areas to convey the recommendation and new technique to them. Also, creating an awareness of the problems which face the farmers and a will of finding the solutions for any problems in those areas.
7. TDA shared in the establishment of three agricultural co-operative societies among Wadi Zabid and Wadi Rima' farmers.
8. Extension offices helped in an illiteracy campaign in the villages where no schools are available.

Third: Plant Protection

1. Different types of insects harmful to the crops in the area were listed and recommendations concerning the insecticides and methods to guard against their harms were adopted and conveyed to farmers.
2. TDA shared in the national campaign against cotton diseases.

3. Comprehensive researches were made for the types of insects and plant disease and the best insecticides, doses and periods were established
4. A special laboratory is under construction to be utilized for the analysis of insecticides and their effectiveness to prepare the necessary recommendations about their use.
5. Showings in the extension activities, e.g., field day, evening meeting, field visits, etc. to enlighten the farmers and solve their problems.

Target and Progress in Extension and Training Section

- I. Target and Progress During the Period from 1974 to 1982
 1. Training and creating of Yemeni Technical Cadres capable of managing the work in the future.
 2. Conveyance of advice to the farmers of the way to use the modern agricultural techniques to increase agricultural output. Deep study of their problems to get proper solutions through consultation with the research station.
- II. Progress During the Existence of the Project
 1. One hundred forty-one extension agents' who had participated in theoretical and practical training are now on the job in different agricultural sections and TDA's Extension Offices. Some of them

are working in other agricultural projects in Tihama.

2. Seventy-nine extension agents were sent by the TDA to different Arab countries to increase their agricultural knowledge and experience.
3. Participation of extension personnel in internal training courses and on-the-job training.
4. TDA established 10 extension offices in the main villages in Wadi Zabid and finished the construction of another 7 extension offices in Wadi Rima' offering different agricultural services to the farmers for the purpose of increasing the output. Extension agents are mostly from the same area of their employment.
5. Four hundred eighty-four extension units were established (Demonstration Farms) for cereal, cotton and vegetable, for the purpose of convincing the farmers of the modern agricultural techniques. The crops include: cotton, maize, millet, sorghum, tomatoes, sweet pepper, okra and egg plant. The work is generally carried out in Autumn. Presently there are 34 extension units for the above-mentioned crops in Wadi Rima and Zabid.
6. Eight new wall bulletins were published and 10 extension pamphlets regarding cereals and vegetables were also published by the research station to evaluate extension work.

7. Fifteen local agricultural extension shows were held in Wadi Zabid and Rima Projects, and they also participated in the National Fair convened in Sana'a.
8. Three hundred rural chiefs were selected and trained in Wadi Zabid and Rima.
9. Photos and slides were produced to help convey agricultural advice to the farmers in an easy way.
10. Extension meetings and field days were held several mornings and evenings in different project areas thus to get their solutions.
11. Many information campaigns were carried out to advise farmers on modern agricultural techniques.
12. Their participation in several agricultural programs on radio and T.V. shows in Sana'a.
13. Their help in the literacy program.
14. Their help to create 3 agricultural cooperatives in Wadi Zabid and Rima and continue to encourage them.
15. They distributed improved seeds and advised farmers to use them.
16. Supply farmers with seedings of fruits and citrus annually.
17. Participation on the annual cotton campaign with cooperation of the plant protection section and the cotton company.

18. Different certificates and rewards were distributed to encourage farmers to increase agricultural output.
19. Agricultural data were collected from Wadi Zabid, Rima and Wadi Mawr for use in agricultural program evaluation.
20. A monthly collection of price data is made from local markets in the project area for local evaluation and sent to the Ministry of Agriculture in Sana'a.

**The Agricultural Credit Fund
in Yemen and its Role in
Agricultural Development**

Since ancient times, Yemenese were engaged with agricultural activities. They have utilized the water resources constructing dams, reservoirs and diversion canals which still exist, spreading to cover different parts of Yemen; Marib Dam being the most famous example.

As a result of the long period of political and social situations dominating, the importance of agricultural activities has deteriorated.

After the revolution, the government put life into the agricultural sector again to play its role in the National Plan for Development. This governmental attention towards the development in the agricultural sector is evident by their establishment of the Agricultural Credit Corporations. It is important to discuss the start of organized

Agricultural Credit Funds in Yemen, its economical evaluation and the different types of loans and the conditions that needs to be available with for each type.

Previously, unorganized type of loans run by illegal money lenders, merchants, etc. dominated all over Yemen till 1975 when Law No. 21 was issued. According to this law, the Agricultural Credit Bank resumed its activities during March of 1975. In its development plan the Bank covered most of the areas and opened the following branches:

(1) Sana'a Branch (2) Hodeidah Branch (3) Beit Al-Faghi Branch (4) Zabid Branch (5) Wadi Mawr Branch (6) Abce Branch (7) Ibb Branch (8) Dhamar Branch (9) Sa'adah Branch.

After some time, the activities were expanded by combining the ACF Branches of Zabid, Taiz, Mawr, and Ibb to the Agricultural Bank.

The government established the National Development Cooperative Bank. Later, both bank's corporations were combined under one corporation utilizing the experiences gained by both corporations and reducing the operating expenses. The consolidation procedures were completed in December 1981.

The Economic Value of the Bank Role

The agricultural activities in Yemen Arab Republic are considered to be a main role; 70% of the population is connected somehow with agriculture. Yemen enjoys different

climatic conditions which enable farmers in different parts of Yemen to cultivate a variety of crops and vegetables all year round. This in itself yield self-sufficiency.

Owing to the fact that most of the farmers in Yemen have comparatively small holdings and due to what they faced from the Government regime before revolution, they are unable to reconstruct and utilize their fields without the aid from the government. They lack the necessary funds to develop the area and make use of modern agricultural techniques. For this reason, the state established the credit bank to help them by issuing different types of loans in cash and kind as well as making the other resources available at reasonable prices.

Loans--Types and Refunding Periods

The agricultural credit bank aims to increase the agricultural crop production, reduce the cost expenses, increase the net income from agriculture and raise the standard of living for the farmer to enable the agricultural sector to help in developing connected sectors. For this reason the bank grants all different types of loans to cover all stages of work activities from the initial to the last stages.

Loans also include animals, poultry, and fish due to the importance of these factors as human food. Loans issued by the bank and its durations are as follows:

1. Short Term Loans - which are meant to cover running expenses. Its duration is to the end of the season but not more than one year.
2. Medium Term Loans - these are the types of loans for activities which do not give a yield during one year but are continuous for many years. It is payable during the same period, which extends from 2 to 4 years. These types of loans are granted for the purchase of irrigation units (e.g., Motor and Pump), tractors and its accessories, etc. as well as for well developments, land reclamation, transportation means for agricultural needs, fish wealth utilization, poultry, gardens of citrus fruits, etc.
3. Long Term Loans - these loans are issued for large agricultural schemes whose production periods extends for a longer period more than that of the medium term loans.

The most important item of such loans at present is for animal wealth and poultry. It may be expanded in the future to cover other aspects, owing to the strategic policy of the bank. Its duration is between five to twelve years.

Securing Guarantees

To guard against all dangers and to assure the continuity of the bank loaning funds and following assurance means are adopted:

- (1) The expected crop
- (2) Movable properties
- (3) Land or built-up property.

Necessary documents may be required to cover one, two, or all of the above according to the type of loan, its size, nature and purpose. The bank may be satisfied only with mortgage of the expected crop in case of short term loans, in case the dealer was tested before and proved to be honorable to facilitate not binding him with getting documents for mortgage of unmovable property, etc.

**Procedures Followed When
Issuing Loans**

Loans are granted to any farmer who applies provided that:

1. Applicant must be a farmer or working in agriculture and have a piece of land leased for a period longer than the loan term period.
2. They present necessary documents to guarantee loan coverage.
3. Results of project feasibility study and its analysis prove that the project shall increase his standard of living and enable him to refund the loan.

CHAPTER II

REVIEW OF LITERATURE

This study is concerned primarily with the impact of the Agricultural Extension Service on the farmers' attitude and behavior toward the recommendations of the maincrops in Wadi Zabid project. The study will analyze, in detail, the changes in the farmers' attitude and behavior that have taken place since the introduction of the innovation through the Agricultural Extension Department at Wadi Zabid project.

Studies of farmers seem to indicate that two related processes help bring new ideas or technology from their source of development to acceptance/rejection of farmers. These processes are called diffusion and adoption. The diffusion of innovations is a particular type of communication that refers to the spread of a new idea, innovations or new technologies from the originating sources to the ultimate users.

According to the various diffusion studies which were summarized by Rogers, there are four elements in the diffusion of new ideas or practices. These are:

(1) the innovation (2) which is communicated through certain channels (3) over time, (4) among the members of a social system.²

Rogers identifies the innovation as:

An idea, practice or object perceived as new by an individual. It matters little, so far as human is concerned, whether or not an idea is 'objectively' new as measured by the lapse of time since its first use or discovery.³

Models of Innovation-Decision Process

The adoption is a mental process from first hearing about the new idea to its final adoption. Many studies described the stages of adoption. To adopt, a farmer must 'climb a ladder' consisting of the following steps:⁴

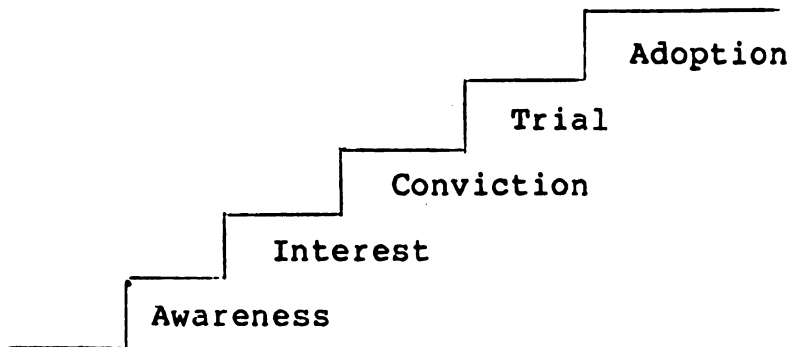


Figure 1. Adoption Stages

Some farmers may never get to the awareness stage, others never to the interest stage, etc. In a given community and for a given innovation, there may be farmers on each step of the ladder. In another community, all farmers may have passed the awareness stage, which few have actually adopted. In still another community, most farmers may have adopted. However, in all communities, a number of people may never reach the adopted stage for various reasons:

The innovation may not be applicable or attractive, others may have no land or money to adopt it, while some may never be properly instructed how to do it. Oh yes, there may also be a few who are so conservative that they resist change. However, these are far fewer than most extension

workers think. Extension workers tend to blame farmers for non-adoption, even when the extension worker has failed himself.⁵

This traditional view of the adoption process was postulated by a committee of rural sociologists in 1955.⁶

Rogers criticized this model and pointed out that this model is too simple because of its numerous deficiencies. Some of the deficiencies of the innovation-decision process are indicated by Rogers (1971:101):

1. It implies that the process always ends in adoption decisions, whereas in reality rejection may also be a likely outcome. Therefore, a term more general than 'adoption process' is needed that allows for either adoption or rejection.
2. The five stages do not always occur in the specified order, and some of them may be skipped, especially the trial stage. Evaluation actually occurs throughout the process, rather than just at one of the five stages.
3. The process seldom ends with adoption, as further information seeking may occur (Mason, 1964) to confirm or reinforce the decision, or the individual may later switch from adoption to rejection (a discontinuance).⁷

Rogers⁸ conceptualizes the model of the innovation-decision process as consisting of four functions or stages: (Figure 1)

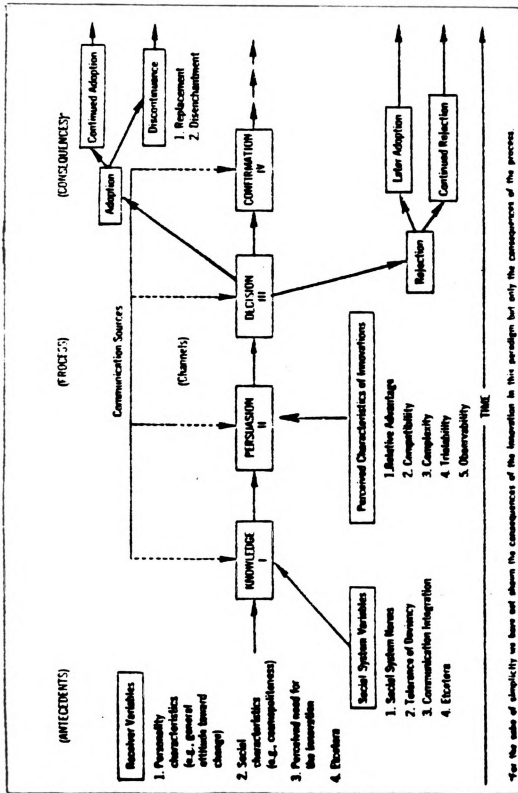
1. Knowledge. The individual is exposed to the innovation's existence and gains some understanding of how it functions.
2. Persuasion. The individual forms a favorable or unfavorable attitude toward the innovation.
3. Decision. The individual engages in activities which lead to a choice to adopt or reject the innovation.

4. **Confirmation.** The individual seeks reinforcement for the innovation-decision he has made, but he may reverse his previous decision of exposed to conflicting message about the innovation.⁹

Factors Affecting the Rate of Adoption

Some ideas diffuse from their first original source to widespread use in a few years. Others may require decades to become accepted. The relative speed which an innovation or idea is adopted depends partially on the characteristics of the innovation. Some of the factors affecting the rate of adoption are:

1. **Relative Advantage** is the degree to which an innovation is perceived as better than the idea it supersedes. The relative advantages of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.¹⁰
2. **Compatibility** is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. The compatibility of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.¹¹
3. **Complexity** is the degree to which an innovation is perceived as relatively difficult to understand and to use. The complexity of an innovation, as perceived by members of social system, is negatively related to its rate of adoption.¹²



Source: Rogers, E. M., Communication of Innovation (1971)

Figure 2. Paradigm of the innovation-decision process

4. **Triability** is the degree to which an innovation may be experimented with on a limited basis. The triability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.¹³
5. **Observability** is the degree to which the results of an innovation are visible to others. The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.¹⁴

In his research on the diffusion of innovation, Rooling¹⁵ described these factors which affect the occurrence and the speed of diffusion as:

1. **Characteristics of the Innovation:** are profitability, the extent to which the innovation can be applied on the farms in the area, the extent to which the innovation can be tried on a small scale, the ease with which its advantage can be demonstrated, etc. Very often innovations can only be applied on larger farms of wealthier farmers, or the innovation is not profitable.¹⁶
2. **Characteristics of the extension message:** Can it be understood? Is it easily distorted? Is it transmitted by the appropriate media to the appropriate people?¹⁷
3. **Characteristics of the communication between farmers:** Do farmers in the community talk easily with each other or are there barriers (political, geographical or otherwise)? Are there farmers who act as opinion leaders to others and who want to help others?¹⁸
4. **Characteristics of the social system:** Does the community have favorable experiences with change in the past? Does it have facilitating or oppressive leadership? How homogeneous are its members regarding the farming system, ecology, farm size, social status, wealth, etc. Are there farmers' organizations which assist progressive development?¹⁹

5. **Characteristics of supporting services:** Such as market prices, marketing channels, credit, in-put provision.²⁰

A field survey was conducted during August, 1977 in Nepal by Kailash N. Pyakuryal, to discover some of the factors affecting adoption of innovation. Chemical fertilizers, compost, improved seeds, green manuring, artificial insemination veterinary services, and insecticides were the innovations considered. The following hypotheses were tested: (1) Adoption was related to size of holding, (2) Adoption was related to age, education, castes, major religion, and family size, (3) There was a relationship between characteristics of innovation and adoption, and (4) There was a relationship between the frequency of Junior Technical Assistants (extension-agents' visit and action).²¹

Time

By definition, time center into diffusion of innovation is an element.²² Time dimension is involved in three ways:

1. in the innovation-decision process by which an individual passes from first knowledge of the innovation through its adoption or rejection,
2. in the innovativeness of the individual, that is, the relative earliness-lateness with which an individual adopts an innovation when compared with another member of his social system, and

3. in the innovation's rate of adoption is a social system, usually measured as the numbers for the system that adopt the innovation in a given time period.²³ Figure (3 and 4)

Diffusion researchers looked at the innovativeness of individuals and characteristics of adoptors based on the relative time of adoption. These researchers identified five categories of adoptors: 1) innovators, 2) early adoptors, 3) early majority, 4) late majority and 5) laggards. Figure (5).

