

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
OROMIA IRRIGATION DEVELOPMENT AUTHORITY (OIDA)  
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**

**THE STUDY  
ON  
CAPACITY BUILDING PROGRAMS FOR  
COMMUNITY-BASED IRRIGATION DEVELOPMENT  
IN  
CENTRAL OROMIA REGION OF ETHIOPIA**

**Volume II  
ANNEX**



**OCTOBER 2004**

**NIPPON KOEI CO.,LTD.**

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TRAINING PROGRAM FOR OIDA STAFF  
(PROGRAM I)

# ANNEX I

## TRAINING PROGRAM FOR OIDA STAFF (PROGRAM I)

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## **CHAPTER 1 OROMIA IRRIGATION DEVELOPMENT AUTHORITY (OIDA)**

### **1.1 Authority and Responsibilities**

OIDA was established in July 1999 with specific aims at streamlining overall irrigation development services under the sole organizational framework. The main task of OIDA is to develop irrigation schemes in line with the national policy of food security and poverty reduction. According to “Oromia Regional State Irrigation Development Authority Establishment Proclamation, No. 30/1999,” the major tasks of OIDA include:

- 1) Study, design and construction of irrigation schemes in potential areas,
- 2) Contribution towards hastening the socio-economic development in rural areas,
- 3) Assistance to rural communities to benefit from irrigation projects through participation in study, construction and operation,
- 4) Provision of technical assistance in irrigation extension, operation and water management of community-based irrigation schemes, and
- 5) Promote environmental conservation through watershed management relevant to irrigation development.

Since its establishment, 159 pre-feasibility and 72 feasibility studies were made and 29 schemes were constructed to develop 2,281 ha of land on which 5,430 family heads were benefited. Water harvesting techniques started in 2002 and 44,149 ponds, 3,452 dug wells, 509 underground tanks were constructed to supplement rain fed farming on 14,443 ha and benefit 48,100 households. The training programs were provided to 663 user community members on irrigation development and their scheme management. In addition to this 9,425 farmers and 247 Development Agents (DAs) were given training on water harvesting techniques.

### **1.2 Strategic Planning and Management Plan (2003-2005)**

OIDA set up Strategic Planning and Management Plan (2003-2005) in September 2003 to develop a systematic approach dealing with the process that enable OIDA to develop shared vision and maintain an appropriate financial and human resources utilization for effective output. The Plan stipulates the following issues of OIDA to be urgently solved under the Plan.

Issue 1 The use of limited irrigation technology

- 1.1 Promote development of surface water resource
- 1.2 Promote development of ground water resource
- 1.3 Promote indigenous knowledge and practices by using low cost technology.

- 1.4 Promote appropriate rainwater harvesting technology at household level
- Issue 2 Poor implementation capacity
  - 2.1 Develop and strengthen the managerial and technical capacity at all level
  - 2.2 Avail machineries, equipments and other improved technologies
  - 2.3 Efficient personnel management
  - 2.4 Efficient utilization of resources
  - 2.5 Establish irrigation data base and management information system
- Issue 3 Low level of irrigation extension service
  - 3.1 Provision of ecology based integrated household package
  - 3.2 Provision of appropriate regular irrigation extension service
  - 3.3 Provide market and credit service information
  - 3.4 Promote post harvest technology
- Issue 4 Insufficient financial resources
  - 4.1 Efficient utilization of grant and loan
  - 4.2 Partnership creation with NGO's
  - 4.3 Promote users community participation
  - 4.4 Promote private sector involvement
- Issue 5 Poor sustainability of the scheme and inefficient irrigation management
  - 5.1 Promote watershed management.
  - 5.2 Improve study, design and construction, quality
  - 5.3 Organize, capacitate and institutionalize user community in irrigation management
  - 5.4 Rehabilitate the abandoned projects and Improve irrigation scheme utilization

The Plan also set up the implementation plans for the departments and the service units of OIDA. During the plan period, the followings are major targets under the Plan to be achieved;

- |  |             |
|--|-------------|
| 1) Pre feasibility study                                 | : 11,205 ha |
| 2) Feasibility study                                     | : 7,838 ha  |
| 3) Study and redesign for rehabilitation and maintenance | : 2,500 ha  |
| 4) Construction of new schemes                           | : 5,868 ha  |
| 5) Rehabilitation of abandon schemes                     | : 1,036 ha  |
| 6) Organize and institutionalize WUA                     | : 90 ha     |
| 7) Conduct WUA training                                  | : 1,360 ha  |

The total fund requirement of the Plan is estimated to be Birr 423 million, of which Birr 349 million or 83% are expected from the government budget and the rest from international organization such as AFD, IFAD, UNDP and donor agencies.



