



Republic of Yemen
Ministry of Agriculture and Irrigation
Irrigation Improvement project
(IIP)
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Project Management Unit

**Agricultural
Development
Component**
Wadi Zabid – Wadi Tuban

Quarterly Report
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By
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MINISTRY OF AGRICULTURE AND IRRIGATION

IRRIGATION IMPROVEMENT PROJECT

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1-Introduction

The Consultant agronomist has been contracted by the Irrigation Improvement Project (IIP) to provide services to the implementation of the Agricultural Development Component (ADC) at Wadi Zabid and Wadi Tuban

The purpose is to assist IIP develop ADC in dynamic and sustainable manner with the over all objective of increasing the potential yield of selected crops through technological interventions to farmers so as to improve crops productivity, farmers income and enhance food security.

The first year of implementation of ADC elapsed on 30 June 2005. The second season contract 2005 / 2006 was signed in July 2005 and continues up the end of June 2006. Within the first year of recruitment of the consultant agronomist, an inception report was drafted November 2004 showing the intent of the activities to be performed in both Wades. A total of six quarterly reports and one final report were submitted to IIP head quarters for the fulfillment of contract terms. The set of activities which were reported include:

- **Follow up on the execution of the ADP for each Wadi.**
- **Strategic planning exercise for options, priorities and actions needed at the specific project sites.**
- **Preparation of specific tasks and timing of inputs for the relevant PIU to closely follow up and monitor input distribution.**
- **Identification of difficulties facing the consulting services during program implementation which require amendments and quick action plans.**
- **Preparation of logical frame work against which objectives outputs and activities could be monitored and evaluated.**
- **Conduct PRA, work shops and seminars to assess farmer's options and needs through sharing experiences with researchers and project entities.**
- **Finalizations of data collection, analysis and documentation of all the technological packages for each activity. All the relevant papers of scientist working with the implementing agencies were reviewed.**
- **Formalization of issues related to development, constraints and suggestions on various technical, organizational and administrative aspects.**

This report highlights the activities of ADC for the period (July2005-June2006). It presents the activities in accumulative manner for the various aspects carried out by consulting agencies: The report encompasses:

- **Overview of interventions and technologies for 2005/2006.**
- **Progress of implementation achieved for each activity by the consulting agencies**
- **-Economic viability assessment**
- **Training and communication skills development at each project site.**
- **-Irrigation efficiency for crops grown on tube-wells.**
- **-Highlights on the new ADP contract for 2006\2007.**

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The report in general incorporates the on- going activities since the start of the second year of ADP in July 2005 and covers all the quarters till the end of June 2006.

The ADP, at Tuban, faced some difficulties during April-May2006 due to the resignation of the team leader of PCAS .Essentially some of data pertaining to the economic analysis and irrigation efficiency studies were not delivered to PIU in Tuban.This issue has now been resolved through the recruitment of a new team leader. The unavailability of some of the essential data has affected the outcome of this report also. The consultant agronomist met with the new PCAS team leader on 12 June 2006 in the presence of PIU director at Tuban.Issues related to finalization of activities of 2005\2006 contract were discussed as priority. Highlights on the activities and scope of ADP were also reviewed.

2. The ADC Strategy

2.1 The IIP

The current Irrigation Improvement Project IIP under implementation, which constitutes the first phase of spate irrigation rehabilitation in Yemen, limits its activities on two main spate irrigation schemes in wadi Zabid and wadi Tuban. The other six schemes of Bana, Hassan, Rima, Mawr, Ahwar and Siham may be included in the second phase. The rehabilitation of these wadies would ultimately affect the traditional crop production set up and cause institutional as well as social changes for the agricultural communities scattered along these wadies.

2.2. Project Description:

The project maintains four main components. These are summarized below:

- A- Rehabilitation of spate irrigation infrastructure for wadi Tuban and Zabid covering a command area of about 26000 ha
- B- Irrigation and environment resource development through participatory irrigation management (PIM) approach.
- C- Institutional strengthening and capacity building through creation of a project management unit (PMU) and other implementation units at Zabid and Lahj.
- D- Agricultural development component through implementation of intensive demonstration program.

2.3. Development objective

The IIP contains two development objectives:

- Rehabilitation, improvement of the water distribution and efficiency of conveyance and use in two spate irrigation schemes of Tuban and Zabid through the development of sustainable system of participatory irrigation management.
- Increase agricultural production, farmers income and food security through implementation of an intensive on-farm demonstration program aimed at increasing crop yield.

In relation to latter development objective, targets were set as indicators for monitoring the progress of achievement for specific crop yields in the project areas

2.4 The strategy for improvement of the agricultural component :

Due to the after-effects of irrigation rehabilitation, there would be (a) an increase in areas under irrigation (b) an increase in conveyance efficiency of water flow, thus bringing faster water flow. The strategy to meet the second objective was to be brought about through implementation of an intensive on-farm demonstration program aimed at increasing crop yield over an area of 3000 ha in Zabid and 2000 ha in Tuban. Proven technologies which has been developed by Agricultural Research and Extension Authority (AREA) under the Generalized Rapid Impact program (GRIP) during (1997–2000) will be transferred to farmers in the project areas . The proposed demonstration activities would cover about 10% of the Tuban and Zabid schemes.

2.5. The set of proven technologies in relation to the constraints of productivity for include:

- The introduction of superior varieties.
- Use of high quality seed.
- Better crop husbandry practices.
- Timely crop protection measures.
- Optimal harvesting.
- Intercropping of compatible crops.
- Improvement of soil fertility levels
- Collection of data on irrigation efficiency of various crops.

2.6. The agricultural benefits accrued from the above set of agricultural intervention were likely to come from :

- Horizontal expansion of agricultural area at both schemes. These were estimated as 10 % for Zabid and 35 % for Tuban.
- Efficiency of water conveyance which has it's implication on the timely sowing of various crops hence bring an estimated 2 % over current levels of production.
- Significant returns from the adoption and disseminations of the proven technologies. An overall adoption rate of 35 % for Zabid and 45 % at Tuban had been assumed. The yield increases due to these rates of adoption for various crops, were anticipated to be between 3-20 % under both spate and well system of irrigation.

Yield Performance indicators for various

Crops at Tuban and Zabid

<i>Main crops</i>	<i>Tuban</i>			<i>Zabid</i>		
	<i>Present</i>	<i>Future</i>	<i>Expected increase</i>	<i>Present</i>	<i>Future</i>	<i>Expected increase</i>
Cotton	1	1.19	15	1.2	1.4	13
Grain sorghum	0.83	0.89	3	0.73	0.78	3-5
Fodder sorghum	7	8	8	9	9.81	3-5
Sesame	0.48	0.55	10	0.55	0.63	10
Maize	–	–	–	–	–	–
Tomato	15	18	20	20	24	20
Onion	7	8.4	20	20	24	20
Eggplant	4	4.8	20	–	–	–
Chili	2	2.4	20	2	2.4	20
Okra	–	–	–	4	4.6	15
Cucurbits	9.8	10.49	3	–	–	–
Banana	–	–	–	25	28.8	10-15
Mango	–	–	–	10	11.5	15

% Share of various crops of net command Area

<i>Main crops</i>	<i>Tuban</i>		<i>Zabid</i>	
	<i>current</i>	<i>Future</i>	<i>current</i>	<i>Future</i>
Cotton	15	19	10	11
Grain sorghum	7	9	24	27
Fodder sorghum	14	19	19	21
Sesame	5	7	9	10
Others	3	4	7	9
Total field crops	44	58	70	77
Vegetable Crops	17	17	15	15
fruits	2	2	9	9
Total horticulture	19	19	24	24
Total cropped area Cropping intensity*	63	77	94	101
	63	77	103	110

* Area of perennials is counted twice

Source: adapted from PAD

2.7. The agricultural development impact:

The sustenance of irrigation and agricultural inputs directly influences incremental production at both sites of project. In two wadies, over 26000 ha of agricultural land are going to benefit from yield increases estimated at 10–15% over the project life. The agricultural benefit which will start accruing from year 5 of the project life and would continue up to year 30 is estimated to bring \$ 5-6 million annually. This will have its influence rural community's income and food security.

2.8. Implementation design:

IIP strategy to conduct agricultural demonstration and interventions was designed through eligible contractual services between the project monitoring units and qualified local public or private sector institution. Following the tendering of reference and letters of invitation, two successful bidders were selected in April 2004 to sign the implementation of agriculture component.

The implementation model of the generalized rapid impact program will ensure that farmers will be familiar with a number of proven technologies – GRIP model aimed at full filling the following objectives:

- The Agricultural Research Authority (ARA) was selected to implement the program at wadi Zabid while the public corporation for Agricultural services (PCAS) was selects for wadi Tuban.
- The program envisaged preparation of seasonal plans in 2004 / 2005 for on farm demonstrations including schedule of technologies to be applied for each demonstrations field.
- At each site PMU designated a field supervisor to assist the project in:
 - Follow - up and monitoring of the demonstration contracts.
 - Supervise and evaluate the quality of implementation and impact of the on farm demonstration on farmers yield and productivity.