The Progressive Farmer Strategy

Extension agents focus on a progressive group of people to induce change and pass it on to potential adoptors. This strategy has a number of advantages:²⁴

- Progressive farmers have larger farms so that the extension worker's effect on total production (export and food production) is maximized.
- Progressive farmers have more education and more economic means and are therefore quicker to understand and quicker to follow advice.
- One usually cannot bypass progressive farmers. They selected themselves as extension's target group.
- They are more homophilous with extension and easy to talk to.
- Progressive farmers provide a challenge to extension. In fact, extension often learns from them what to tell others.²⁵

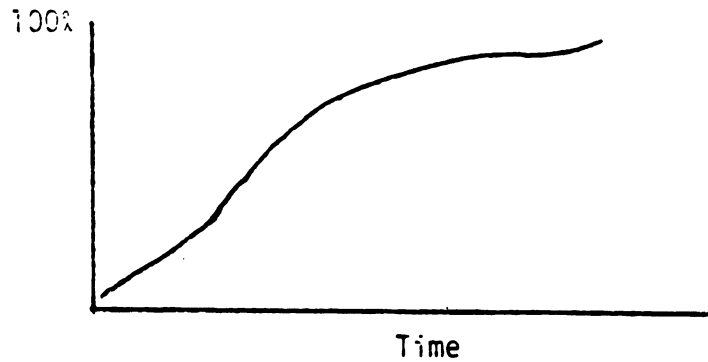


Figure 3. Accumulated Percentage of Adopters Over Time.
 Source: Roling, Research on the Diffusion of Innovations.

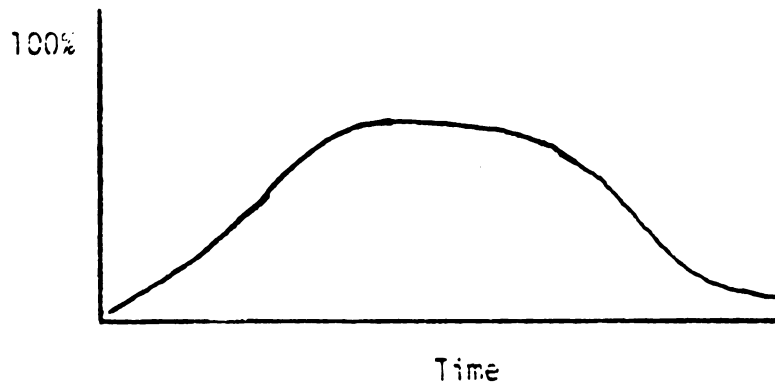


Figure 4. Percent of New Adopters at Given Time.
 Source: Roling, Research on the Diffusion of Innovations.

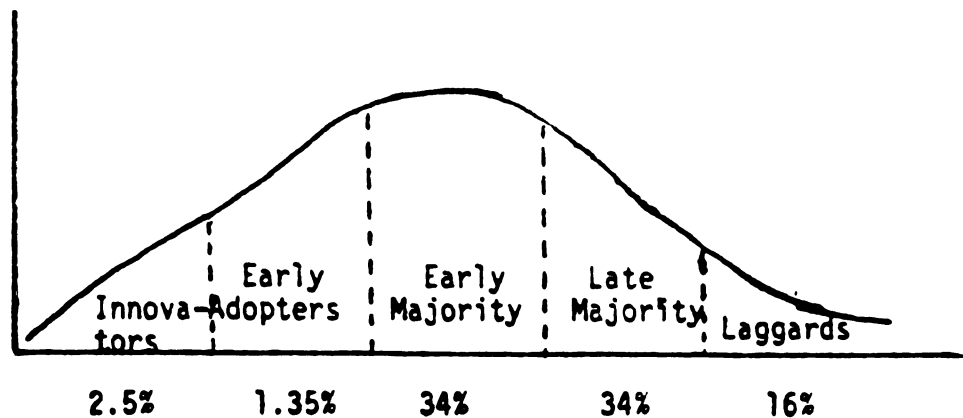


Figure 5. Categories of Adopters on the Basis of Innovativeness.

Source: Rogers, Diffusion of Innovations

There are also a number of disadvantages to the progressive strategy:²⁶

- By only having contact with progressive farmers, the extension builds up an idea of 'the' farmers which is not representative of the farmers in the area. This increases the likelihood that the innovations and extension messages which are promoted are not applicable to average or small farmers.
- By only giving first-hand information of large farmers, others are likely to get second hand distorted and incomplete information, increasing the likelihood that their land remains unproductive (migration to slums, etc.).
- Diffusion from large, progressive farmers to others is sometimes not automatic, especially if the farmers in the community are heterogeneous in terms of farming systems, farm size, social status, capital availability and so on. Thus, whole sections of the farmers may be bypassed, although small farmers usually utilize on-farm resources more efficiently than large ones.
- For various reasons, diffusion processes increase differences in wealth and power. By focussing government services, such as extension, credit and subsidies, on the earlier (wealthier) adoptors, one only accelerates these differences.
- Diffusion can 'work' in that information often spreads throughout the community. However, diffusion does not guarantee a 'trickle down' of benefits. In fact, 'trickle down' does not work.²⁷

Opinion Leadership

In every social system certain persons have the ability to influence or determine the decisions of others. The extension agent who can identify the community leaders, can enhance his chance for achieving his objective²⁸ and

improving the credibility of the innovation, thereby increasing its probability of adoption.²⁹

Rogers³⁰ defines opinion-leadership as the degree to which an individual is able to informally influence other individuals' attitudes or overt behavior in a desired way with relative frequency.

Leader Behavior

Leader behavior of county extension agents has been studied as it relates to the concepts of initiating structure and consideration. These concepts and the result of their application were summarized in Cummingham's article.³¹

Initiating structure refers to the leader's behavior in endeavoring to establish well-defined patterns of organization, channels of communication, and methods of procedure. Consideration refers to behavior indicative of friendship, mutual trust, respect, and warmth in the relationship between the leader and members of his staff.³²

Initiating structure refers to 'getting the job done'. Consideration reflects concern for individuals in the group and their feelings. The individual who exhibits behavior highly oriented toward initiating structure is one who sees or recognizes the job to be done and moves to accomplish it. This individual is task-oriented. He strives to fulfill the purposes of the organization, often at the expense of others concerned. Initiating structure reflects behavior which

1. emphasizes the quality of work,
2. clarifies every one's responsibilities,

3. is continually planning to get everything done,
4. offers new approaches to get things started,
5. is first in getting things started, and
6. encourages the meeting of deadlines.

The individual, exhibiting behavior highly oriented to consideration, tries to maintain close understanding between members of a group. This person is more concerned with group cohesiveness than with accomplishing specific purposes. Consideration is reflected by a person when he:

1. finds time to listen to others,
2. does little things to make it a pleasure to work with him,
3. shows interest in others as persons,
4. compliments others for their work,
5. has an open ear, or
6. has others share in making decisions.³³

CHAPTER III

DESIGN OF THE STUDY

Population and Sampling

The objective of the present study is to examine and explain variations in adoptive behavior of a set of farmers in Wadi Zabid. Therefore, a design facilitating selection of farmers with a wide range of variation in adoptive behavior was appropriate. This was accomplished by using 300 farmers chosen randomly from the extension record for the Fall season 1982/83. The randomly chosen sample represents the main ten towns and villages of the project area when the ten extension offices were conducted.

The information obtained from the selected samples referred to the past and current conditions of farmers, therefore the size of the sample may be seen in some tables as bigger than 300 farmers. Information in the individual farmers was obtained by interviewing them.

Organization of Field Work

The organization of data-gathering field work started in summer 1983. The research spent 30 days collecting the data.

Personal interviews were conducted for data collection, well trained Yemenese were selected from the staff of the Agricultural Extension Department to assist the researcher in collecting the data from the farmers. Some of the advantages of selecting the Yemenese assistants are credibility and homophony. Previous studies and researches conducted by the Agricultural Extension Department and utilized by Kuwait Fund for Arab Economic Development and other international agencies such as the World Bank, were based on information gathered by those whom the researcher sought their help. Three training meetings were held with those agents, explaining the objectives of this study and the questionnaire. Daily meetings, after gathering the information are already obtained from farmers, were held to discuss the problems which have been faced while interviewing the farmers.

Questionnaire Design

In view of the objectives of this study and research, the farm practices recommended by the Agricultural Extension Department at the project, the researcher decided to develop a questionnaire and sample a portion of farmers through personal interviews. The questions were designed to be answered with a simple check mark in a box. This is the easiest and quickest way for the respondents to answer, in order to encourage them to continue with the rest of the questionnaire. One open-ended question (#5) was designed to

find out about the most important person (local leader) whom the respondent felt the need to consult when seeking information. This question was necessary to examine to what extent the Agricultural Extension Department has recognized the local leaders and involved the spread of their influence on the farmers. The question provides a usable conceptual framework for examining the flow of communication.

Variables

Dependent Variables-Farmers Attitude and Behavior

Farmers attitudes and adoption is measured based on the frequency of the following agricultural innovations and recommendations.

1. Use of Maize, Tihama I and II
2. Use of Cotton, Coker 310
3. Use of chemical Fertilizers
4. Use of Pesticides
5. Use of Seed Dressing before Sowing
6. Use of Date of Sowing
7. Use of Mechanical Plowing
8. Use of Mechanical Levelling
9. Use of Mechanical Ridging
10. Sowing in Hills
11. Filling and Thinning
12. Date of Harvesting

Independent Variables

Extension communications and contact with farmers and land-ownership, size of land holding, farmers age and education.

Definitions

1. **Attitude:** the response of farmers whether they like or dislike the extension recommendations.
2. **Adoption:** using at least one recommendation. It is divided into three:
 - i) High adoption: 9 or above recommendations
 - ii) Medium adoption: 5-8 or above recommendations
 - iii) Low adoption: 1-4 or above recommendations
3. **Farmers Interaction:** having attended at least one of the extension activities:
 - i) High Interaction: 5-7 activities
 - ii) Medium Interaction: 3-4 activities
 - iii) Low Interaction: 1-2 activities
4. **Size of Land Holding:** Average size of holding is 14 Maa'd which is equal to 5.07 ha.
 - i) High above 14 Maa'd
 - ii) Low less than 14 Maa'd
5. **Agricultural Extension Communication:** is defined as having attended/reached at least one of the extension activities/methods:
 - i) High: 5-7 Extension activities
 - ii) Medium: 3-4 Extension activities
 - iii) Low: 1-2 Extension activities

6. **Education:** Farmers are divided into three categories depending upon their education:

- i) **Literate:** those who can read and write
- ii) **Semi-Literate:** those who can read only
- iii) **Illiterate:** those who cannot read or write

Data Analysis:

In examining the farmer's attitude and behavior towards different independent variables, a frequency analysis and chi-square analysis is used manually.

CHAPTER IV
FINDINGS AND DISCUSSION

Table 2

Adoption of recommendation of cotton and maize under different methods of irrigation system is represented in Table 2.

For cotton, out of 244 farmers, 160 (65%) are high adopters, 75 (31%) are medium adopters and 9 (4%) are low adopters.

For maize, out of 173 farmers, 84 (49%) are high adopters 66 (38%) are medium adopters, 23 (13%) are low adopters. The total number of farmers is 300; but here the total comes to 417 because some are cultivating both cotton and maize and some answer because of their experience.

Table 3

Farmers' attitude toward the recommendation of cotton crop is shown in Table 3.

1. New Seed varieties - Coker 310

Out of 244 farmers, 164 (67.2%) are in favor and 80 farmers (32.8%) are against Coker 310 and that is because they believe that the old variety ACALA is much better than COKER 310. The reasons, from their view are:

TABLE 2
ADOPTION OF RECOMMENDATION OF COTTON AND MAIZE CROPS

| ADOPTION | COTTON | | | TOTAL | | | MAIZE | | | TOTAL | | | |
|----------|--------|-----|-------------------------|-------|-----|-----|-------|-----|-----|-------------------------|-----|-----|---|
| | Spate | | Wells/ Supplementary | No. | % | No. | % | No. | % | Wells/ Supplementary | | No. | % |
| | No. | % | No. | | | | | | | % | No. | | |
| High | 23 | 64 | 137 | 160 | 65 | 26 | 40 | 58 | 54 | 84 | 49 | | |
| Medium | 10 | 28 | 65 | 75 | 31 | 28 | 43 | 38 | 35 | 66 | 38 | | |
| Low | 3 | 8 | 6 | 9 | 4 | 11 | 17 | 12 | 11 | 23 | 13 | | |
| TOTAL | 36 | 100 | 208 | 244 | 100 | 65 | 100 | 108 | 100 | 173 | 100 | | |

TABLE 3
FARMERS' ATTITUDE TOWARDS
THE RECOMMENDATIONS OF COTTON CROP.

| Recommendation of Cotton | Farmers Attitude | | | | Total |
|--------------------------------------|------------------|------|---------|------|-------|
| | In Favour | | Against | | |
| | No. | % | No. | % | |
| New Seed Varieties Cocker 310 | 164 | 67.2 | 80 | 32.8 | 244 |
| ----- | | | | | |
| Use of Fertilizers and Pesticides | | | | | |
| Chemical Fertilizers | 227 | 93 | 17 | 7 | 244 |
| Seed Dressing Before sowing | 209 | 85.7 | 35 | 14.3 | 244 |
| Chemical Pesticides | 234 | 96 | 10 | 4 | 244 |
| ----- | | | | | |
| Field Practices: | | | | | |
| Date of Sowing | 227 | 93 | 17 | 7 | 244 |
| Mechanical Plowing | 242 | 99.1 | 2 | 0.9 | 244 |
| Mechanical Leveling | 237 | 97.1 | 7 | 2.8 | 244 |
| Mechanical Ridging | 201 | 82.4 | 43 | 17.6 | 244 |
| Sowing in Hills | 157 | 64.3 | 87 | 35.7 | 244 |
| Filling & Thinning | 218 | 89.3 | 26 | 10.7 | 244 |
| Cultivation | 211 | 86.5 | 33 | 13.5 | 244 |
| Date of Harvesting | 220 | 90.2 | 24 | 9.8 | 244 |

- (a) ACALA needs only little water.
- (b) Chance to succeed is more with ACALA.
- (c) Harvesting is needed only once, so less labor is required and provides land use for other cultivation.
- (d) ACALA is more resistance to insects.
- (e) ACALA gives tall plants with more fruit so picking is easier.