### 1.3 Organization

All the activities of OIDA are under the control of the General Manager at the head office in Addis Ababa. The operation is entrusted to four (4) branch offices, namely Central, Eastern, Western and Southern branch offices, and further to the woreda offices. Under the decentralization policy, the tasks and responsibilities of the branch offices and the woreda offices are expanded.

The organization charts of the head office and the branch office are presented in Figure 1.2.1. The OIDA head office is organized by three (3) departments for study and design, construction, and irrigation extension with four (4) service units for planning and information management, community participation, administration and finance, and audit. The branch offices are organized by four (4) teams, namely study and design, construction, supervision, and agriculture irrigation development and community participation, and four (4) service units, namely planning and programming, administration and finance, garage and transportation, and audit. Under the branch offices, 112 woreda offices were operational in June 2003.

### 1.4 Staff Structure

OIDA was organized by 720 staff as of November 2000. The technical staff accounted for 430 or 60% of the total staff. Engineering staff accounted for 195 staff at head office and branch office. The staff structure of OIDA has been expanded up to 810 as a result of increased assignment for both Eastern and Southern Branch Offices. Moreover, 62 staff members were either shifted from the branch offices to or newly recruited at the woreda offices under the decentralization policy. The OIDA woreda staffs have been increased from 211 persons at 69 woredas in November 2000 to 273 persons at 112 woredas in June 2003. The state government encourages establishment of the OIDA offices at all 197 woredas. The past and current staff structures are presented below.

**Staff Structure of OIDA**

No.	Headquarters and Offices	November 2000		June 2003	
		No.	%	No.	%
1	Addis Ababa HQ	103	14.2	97	11.9
2.	Central Branch Office	136	18.9	129	15.9
3.	Western Branch Office	121	16.8	127	15.7
4.	Eastern Branch Office	82	11.4	103	12.7
5.	Southern Branch Office	68	9.4	81	10.0
6.	Woreda (District) Office*	211	29.3	273	33.7
	Total	720	100.0	810	100.0

Source: OIDA Personnel Division

Remarks: \* no. of woreda offices: 69 in 2000 and 112 in 2003.

Strategic Planning and Management Plan estimates the total staff requirement to be 1,625 consisting of 118 for the headquarters, 583 for branch offices and 924 for woreda offices by 2005.

## 1.5 Equipment

OIDA takes responsibilities for the construction works of new irrigation scheme and has his own construction equipment and vehicles for transportation. The list of construction equipment and existing condition in 2003 is presented in Table 1.5.1. All heavy equipment such as dump truck and bulldozer is distributed to each branch office for their activities, but 45% of heavy equipment are out of use or need repairing.

## 1.6 Budgetary Arrangement

The budget allocation in 1997-1999 of the Region is stipulated below.

**Annual Budget of the Oromia Region (1997-1999)**

Sector/Organization	Average in 1997-1999 (Million Birr)			
	Capital Budget (A)	Salary and Recurrent Budget (B)	Total (A+B)	(B)/(A+B) %
I. Economic Sector Total	228.0	108.9	336.9	32.3
Agriculture	59.2	11.9	71.2	16.8
<b>Irrigation</b>	<b>7.3</b>	<b>5.9</b>	<b>13.2</b>	<b>45.0</b>
Water, Mining and Energy	72.9	11.4	84.3	13.6
Industry and Tourism	0.2	9.3	9.5	97.9
Rural Road	85.9	16.1	101.9	15.8
Transport	2.7	12.0	14.7	81.8
II. Social Sector Total	149.0	515.4	664.5	77.6
Total (I and II)	377.1	624.3	1,001.4	62.3
Regional State Total	384.2	870.1	1,254.3	69.4

Source: Department of Finance, Oromia Region

Annual capital budget (investment) for the irrigation development during the period from 1997 to 1999 in the Region was about Birr 7.3 million on average that accounts for 2% of the total economic sector investment of the Region, i.e. Birr 228.0 million. Staff salary occupies the largest portion of the recurrent budget. As seen in the above table, the salary in the irrigation sector is as high as 45% of the total budget.

The annual budgets after the establishment of OIDA in 1999 are summarized below.

### Annual Budget of OIDA (2000-2004)

Unit : Birr 1000

Year	Capital Budget (A)	Salary and Recurrent Budget (B)	Total (A+B)	Proportion (B)/(A+B) %
2000	5,776	5,176	10,952	47.3
2001	35,006	8,261	43,267	19.1
2002	12,939	11,248	24,187	46.5
2003	18,748	8,758	27,506	31.8
2004	23,506	8,245	31,751	26.0
Average	19,195	8,338	27,533	30.3

Source: Planning and Information Service of OIDA, 2004

Annual capital budget was increased from Birr 7.3 million in 1997-99 to Birr 19.2 million in 2000-04. The sharp increase in 2001 was due to financial assistance by IFAD. The budget was allocated to capacity building of OIDA including procurement of vehicles and heavy equipment.