2.9. Implementation Arrangements:

- The consultants selected (ARA & PCAS), shall provide qualified and experienced staff for the various technology packages to be introduced.
- The consultants (ARA & PCAS) shall also design and conduct appropriate training course for the team implementing the program, for the farmer's representative and key farmers.

The consultants (ARA & PCAS) shall implement the seasonal plans for various demonstrations. They will also (a) ascertain the validity of the technical package proposed for each site and (b) identify the constraints that farmers think should be resolved as a matter of priority.

- The consultants (ARA & PCAS) shall have the necessary mobility and office equipment to facilitate daily activities.
- A farmer selection for implementation of the program shall be arranged is consultation with the project implementation units at Zabid and Tuban. Activities designed for crop improvement shall be demonstrated on representative fields spread along the wadies close to farmers' centers and along main roads for the facilitation and quick dissemination of technologies. (ARA & PCAS) shall conduct promotional campaigns aiming at strengthening the impact of proven technologies among farmers groups over the upper, middle and lower parts of wadies.

2.10. Proposed Demonstrations:

- The following table depicts the set of crops , activities and areas targeted for each technology as it appeared on the contract terms

<i>Crop</i>	<i>Activity</i>	<i>Targets</i>	
		<i>Tuban</i>	<i>Zabid</i>
Cotton	Introduction of improved seed	70	100
	Optimum husbandry practices	60	150
	Fertilization	70	100
	Plan protection / pest management	200	400
	Total	200	400
Grain Sorghum	Fertilization	80	80
Fodder Sorghum	Fertilization	150	120
Maize	introduction of new variety introduction	–	35
Sesame	Fertilization and variety introduction	70	40
Groundnut	Fertilization	30	
Mango	Fertilization of introduced varieties	50	25_
Vegetables cucurbits	Timely control of cucurbit fly	25	20
Tomato	Balanced fertilization	25	20
Onions	Balanced fertilization	25	20
Okra	Balanced fertilization	25	20
Chilies	Balanced fertilization	20	20
TOTAL		700	800_

.2.10.1 Identification of Agricultural Constraints:

For each Wadi, a number of methods were used to reveal factors associated with low productivity of major cereal and cash crops. Survey, PRA, consultations, research and extension experiences, seminars and work shops, were held to identify and prioritize the constraints in relation to spate and tube well production systems.

The set of intervention required were formulated and reflected in a contract between IIP and the two consulting institutions.

The project document of IIP identified in annex (D), the major constraints which could be targeted by the consultants realizing that no one single factor by it self can solve the complexity of agricultural set backs. Multiple interventions were approached for each Wadi. Farmers were considered as equal partners in selection, testing and evaluation of technology.

In 2005 / 2006, fifteen demonstration activities were identified to address the major food and cash crops constraints in each Wadi.

In addition, a set of 8 other interventions which go along with these crops have been introduced as a separate package with the contract.

2.10.2 Plan of Work for dissemination of activities:

- Each consulting agency, in Wadi Zabid and Wadi Tuban were requested to review and formulate its plans in form of an inception report which outlines the following
- Methodology for expediting the dissemination of appropriate technologies.
- Selection of activity sites based on established criteria.
- Selection of participating farmers based on willingness and readiness to participate.
- Recruitment of technical team (researchers, SMS, extensions) based on specialization and readiness to work with farming communities.
- Preparation of logistics for fulfillment of activities including:

Office and working environment in the duty station, mobility for the staff, storage facilities.

- * Preparation of the required inputs in line with recommendations, quantities and quality (improved seed, fertilizer, pesticides, field equipments, etc...)
- * plan and execute a comprehensive training and awareness campaign to go hand in hand with demonstration activities
- * Produce reports, documents, leaflets, pamphlets ...etc which highlight the ADP progress and impact.

.2.10 .3 Rationale for crop interventions:

The low productivity associated with food and cash crops in both wadies needed an intensive extension strategy .Further the new participatory approach embodied in the project design, required modifications in the classical top-to-bottom orientation. The program also required strong multimedia communication and capacity building philosophy.

2.10 .4 Rationale for new activities incorporated in 2005 / 2006 :

Introduction of new crops to the area:

The Ministry of Agriculture started promoting sunflower production in 2004/2005 on large scale (40 ha). It was thought that Wadi Zabid and Tuban will grow such important oil crop so as to be part of the national set up for promoting such a crop. The crop will also assist develop another industry which is "honey production" since sunflower is known to be cross pollinated by such insects which are naturally available.

Introduction of new varieties:

Good varieties act as a catalyst for the whole agricultural activity .Varieties which were developed by ARA in various research stations were promoted with selected farmers e.g. Sorghum variety (Turaiba) which is dual purpose and maize variety "Taiz 3" was also grown for the first time in 2004 / 2005 in Zabid. The sunflower varieties such as (Sanbro, Hisun33, Hisun 36, and Hisun39) were grown at Zabid for wider introduction). The while seeded sesame variety –Surdod –1- was also introduced to Zabid farmers.

Introduction of seed maintenance programs:

Farmers complains about deterioration of cotton , maize and sorghum seeds were addressed through launching small seed maintenance activity for such crops – This was seen as very vital since it is not being routinely under taken by institutions which have national mandates .

Introduction of legume fodders:

Farmers at both Wadi Zabid and Tuban don't grow legume fodder although their main produce is grass fodders to address fodder quality problems. It was important to disseminate some crops such as Clitoria, Sesbania, Filipsara, Cajanus, cowpea etc which are important at various project sites

2.4,5 Introduction of water saving systems:

Wadi Zabid and Wadi Tuban are also prone to water shortages specialty at the lower segments. Tube wells of 200 – 300 m depth are not uncommon.

Farmers will be supported by trickle as well as bubbler and other devices which maintain higher water efficiency. Such devices will be distributed on pilot bases for the newly created Water Users Association. These would be considered as permanent extension units from which the idea can be further copied.

Dissemination of commercial Mango Seedlings:

Both wades will be surveyed for fruit trees of mango, citrus and sapodilla (abbasi). Certain varieties such as Abusamaka, Galb Elthour, Zubda, mabrouka, (in Tuban),are known for their higher market prices. IIP will assist in promoting these varieties and informing farmers where to find them so that propagation could be further under taken.

Introduction of organic and foliar fertilizers:

For vegetables and fruits, the promotion of foliar and organic fertilizers is necessary because late application of urea fertilizer can cause damage to leaves. Also important micro elements which are deficient can be further rectified

2.11. Monitoring and Evaluation:

The PMU appointed supervisors for each of Tuban and Zabid units with the following mandate:

- Follow up and monitor the execution of contracts and evaluate the performance of delivery of its activities.
- Gather data on the implementation and impact of the demonstration on yield and productivity.
- The PMU had also appointed an international consultant with terms of reference to suggest improvements in the execution of ADP in order to achieve the project objectives.

3- Agricultural Technology Transfer

The overall level of implementation of agricultural demonstration in 2005/2006 for wade Zabid and wade Tuban is illustrated below:

3 - 1 ADP Implementation at Wadi Zabid :

Table below shows progress in implementation of ADP
in Wadi Zabid during (July 2005 –June 2006)

Crop	Activity	Area ha		% execution	Number of farmers
		Planned	Executed		
Cotton	Quality seed	100	70	70	
	Crop husbandry	150	120	70	
	Fertilizer application	100	100	100	
	Pest control	400	400	100	332
	Seed maintenance	–	15		
Sub Total		400	340	85	332
Maize	Introduction of Variety	20	20	100	41
	Fertilizer application	35	40	129	
Sorghum grain	Fertilizer application	80	92	115	108
&fodder	Fertilizer application	120	100	87	80
Sub total		200	172	95	179
Sesame	Introduction of Variety	20	20	100	
	Pest control	40	40	100	
	Post harvest fertilizer	10	10	100	
Sub total		40	40	100	53

Vegetables					
Tomato	Pest control+ balanced Fertilizer	20	20	100	32
Onions	Pest control+ balanced Fertilizer	20	2	10	20
Okra	Pest control+ balanced Fertilizer	20	28	130	30
Chili	Pest control+ balanced Fertilizer	20	22	110	16
Cucurbits	Pest control+ balanced Fertilizer	20	32	100	32
Sub total		100	108	108	112
Fruits					
Mango	Tree management	22	22	100	46
Lemon	Tree management	2	2	100	4
Sapota	Tree management	1	—	—	—
Sub total		25	24	96	50
Total		800	768	97	763

* In Wadi Zabid, (245 ha) were planted on spate. In 2005 / 2006 flooding at the lower part of the Wadi was insignificant.

ADP activities on spate in Wadi Zabid:

The implementation on spate in 2005 / 2006 for the various crop increased to 32 % in 2005 / 2006 as compared to 18 % 2004 / 2005.