2. Use of Fertilizers and Pesticides

Recommendations for the use of fertilizers and pesticides are sub-divided into three parts.

a) Use of chemical fertilizers:

The recommended amount of chemical fertilizers must be used at a suitable time and quantity for getting a good yield. Results obtained after examining the 244 answers of farmers are as follows:

Majority of farmers i.e. 227 (93%) are in favor and 17 (7%) are against using chemical fertilizers.

b) Seed Dressing before Sowing:

Two hundred and nine (85.7%) are in favor and 35 (14.3%) are against this recommendation.

c) Chemical Pesticides:

Two hundred and thirty four (96%) are in favor and 10 (4%) are against using chemical pesticides to prevent their plants from pests.

3. Field Practices

The following results were obtained from examining 244 questions about field practices.

a) Date of Sowing:

The date of sowing recommended for cotton crops is from the middle of July to the end of September except in areas under Wadi irrigation systems where the floods arrive at later times. 227 (93%) are in favor and 17 (7%) are against this date.

b) Mechanical Plowing:

Two hundred forty-two (99.1%) showed a positive attitude and 2 (2.8%) are against.

c) Mechanical levelling:

Two hundred thirty-seven (99.1%) showed a positive attitude and 7 (2.8%) are against.

d) Mechanical Ridging:

Two hundred one (82.4%) are in favor and 43 (17.6%) against.

e) Sowing in Hills:

One hundred fifty-seven (62.3%) are in favor and 87 (35.7%) are against sowing in hills, because it is very expensive, needs more labor and also use to the unavailability of workers.

f) Filling and Thinning:

Two hundred eighteen (89.3%) are in favor and 26 (10.7%) are against.

g) Cultivation:

Two hundred eleven (86.5%) are in favor and 33 (13.5%) are against.

h) Date of Harvesting:

Two hundred twenty (90.2%) are in favor and 24 (9.8%) are against.

The highest positive attitude of farmers are towards mechanical plowing and highest negative attitude of farmers are towards sowing in hills, the reasons have been previously discussed.

Table 4

Farmers attitude toward the recommendations of maize crop is described in Table 4. The recommendations for maize are discussed in Appendix C. Here, we talk about the farmers approach toward these recommendations. To study their approach, simple questions as described earlier are given to farmers who cultivated maize crops. Table 4 was drawn after examining their answers in which the red portion indicates the number of farmers who favor and who are against. Elaborating the table, one can realize the following farmer attitudes.

1. The New Seed Varieties:**a) Tihama 1:**

After going through the answers of 173 farmers, we realize that 171 farmers (98.8%) are in favor and 2 (1.2%) are against this new seed variety.

TABLE 4
FARMERS' ATTITUDE TOWARDS THE RECOMMENDATIONS OF MAIZE CROP

| RECOMMENDATIONS OF MAIZE | FARMER'S ATTITUDE | | | | TOTAL |
|--|-------------------|------|---------|------|-------|
| | INFAVOUR | | AGAINST | | |
| | NO. | % | NO. | % | |
| NEW SEED VARIETIES : | | | | | |
| TIHAMA 1 | 171 | 98.8 | 2 | 1.2 | 173 |
| TIHAMA 2 | XX | XX | 173 | 100 | 173 |
| USE OF FERTILIZERS AND PESTICIDES | | | | | |
| CHEMICAL FERTILIZERS | 168 | 97.1 | 5 | 2.9 | 173 |
| SEED DRESSING BEFORE SOWING | 129 | 74.6 | 44 | 25.4 | 173 |
| CHEMICAL PESTICIDES | 165 | 95.4 | 8 | 4.6 | 173 |
| FIELD PRACTICES : | | | | | |
| DATE OF SOWING | 150 | 86.7 | 23 | 13.2 | 173 |
| MECHANICAL PLOWING | 173 | 100 | XX | XX | 173 |
| MECHANICAL LEVELING | 166 | 96 | 7 | 4 | 173 |
| MECHANICAL RIDGING | 139 | 80.3 | 34 | 19.7 | 173 |
| SOWING IN HILLS | 107 | 62 | 66 | 38 | 173 |
| FILLING & THINNING | 150 | 87 | 23 | 13 | 173 |
| CULTIVATION | 150 | 87 | 23 | 13 | 173 |
| DATE OF HARVESTING | 147 | 85 | 26 | 15 | 173 |

b) Tihama 2:

Regarding this new seed variety, all the 173 farmers (100%) are against Tihama 2 because of its white color.

2. Use of fertilizers and pesticides:**a) Chemical fertilizers:**

One hundred sixty-eight farmers (97.1%) are in favor and 5 (2.9%) are against using chemical fertilizers.

b) Seed dressing before sowing:

Out of the 173 farmers, 129 (74.6%) are in favor and 44 (25.4%) are against seed dressing before sowing. This is because they think that if taken accidentally by children or animals that would poison them.

c) Chemical pesticides:

Out of 173 farmers, 165 (95.4%) show a positive attitude toward using chemical pesticides and 8 (4.6%) are against.

3. Field practices:**a) Date of sowing:**

The recommended date of sowing is during September and October and may be extended up to December for the Maize crop. One hundred fifty (86.7%) are in favor and 23 (13.3%) are against because they prefer their own date.

b) Mechanical Plowing:

One hundred and seventy three farmers (100%) showed a positive attitude toward mechanical plowing.

c) Mechanical Levelling:

One hundred and sixty six (96%) showed a positive attitude and 7 (4%) showed a negative attitude toward this recommendation.

d) Mechanical Ridging:

One hundred and thirty nine (80.3%) showed a positive attitude and 34 (19.7%) showed a negative attitude toward mechanical ridging. This is because they irrigate their land by spate.

e) Sowing in Hills:

One hundred and seven (62%) showed a positive attitude and 66 (38%) showed a negative attitude toward sowing in hills. This is because sowing in hills is very expensive and needs more labor.

f) Filling and Thinning:

One hundred and fifty (87%) are in favor and 23 (13%) are against this recommendation.

g) Cultivation:

One hundred and fifty (87%) are in favor and 23 (13%) are against this recommendation, because this needs more labor.

h) Date of harvesting:

The recommended date of harvesting is 100 to 110 days from date of sowing. One hundred forty-seven

farmers (85%) are in favor and 26 (15%) are against this date.

The highest positive attitude are towards mechanical plowing and the highest negative attitude is towards the new seen variety Tihama 2.

Table 5

The adoption of improved practices of cotton crop is described in Table 5.

1. New Seed varieties Coker 310:

All of the 244 farmers (100%) adopted this new seed variety which is Coker 310. This is because the farmers received all their cotton seed from the National Company of Cotton which distributes only this kind.

2. Use of Chemical Fertilizers & Pesticides:

a) Chemical Fertilizers:

Out of 244, 146 (59.8%) farmers are using chemical fertilizers. The rest, 98 (40.2%) farmers, have not adopted. Thses 98 farmers say that chemical fertilizers are:

- 1) Very costly
- 2) not available
- 3) some think that land does not need it since it is already fertile.

TABLE 5
ADOPTION OF IMPROVED
PRACTICES OF COTTON CROP.

| RECOMMENDATION OF COTTON | ADOPTION | | | | TOTAL |
|--------------------------------------|----------|------|--------------|------|-------|
| | ADOPTERS | | NON-ADOPTERS | | |
| | NO. | % | NO. | % | |
| NEW SEED VARIETIES COCKER 310 | 244 | 100 | XX | XX | 244 |
| USE OF FERTILIZERS & PESTICIDES : | | | | | |
| CHEMICAL FERTILIZERS | 146 | 59.8 | 98 | 40.2 | 244 |
| SEED DRESSING BEFORE SOWING | 244 | 100 | XX | XX | 244 |
| CHEMICAL PESTICIDES | 158 | 64.7 | 86 | 35.2 | 244 |
| FIELD PRACTICES : | | | | | |
| DATE OF SOWING | 180 | 73.8 | 64 | 26.2 | 244 |
| MECHANICAL PLOWING | 240 | 98.4 | 4 | 1.6 | 244 |
| MECHANICAL LEVELLING | 210 | 86 | 34 | 14 | 244 |
| MECHANICAL RIDGING | 14 | 5.7 | 230 | 94.3 | 244 |
| SOWING IN HILLS | 42 | 17.2 | 202 | 82.8 | 244 |
| FILLING & THINNING | 183 | 75 | 61 | 25 | 244 |
| CULTIVATION | 147 | 60.2 | 97 | 39.8 | 244 |
| DATE OF HARVESTING | 185 | 75.8 | 59 | 24.2 | 244 |

b) Seed dressing before sowing:

Two hundred forty-four (100%) farmers practice seed dressing before sowing. This is because all seeds distributed by the National company are already dressed.

c) Chemical Pesticides:

Chemical Pesticides are used to protect the plant from Microtearm species. Protection of plant from other species is done by National Cotton Protection Campaign which is organized by the Ministry of Agriculture under the supervision of the Department of Plant Protection in T.D.A. One hundred fifty-eight (64.7%) farmers adopted and 86 (35.2%) are not adopting. This is because:

- 1) extreme cost
- 2) lack of technical know-how
- 3) unavailability

3. Field Practices:**a) Date of Sowing:**

One hundred eighty (73.8%) are adopters and 64 (26.2%) are non-adopters. This is because they think that the recommended date is not suitable.

b) Mechanical Plowing:

Two hundred forty (98.4%) are adopting mechanical plowing and 4 (1.6%) are not adopting.

c) Mechanical Levelling:

Two hundred ten (86%) are adopting and 34 (14%) are not adopting this recommendation.

d) Mechanical Ridging:

Fourteen (5.7%) are adopting and 230 (94.3%) are not adopting because they say that a ridger is not readily available. What is available is too expensive and some say that the land does not need ridging since they irrigate their land by spate.

e) Sowing in Hills:

Forty-two (17.2%) farmers are adopting this recommendation, and 230 (94.3%) are not adopters because of cost and need for additional labor.

f) Filling and Thinning:

One hundred eighty-three (75%) farmers adopt and 61 (25%) farmers are not adopting this recommendation. Actual observations show that in one hill 8 to 15 cotton seed are cultivated, which is too thick. Without thinning, the plants will have more leaves than flowers.

g) Cultivation:

One hundred forty-seven (60.2%) are adopting and 97 (39.8%) are not adopting this recommendation.

h) Date of Harvesting:

One hundred eighty-five (75.8%) are adopting and 59 (24.2%) are not adopting this recommended date because they think it is not a suitable date. Also

most of the farmers prefer to leave the whole plants to ripen so that they can pick the cotton at one time which saves money and labor.

The highest positive adoption is for seed dressing before sowing and the new seed varieties COKER 310. The highest negative adoption is towards the mechanical ridging (table 5).

Table 6

Adoption of improved practices of maize crops is represented in Table 6. The following determines the adopters and non-adopters for each recommendations:

I. New Seed Variety.

a) TIHAMA I

One hundred sixty-one (93%) adopts and 12 (7%) are not adopting this.

b) TIHAMA II

All of the 173 farmers are against using TIHAMA II because of its white color.

II. Use of Chemical Fertilizers and Pesticides

a) Chemical fertilizers: One hundred ten (63.6%) adopts and 63 (36.4%) are not adopting this because:

1. It is not available
2. They do not know how to use it
3. Cost
4. Some are saying that land does not need fertilizer since it is fertile.

TABEL 6
ADOPTION OF IMPROVED
PRACTICES OF MAIZE CROP.

| RECOMMENDATIONS OF MAIZE | ADOPTION | | | | TOTAL |
|--|----------|------|--------------|------|-------|
| | ADOPTERS | | NON-ADOPTORS | | |
| | NO. | % | NO. | % | |
| NEW SEED VARIETIES: | | | | | |
| TIHAMA 1 | 161 | 93 | 12 | 7 | 173 |
| TIHAMA 2 | XX | XX | 173 | 100 | 173 |
| USE OF FERTILIZERS & PESTICIDES : | | | | | |
| CHEMICAL FERTILIZERS | 110 | 63.6 | 63 | 36.4 | 173 |
| SEED DRESSING BEFORE SOWING | 82 | 47.4 | 91 | 52.6 | 173 |
| CHEMICAL PESTICIDES | 107 | 61.8 | 66 | 38.2 | 173 |
| FILE PRACTICES: | | | | | |
| DATE OF SOWING | 130 | 75.1 | 43 | 24.9 | 173 |
| MECHANICAL PLOWING. | 170 | 98.3 | 3 | 1.7 | 173 |
| MECHANICAL LEVELLING | 139 | 80.3 | 34 | 19.7 | 173 |
| MECHANICAL RIDGING | 13 | 7.5 | 160 | 92.5 | 173 |
| SOWING IN HILLS | 29 | 16.8 | 144 | 83.2 | 173 |
| FILLING & THINNING | 131 | 75.7 | 42 | 24.3 | 173 |
| CULTIVATION | 120 | 69.4 | 53 | 30.6 | 173 |
| DATE OF HARVESTING | 142 | 82 | 31 | 18 | 173 |

b) Seed Dressing before Sowing:

Eighty-two (47.4%) are adopting and 91 (52.6%) are not adopting because of the lack of technical knowledge of mixing the seed with fertilizer.

c) Chemical Pesticides:

Out of 173 farmers, 107 (61.8%) are using and 66 (38.2%) are not using this because:

1. It is not easily available
2. Cost
3. They do not know how to apply pesticides among their crops

III. Field Practices**a) Date of Sowing**

One hundred thirty (75.1%) are adopting and 43 (24.9%) are not adopting this recommended date.

b) Mechanical Plowing

One hundred seventy (98.3%) are adopting and 3 (1.7%) are not adopting this recommendation.

c) Mechanical Levelling

One hundred thirty-nine (80.3%) are adopting 34 (19.7%) are not adopting this recommendation.

d) Mechanical Ridging

Thirteen (7.5%) are adopting and 160 (92.5%) are not adopting this.

e) Sowing in Hills

Twenty-nine (16.8%) are adopting and 144 (83.2%) are against this recommendation.

f) Filling and Thinning

One hundred thirty-one (75.5%) adopts and 42 (24.3%) does not adopt this recommendation.

g) Cultivation

One hundred twenty (69.9%) are adopters and 53 (30.6%) are non-adopters because it needs more labor.

h) Date of Harvesting

One hundred forty-two (82%) are in favor of this and 31 (18%) are against the recommended date of harvest.

