

Republic of Yemen
Ministry of Agriculture & Irrigation
Irrigation Development Project
(IDA Credit No.3412-YEM)

**Assessment Study of the Impact of Agricultural
Demonstrations Program on Production and Income
in Zabid and Tuban Valleys**
(Final Report)

Prepared by consultant
Dr. Khaled Qasim Qaid

Oct. 2007

Table of Contents

| | |
|-----------------------------------------------------------------|-----------|
| 1. Executive Summary | 1 |
| 2. Introduction..... | 3 |
| 2-1 Background..... | 3 |
| 2-2 Project Goals..... | 3 |
| 2-3 Importance of the Two Valleys | 4 |
| 2-3-1 Zabid Valley | 4 |
| 2-3-2 Tuban Valley | 4 |
| 2-4 Project Components..... | 4 |
| 2-4-1 Rehabilitation of Spate Irrigation Infrastructure | 4 |
| 2-4-2 Participatory Irrigation Management (PIM) | 5 |
| 2-4-3 The Institutional Component:..... | 6 |
| 2-4-4 The Agricultural Development Component (ADC)..... | 6 |
| 2-5 Justification of ADC | 6 |
| 2-6 ADP Goals | 6 |
| 2-7 Design of ADP's Activities | 7 |
| 2-8 Implementation Design..... | 7 |
| 2-9 Targeted Crops | 8 |
| 2-10 Evaluating Intervention Approach..... | 9 |
| 3. Evaluating the Socio-economic Impact of the IIP | 11 |
| 3.1 Justification | 11 |
| 3.2 Goals of Evaluation | 11 |
| 3.3 Methodology..... | 11 |
| 3-3-1 Preparation and Orientation | 12 |
| 3-3-2 Data Collection..... | 12 |
| 3-3-3 Sampling..... | 13 |
| 3-3-4 Training of Field Researcher..... | 14 |
| 3-3-5 Tools Testing..... | 14 |
| 3-3-6 Data Collection and Field Interviews..... | 14 |
| 3-3-7 Contacting Relevant Agencies | 15 |
| 3-3-8 Data Treatment..... | 15 |
| 4. Results | 18 |
| 4-1 Impact of the ADP on Communities | 18 |
| 4-1-1 Beneficiaries from the ADP | 18 |
| 4-1-2 Areas Covered by the ADP | 19 |
| 4-1-3 Irrigation Systems | 19 |
| 4-1-4 Efficiency of Water Distribution and Irrigation..... | 21 |
| 4-1-5 Crops Structure..... | 24 |
| 4-1-5-1 Crops Structure in Zabid | 24 |
| 4-1-5-2 Crops Structure in Tuban | 24 |
| 4-1-6 Farmers Perspectives of the ADP..... | 28 |
| 4-2 the Impact of the ADP | 31 |
| 4-2-1 Impact of the ADP on Crops Yield | 31 |
| 4-2-1-1 Impact on Productivity of Cotton | 31 |
| 4-2-1-2 Impact on Sorghum (grains, fodders) | 32 |
| 4-2-1-3 The Impact on Production of Maize | 34 |
| 4-2-1-4 Impact of the ADP on Productivity of Sesame..... | 35 |
| 4-2-1-5 The Impact of the ADP on Vegetable Crops | 36 |
| 4-2-1-6 Impact of the ADP on Fruits Crops | 41 |

Irrigation Improvement Project

Assessment Study of the Impact of Agricultural Demonstrations Program on Production and Income in Zabid and Tuban Valleys

| | |
|-----------------------------------------------------------|-----------|
| 4-2-2 Other Impact of the ADP | 47 |
| 4-2-2-1 Introducing Groundnut in Tuban Valley..... | 47 |
| 4-2-2-2 Introducing the Sunflower Crop in ZAbid..... | 47 |
| 4-2-2-3 Impact of Program on Livestock..... | 47 |
| 4-2-2-4 Created Jobs | 48 |
| 5. Problems and Difficulties | 50 |
| 6. Recommendations and Suggestions | 52 |
| 7. Appendix no. 1 Questionnaire | 54 |
| 8. Appendix no. 2 The study team | 64 |
| 9. Appendix no. 3 photographic Documentation | 65 |
| 10. Appendix no. 4 List of Interviewers | 78 |

List of Tables

| | |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Table no. 1: Beneficiaries Organizations in Zabid and Tuban..... | 5 |
| Table no 2 Technologies targeted by the ADC (2004-2007) and activities targeted by evaluation | 9 |
| Table no. 3: Study sample distributed across areas . خطأ! الإشارة المرجعية غير معرفة. | |
| Table no. 4: Number of families benefiting of project services and components | 18 |
| Table no. 5: Areas covered by the ADC and the ADP | 19 |
| Table no. 6: Crops structure and increase in planted area in both valleys before and after the implementation of the ADP | 25 |
| Table no. 7: Adoption average of technologies among participants in the sample in both valleys | 29 |
| Table no. 8: Adoption Indicators of farmers participating in the ADP (sample based)..... | 30 |
| Table no. 9: Adoption Indicators of non- participating farmers in the ADP | 30 |
| Table no. 10: Productive of Cotton | 32 |
| Table no.11: Impact of the ADP on production and revenue of sorghum grains..... | 33 |
| Table no.12: Impact of the ADP on production and revenue of sorghum fodders | 34 |
| Table no. 13: Impact of ADP on production and revenue of maize .. | 35 |
| Table no. 14: Impact of ADP on production and revenue of sesame | 36 |
| Table no. 15: Impact of ADP on production and revenue of tomatoes | 37 |
| Table no. 16: Impact of ADP on production and revenue of onion... | 38 |
| Table no. 17: Impact of ADP on production and revenue of okra | 39 |
| Table no. 18: Impact of ADP on production and revenue of chilli | 40 |
| Table no. 19: Impact of ADP on production and revenue of chilli | 41 |
| Table no. 20: Impact of ADP on production and revenue of mango. | 42 |
| Table no. 21: List of Interviewers in Wadi Zabid | 78 |
| Table no. 22: List of Interviewers in Wadi Tuban | 83 |

List of Figures

| | |
|-----------------------------------------------------------------------------------------------|-----------|
| Shape no. 1: Distribution of sample between the two valleys..... | 13 |
| Shape no. 2: Distribution of sample according to location of farmers | 16 |
| Shape no. 3: Distribution of sample according to participation | 16 |
| Shape no. 4: Distribution of sample according to irrigation system.. | 20 |
| Shape no. 5: Irrigation systems in Zabid valley..... | 20 |
| Shape no. 6: Membership in beneficiaries Association..... | 20 |
| Shape no. 7: Farmers perspectives about improvements in flood irrigation systems | 23 |
| Shape no. 8: Types of improvement in flood irrigation systems | 23 |
| Shape no. 9: Crops structure (Zabid Valley | 26 |
| Shape no. 10: Crops structure (Tuban Valley | 26 |
| Shape no. 11: Average productivity for cereal crops in Zabid Vally (kg/ha) | 43 |
| Shape no. 12: Average productivity of sorghum grains in Tuban valley (kg/ha) | 43 |
| Shape no. 13: Production average of cash crops in Zabid valley (kg/ha) | 44 |
| Shape no. 14: Production average of cash crops in Tuban valley (kg/ha) | 44 |
| Shape no. 15: Production average of vegetable crops in Zabid valley (kg/ha) | 45 |
| Shape no. 16: Production average of vegetable crops in Tuban valley (kg/ha) | 45 |
| Shape no. 17: Production average of mango crops in Zabid valley (kg/ha) | 46 |
| Shape no. 18: Production average of mango crops in Tuban valley (kg/ha) | 46 |
| Shape no. 19: Project impact on livestock in targeted area..... | 48 |
| Shape no. 20: Project impact on jobs | 49 |

1. Executive Summary

This report presents the main findings of the study carried out to assess the impact of the Agricultural Demonstrations Program (ADP) on production and farmers' income in Zabid and Tuban valleys. The project was funded by the International Development Association (IDA)—Credit No.3421—and implemented during the period (2004-2007) by the Irrigation Improvement Project (IIP) in collaboration with the Agricultural Research Authority (ARA) and the Public Corporation for Agricultural Services (PCAS).

The report contains an overview of the IIP, the Agricultural Development Component (ADC), the ADP, and project goals and areas. It also includes a brief description of the ADP's implemented activities, technologies covered, and the most important training sessions, meetings, field visits, and awareness raising programs.

The report includes an appraisal of indicators used to evaluate the social and economic impact of the use of technologies on production and farmers' income, goals of the study of the impact of the use of agricultural technologies between (2004-2007). The study methods, approaches, sampling, and data collection means are also addressed.

The report discusses the impact of the ADC and the ADP on targeted communities in terms of number of beneficiaries, areas covered, improvements in the irrigation and distribution systems. The project's contribution to the establishment of beneficiaries associations in both valleys, changes in the structure of crops production, dissemination to and farmers adoption of technologies targeted by the program, farmers perspectives on the impact of the program on their communities, are all discussed.

The report analyzes the impact of the ADC and the program as a whole on agricultural activities in rural areas in terms of economic importance of targeted crops, the impact on crops productions, and subsequently, on income.

Indicators of economic analysis of the sample confirm that the introduction of enhanced agricultural technologies has led to an increase in the annual production and revenues across planted areas in both valleys, and for various crops. This has been the case whether irrigation relied on flood or wells water.

To ensure sustainability of the introduced technologies, the report identifies main obstacles faced by framers in the course of utilizing modern agricultural technologies introduced by the ADP. It also discusses the most important suggestions and recommendations, which are related to the availability of

agricultural inputs, pricing of crops, modernization of irrigation facilities, and the necessity of expanding the ADP activities to other governorates.

The study results include some indicators of improvement in agricultural income in targeted areas. The most important indicators are the increase in productivity of each planted unit, net agricultural income, the average income of farmers from planted products and from livestock, improvement of farmers' expenditures in targeted communities on health, education, and other services.

The study shows that the average productivity of a hectare (ha) of cotton in fields covered by the ADP is 1802 kg/ha compared to an average of 1212 kg/ha using technology base. This means the production has increased by 49% under the ADP. Also, the study results show an average productivity of sorghum of 828 kg/ha of grain sorghum, and 8803 kg/ha of fodder, with an average increase of 34% for grain sorghum and 27% for fodders.

As to maize productivity in Zabid valley, it increased from 803 kg/ha in fields using the technology base to 1344 kg/ha in fields covered by the ADP. This means the average productivity under the ADP is higher by 67.4% than the average under technology base.

The study results indicate that the average production of a ha of sesame with the program intervention is higher than the average using base technology with an average of 53%.

The results show that the average production of tomatoes under the ADP is about 18108 kg/ha with an increase of 6946 kg/ha—62%—over the production in fields using base technologies. Also the average production for a hectare of onion under the ADP is about 25847 kg/ha with an increase of 10940 kg/ha—73%.

Among other effects of the ADP is the introduction of groundnuts crop in Tuban and the sunflower crop in Zabid valley. When comparing the productivity of groundnuts under the ADP with that under technology base in areas irrigated with flood water, the study found that the average productivity under technology base was only 600 kg/ha, and increased to 960 kg/ha under the ADP, with an increase of 60%. As to sunflower, the results indicate that the average productivity under the ADP reached a level of 2400 kg/ha.

The study results indicate the existence of a positive impact in targeted areas where the size of ownership of livestock by those participating in the study sample increased under the ADP over the level achieved using the technology base. The number of farm animals increased from 2849 to 3977 with an increase of 40%. The study results indicate that the program has led indirectly to improvement of farmers' income by creating more opportunities for work.

2. Introduction

2-1 Background

The agricultural sector (AS) in Yemen is considered one of the building blocks of the national economy. More than half of the country's population directly relies, for their basic food needs, on the AS. The AS's exports represent an important source for hard currencies, which are badly needed for funding economic development plans. The AS employs around 3 million worker—more than 55% of the labour force.¹ It also consumes around 3.1 billion—91%--of the country's 3.4 billion cubic meter of the annually renewed water resources.² Between 1995 and 2005, the investment in the AS reached around 27.3 billion Yemeni Rial (YR)—3.4% of total investment—which is estimated at 812.5 billion YR. The AS's contribution to the GNP in 2005 was estimated at 61.8 billion YR—20.9% of the GDP, which is estimated at 295.5 billion YR for the same year.

The developmental goals in the AS seek to achieve food security, fight poverty, and ensure sustainability of growth. Strategic policies adopted in the AS seek to increase cereal and livestock production, and subsequently, to increase revenues generated from rainfall irrigated areas. The IIP is part of the government's effort to fight poverty. From the onset, the IIP sought to effectively mitigate the negative consequences of financial, administrative, and economic reforms. The project has been assigned tasks such as securing, transporting, and distributing flood water to beneficiaries in Zabid and Tuban valleys in an efficient and sustainable manner. The IIP seeks to achieve its goals by rehabilitating the irrigation structure system.

2-2 Project Goals

The IIP seeks to achieve the following goals in its first stage:

- Improvement of the water distribution and efficiency of conveyance and use in two spate irrigation schemes in Tuban and

¹ The Ministry of International Development and Cooperation, the Central Organization for Statistics, the Annual Statistics Books.

² The Ministry of Water and Environment, *the National Strategy and the Investment Program for Water Sector 2005-2010*.

Zabid valleys through the development of sustainable system of participatory irrigation management.

- Increase agricultural production and farmers' income through implementation of an intensive on-farm demonstration program.

2-3 Importance of the Two Valleys

2-3-1 Zabid Valley

Zabid valley is 140 km long and the planted area in the valley is estimated at 17 thousand ha—75.2 of a fertile area of 22.6 thousand ha. The irrigated areas are about 15 thousand ha while the acquisition average is about 1.5 ha. The annual flow of the valley is about 135 million cubic meter. The flow comes from an area estimated at 4450 square km with an annual average of precipitation of 550 mille litter.³

2-3-2 Tuban Valley

The Tuban valley occupies the largest part of Lahj governorate. The Tuban valley splits into two streams beneath Al-zaidah village in the north of Al-hotah city. The two parts are: Al-sagheer valley—also known as Obar Luzan or Luzan valley—and Al-Kabeer valley. The Al-sagheer valley passes through Al-Imad area north east of sheik Otthman, and in Aden city before pouring into the Abbyan beach or into the Aden sea in flood times. Al-Kabeer valley, which split from the main valley several miles to the south of Al-zaidah village, flows into Aden sea close to Al-hasswah. The two valleys feed several canals called Abbr which split into sub canals benefiting around 8302 farmers responsible for 13 thousand family. The Lahj valley delta—also called Tuban delta—includes an area of 5600 skm between the two branches.⁴

2-4 Project Components

2-4-1 Rehabilitation of Spate Irrigation Infrastructure

This component includes:

- Rehabilitation and improvement of transferring barriers, irrigation channels, and controlling gates.

³ The Ministry of Agriculture and Irrigation, Irrigation Department, *Steps on the Way: Facts and Figures*, Vol. 2, Issue 4, 2005.

⁴ Agricultural Research Authority (ARA), *Guidance for Usage of Water and Soil in the Southern Coastal Areas*, Jan. 2006.

- Implementation of village and valleys ends protection from potential flood damages.
- Rehabilitation and improvement of agricultural roads in the ADP areas.

2-4-2 Participatory Irrigation Management (PIM)

This component includes:

- Establishing and strengthening beneficiaries' groups and associations at different irrigation facilities and the provision of technical support and training to enable these organizations to administer and take responsibility of irrigation facilities located in their areas of operation. The IIP supported the beneficiaries' associations in Zabid and Tuban valleys as follows:

| Valley | Tuban | Zabid |
|----------------------------|-------|-------|
| Organizations | | |
| Beneficiaries' groups | 230 | 213 |
| Beneficiaries Associations | 16 | 16 |
| Irrigation Councils | 1 | 1 |

Source: The ADP reports

- The establishment of information management systems (GIS, MIS) which includes data related to villages, population centres, and irrigated fields. The IIP also gathered information about types ownership, rented lands, and the number and depth of dogged wells in these areas.
- The IIP carried out awareness-raising campaigns for beneficiaries about the project and its goals.

2-4-3 The Institutional Component:

This component includes:

- Providing technical support for state institutions working on water and irrigation issues to enable them to change the currently centralized flood irrigation management system and adopt a decentralized participatory management system.
- Implementation of several technical and legal studies about issues related to irrigation.
- Creating a project management unit (PMU) and two executive units in Zabid and Tuban valley.

2-4-4 The Agricultural Development Component (ADC)

The IIP adopted several policies and strategies aiming at achieving economic development in agricultural communities through the use of participatory method. The IIP relied on the ADC and—in particular on Agricultural Demonstrations Program (ADP)—to achieve the increase in yields and in farmers' income. The ADP was used to disseminate new agricultural technologies to as many farmers as possible.

2-5 Justification of ADC

Results of various studies in the AS, especially those evaluating production, point out several problems serving as obstacles to development of production. Those problems, the studies confirm, result from failure to fully implement programs concerned with the basic needs for development in the AS such as:

- Low productivity of cash crops and cereals.
- Increase of production cost of crops and weak competition capacity.
- Unavailability of agricultural inputs
- Weakness of marketing techniques

2-6 ADP Goals

The ADP is one of the programs implemented by the IIP which contributed to the following:

- Improvement of the efficiency of water irrigation systems.

- Improvement and enhancement of crops yields under prevalent agricultural systems, tackle prevalent problems, enhance communities capacity to conserve agricultural and environmental resources through the use of advanced technologies, and consequently increase income of local communities. These goals were to be achieved through awareness and guidance campaigns.

2-7 Design of ADP's Activities

The drafting and design of the ADP activities was conducted according to the following principles:

- The IIP's original document about the project and its goals
- Strategies and policies formulated by the Ministry of Agriculture and Irrigation (MAI) and related to vertical expansion.
- Achieving sustainable growth through community participation and ownership of technologies and means.
- Economic and technical considerations related to horizontal expansion through:
 - Increase in conveyance efficiency of water flow, thus bringing faster water flow and allowing planting of land in suitable times.
 - Implementation of intensive agriculture which can benefit from research technologies

2-8 Implementation Design

The ADP, seeking to achieve the developmental goal, adopted the following methods:

I. Benefiting from research to achieve the needed changes in agricultural communities and disseminating ideas and technologies:

- Technology transfer
- Beneficiaries' participation in planning, testing, and evaluation of technologies
- The establishment of a development model to help in administering, planning, and implementation of demonstrations
- Searching for funds to farmers from donors and decision makers

II. Prioritization of problems relating to production and productivity for each crop, and ways to mitigate the impact of those problems.

III. Awareness-raising, guidance campaigns, and the evaluation of the spread and adoption of technologies according to a program that facilitate farmers participation in the evaluation process.

The IIP implemented the ADP through eligible contractual services between the Project Management Units (PMU) and qualified local public and private sector institutions using World Bank guidelines. The IIP selected, through tendering, the Agricultural Research Authority (ARA) to implement the program at Zabid and the Public Corporation for Agricultural Services (PCAS) to implement the program at Tuban valley.