**Progress in Implementation of Agricultural Demonstration
in Wadi Tuban 2005/2006**

No	Activity	Planned area (ha)	Implemented area (ha)			Implem entatio n (%)
			Flood	Tuban Well	total	
1	The Use of High Quality cotton seeds	70	-	70	70	100
2	Propel crop husbandry of cotton	70	58	12	70	100
3	Fertilizer application in cotton	60	31	29	60	100
4	Fertilizer application in Sorghum for Grain	80	38.5	43.25	81.75	102.2
5	Fertilizer application in Sorghum for Fodder	150	70	82.25	152.25	101.5
6	Super phosphate application for Sesame	70	48.5	17.5	66	94.3
7	Introduction Groundnut into Wadi Tuban	30	30	0	30	100
Total field Crops		530	276	254	530	100
8	Balanced Fertilizer application in cucurbits	25	1	27	28	112
9	Balanced Fertilizer application in Tomatoes	25		25	25	100
10	Balanced Fertilizer application in Onions	25		25	25	100
11	Balanced Fertilizer application in Okra	25		30	30	120
12	Balanced Fertilizer application in Pepper	20		13	13	65
13	Management of Mango Tress	40		40.375	40.375	101
14	Management of Lime Tress	8		10.375	10.375	130
15	Management of Sapodilla Tress	2		0.875	0.875	43.7
Total Horticultural crops		170	1	172.625	172.625	100.9
Grand Total		700	277	702.625	702.625	100.4

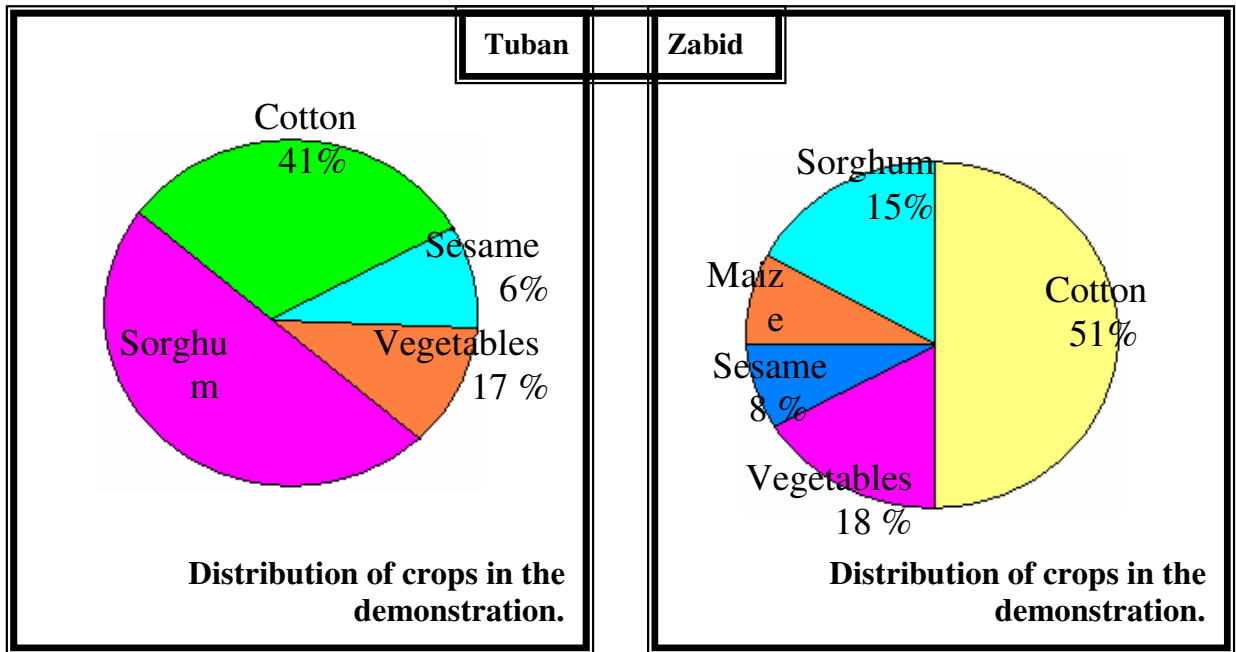
**Preliminary Results of the Agricultural Demonstration
in Program in Wadi Tuban for 2005/2006**

No	Activity	Yield (Kg/ha)		Implementation (%)
		control	Improved Technology	
1	The Use of Quality cotton Seeds (tube well)	1379	1835	33.1
2	Propel crop Husbandry of cotton (flood)	1257.9	1645.5	30.8
	(Tube well)	1480.9	2008.3	35.6
3	Fertilizer application in cotton Cultivation (flood)	1088	1660	52.6
	(Tube well)	1523	2023	33.0
4	Fertilizer application in Sorghum for Grain (flood)	387.2	956.8	147.1
5	Fertilizer application in Sorghum for Fodder (flood)	811(hz)	1104(hz)	36
6	Super phosphate application for Sesame (flood)	536	704	31
7	Introduction Groundnut into Wadi Tuban (flood)	532.9	778.7	46.12
8	Balanced Fertilizer application in Cucurbits	—	—	—
9	Balanced Fertilizer application in Tomatoes	11790	16000	35.7
10	Balanced Fertilizer application in Onions	21720	34760	60.0
11	Balanced Fertilizer application in Okra	1463	2405	64.0
12	Balanced Fertilizer application in Pepper	1860	2211	18.9
13	Management of Mango Trees	—	—	—
14	Management of Lime Trees	—	—	—
15	Management of Sapodilla Trees	—	—	—

Kind of inputs used in Wadi Zabid and Wadi Tuban

Tuban	Zabid
Urea	Urea
Super phosphate	Tri-super phosphate
Potassium sulphate	Potassium sulphate
Dimethoate 1cm3/lit	Dragocombi 2.5 ml /it
Sumicidin 1.5 cm/lit	Termicine .ml /lit
—	Abronstar 10 gm /10gm/4kg of seed
Vitavax	Vitavax 3gm/100kg of seed
Mancozeb	Noura / caco3 / for/tree
Cy per methrin	Fabronil 5%
Biofol 16:16:16	Folio (fifol 20m1/lit

ADP crop distribution at Wadi Zabid and Wadi Tuban



Distribution of ADP areas among WUA in Tuban

Crops	Upper	Middle	Lower	Total (ha	farmers
Mango	14.9	19.7	5.7	40	131
Lime	1.75	3.9	4.7	8	36
Sapodilla	.375	.5	.875	2	3
				50	170
Cucurbits	11	13.5	28	28	40
Tomato	5.5	12	7.5	25	44
Onion	5.5	11.5	8	25	41
Okra	9.5	10.75	9.75	30	51
Pepper	1	6.5	5.5	13	20
sesame	21	28	17	66	83
Groundnut	1	24.5	4.5	30	52
Sorghum grain	25.5	32.25	24	81.75	106
Sorghum fodder	45.5	54.75	23	123.25	171
Cotton seed	4	14	52	70	46
Cotton husbandry	16.5	45.5	8	70	71
Cotton fertilizer	29.5	14	16.5	60	61
	50	73.5	66.5	200	956

Distribution of ADP areas among WUA in Zabid

Crops	Upper	Middle	Lower	Total (ha)	farmers
Cotton	—	—	320	320	330
Maize	40	4		45	45
Sorghum (grain)	28	64		92	162
Sorghum (fodder)	35	37	18	90	80
Sesame	—	11	29	40	46
Chili	—	2	20	22	24
Okra	—	—	26	26	32
Tomato	—	—	25	26	44
Onion	—	—		1	02
Mellon	—	—	48	48	34
					799
Mango	35	15		50	—
Lime	—	—	4	4	—
Sapodilla	—	—	—	—	—
	—	—	—	—	82

1- Cotton

1.1- The problem:

The low productivity of cotton (1.1) tons/ha) in Wade Zabid and Wadi Tuban staminate from various complexities including institutional, technical environmental and policy factors which concertedly affect crop yield. The technical factors include

- ✓ Dissemination of low quality seed by the cotton authority through ginneries and use of very high seeding rates
- ✓ Poor crop management operations, which are divergent from the recommendation
- ✓ Limited plant protection measures which are untimely and lack proper frequencies
- ✓ Crop nutritional needs are sub optimal

Under spate production System, the ADP, while trying to be close to the recommendation, has adopted the following polices

Use of economic dozes of inputs

Minimize use of chemicals and insecticides

Target farmers by more than one activity to create yield improvement

1.2 Base Technology

Based on diagnostic surveys which were conducted by IIP, plant protection measures were thought to be applicable to all farmers. Tow spraying, which are timely and based on reelection of effective insecticides were recommended. Early spraying (1-1.5 month) after painting and another spraying prior to flowering (2-3 month) after planting

1.3 Supportive activities

- Three supportive activities including
- ✓ Use of high quality reed
 - ✓ Fertilizer application (N/P)
 - ✓ Good husbandry practices such as row planting and timely weeding

1.4 Executed activities

Activity	Tuban			Zabid		
	Area targeted	Area executed	% Execution	Area targeted	Area executed	% Execution
High quality Seed	70	70	100	100	83	83
Fertilizer application	60	60	100	100	100	100
Crop husbandry	70	70	100	150	120	80
Plant protection	200	200	100	400	404	101
Total cotton area	200	200	100	400	320	80

Au the area in Zabid was planted at the lower segment which is the traditional cotton area – in Tuban 50ha, 73ha and 67 ha were grown at the upper, middle and lower parts respectively.

About 44% of the cotton area was grown on spate in Tuban while 100% cotton of the area was grown under tube well in Zabid – the floods in 2005/2006 didn't reach the lower part of the Wadi.