In summary, the majority of farmers adopted TIHAMA I and mechanical plowing. All of the were against using TIHAMA II.

Table 7

Farmers interaction due to extensive activities is represented in Table 7. Several methods are used to reach the farmers to convey all the recommendation. The following are the methods and the farmers replies:

1. Extension Office Visit

When farmers need clarification, or when they need assistance and when they need chemical fertilizers or pesticides, they visit extension offices seeking advice and help. Two hundred forty-two (81%) out of 300 farmers received benefit by this method.

TABLE 7
FARMERS' INTERACTION

| EXTENSION ACTIVITIES | FARMERS' REPLIES | | |
|-----------------------------|------------------|----|---|
| | NO. | % | * |
| Extension Headquarter Visit | 242 | 81 | |
| Extension Meeting | 239 | 80 | |
| Extension Exhibition | 96 | 32 | |
| Extension Campaign | 139 | 46 | |
| Demonstration Field Visit | 229 | 76 | |
| Home/Farm Visit | 287 | 96 | |
| Circular Letter/pamphlet | 72 | 24 | |

* Each farmer may have been reached by one or more of the extension activities listed. Therefore, the percentage has been calculated by dividing the number of farmers who participated by the potential number (300)

2. Extension Meeting

Meetings are conducted in the morning and at night. The morning meeting is an organized meeting where the farmers are invited to see the application of agricultural processes. Night meetings are those usually held in large towns and villages to discuss agricultural problems, to acquaint farmers with new recommendations and to illustrate the accomplishments realized by the extension service unit. About 239 (80%) out of 300 farmers were benefited by this method.

3. Extension Exhibition

This is a teaching method to inform farmers with high levels of production and the ways which will help them to realize such levels. About 96 (32%) farmers were benefited by this method.

4. Extension Campaign

Extension agents contact farmers on a wide scale utilizing loud speakers in villages, markets or cinemas for announcing about the various meetings or informing them about important information and National celebrations. One hundred thirty-nine (46%) farmers got benefit by this method.

5. Demonstration Field Visit

Farmers are invited to the fields at harvesting time to demonstrate the recommendations applied on demonstration units and to varify the economic results of applying such recommendations. Two hundred twenty-nine (76%) farmers were benefited by this method.

6. Home and Farm Visit

This includes visiting farmers both at fields and homes where the farmers are interviewed by experts, engineers and trainees. The purpose of these visits are to get acquainted with farmers, and to study their problems which are hindering the development of agricultural production. Two hundred eighty-seven (96%) farmers were benefited by this method.

7. Circular Letter/Pamphlet

In spite of the high rate of illiteracy in the project area, the written word still could be considered a very effective teaching method because farmers can use it as a reference. The Extension Department issues monthly wall bulletins including the most important information

and recommendations through the month of issuing. The department also issues pamphlets including all the recommendations for developing cotton and maize products. Specialized pamphlets are issued and distributed among agents and concerned farmers in the project area. Seventy-two (24%) farmers regard useful information through this method.

It is clear that the most frequent teaching method utilized in reaching farmers is home and farm visits (Table 7). This is because the agents can visit farmers in their homes and farms by motorbikes which are provided by the T.D.A.

Table 8

The farmer's attitude towards adoption of recommended practices and interaction with the agricultural extension programs are presented in Table 8. Here, farmer attitude, as defined earlier, is divided into four parts: (1) strongly agree (2) agree (3) disagree and (4) strongly disagree and farmers interaction as defined earlier is divided into (1) high (2) medium and (3) low. By referring to Table 8, one can obtain the number of farmers who strongly agree, agree, disagree and strongly disagree under high, medium, and low interaction.

In examining the farmer's attitude toward adoption of recommended practices and their interaction with

TABLE NO. 8
 FARMERS ATTITUDE TOWARDS ADOPTION OF RECOMMENDED PRACTICES
 AND THEIR INTERACTION WITH THE AGRICULTURE EXTENSION PROGRAM.

| AG. EXTENSION COMMUNICATION | FARMERS ATTITUDE | | | | | | | | | |
|--------------------------------|------------------|-----|-------|-----|----------|-----|----------------|---|-------|---|
| | STRONGLY AGREE | | AGREE | | DISAGREE | | STRONGLY AGREE | | TOTAL | |
| | NO. | % | NO. | % | NO. | % | NO. | % | NO. | % |
| HIGH | 106 | 56 | 46 | 50 | 2 | 11 | X | X | 154 | |
| MEDIUM | 62 | 33 | 28 | 30 | 5 | 26 | X | X | 95 | |
| LOW | 20 | 11 | 19 | 20 | 12 | 63 | X | X | 51 | |
| TOTAL | 188 | 100 | 93 | 100 | 19 | 100 | X | X | 300 | |

TABLE 8-1
RESULT OF CHI-SQUARE TEST OF FARMERS ATTITUDE
AND EXTENSION COMMUNICATION

| AG. EXTENSION COMMUNICATION | FARMER ATTITUDE | | | |
|--------------------------------|-------------------------|----------------|-------------------|-------------------------|
| | STRONGLY AGREE (NO.) | AGREE (NO.) | DISAGREE (NO.) | STRONGLY AGREE (NO.) |
| HIGH | | | | |
| Obs. | 106.00 | 46.00 | 2.00 | X |
| Expect. | 96.51 | 47.74 | 9.75 | X |
| MEDIUM | | | | |
| Obs. | 62.00 | 28.00 | 5.00 | X |
| Expect. | 59.53 | 29.45 | 6.02 | X |
| LOW | | | | |
| Obs. | 20.00 | 19.00 | 12.00 | X |
| Expect. | 31.96 | 15.81 | 3.23 | X |

agricultural extension programs, the result of using the Chi-Square analysis shows:

1. Null hypothesis is that there is no association between farmers attitude and agricultural extension communication.
2. Since the calculated value of χ^2 with 4 d.f. is much greater than the theoretical value of χ^2 (9.49) at 5% level of significance, we may reject the null hypothesis on the basis of available information.

Table 9

The farmers adoption of agricultural recommendations and assistance from extension service is shown in Table 9. Adoption is divided into high, medium and low categories as is agricultural extension communication. Thus, by referring to Table 9, the number of farmers who adopt agricultural recommendations and seek assistance from extension service can be obtained.

The co-relation between farmers adoption of agricultural recommendation and assistance received from the extension service was examined using Chi-square analysis.

1. The null hypothesis is that there is no association between adoption and agricultural extension communication.
2. The calculated value of χ^2 with 4 d.f. (43.309) is much greater than the theoretical value (9.49) at 5% level of significance and we may reject the null hypothesis.

TABLE 9
ADOPTION OF EXTENSION RECOMMENDATIONS
AND ASSISTANCE RECEIVED FROM EXTENSION DEPARTMENT.

| AG. EXTENSION COMMUNICATION | ADOPTION | | | | | | |
|--------------------------------|----------|-----|--------|-----|-----|-----|-------|
| | HIGH | | MEDIUM | | LOW | | TOTAL |
| | NO. | % | NO. | % | NO. | % | |
| HIGH | 109 | 62 | 42 | 41 | 3 | 13 | 154 |
| MEDIUM | 54 | 31 | 33 | 33 | 8 | 35 | 95 |
| LOW | 13 | 7 | 26 | 26 | 12 | 52 | 51 |
| TOTAL | 176 | 100 | 101 | 100 | 23 | 100 | 300 |

TABLE 9-1
RESULT OF CHI-SQUARE TEST OF ADOPTION
AND EXTENSION COMMUNICATION

| AG. EXTENSION COMMUNICATION | ADOPTION | | |
|--------------------------------|---------------|-----------------|--------------|
| | HIGH (No.) | MEDIUM (No.) | LOW (No.) |
| HIGH | | | |
| Obs. | 109.00 | 42.00 | 3.00 |
| Expec. | 90.35 | 51.85 | 11.81 |
| MEDIUM | | | |
| Obs. | 54.00 | 33.00 | 8.00 |
| Expec. | 55.73 | 31.98 | 7.28 |
| LOW | | | |
| Obs. | 13.00 | 26.00 | 12.00 |
| Expec. | 29.92 | 17.17 | 3.91 |

Table 10

The reasons for non-adoption and the number of non-adopters coming under each reason and factors affecting the rate of adoption are given in Table 10.

1. New Seed Variety:**a) Tihama 1:**

Twelve (100%) farmers are not using Tihama 1 because they have their own seeds to cultivate.

b) Tihama 2:

One hundred seventy-three (100%) farmers are against this variety because they say that it is not profitable and because of its white color which they cannot tolerate.

2. Use of Chemical Fertilizers and Chemical Pesticides:**a) Chemical Fertilizers:**

One hundred sixty-one farmers are not using chemical fertilizers.

- (1) Forty-three (27%) farmers are against because of its unavailability.
- (2) Thirteen (8%) farmers are not adopting due to lack of technical know-how.
- (3) Seventy-one (44%) farmers are not adopting because it is very costly.
- (4) Two (1%) farmers say that it is not profitable.
- (5) Twenty-three (14%) farmers say that their land does not need fertilizers since it is already fertile.

TABLE NO. 10
PRECEIVED REASONS FOR NON-ADOPTION

| EXTENSION RECOMMENDATIONS | PRECEIVED REASONS | | | | | | | | | | TOTAL | | |
|---|-------------------|--------------------|---------------------------|------|---------------------|--------------|------------------------------|-------|-----|-----|-------|-----|-----|
| | LACK OF AWARENESS | UN-AVAIL- LABLE | LACK OF TECHNICAL KNOWHOW | COST | NOT PROFITA- BLE | NOT SUITABLE | FERTILITY CONDITIONS OF LAND | OTHER | | | | | |
| No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | | |
| New Seed Varieties: | | | | | | | | | | | | | |
| Tihama 1 | | | | | | | | | | 12 | 109 | 12 | |
| Tihama 2 | | | | | 173 | 100 | | | | | | 173 | |
| Use of Fertilizers & Pesti- cides: | | | | | | | | | | | | | |
| Chemical Fertilizers | 43 | 27 | 13 | 8 | 71 | 44 | 2 | 1 | 23 | 14 | 9 | 7 | 161 |
| Seed Dressing before sowing | | | 60 | 66 | | | | | | | 31 | 34 | 91 |
| Chemical Pesticides | 34 | 31 | 15 | 14 | 39 | 35 | 2 | 2 | | | 21 | 19 | 111 |
| Field Practices: | | | | | | | | | | | | | |
| Date of Sowing | | | | | | | 10 | 13 | 67 | 84 | 3 | 3 | 80 |
| Mechanical Plowing | | | | | 2 | 67 | | | | | 1 | 33 | 3 |
| Mechanical Levelling | 39 | 65 | | | 16 | 27 | | | 4 | 6 | 1 | 1 | 60 |
| Mechanical Ridging | 234 | 84 | | | 2 | 6 | | | 40 | 14 | | | 280 |
| Sowing in Hills | 2 | 1 | | | 210 | 96 | 5 | 2 | 1 | 1 | | | 218 |
| Filling and Thinning | | | | | 69 | 96 | 1 | 1 | | | 2 | 3 | 72 |
| Cultivation | | | | | 111 | 97 | 2 | 2 | | | 1 | 1 | 114 |
| Date of Harvesting | | | | | 41 | 55 | 4 | 5 | 30 | 40 | | | 75 |

(6) Lastly, 9 (7%) farmers are not adopting due to minor reasons.

Hence, a total of 161 farmers are not using chemical fertilizers.

b) Seed Dressing Before Sowing:

Due to lack of technical know-how, 60 (66%) farmers are not adopting, and 31 (34%) farmers are against due to other minor reasons; such as they are afraid, if taken by children and animals accidentally, it may poison them. Hence, totally 91 farmers are not using this recommendation.

c) Chemical Pesticides:

Thirty-four (31%) farmers are not using chemical pesticides because of its unavailability, 15 (14%) because of lack of technical know-how, 39 (35%) because of its cost, 2 (2%) say that use of pesticides is not profitable and 21 (19%) farmers are against this recommendation due to some other minor reasons. Thus, 111 farmers are not using chemical pesticides.

Field Practices

a) Date of Sowing:

Ten (13%) farmers say sowing on the recommended date is not profitable and 67 (84%) say that the recommended date is not suitable, and they prefer their own date, 3 (3%) are not adoption this

recommended date for other minor reasons. Totally, 80 farmers are not adopting this recommended date.

b) Mechanical Plowing:

Two (67%) farmers are not adopting mechanical plowing because the machines are very costly, and 1 (33%) is not adopting this due to another minor reason. Totally, 3 farmers are not adopting mechanical plowing.

c) Mechanical Leveling:

Thirty-nine (65%) are not adopting this recommendation because of its unavailability, 16 (27%) say that it is very costly, 4 (6%) say that land does not need levelling since they irrigate their land by spate, 1 (1%) is not adopting this recommendation because of some other minor reasons. Thus, 60 farmers are not adopting this recommendation.

d) Mechanical Ridging:

Two hundred thirty-four (84%) farmers are not adopting because the ridger is not easily available, 2 (6%) are not adopting this due to its cost, 40 (14%) say that land does not need ridging since they irrigate their land by spate. Thus, 280 farmers are not adopting mechanical ridging.

e) Sowing in Hills:

Two (1%) say that the machines for sowing are not available, 210 (96%) farmers say that sowing in hills are very costly, 5 (2%) say it is not

profitable, 1 (1%) says that it is not necessary. Totally, 72 farmers are not adopting sowing in hills.

f) Filling and Thinning:

Sixty-nine (96%) farmers are not adopting this because they say that it is very costly, 1 (1%) says that it is not profitable, and 2 (3%) are not adopting this due to some other minor reasons. Totally, 72 farmers are not adopting filling and thinning.

g) Cultivation:

One hundred eleven (97%) farmers are not adopting cultivation because it is very expensive. Two (2%) say that it is not profitable and 1 (1%) is not adopting this due to some other minor reasons. Totally, 114 farmers are not adopting cultivation.

h) Date of Harvesting:

Forty-one (55%) say that it is very expensive to harvest more than once, 4 (5%) say that it is not profitable to adopt this date of harvesting, 30 (40%) farmers are not adopting this recommended date because they think it is not a suitable date. Totally, 75 farmers are not adopting this recommended date. So, by observing Table 10, one can realize the number of farmers who are not adopting under each reason.