The ARA and the PCAS followed the generalized rapid impact in the implementation of the program, which emphasizes stakeholders' participation. The goal of adopting this methodology was to widely spread several agricultural technologies in both valleys, encourage farmers to use these technologies on constant basis so that they can increase production and income and as a result improve their living conditions.

2-9 Targeted Crops

The ADP targeted crops structure in each valley to achieve the goal of planting each crop:

- Cash crops such as cotton
- Cereals crops—sorghum (grains and fodders) and maize.
- Oil crops such as sesame and groundnut
- Vegetable crops (onion, tomatoes, okra, and chilli)
- Fruit crops (mango, lemons)

The ADP sought to enhance production and increase farmers' income through the use of demonstrations of new technologies in farmers' fields. Table no. 1 depicts the targeted technologies by the ADP and activities that will be assessed.

2-10 Evaluating Intervention Approach

The ADP design of intervention approaches was appropriate and based on main agricultural problems. The ADP used the following criteria:

- Main prevalent agricultural crops in each valley
- Technical difficulties faced by farmers in each valley
- Easiness of implementing technologies by farmers
- Faster and greater impact of technologies
- The inclusion of accompanying activities such as training and awareness-raising
- Involving representatives of beneficiaries organizations in the implementation of the ADP activities.

| Table no. 2: Technologies targeted by the ADP during the three seasons (2004/2005, 2005/2006, 2006-2007) | | |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Crop | Technologies and activities | Accompanied programs and comments |
| Cotton | Improved seeds (Acala. S.J.2) | Protection of crop in the valley including the use of basic seeds, improved seeds and treated |
| | Application of Economic Fertilizer (urea and phosphates) | |
| | Crop management | Crop management through timing, intensification, planning and removal of other plants |
| | Pesticides | The use of pesticides for twice |
| Sorghum grain | Improved seeds Treated seeds Application of Economic Fertilizer (urea and phosphates) | — |
| Sorghum fodder | Treatment of seeds Application of Economic Fertilizer (urea and phosphates) | — |
| Maize (Zabid only) | Introduction of City Lagos Application of Economic Fertilizer (urea and phosphates) | Crop protection program |
| Groundnut (Tuban only) | Crop management under flood irrigation Reintroducing the crop after a long period of abandonment Crop management | — |
| Sesame | Plant protection Phosphate fertilizer | Gathering post-harvest waste |
| Vegetables | Pesticides Balanced fertilizer | Leaf fertilizing |
| Fruits | Trees' management (fertilizing, pesticides, and trimming) | Distributing commercially popular varieties Immunization training |
| Water Technologies | Collecting of basic information about farmers practices under different schemes and determination of the efficiency degree | Activity |
| Sunflower (Zabid only) | Introducing the crop to the valley and orienting the farmers about it | |

3. Evaluating the Socio-economic Impact of the IIP

3.1 Justification

The ADP, in its first stage, completed almost three years. During these seasons, the IIP implemented 17 activity, disseminated agricultural research technologies, and encouraged farmers to use technologies in solving priority problems. Some of the ADP programs started in 2004 and most of the programs started during the period 2005-2007. It was therefore necessary to assess the socio-economic impact of the ADP on rural communities and its contribution to poverty reduction and the improvement of living conditions.

3-2 Goals of Evaluation

The goals of evaluating the impact of agricultural technologies introduced by the IIP (2004-2007) to farmers in Zabid and Tuban valleys, as outlined in the TORs, are as follows:

- Evaluating indicators of adoption and spread of technologies in targeted areas.
- Evaluating the impact of the use of technologies on production of targeted crops.
- Evaluating the economic impact of the use of technologies in comparison with farmers' methods (the technology base) for targeted crops.
- Evaluating perspectives of targeted groups about the use of these technologies.
- Evaluating the general impact of applying these technologies on production stability in targeted valleys.

3-3 Methodology

The suitable methods and data collection means to implement the evaluation were selected based on the TORs detailed tasks, the revision of all documents, reports, and relevant studies, and data related to the ADC and the ADP in the two valleys. In addition, a tentative scheme of the potential socio-economic impact was drawn. For example, the following were some of the potential impact:

A. Getting new agricultural services that were not available before. Those services are expected to have contributed to the enhancement of methods for water distribution, increase in productivity, crop revenue, and sustainable increase in farmers' income. Likewise, training and empowerment of communities was expected to improve the living conditions in the long run.

B. The employment of the newly earned income would lead to improvement in living conditions for families, enhancement of food nutrition and close levels, and purchase of school stationery, ... etc, especially when income is used reasonably and not wasted on the consumption of Qat for example.

C. Creation of new jobs for the unemployed or underemployed in the agricultural activities would lead to direct increase in income.

The consultant followed the following steps to execute the study :

3-3-1 Preparation and Orientation

The consultant followed these steps:

- Collecting and revising all project documents, follow-up and periodical reports, previous studies, expected outputs and results, progress reports...etc. The secondary information relating to the number of beneficiaries of activities implemented by the IIP in its first stage (2004-2007) was collected. In addition, the survey questionnaire was obtained in order to identify variables and indicators used and to test its suitability for measuring potential changes.
- Selection of evaluation indicators, means for data collection, and preparation of research tools needed for the collection of needed information.

3-3-2 Data Collection

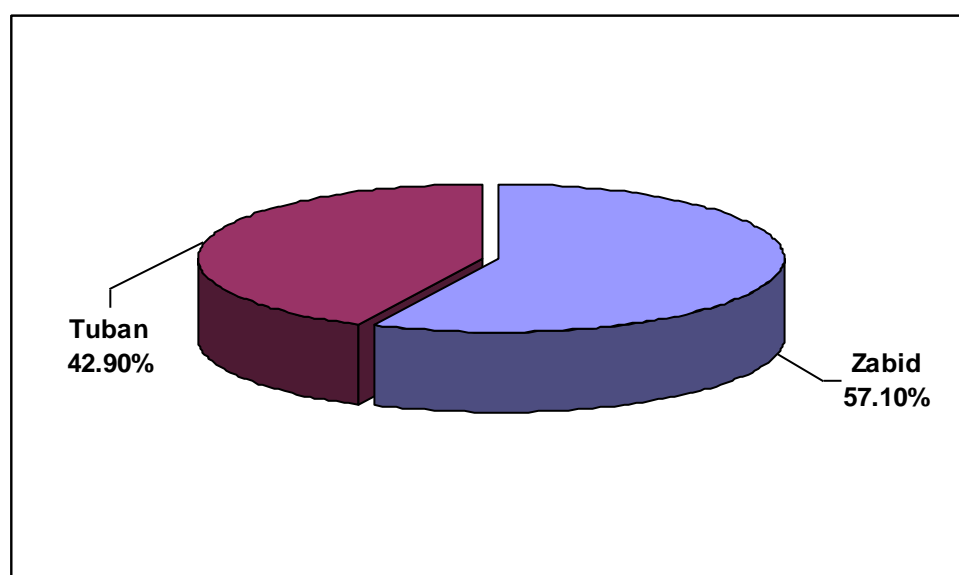
The consultant designed and prepared the data collection form to be used in gathering data from beneficiaries specified in the TORs and on issues related to the assessment of the impact of the project. The form was discussed with the IIP's administration for comments and suggestions. It was then revised based on comments and suggestions. The heads of the study's research teams took part in this step.

3-3-3 Sampling

The field surveys were carried out in Hodeidah and Lahj governorates. In Hodeidah, three districts were selected: Zabid, Al-grahy, and Al-Tuhaita which are located in Zabid valley. Several areas were selected representing the upper, the middle and the lower stream. The selection was made based on the 16 beneficiary association formed with the support of the project. In Lahj governorate, the study was carried out in Tuban district and in the targeted valleys of: Al-kabeer valley, Al-sagheer valley, and Al-Athem valley. Several villages were selected in the upper, middle and lower parts of the valleys based on the 16 association formed with the support of the project.

Random sampling was employed to select a sample of beneficiary in each valley. The size of the sample was 310 farmers—about 1% of the study population. The number of farmers surveyed in Zabid valley is 177 and the number of those surveyed in Tuban valley is 133. The sample was drawn from the upper, middle, and lower parts of each valley.

Shape no. 1: Distribution of sample between the two valleys



The sample was determined based on the following criteria:

- Half of the sample is farmers participating in the ADP for any targeted crop and in any of the three seasons of the program period.
- Representation of prevalent agricultural systems: flood irrigation and stable irrigation
- Representation of crops areas.
- Half of the sample—those who did not participate in the ADP—are randomly questioned in targeted areas while taking into account crops varieties and the irrigation system.
- The survey result should represent one of the ways for evaluating the impact of the ADC and consequently the developmental goals of the project.

3-3-4 Training of Field Researcher

The field researchers were trained on data collection, the importance of obtaining information and the types of information needed, the goals of the project and of the evaluation, data collection methods and tools, and ways to ask questions and to take notes. In addition, some exercises relating to interviews, discussions, and note-taking were carried out to ensure that field researchers do fully understand the process. The common mistakes—which occur during data collection, questionnaires' completion, and discussions—were discussed.

3-3-5 Tools Testing

The data collection tools were tested using a small sample of farmers in Tuban valley. The goal was to ensure that the questionnaire's design and language are clear enough and to measure the time needed to execute each task. Those surveyed in the testing stage were not part of the sample of the actual study. The problems revealed during the testing stage were solved and the questionnaire was altered accordingly. The tools testing took two days and a third day was devoted to the analysis of the test results with the researchers. All questioners and forms were reviewed with and approved in every stage by the IPP.

3-3-6 Data Collection and Field Interviews

All questioners and data collection forms were prepared and handed over to research teams according to the size of the sample covered by each team and in every valley. The consultant, in collaboration with the PMU and directors of the executive units in targeted areas, contacted the

relevant parties to inform them of the arrival of research teams, targeted areas for each team, and the timetable. This was done before the teams travel to their assigned areas. The field research teams' travel to their place of work equipped with valleys maps. The process of data collection started on Sep. 4 , 2009.

Tables no. 4 (and shape no. 2) presents the distribution of the study sample across areas in the two valleys. Shape no. 3 exhibits the distribution of the sample according to farmers participation in the ADP. In its turn, table no. 3 presents the distribution of farmers included in the sample according to membership in beneficiaries' associations.

3-3-7 Contacting Relevant Agencies

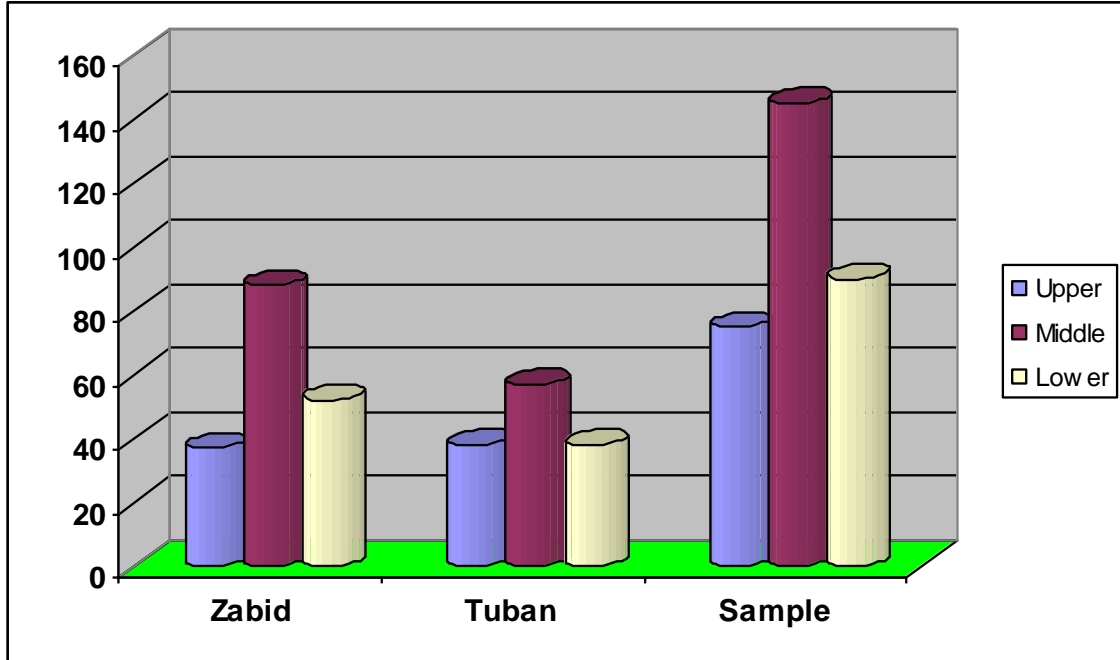
The consultant contacted several relevant agencies, including the ARA represented by the head of the consultant team responsible for the implementation of the program in Zabid valley, and the PCAS, and members of irrigation councils in Zabid and Tuabn valleys. A direct contact was also made with the executive unit in each valley.

3-3-8 Data Treatment

The data was daily reviewed in the field by the heads of research teams and before leaving locations to ensure that all needed data is properly collected. A desk review of the data was also carried out to ensure preciseness before keying it to the computer.

The data was analyzed using a statistical program (SPSS V.11) prepared for social scientists, and the EXCEL program. The consultant selected the programs to fit the socio-economic variables being measured. Descriptive statistical measures, such as percentages, the mean, the maximum and the minimum levels, and variance. The number of variables included in the questionnaire is 158. Some variables are quantitative and others are qualitative. The consultant designed an SPSS sheet for data that allows the performance of statistical analysis of variables.

Shape no 2: Distribution of the Sample According to Participation



Shape no. 3: Distribution of the Sample according to participation

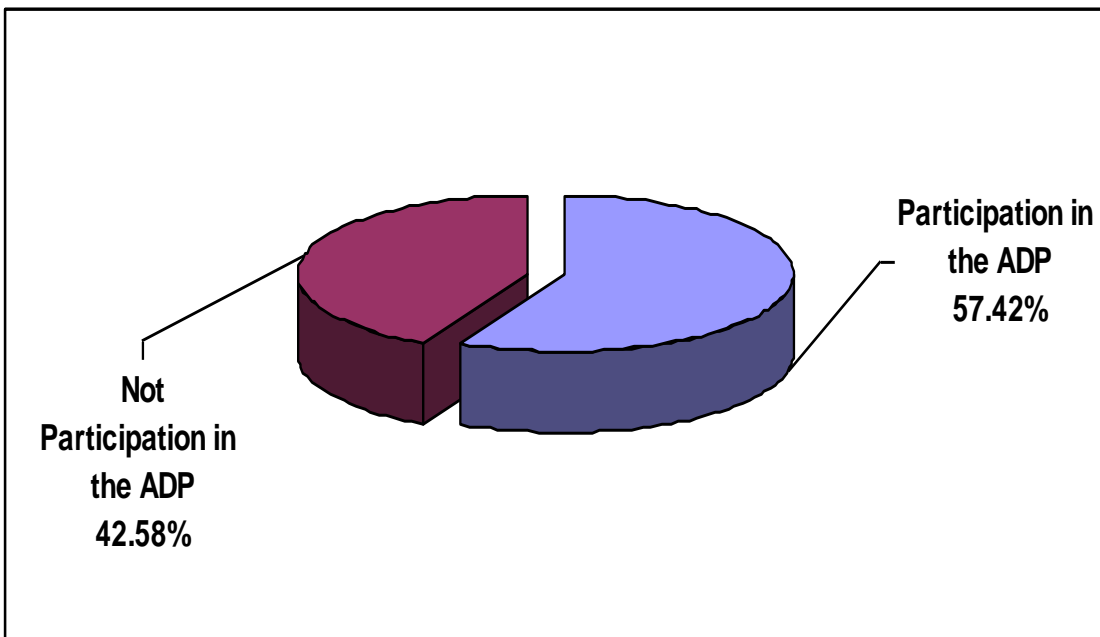


Table no. 3: Distribution of sample according to farmers and associations' areas

| Zabid Valley | | | | Tuban Valley | | | |
|---------------------|---------------------|----|-------|---------------------|---------------|----|-------|
| Location | Association | # | % | location | Association | # | % |
| Upper | Al-Buny & Albary | 8 | 20.90 | Upper | Al-Sadain | 17 | 36.84 |
| | Al-raodah/Al-garbah | 20 | | | Al-arrais | 12 | |
| | Al-ryan | 9 | | | Rass Al-waddy | 20 | |
| Middle | Al-bakar | 19 | 48.60 | Middle | Middle Area | 10 | 35.34 |
| | Al-grheezy | 5 | | | Baizag | 4 | |
| | Al-greeb | 1 | | | Valig Ayad | 19 | |
| | Al-abree | 9 | | | Valig Alnonoo | 5 | |
| | Al-mawry | 18 | | | Al-hathirm | 5 | |
| | Al-mansoory | 12 | | | Al-thalab | 4 | |
| | Al-nassairy | 9 | | Lower | Mujahid | 3 | 27.82 |
| | Al-yousufi | 13 | | | Al-wahat | 3 | |
| Lower | Al-sharabi | 14 | 30.50 | | Al-ryadh | 8 | |
| | Al-beerah/harim | 31 | | | Al-farzah | 23 | |
| | Al-mahriqi | 9 | | | | | |

4. Results

4-1 Impact of the ADP on Communities

The assessment of the socio-economic impact contains two levels: the sample level (the micro level), which relies on data collected through field survey; and the macro level, which depends on data gathered gathered by the IIP, and encompasses all activities implemented during the period 2004-2007. This part focuses on evaluating the project performance and impact using the macro level data.

The field survey was executed in Sep. 2005, and covers 177 farmer in Zabid valley and 133 farmer in Tuban valley. The questionnaire included specific questions about the impact of the ADP. Below are the results of analysis and the most important indicators.

4-1-1 Beneficiaries from the ADP

The number of families benefiting from activities and services provided by the IIP in its first stage is estimated at 64105 families: 49784 in Zabid and 14321 in Tuban. The number of direct beneficiaries is estimated at 434490 inhabitants; 49% females and 51% males. The number of agricultural families targeted by the ADC and the ADP about 2800 of families living in 278 villages and encompassing 19 thousand farmers.