1.5 yields obtained

Activity	Zabid (tons/ha)			Tuban (tons/ha)		
	Control	Treatment	% Increase	Control	Treatment	% Increase
Plant protection	1.100			1.379		
High quality seed + protection		1.730	65%	1.379	1.835	33%
Fertilizer + protection		1.90	54%	1.088	1.665	52.6
Husbandry + protection		1.600	45%	1.257	1.645	31%
All activities		1.900	72%	1.523	2022	33%

1.6 Expected increase in yield Potential

Some individual farmers obtained 1.2 tons /miad which gave close to 3tons per ha .This yield potential with progressive farmers could be targeted through timely sowing, optimal plant density and high quality seed

2- Sorghum (grain and fodder)

2.1 The problem

The low productivity of sorghum is attributed to prevalence of local varieties which are being planted under high density and very low nutritional support.

2.2 Base technology

Attempts were to increase sorghum productivity through improvement of agro – techniques and more specifically through improvement of plant nutrition. Farmers are not used to fertilize sorghum under spate. Even under tube well systems, sorghum is only supported by 50 kg urea after first Raton. The ADP has used an economic doze of 100 kg. Urea and 50 kg super phosphate to address low productivity problems

2.3 Supportive activities

Due to multiplication of there local rarities over generations, the identity of the variety is withered to be deteriorating. The disease pressures have also resulted in presence of almost 30% infection with smut diseases (covered smut). This has dictated the use of seed treatment and cleanup of the existing variety. Only 200 kg of seed was used to maintain the variety but reed treatment for farms reed was practiced

2.4 Executed activities

Activity	Zabid (tons/ha)			Tuban (tons/ha)		
	Area targeted	Area executed	% Execution	Area targeted	Area executed	% Execution
Fertilizer application (grain)	80	96	120%	80	82	106
Fertilizer application (fodder)	120	80	61%	150	152	101

- In Tuban 47% of the grain sorghums were planted on spate while in Zabid 80% of the grain sorghums were raised on pate.
- Sorghum is distributed widely in the upper, middle and lower regiments of both wades.

2.5 yields obtained

Activity	Yield obtain in Zabid			Yield obtain in Tuban		
	Control	Treatment	% Increase	Control	Treatment	% Increase
Fertilizer application /grain – Under spate	387.2	956.8	147	.600	1.00	67
Fertilizer application (fodder)	811(hozma)	1104 (hozma)	36	—	—	—
Fertilizer application with pure seed				.6	1.3	118%

2.6 yield potential

Both grain and fodder yield of sorghum can increased under the current systems of production through

- Selection and dissemination of seeds of new varieties
- Regular maintenance and treatment of existing varieties
- Improve plant nutrition under tube well systems
- Control of midge for grain sorghum production and breeding of varieties specifically for grain and others for fodder

3.6 yields potential

Yields obtained at ADP, can still be further improved by:

- Selection of appropriate varieties especially for water melon
- Systematic control of whitefly and aphids which are persistent vectors and due to intensification, the host plants seem to be continues
- Cultural practices for most of vegetable needs to be improved e.g. sowing dates, plant population, harvesting techniques, post harvest preparations...etc
- Nutritional recommendations need to be emphasized especially for micronutrients. Foliar spraying can also be enhanced
- Seedling hardening techniques for tomato, chili and onion

3- Vegetables: (Tomato, Okra, Onion, Chili and, water melon)

3.1 The problem

The area of vegetables is expanding while productivity is deteriorating. Low productivity in most of the above mentioned vegetables were attributed to

- High biological pressures in form of insects, diseases and weed infestation
- Poor crop management operation including sub-optimal use of fertilizer
- High cost of production and limited access to market.

3.2 Base technology

Based on discussions with farmers, IIP has chosen the measures to address plant protection. Farmers tend to be exploited by the services available where choices are limited and dosages are neglected normally for tomato and water melons farmers tend to give high number of sprays to avoid the viral spread 4.5 sprayings from recommended insecticides at the onset of infection

3.3 Supportive activity

Balanced plant nutrition using Urea, Phosphates and Potassium fertilizers and also foliar fertilizer which can supplement organic fertilizer commonly used by farmers.. 150 kg of Urea, 100kg of super phosphate and 50 kg of potassium sulphate is added as recommended doses. Farm yard manure is always encouraged.

3.4 Executed activities

Activity	Tuban			Zabid		
	Area targeted	Area executed	% incense	Area targeted	Area executed	% incense
Plant protection	120	120	100%	100	123.5	100%
Balanced fertilizer	120	120	100%	100	123.5	100%

3.5 yields obtained

Crops	Yield obtain in Zabid			Yield obtain in Tuban		
	Control	Treatment	% Increase	Control	Treatment	% Increase
Tomato	14.3	18.8	32	11.79	16.00	36
Chili	4.2	5.3	26	1.86	2.211	19
Okra	4.4	5.7	29	1463	2.405	64
Water melon	14.9	20	34			
Onion	17.3	23.6	36	21.72	34.76	60

❖ All the area under vegetables are raised on tube wells

4.ADC Economic Viability

Yield results obtained from the various demonstrations need to be carefully assessed before being used by farmers, researchers or policy makers.

There are several elements in the assessment process which include:

- Researchers relate the results to the prevailing economic options which can convince farmers adopt the technology.
- the human element in farming as well as other biological elements leading to adequate food supply to their families
- Farmers tend to manage a complex system of enterprise that may at the end offer them some stability in income. Such as (animals , off-farm activities – family labor , various crops)
- In any farm operation, an element of risk exists, and farmers weigh the benefits in their own fashion of understanding.

4.1 Strategic and Social Value:

The set of technologies which had been implemented carry an economic and social value for the two Wades. The economic value is linked to the policy pertaining to the strategic importance of the crops at governorate and national level.

Cotton, sesame and vegetables are considered as cash crops while sorghum is linked to food security. The government policy still plays a great role in cotton production and marketing. The ginnery in Lahj and Zabid and the presence of the textile factory at Aden, have complementary roles. On the other hand food crops such as sorghum, maize and vegetables carry asocial importance which is linked to the role of these crops in the house hold subsistence, income and diet quality.

4.2 . The Statistics:

The current available statistics were derived from the 2004 agricultural year book and recent surveys conducted in the two Wadies .Areas under traditional food crops are declining. Likewise areas under vegetables are showing negative trend at governorate level although individual crops may show an apparent increase in planted areas. Productivity on the other hand has remained stagnant.

4.3 . Improved Technologies :

Crops	Lahj Governorate			Hodeidah Governorate		
	Area ha	Total Production Tons	productivity	Area (ha)	Total Production Tons	Productivity
Cotton	4019	4123	1.03	14631	17213	1.2
Sesame	355	272	.76	17615	7911	.45
Sorghum grain	1673	918	.55	72389	60945	.8
Sorghum fodder	6243	97561	15.6	114547	1429455	12.4
Vegetables	2262	167574	7.4	69621	818951	11.7
Fruits	905	4076	4.5	97056	719701	7.4

The implementation of improved technologies for various crops was meant to increase yield and in return fetch more returns in farm income. This situation

became more complex when price fluctuations especially for fruits and vegetables became evident in any of the Wadies.

The improved technologies of cotton had resulted in 48% increase in Wadi Zabid and 39% in Wadi Tuban, like wise for sesame the increase was 35 and 14% in Tuban and Zabid respectively. For sorghum fodder 30% and 45% increase was in Tuban and Zabid respectively.

4.4 . The Economic Parameters :

The economic assessment was conducted at both Wadi Zabid and Tuban on the analysis of partial budget. This assessment primarily involves collection of data on the following indicators;

- Average yield obtained for the activity.
- Average additional yield due to treatment.
- Average gate-price of the crop during the normal marketing season.
- Average cost of the product (Average yield x average price)
- Cost of the additional technology (Average of yield addition x price)
- Calculation of the variable cost due to technology (this is the cost of technology / or treatment).
- Calculation of net returns (Total cost–variable cost).
- Calculation of net return on every YR spent on the technology

Net return–gross income.

Total variable cost

The calculation of returns in terms of every riyal invested gives a good indication on relative adoption of technology. The higher the value on net returns, the higher the rate of adoption. When values are low, farmers will think twice looking at other feasible options. This is especially true when the price of crops fluctuate on the market.