Table 11

The adoption and land ownership data is given in Table 11. Here, as before, adoption is divided into three areas: high, medium, and low. Land ownership is divided into two--owners and share croppers. Chi-square analysis shows:

1. The null hypothesis is that there is no association between adoption and land ownership.
2. The calculated values of χ^2 with 4 d.f. is greater than the theoretical value χ^2 (9.49) and therefore we have evidence against the null hypothesis and so we may reject it.

TABLE 11
ADOPTION AND LAND OWNERSHIP

| LAND TENURE | ADOPTION | | | | | | TOTAL |
|--|----------|-----|--------|-----|-----|-----|-------|
| | HIGH | | MEDIUM | | LOW | | |
| | No. | % | No. | % | No. | % | |
| Owners | 35 | 20 | 26 | 26 | 2 | 9 | 63 |
| Share Croppers | 29 | 16 | 24 | 24 | 10 | 43 | 63 |
| Combination Owner/Renter Share cropper | 112 | 64 | 51 | 50 | 11 | 40 | 174 |
| Total | 176 | 100 | 101 | 100 | 23 | 100 | 300 |

TABLE 11-1

**RESULT OF CHI-SQUARE TEST OF
ADOPTION AND LAND OWNERSHIP**

| LAND TENURE | ADOPTION | | |
|--|---------------|-----------------|--------------|
| | HIGH (No.) | MEDIUM (No.) | LOW (No.) |
| OWNERS | | | |
| Obs. | 35.00 | 26.00 | 2.00 |
| Expec. | 39.96 | 21.21 | 4.83 |
| SHARE CROPPERS | | | |
| Obs. | 29.00 | 24.00 | 10.00 |
| Expec. | 36.96 | 21.21 | 4.83 |
| COMBINATION OWNER/ RENTER SHARE CROPPER | | | |
| Obs. | 112.00 | 51.00 | 11.00 |
| Expec. | 102.08 | 58.58 | 13.34 |

Summarizing Table 11, the owners are more keen in adopting the recommendations than share croppers and this is because of the existing relationship between them.

The existing relationship is as follows:

Spate area ----- 2/3rd of product to land owner
1/3rd to share cropper

Well area ----- 1/4th to land owner
1/2 to well owner
1/4th to share cropper.

Thus, with these ratios being unchanged, all parties have shared the increased production due to the project, with higher benefits going to the land owner than to share

cropper, although share cropper is responsible for the input cost.

Table 12

Represents adoption and size of land holdings. Adoption as mentioned earlier is divided into high, medium, and low categories. Size of land holding is divided into large and small categories to make the wide difference.

Under large size holdings, 29 (83%) farmers are high adopters, 14 (54%) are medium adopters and 1 (50%) are low adopters. Thus, 44 out of 63 farmers are adopters.

Under small size holdings, 6 (17%) farmers are high adopters, 12 (46%) are medium adopters and 1 (50%) are low adopters. Thus, a total of 19 farmers are adopters.

TABLE 12
ADOPTION AND SIZE OF LAND HOLDING

| Size of Holding | ADOPTION | | | | | | TOTAL |
|-----------------|----------|-----|--------|-----|------|-----|-------|
| | HIGH | | MEDIUM | | LOW | | |
| | No. | % | No. | % | No. | % | |
| Large | 29 | 83 | 14 | 54 | 1 | 50 | 44 |
| Medium | x | x | x | x | x | x | x |
| Small | 6 | 17 | 12 | 46 | 1 | 50 | 19 |
| Total | 35 | 100 | 26.00 | 100 | 2.00 | 100 | 63 |

TABLE 12-1

**RESULT OF CHI-SQUARE TEST OF ADOPTION
AND SIZE OF LANDHOLDING**

| SIZE OF HOLDING | ADOPTION | | |
|--------------------|---------------|-----------------|--------------|
| | HIGH (No.) | MEDIUM (No.) | LOW (No.) |
| LARGE | | | |
| Obs. | 29.00 | 14.00 | 1.00 |
| Expec. | 24.44 | 18.16 | 1.40 |
| MEDIUM | | | |
| Obs. | X | X | X |
| Expec. | X | X | X |
| LOW | | | |
| Obs. | 6.00 | 12.00 | 1.00 |
| Expec. | 10.56 | 7.84 | .60 |

Chi-square analysis shows:

1. The null hypothesis is that there is no association between adoption and size of land holding.
2. the calculated value of χ^2 with 4 d.f. is slightly greater than the theoretical value of χ^2 at 5% level of significance. Although the evidence is not strong, we may reject the null hypothesis.

Table 13

The number of adopters under different age categories is shown in Table 13.

1. Under the age of 35 years or less:

Forty-two (24%) farmers are high adopters, 16 (16%) are medium adopters and 2 (9%) are low adopters.

TABLE 13
ADOPTION AND FARMERS' AGE

| AGE | ADOPTION | | | | | | TOTAL |
|-------------|----------|----|--------|----|-----|----|-------|
| | HIGH | | MEDIUM | | LOW | | |
| | NO. | % | NO. | % | NO. | % | |
| 35 or less | 42 | 24 | 16 | 16 | 2 | 9 | 60 |
| 36 - 45 | 55 | 31 | 23 | 23 | 3 | 13 | 81 |
| 46 - 55 | 39 | 22 | 33 | 32 | 5 | 22 | 77 |
| 56 or above | 40 | 23 | 9 | 29 | 13 | 56 | 82 |

TABLE 13-1
RESULT OF CHI-SQUARE TEST OF
ADOPTION AND FARMER'S AGE

| AGE | ADOPTION | | |
|-------------|----------|-------|-------|
| | (No.) | (No.) | (No.) |
| 35 OR LESS | | | |
| Obs. | 42.00 | 16.00 | 2.00 |
| Expec. | 35.20 | 20.20 | 4.60 |
| 36-45 | | | |
| Obs. | 55.00 | 23.00 | 3.00 |
| Expec. | 47.52 | 27.27 | 6.21 |
| 46-55 | | | |
| Obs. | 39.00 | 33.00 | 5.00 |
| Expec. | 45.17 | 25.92 | 5.90 |
| 56 OR ABOVE | | | |
| Obs. | 40.00 | 9.00 | 13.00 |
| Expec. | 48.11 | 27.61 | 6.29 |

2. Between the ages of 36 to 45 years:

Fifty-five (31%) are high adopters, 23 (23%) are medium adopters and 3 (13%) are low adopters. Thus, a total of 81 farmers in the age group 36 to 45 adopt the recommendations.

3. Between the ages of 46 to 55 years:

Thirty-nine (22%) farmers are high adopters, 33 (32%) are medium adopters and 5 (22%) are low adopters. Thus, a total of 77 farmers in the age group 45 to 55 are adopting the recommendations.

4. In the age group of 56 and above:

Forty (23%) farmers are high adopters, 29 (29%) are medium adopters and 13 (56%) are low adopters. Thus, a total of 82 farmers in the age group 56 and above are adopting the recommendations. Thus, the maximum number of farmers who adopt recommendations are in the age group of 56 and above which is 82 farmers.

Using Chi-square,

1. The null hypothesis is that there is no association between farmers age and adoption.
2. The calculated values of χ^2 with 6 d.f. is greater than the theoretical value of χ^2 at 5% level of significance (12.59) therefore we may reject the null hypothesis.

Table 14

Adoption and farmer's education is shown in Table 14.

Adoption is divided into three categories. Education of farmers are also divided into literate, semi-literate, and illiterate.

1. Literate:

Seventy-three (41%) farmers are high adopters, 36 (36%) are medium adopters and 4 (17%) are low adopters. Thus, out of 300 adopters, 133 are literate and adopt the recommendations.

2. Semi-literate:

Twenty-one (12%) farmers are high adopters, 17 (17%) are medium adopters and 2 (9%) are low adopters. Thus, out of 300 adopters, 40 farmers are semi-literate and adopt the recommendations.

3. Illiterate:

Eighty-two (47%) farmers are high adopters, 48 (47%) are medium adopters and 17 (74%) are low adopters. Out of 300 adopters, 147 farmers are illiterate and adopt the recommendations. Most low adopters (74) are illiterate (Table 14).

Using Chi-square,

1. The null hypothesis is that there is no association between farmers education and adoption.
2. The calculated value of χ^2 with 4 d.f. is smaller than the theoretical value of χ^2 (9.49) at a 5% level of significance, therefore on the basis of available

TABLE 14
ADOPTION AND FARMER'S EDUCATION

| Education | ADOPTION | | | | | | TOTAL |
|---------------|----------|----|--------|----|-----|----|-------|
| | HIGH | | MEDIUM | | LOW | | |
| | No. | % | No. | % | No. | % | |
| Literature | 73 | 41 | 36 | 36 | 4 | 17 | 133 |
| Semi-literate | 21 | 12 | 17 | 17 | 2 | 9 | 40 |
| Illiterate | 82 | 47 | 48 | 47 | 17 | 74 | 147 |

TABLE 14-1
RESULT OF CHI-SQUARE TEST OF ADOPTION
AND FARMER'S EDUCATION

| EDUCATION | ADOPTION | | |
|---------------|---------------|-----------------|--------------|
| | HIGH (No.) | MEDIUM (No.) | LOW (No.) |
| LITERATE | | | |
| Obs. | 73.00 | 36.00 | 4.00 |
| Expec. | 66.29 | 38.04 | 8.66 |
| SEMI-LITERATE | | | |
| Obs. | 21.00 | 17.00 | 2.00 |
| Expec. | 23.47 | 13.47 | 3.07 |
| ILLITERATE | | | |
| Obs. | 82.00 | 48.00 | 17.00 |
| Expec. | 86.24 | 49.49 | 11.27 |

information, we may accept the null hypothesis and we can arrive to the result that illiteracy is not an obstacle for adoption which is against all literatures and research. This observation may be logically accepted, keeping in mind that this project has been going on for about 10 years, therefore, most of farmers are late adopters.

Table 15

Farmers attitude towards the credit fund services is shown in Table 15.

Out of 290 farmers, 210 (72%) are in favor and 80 (28%) are against the procedures for getting credit fund. Out of 290 farmers, 279 (96%) are in favor and 11 (4%) are against the loans for agricultural equipment, that is mid-term loans, loans for agricultural input, that are short-terms loans and long-term loans.

Table 16

The number of farmers who listen to the radio and the period of listening data are given in Table 16.

Out of 300 farmers 275 (92%) are radio listeners and 25 (8%) are non-listeners (Table 15A).

Referring to Table 15B, 139 (33.2%) listen to the radio at night, 123 (29.3%) are evening listeners, 83 (19.8%) are afternoon listeners and 74 (17.7%) are morning listeners.

TABLE NO. 15

FARMER'S ATTITUDE TOWARDS THE CREDIT FUND SERVICES

| Agricultural Credit Fund Service | Farmer's Attitude | | | | Total |
|--|-------------------|----|---------|----|-------|
| | In Favour | | Against | | |
| | No. | % | No. | % | |
| Procedure | 210 | 77 | 80 | 28 | 290 |
| Loans for Agricultural Inputs (short-term loans) | 279 | 96 | 11 | 4 | 290 |
| Loans for Agricultural Equipment & Pumps (Mid-term Loans) | 279 | 96 | 11 | 4 | 290 |
| Long-term Loans | 279 | 96 | 11 | 4 | 290 |

TABLE NO. 16

Radio Listeners and Period of Listening

| (A) | (B) | | Listening Periods | Number of Listeners | |
|-----|--------------------------|-----|-------------------|---------------------|------|
| | Radio Listeners Category | No | | No | % |
| | Listeners | 275 | Morning | 74 | 17.7 |
| | Non-Listeners | 25 | Afternoon | 83 | 19.8 |
| | Total | 300 | Evening | 123 | 29.3 |
| | | | Night | 139 | 33.2 |

Table 17

The number of T.V. watchers is given in Table 17. By referring to Table 16, we can see that out of 300, 265 (88%) are T.V. watchers and 35 (12%) are non-watchers.

TABLE 17
Television Watchers

| T.V. Watchers Category | No. | % |
|------------------------|-----|-----|
| T.V. Watchers | 265 | 88 |
| T.V. Non-watchers | 35 | 12 |
| TOTAL | 300 | 100 |

Table 18

Tihama Development Authority (T.D.A.) reported that 300 rural leaders were recognized and been trained in Wadi-Zabid and Wadi-Rima. Only 57 local leaders names were obtained from the extension departments.

Table 18 shows the list of names of local leaders as recognized by the extension department and also shows the farmers opinion about these leaders. Out of the 57 local leaders, only 9 leaders are recognized by four or more farmers which means that the agricultural extension is parring the extension message to farmers through people whom are not very accredited which affect level and speed of farmer's adoption.