Table no. 4 exhibits the number of beneficiaries of the project services in Zabid and Tuban valleys.

| Valley | District | No of families | Population | | |
|--------|-----------|----------------|------------|--------|--------|
| | | | Male | Female | Total |
| Zabid | Al-garahy | 14913 | 48713 | 49572 | 98285 |
| | Zabid | 24060 | 87183 | 84318 | 171501 |
| | Al-tohyta | 10811 | 38653 | 35911 | 74564 |
| Tuban | Tuban | 14321 | 46690 | 43450 | 90140 |
| Total | | 64105 | 221239 | 213251 | 434490 |
| % | | | 51 | 49 | 100 |

Source: General census of the 1994

4-1-2 Areas Covered by the ADP

After three seasons, the size of areas covered by activities of the ADP is 4005 ha; 1990 ha in Zabid and 2015 ha in Tuban. Table no.6 presents areas in which demonstrations were implemented.

| Table no. 5: Areas covered by the ADP | | | | |
|----------------------------------------------|-----------|-----------|-----------|-------|
| Years | 2004/2005 | 2005/2006 | 2006/2007 | Total |
| Zabid Valley | 390 | 800 | 800 | 1990 |
| Tuban Valley | 615 | 700 | 700 | 2015 |
| Total | 1005 | 1500 | 1500 | 4005 |

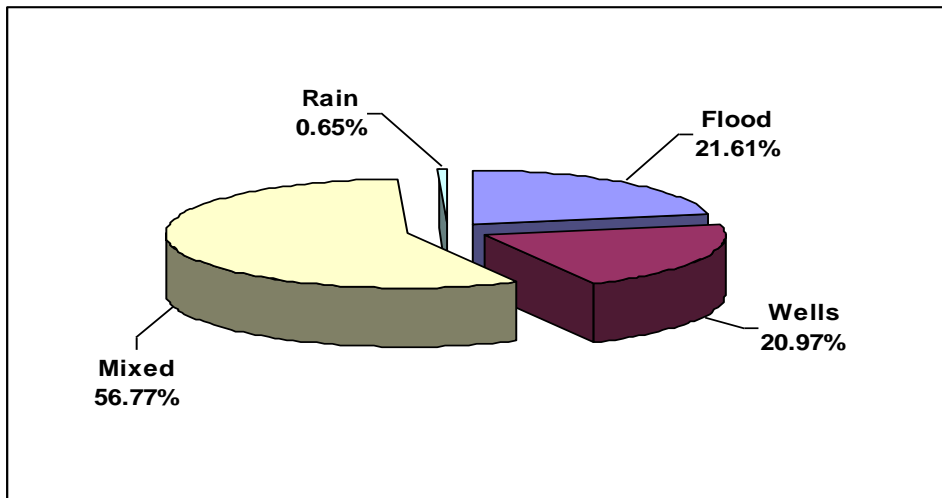
4-1-3 Irrigation Systems

The irrigation system implemented in Zabid is traditions-based and goes back to more than 750 years back (Ismail Al-Giberty). The current irrigation system in Tuban represent an extension of the traditional irrigation systems and to rules agreed on in the 1950s (Sultan Al-Abdaly's law). Flood irrigation in both valleys is distributed according to the rule of the upper and the upper. Flood distribution in Tuban is more equitable. After the first round of irrigation, flood goes to the next on the valley. In Zabid valley, the same farm can get its share of flood water after each period of water stream vanishing.

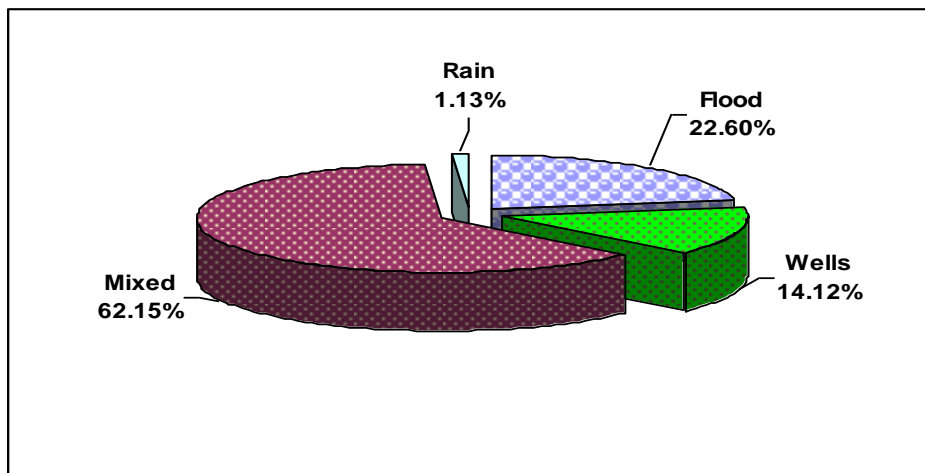
The study results indicate that 22% of farmers in Zabid use flood irrigation, 14% of them use well irrigation, 63% depends on a complementary irrigation system, which combines both systems, and 1% depends on rainfall. In Tuban valley, 21% use flood, 30% use wells, and 49% use both systems. Shapes 4 and 5 illustrate irrigation systems used by the sample in both valleys.

The ADP selected representatives from water beneficiaries' associations and trained them as future guiders to farmers. These beneficiaries associations are responsible for the management and distribution of water resources. The study found that 80% of the sample are members of these associations and the rest of sample (20%) who are not currently members expressed interest in joining these associations (See shape no. 6).

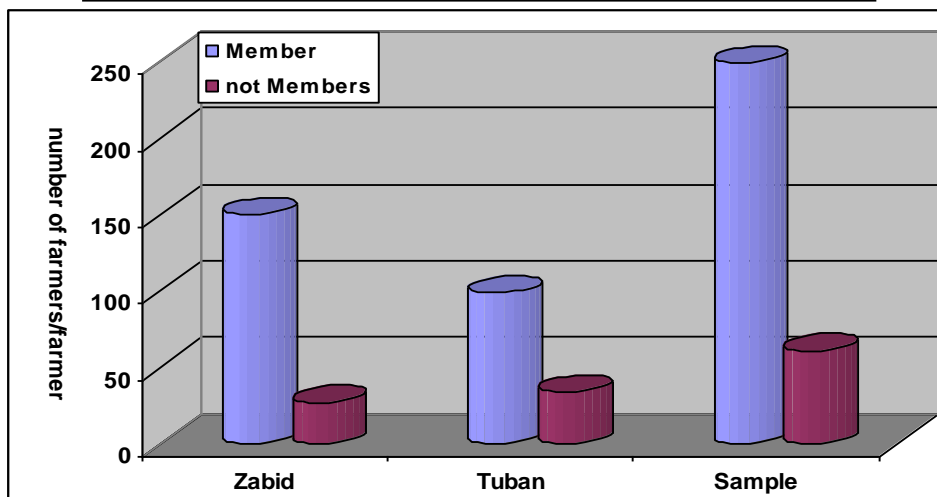
Shape no. 4: Distribution of sample according to irrigation



Shape no. 5: irrigation system in Zabid Valley



Shape no. 6 membership in beneficiaries Association



4-1-4 Efficiency of Water Distribution and Irrigation

The ADP sought to increase the productivity of agricultural crops using the same quantity of water or less (More Crop Per Drop). Generally speaking, the program succeeded in achieving this goal. The IIP through the ADP has been able to increase the productivity of targeted agricultural crops using the same amount of water used under base technology. This has been the case for all introduced technologies and for all crops except the sunflower which is introduced to Zabid valley for the first time. Some of the program techniques, such as the technique of planting cotton, reduced the amount of water used under base technology by 25-30%. The IIP took several steps to introduce modern irrigation systems within a strategy of creating demonstration farms.

Box no. (1): The Role of the IIP in organizing irrigation

The president of the Al-raodah/Al-hurryah Association said that the irrigation process is now more stable thanks to efforts made by the IIP. He suggests the completion of barriers in canals to achieve further improvement in the distribution systems. He also thought that the intensification of demonstrations and their dissemination to various areas in the country is important.

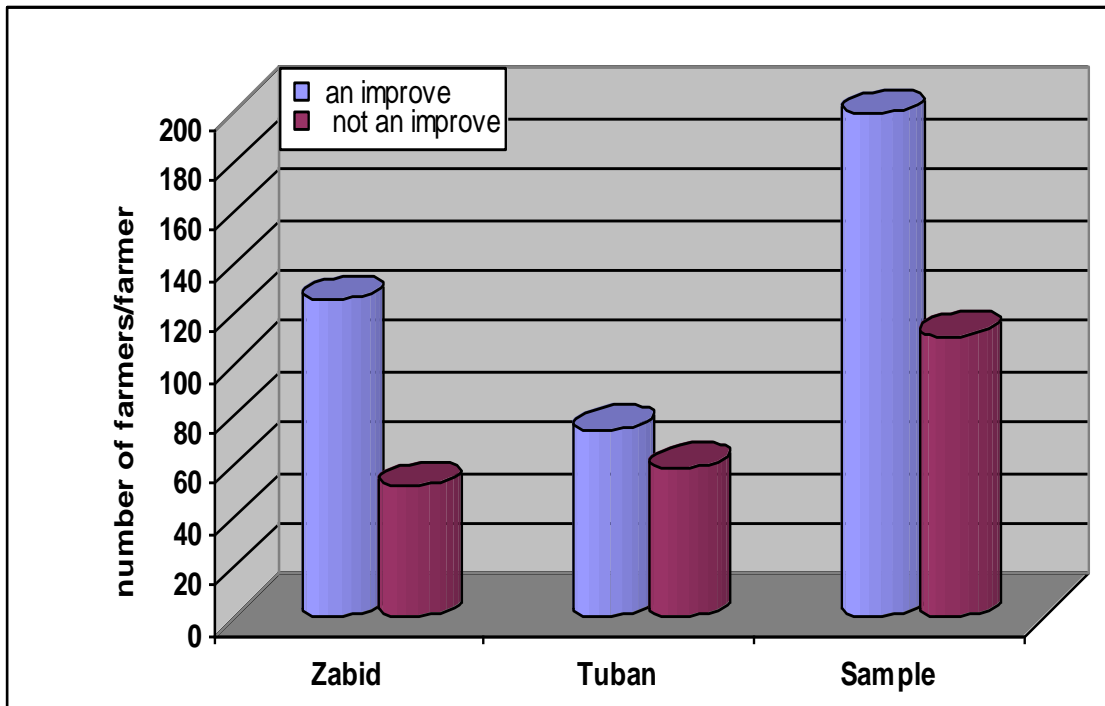
The IIP sought through the ADP to collect data about farmers' traditional practices relating to water use in irrigation. In particular, the IIP sought to collect data relating to efficiency of the use of water under both flood and well irrigation systems. The ADP, therefore, ensured the existence of some specialized staff to familiarize farmers with developed irrigation systems.

To measure the impact of the program on water management, a question about the extent to which the water distribution system had improved was asked. The answers to the question reveal that 64% of farmers think there is an improve while 30% think there is not. In Zabid valley, 70% of farmers thought there is an improve while 30% there is not (see shape 7). At the sample level, the most important improvements are the creation and rehabilitation of facilities, improvement in water organization, management, distribution, cleaning of canals, and water availability (see shape 8).

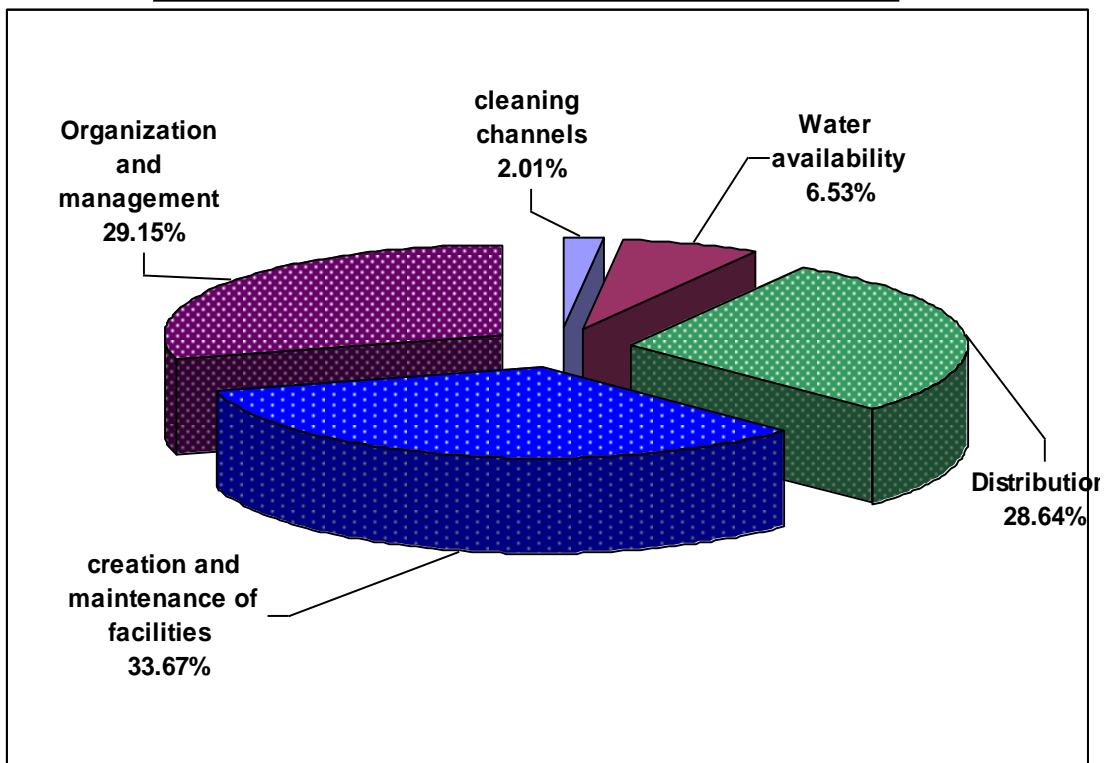
The increase in the percentage of farmers, who think there is an improvement in flood water distribution in both valleys goes well with the first goal of the project, which is the enhancement of efficiency of irrigation and distribution facilities in both valleys, through the rehabilitation and improvement of irrigation facilities and the involvement of beneficiaries in the management of these facilities.

It is worth noting, however, that farmers—according to studies carried out by the IIP on irrigation water management in Zabid and Tuban valleys— still add quantities of water that exceed recommended by Agricultural Research Authority, especially for vegetable crops and fruit trees.

Shape no. 7: farmers perspective about improvement in flood irrigation system



Shape no. 8: Type of improve in Flood irrigation



4-1-5 Crops Structure

4-1-5-1 Crops Structure in Zabid

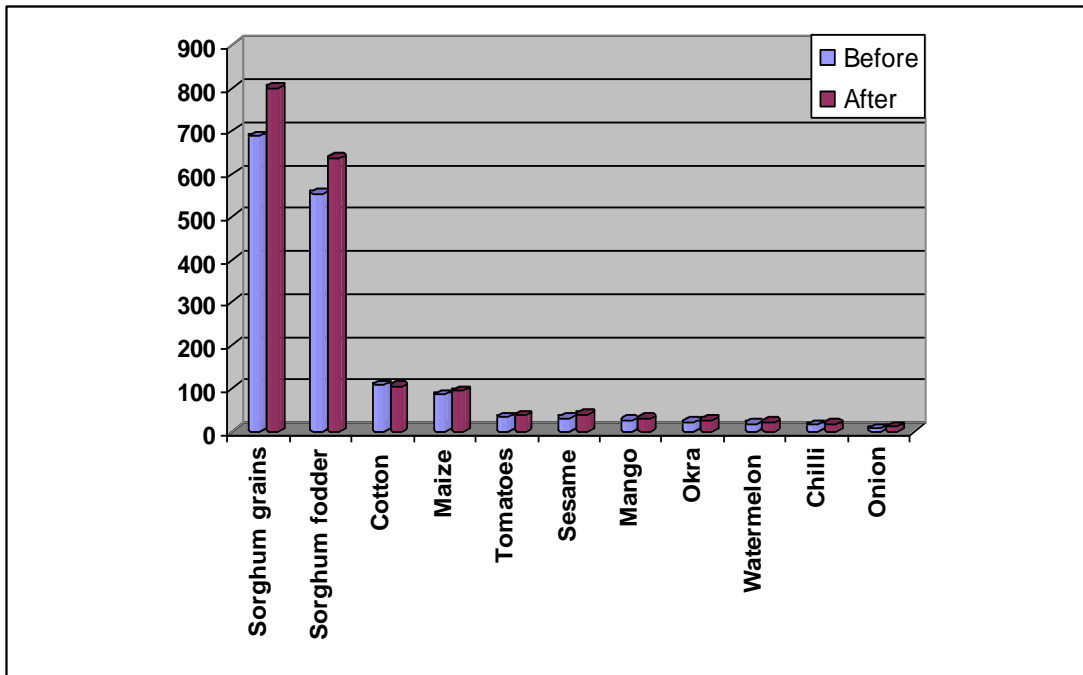
The results of sample analysis reveal that the sorghum grains crop occupies the top of the list of crops in Zabid valley before and after the implementation of program activities. The sorghum fodder occupies the second rank followed by cotton, maize, tomatoes, sesame, mango, okra, watermelon, chili, and onion. Table no. 6 shows that the area planted with okra, sesame, mango, and sorghum grain increased after the implementation of the program in comparison to its previous status by 31.5%, 21%, 18.3 %, 61.1%, 15.7%, 15.1 %, 14.7%, 12.8%, 8.7 % respectively. The area planted with cotton decreased from 106 ha to 104 and by the average of about 2.5%

4-1-5-2 Crops Structure in Tuban

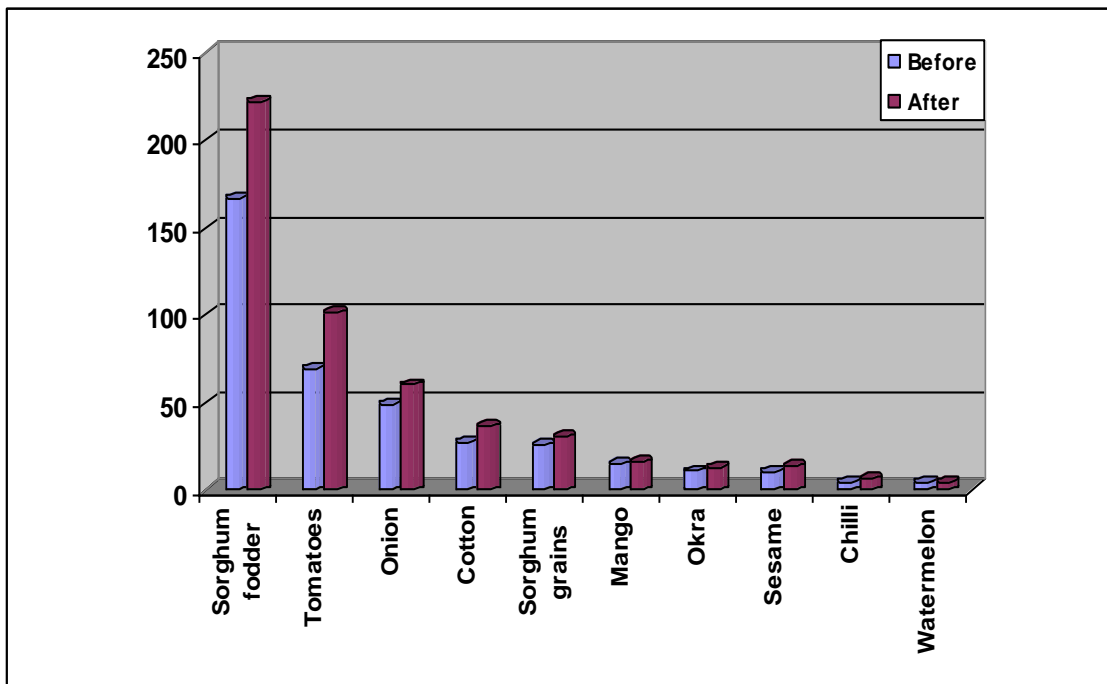
The results of sample analysis indicate that the sorghum fodder crop occupies the top of the list of crops in Tuban valley before and after the implementation of program activities. Tomatoes occupies the second rank followed by onion, cotton, sorghum grains, mango, okra, chili, squash, groundnut, and maize. In terms of increase in planted area after the implementation of the program, the first three ranks in the list are occupied by tomatoes, chili, cotton, and sorghum fodder with increases of 47.3%, 43.2 %, 33.3%, 32.5% respectively.

| Table no.6: Crops structure and increase in planted area in both valleys before and after the implementation of the ADP | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------|---------------------|-----------------------|---------------------|-------------------|---------------------|
| Crops | Zabid Valley | | | Crops | Tuban Valley | | |
| | Before (ha) | After (ha) | Increase (%) | | Before (ha) | After (ha) | increase (%) |
| Cotton | 106.7 | 104.1 | -2.44 | Cotton | 27.0 | 36.0 | 33.33 |
| Sorghum grains | 688 | 800.2 | 16.31 | Sorghum grains | 25.2 | 30.2 | 19.84 |
| Sorghum fodder | 553.6 | 636.3 | 14.94 | Sorghum fodder | 167.0 | 222.0 | 32.93 |
| Maize | 85.6 | 93.4 | 9.11 | Maize | - | - | - |
| Groundnut | - | - | - | Groundnut | 1.7 | 1.7 | 0.00 |
| Sesame | 30.5 | 40.0 | 31.15 | Sesame | 10.4 | 13.6 | 30.77 |
| Tomatoes | 31.5 | 35.7 | 13.33 | Tomatoes | 69.1 | 101.2 | 46.45 |
| Onion | 6.2 | 9.6 | 54.84 | Onion | 49.0 | 60.0 | 22.45 |
| Okra | 20.3 | 26.7 | 31.53 | Okra | 10.6 | 12.8 | 20.75 |
| Chilli | 14.0 | 16.2 | 15.71 | Chilli | 4.4 | 6.3 | 43.18 |
| Watermelon | 17.3 | 20.0 | 15.61 | Watermelon | 4.1 | 4.4 | 7.32 |
| Mango | 25.1 | 29.0 | 15.54 | Mango | 14.4 | 16.0 | 11.11 |
| Sunflower | 0.0 | 1.8 | - | Sunflower | - | - | - |

Shape no.9: Crops structure (Zabid Valley)



Shape no.10: Crops structure (Tuban Valley)



When a new technology is introduced, it is often adopted at the beginning by a small number of farmers. The technology then spread to the rest of farmers. The average of adoption refers to the speed of adoption by all farmers.