#### 1.7 Community-based Irrigation Development

Community-based irrigation management is the principle of the OIDA schemes. The ownership of the schemes is transferred to WUAs after completion of project construction. Given an autonomous status, WUA takes major responsibilities for scheme management after hand-over of the scheme, while OIDA is responsible for monitoring and provision of necessary advice to WUA. The budget for rehabilitation of the schemes is occasionally allotted as far as external funds are available. Therefore, the project sustainability is dependent highly upon:

- 1) Quality standard of irrigation facilities linked with OIDA's engineering capacity for appropriate plan formulation, design and quality control of project facilities during construction stage,
- 2) Trouble shooting linked with OIDA's engineering capacity to identify problems arising from daily operation through intensive monitoring, and
- 3) WUA's technical and financial management capacity built through awareness creation and training prior to project implementation.

Therefore, capacity building for both OIDA and WUA is the utmost important for successful operation and management of the community-based irrigation schemes.

## CHAPTER 2 TRAINING PROGRAMS ON COMMUNITY-BASED IRRIGATION DEVELOPMENT

### 2.1 Objectives

Program I of the Study aims at staff training of OIDA and other governmental agencies. Individual activities of the Study have been undertaken to be integrated into one core program of capacity building for OIDA staff. The OIDA staff members were encouraged to learn operational skills and techniques dealing with issues raised in actual process of project activities by applying theoretical concepts into practice and sharing and exchanging views between the JICA Study Team and the OIDA staff. The training programs can be categorized into two (2) modalities, namely on-the-job training and classroom/workshop training as summarized below.

**Categorization of JICA Study Programs in Training Modalities**

Study Component	Main Training Modality used	
	On-the-job Training Modality	Classroom and Workshop Training Modality
Program I	PBME of Shubi-Sombo Schemes	PCM Training Workshop
	Farm Economy and Crop Budget Analyses	Project Monitoring Workshop (1), (2), (3) and (4)
	Hydrology and water use analyses in Meki	Workshop for Irrigation Engineering
Program II	Establishment of six (6) WUA in Meki Area	
	PBME of six (6) new schemes	
Program III	Rehabilitation of three (3) existing schemes	
	PBME of three (3) schemes	

### 2.2 Capacity Building for Project Cycle Management (PCM)

#### 2.2.1 Objectives

Since the beginning of 1990s, an issue of sustainability has been laid in a central concern for development program or project. In other words development planners, sector engineers as well as development field workers face challenging tasks and duties in order to incorporate the issue of sustainability into an entire activity of planning, implementing and monitoring and evaluating innovative program or project. Irrigation development program or project is not exceptional.

Within the current policy framework of irrigation development in Oromia Regional State, community-based irrigation development becomes the principal modality of planning, implementation and monitoring and evaluation of irrigation schemes under OIDA in order to ensure project sustainability. In this context, central among pre-requisites for irrigation development program is the presence of a social unit capable of sustaining such program. At present, with regard to operation and

management, WUA is responsible for operation and management of irrigation scheme under its given autonomous status, while OIDA is responsible for monitoring and provision of necessary advice to WUA. Hence, managerial capacity of WUA become one of determinant factors to ensure sustained operation and management of irrigation schemes in order to attain socio-economic goals of food security as well as surplus agricultural productions.

Despite the above policy emphasis, however, current performance of operation and management indicates less achievement than planned. In reference with the database formulated during previous study “The Meki Irrigation and Rural Development Project in Oromia Region Ethiopia” (hereinafter, “The Meki Study”), the general features of the OIDA schemes’ performance can be spelled out as follows;

- a) Actual irrigated area amounted to 58 % out of 9,644 ha of the planned area;
- b) Actual beneficiaries accounted for 58 % out of 26,984 households as planned;
- c) Water shortage problems were recognized in about 40 % of the schemes;
- d) WUA has not yet been established in 30 % of the schemes.
- e) Engineering information including design documents and drawings is not sufficiently available in over 50 % of the schemes.

It can be concluded in general that irrigation performance in Oromia has not yet reached a stage where irrigation schemes are sufficiently managed by user community. Performance of irrigation schemes may be determined in combination of various factors including a degree of even distribution of irrigation water and land, capacity and strengths of WUA management, accessibility to credit facilities or supportive measure of farm inputs, availability of empirical knowledge on farming and the like. Since these factors are normally inter-linked, structuring factors in cause-effect relationships are required for OIDA staff in order to assist WUA in enhancing managerial capacity to tackle problems that they encounter. In so doing, more effective and systematic intervention of OIDA is required. For this, capacity building among OIDA staff is one of critical issues in order for them to systematically intervene for solving complex and causal problems that WUA tackle.