TABLE 18
LIST OF LOCAL LEADERS FROM EXTENSION DEPARTMENT
RECORD AND FARMERS OPINION ABOUT THOSE

| Sl No. | Local Leaders name as in Extension Department Record. | No. of Farmers Supporting |
|--------|---|---------------------------|
| 1 | Hussain A. Najar | 3 |
| 2 | Abed M. Mujani | 0 |
| 3 | Futhani A. Haddad | 0 |
| 4 | Futhani S. Zain | 0 |
| 5 | Ahmad A. Zain | 0 |
| 6 | Mohammed A. Dally | 0 |
| 7 | Futhani Shami | 0 |
| 8 | Albbar Hera | 0 |
| 9 | Youssif Mujani | 1 |
| 10 | Essa H. Koudeep | 1 |
| 11 | Ali. H. Sabbath | 2 |
| 12 | Mohammed S. Mustafa | 0 |
| 13 | Yahia H. Al Dourib | 0 |
| 14 | Mohammed Y. Sophi | 1 |
| 15 | Ali H. Koreshi | 0 |
| 16 | Awad A. Kamari | 0 |
| 17 | Alkunath Jatari | 0 |
| 18 | Ahmed O. Jananni | 0 |
| 19 | Dawood Nahari | 1 |
| 20 | Yahia A. Al Ahyiaf | 0 |
| 21 | Mohammed H. Thalah | 3 |
| 22 | Abdu A. Alahyiaf | 39 |
| 23 | Ayxash Al Anyiaf | 7 |
| 24 | Ayyash A. Honduch | 1 |
| 25 | Mohammed M. Lmoshari | 11 |
| 26 | Ahmed A. Al Akill | 1 |
| 27 | Yahia O. Kadiri | 2 |
| 28 | Salem. A. Kattab | 0 |
| 29 | Ali A. Al Ahyiaf | 1 |
| 30 | Abdulla M. Khozaif | 0 |
| 31 | Ali A Hobal | 0 |
| 32 | Ali A. Hamas | 0 |
| 33 | Saleh M Rholaif | 0 |
| 34 | Yossif A. Talha | 0 |
| 35 | Omar A Al Sahari | 92 |
| 36 | Abdullah Olayan | 0 |
| 37 | Ahmed M. Naheeb | 2 |
| 38 | Abed A. Lahdal | 2 |
| 39 | Auliaman a. Ajhash | 0 |
| 40 | Yossif Lashi | 4 |
| 41 | Suliaman Lashi | 6 |
| 42 | Matari Karan Basu | 1 |
| 43 | Suliaman K. Modhadah | 16 |

| | | |
|----|----------------------|----|
| 44 | Abdul Rehiman Gazali | 3 |
| 45 | Ali Y. Barbour | 0 |
| 46 | Abid M. Wasel | 11 |
| 47 | Mohammed K. Al Abdal | 0 |
| 48 | Hussain alanbari | 0 |
| 49 | Hassan O. Jamani | 0 |
| 50 | Abdu Hindi | 0 |
| 51 | Hassan M. Sathi | 13 |
| 52 | Alfotani H. Mofrh | 0 |
| 53 | Alfotani S. Zerae | 0 |
| 54 | Ahmed A. Yassin | 0 |
| 55 | Mohammed A. Hidara | 0 |
| 56 | Saheed. F. Mhohazab | 2 |
| 57 | Salim O. Hobal | 0 |

TABLE 18-1

LIST OF LOCAL LEADERS WHO HAVE BEEN RECOGNIZED BY
INTERVIEWING FARMERS

| Sl. No. | Local Leaders Names | No. of Farmers supporting |
|---------|-----------------------|---------------------------|
| 1 | Ebrahim Zibroak | 2 |
| 2 | Ahmad A. Idarouz | 24 |
| 3 | Ahmad Ali Idarouz | 2 |
| 4 | Ahmad A Vakidhi | 3 |
| 5 | Ahmad F Khalel | 6 |
| 6 | Ahmad Selahe | 6 |
| 7 | Esmail Habira | 3 |
| 8 | Barmom A Barashi | 3 |
| 9 | Dawood Y. Ashor | 2 |
| 10 | Dawood Morañ | 2 |
| 11 | Dawood A Alzalmi | 5 |
| 12 | Hassan Kholash | 7 |
| 13 | Kassim H Damash | 3 |
| 14 | Kassim A Bakith | 3 |
| 15 | Alezi Ahmad Al Hadal | 4 |
| 16 | Abdu A Hidarouz | 2 |
| 17 | Awad Thalha | 3 |
| 18 | Leasy Yacob | 8 |
| 19 | Isash Damees | 2 |
| 20 | Abdul Rehiman Moshari | 5 |
| 21 | Omar S. Hobal | 4 |
| 22 | Abdu Darsh | 4 |
| 23 | Abdu Haroon | 3 |
| 24 | Abdulla Ashreg | 2 |
| 25 | Hiash A Eashi | 7 |
| 26 | Awad H. Mohatab | 7 |
| 27 | Ali. M. Bajil | 3 |
| 28 | Fathr Ahatari | 0 |
| 29 | Mogshin H Hyçara | 3 |
| 30 | Mohamed A. Wajeth | 2 |
| 31 | Moshin Marshorki | 2 |
| 32 | Mohammed Moshin | 2 |
| 33 | MoaammeaYacob | 3 |
| 34 | Mohammed A. Balcom | 2 |
| 35 | Mohammed O Saagani | 4 |
| 36 | Mohammed A Al Hadal | 3 |
| 37 | Mohammed N. Bothari | 2 |
| 38 | Mohammed F. Batha | 3 |
| 39 | Mohammed F. Misgagi | 3 |
| 40 | Mohammed N. Elmer | 3 |
| 41 | Mohammed F. Merhi | 2 |
| 42 | Salim S Bajil | 2 |
| 43 | Sulaiman A. Jasara | 2 |

| | | |
|----|------------------|---|
| 44 | Salim M. Abra | 2 |
| 45 | Sayed A. Mohajab | 2 |
| 46 | Salai A. Moshin | 2 |
| 47 | Salai F. Kathib | 2 |
| 48 | Yahiya Hotara | 2 |
| 49 | Yahiya M. Fakhi | 2 |
| 50 | Yossif A. Batai | 2 |

Table 19

The farmers's level of adoption in various extension offices in Wadi Zabid Project is shown in Table 19. Out of the 10 extension offices, only 4 extension offices have the highest percentage of adopters. They are (1) Quriah, (2) Zabic, (3) Garrahi, and (4) Zaribah.

In Quriah:

Out of 30 farmers, 28 (93.3%) are high adopters and 2 (6.7%) are medium adopters and there were no low adopters.

In Zabid:

Out of 30 farmers, 22 (73.3%) are high adopters, 8 (26.7%) are medium adopters and there were no low adopters.

In Garrahi:

Out of 30 farmers, 23 (76.7%) are high adopters, 7 (23.3%) are medium adopters and no low adopters.

In Zaribah:

Out of 30 farmers, 28 (93.3%) are high adopters, 2 (6.7%) are medium adopters and there were no low adopters.

This table shows also the overall adoption of the 300 farmers in the 10 extension zones. Out of 300 farmers, 176 (59%) are high adopters, 101 (33%) are medium and 23 (8%) are low adopters.

TABLE NO. 19
 FARMER'S LEVEL OF ADOPTION IN THE EXTENSION OFFICES IN WADI ZABID PROJECT

| Extension Offices | Munshidish | | Mujallab | | Quriah | | Turaiibuh | | Zabid | | Teheitah | | Gerbah | | Garrahi | | Zaribah | | Mahal Mubarak | | Overall Adoption | | |
|----------------------|------------|------|----------|------|--------|------|-----------|-----|-------|------|----------|-----|--------|-----|---------|------|---------|------|------------------|------|---------------------|-----|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| HIGH | 13 | 43.3 | 20 | 66.7 | 28 | 93.3 | 13 | 60 | 21 | 73.3 | 3 | 10 | 18 | 60 | 23 | 76.7 | 28 | 93.3 | 3 | 10 | 176 | 59 | |
| MEDIUM | 13 | 43.3 | 10 | 33.3 | 2 | 6.7 | 12 | 40 | 8 | 26.7 | 18 | 60 | 9 | 30 | 7 | 23.3 | 2 | 6.7 | 20 | 66.7 | 101 | 33 | |
| LOW | 4 | 13.3 | X | | X | | X | X | X | X | 2 | 30 | 3 | 10 | X | X | X | X | X | 7 | 23.3 | 23 | 8 |
| TOTAL | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 30 | 100 | 300 | 100 | |

CHAPTER V
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary:

Purpose:

The purpose of this study was to measure the attitude and the adoption of the farmers toward the extension service's recommendations, to find out the extent of success regarding the recognition of local leaders, to determine the factors affecting the adoption of the agricultural recommendations, and to examine alternative information delivery systems in reaching farmers.

Methodology:

A sample of 300 farmers was randomly chosen from extension department records. Personal interviews were conducted for data collection with the assistance of well-trained extension agents. Three training meetings were held with those agents, explaining the objectives of this study before the interviews with the farmers were conducted.

Findings:

Regarding farmers' attitudes and the adoption of recommendations for chemical fertilizers and pesticides, the majority of farmers showed a high positive attitude and had

adopted the Extension's recommendations, although a few farmers were still against some of these recommendations. Regarding field practices, only a few farmers showed a negative attitude and had not adopted the Extension's recommendations. A noticeable portion of farmers were against Coker 310 and preferred Acala. None of the farmers were using maize. Tihama II and all had a negative attitude toward this seek variety.

This study revealed that there is an obvious high level of adoption of agricultural extension recommendations in the project area as a direct result of T.D.A. developmental movement and the efforts and cooperation of local officials and public bodies in the project area within the last 10 years.

Conclusions:

Five hypotheses about farmers' attitudes and behaviors were tested. The results were:

1. A farmer's attitude is related positively to the farmer's interaction with the agricultural extension service.
2. A farmer's adoption is related positively to:
 - a) a farmer's interaction with the agricultural extension service,
 - b) land ownership,
 - c) the size of the land holding, and
 - d) the age of the farmer.

It is most interesting that the researcher discovered that older farmers are more likely to adopt improved practices than younger farmers and that illiteracy is not an obstacle for the adoption in the Wadi Zabid project. Both of these findings are contrary to all findings in the literature. These findings may be logically accepted, keeping in mind that most of the landowners are older and that this project was started 10 years ago, therefore making the sample of this study late adopters.

Recommendations:

It is important to mention here some of the essential recommendations which will help in realizing the desired situation at full development. These recommendations are:

1. Research efforts must be continued to introduce new cotton crop varieties.
2. It is advisable that the government should introduce simple agricultural mechanization to be a substitute of the scarcity of the agricultural labor and its relative high costs--presently and in the future.
3. All the needed inputs, for applying the recommendations such as selected seeds, fertilizers, pesticides, and agricultural machinery must be made available to farmers at the right time and places and at suitable prices.
4. Agricultural credit fund efforts must be continued to provide farmers with the needed inputs and money in the suitable time at suitable prices and to facilitate easy procedures for obtaining these loans.

5. Research efforts must be continued in studying the still existing problems--and farmers suggestions for overcoming them--and to determine, with the help of other TDA departments, the most suitable solutions for overcoming problems.
6. Agricultural extension efforts must be continued using all possible extension teaching methods including the mass media such as T.V. and radio to reach and convince the majority of farmers of the application and adoption of all the recommendations in order to reach the desired levels of production at full development.
7. Efforts must be continued to recognize more real local leaders.
8. Effort should be made to change the existing relationship between land owner and small share cropper. In other words, this should be in favor of those who actually work the land by benefitting them more, with advantages of technical progress. This can be achieved by limiting the proportion of the harvest levied by the land owner.

FOOTNOTES

FOOTNOTES

¹Tihama Development Authority (TDA), "Tihama Development Project No. 1," Completion Report, YAR, July 1980.

²Evert M. Rogers and Floyd F. Shoemaker, Communication of Innovation: A Cross-cultural Approach, 2nd ed. (New York: The Free Press, 1971), p. 18.

³Ibid., p. 19.

⁴Niels Roling, Research on the Diffusion of Innovation: Its Lessons for Extension, (International Agricultural Center, Wageningen, Netherlands).

⁵Ibid., p. 19.

⁶Rogers and Shoemaker, p. 100.

⁷Ibid., p. 101.

⁸Ibid., p. 101.

⁹Ibid., p. 103.

¹⁰Evert M. Rogers, Diffusion of Innovation, 3rd. (New York: The Free Press, 1983).

¹¹Ibid., p. 238.

¹²Ibid., p. 238-239.

¹³Ibid., p. 239-240.

¹⁴Ibid., p. 240.

¹⁵Roling, p. 4.

¹⁶Ibid., p. 4.

¹⁷Ibid., p. 4.

¹⁸Ibid., p. 4.

¹⁹Ibid., p. 4.

²⁰Ibid., p. 4.

²¹Kalash Nath Pyakuryal, "Factors Affecting Adoptions in Saradanagar Village, Panchayat Chitwan, Nepal," Rural Soc., Vol. 1, p. 13, Feb. 1978.

²²Roling, p. 3.

²³Rogers and Shoemaker, 1971, p. 24-25.

²⁴Roling, p. 5.

²⁵Ibid., p. 5.

²⁶Ibid., p. 5.

²⁷Ibid., p. 5.

²⁸Ronald C. Power, "Power Actors and Social Change," Journal of Cooperative Extension, Fall 1967, p. 238.

²⁹Rogers and Shoemaker, 1971, p. 244.

³⁰Ibid., p. 199.

³¹Clarence J. Cunningham, "Dimension of Leader Behavior," Journal of Cooperative Extension, Winter 1966, p. 223.

³²Andrew W. Haplin, The Leadership Behavior of School Superintendents (Columbia, Ohio: College of Education, The Ohio State University, 1956), p. 11.

³³Cunningham, p. 223.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Cunningham, Clarence J. "Dimension of Leader Behavior," Journal of Co-operative Extension, Winter 1966, pp. 223-281.
- Foreign Area Studies (FAS). Area Handbook for the Yemens. 1st ed., the U.S. Government Printing Office, Washington D.C., 1977.
- Freeman, David M. Hosein Azadi, and Max K. Lowdermilk, "Adoption of Agricultural Innovations," Rural Soc., Vol. 47, No. 1, Spring 1982, pp. 68-80.
- Haplin, Andrew W. The Leadership Behavior of School Superintendents (Columbia, Ohio: College of Education, The Ohio State Univ., 1956).
- Kuwait Fund for Arab Economic Development (KFAED), Wadi Zabid Project, Kuwait City, Kuwait, March 1982, (a case study, in Arabic).
- Lionberger, "Community Adoption," J. of Cooperative Extension, Vol. 4, Winter 1963, pp. 201-209.
- Powers, Ronald C. "Power Actors and Social Change," J. of Cooperative Extension, Fall 1967, pp. 238-248.
- Pyakuryal, Kailash Nath. "Factors Affecting Adoption of Innovation in Saradana Village Panchayat Chitwan, Nepal," Rural Soc., Vol. 13, Feb. 1978, pp. 19-36.
- Rogers, Everett M. Diffusion of Innovation, 3rd ed., (New York: The Free Press, 1983).
- Rogers, E. M. and Floyd F. Shoemaker. Communication of Innovations: A Cross-Cultural Approach, (New York: The Free Press, 1971).
- Tihama Development Authority (TDA). "Educational and Economic Effect of Cotton and Maize Demonstrations," Extension Research Bulletin, No. 7, Y.A.R., April 1978.

Tihama Development Authority (TDA). "Report on the Result of Demonstrations for the Improvement of Field Crops and Vegetables in the Fall Season, 1979/80 on Wadi Remala Project," Agriculture Extension and Training Development, Y.A.R., June 1980.

Tihama Development Authority (TDA), "Tihama Development Project I: Completion Report," TDA, Y.A.R., July 1980.

APPENDICES

Appendix A
The Questionnaire

1. Farmer's Name _____ Age _____
Farm Size _____
Extension Zone _____

2. Cultivated crops under various system of irrigation

A. Perrenial irrigation 1. _____ 2. _____

B. Spate irrigation 1. _____ 2. _____

C. Well irrigation 1. _____ 2. _____

3. Do you : 1. Own all the land you operate?

2. Own part and rent part of the land
you operate?

3. Rent all of the land you operate?

4. Share-cropper.

4. Who are the members of the town whom you usually consult when
you face a problem in your farm/home or when you try to find
more information before you actually made your decision
(please name three or four source)

a. _____

b. _____

c. _____

d. _____

5. Can you : Read and Write Read only
 Neither read or write

6. What of the following Extension activities did you or your family have attended or participated with? (If none write '0')

1. _____ An agent visited your farm or home
2. _____ You or your family visited the Extension Office.
3. _____ You or your family attended a field meeting organized by the Agricultural Extension.
4. _____ You or your family attended Extension and Agricultural exhibition.
5. _____ You or your family participated in Extension campaign.
6. _____ You or your family received a circular letter or pamphlet from the Extension Service.
7. _____ You or your family visited a field demonstration.