It is worth noting that technologies with relative advantage, more suitable to prevalent farming system, and less complicated, tend to spread among farmers faster. The adoption average is the percentages of farmers who adopted the technology to the number of total farmers.

Box no. (3): the necessity of disseminating technologies

Farmer Moh'd Hameed Saif, who is responsible for guidance in Al-bari Association (upper Zabid valley) suggests a follow-up of what the ADP has started and the dissemination of technologies to all farmers

The study found, as shown in table no. 7, the adoption average of technologies implemented by the ADP in Zabid is 20.3%. The average has fluctuated between a lower level of 2.3% for the introduction of sunflower, and a higher level of 43.5% for balanced fertilizing of grain sorghum. Some crops such as maize (city lagos type) are planted in specific areas of the valley. For maize, its adoption in areas where planted is high.

The adoption average of technologies in Tuban valley is 19.7% and fluctuates between a lower level of 8.3% for combating ants and a higher level of 45.1% for balanced fertilizing of vegetables.

It is evident that the success of any enhancing technology can be measured by the level of adoption of the technology by farmers. If technology is not adopted, it is difficult to measure increase in farmers' income in the medium to long run. Although averages of adoption reached levels beyond those targeted for some crops, other crops face difficulty in adopting new technologies. The study, therefore, included a question for farmers about the problems they faced during the implementation of the program, and they raise some of the difficulties such as:

- Low prices of agricultural products either because of a lower pricing of a product (such as in the case of cotton), or because of unsuitable marketing channels, or as a result of market distortions such as untrained intermediaries, as in the case of fruits and vegetables.

- Many distortions are associated with planting and marketing of cotton such as low quality seeds which do not depend on seeds improvement systems. This leads farmers to the abandonment of the crop altogether.

Box no. (4): Adoption difficulties

Farmer Mohm'd Ahmed Yousif from Al-Nassery valley (lower part of Zabid valley) thinks the absence of agricultural marketing and of the agricultural cycle in the valley were and still are some of the most important obstacles facing production growth.

- Research and guidance work in those valleys have stopped years ago and they need to be revived.
- Pesticides campaigns for cotton crop come often times late and do not cover all areas. To avoid that, coordination is needed among consulting agencies, agricultural offices, and guiding agencies.
- The agricultural indicators in these valleys (in particular Zabid valley) in terms of water distribution and partnership shares play an important role as an incentive for the adoption of these technologies.
- The renting system of land, especially in Zabid valley, puts the burden of adopting new technologies on the shoulder of farmers which serves as a disincentive for them.

4-1-6 . Farmers Perspectives of the ADP

- There is a consensus among farmers benefiting from the ADP that technologies helped in improving the productivity of crops.
- Many farmers think the use of new fertilizing technologies led to increase in production of cotton, cereals, fodders, and vegetables.
- Many farmers expressed interest in participating in the program in the future.
- There is a consensus among farmers on the importance of expanding the program activities to other farmers and areas.

Table no. 7: Adoption average of technologies among participants in the sample in both valleys

| Crop | Technologies and Activities | Zabid Valley | | Tuban Valley | |
|------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------|-------------|--------------|-------------|
| | | # | Average | # | Average |
| Cotton | Improved seeds (Acala. S.J.2) | 28 | 15.8 | 16 | 12.0 |
| | Application of Economic Fertilizer (urea and phosphates) | 29 | 16.4 | 16 | 12.0 |
| | Crop management | 31 | 17.5 | 16 | 12.0 |
| | Pesticides | 29 | 16.4 | 18 | 13.5 |
| Sorghum grains | Improved seeds | 30 | 16.9 | 40 | 30.1 |
| | Treated seeds | 46 | 26 | 14 | 10.5 |
| | Application of Economic Fertilizer (urea and phosphates) | 77 | 43.5 | 13 | 9.8 |
| Sorghum fodder | Treatment of seeds | 35 | 19.8 | 27 | 20.3 |
| | Application of Economic Fertilizer (urea and phosphates) | 39 | 22 | 44 | 33.1 |
| Maize (Zabid only) | Introduction of City Lagos | 32 | 18.1 | 1 | 0.8 |
| | Application of Economic Fertilizer (urea and phosphates) | 36 | 20.3 | 0 | 0.0 |
| Groundnut (Tuban only) | Crop management under flood irrigation | 0 | 0 | 1 | 0.8 |
| | Crop management | 0 | 0 | 2 | 1.5 |
| Sesame | Wells cementing | 31 | 17.5 | 13 | 9.8 |
| | Pesticides | 25 | 14.1 | 11 | 8.3 |
| Vegetables | Pesticides | 53 | 29.9 | 37 | 27.8 |
| | Balanced fertilizer | 57 | 32.2 | 60 | 42.1 |
| Fruits | Trees' management (fertilizing, pesticides, and trimming) | 25 | 14.1 | 42 | 31.6 |
| Water technologies | Collecting of basic information about farmers practices under different schemes and determination of the efficiency degree | 53 | 29.9 | 28 | 21.1 |
| Sunflower (Zabid only) | Introducing the crop to the valley and orienting the farmers about it | 4 | 2.3 | 0 | 0.0 |
| Total | | 660 | | 399 | |
| Average | | 33 | 18.6 | 20.0 | 15.0 |

Source: Field study results

To account for farmers orientations and perspectives, regardless of whether they participated in the ADP activities or not, the survey results includes some of the indicators as in tables 8 and 9.

| Indicator | Zabid | | Tuban | | Total | |
|------------------------------------------------------------------------------------------------------------|------------|--------------|-----------|--------------|------------|--------------|
| | # | % | # | % | # | % |
| <i>The number of farmers who:</i> | | | | | | |
| Participated in the ADP activities | 113 | 100.0 | 65 | 100.0 | 178 | 100.0 |
| Hosted demonstrations in their farms | 97 | 85.8 | 65 | 100.0 | 162 | 91.0 |
| Said that demonstrations increased productivity in their farm under the prevalent irrigation system | 103 | 91.2 | 63 | 96.9 | 166 | 93.3 |
| Visited other fields run by the ADC | 97 | 85.8 | 52 | 80.0 | 149 | 83.7 |
| Used same technologies in their farms | 103 | 91.2 | 60 | 92.3 | 163 | 91.6 |
| Who participated in field days or evening meetings | 110 | 97.3 | 58 | 89.2 | 168 | 94.4 |
| Participated in field training | 99 | 87.6 | 53 | 81.5 | 152 | 85.4 |
| Adopted technologies as a result of training | 99 | 87.6 | 57 | 87.7 | 156 | 87.6 |
| Said their farms income increased | 104 | 92.0 | 62 | 95.4 | 166 | 93.3 |
| Source: Field study results | | | | | | |

| Indicator | Zabid | | Tuban | | Total | |
|-----------------------------------------------------------|-----------|--------------|-----------|--------------|------------|--------------|
| | # | % | # | % | # | % |
| The number of people who: | | | | | | |
| Are in the study sample but did not participate | 64 | 100.0 | 68 | 100.0 | 132 | 100.0 |
| Heard about the program | 64 | 100.0 | 60 | 88.2 | 124 | 93.9 |
| Participated in field days and awareness meetings | 31 | 48.4 | 33 | 48.5 | 64 | 48.5 |
| Benefited from meetings | 25 | 39.1 | 32 | 47.1 | 57 | 43.2 |
| Who applied what they saw | 29 | 45.3 | 27 | 39.7 | 56 | 42.4 |
| Who said they benefited from applying technologies | 33 | 51.6 | 29 | 42.6 | 62 | 47.0 |
| Source: Field study results | | | | | | |

4-2 the Impact of the ADP

The basic document of the program summarizes the developmental impact of the program in the increase of farmers' income in Zabid and Tuban valleys. Although this goal is shaped by many natural, political and social factors, the study results include some indicators of improvement in agricultural income in targeted areas. The most important indicators are the increase in productivity of each planted unit, net agricultural income, the average income of farmers from planted products and from livestock, improvement of farmers' expenditures in targeted communities on health, education, and other services

4-2-1 Impact of the ADP on Crops Yield

The discussion of the impact of the program on productivity of an area unit of targeted crops by comparing productivity averages in the fields of farmers participating in the study sample before and after the implementation of the program.

4-2-1-1 Impact on Productivity of Cotton

Cotton is considered on of the most important cash crops in Zabid and Tuban valleys. The area planted with cotton has decreased for several reasons among which is the scarcity of water resources, and increase of production cost compared to revenues. The IIP sought, through the ADP, to improve the productivity of cotton crop using a cluster of new technologies: improved seeds (Acala. S. J.2), balanced phosphoric acid nitrogen fertilizing, crop management, and pesticing.

The results show, as in table no. 10, that the average productivity of an hectare (ha) of cotton before the implementation of the program fluctuated between a lower level of 556 kg/ha and a higher level of 2335 kg/ha with an average of 1159 kg/ha. After the implementation of the program, the productivity of a hectare (ha) of cotton fluctuates between a lower level of 834 kg/ha and a higher level of 4670 kg/ha with an average of 1745 kg/ha. It is evident that the average productivity of an ha after the implementation of the program is greater than the average before the implementation. The increase is by an average of 50.6%. This confirms the impact of technologies used by the program during the period (2004-2007).

| Valley Item | Zabid | | | Tuban | | |
|---------------------------------------|------------------------|----------------|---------------------|------------------------|----------------|---------------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 1159 | 1745 | 50.6 | 1265 | 1859 | 47.0 |
| Lower Level (kg/ha) | 556 | 834 | 50.0 | 300 | 720 | 140.0 |
| Higher Level (kg/ha) | 2335 | 4670 | 100.0 | 4320 | 6336 | 46.7 |
| Price Average (Rial/kg) | 85 | 85 | 0.0 | 77 | 77 | 0.0 |
| Revenue Average (Rial/ha) | 98515 | 148325 | 50.6 | 97405 | 143143 | 47.0 |
| Average Cost (Rial/ha) | 93236 | 123884 | 32.9 | 35446 | 73846 | 108.3 |
| Net Revenues Average (Rial/ha) | 5279 | 24441 | 363.0 | 61959 | 69297 | 11.8 |
| Rial Revenue (Rial/Rial) | - | 1.6 | - | - | 1.2 | - |

Source: Study results and the Agricultural Statistic Book

As to Tuban valley, the average productivity of a hectare (ha) of cotton after the implementation of the program 1859 kg/ha with an average of 1159 kg/ha. The average productivity before the implementation of the program fluctuated between a lower level of 300 kg/ha and a higher level of 4320 kg/ha. After the implementation of the program, the productivity of a hectare (ha) of cotton fluctuates between a lower level of 720 kg/ha and a higher level of 6336 kg/ha.

4-2-1-2 Impact on Sorghum (grains, fodders)

The sorghum crop, with its various types, is one of the most spread crops in Zabid and Tuban. This is due to its dual use (grain and fodder). The farmers can earn some cash by selling the fodder and this encourages them to expand plantation. The crop does not require too much care as other crops. The IIP, therefore, sought to increase the productivity of the crop by spreading improved types of seeds, and through the improvement of agricultural process especially those related to given the crop its needed nutrients (acid and phosphate).

The study results show (see tables no. 11 and 12) that the average productivity of sorghum in Zabid valley reached the level of 608 kg/ha of

grains and 7224 kg of fodder). By contrast, the average productivity for fields using technologies introduced by the program about 817 kg of grains and 8420 kg of fodders with an average increase of 34.4% in grains and 23.8 in fodders.

In Tuban valley, the study found the average productivity of sorghum without the program intervention is about 628 kg of grains and 6530 kg of fodders while the average for fields where the program intervened is 838 kg of grains and 8470 kg of fodders with an average increase of 33.4% in grains and 29.7 in fodders.

| Valley Item | Zabid | | | Tuban | | |
|---------------------------------------|------------------------|----------------|---------------------|------------------------|----------------|---------------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 608 | 817 | 34.4 | 628 | 838 | 33.4 |
| Lower Level (kg/ha) | 222 | 278 | 25.2 | 240 | 480 | 100.0 |
| Higher Level (kg/ha) | 1390 | 1946 | 40.0 | 1200 | 1920 | 60.0 |
| Price Average (Rial/kg) | 170 | 170 | 0.0 | 166 | 166 | 0.0 |
| Revenue Average (Rial/ha) | 103360 | 138890 | 34.4 | 104248 | 139108 | 33.4 |
| Average Cost (Rial/ha) | 68050 | 81828 | 20.2 | 59657 | 82857 | 38.9 |
| Net Revenues Average (Rial/ha) | 35310 | 57062 | 61.6 | 44591 | 56251 | 26.1 |
| Rial Revenue (Rial/Rial) | - | 1.6 | - | - | 1.5 | - |

Source: Study results and the Agricultural Statistic Book

Table no. 12: Impact of the ADP on Productivity and revenue of sorghum fodders

| Valley Item | Zabid | | | Tuban | | |
|---------------------------------------|-----------------|---------------|--------------|-----------------|---------------|--------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 7378 | 9135 | 23.8 | 6530 | 8470 | 29.7 |
| Lower Level (kg/ha) | 1546 | 2015 | 30.3 | 950 | 1200 | 26.3 |
| Higher Level (kg/ha) | 22400 | 28000 | 25.0 | 19200 | 24000 | 25.0 |
| Price Average (Rial/kg) | 26 | 26 | 0.0 | 77 | 77 | 0.0 |
| Revenue Average (Rial/ha) | 191828 | 237510 | 23.8 | 502810 | 652190 | 29.7 |
| Average Cost (Rial/ha) | 58050 | 81828 | 41.0 | 22432 | 45882 | 104.5 |
| Net Revenues Average (Rial/ha) | 133778 | 155682 | 16.4 | 480378 | 606308 | 26.2 |
| Rial Revenue (Rial/Rial) | | 1.1 | | | 1.2 | |

Source: Study results and the Agricultural Statistic Book

4-2-1-3 The Impact on Production of Maize

The maize crop, as one of the cereal crops, earns greater attention from farmers in Zabid valley, especially in the upper parts of the valley. This could be due to farmers' preference of maize for food and to the revenue they can earn by selling cereals and fodders. The IIP sought to increase the productivity of the crop by making available the improved seeds of the city lagos type and the needed fertilizers (euro and phosphate).

As table no. 13 shows average production of maize in Zabid valley before the implementation of the program fluctuated between 268 kg/ha and 1680 kg/ha with an average of 803 kg/ha. By contrast the average, after the implantation of the program, fluctuates between 348 kg/ha and 2240 kg/ha with an average of 1344/ha. The average productivity of a ha under the program is 67.4% higher, especially when city lagos crop (7931) is

used. This means a positive impact for technologies implemented by the program during the period (2004-2007).

| Valley Item | Zabid | | | Tuban | | |
|---------------------------------------|-----------------|---------------|--------------|-----------------|-------------|--------------|
| | Technology Base | Program | (%) Increase | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 803 | 1344 | 67.4 | 770 | 1215 | 57.8 |
| Lower Level (kg/ha) | 268 | 348 | 29.9 | 720 | 820 | 13.9 |
| Higher Level (kg/ha) | 1680 | 2240 | 33.3 | 1200 | 1930 | 60.8 |
| Price Average (Rial/kg) | 80 | 80 | 0.0 | - | - | - |
| Revenue Average (Rial/ha) | 64240 | 107520 | 67.4 | - | - | - |
| Average Cost (Rial/ha) | 54555 | 67782 | 24.2 | - | - | - |
| Net Revenues Average (Rial/ha) | 9685 | 39738 | 310.3 | - | - | - |
| Rial Revenue (Rial/Rial) | | 3.3 | | | | |

Source: Study results and the Agricultural Statistic Book

4-2-1-4 Impact of the ADP on Productivity of Sesame

The IIP sought to increase the productivity of the sesame crop through the use of demonstration fields to show the farmers the importance of using fertilizers and pesticides.

Table no. 14 indicates that the average productivity for farms benefiting from the ADP technologies in Zabid valley is about 985 kg/ha with a disparity of 360 kg/ha or 57.6% of the average productivity in the absence of program intervention, which is estimated at 625 kg/ha. The average production of sesame fluctuates after the implementation of program between a lower level of 209 kg/ha and a higher level of 1779 kg/ha compared to a lower level of 166 kg/ha and a higher level of 1260 kg/ha.