4.5 . Return on Investments at Wadi Zabid and Tuban :

Corp	Activity	Return on every Riyal Invested	
		Wadi Tuban	Wadi Zabid
Cotton	- improved seed		6
	- Fertilizer application		7
	- Pest control		-
	- Crops husbandry		2
Sesame	Fertilizer application		3
Cucurbits	Pest Control		24
Sorghum (grain)	- Fertilizer application		2
Sorghum (fodder)	- Fertilizer application		-
Maize	- Fertilizer application		16
Mango	- Fertilizer application		-
Tomato	- Fertilizer application		7
Onion	- Fertilizer application		-
Chili	- Fertilizer application		10
Okra	- Fertilizer application		9
			-

Remarks:

- At both Wadies cucurbits achieved the highest rate of returns.
- Among the vegetable crops, dry chili seems to offer stable income at both wadies. The price of other vegetables fluctuated over the season.
- Cotton has stable but low returns at both wadies and doesn't offer farmers an incentive to grow.
- Sesame and fodder sorghums are potential candidates to increase farmer's can be boosted in these two crops.
- Farmers all over the two wades, get their stable income from fodder Sorghum

4-6. Cost of Production:

During 2005 / 2006 season , systematic estimates of cost of production for cotton , grain sorghum ,maize, sesame , tomato , onions , Chili and water melon were recorded at selected sites in each project entity . This data was contained in the quarterly reports and constituted part of the data needed for partial budget analysis. The table below shows cost of crop production for Wadi Zabid in 2005\2006

**Comparisons of Investment Returns for season
2004/2005 and 2005/2006**

Crop	Activity	Return on Investment	
		Season 2004/2005	Season 2005/2006
Cotton	Improved seed	4	6
	Balanced practices	3	7
	Cultural practices	5	2
	Seed + fertilizer + crop husbandry	2	3
Sorghum (grain)	Fertilizer application	0	2
	Improved seed	—	4
Maize	Variety + fertilizer	6	16
Sesame		4	3
Vegetables	Balanced fertilizer		
Okra	Balanced fertilizer	1	9
Chili	Balanced fertilizer	4	10
Tomato	Balanced fertilizer	4	7
Onion	Balanced fertilizer	6	—
Watermelon	Balanced fertilizer	74	24

Cost of production for major crops in
Wadi Zabid 2005/2006 (YR/ha)

Crops Cost items	Cotton	Sesame	Sorghum	Maize	Tomato	Okra	Chili	Water melon
<i>1- Land preparation</i>								
□ Primary tillage	6000	4000	6000	9700	6000	6000	4000	6000
□ Secondary tillage	4000	4000	4100	6000	4000	3000	3300	4000
□ Stripping	4000	4000	2000	2000	4000	2000	5400	2000
□ Cultivation	2500	2000	3800	3000	2000	2000	4000	2000
Sub total	16500	14000	15900	20700	16000	13000	16700	14000
<i>2- Labor</i>								
□ Land preparation	1500	5400	2700	2700	2700	2700	2700	4300
□ Planting	1500	600	1400	1800	5400	2700	7000	1200
□ Irrigation	4500	4000	600	4500	12000	14000	20000	10000
□ Weeding	—	0	0	0	9000	2000	8000	1200
□ Spraying	2700	900	0	500	14000	4500	4000	11000
□ Harvesting	12000	5400	7700	6400	58000	66000	25000	0
□ Threshing	—	2000	6000	5900	0	0	0	0
Sub total	22200	18300	18400	21800	101100	91900	66700	27700
<i>3- In puts</i>								
□ Seed	0	1400	2300	2000	16000	3000	3000	6000
□ Fertilizer	24000	4900	3600	4700	9200	9200	10800	22000
□ Chemicals	2400	4300	0	1200	4800	4200	13900	18000
□ Diesel /oil	18900	15000	600	18900	32000	52000	71000	25000
Sub total	45300	25600	6500	26800	62000	68400	98700	71000
<i>4- Zakat</i>	9200	5000	5600	5900	17000	15000	14600	15000
<i>5- Out puts</i>								
□ Primary product	144000	110000	63200	93500	379000	307300	337500	313300
□ Secondary product	40000	0	45900	29800	0	0	0	0
Total out put	184000	110000	109100	123300	379000	307300	337500	313300
Total inputs	93300	62900	46400	75200	198100	188300	196700	127000
Net Revenue	90700	47100	62700	48100	181400	119000	140800	186300

4.7 . Mean market prices:

Mean market prices for cereals, vegetables and other products for Lahj and Zabid were also recorded after taking average monthly price fluctuation for these commodities. These were considered to be extremely important data as farmers tend to sell their fresh produce during the season with highly fluctuating market prices. Certain crops which have low marginal returns were attributed to these fluctuations. The mean market prices were used to compute cost of additional technology in the analysis of the final benefits. The farm gate prices were surprisingly lower than 2004\2005 although diesel prices were high and reflected itself on higher cost of production.

The following farm gate prices were used for computations,

Cotton.....	YR85-Kg	Tomato.....	YR20-Kg
Sorghum.....	YR80-Kg	Water melon.....	YR20-Kg
Maize.....	YR75-Kg	Okra.....	YR50-Kg
Sesame.....	YR150-Kg	Chili.....	YR200-Kg

Towards the end of the season, prices such as YR150,120, 150 and 550 dominated for Tomato, Water melon, Okra and Chili respectively for each Kg of the commodity.

Partial Budget Analysis

Passport Data

Crop	: Cotton
Variety	: Acala S.J.2
Main activity	: Plant protection (2 sprayings)
Supportive activity	: Dissemination of improved seed
% yield increase due to activity	: 57%

Calculation of gross income

	Budget break down	Farmers practice	Effect due to applied activity
1	Average yield obtained (Kg /ha)	1100	1730
2	Average farm-gate price (YR/Kg	85	85
3	Main product price (YR/Kg)	93500	147050
4	Secondary product price	27000	32400
5	Farmers gross income (YR/ha	120500	179450

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	Free	free
7	Cost of additional fertilizer (YR/ha)	—	—
8	Cost of pesticides (YR/ha)	0	5500
9	Other costs (additional lab our) (YR/ha)	2000	4000
10	Total variable cost (YR/ha)	2000	9500
11	Net return (YR/ha)	118000	169950

Return on Investment

12	Return on every Riyal spent on the activity		6.36
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13- Remarks:

Partial Budget Analysis

A- Passport Data

Crop	: Cotton
Variety	: Acala S.J.2
Main activity	: Plant protection (2 sprayings)
Supportive activity	: Improved cultural practices
% yield increase due to activity	: 45%

B- Calculation of gross income

	Budget break down	Farmers practice	Effect due to applied activity
1	Average yield obtained (Kg /ha)	1100	1600
2	Average farm-gate price (YR/Kg	85	85
3	Main product price (YR/Kg)	93500	136000
4	Secondary product price	27000	27000
5	Farmers gross income (YR/ha	120500	163000

C- Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	Free	free
7	Cost of additional fertilizer (YR/ha)	3500	14900
8	Cost of pesticides (YR/ha)	3000	3000
9	Other costs (additional lab our) (YR/ha)	2000	4000
10	Total variable cost (YR/ha)	8500	21900
11	Net return (YR/ha)	112000	141100

D- Return on Investment

12	Return on every Riyal spent on the activity		1.62
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13- Remarks:

Partial Budget Analysis

A- Passport Data

Crop	: Cotton
Variety	: Acala S.J.2
Main activity	: Plant protection
Supportive activity	: Fertilizer Application (urea + phosphates)
% yield increase due to activity	: 53%

B- Calculation of gross income

	Budget break down	Farmers practice	Effect due to applied activity
1	Average yield obtained (Kg /ha)	1100	1688
2	Average farm-gate price (YR/Kg	85	85
3	Main product price (YR/Kg)	93500	143480
4	Secondary product price	27000	32400
5	Farmers gross income (YR/ha	120500	175880

C- Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	Free	free
7	Cost of additional fertilizer (YR/ha)	5400	10800
8	Cost of pesticides (YR/ha)	0	5500
9	Other costs (additional lab our) (YR/ha)	2300	4500
10	Total variable cost (YR/ha)	7700	20900
11	Net return (YR/ha)	112800	154980

D- Return on Investment

12	Return on every Riyal spent on the activity		7.5
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13- Remarks:

Partial Budget Analysis

A- Passport Data

Crop	: Cotton
Variety	: Acala S.J.2
Main activity	: Plant protection
Supportive activity	: (seed + fertilizer + husbandry)
% yield increase due to activity	: 84%

B- Calculation of gross income

	Budget break down	Farmers practice	Effect due to applied activity
1	Average yield obtained (Kg /ha)	1100	1930
2	Average farm-gate price (YR/Kg	85	85
3	Main product price (YR/Kg)	93500	162600
4	Secondary product price	27000	32400
5	Farmers gross income (YR/ha	120500	195000

C- Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	Free	free
7	Cost of additional fertilizer (YR/ha)	5700	11400
8	Cost of pesticides (YR/ha)	2000	9500
9	Other costs (additional lab our) (YR/ha)	6500	12400
10	Total variable cost (YR/ha)	14200	33300
11	Net return (YR/ha)	106300	161700

D- Return on Investment

12	Return on every Riyal spent on the activity		2.65
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: grain sorghum (under spate)
Variety	: Qaira (local)
Main activity	: Fertilizer application
Supportive activity	: Seed treatment
% Yield increase due to activity	: 63%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	594	990
2	Average farm-gate price (YR/Kg	80	80
3	Main product price (YR/Kg)	59400	79200
4	Secondary product price	24300	32400
5	Farmers gross income (YR/ha	71820	111600

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	—	—
7	Cost of additional fertilizer (YR/ha)	—	10800
8	Cost of pesticides (YR/ha)	—	—
9	Other costs (additional lab our) (YR/ha)	—	900
10	Total variable cost (YR/ha)	0	11700
11	Net return (YR/ha)	71820	99900

Return on Investment

12	Return on every Riyal spent on the activity		2.04
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: grain sorghum (under spate)
Variety	: Qaira (local)
Main activity	: Fertilizer application
Supportive activity	: Seed treatment+ variety
% Yield increase due to activity	: 120%