7. What is your opinion of the following TDA recommendations, services and activities.

A.

| Recommendations of Cotton | <u>Farmers Attitude</u> | |
|---|-------------------------|---------|
| | In favour | Against |
| <u>Agricultural Extension</u> | | |
| <u>Recommendations</u> | | |
| <u>New Seed Varieties</u> | | |
| Cotton, Coker 310 | | |
| <u>Use of Fertilizer and Pesticides</u> | | |
| Chemical fertilizers | | |
| Seed dressing before sowing | | |
| Chemical pesticides | | |
| <u>Field Practices</u> | | |
| Date of sowing | | |
| Mechanical plowing | | |
| Mechanical leveling | | |
| Mechanical ridging | | |
| Sowing in hills | | |
| Planting and thinning | | |
| Cultivation | | |
| Date of harvesting | | |
| <u>Agricultural Credit Fund (ACF)</u> | | |
| <u>Services</u> | | |
| Loan procedures | | |
| Loans for agricultural inputs (seasonal term) | | |
| Loans for agricultural equipment (Medium term) | | |
| Long term Loans | | |

P.

| Recommendations of Maize | <u>Farmer' Attitude</u> Infavour Against |
|--------------------------|---|
|--------------------------|---|

Agricultural Extension
Recommendations

New Seed Varieties

Maize, Tihama 1
Maize, Tihama 2

Use of Fertilizers and Pesticides

Chemical fertilizers
Seed dressing before sowing
Chemical pesticides

Field Practices

Date of sowing
Mechanical plowing
Mechanical levelling
Mechanical ridging
Sowing in hills
Thinning and weeding
Cultivation
Date of harvesting

Agricultural Credit Fund (ACF) Services

Loan procedures
Loans for agricultural inputs
(seasonal term)
Loans for agricultural
equipment (medium)
Long term loans

8. What is your opinion of the TDA recommendations, services and activities in general?

- (a) Strongly in favour; (b) In favour; (c) Against
(d) Strongly against

9. If adopted, which of the following recommendatic(s).

A.

| Recommendations of Cotton | <u>Farmer's replies</u> | |
|--|-------------------------|-------------|
| | Adopted | Not adopted |
| <u>New Seed Varieties</u> | | |
| Cotton, Coker 310 | | |
| <u>Use of Fertilizers and Pesticides:</u> | | |
| Chemical fertilizers | | |
| Seed dressing before sowing | | |
| Chemical pesticides | | |
| <u>Field Practices</u> | | |
| Date of sowing | | |
| Mechanical plowing | | |
| Mechanical levelling | | |
| Mechanical ridging | | |
| Sowing hills | | |
| Filling and thinning | | |
| Cultivation | | |
| Date of harvesting | | |

B.

| Recommendations of Maize | Farmers' replies | |
|--------------------------|------------------|-------------|
| | Adopted | Not adopted |

New Seed Varieties:

Maize, Tihama 1
Maize, Tihama 2

Use of Fertilizers and Pesticides:

Chemical fertilizers
Seed dressing before sowing
Chemical pesticides

Field Practices:

Date of sowing
Mechanical plowing
Mechanical levelling
Mechanical ridging
Sowing on hills
Filling and thinning
Cultivation
Date of harvesting

11. Do you listen to radio?

Yes

No

12. When do you usually listen to it?

Morning

Afternoon

Evening

At night

13. Do you watch T.V?

Yes

No

Date of interview :

Name of interviewer:

Signature

Appendix B

LIST OF AGRICULTURAL EXTENSION AGENTS PARTICIPATED IN DATA COLLECTION

| No. | Name | Educational Qualification | Extesion course attended | Date of appointment |
|-----|-------------------------|------------------------------|--------------------------------|------------------------|
| 1 | Mohamood Y. Alnagar | Secondary School | 1st course | July 1975 |
| 2 | Moshin M. Al Marzogi | " | " | " |
| 3 | Abdul Al Kader Celan | " | 2nd course | July 1976 |
| 4 | Riskeasy Sakeer | " | Ist course | July 1975 |
| 5 | Tariq A. Syeed | Agricultural institute | " | July 1983 |
| 6 | Abdul Razak Alhamini | Secondary School | " | July 1975 |
| 7 | Dawood O Almisgagi | " | " | " |
| 8 | Mahmood M. Khali | " | 2nd course | Nov. 1978 |
| 9 | Mohammed A Ward | " | Ist Course | July 1975 |
| 10 | Hassan Y. Waro | " | 4th Course | Sept. 1975 |
| 11 | Mohammed F. Al Misgai | " | Ist Course | July 1975 |
| 12 | Ratnan Kaleeb | Elimantary | Ist Course | July 1975 |
| 13 | Sayed Ahmed Kataf | " | Ist Course | July 1975 |
| 14 | Ahmed M. Aliasbi | " | 2nd Course | Nov. 1978 |
| 15 | Mohamed M. Alfatri | " | Ist Course | July 1975 |
| 16 | Sayed A. Alasbahi | " | Ist Course | July 1975 |
| 17 | Aleasy Mohammed A Atada | " | 2nd Course | July 1976 |
| 18 | Ahid H. Rabee | " | 2nd Course | Nov. 1978 |
| 19 | Salim S. Mohraki | " | Ist Course | July 1975 |
| 20 | Hussain K.H. Alali | Secondary | 3rd Course | Nov. 1978 |
| 21 | Abdul Salem A Khalid | " | 4th Course | Sept. 1975 |

استمارة استبيان للمزارعين في
منطقة مشروع وادي زبيد

١- اسم المزارع _____ السن _____
حجم المزرعة _____ مكتب الإرشاد أو _____
المطقة الإرشادية: _____

٢- ما هي المحاصيل التي تزرعها تحت أنظمة الري التالية :
أ - المحصول المروي بواسطة الآبار _____ و _____
ب - المحصول المروي بواسطة الفيضان _____ و _____
ج - المحصول المروي بواسطة الآبار _____
والفيضان _____ و _____

٣- بالنسبة للملكية الأرض التي تزرعها ٠٠٠٠ هل أنت :-
 مملكتها كلها ؟
 مملكتك جزء منها ومتأجر الجزء الآخر ؟
 مسأجرها كلها ؟
 مشارك ؟

٤- عندما تواجه مشكلة في مزرعتك ٠٠٠ فمن من أهل قريبتك الذين تذهب إليهم
لتحصول على المعلومات التي تساعدك في حل المشكلة ؟
أ - الأم _____
ب - الأب _____
ج - الأم _____
د - الأب _____

٥- بالنسبة لمستواك التعليمي : هل تقرأ وتكتب ؟
 نعم لا اقرأ ولكن لا أكتب

٦- أي أنشطة الإرشاد التالية التي قد شاركت فيها أنت أو أحد أفراد عائلتك :-

- أنت أو أحد من أفراد عائلتك قام بزيارة لمكتب الإرشاد بالهيئة .
 أنت أو أحد أفراد عائلتك حضر اجتماعا إرشاديا .
 أنت أو أحد أفراد عائلتك حضر حملة إرشادية .
 أنت أو أحد أفراد عائلتك زار معرضا إرشاديا .
 أنت أو أحد أفراد عائلتك زار إحدى الوحدات الإرشادية لأحد المزارعين .
 أحد المرشدين قام بزيارتكم في البيت أو المزرعة .
 شراك دورية أو كتبهات إرشادية تعطلك من مكتب الإرشاد بالمشروع .

- ٢ -

٧ - ما رأيت في التوصيات الإرشادية والخدمات الزراعية التي تقدمها الهيئة للمشروع:

أولا : بالنسبة للنقطن :-

| رد المزارع | | التوصيات للفظن |
|------------|----------|---|
| مويد | غير مويد | |
| | | <p>أ - <u>استعمال الأصناف الجديدة :</u></p> <p>كوكر ٣١٠</p> <p>ب - <u>استعمال الأسمدة والمبيدات :</u></p> <p>الأسمدة الكيماوية عقير المذور بالأسمدة قبل زراعتها المبيدات الكيماوية</p> <p>ج - <u>النشاط الحقلية :</u></p> <p>موعد الزراعة الحراثة بالآلة تسوية الأرض بالآلة تخطيط الأرض بالآلة الذري في الحور (المقر) الخف والترقيع العزيق موعد الحصاد</p> <p>د - <u>خدمات صندوق التمليف الزراعي :</u></p> <p>أقراءات القرض قروض قصيرة الأجل قروض متوسطة الأجل قروض طويلة الأجل</p> |

- ٢ -

ثانيا : بالنسبة للذرة :-

| رد المزارع | | التوصيات للذرة |
|------------|------|--|
| مواسيد | موسم | |
| | | <p>أ - <u>استعمال الأضراس الحديدية :</u></p> <p>تهامة ١ تهامة ٢</p> <p>ب - <u>استعمال الأسمدة والمبيدات :</u></p> <p>الأسمدة الكيماوية تغفير المذور بالأسمدة قبل زراعتها المبيدات الكيماوية</p> <p>د - <u>النشاط الحقلى :</u></p> <p>موعد السراغة الحراثة الآلية نسوبة الارى الآلية نخبط الارى الآلية الذرة فى الجور (النقر) الحف والترقيع العزيق موعد الحصاد</p> <p>د - <u>خدمات صندوق التمليف الزراعى :</u></p> <p>اجراءات القرص فروى قصيرة الأجل فروى متوسطة الأجل فروى طويلة الأجل</p> |

- ٤ -

٨- ما رأيك بتوصيات وخدمات الإرشاد عموماً ؟
 جيدة جداً جيدة سيئة سيئة جداً

٩- أرى التوصيات التالية التي تأخذها وتعمل بها :-

أولاً : بالنسبة للقطن :-

| رد المزارع | | التوصيات للقطن |
|------------|------|--|
| مبني | مبني | |
| | | <p>أ- <u>استعمال الأسمدة الجديدة :</u></p> <p>كوكبر ٣١٠</p> <p>ب- <u>استعمال الأسمدة والنسبات :</u></p> <p>الأسمدة الكيماوية تعتبر المدور بالأسمدة قبل رراعتها استعمال النسبات الكيماوية</p> <p>د- <u>النشاط الحقلى :</u></p> <p>موعد الرراعة تسوية الارض سآآآ تنظيف الارض سآآآ المدرفى الحور (السفر) الحف واسترقبع العريق موعد الحصاد</p> |

- ٥ -

ثانيا : بالنسبة للذرة :-

| رد المزارع | | التوصيات للذرة |
|------------|------------|---|
| متينسى | غير متينسى | |
| | | <p>أ - <u>استعمال الأسمدة الجديدة :</u></p> <p>تهامة ١ تهامة ٢</p> <p>ب - <u>استعمال الأسمدة والمبيدات :</u></p> <p>الأسمدة الكيماوية تعفير السذور بالأسمدة قبل زراعتها استعمال المبيدات الكيماوية</p> <p>ج - <u>النشاط الحقلى :</u></p> <p>موعد الزراعة الحرق سالة نسبة الارض سالة تخطيط الارض سالة السدور في العور (المقر) الحف والترقيع العزيق موعد الحصاد</p> |

- ٦ -

١٠- إذا كنت لا تعمل بنوعيات الإرشاد الزراعية .. فما هي الاسباب لذلك ؟

| أسباب التوعية | الاسباب | عدم السمع بها | عدم توفرها | عدم معرفة كيفية استعمالها | ارتفاع سعرها | عدم ملائمة العلامة | ضعيفة التوعية على الوادي | أخرى |
|------------------|---|---------------------|---------------|------------------------------------|-----------------|--------------------------|-----------------------------------|------|
| | ١- خيامة ٢- خيامة استعمال الأسمدة الكيماوية تعفير البذور قبل زراعتها استعمال المبيدات الكيماوية موعد الزراعة حرق الأرض بالآلة تسوية الأرض بالآلة تنضيد الأرض بالآلة السد في حور (نقرا) الحف والترويق العريق موعد الحصاد | | | | | | | |

١١- هل تستمع للراديو ؟

لا نعم

١٢- متى تستمع للراديو ؟

 في الصباح (من بعد صلاة العحر حتى صلاة الظهر) بعد الظهر (من بعد صلاة الظهر حتى صلاة العصر) في المساء (من بداية الغروب حتى صلاة العشاء) ليل (من بعد صلاة العشاء حتى منتصف الليل)

١٣- هل شاهدت التليفزيون ؟

لا نعم

تاريخ الاستمعال : _____

اسم المرشد الزراعي : _____

التوقيع : _____

كشف بأسماء المرشدين ومؤهلاتهم العلمية
الذين قاموا بعملية جمع المعلومات خلال الفترة

| رقم | اسم المرشد الزراعي | المؤهل العلمي | رقم الدورة الارشادية التي اشترك فيها | تاريخ التعيين |
|-----|------------------------|------------------------|---|------------------|
| ١ | محمود بوند احجار | ثانوية ادبي | الاولى | يوليو ١٩٧٥ |
| ٢ | عيسى محمد عمر المرزوقي | " " | " | " |
| ٣ | عبد القادر حيتن | " " | الثانية | يونيو ١٩٧٦ |
| ٤ | رقيق عمرى عفيف | " " | الاولى | " |
| ٥ | طارق عبد الله سعيد | اعدادى + معهد زراعي | معهد زراعي | يوليو ١٩٨٣ |
| ٦ | عبد الحريان الهامسي | ثانوية ادبي | الاولى | يوليو ١٩٧٥ |
| ٧ | داود عمر المرشاحي | اعدادى | " | " |
| ٨ | منعمون احمد حنبل | " | الثالث | نوفمبر ١٩٧٨ |
| ٩ | محمد عيسى ابراهيم وريو | " | الاولى | يوليو ١٩٧٥ |
| ١٠ | حسن يحيى وريو | ثانوية ادبي | الرابعة | سبتمبر ١٩٧٩ |
| ١١ | محمد فرج اسرحاني | اعدادية | الاولى | يوليو ١٩٧٥ |
| ١٢ | عبدان خالد | اعدادية | " | " |
| ١٣ | سعيد احمد كراي | " | " | " |
| ١٤ | احمد منعم التومسي | " | الثالث | نوفمبر ١٩٧٨ |
| ١٥ | منعم بن محمد العنزي | " | الاولى | يوليو ١٩٧٥ |
| ١٦ | سعيد نساوايخ الامين | " | " | " |
| ١٧ | اعرن منعم ادهل هادي | " | الثانية | يوليو ١٩٧٦ |
| ١٨ | عبد حسن رمعي | " | الثالث | نوفمبر ١٩٧٨ |
| ١٩ | عالم بن عالم محرفي | " | الاولى | يوليو ١٩٧٥ |
| ٢٠ | حسين خالد العلي | اعدادى | الثالث | نوفمبر ١٩٧٨ |
| ٢١ | عبد السلام عيسى حنبل | ثانوية ادبي | الرابعة | سبتمبر ١٩٧٩ |