Cognizant of this, a training workshop on Project Cycle Management (PCM) is undertaken with a focus on its Problem Analysis, which is formulated as one of systematic planning and management tools, in order to meet such needs of capacity building for its staff members of OIDA Central Branch office. The training workshop on PCM-Problem Analysis was conducted with the three following immediate objectives;

- i. To expose trainees on one of systematic planning tools known as PCM with a specific focus on problem analysis method;

- ii. To equip trainees with PCM problem analysis method through classroom exercise as well as field exercise; and,
- iii. To provide a forum to exchange experiences and views of training participants

## 2.2.2 Training Workshop

### (1) Type of Training Workshop

The training workshop is designed on the basis of one fundamental guiding principle that is output-oriented training<sup>1</sup>. The approach employed in the training workshop fosters participatory learning, through active exchange of ideas and experiences among participants. It aimed at enhancing the capabilities of participants to make consensus building as well as a group problem solving. The training is organized to create tangible goal to produce a set of reference materials that are prepared by participants, to be used for field reference materials after training. Output-oriented training emphasizes on socialization process of acquired knowledge and skill.

### (2) Components of Training Workshop

The training workshop is designed consisting of three distinct but interrelated components; namely,

- i) lecture component; in which basic idea on project cycle management can be understood in the context of participatory local social development and planning;
- ii) case analysis component; in which by analyzing a case study participants are encouraged through classroom exercise with immediate purposes (i) to acquire basic knowledge and skills to identify stakeholders and as many as problems and (ii) to structure a problem tree by analyzing cause-effects relationships among those identified causes and effects.; and,
- iii) field exercise component; in which participants are further encouraged to conduct problem analysis on existing schemes as a field testing.

### (3) Linkage with Program I and III

The training workshop was to be undertaken as an integral part of the Study. In this line, possible linkage with the other programs of the Study was sought. As a result, case analysis of the training workshop is to be linked with rehabilitation works of Program III, while the field exercise is to be related to further monitoring activities of three schemes of Shubi-Sombo expecting problem tree to be formulated through

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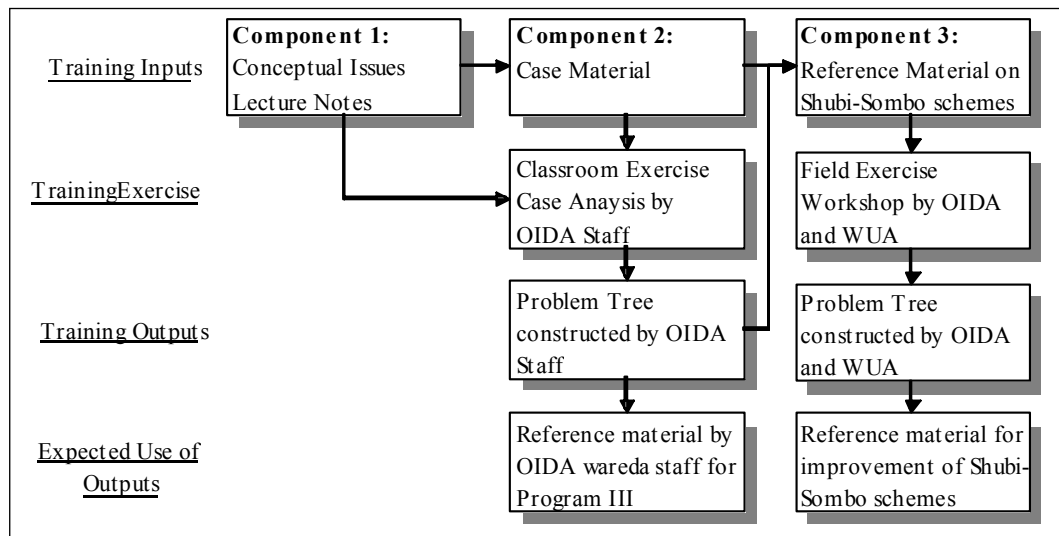
<sup>1</sup> Basic design on output-oriented training was formulated by United Nations Centre for Regional Development (UNCRD) in 1994, when the 24<sup>th</sup> International Training Course in Regional Development Planning was undertaken in accordance with this training framework. This approach has been further applied to organize a series of Africa Training Course in Regional Development Planning by UNCRD Africa office.

field practices can be used as (i) reference materials for each WUA and (ii) monitoring tools for OIDA DA concerned.