Calculation of gross income

	Budget breakdown	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	620	1350
2	Average farm-gate price (YR/Kg	80	80
3	Main product price (YR/Kg)	49600	108000
4	Secondary product price	24300	40500
5	Farmers gross income (YR/ha	73900	148500

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	2400	4400
7	Cost of additional fertilizer (YR/ha)	0	10800
8	Cost of pesticides (YR/ha)	—	—
9	Other costs (additional lab our) (YR/ha)	0	900
10	Total variable cost (YR/ha)	2400	16100
11	Net return (YR/ha)	71500	132400

Return on Investment

12	Return on every Riyal spent on the activity		4.44
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: Maize
Variety	: City Lagos
Main activity	: Variety dissemination
Supportive activity	: Fertilizer application
% yield increase	: 123%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	1170	2570
2	Average farm-gate price (YR/Kg	75	75
3	Main product price (YR/Kg)	87750	192750
4	Secondary product price	28400	32600
5	Farmers gross income (YR/ha	116150	225350

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	2000	4000
7	Cost of additional fertilizer (YR/ha)	15600	15600
8	Cost of pesticides (YR/ha)	0	4400
9	Other costs (additional lab our) (YR/ha)	0	5700
10	Total variable cost (YR/ha)	17600	29700
11	Net return (YR/ha)	98550	195650

Return on Investment

12	Return on every Riyal spent on the activity		16.06
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: Sesame
Variety	: local
Main activity	: Plant protection
Supportive activity	: Phosphate fertilizer
% yield increase	: 47%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	500	734
2	Average farm-gate price (YR/Kg	150	150
3	Main product price (YR/Kg)	75000	110100
4	Secondary product price	—	—
5	Farmers gross income (YR/ha	7500	110100

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	—	2400
7	Cost of additional fertilizer (YR/ha)	—	2000
8	Cost of pesticides (YR/ha)	—	3600
9	Other costs (additional lab our) (YR/ha)	0	300
10	Total variable cost (YR/ha)	0	8300
11	Net return (YR/ha)	75000	101800

Return on Investment

12	Return on every Riyal spent on the activity		3.22
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: Tomato
Variety	: Amal
Main activity	: Plant protection
Supportive activity	: Fertilizer application
% yield increase	: 31%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	14270	18780
2	Average farm-gate price (YR/Kg	20	20
3	Main product price (YR/Kg)	285400	375600
4	Secondary product price	—	—
5	Farmers gross income (YR/ha	285400	375600

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	3500	3500
7	Cost of additional fertilizer (YR/ha)	91.80	19500
8	Cost of pesticides (YR/ha)	4600	4600
9	Other costs (additional lab our) (YR/ha)	12600	13540
10	Total variable cost (YR/ha)	29880	41140
11	Net return (YR/ha)	255520	334500

Return on Investment

12	Return on every Riyal spent on the activity		7.1
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: Watermelon
Variety	: Sugar baby
Main activity	: Plant protection
Supportive activity	: Fertilizer application
% yield increase	: 34%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	14890	20510
2	Average farm-gate price (YR/Kg	20	20
3	Main product price (YR/Kg)	297800	410200
4	Secondary product price	—	—
5	Farmers gross income (YR/ha	297800	410200

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	3200	3200
7	Cost of additional fertilizer (YR/ha)	3600	16200
8	Cost of pesticides (YR/ha)	19000	9800
9	Other costs (additional lab our) (YR/ha)	200	1200
10	Total variable cost (YR/ha)	26000	30400
11	Net return (YR/ha)	271800	379800

Return on Investment

12	Return on every Riyal spent on the activity		24.54
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13- Remarks:

Partial Budget Analysis

Passport Data

Crop	: Okra
Variety	: Clemson Spineless
Main activity	: Plant protection
Supportive activity	: Balanced nutrition
% Yield increase	: 28%

Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	4430	5700
2	Average farm-gate price (YR/Kg	50	50
3	Main product price (YR/Kg)	—	—
4	Secondary product price	221500	285000
5	Farmers gross income (YR/ha	221500	285000

Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	—	—
7	Cost of additional fertilizer (YR/ha)	9180	16100
8	Cost of pesticides (YR/ha)	4500	3000
9	Other costs (additional lab our) (YR/ha)	5100	6300
10	Total variable cost (YR/ha)	18780	25400
11	Net return (YR/ha)	202720	259600

Return on Investment

12	Return on every Riyal spent on the activity		8.59
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13- Remarks:

Partial Budget Analysis

A- Passport Data

Crop	: Chili
Variety	: local
Main activity	: Plant protection
Supportive activity	: Balanced nutrition
% yield increase	: 26%

B- Calculation of gross income

	Budget break down	Farmers practice	effect due to activity
1	Average yield obtained (Kg /ha)	4200	5300
2	Average farm-gate price (YR/Kg	200	200
3	Main product price (YR/Kg)	756000	954000
4	Secondary product price	—	—
5	Farmers gross income (YR/ha	756000	954000

C- Cost of activity compared to farmers practice

6	Cost of improved seed (Y/R/ha)	—	—
7	Cost of additional fertilizer (YR/ha)	9100	19500
8	Cost of pesticides (YR/ha)	14800	19300
9	Other costs (additional lab our) (YR/ha)	5200	8400
10	Total variable cost (YR/ha)	29100	47200
11	Net return (YR/ha)	726900	906800

D- Return on Investment

12	Return on every Riyal spent on the activity		9.93
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13- Remarks:

5. Public Awareness and Capacity Development

The following tools of communication were commonly used to deliver the communication message to farmers. Individual farmers, groups of farmers and the agricultural society were targeted primarily in the fields and also at formal places and informal levels.

- 1- Field day.
- 2- Regular meetings
- 3- Information dissemination and awareness creation using several media.
- 4- Training and formal capacity building strategies.
- 5- Field survey, work shop and documentation approaches.

5.1. Field, days :

This was the most powerful tool used in the field to realize the efficiency of specific activities and technologies. At both wadis Tuban and Zabid field days were planned to secure the highest farmers participation. A model agenda was developed for each field day, which used to take 2 – 3 days of planning. Farmers, extensionists and researchers used to get together with the technology being demonstrated.

- The farmer who received the technology, will explain what the kind of intervention was applied in the field.
- Farmers, who were invited to participate, question the farmer about his practices.
- Holding on-spot-discussion to evaluate effect of technology on his normal practices and properly record his feed back.
- Presentation of the technology by extension and researcher.
- Exchanging ideas and identifying farmer's opinions and comments;

The following table illustrates the field days conducted at Tuban and Zabid during 2005 / 2006. Over 650 farmers attended the organized field days.

During the various field days organized, farmers were able to distinguish between treatments and the control in fields. They were also able to distinguish yield differences. Although they expressed their satisfaction with various technologies yet they could not confirm their adoption. Clearly the economics of the return was not visible to them right away except for certain crops such as Mango, cucurbits and for sorghum fodder.

**Details of field days and demonstrations executed within areas of
WUAs Zabid during (2005/2006)**

No	Activities	No of Farmer s	WUAs	Date
1	Maize seeds treatment before panting to protect crop from termite	7	Al-Jerbah	8/28
2	Cotton seeds treatment before planting to protect crop from termite	6	Al-shara'abi	8/31
3	Sorghum seeds treatment before planting to protect crop from termite (Okab)	12	AL -Bagar	9/5
4	Management of mango trees	6	Al- Bari	9/11
5	Management of mango trees	5	Al- Buna	9/17
6	Treatment of chili seeds lings prior to planting to protect crop from termite	10	Al-Mahragi	9/22
7	Vegetables leaves fertilizer application	12	Beerah	10/3
8	Protecting okra crop from pests and the effect of balanced fertilizer application	20	Al- Mahraki + Beerah	10/15
9	Protecting chill crop and the effect of balanced fertilizer application	15	Al-Mahraki +Beerah	11/20
10	The maize city lag us variety	18	Al-Jerbah	11/27
11	Improved seeds and fertilizer application in sorghum growing	19	Al-Rayan	12/4
12	White sesame variety " surdud -1 and loss reduction	29	Al-Nasseri	12/7
13	Improved seeds and fertilizer application in sorghum growing	16	Al-Jirbah	12/7
14	Cotton and sesame technologies	29	Al-Shara'abi	12/11
15	Cotton and Tomato technologies	27	Al-Harram	12/12
16	White sesame variety " surdud -1 and loss reduction	18	Al-You Sufi +Bari	12/13
17	Maize City lagus variety + seed selection	26	Al- Apri	12/19
18	Fertilizer application + pests control on melon	25	Al-Shara'abi	12/21
19	Mango improved variety	13	Al-Jerib	12/24
20	Growing maize city lag us variety under flood irrigation system	12	Al-Buni	2/28
21	Introducing sunflower crop	15	Al-Nasseri	3/19
	Total number of participating farmers	340		