As to Tuban valley (see table no. 14) the average productivity before the implementation of the program fluctuated between a lower level of 144 kg/ha and a higher level of 1152 kg/ha with an average of 542 kg/ha. After the implementation of the program, the average fluctuates between a lower level of 344 kg/ha and a higher level 1440 kg/ha with an average

of 803 kg/ha. This means that means the average production of a ha of sesame with the program intervention is higher than the average using base technology with an average of 48.2%.

| Valley \ Item | Zabid | | | Tuban | | |
|--------------------------------|-----------------|---------|--------------|-----------------|---------|--------------|
| | Technology Base | Program | (%) Increase | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 625 | 985 | 57.6 | 542 | 803 | 48.2 |
| Lower level (kg/ha) | 166 | 209 | 25.9 | 144 | 344 | 138.9 |
| Higher level (kg/ha) | 1260 | 1779 | 41.2 | 1152 | 1440 | 25.0 |
| Price Average (Rial/kg) | 160 | 160 | 0.0 | 265 | 265 | 0.0 |
| Revenue Average (Rial/ha) | 100000 | 157600 | 57.6 | 143630 | 212795 | 48.2 |
| Average Cost (Rial/ha) | 88399 | 92481 | 4.6 | 19600 | 23800 | 21.4 |
| Net Revenues Average (Rial/ha) | 11601 | 65119 | 461.3 | 124030 | 188995 | 52.4 |
| Rial Revenue (Rial/Rial) | | 14.1 | | | 16.5 | |

Source: Study results and the Agricultural Statistic Book

4-2-1-5 The Impact of the ADP on Vegetable Crops

The most important vegetables targeted by the ADP are tomatoes, union, okra, chilli, and watermelon. The IIP through the ADP sought to increase the productivity of these crops by pesticing and economic fertilizing.

A. Tomatoes

As table no. 15 shows balanced fertilizing and use of pesticides, which have been used by the ADP led to a substantial increase in production. In Zabid valley, the average production of tomatoes after the

implementation of program is about 18782 kg/ha with an increase of 7608 kg/ha—68.1%—over the production without the use of technologies, which is estimated at 11174 kg/ha. The average production of tomatoes fluctuates between a lower level of 5560 kg/ha and a higher level of 22400 kg/ha without the program intervention. By contrast, the production average fluctuates between a lower level of 8340 kg/ha and a higher level of 39200 with the implementation of program technologies.

In Tuban, the average production fluctuates between a lower 2400 kg/ha and a higher level of 26400 kg/ha with an average of 11150 kg/ha before implementation of the program. With the implementation of the program, the average fluctuates between a lower level of 2750 kg/ha and a higher level of 33600 kg/ha with an increase of 56.3% in production.

| Table no. 15: Impact of ADP on Productivity and revenue of tomatoes | | | | | | |
|----------------------------------------------------------------------------|-----------------|----------------|--------------|-----------------|----------------|--------------|
| Valley Item | Zabid | | | Tuban | | |
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 11174 | 18782 | 68.1 | 11150 | 17433 | 56.3 |
| Lower level (kg/ha) | 5560 | 8340 | 50.0 | 2400 | 2750 | 14.6 |
| Higher level (kg/ha) | 22400 | 39200 | 75.0 | 26400 | 33600 | 27.3 |
| Price Average (Rial/kg) | 90 | 90 | 0.0 | 111 | 111 | 0.0 |
| Revenue Average (Rial/ha) | 1005660 | 1690380 | 68.1 | 1237650 | 1935063 | 56.3 |
| Average Cost (Rial/ha) | 471457 | 553475 | 17.4 | 1068200 | 1090000 | 2.0 |
| Net Revenues Average (Rial/ha) | 534203 | 1136905 | 112.8 | 169450 | 845063 | 398.7 |
| Rial Revenue (Rial/Rial) | - | 8.3 | - | - | 32.0 | - |

Source: Study results and the Agricultural Statistic Book

B. Onion

As shown in table no. 16, the production of onion in Zabid is between a lower level of 2224 kg/ha and a higher level of 35000 kg/ha with an average of 14048 kg/ha before the implementation of the program. After implementation of the program, the average is between 3336 kg/ha and a higher level of 39200 with an average of 27034 kg/ha. The average increase in production, due to implementation of program, is about 92%

| Item \ Valley | Zabid | | | Tuban | | |
|--------------------------------|-----------------|---------|--------------|-----------------|---------|--------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 14084 | 27034 | 91.9 | 15781 | 24713 | 56.6 |
| Lower Level (kg/ha) | 2224 | 3336 | 50.0 | 4800 | 7200 | 50.0 |
| Higher Level (kg/ha) | 35000 | 39200 | 12.0 | 33600 | 36700 | 9.2 |
| Price Average (Rial/kg) | 80 | 80 | 0.0 | 74 | 74 | 0.0 |
| Revenue Average (Rial/ha) | 1126720 | 2162720 | 91.9 | 1167794 | 1828762 | 56.6 |
| Average Cost (Rial/ha) | 258650 | 323094 | 24.9 | 162515 | 219615 | 35.1 |
| Net Revenues Average (Rial/ha) | 868070 | 1839626 | 111.9 | 1005279 | 1609147 | 60.1 |
| Rial Revenue (Rial/Rial) | - | 16.1 | - | - | 11.6 | - |

Source: Study results and the Agricultural Statistic Book

In Tuban valley, the average production for a hectare of onion after the implementation of the program is about 24713 kg/ha with an increase of 8932 kg/ha—65.6%—over the average production before the implementation of the program, which is estimated at 15781 kg/ha. The average production of onion before the program fluctuates between 4800 kg/ha and a higher level of 33600 kg/ha. After implementation of the program, the average fluctuates between a lower level of 7200 kg/ha and 36700 kg/ha with the use of balanced fertilizing.

C. Okra Crop

As shown in table no. 17, the average productivity for farms using program technologies in Zabid valley reached 8471 kg/ha with an increase of 2956 kg/ha—45.8%—over production average before the implementation of the program, which is estimated at 5812 kg/ha. The average production before the implementation of the program fluctuates between a lower level of 2700 kg/ha and a higher level of 14000 kg/ha. After the implementation, the average fluctuates between a lower level of 4375 kg/ha and a higher level of 19200 kg/ha.

For Tuban valley, as shown in table no. 17, the average production of okra fluctuates between a lower level of 1200 kg/ha and a higher level of 12000 kg/ha with an average of 6262 kg/ha.

After the implementation of the program, the average fluctuates between a lower level of 1560 and a higher level of 21000 kg/ha with an average of 10223 kg/ha. The increase in productivity with the implementation of the program is around 63.3%.

| Table no. 17: Impact of ADP on Productivity and revenue of okra | | | | | | | |
|------------------------------------------------------------------------|---------------------------------------|------------------------|----------------|---------------------|------------------------|----------------|---------------------|
| Valley | Item | Zabid | | | Tuban | | |
| | | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| | Average Productivity (kg/ha) | 5812 | 8471 | 45.8 | 6262 | 10223 | 63.3 |
| | Lower Level (kg/ha) | 2700 | 3475 | 28.7 | 1200 | 1560 | 30.0 |
| | Higher Level (kg/ha) | 14000 | 19200 | 37.1 | 12000 | 21000 | 75.0 |
| | Price Average (Rial/kg) | 60 | 60 | 0.0 | 53 | 53 | 0.0 |
| | Revenue Average (Rial/ha) | 348720 | 508260 | 45.8 | 331886 | 541819 | 63.3 |
| | Average Cost (Rial/ha) | 226462 | 263675 | 16.4 | 19556 | 75576 | 286.5 |
| | Net Revenues Average (Rial/ha) | 122258 | 244585 | 100.1 | 312330 | 466243 | 49.3 |
| | Rial Revenue (Rial/Rial) | | 4.3 | - | - | 3.7 | |

Source: Study results and the Agricultural Statistic Book

D. Chilli Crops

As shown in table no. 18, the average production of chilli in Zabid before the implementation of the program fluctuates between a lower level of 1390 kg/ha and a higher level of 8400 kg/ha with an average of 4090 kg/ha. After the implementation of the program, the production average fluctuates between a lower level of 1638 kg/ha and a higher level of 16800 kg/ha, with an increase of 66.2%.

| Valley | Item | Zabid | | | Tuban | | |
|--------|---------------------------------------|-----------------|----------------|--------------|-----------------|----------------|--------------|
| | | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| | Average Productivity (kg/ha) | 4090 | 6796 | 66.2 | 6347 | 11490 | 81.0 |
| | Lower Level (kg/ha) | 1390 | 1738 | 25.0 | 2880 | 5400 | 87.5 |
| | Higher Level (kg/ha) | 8400 | 16800 | 100.0 | 10560 | 16800 | 59.1 |
| | Price Average (Rial/kg) | 200 | 200 | 0.0 | 266 | 266 | 0.0 |
| | Revenue Average (Rial/ha) | 818000 | 1359200 | 66.2 | 1688302 | 3056340 | 81.0 |
| | Average Cost (Rial/ha) | 336174 | 387904 | 15.4 | 289021 | 336071 | 16.3 |
| | Net Revenues Average (Rial/ha) | 481826 | 971296 | 101.6 | 1399281 | 2720269 | 94.4 |
| | Rial Revenue (Rial/Rial) | - | 10.5 | - | - | 29.1 | - |

Source: Study results and the Agricultural Statistic Book

The table no. 18, reveals that the average production of chilli in Tuban valley before the implementation of the program fluctuates between a lower level of 2880 kg/ha and a higher level of 10560 kg/ha with an average of 6347 kg/ha. After implementation, the production average fluctuates between a lower level of 5400 kg/ha and a higher level of 16800 kg/ha with an average of 11490 kg/ha. The production average with the implementation of the program increases by 81%, which is an indication of positive impact of technologies

E. Watermelon

It is evident from table no. 19 that the average production of watermelon in Zabid valley fluctuates between a lower level of 5560 kg/ha and a higher level of 13900 kg/ha with an average of 10020 kg/ha under base technology. Under the program, the average fluctuates between a lower level of 11120 kg/ha and a higher level of 15553 kg/ha. The average production, under the program, increased by 5533 kg/ha or 55.2%

| Valley Item | Zabid | | | Tuban | | |
|--------------------------------|-----------------|---------|--------------|-----------------|---------|--------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 10020 | 15553 | 55.2 | 8120 | 11320 | 39.4 |
| Lower Level (kg/ha) | 5560 | 11120 | 100.0 | 9000 | 14200 | 57.8 |
| Higher Level (kg/ha) | 13900 | 18510 | 33.2 | 12000 | 20000 | 66.7 |
| Price Average (Rial/kg) | 56 | 60 | 7.1 | - | - | - |
| Revenue Average (Rial/ha) | 561120 | 933180 | 66.3 | - | - | - |
| Average Cost (Rial/ha) | 156383 | 179844 | 15.0 | - | - | - |
| Net Revenues Average (Rial/ha) | 404737 | 753336 | 86.1 | - | - | - |
| Rial Revenue (Rial/Rial) | - | 15.9 | - | - | - | - |

Source: Study results and the Agricultural Statistic Book

As table no. 19 shows, the production average in Tuban under base technology fluctuates between a lower level of 9000 kg/ha and a higher level of 12000 kg/ha with an average of 8120 kg/ha. By contrast, the average fluctuates between a lower level of 14200 kg/ha and a higher level of 20000 kg/ha after the implementation of the program with an average of 11320 kg/ha. This means the average increased by 39.4%.

4-2-1-6 Impact of the ADP on Fruits Crops

The basic technologies used by the ADC is to teach farmers how to care for fruits trees, especially mango. The supporting technologies used include the distribution of commercially needed varieties, utilization of balanced fertilizers, crops husbandry, and the using of highly efficient irrigation.

The impact if used technologies on mango trees can be seen in table 20, which shows that the productivity average for farms covered by the

program in Zabid fluctuates between a lower level of 6500 kg/ha and a higher level of 20850 kg/ha with an average of 22347 kg/ha. The increase was by 9637 kg/ha, or more than 75%, over the production average using base technology, which is 12710 kg/ha. The average production of mango under base technology fluctuates between a lower level of 6000 kg/ha and a higher level of 19200 kg/ha.

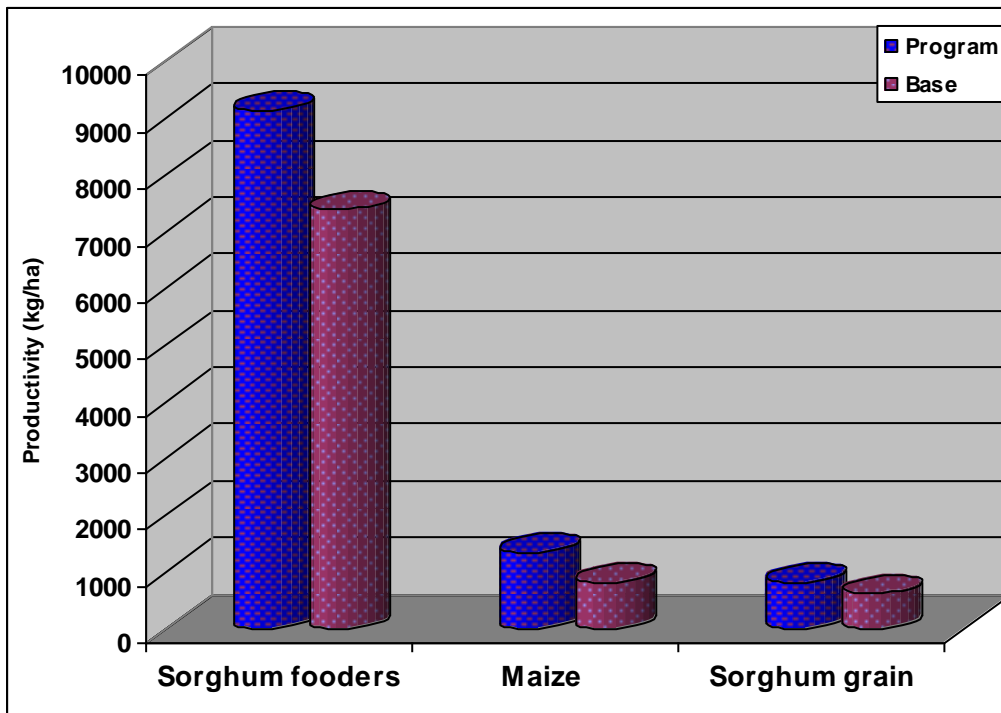
In Tuban valley (see table 20), the production average of mangos under base technology fluctuates between a lower level of 4800 and a higher level of 24520 kg/ha with an average of 14457 kg/ha. After the implementation of the program, the average fluctuates between a lower level of 9600 kg/ha and a higher level of 30000 kg/ha with an average of 27174 kg/ha. This means an increase of 88% under the implementation of the program.

| Valley \ Item | Zabid | | | Tuban | | |
|---------------------------------------|-----------------|---------|--------------|-----------------|---------|--------------|
| | Technology Base | Program | Increase (%) | Technology Base | Program | Increase (%) |
| Average Productivity (kg/ha) | 12710 | 22347 | 75.8 | 14457 | 27174 | 88.0 |
| Lower Level (kg/ha) | 6000 | 6500 | 8.3 | 4800 | 9600 | 100.0 |
| Higher Level (kg/ha) | 19200 | 20850 | 8.6 | 24520 | 30000 | 22.3 |
| Price Average (Rial/kg) | 180 | 180 | 0.0 | 150 | 150 | 0.0 |
| Revenue Average (Rial/ha) | 2287800 | 4022460 | 75.8 | 2168550 | 4076100 | 88.0 |
| Average Cost (Rial/ha) | 85500 | 98300 | 15.0 | 98765 | 112000 | 13.4 |
| Net Revenues Average (Rial/ha) | 2202300 | 3924160 | 78.2 | 2069785 | 3964100 | 91.5 |
| Rial Revenue (Rial/Rial) | | | | | | |

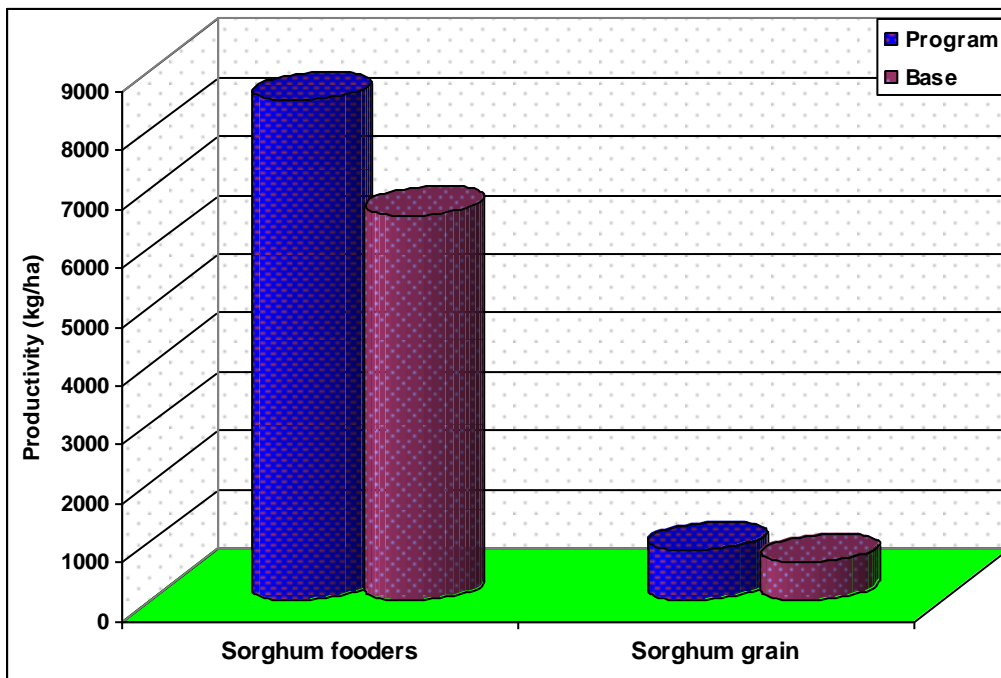
Source: Study results and the Agricultural Statistic Book

The sample analysis indicators confirm that the introduction of new and improved technologies in the agricultural production in Zabid and Tuban valleys led to increase in production averages and economic revenues in all areas, for all crops targeted by the ADP, and under flood and well irrigation. To ensure the sustainability of agricultural technologies it is important to make available other elements necessary for agricultural production, the most important of which are marketing, pricing, and improved irrigation means.