#### (4) Structure of Training Workshop

In accordance with the above set framework, training workshop is designed as illustrated below.

**Illustrated Structure of Training Workshop**



#### (5) Selection of Trainees

Trainees were strategically selected from (i) OIDA Tiyo wareda office for rehabilitation work on Kater scheme; (ii) OIDA Munesa wareda office for rehabilitation works on Gedamso, Sadi Sadi & Lafa schemes respectively; (iii) Dugda Bora wareda Irrigation Development Desk (hereinafter “OIDA Meki Office”)office for monitoring Shubi-Sombo WUAs; and (iv) OIDA Central Branch office for supportive works to wareda offices.

#### (6) Formation of Workshop Moderators

The JICA Study Team played a role as resource persons for overall workshop program. In addition to the Team, two OIDA staff, who had been already trained in project cycle management by UNCRD Africa office, were assigned as moderators for group exercise.

#### (7) Methods of Training Workshop

Methods employed in training were in combination of lecture, group discussions, group exercise both in classroom and in fields, presentation and workshop. With specific regards to group exercise, an entire process of the workshop adopted group

dynamics through which trainees can fully motivated to discuss issues freely admitting differences among groups that provide a basis for wider understanding. For making a group, a number of around six or seven is adopted to form each group in order to maximize effects of group discussions as well as to conduct field exercises in the Shubi-Sombo schemes (see Annex III).

#### (8) Preparation of Case Material for Problem Analysis Exercise

A case material for the classroom exercise on problem analysis was prepared through PRA on Gedamso scheme, one of the schemes selected for rehabilitation work in Program III (see Annex III). The PRA session was organized on 6 August 2003 at the time when Gedamso WUA extended executive meeting was held. In the meeting, 42 WUA members assembled for discussion. During the PRA session, the following methods were used; (i) historical timeline, (ii) focus group discussions, (iii) sketch mapping, and (v) scenario analysis. Also semi-structured questionnaire was used for collecting information and data. All the collected information and data was transformed into a case material for training purpose in which all the proper nouns were changed into imaginary names. The case material for problem analysis exercise in classroom session is presented in the training material in Attachment-1.

#### (9) Constructing Daily Schedule

The Training Workshop on PCM- Problem Analysis was carried out according to the following work schedule;

- 1) Component 1: Lecture Session : 18<sup>th</sup> August
- 2) Component 2: Case Analysis : 19<sup>th</sup> and 20<sup>th</sup> August
- 3) Component 3: Field Exercise : 21<sup>st</sup> and 22<sup>nd</sup> August

Detailed workshop program is presented in Table 2.2.1.

### 2.2.3 OIDA Participants

#### (1) Total Number of Participants by the Respective Office

A total number of participants accounts for 20 consisting of the followings;

**Total Number of Participants**

OIDA Offices	Number
1) OIDA Tiyo Wareda Office	4
2) OIDA Munesa Wareda Office	6
3) OIDA Meki Office	4
4) Central Branch Office	6
Total	20

Source: JICA Study Team



Three training groups were organized for exercise on the workshop as listed in Table 2.2.2 and summarized below. And detailed information of participants is presented in the list of participant in Table 2.2.3.

#### Training Group

Unit : nos.

	Group A	Group B	Group C
Moderator	1	1	1
Trainee	7	7	6

#### (2) Places of Assignments of Participants

Twenty (20) participants consisted of the following compositions in accordance with their assignment.

#### Place of Assignment of Participants

Place of Assignment	Number
1) Wareda Head	2
2) Wareda Expert	4
3) Wareda Development Agent (DA)	8
4) Branch Expert	6
Total	20

Source: JICA Study Team

#### (3) Age and Work Experiences in Irrigation Sub-sector

An average age of participants is 33 ranging from 23 to 49. With regard to service period in irrigation sector, an average length of work experience is around 6 years with a range from 0.2 to 23 years. Distribution of work experiences are indicated as below;

#### Work Experiences

Distribution of Work Experiences in years	Number	Ratio (%)
1) Less than 5 years	14	70
2) 5 to 10 years	3	15
3) 11 to 15 years	1	5
4) 16 years and above	2	10
Total	20	100

Source: JICA Study Team

Those who have relatively short experiences in irrigation sector were majority of the participants sharing 70 %. Participants can be, therefore, characterized into less experienced OIDA staff, who needs capacitaization for planning, implementation and monitoring and evaluation of project.