FIELD DAYS CONDUCTED AT WADI TUBAN

No	Location	Date	Topic	No participants
1	Al-Araes	17/12/2005	Fertilizer application in sorghum for grains Fertilizer application in sorghum for fodder	22
2	Ras Alwadi	18/12/2005	Fertilizer application, cotton crop management Fertilizer application in sesame Balanced fertilizer application in tomatoes Balanced fertilizer application in onions	34
3	Al-had harem	25/12/2005	Cultivation and crop management in cotton Fertilizer application in cotton Balanced fertilizer application in onions	15
4	Al-furdha	26/12/2005	Fertilizer application in cotton, improved cotton seeds Seed maintenance in cotton	26
5	Baizag	31/12/2005	Balanced fertilizer application in tomatoes	27
6	Al-what	29/1/2006	Fertilizer application in cereals, fertilizer application in sesame	29
7	Al- riyad +Al-furdha	4/2/2006	Fertilizer application in cotton cultivation Improved cotton seeds. Balanced fertilizer application in tomatoes	29
8	Al-Araes	5/2/2006	Management of fruit trees	33
9	Alsadein	26/2/2006	Production of improved seeds of sorghum proper methods of seed storage	21
10	Al-Hadharem	10/3/2006	Cultivation and groundnuts crop management	18
11	Alwhat	18/3/2006	Management of fruit trees	19
12	Lafeh Al-fakeh	25/3/2006	Balanced fertilizer application in pepper	15
13	Al-furdha	27/3/2006	Balanced fertilizer application in pepper	23
Total				311

5.2 . Consultative meeting with farmers :

Regular meeting with farmers were arranged especially during afternoon and evenings. The immediate objectives were to;

- Enlighten farmers about the importance of increasing crop productivity.
- Acquainting farmers with ADC of IIP
- Explaining objectives and activities encountered.

Farmers were encouraged to discuss some topics such as:

- Priorities of farmers in their specific locations.
 - Cropping pattern and preference to farmers.
 - Cost of the production of important crops.
 - Farmer's opinion about intervention in their locations.
 - Suggestion for incorporating farmers priorities in the ADC were incorporated.
- While in Tuban 11 of these consultative meetings were held during one month, at Zabid 13 meeting were organized in an interval of six month. The total number of farmers who attended these meetings was 201 in Tuban and 171 farmers in Zabid..

Implemented evening meetings with farmers and community leaders in Wadi Tuban

No	Date	Association	No Participants	Discussion topics
1	8/3/2006	Lufaih Al-Fakeih	22	<p>Most issues raised during discussion in all WUAs were related to the Following</p> <ol style="list-style-type: none"> 1. Technical and Management problems raised by farmers and what are the most important services required by farmers 2. Successful technologies from farmers point of view and degree of adoption by farmers 3. Farmers suggestions to improve the program in the coming season 2006/2007
2	9/3/2006	Raids	16	
3	12/3/2006	Fardha	12	
4	15/3/2006	Central area	17	
5	19/3/2006	Al-Arais	15	
6	19/3/2006	Lahsan	13	
7	23/3/2006	Faleg Nion	21	
8	25/3/2006	B aizag	24	
9	29/3/2006	Thalab	13	
10	29/3/2006	Sa'adein	24	
11	30/3/2006	Hadharem	9	
	30/3/2006	Ubar Yaqoub	15	
Total			201	

**Details of evening sessions with farmers executed in
Different WUAs areas in Zabid (2005/2006)**

Topics tackled in meetings	No of Farmers	WUAs	Date
Introduction to IIP _ agricultural component + importance of Seeds treatment prior to planting	20	AL - Bagar	20/9
Sorghum and Maize Technologies and the importance of seeds maintenance	15	Al- Jerbah	20/11
Sorghum and Maize Technologies and the importance of seeds maintenance	25	Al-Mawi	21/11
Sorghum Technologies and the importance of Seeds maintenance	18	Al-Rayan	22/11
Cotton, vegetables and sesame technologies	26	Al- sharaabi	28/12
Cotton, vegetables and sesame technologies	13	Al- nasseri	5/12
Cotton, vegetables and sesame technologies	15	Beerah	4/12
Cotton, vegetables and sesame technologies	13	Al- Mhragi	4/3/
Cotton, vegetables and sesame technologies	14	Haram	5/3
Technical and economical assessment of technologies demonstrated	12	Al- Nasseri	29/3
Total number of farmers attended	171		

**Training courses organized for farmers, local
Community and WUA leaders at Tuban**

Date	Training topic	Location	Trainer	No of participants
1	Technologies for improvement of mangoes , lemon, and sapodilla	Program office – Lahej	Dr. Mohamed Awadh Saleh (Horticultural crops specialist)	9
2	Pests of fruit trees, vegetables and sesame	Program office – Lahej	Badran Mohamed Saleh (plant protection Specialist	14
3	Fertilizer application in field crops and vegetables	Program office – Lahej	Dr. Hussein Al- Kaff (Soil fertility Specialist)	8
4	Control of termites in mango orchards	Ali Allergies farm (Ras Al- Wadi)+ Abdo Hussein Farm (Al- areas	Badran Mohamed Saleh (plant protection Specialist	9
5	Crop management of groundnuts in Wadi Yuban and seed maintenance of cotton.	Program office – Lahej	Dr. Mohamed Ali Hassan (Agronomy Specialist)	12

- 6- Improved Technologies for mango, Lime and sapodilla**
- 7- Foliar fertilizer application for field and vegetable crops**
- 8- The efficiency of irrigation water used at field level**
- 9- Management of field experiments and certified seed fields**

**Details of ADP training courses executed in Zabid valley during
the current season (2005/2006)**

No.	Training Subject	Training beneficiaries	Number of participants	Duration (days)	Place of training
1	IIP agricultural components and its different activities	- -Specialists - WUAs Representatives	15	3	TDA, Zabid
2	Extension communication	- -Specialists - WUAs Representatives	15	2	TDA, Zabid
3	Extension program planning	- -Specialists - WUAs Representatives	15	1	TDA, Zabid
4	Methods of program monitoring and evaluation	- -Specialists - WUAs Representatives	15	1	ADP Office, Al-Jarahi
5	Concept of Volunteer work and role of Associations	- -Specialists - WUAs Representatives	15	1	ADP Office, Al-Jarahi
6	The Importance of Fertilizer application for plants	- -Specialists - WUAs Representatives	23	3	ADP Office, Al-Jarahi
7	Seeds maintenance and purification	- -Specialists - WUAs Representatives	24	2	ADP Office, Al-Jarahi
8	Multiplication and grafting of Mango	- -Specialists - WUAs Representatives	16	1	
9	Mango Orchard Management	- -Specialists - WUAs Representatives	16	1	
Total no of WUAs/farmers trained			154		

5.3. Information dissemination using multi media:

All sorts of media such as news papers, radio, T.V, web – Site, news agencies, bulletin..... etc. was used at both Wadies to disseminate information about ADC. Regular radio programs seem to be popular among farmers. Also published issues on various ADC activities were used as a tool to convince and update farmers and decision makers as well. At Zabid, a periodical named "Agriculture and Irrigation" was being produced monthly

5.4.National exhibitions

During May 2006, the ADP Program participated in the national agricultural show Farmers groups were constantly highlighted on the program scope and results.

6-Irrigation Efficiency Management

1- Physical properties of soils at Wadi Zabid

Systemic soil analysis for physical properties was undertaken to reveal its characteristics. Using augers, the samples were taken at 20 cm depth up to 100 cm. From each location 5 Samples at Various depth (20, 40, 60, 80,100 cm) were taken. The numbers of locations across the Wadi were representing upper, middle and lower valley zones (Girba, Zariba, Roda, Nasiri, and Masharig)

Soil samples were analyzed at NRNRRC Dhamar. Analysis for soil density, PH, salinity, PWP and available water was undertaken to reveal the soil retention capacity.

Data is presented below

Table (6-1) physical properties of Soil at Wadi Zabid:

Based on Soil samples collected from locations representing upper, middle and lower parts of Wadi Zabid, the following table shows the physical properties pertaining of density, field capacity, permanent wilting point PWP and calculation of water available to plants.

Location	Density (gm)	Field capacity (mm)	Pwp(mm)	Available moisture (mm)	Range of available
Girba (upper Wadi)	1.34	312	187	124	23-27
Roda (upper Wadi)	1.32	327	199	132	24-28
Zariba (upper- central)	1.40	249	144	105	21-22
Nasiri (central-lower)	1.34	292	145	148	28-32
Masharig (lower part)	1.48	229	120	104	16-24

- ✱ Soil density increases with depth
- ✱ Soil PH is suitable for all crop types. There is slight increase of PH at Nasiri
- ✱ Water retention capacity decreases from the upper to lower Wadi zones.
- ✱ Permanent willing point is greater at 60cm depth and onwards
- ✱ Salinity, as measured by EC is favorable for all crop types. It needs to be monitored at Wadi Nasiri (8.2).