قسم الارشاد الزراعي والتدريب

كشف بالقادة الريفيين في مكاتب وادي زبيد حتى ١٩٨٣/٨/٣١

(١) اسم المكاتب : التربة

- | | |
|---------------------|-------------------------|
| ١- حسين عدالله حجار | ١- الشيخ احمد محمد وهيب |
| ٢- عبد محمد مجنى | ٢- احمد عدالله العامل |
| ٣- فتحي سالم زين | ٢- يحيى عبيد فادري |
| ٤- فتحي عبيد خداد | ٤- سالم عدالله مطاب |
| | ٥- علي احمد الاهيف |
| | ٦- عدالله موسى حليف |
| | ٧- علي عدالله هبل |
| | ٨- علي عبده حماس |
| | ٩- صالح موسى حليف |

(٢) اسم المكاتب : الحرة

- | |
|-------------------|
| ١- احمد عمر رين |
| ٢- محمد احمد دالي |
| ٣- فسيحي ناعي |

(٧) اسم المكاتب : زبيد

- | |
|-----------------------|
| ١- يوسف عوض طنحه |
| ٢- عمر اسماعيل الساري |
| ٣- عدالله عنيان |
| ٤- عبد احمد الاهدل |
| ٥- سليمان عبد اجيش |

(٣) اسم المكاتب : الريه

- | |
|--------------------|
| ١- الفخار هره |
| ٢- يوسف مجاهد |
| ٣- عيسى حسين نصيب |
| ٤- عيسى حسين شعظ |
| ٥- محمد شمال منطفي |

(٨) اسم المكاتب : مخر مارك

- | |
|----------------------|
| ١- الشيخ يوسف لاشي |
| ٢- الشيخ سليمان لاشي |
| ٣- مطري كرساشي |
| ٤- سليمان كليب مدحدح |
| ٥- عبدالرحمن عمالي |
| ٦- علي يحيى سرور |

(٤) اسم المكاتب : الغوريه

- | |
|---------------------|
| ١- يحيى حمود الدريب |
| ٢- محمد يوسف عومي |
| ٣- عني حمود قريش |
| ٤- عوض علي قمرى |

(٩) اسم المكاتب : الحراحي

- | |
|---------------------------|
| ١- السيد عبد مهدي واصل |
| ٢- السيد محمد فاسم الاهدل |
| ٣- السيد حسين الاساري |
| ٤- حسن عمر حماسي |
| ٥- عبده هدى |

(٥) اسم المكاتب : التحيه

- | |
|---------------------|
| ١- الكندي مطري |
| ٢- احمد عمر حاسي |
| ٣- داود سهارى |
| ٤- يحيى احمد الاهيف |
| ٥- محمد حسين طنحه |
| ٦- عبده عني الاهيف |
| ٧- عباس علي الاهيف |

تأيم كشف القادة الريفيين في مكاتب وادي زبيد حتى ١٩٨٣/٨/٣١

(١٠) اسم المتكبر : المرتديه

- ١- الشيخ حسن محمد شدي
- ٢- النسي حسن مفرح
- ٣- النسي سالم رزاعي
- ٤- احمد ابراهيم ياسين
- ٥- محمد علي حيدر
- ٦- سعيد نسي مهذب
- ٧- سالم عبد هل

السفدر : جداول تحت عملييات - قسم الارشاد الزراعي - الهيئة العامة لتطوير
تهامة .

اسماء القيادات الريفية التي تم التعرف عليها
من خلال المقابلة الشخصية مع المزارعين

| عدد المزارعين | اسم القائد الريفي | عدد المزارعين | اسم القائد الريفي |
|---------------|-------------------------|---------------|-------------------------|
| ٧ | ٢٦- عوض حسن محجب | ٢ | ١- ابراهيم زرزق |
| ٣ | ٢٧- علي محمد باجل | ٢٤ | ٢- احمد ابراهيم عيدروس |
| ٦ | ٢٨- فتاح هناري | ٢ | ٣- احمد علي عيدروس |
| ٣ | ٢٩- محسن حسين حيدر | ٣ | ٤- احمد عبده وافدي |
| ٢ | ٣٠- محمد علي وجيه | ٦ | ٥- احمد فتحي حليم |
| ٢ | ٣١- محسن مرزوق | ٦ | ٦- احمد ماضي |
| ٢ | ٣٢- محمد محسن | ٣ | ٧- اسماعيل حبيره |
| ٣ | ٣٣- محمد جفون | ٢ | ٨- مروه عبدالله سراج |
| ٢ | ٣٤- محمد علي سليم | ٢ | ٩- داوود يوسف عثور |
| ٤ | ٣٥- محمد عمر شحاي | ٢ | ١٠- داوود مراد |
| ٣ | ٣٦- محمد احمد الاهنل | ٥ | ١١- داوود علي الساس |
| ٢ | ٣٧- محمد ناصر طيلي | ٧ | ١٢- حسن فتحي |
| ٣ | ٣٨- محمد فتحي فاسم بطاح | ٣ | ١٣- فاسم حسن ديمش |
| ٣ | ٣٩- محمد فرج مزحاجي | ٣ | ١٤- فاسم عمر احمد عجيل |
| ٣ | ٤٠- محمد محسن المير | ٤ | ١٥- اعزق احمد الاهنل |
| ٢ | ٤١- محمد فرج مرعي | ٢ | ١٦- عبده ابراهيم عيدروس |
| ٢ | ٤٢- سالم صالح باجل | ٣ | ١٧- عومي عتقه |
| ٢ | ٤٣- سليمان احمد حزره | ٨ | ١٨- اعزق جفون |
| ٢ | ٤٤- سالم محمد عمره | ٢ | ١٩- عباس ديمبي |
| ٢ | ٤٥- عبيد عبد الله محجب | ٥ | ٢٠- عبد الرحمن مشرق |
| ٢ | ٤٦- صالح احمد محسن | ٤ | ٢١- عمر صالح هنز |
| ٢ | ٤٧- صالح فتحي نصيب | ٤ | ٢٢- عبده درسي |
| ٢ | ٤٨- يحيى حجرة | ٣ | ٢٣- عبده هنز |
| ٢ | ٤٩- يحيى محمد نقيب | ٢ | ٢٤- عبدالله ارزي |
| ٢ | ٥٠- يوسف ابكر بطاح | ٧ | ٢٥- عباس فتحي باري |

APPENDIX C

THE AGRICULTURAL EXTENSION RECOMMENDATION OF COTTON AND MAIZE CROPS

Recommendations for Growing Cotton at Maximum Profit:

Based on research work, both at the experimental station level and on-the-farm testing, the following packages of recommendations were formulated. While these recommendations were meant for adoption in Wadi Zabid, all indications suggest that they may be applicable to the Tihama Plain.

Recommendations of Cotton for Spate Irrigated Areas:

1. The most suitable sowing date for cotton in the Tihama generally is August and September. October plantings and beyond must be avoided as much as possible, unless the time of flooding dictates such delay in planting.
2. Plow the soil adequately and then level the basin as one unit, preferably with a tractor-drawn land leveler to facilitate adequate levelling and consequently more even distribution of spate water.
3. Implement on main canal from the point of intake (not more than 50 cms. depth) extending to the opposite side of the basin, thus dividing the basin into two equal

parts. One or two more canals could be implemented at right angles to the main canal. Those canals will help irrigation water to rise or subside in and out of basin with as little as possible soil erosion.

4. Allow water into the basin slowly. Fixed wooden gates at the intakes and outlets of basins is certainly helpful and will facilitate control over irrigation. Wait until all the basin is covered completely with water to an average of not more than 200-250 mm. depth (approximation here is inevitable). Two or three hours of flooding will be enough. Allow water out of the basin slowly to the next basin.
5. After approximately one week, depending on the rate and degree of soil dryness, nitrogen fertilizer must be broadcast by hand in the form of ammonium sulphate 21% at the rate of 75 kgs. of active nitrogen/ha. If superphosphate or compound nitrophous 20/20 is available; then the rate of fertilizer may be modified to 100 units of nitrogen and 50 units of phosphate. Furthermore, soil treatment against termites may be applied also at this stage of soil moisture (consult Plant Protection Division) for dosage, insecticide, and method of application).
6. The recommended variety of seek is Coker-310. Planting could be done adequately behind the farmers' Oxen-drawn plow at a seeding rate of 35 kgs/ha. Seed dressing

before sowing is desirable for early seedlings protection or later termite control.

7. Cultivation may be needed if weeds constitute a problem. Thinning must be carried out after cultivation, about 25-30 days after germination and prior to giving the next flood. Not more than 15-20 plants/m² should be kept after thinning.
8. Allowing spate flood at 40-50 days if available. Caution must be exercised against over-watering. As a matter of fact 150-200 mm. per irrigation will be quite enough to wet the root zone.
9. Examine the field periodically for any boll worm infestation and consult the plant protection service for appropriate treatment.
10. The crop will take about 130-150 days to picking. Take the first pick when 50-70% of the bolls are opened. The second pick may be taken 3-4 weeks later. No irrigation is required after the first pick.

**Recommendations of Cotton for
Well and/or Supplementary
Irrigated Areas:**

1. Plant from mid-July through August and September. Avoid plantings later than September.
2. Use the new variety Coker-310, which has proved to be suitable for the area and has relatively good yield.
3. Seed bed preparation should be adequate: two plowings and then land leveling. For adequate irrigation control and saving up to 50% of irrigation water, the

furrow/ridge irrigation system must be adopted. Ridges should be 60-70 cms. apart. The direction of ridging should be at a right angle to the main irrigation canal. The field could then be divided by secondary irrigation canals.

4. For termite control, consult the plant protection service for either soil treatment or preplanting seed dressing.
5. Fertilizer dosage should be split into two equal doses:
 - a) Before planting (35 kgs of active N/ha.) broadcasting in the bottom of the furrow.
 - b) After the first cultivation and thinning (35 kgs. of active N/ha.) beneath the plants.
6. Sowing should be in hills 25 cms. apart on the side of the ridge. Four or five seeds/hill are recommended to help the seedlings to emerge.
7. Cultivation is recommended once or twice depending on the weed population: the first cultivation four weeks after planting and the second three weeks later. Thinning should be done to 2-3 plants/hill after the first cultivation and just before giving the first irrigation (Mohaayat) which should be moderate.
8. Irrigation is recommended at 15-21 days depending on the texture of the soil. If the field is adequately levelled not more than 80-100 mm. per irrigation are required.

9. Examine the field periodically for any pest infestation and consult plant protection service for adequate measures.
10. The crop will take 130-150 days to picking. Take the first pick when 50% of the bolls are opened. The second pick may be taken one month later with no need for irrigation after the first pick.

**Recommendations for Maize
Production in Tihama:
Recommendations for Maize for
Spate-Irrigation:**

1. The best zone for growing maize under spate condition is in the Group I area where water is available for most of the season.
2. The recommended sowing date is during September and October and may be extended through December. Later sowing usually manifests a systematic yield decline.
3. Plow the soil twice in opposite directions and then level the basin preferably with a tractor-drawn land leveller to facilitate adequate levelling.
4. Implement one main canal from the point of intake (not more than 50 cms. deep) to the opposite side, thus dividing the basin into two equal parts, preferably. One or two more canals could be implemented at right angles to the main canal of the same depth. This will help irrigation water to rise or subside in and out of the basin with little or no soil erosion.

5. Allow water to basin slowly. Fixing concrete/wooden gates at the intake and outlet of basin is certainly helpful and will facilitate control over the irrigation operation. Wait until the basin is covered completely with water to a depth of not more than 200-300 mm. (approximation here is inevitable). Two or three hours of flooding are enough. Then the water should be allowed out of basin slowly to the next basin.
6. After 7-10 days, depending on the rate of soil dryness, nitrogen fertilizer must be broadcast by hand evenly throughout the basin. The fertilizer form recommended is ammonium sulphate 21% at the rate of 100-120 kgs. of active nitrogen/ha. Soil treatment against termites should take place at that stage of soil moisture (consult the Plant Protection Division for dosage, insecticide, and method of application).
7. use either one of the two newly developed maize composites Tihama 1 or 2 depending on farmer's preference for kernel color. Sowing could be done adequately behind the farmer's oxen-drawn plow at a seeding rate of 30-35 kgs/ha. Seed dressing before sowing may be recommended for early seedling protection.
8. Plant density should be adjusted by thinning to one plant in each 400 cms.² (20 x 20), 30 days after germination and prior to giving the next flood.

9. Irrigation should be at monthly intervals. Caution must be exercised not to apply excess water, 200-250 mm per irrigation will be quite enough to wet the root zone. Avoid as much as possible, irrigation during wind storms.
10. The crop will take 100-110 days to mature. Strip the husked ears from the standing plants and spread them on cotton straw for a few days, then take the husk covers off and let them air-dry for 7-10 days. Do not thresh maize with cudgell as used with sorghum and millet. Maize is better shelled either by hand labor or small mechanical shellers if available.

**Recommendations of Maize for
Well and/or Supplementary
Irrigated Areas:**

1. The most suitable sowing date is September through October and may be extended to December.
2. Two varieties are recommended: Tihama Composite 1 and 2. The choice will depend on farmers' preference to kernel color.
3. Seed bed preparation should be adequate: two plowings and land levelling. The furrow/ridge irrigation system must be adopted when groundwater is used (50% of irrigation cost could be saved that way). Furrows should be 60-70 cms. apart.
4. For termite control, consult the Plant protection Division for either pre-planting soil treatment for seed dressing.

5. Plant in hills 25 cms apart at the lower side of the ridge. Put 3-4 kernels/hill.
6. Cultivation may be needed once or twice. The first cultivation is to eliminate weeds and to bring the plants into the middle of ridges. It should be followed by thinning to one plant/hill and then the first irrigation (Mohaayat) which must be moderate in depth. A second cultivation may be needed if the weed population constitutes a problem.
7. Nitrogen fertilization should be applied in two equal doses, the first prior to sowing, broadcasted in the middle of the furrow and the second 30-40 days after germination (before the second irrigation). A total recommended nitrogen of 100-120 kgs. of active nitrogen/ha should be applied.
8. Irrigation frequency recommended is at 15-21 days intervals, applying only 100 mm per irrigation. Thus, a total of 6-7 irrigations are needed to bring the crop maturity.
9. Examine the field periodically for any pest infestation and consult the plant protection service for adequate treatment.
10. When the crop is ready to harvest (100-110 days), husked ears should be left to dry for a few days. Then, husks are taken off and again ears left to air-dry for 7-10 days. Shelling could be done either by hand or with mechanical shellers. Threshing with a wooden cudgell, as it used to be, should be avoided.

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