#### (4) Areas of Professions and Educational Background of Participants

In accordance with areas of professions, participants are broadly categorized into five groups;

**Areas of Professions**

Areas of Professions	Number	Ratio (%)
1) Agricultural or Irrigation Engineering	4	20
2) Construction Engineering	1	5
3) Agricultural or Agronomy or Extension	10	50
4) Economics or Sociology	3	15
5) Other certificated	2	10
Total	20	100

Source: JICA Study Team

Some 75 % of participants are found to be either engineering or agricultural oriented professionals rather than those with social science background. In terms of educational background, participants are categorized into four groups;

**Educational Background**

Educational Background	Number	Ratio (%)
1) MA	1	5
2) BSc	3	15
3) College Diploma	14	70
4) Certificate	2	10
Total	20	100

Source: JICA Study Team

The above table indicates that 90 % of participants are holding college diploma.

#### (5) Types of Tasks and Duties Performed by Participants

Participants were asked questions on their experiences in community-based project cycle including;

- i. awareness creation; experiences in sensitization, consultation with users on land exchange practices, demarcation of duties between users and OIDA, economic benefits and self-financial management of irrigation
- ii. systematic procedure of planning; experiences in sequential process of planning.
- iii. community-based planning and designing; experiences in consensus building on layout making, canal designing, land arrangements, land exchange.
- iv. community-based construction; experiences in mobilization of community contributions towards construction in kinds and cash, and,
- v. community-based monitoring and evaluation; experiences in financial management, resource acquisition or mobilization for irrigation management.

Tendencies of their experiences among participants are summarized below.

### Experiences among Participants

Unit : %

Tasks	Often	Sometimes	Nil
(i) Awareness Creation	35	55	10
(ii) Systematic Planning	10	10	80
(iii) Community-Based Planning and Design	15	35	50
(iv) Community-Based Construction	15	45	40
(v) Community-Based M & E	15	65	20

Source: JICA Study Team

This table indicates the current tendencies of task performance of OIDA staff, within a limited source of information from participants:

- 80 % of staff is experiencing awareness creation for users community on a brief outline of irrigation management.
- In comparison of higher involvement in awareness creation stage, users communities are not well consulted in planning and designing stages at the rate of 20 to 50 %.
- Despite less involvement of users community in planning and design stage, users community are somehow mobilized into construction and monitoring.

It is found that user communities may be normally less involved in planning and designing stages. This tendency might also link with lower performance of irrigation scheme described as earlier.

#### (6) Areas of Trainings Previously Taken by Participants

With regard to any areas of trainings that participants might have taken previously, six participants were reported to have taken no training in the past, while the following trainings were reported to be taken by the rest of 14 participants, some of whom had several training opportunities.

#### Areas of Trainings previously taken by Participants

Area of Training	Number
1) Logical-framework	1
2) Project planning and monitoring	1
3) Participatory rural appraisal	1
4) Community participation	2
5) Data collection, community mobilization for irrigation crop management	2
6) Irrigation development agent in-service training	2
7) Irrigation water management	4
8) Irrigation and extension	2
9) Irrigation system	1
10) Small scale irrigation	1
11) Irrigation, salinity control & drainage	1
12) Soil and water conservation	1
13) How to make farmers active	1
14) Water supply	1
15) Finance and economic management	1
Total	22

Source: JICA Study Team

## 2.2.4 WUA Participants

For field exercise session in the Shubi-Sombo schemes, members of three WUAs participated in problem analysis sessions as follows.

**WUAs Participants**

WUA	21 August		22 August	
	No	%	No	%
1) Shubi WUA	11	65	11	65
2) Sombo Genet	12	52	13	57
3) Sombo Aleltu	10	53	14	74
Total	33	-	38	-

Source: JICA Study Team

## 2.2.5 Conclusion and Recommendation

### (1) Stakeholder Analysis in Classroom Exercise

#### 1) Identification of stakeholders in the case study

Each training group conducted exercises to identify stakeholders presented in the study. Stakeholders commonly identified by the three groups are broadly classified into two categories; namely, (a) external stakeholders, and (b) internal stakeholders; (a) External stakeholders include (a-i) Wareda OIDA office; (a-ii) Wareda Cooperative Promotion Desk; (a-iii) Wareda Administration Office, (a-iv) Wareda Agricultural Desk; and (a-v) IIDF as funding agency, while (B) internal stakeholders are identified with (b-i) Peasant Association; (b-ii) WUA; (b-iii) water users cooperative (WUC). On the other hand, the following stakeholders are also identified through individual group works; namely, (i) elders; (ii) a group of landless farmers; (iii) share croppers from outside; (iv) export trader; (v) local middlemen; and (vi) Wareda Natural Resource and Land Administration Desk.