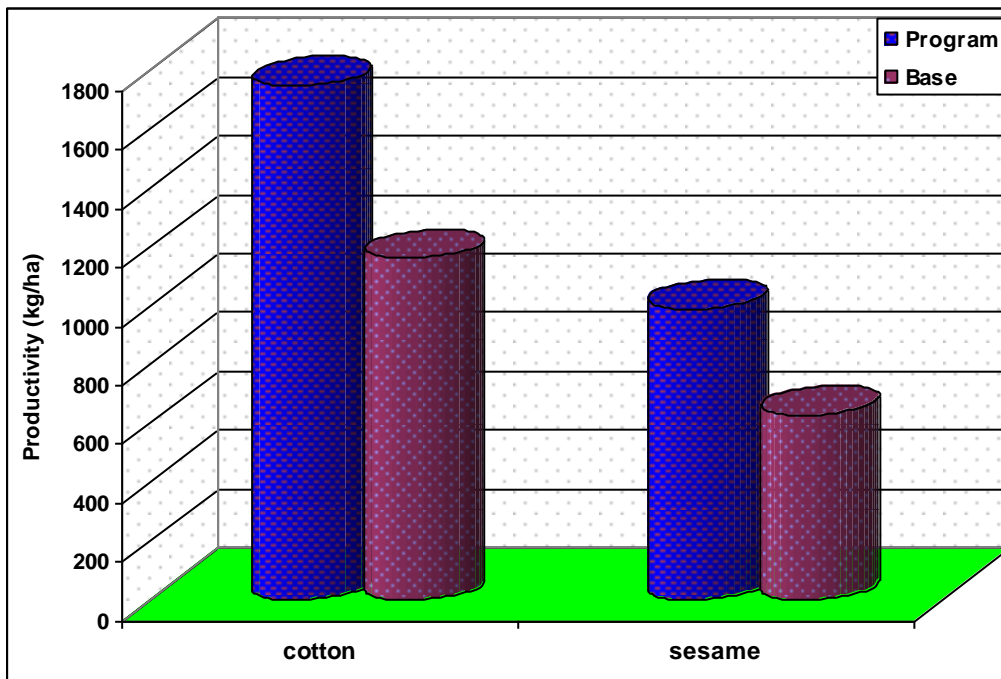
Shape no. 11: Average productivity for cereal crops in Zabid Valley



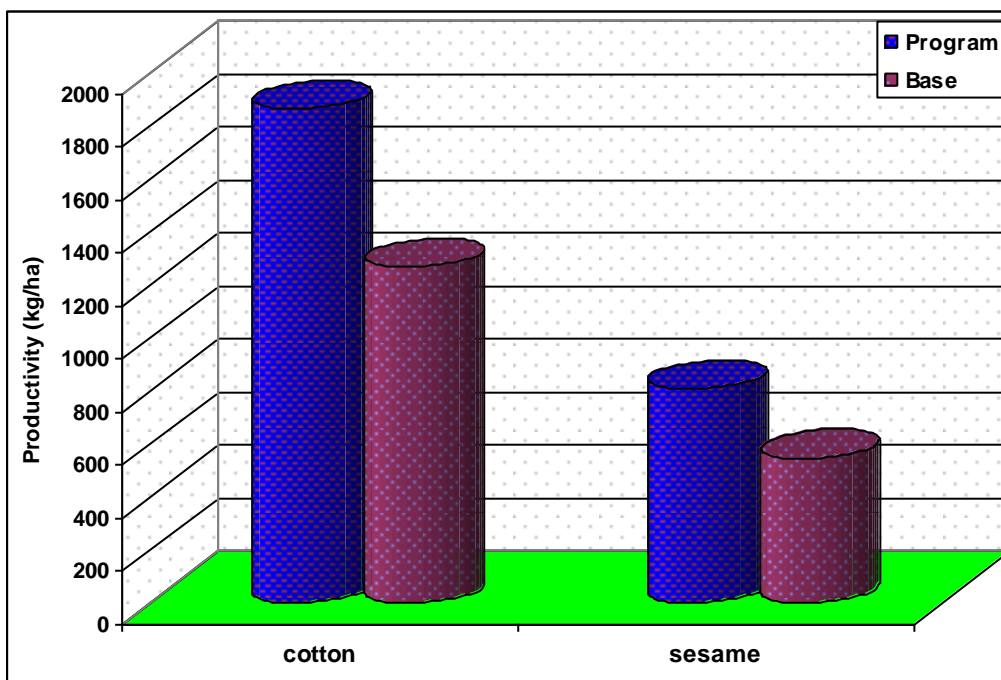
Shape no. 12: Average productivity of sorghum grains in Tuban valley



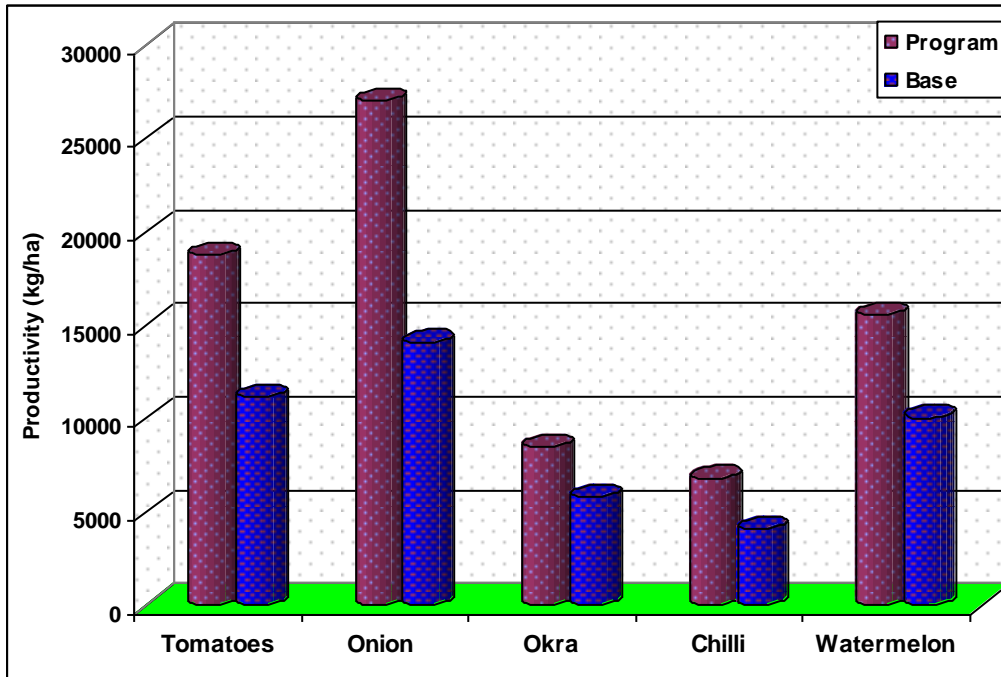
Shape no. 13: Productivity average of cash crops in Zabid valley



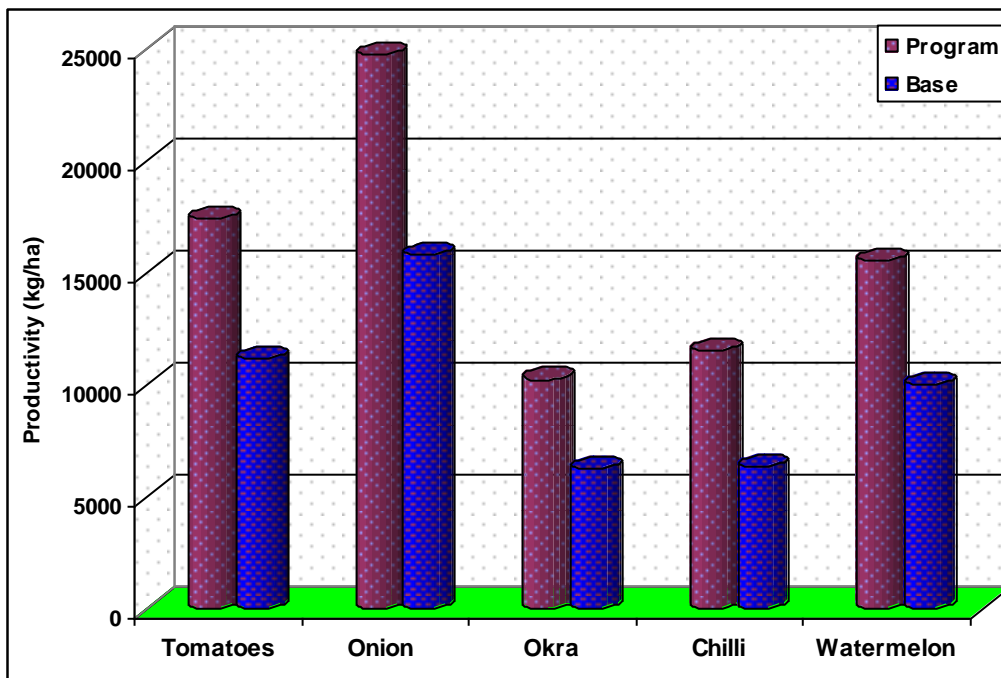
Shape no. 14: Productivity average of cash crops in Tuban valley



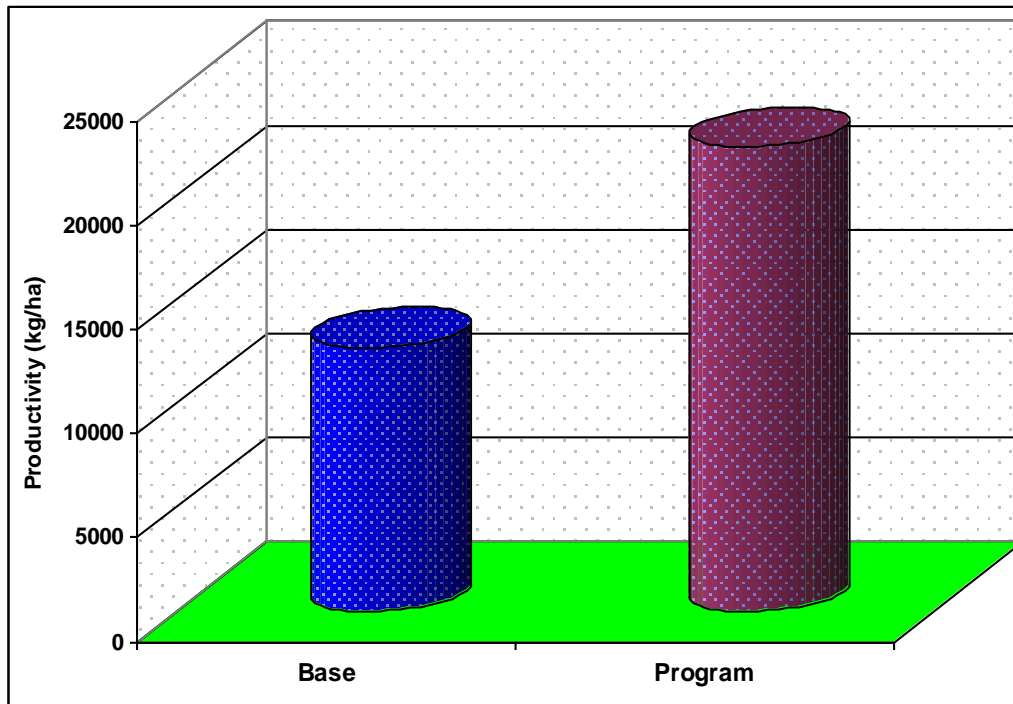
Shape no. 15 Productivity average of vegetable crops in Zabid valley



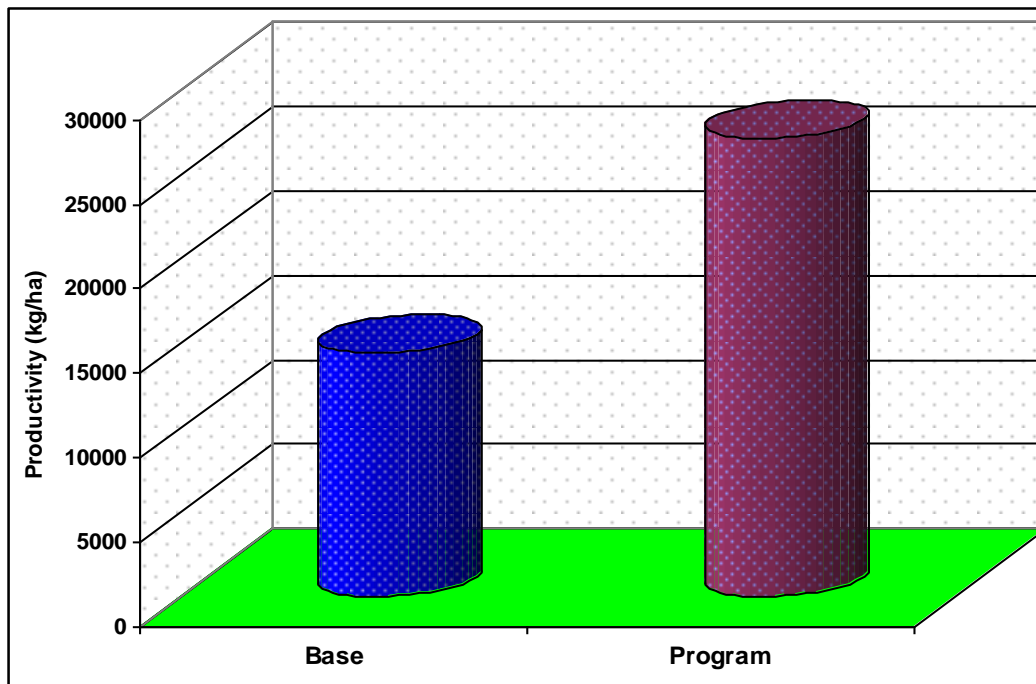
Shape no. 16: Productivity average of vegetable crops in Tuban valley



Shape no. 17 Productivity average of mango crops in Zabid valley



Shape no. 18: Productivity average of mango crops in Tuban valley



4-2-2 Other Impact of the ADP

4-2-2-1 Introducing Groundnut in Tuban Valley

Groundnuts was not an important crop in Tuban delta, but the program introduced the crop to farmers and explained to them its importance and the right technologies that should be used in planting it so that the average productivity can be increased. When comparing productivity of groundnuts under the program with that with the technology base, the study found that the productivity average increased from 600 kg/ha to 960 kg/ha with an increase of 60% under the flood irrigation system. Also, the study found that the area planted with groundnuts is small due to scarcity of flood in the middle and lower parts of Tuban valley where areas hospitable to plantation of crop is located.

4-2-2-2 Introducing the Sunflower Crop in ZABid

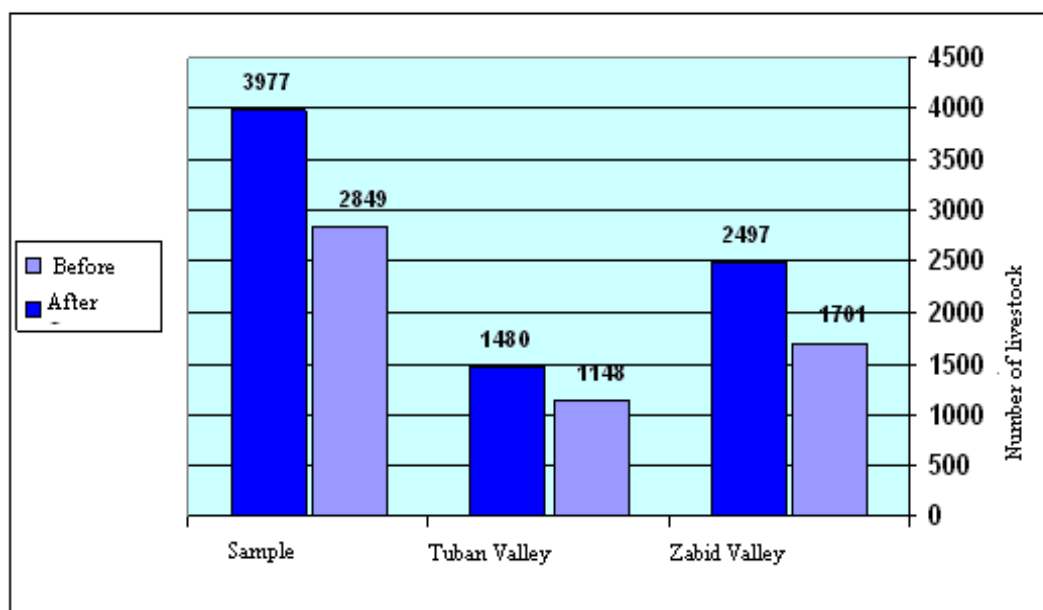
The ADP introduced the sunflower cash crop to areas in Zabid valley so that it can serve as an additional source of income for farmers. The contract signed between the IIP and the ARA allocated an area of 20 ha the plantation of sunflower in Zabid valley. Some farmers, however, express disinterest in expanding the plantation of this crop because of weak demand for the crop. Notwithstanding, results indicate that the productivity average from this crop reached 2.4 ton/ha. There is a potential for expansion in plantation of sunflower if new demand arise and if seeds and other elated inputs are made available.

4-2-2-3 Impact of Program on Livestock

The study results, as shown in shape no. 19, indicate the existence of a positive impact in targeted areas where the size of ownership of livestock by those participating in the study sample increased after the implementation of the program over the level before the implementation. The number of farm animals increased from 2849 to 3977 with an increase of 40%. In its turn, the number of sold animal increased during the 2005L2006 and 2006/2007 seasons to 551 in Tuban valley and with a total of 1369 of those participating in the study sample and an average of 4 animals per farmer.

When farmers with farm animals (represent about 40% of the sample size) were asked about the income earned from sale of livestock, the study found that it fluctuates between a lower level of 12 thousand YR and a higher level of 5 million YR during the two season (sduring the 2005L2006 and 2006/2007) with an average of 96 thousand YR per year (8 thousand per month).

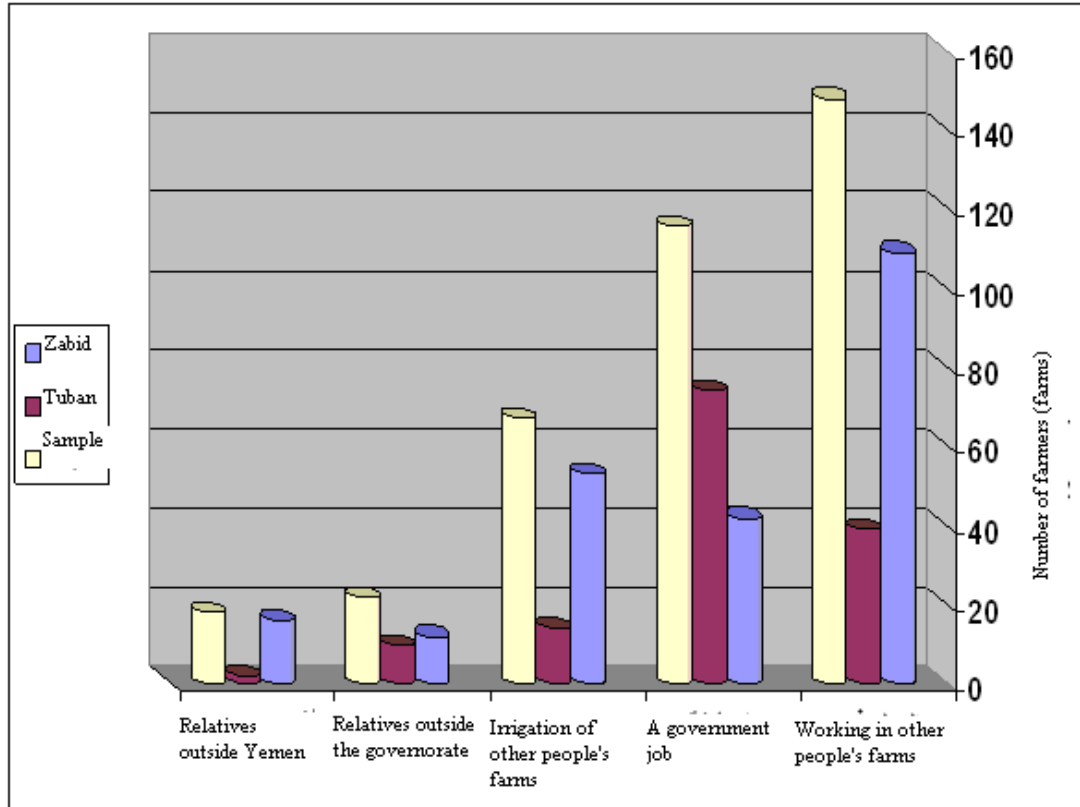
Shape no. 19: Project impact on livestock in targeted area



4-2-2-4 Created Jobs

The program created indirect seasonal jobs in addition to farmers jobs. When farmers participating in the study sample were asked about other sources for income, it found that 35% earn additional income by working in other people's farms, and 4.2% of those participating in the sample earn addition income by irrigating other people's farms. This indicate that the program has led indirectly to improvement of farmers income.