2- Survey on farmers irrigation practices;

Zabid farmers were surveyed during September 2005 and March 2006 to reveal irrigation practices and amount of water added to each crop. The survey included 42

farmers growing cotton , sesame , sorghum , water melon , okra , tomato , chili , maize , mango and banana , All data was taken under irrigation by tube wells. The survey included collection of data pertaining to;

- ✓ Type of pumps capacity and average number of working hours
- ✓ Irrigation flow data from pumps to field and time required for irrigating one (Miad). (frequency of irrigation)
- ✓ Amount of irrigation water used according to farmers practice and habit of irrigation for each crop

The collection of data has lead to an estimation of added water per crop per season. This data is being presented below

Table (6-2) Farmers practices of irrigation at Wadi Zabid:

Crops	Number of irrigation	Discharge	Number of Hours	Quantity of water per irrigation	Total quantity for the season
Cotton	4	10	20	1999	7978
Sorghum	3	7	20	1396	4188
Maize	4	7	20	1396	5584
Sesame	3	7	20	1396	4188
Water melon	13	7	7	489	6352
Tomato	15	7	9	628	9424
Okra	15	10	20	1994	29916
Chili	15	8	20	1596	23933
Banana	18	14	24	3422	61603

3- Amount of irrigation water pumped from Zabid soils;

In continuation of the data collected in the previous study; more data was collected on the average hectarage grown under each individual crop. The data is being used to extrapolate the annual rate used for sustaining field crops. Data are presented below. Data clearly indicates very high levels of water extraction for the crops under study. Putting under consideration that

**Table (6-3) Total quantity of irrigation water
extracted from soils of Wadi Zabid annually:**

Crops	Estimated area in 2005 / 2006 (ha)	Average water used for irrigation (mm)	Total amount in million cu m 3
Cotton	3469	680	24.8
Sesame	1200	736	.8.8
Sorghum	4967	580	22.5
Maize	620	717	5.05
Water melons	860	1420	4.3
Tomato	860	2400	20.6
Okra	724	2304	17.4
mango	3600	1389	50
banana	3200	2503	80
total			213

4-

Efficiency of irrigation water use by farmers;

Irrigation water is being lost by two main practices

- ✓ Efficiency of water flow from pump to field and
- ✓ Efficiency of irrigation practice in relation to the actual moisture requirements by plants.

4.1 The efficiency of water flow in open earthen dikes was measured by parchal flume method. Water flow was measured by taking several data from field using a bucket and an instrument which measures water flow. This is taken across 30, 60, 100 meters. Data from 3 locations are shown below

Table (6-4)

**Irrigation losses between wells and fields
for open canals using Parshal Flume**

Sampling area	Irrigation flow	Canal length(m)	Time minutes	Discharge		% irrigation loss
				Q 1	Q 2	
Bari	. 45	100	9. 20	4.3	25	41.9
Masharig	. 36	82	7.50	2.87	1.3	54.7
Haram	. 50	155	15.00	3.80	1.65	56.6

4.2 The actual water requirements by plants were derived from weather data, and relevant information on evapotranspiration from Zabid and Al- Jarrahi. The CROPWAT program developed by FAO was used to relate weather data accumulated for the past 23 years for both humid and dry years. This data gives an estimate for each crop being grown in the Wadi. The comparison of such data with the ones collected on the actual amount of water being used by farmers gives a good estimate on the efficiency of water use by farmers

**Table (6-5) Irrigation efficiency for cultivated
Crops at Wadi Zabid (cu m³/ha)**

Crops	Average amount of irrigation water used	. cultivated irrigation requirement	Loss	Irrigation efficiency %	% loss
Cotton	10800	7000	3800	65	35
Sesame	7949	4500	3449	57	43
Sorghum	7776	4500	3276	58	42
Maize	6912	4500	2412	65	35
Water melon	8424	4000	4424	47	53
Tomato	6221	3500	2721	56	44
Okra	8100	3500	4600	43	57
Chili	6480	3100	3380	48	52
Banana	9720	1200	8520	12	88
Mango	2296	1021	1275	44	65

5- Efficiency of crop production;

Yields which were obtained under a set of moisture system used for unit areas can be further used to estimate crop efficiency.

Unfortunately, data on spate was not collected in the first year of the program due to the late recruitment of irrigation specialists by the consultants. This data need to be emphasized and collected this season on a priority basis.

7- Crop Interventions 2006\2007

The ADP for 2006\2007 was formulated in May 2006 after a long wait for the workshop which was to be held at Taiz in March. The main features of the contract were as follows:

- * 1500 ha of ADP will be executed for 13crops with 17 different activities for both project sites
- * Most of the activities are similar to the previous on-going activities.
- * The extension campaign that goes along with ADP has been strengthened by documentation
- * The cost per unit area has been reduced to US\$ 230 as compared to US\$ 270 and US\$ 300 for 2005\2006 and 2004\2005 respectively
- * The final version still awaits the last remarks which have already sent letters of their initial acceptance to be involved in ADP

ADP-Wadi Tuban 2006/07 Cotton Technologies

Base Technology = plant protection

Other selected technologies = improved seed (Basic seed + treatment)

Row planting /weeding

Fertilizer application

Constraint =low productivity

	Technology	Field activities	Area (ha.)
1-	Plant protection	<ul style="list-style-type: none"> ● Two Sprayings + one by government 	200
2-	Crop husbandry	<ul style="list-style-type: none"> ● Row planting ● one weeding 	50
3-	Improved seed	<ul style="list-style-type: none"> ● Basic seed ● Seed treatment 	100
4-	Fertilizer application	<ul style="list-style-type: none"> ● Urea and Super phosphate ● Foliar application 	100 20
	Total (base tech)		200

ADP - Wadi Zabid 2006/2007

Cotton Technologies

Base technology = plant protection

Other selected technologies = improved seed (Basic seed + treatment)

Row planting /weeding

Fertilizer application

Constraint: low productivity

	Technology	Field activities	Area (ha.)
1-	Plant protection	<ul style="list-style-type: none">• Two Sprayings	300
2-	Crop husbandry	<ul style="list-style-type: none">• Row planting	50
3-	Improved seed	<ul style="list-style-type: none">• Basic seed• Treatment	300
4-	Fertilizer application	<ul style="list-style-type: none">• Urea and Super phosphate	100
	Total (base tech)		300

ADP- Wadi Tuban 2006/2007

**Technologies for Cereals, Oil Crops, Vegetables and Fruits
Constraint: Low Productivity**

Crop	Base Technology	Area (ha)	Other Technologies	Area (ha)
Sorghum grain	<ul style="list-style-type: none"> Fertilizer application 	100	<ul style="list-style-type: none"> Seed treatment of purified local varieties 	100
Sorghum fodder	<ul style="list-style-type: none"> Fertilizer application 	50	<ul style="list-style-type: none"> Seed treatment of local varieties 	50
Sesame	<ul style="list-style-type: none"> Plant protection (leaf roll, capsule borers) 	70	<ul style="list-style-type: none"> Fertilizer with phosphates 	70
Groundnut	<ul style="list-style-type: none"> Introduction of crop varieties and crop husbandry 	30	-	-
Tomato	<ul style="list-style-type: none"> Plant protection & Balanced fertilizer application 	25	<ul style="list-style-type: none"> Foliar fertilizer 	10
Onion	-do-	25	<ul style="list-style-type: none"> Foliar fertilizer 	10
Okra	-do-	25	<ul style="list-style-type: none"> Foliar fertilizer 	10
Chili	-do-	25	-	-
Mango and lemon	<ul style="list-style-type: none"> Tree management (pruning/trimming) Crop husbandry 	50	<ul style="list-style-type: none"> Commercial varieties Foliar fertilizer 	10
	Irrigation Efficiency	100		
Total		500		

ADP- Wadi Zabid 2006/2007

Technologies for Cereals, Oil Crops, Vegetables and Fruits

ADP- Wadi Zabid 2006/2007

Constraint: Low Productivity

Crop	Base Technology	Area (ha)	Other Technologies	Area (ha)
Sorghum Grain	<ul style="list-style-type: none"> Fertilizer application 100 kg urea + 50 kg Super phosphate 	100	<ul style="list-style-type: none"> Improved seed Treatment 	100
Sorghum fodder	<ul style="list-style-type: none"> Fertilizer application 100 kg urea + 50 kg Super phosphate 	50	<ul style="list-style-type: none"> Improved seeds Treatment 	50
Sesame	<ul style="list-style-type: none"> Plant protection (leaf roll , capsule borers) 	50	<ul style="list-style-type: none"> Fertilizer with super phosphate 	50
Maize	<ul style="list-style-type: none"> Fertilizer application - Urea 150 kg - Super phosphate 50kg 	30	<ul style="list-style-type: none"> Variety 	30
Sunflower	<ul style="list-style-type: none"> Crop management 	20	<ul style="list-style-type: none"> Balanced fertilizer 	20
Tomato	<ul style="list-style-type: none"> Plant protection 	25	<ul style="list-style-type: none"> Balanced fertilizer 	25
Onion	<ul style="list-style-type: none"> Plant protection 	10	<ul style="list-style-type: none"> Balanced fertilizer 	10
Watermelon	<ul style="list-style-type: none"> Plant protection 	15	<ul style="list-style-type: none"> Balanced fertilizer 	15
Okra	<ul style="list-style-type: none"> Plant protection 	25	<ul style="list-style-type: none"> Balanced fertilizer 	25
Chili	<ul style="list-style-type: none"> Plant protection 	25	<ul style="list-style-type: none"> Balanced fertilizer 	25
Mango & lemon	<ul style="list-style-type: none"> Tree management (pruning, trimming) Crop husbandry 	50	<ul style="list-style-type: none"> Seedlings of commercial varieties 	10
Total	Irrigation Efficiency	100		
Total	500			