#### 2) Categorization of stakeholders by using participation matrix

After the identification of stakeholders, each group was encouraged to categorize stakeholders by using participation matrix that has two dimensions; (i) a degree of activeness; and (ii) a degree of institutionalization. In this exercise, each group was given a privilege to freely define a degree of activeness as well as institutionalization. In this regard, one group succeeded in presenting their working definition (see result of Group A on participation matrix in Attachment-1. Despite a fact that different perspectives existed among three groups, most of identified stakeholders were recognized as non-actively participating stakeholders in operation and management of the

scheme.

### 3) Comparative study between present and desired levels of stakeholder participation

In order for participants to articulate desired levels of stakeholder involvement in operation and management of irrigation scheme, participants were further encouraged to form their comparative views between the present and desired level of stakeholder participation. All the groups have common understanding on that both WUA and water users cooperative (WUC) were identified with target groups for attainment of effective, efficient and sustainable operation and management of irrigation scheme. However, it is a fact that participants could not reach consensus first on how to categorize WUA and WUC in the context of operation and management of the scheme. Some participants argued that WUC should be separately organized from WUA, while other participants suggested that WUC should be an integral part of WUA. Through this discussion, it is found that relationships between water users association and agricultural cooperative are not clearly understood. In other words, it is suggested that OIDA and Cooperative Promotion Office should work out their linkages in organizational process of users' community in the near future. Basically, it was understood that members of WUC should be a part of members of WUA, resulting in that interested groups of WUA members could form a cooperative in order to have access to credit facilities offered through cooperative promotion office. It was also well recognized in floor discussions that harmonization between the two is essential.

Detailed results of group exercises are referred to Attachment-2.

## (2) Problem Analysis (1) in Classroom Exercise

### 1) Identification of problems in the case study

In reference with the case study, three groups identified relevant problems in assumption that irrigation development should improve life standard of users' community through attainment of household economic benefits in general and household food security in particular. Having analyzed by three groups, it was commonly viewed that the operation and management of the scheme presented in the case study were insufficiently performed.

### 2) Identification of a core problem

Under the above general perspectives on poor performance of irrigation scheme in the case study, two training groups had identified a similar core

problem with ‘poor performance of irrigation farming’ or ‘inefficient irrigation development performance’. Although clarification between irrigation development and irrigation farming were not made during floor discussions followed by group presentation, it was commonly understood that the irrigation scheme did not reach a planned or desired level of benefit-making. Apart from these two groups, one group focused on the low level awareness of irrigation farming as core problem that provided the scheme with low performance.

### 3) Identification of direct causes for the core problem

In relation with a core problem as ‘low performance of irrigation scheme’, two groups identified several direct causes that could be classified into sub-groupings as follows; namely, (i) uneven distribution of irrigation land as land issue; (ii) poor irrigation water management as an issue of even water distribution; (iii) weak performance of WUA as an organizational issue; (iv) difficulties to have access to credit facilities or farming inputs as an issue of accessibility of agricultural inputs; (v) lack of irrigation farming techniques and skills as an agricultural issue; and (vi) less commitment to participation in developmental works as common problem prevailing in rural Ethiopia. One group further analyzed the core problem as low awareness of irrigation farming. To sum up, it is clearly understood that these causal relationships among identified problems are found in low performance recorded by the most existing irrigation schemes.

Results of group works on problem tree are shown in Attachment-1.

## (3) Problem Analysis (2) in Field Exercises in the Shubi-Sombo schemes

### 1) Identification of problems of individual scheme operation and management

Immediately after the completion of classroom exercises, three training groups were requested to conduct field exercises on problem analysis of in the Shubi-Sombo schemes. With reference to hand outs to describe results from monitoring activities, they were informed of critical situation in which replacement reserves of pump are not made sufficiently. Under such guidance, three training groups conducted a session with WUA members in order to share this given views and further to identify felt-problems by WUA members. In short, it was found that all three WUA members could share views of problem that savings for pump replacement cost were not made as per the payment schedule.

## 2) Identification of a core problem

Having shared views on problem that savings for pump replacement cost were not made, each group was encouraged to identify a core problem around this problem. Eventually, three groups identifies different core problem through group discussions as follows;

**Core Problem identified by Trainees**

WUA	Core Problem
Shubi WUA	Low income from irrigation farming
Sombo-Genet WUA	Pump replacement cost are not collected sufficiently
Sombo-Aleltu WUA	Insufficient guarantee for continuity of the scheme

Source: Results from problem analysis session in training workshop

It is understood that Shubi WUA considered the problem of insufficient depreciation reserve as one of effects from their identified core problem, while Sombo-Aleltu WUA took the problem as one of direct cause for their identified core problem.