Shape no. 20: Project impact on jobs



5. Problems and Difficulties

The questionnaire included a question about the most important problems they face when implementing new technologies introduced by the ADC. They were also asked to identify causes of problems and difficulties and to propose solutions to those problems. The most important problems according to participants are the following:

- Scarcity of water resources, specially in Tuban valley in Lahj governorate, greatly affected the cotton crops. This has led farmers to substitute cotton with other crops (Feeders) that sell fast and do not need too much care and water. Related to this problem is the rise of the cost of cotton plantation, the rise of the diesel fuels cost, and the low market prices of cotton, and disinterest of specialized agencies in buying all of the cotton produced. When clothes factories buy cotton, they do not pay farmers immediately. Some of the farmers in Hodeidah and Lahj blame the conditions on the PCAS which is responsible for support of cotton.
- Weak awareness among farmers of some important agricultural processes such as good levelling, deep ploughing from time to time, leaving spaces between plants, renewal of old mango trees and others.
- Weak knowledge of marketing procedures and processes, specially those that take place before sending products to markets such as picking, sorting, ..etc.
- Fluctuating market prices for some agricultural crops in short period of times. Crops affected, for example, include tomatoes and onions. Fluctuations affect farmers by reducing their revenues to levels that do not cover the cost of planting. What makes things worse is the fact that such crops do not last long and it is difficult to stock them for long periods.
- The farmers in Tuban complained of regression in cropping of tomatoes because of marketing problems and fluctuating prices and the closure of tomatoes processing factory in Lahj governorate.
- The farmers face marketing problems related to fruits crops especially mango. As a result they are forced to sell crops in farms and for prices controlled by traders and middlemen and at the expense of farmers.
- High diesel and other agricultural inputs prices.
- Lack of seeds especially when needed.
- Marketing of expired pesticides to farmers who can not detect that
- Weak soil, especially in areas located in the lower parts of valleys.
- High prices of seeds and pesticides
- Weak role of agricultural guidance

Irrigation Improvement Project

Assessment Study of the Impact of Agricultural Demonstrations Program on Production and Income in Zabid and Tuban Valleys

- Absence of the role of agricultural marketing
- Problems resulting from built barriers in the upper part of the Zabid valley.
- Absence of agricultural cycle .
- Absence of laws and sub-laws organizing the distribution and usage of flood water.
- Low adoption of technologies relating to sunflower crop and weak demand
- Absence of modernized irrigation methods.
- Spread of agricultural diseases.

6. Recommendations and Suggestions

- The importance of implementing the ADP in other governorates and involving farmers in planning, implementation and evaluation of program and activities so that farmers can benefit from new technologies. Emphasis should be put on speeding the dissemination of technologies in specified time and location, and on flow of information among various parties.
- Purchasing of cotton from farmers with prices that vary according to degrees, and speeding up sorting and paying and the rehabilitation of the spinning and weaving factory in Aden. Emphasis should also be put on enhancing the quality of cotton through agricultural processes before ginning and as a result be able to acquire higher prices.
- Specification and activation of roles and responsibilities of agencies involved in agricultural development (research, guidance, farmers, associations, private sector, firms and corporations, factories, seeds improvement) so that the process is sustainable.
- The importance of activating, funding, and strengthening the role of agricultural guidance as a continuous educational and developmental service.
- Intensification of agricultural guidance and awareness-raising in the upcoming years in various regions with the goal of familiarizing farmers with new technologies.
- Enhancing the management of agricultural procedures in order to increase productivity and farmers income, and awareness-raising of farmers of issues such as water management, leveling of land before flood, deep ploughing, dissemination of improved seeds, treatment of seeds before plantation, and pesticing and fertilizing.
- Establishing and activating an effective information system on marketing so that it can provide farmers with information in the right time. This can help farmers do better in marketing their crops.
- Supporting farmers to enhance the efficiency of the use of water resources. This can be achieved, for example, by encouraging farmers to use pipes and pumps, and new irrigation networks. The use of modern irrigation nets will mitigate the loss of water which

is associated with the use of old irrigation systems. Priority should be given to lower areas in each valley.

- Development of harvesting and irrigation technologies while taking into consideration the traditional ways of barriers building and irrigation facilities, and the study of the impact of building dams in the upper parts of valleys on middle and lower areas of valleys.
- Searching for technical solutions for agricultural diseases.

Appendix no. 1

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">Questionnaire</p> <p style="text-align: center;">Assessment Study of the Impact of</p> <p style="text-align: center;">Agricultural Demonstrations Program on Production and</p> <p style="text-align: center;">Income in Zabid and Tuban Valleys</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Valley..... Governorate

Questionnaire no: ()

Date: / /2007

I. Personal information

| | |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------|
| Farmer's name: | District: |
| Age: | Region: |
| Location in the valley: Upper () Middle () Lower () | |
| Place of Residence: | Canal: |
| Total area: | Association: |
| Irrigation system: Flood () Ground water () Mixed () | |

Researcher's Name:.....Signature.....

II. Beneficiaries Associations:

1. Are you a member in water beneficiaries associations?

Yes.....No....

2. In which activities do you participate?

III. General Information:

1. Martial status:

A. Single (). B. Married (). C. Divorced (). D. Widower ()

2. Education:

A. Illiterate (). B. Reads and writes (). C. Primary (). D. Elementary (). E. Secondary (). F. University level ()

3. Occupation:

A. Farmer (). B. Trader (). C. Worker (). D. Employee (). E. Others:

4. Main source of income:

A. Farming (). B. Trading (). C. Government job (). E. Others:

5. Secondary source of income:

A. Farming (). B. Trading (). C. Government job (). E. Others:

6. Residential status:

a. Family house: Owned () Rent () Endowment () Others:.....

b. Type of housing: Berdeen (). Weeds (). Clay (). Canes (). Timplates (). Others:.....

c. Number of rooms: one () Two () Three () More than three ()

7. Family structure

| # | Name | Relation to head of household | Sex | Age (years) | Marital status | Education | Occupation |
|----|------|-------------------------------|-----|-------------|----------------|-----------|------------|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |

For researchers only:

7. The no. of employed in the family Males () Females () Total ().

8. The number of family members residing in the house: Males () Females ()
Total ().

IV. Information about Current Agricultural Living Style

1. Total planted area which still with the family

A. Owned.....acre. Rented.....acre. Usageacre.

2. If you share production, are you satisfied with the yields?

Yes.....No....

3. Do you have a land that was not planted last year?

Yes.....No....

(if the answer is no, skip to V)

4. If your answer to question no 3 of IV is “Yes” what is the area of the land?

.....Acre

5. What are the reasons for not planting the land?

A. Main reasons: lack of financial resources (). Scarcity of water resources ().

B. Secondary reasons:

V. Information about the total areas planted according to modern irrigation systems:

- A. Areas planted using flood water.....acre.
- B. Areas planted using underground water....acre.
- C. Areas planted using mixed irrigation systems....acre.
- D. Areas planted using rain water....acre.
- E. Areas planted using springs water....acre.

2. Do flood water come annually to your farm?

Yes.....No.....

3. How many times per year does flood water come to your farm?

Once () Twice () Thrice () More () None ().

4. Is there an improvement in the flood distribution system?

Yes.....No.....

5. if your answer to the preceding question is “Yes,” what type of improvement?

Yes.....No.....

6. If you answered question four of this section with “No,” what are the reasons? What are your suggestions for improvement?

A. Reasons:.....
.....
.....

B. Suggestions.....
.....

7. Do you have an irrigation unit (well + pump)?

Yes.....No.....

8. If your answer to the preceding question is “Yes” do you sell water to others?

Yes.....No.....

9. In case of flood occurrence, do you notice an increase in the level of underground water?

Yes.....No.....

10. If your answer to the preceding question is “Yes” what is the average increase?

.....meter

11. Do you usually buy additional water for irrigation?

VI. Impact of the ADP on area and productivity:

A. Vegetarian Production

| | | Irrigation system | Total Planted Area | | Productivity Kg/acre | | Comments |
|----|---------------------------------------------------|-------------------|--------------------|-----|----------------------|-----|----------|
| | | | Base Technology | ADP | Base Technology | ADP | |
| 1 | Crops Cereals/fodders: Sorghum | | | | | | |
| 2 | Millets | | | | | | |
| 3 | Maize | | | | | | |
| 4 | Summer feed | | | | | | |
| 5 | Cotton | | | | | | |
| 6 | Sesame | | | | | | |
| 7 | Groundnuts Sunflower | | | | | | |
| 8 | Gourds: Watermelon/Sweet melon/ Cucumber | | | | | | |
| 9 | Legumes: Kidney bean | | | | | | |
| 10 | Pear | | | | | | |
| 11 | Pulse | | | | | | |
| 12 | Fruits Mango | | | | | | |
| 13 | Banana | | | | | | |
| 14 | papaw | | | | | | |
| 15 | Guava | | | | | | |
| 16 | Palms | | | | | | |
| 17 | Abbasee | | | | | | |
| 18 | Organges | | | | | | |
| 19 | Lemon | | | | | | |
| 20 | Others | | | | | | |
| 21 | Tomateos | | | | | | |
| 22 | Union | | | | | | |
| 23 | Okra | | | | | | |
| 24 | Pepper | | | | | | |
| 25 | Chilli | | | | | | |
| 26 | legume | | | | | | |
| 27 | Purslane | | | | | | |
| 28 | Watercress/Salads | | | | | | |
| 29 | Eggplants | | | | | | |
| 30 | Others | | | | | | |

Comments for researchers:

- Complementary irrigation: flood irrigation + underground water irrigation)
- Vegetables: union, tomatoes, okra, eggplants, pumpkins,....., and these crops are usually planted using underground water
- Legumes: it includes crops such as kidney beans and other types.
- Local measures: Basket= 20 kg, a bag of cereal=6 faracelah, a faracelah=12 kg

B. Livestock Production

1. What types of animals do you rear?

| # | Animal | Number | | Soled in two seasons | Comments |
|----|----------|-----------------|---------------|----------------------|----------|
| | | Base technology | Under the ADP | | |
| 1 | Goats | | | | |
| 2 | Sheep | | | | |
| 3 | Cattle | | | | |
| 4 | Calves | | | | |
| 5 | Camels | | | | |
| 6 | Horses | | | | |
| 7 | Donkeys | | | | |
| 8 | Bee nest | | | | |
| 9 | Chicken | | | | |
| 10 | Rabbits | | | | |
| 11 | Others | | | | |

2. What sources of income (other than the farm) did the family have last year?

- Labor of family members working in other farms:..... (Ryals)
- Labor of family members working in other governorates:..... (Ryals)
- Government jobs:(Ryals)
- Renting farm animals:..... (Ryals)
- Renting the farm equipments:.....(Ryals)
- Selling land:..... (Ryals)
- Selling irrigation water:..... (Ryals)
- Income from expatriates:..... (Ryals)
- Others (list):..... (Ryals)

Questions to the researcher:

- What is the annual average income from agricultural crops?
.....(Ryals)
- What is the average income from livestock?
.....(Ryals)
- What is the average annual income from agriculture?
.....(Ryals)

VII. The ADP Services:

A. If the farmer participated in the ADP:

1. Did the ADP run demonstration fields in your farm?
Yes (). No ().
2. What crops and technologies implemented in your farm?
.....
3. Did the demonstrations lead to increase in productivity under the current irrigation system?
Yes (). No ().
4. Did you visit other demonstration fields run by the ADP?
Yes (). No ().
5. Is it possible to use the same technologies in your field?
Yes (). No ().
6. if the answer is no, list the reasons:.....
.....
.....
7. did you participate in the ADP field days or night meetings?
Yes (). No ().
8. Did you participate in any field training?
Yes (). No ().
9. Did you adopt any practice you learned from training?
Yes (). No ().
10. Did the agricultural income increase?
Yes (). No ().
11. What could be done to maximize farmers benefits?
.....
.....
.....
.....

B. If the farmer did not participate in implementing the demonstrations?

1. Did you hear about the agricultural guidance program?
Yes (). No ().
2. Did you participate in any field days or agricultural meetings?
Yes (). No ().
3. Did you benefit from these activities?
....Yes (). No ().
4. Did you implement any of the things learned in your farm?
Yes (). No ().
6. Give examples of new things you planted:.....
.....
.....

7. Did the agricultural income increase as a result of the new knowledge?

Yes (). No ().

8. What could be done to maximize farmers' benefits and participation?

.....
.....
.....
.....

VIII. The environmental situation:

1. Was the area exposed to environmental damage as a result of decrease in flood rate?

Yes (). No ().

2. If the answer is "Yes" put (√) in front the relevant damages

Yes (). No ().

- Desertification ().
- Disappearance of some types of natural plants ().
- Decrease of the level of underground water ().
- Saltification of the underground water ().
- Decrease in the size of planted area ().
- Decrease in the number of livestock ().
- Selling out the agricultural land ().
- Increase of immigration rate ().

IX. The Farmers Possessions

1. What things do you own?

Land () Machines () Stores () pumps ()

2. Did you buy or rent a new land?

Yes (). No ().

3. Did you build a new house or add a new room/floor to the house?

Yes (). No ().

4. Did you buy new house equipment?

Yes (). No ().

5. Did you buy a new pump/car?

Yes (). No ().

6. Did you buy any of your sons or daughters married?

Yes (). No ().

7. Did you go for haj?

Yes (). No ().

8. How much do you spend monthly on each of the following?

| Type of expenditure | Monthly expenditure (Ryal) | Comments |
|-----------------------|----------------------------|----------|
| Medicine | | |
| Education of children | | |
| Transportation | | |
| Construction | | |
| Equipments | | |
| Qat | | |
| Apparels | | |
| Others | | |
| | | |

IX. Prospects and Obstacles of Agricultural Work

1. What are the agricultural problems that you can not control? What causes them? What are your suggestions?

| Types of problems | Reasons | Suggestions |
|-------------------|---------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Any further comments?

.....
.....
.....
.....
.....
.....
.....
.....
.....

Appendix no. 2

The study team

| # | Name | Degree | Field | Responsibilities |
|----|-------------------------------|--------|---------------------------|--------------------------------------------------------|
| 1 | Dr. Khaled Qasim Qaid | PhD | Agricultural economics | Teams leader Report drafter |
| 2 | Dr. Ahmed Al-Samawi | PhD | Guidance | Participating in reports writing |
| 3 | Dr. Amer Abdulhafiz Al-qubati | PhD | Agricultural economics | Heading a field team |
| 4 | Dr. Ali Mahyoub Saif Al-Asli | PhD | Agricultural economics | Heading a field team |
| 5 | Dr. Adnan Al-Sinui | PhD | Agricultural economics | Participating in writing and translating of the report |
| 6 | Dr. Mahmoud Ali Abdullah Rajh | PhD | Plants diseases | Participating in and reviewing of field research |
| 7 | Dr. Said Abdu Sais | MA | Agricultural economics | Participating in and reviewing of field research |
| 8 | Enginner/Mohammed Qaid Harth | B.S | Protection and forests | Participating in and reviewing of field research |
| 9 | Ahmed Moqbil Morshed | B.S | Commerce and economics | Participating in and reviewing of field research |
| 11 | Others | | Administrative Assistants | |

Appendix no:

Appendix no. 4
List of Interviewers

Table. (21): List of Interviewers in Wadi Zabid

| no | Name | Location | Committee |
|----|-------------------------------|----------|------------------|
| 1 | Mohamed hamed saif | upper | alboni wa albari |
| 2 | Said abas bazy | upper | alboni wa albari |
| 3 | Mohamed awad waheb nasser | upper | alboni wa albari |
| 4 | Zaid ali donfa | upper | alboni wa albari |
| 5 | Abduallah Mohamed shdy | upper | alboni wa albari |
| 6 | Ahmed ali mohathb | upper | alboni wa albari |
| 7 | Abdulwahab omer shary | upper | alboni wa albari |
| 8 | Abduh mansor mohathb | upper | alboni wa albari |
| 9 | Mahmud ali alidaross | upper | Alroda\ aljerba |
| 10 | Ebrahim ahmed almzroky | upper | Alroda\ aljerba |
| 11 | Hassan yahya hassan alidaross | upper | Alroda\ aljerba |
| 12 | Nasser ghaleb mahros | upper | Alroda\ aljerba |
| 13 | Ebrahim almzroky | upper | Alroda\ aljerba |
| 14 | Hassan said aorem | upper | Alroda\ aljerba |
| 15 | Hassan hassan ahmed tbily | upper | Alroda\ aljerba |
| 16 | Omer salem ahmed | upper | Alroda\ aljerba |
| 17 | Abduh Mohamed esmail | upper | Alroda\ aljerba |
| 18 | Soliman salem mahros | upper | Alroda\ aljerba |
| 19 | Mohamed sager ahmed wasil | upper | Alroda\ aljerba |
| 20 | Omer bn omer ebrahem | upper | Alroda\ aljerba |
| 21 | Ahmed salim alshrihi | upper | Alroda\ aljerba |
| 22 | Abduh ali hassan dewib | upper | Alroda\ aljerba |
| 23 | Manssor yahya hassn | upper | Alroda\ aljerba |
| 24 | Soliman ahmed wasel | upper | Alroda\ aljerba |
| 25 | Mohamed salim abduallah orim | upper | Alroda\ aljerba |
| 26 | Abduallah Mohamed ahmed | upper | Alroda\ aljerba |
| 27 | Abdualkreem ali alidaros | upper | Alroda\ aljerba |
| 28 | Thabet hassan omer | upper | Alroda\ aljerba |
| 29 | Ebrahem awad omrah | upper | alrian |
| 30 | Fotini esa'a mdahdah | upper | alrian |
| 31 | Jaafar daod ebrahem | upper | alrian |
| 32 | Omer hassan hwary | upper | alrian |
| 33 | Ahmed Mohamed mojahed | upper | alrian |
| 34 | Mohamed ali dar | upper | alrian |

| | | | |
|----|--------------------------|-------|--------|
| 35 | Yossef ahmed omer mdahdh | upper | alrian |
|----|--------------------------|-------|--------|

Table. (21): List of Interviewers in Wadi Zabid

| no | Name | Location | Committee |
|----|-------------------------------|----------|------------|
| 36 | Yahya mastor alhatar | upper | alrian |
| 37 | Ebrahem Mohamed sager | upper | alrian |
| 38 | Mohamed ahmed khlel | middle | alibri |
| 39 | Ali hussin alhendy | middle | alibri |
| 40 | Mohamed kasim bgail | middl | almanssori |
| 41 | Salim hassan mrikin bgail | middle | almanssori |
| 42 | Hail ali ahmed bgail | middle | almanssori |
| 43 | Salih fotini awas | middl | almanssori |
| 44 | Soliman ali ahmed | middle | almanssori |
| 45 | Mohamed salim mohjab | middle | almanssori |
| 46 | Abduallah said sofya | middle | almanssori |
| 47 | Mahmod daod gershy | middl | almanssori |
| 48 | Ahmed obid hairy | middle | almanssori |
| 49 | Omer ahmed modahdeh | middle | almanssori |
| 50 | Ali qassm bgil | middl | almanssori |
| 51 | Mohamed ali mohamed | middle | almanssori |
| 52 | Jafer abduh aflah | middle | almawei |
| 53 | Salih salih zaid qadeb | middl | almawe |
| 54 | Soleman yahya Mohamed maken | middle | almawe |
| 55 | Mohamed soliman mohamed | middle | almawe |
| 56 | Talib Mohamed argash | middl | almawe |
| 57 | Mohamed salih qatheb | middle | almawe |
| 58 | Ahmed ali saiah | middle | almawe |
| 59 | Ali Mohamed atal | middl | almawe |
| 60 | Abduh abduallah kassim sharai | middle | almawe |
| 61 | Ahmed abduallah haron | middle | almawe |
| 62 | Salim ahmed Mohamed tabakh | middl | almawe |
| 63 | Aiash hussin sayah | middle | almawe |
| 64 | Hussin essa qatheb | middle | almawe |
| 65 | Esmail hussin essa qatheb | middl | almawe |
| 66 | Mohamed ali hassn btah | middle | almawe |
| 67 | Ayash said afef | middle | almawe |
| 68 | Hussin essa hussin qatheb | middl | almawe |
| 69 | Ahmed Mohamed beshy | middle | almawe |
| 70 | Salih zhary ali | middle | alnasseri |

Table (21): List of Interviewers in Wadi Zabid

| no | Name | Location | Committee |
|-----|-----------------------------|----------|-----------|
| 71 | Esmail said esmail | middle | alnasseri |
| 72 | Essam Mohamed damaj | middle | alnasseri |
| 73 | Ezy ahmed alahdal | middl | alnasseri |
| 74 | Ahmed Mohamed hassan qatheb | middle | alboqr |
| 75 | Mohamed sager kassem qatheb | middle | alboqr |
| 76 | Abdualkareem ali qatheb | middl | alboqr |
| 77 | Abduallah salih qatheb | middle | alboqr |
| 78 | Fotini Mohamed salim wjeeh | middle | alboqr |
| 79 | Yahya ebrahim jarah | middl | alboqr |
| 80 | Ali Mohamed blee | middle | alboqr |
| 81 | Abdualkawee Mohamed maken | middle | alboqr |
| 82 | Mahmod essa hossin | middl | alboqr |
| 83 | Mahmod ali bogel | middle | alboqr |
| 84 | Mohamed fotini ater | middle | alboqr |
| 85 | Abar salim omer ossely | middl | alboqr |
| 86 | Khalid Mohamed ahmed tabakh | middle | alboqr |
| 87 | Abar nassr salim wjeeh | middle | alboqr |
| 88 | Ali khadm alwaheeh | middl | alboqr |
| 89 | Salom soliman abdualhak | middle | alboqr |
| 90 | Omer yossef dukhini | middle | alboqr |
| 91 | Abduallim ahmed alahdal | middl | alboqr |
| 92 | Abdualkader Mohamed maken | middle | alboqr |
| 93 | Soliman fotini shraf | middle | aluosifi |
| 94 | Ebrahim fotini mohamed | middl | aluosifi |
| 95 | Hassan fotini btah | middle | aluosifi |
| 96 | Awad ali komere | middle | aluosifi |
| 97 | Soliman salim alkabaty | middl | aluosifi |
| 98 | Daod obaid khlef | middle | aluosifi |
| 99 | Abduh ebrahim atya | middle | aluosifi |
| 100 | Qaboss said ebrahim akby | middl | aluosifi |
| 101 | Omer ali ossara | middle | aluosifi |
| 102 | Daod fotini mohamed | middle | aluosifi |
| 103 | Said ali soliman | middl | aluosifi |
| 104 | Hossin omer mashhor | middle | aluosifi |
| 105 | Yahya soliman btah | middle | aluosifi |

Table (21): List of Interviewers in Wadi Zabid

| no | Name | Location | Committee |
|-----|---------------------------------|----------|---------------|
| 106 | Mohamed alezy wasl | middle | aljarhazy |
| 107 | Sallih soliman said | middle | aljarhazy |
| 108 | Abduh zaid hobira | middl | aljarhazy |
| 109 | Fooz abduh abduallah haroon | middle | aljorib |
| 110 | Hamza ahmed abduallah qtab | middle | alsharabi |
| 111 | Yahya yahya abduahbake wasil | middl | alabri |
| 112 | Ebrahim said thiban | middle | alabri |
| 113 | Said ahmed alktbah | middle | alabri |
| 114 | Salim ahmed abduallah abrah | middl | alabri |
| 115 | Ebrahim ahssan mahdy wasil | middle | alabri |
| 116 | Mohamed sager mohamed | middle | alabri |
| 117 | Majed ali alsoit | middl | alnasseri |
| 118 | Soliman obaid agash | middle | alnasseri |
| 119 | Mohamed ahmed yossef | middle | alnasseri |
| 120 | Salim abduh mojahed | middl | alnasseri |
| 121 | Mohamed ahmed waro | middle | alnasseri |
| 122 | Abduallah ali ahmed botili | middle | aljarhazy |
| 123 | Abduh ahmed botili | middl | aljarhazy |
| 124 | Ali salim ebrahim | middle | alabri |
| 125 | Ali salim habl | lower | Albirah\harim |
| 126 | Ahmed ebrahim mosher | lower | Albirah\harim |
| 127 | Kassem ahmed ali habl | lower | Albirah\harim |
| 128 | Ahmed manssor abduallah mahrky | lower | almahraqi |
| 129 | Faraj salim habl | lower | almahraqi |
| 130 | Mohamed abduallah yahya mahrky | lower | almahraqi |
| 131 | Manssor abduallh hibatallh mahr | lower | almahraqi |
| 132 | Abduallah Mohamed mahraky | lower | almahraqi |
| 133 | Mohssen salim mahrahy | lower | almahraqi |
| 134 | Mohamed faraj daod mahraky | lower | almahraqi |
| 135 | Abduallgane Mohamed yahya | lower | almahraqi |
| 136 | Hassan Mohamed ahmed mahraky | lower | almahraqi |
| 137 | Ahmed yahya salim dlibi | lower | Albirah\harim |
| 138 | Ahmed yossef abduallah zalil | lower | Albirah\harim |
| 139 | alakil Hassan abar | lower | Albirah\harim |
| 140 | Ahmed hassan mohamed | lower | Albirah\harim |

Table(21): List of Interviewers in Wadi Zabid

| no | Name | Location | Committee |
|-----|-----------------------------------|----------|---------------|
| 141 | Yahya yossef zalil | lower | Albirah\harim |
| 142 | Awad ahmed nowih | lower | Albirah\harim |
| 143 | Majed Mohamed ahmed | lower | Albirah\harim |
| 144 | Abduh ebrahim habl | lower | Albirah\harim |
| 145 | Abduallah abduallah ali habl | lower | Albirah\harim |
| 146 | Mohamed yossef nowih | lower | Albirah\harim |
| 147 | Ahmed esmail mahraky | lower | Albirah\harim |
| 148 | Abduh hassan ali darwsh | lower | Albirah\harim |
| 149 | Salian omer zalil | lower | Albirah\harim |
| 150 | Yahya Mohamed abduallah mahraky | lower | Albirah\harim |
| 151 | Soliman manssor mahraky | lower | Albirah\harim |
| 152 | Mohamed Mohamed moteebn | lower | Albirah\harim |
| 153 | Salim Mohamed abduallah almahraky | lower | Albirah\harim |
| 154 | Ali omer ahmed habl | lower | Albirah\harim |
| 155 | Awad abduallah ali habl | lower | Albirah\harim |
| 156 | Ali ahmed ali jehad | lower | Albirah\harim |
| 157 | Hossin abduallah Mohamed habl | lower | Albirah\harim |
| 158 | Hassan Mohamed abduallah jabaly | lower | Albirah\harim |
| 159 | Hamod ali alawy | lower | Albirah\harim |
| 160 | Morie faraj habl | lower | Albirah\harim |
| 161 | Abduh sadek zalil | lower | Albirah\harim |
| 162 | Ebrahim yahya jolaom | lower | Albirah\harim |
| 163 | Salim omer hossin | lower | Albirah\harim |
| 164 | Safwan ali salim qatab | lower | alsharabi |
| 165 | Mossa awad jarallh | lower | alsharabi |
| 166 | Ahmed awad moafa jarallah | lower | alsharabi |
| 167 | Said Mohamed ahmed jarallah | lower | alsharabi |
| 168 | Khalid hamod zalil | lower | alsharabi |
| 169 | Qassim abduallah salim qatab | lower | alsharabi |
| 170 | Ahmed obaid agash | lower | alsharabi |
| 171 | Ali abduh Mohamed ahmizjab | lower | alsharabi |
| 172 | Yahya Mohamed abduallah zalil | lower | alsharabi |
| 173 | Mahdy abduallah omer qatab | lower | alsharabi |
| 174 | Alakel ahmed abduallah qatab | lower | alsharabi |
| 175 | Adel Mohamed jarallah | lower | alsharabi |
| 176 | Obaid awad jarallah | lower | alsharabi |
| 177 | Abduh haddy salim | lower | Albirah\harim |

Table (22): List of Interviewers in Wadi Tuban

| no | Name | Location | Committee |
|----|----------------------------------|----------|-------------|
| 1 | Anwer salih ali | middle | Falij anino |
| 2 | Hamod fathl abduallah | upper | alsaadin |
| 3 | Thabet abduallah fathl | upper | alsaadin |
| 4 | Taha said atood | upper | alsaadin |
| 5 | Ahmed mahdy abduallah fdain | upper | alsaadin |
| 6 | Hassan abduallah Nasser aldokhah | upper | alsaadin |
| 7 | Abdualbasit ali ali mohamed | upper | alsaadin |
| 8 | Fahmy ali kilah awad | upper | alarais |
| 9 | Mohssen alkilah awad | upper | alarais |
| 10 | Ahmed salih aldahbaly | upper | alarais |
| 11 | Awad salih ahmed aldahbaly | upper | alarais |
| 12 | Hady Mohamed awad | upper | alarais |
| 13 | Salih Mohamed jool | upper | alarais |
| 14 | Mohamed salim almatery | upper | alarais |
| 15 | Abduasafy alwan | upper | alarais |
| 16 | Ali alkilah awad ali | upper | alarais |
| 17 | Mohamed ahmed moraaj | upper | alarais |
| 18 | Salih alrohati ahmed awad | upper | alarais |
| 19 | Fares abduh mokbel | upper | alarais |
| 20 | Aamer salih ali aljabaly | upper | Ras alwadi |
| 21 | Mohamed abduallah hamed | upper | Ras alwadi |
| 22 | Salih salih ali | upper | Ras alwadi |
| 23 | Salih hossin ali | upper | Ras alwadi |
| 24 | Hedarah fathl mahrok | upper | Ras alwadi |
| 25 | Ali saif mokbel | upper | Ras alwadi |
| 26 | Abduh Mohamed jafer alahdal | upper | Ras alwadi |
| 27 | Ali said ali | upper | Ras alwadi |
| 28 | Salim Nasser mohssen | upper | Ras alwadi |
| 29 | Mohamed ali alahdal | upper | Ras alwadi |
| 30 | Mohssen abduallah mohssen | upper | Ras alwadi |
| 31 | Jobran abduallah homadi | upper | Ras alwadi |
| 32 | Ali Mohamed salih | upper | Ras alwadi |
| 33 | Ali salih hedarah alrajai | upper | Ras alwadi |
| 34 | Anter salih mohamed | upper | Ras alwadi |
| 35 | Hassan ali salih alrajai | upper | Ras alwadi |

Table (22): List of Interviewers in Wadi Tuban

| no | Name | Location | Committee |
|----|--------------------------------|----------|------------------|
| 36 | Abduallah hedarah salim kambah | upper | Ras alwadi |
| 37 | Ahmed Mohamed thabet robah | upper | Ras alwadi |
| 38 | Ali abduallah sli alrajai | upper | Ras alwadi |
| 39 | Abduallah Mohamed zaid | upper | Ras alwadi |
| 40 | Ali ali abduallah | middle | Almanteka alwsta |
| 41 | Morad abobakr mohssen | middle | Almanteka alwsta |
| 42 | Yasser mahdi awad | middle | Almanteka alwsta |
| 43 | Abdualkader salim abduallah | middle | Almanteka alwsta |
| 44 | Abduahrahem abduallah alabd | middle | Almanteka alwsta |
| 45 | Sedek ali salam | middle | Almanteka alwsta |
| 46 | Salih awad salih monasr | middle | Almanteka alwsta |
| 47 | Abduh Mohamed fathl | middle | Almanteka alwsta |
| 48 | Abubakr mohssen ali manai | middle | Almanteka alwsta |
| 49 | Ali ahmed ali alsalami | middle | Almanteka alwsta |
| 50 | Nasser salih salim | middle | althalab |
| 51 | Fathl Mohamed taher | middle | althalab |
| 52 | Jafer adaros salih | middle | althalab |
| 53 | Salim Mohamed salim hedrah | middle | althalab |
| 54 | Mohamed abduallah alrabash | middle | alhatharem |
| 55 | Yafy abduallah abaas salih | middle | alhatharem |
| 56 | Obaid salim said | middle | alhatharem |
| 57 | Rames abduh alhomediy | middle | alhatharem |
| 58 | Jamal hady salim | middle | alsaadin |
| 59 | Fathl yossef alsmaty | middle | alsaadin |
| 60 | Yahya awad hassan qadim | middle | alsaadin |
| 61 | Salah thabet Mohamed | middle | alsaadin |
| 62 | Adnan alawd | middle | alsaadin |
| 63 | Ahmed mohssen ali | middle | alsaadin |
| 64 | Abduallah said mahmod | middle | alsaadin |
| 65 | Abduallah awad mohamed | middle | alsaadin |
| 66 | Abdu fathl mohamed | middle | alsaadin |
| 67 | Salih awad salih qirai | middle | alsaadin |
| 68 | Abdualkafi ali alhaj | middle | alsaadin |
| 69 | Wahed ahmed abdu alsalimi | middle | berzaj |
| 70 | Said salih silan | middle | berzaj |

Table (22): List of Interviewers in Wadi Tuban

| no | Name | Location | Committee |
|-----|--------------------------------|----------|-------------|
| 71 | Abduallah ali ahwary | middle | berzaj |
| 72 | Alawy khalid hail | middle | berzaj |
| 73 | Salih abduallah taleb altrimi | middle | Falij anino |
| 74 | Said Mohamed dobah | middle | Falij anino |
| 75 | Fesal hossen mahmod | middle | Falij anino |
| 76 | Nassr hamid yahya | middle | Falij anino |
| 77 | Finod Mohamed qassem | middle | Falej aiad |
| 78 | Ali Mohamed salim | middle | Falej aiad |
| 79 | Mahdy salim abras | middle | Falej aiad |
| 80 | Abduallah mothana ahmed | middle | Falej aiad |
| 81 | Mostafa Mohamed salih | middle | Falej aiad |
| 82 | Khaldon Mohamed fathl awad | middle | Falej aiad |
| 83 | Ali Mohamed ali soliman | middle | Falej aiad |
| 84 | Salih abady alwjili | middle | Falej aiad |
| 85 | Mohssen ahmed salih alatify | middle | Falej aiad |
| 86 | Faissal awad shaker | middle | Falej aiad |
| 87 | Hashem ahmed jaafer | middle | Falej aiad |
| 88 | Salih Mohamed said howder | middle | Falej aiad |
| 89 | Abdu mohssen ali jandoh | middle | Falej aiad |
| 90 | Mahmod Mohamed ali | middle | Falej aiad |
| 91 | Abdualkarem abdualkawi alahdal | middle | Falej aiad |
| 92 | Awad Nasser hidarah | middle | Falej aiad |
| 93 | Fathl ahmed abduallah | middle | Falej aiad |
| 94 | Mohamed salim mohamed | middle | Falej aiad |
| 95 | Adel Mohamed arab | middle | Falej aiad |
| 96 | Mahmod said almohamdy | middle | alhatharem |
| 97 | Aidaros Mohamed jaafer | lower | mohahed |
| 98 | Fathi yassen salah | lower | mohahed |
| 99 | Alawi Mohamed abduallah aljawi | lower | mohahed |
| 100 | Amin alawi aljawi | lower | alwaht |
| 101 | Khalid hossen salih | lower | alwaht |
| 102 | Saif jahes abduallah | lower | alwaht |
| 103 | Mahdy ali hassan | lower | alriad |
| 104 | Abduallah hidarah almontaser | lower | alriad |
| 105 | Abdualkawe salih abduallah | lower | alriad |

Table (22): List of Interviewers in Wadi Tuban

| no | Name | Location | Committee |
|-----|-----------------------------|----------|-----------|
| 106 | Abdualhakim khadr abduallah | lower | alriad |
| 107 | Abduallah hidarh almontaser | lower | alriad |
| 108 | Mohamed abduallah said | lower | alriad |
| 109 | Amar abduallah hidarah | lower | alriad |
| 110 | Said Nasser ali | lower | alriad |
| 111 | Abduallah said ali altahs | lower | alafardah |
| 112 | Ali salih khmes | lower | alafardah |
| 113 | Abduallah said ali | lower | alafardah |
| 114 | Nasser Mohamed abduallah | lower | alafardah |
| 115 | Najeeb ali ahmed | lower | alafardah |
| 116 | Bilal abduh fathl | lower | alafardah |
| 117 | Hedarah ahmed awad | lower | alafardah |
| 118 | Ahmed salim ahmed dobai | lower | alafardah |
| 119 | Ejaab ahmed fathl | lower | alafardah |
| 120 | Ahmed fathl nasser | lower | alafardah |
| 121 | Bader salim awad | lower | alafardah |
| 122 | Ali Mohamed fathl | lower | alafardah |
| 123 | Ahmed salim harsy | lower | alafardah |
| 124 | Skraan ahmed fathl | lower | alafardah |
| 125 | Mohamed salih selan | lower | alafardah |
| 126 | Mithaq abduh fathl | lower | alafardah |
| 127 | Nasser salim ali | lower | alafardah |
| 128 | Wajdi Nasser fathl | lower | alafardah |
| 129 | Salih ahmed thabet | lower | alafardah |
| 130 | Mohamed salim salih | lower | alafardah |
| 131 | Mohssen salih ali | lower | alafardah |
| 132 | Ali Mohamed abduallah | lower | alafardah |
| 133 | Fathl salih ali | lower | alafardah |