## 3) Identification of direct causes for core problem

In relation with this problem, WUA members made an attempt to list up their felt-problems. Those felt-problems could be eventually summarized into the following groups of problems; (i) lower income obtained from irrigation farming than expected; (ii) improper irrigation water management as per bylaw; (iii) weakness of WUA management; (iv) few opportunities to have an access to credit facilities or farming inputs; (v) unfavorable marketing, and the like. It should be noted herewith that an issue of land exchange was listed up as one of causes leading to low benefits from irrigation farming. However, this land exchange issue should be continuously discussed in WUA meeting to clarify it as whether or not uneven distribution of land is an issue.

Problem analyses on the three schemes are presented in Attachment-2.

## (4) Immediate outcomes from the Training Workshop

### 1) General interpretation by OIDA staff

Articulating project goal and formulating project strategy requires, needless to say, construction of a variety of problems or causes. In other words, it can be said that no effective actions could be taken unless problems is constructed in logical order. Individual participants are found to have a certain degree of competence to identify problems. As earlier mentioned, most of identified problems are found in most existing irrigation scheme. Despite this, most

participants faced difficulties to great extent to construct problems logically into a set of their causal relationships. It is expected that the exercise to construct problem tree could help them to further formulate strategic plan of actions for improvement of existing irrigation scheme.

## 2) General interpretation by WUA members

It implies that an ownership of the tool for the management is one of essential issue. In this context representatives from each WUA members were requested to present their own problem analysis tree, expecting that this could create a sense of ownership on the tool by WUA members. This could be expected for WUA members to formulate collective actions for improvement of the scheme by them. On the last day of the Training Workshop on 22 August, a session was held for WUA representative s to present their problem trees. Through active exchange of their own views and ideas on problem trees, it was commonly expressed by WUA representatives that (i) it was the first time to discuss the same issue among three WUAs, and more importantly (ii) it was eventually the first time to recognize that they are facing the same or similar problems in the management of the scheme. One of the outcomes was that an issue for WUA to re-organize into cooperative was raised from their presentation. Certainly, their finding on it is responding to one of critical findings of the Study Team through monitoring.

## 3) Implication for development agent

On the session when WUA representatives presented their problem trees, OIDA Development Agent (DA) was requested to assist WUA members in presenting problem trees. In the floor discussions, it was found that DAs from each group assisted WUA member especially in presenting causal relationships among problems in logical sequence. Through this, it is expected that DA concerned with three Shubi-Sombo schemes could use problem trees as monitoring tool to re-organize WUA members into collective actions for improvement of scheme management.

## (5) Impressions by OIDA Participants on Training Workshop

As a formality, OIDA participants as well as associate resource staff were requested to fill course evaluation questionnaire at the end of the training workshop on 22 August 2003. The five grading score was used and results of score were converted into percentage. Results are indicated as below.



### Results of Workshop End Participants' Evaluation

No.	Questionnaire	Score (%)
I-1	Importance of output oriented training	89
I-2	Methods applied	90
II-1	Selection of topics for modules	91
II-2	Allocation of times	61
II-3	Orgnization of lectures, group discussion	84
III-1a	Lecture Session 1: Conceptual Issues: Degree of Importance	90
III-1b	Lecture Session 2: Conceptual Issues: Selection of Topics	92
III-2a	Lecture Session 2: Introduction to PCM: Degree of Importar	92
III-2b	Lecture Session 3: Introduction to PCM: Selection of Topics	89
III-3a	Classroom Exercise: Case Analysis: Degree of Importance	95
III-3b	Classroom Exercise: Case Analysis: Selection of Topics	92
III-4a	Field Exercise in Shubi-Sombo: Degree of Importance	92
III-4b	Field Exercise in Shubi-Sombo: Selection of Topics	84
IV-1a	Handoutts: Degree of Importance	89
IV-1b	Handoutts: Selection of Topics	91

Source: JICA Study Team

The results indicate that participants in training workshop expressed their satisfaction with contents of training, except that time allocated for the Workshop was found to be too short for them.

## 2.3 Participatory Rural Appraisal (PRA)

### 2.3.1 Objectives

Central among urgent requirements on human resources of OIDA for attainment of irrigation project sustainability is the presence of (i) engineers who fairly equip themselves with basic operational knowledge on participatory development approach and (ii) social workers who understand basic knowledge on engineering and agricultural aspects of irrigation scheme. Besides their human presence, it is essential to create a workable framework through which such engineers and social workers can be harmoniously engaged in a full process of irrigation project plan formulation, implementation and monitoring and evaluation in partnership with local community that is a unit of management through the formation of water users association (WUA). Water users association is defined as users' organization that has chief mandate to integrate three main aspects of engineering, agriculture and organization of irrigation scheme into sustainable scheme management.

Cognizant of this, the JICA Study team organized a capacity-building program to provide OIDA engineers and social workers with a forum where professionals and local users' community members can make interaction of each others for irrigation development through tackling operational and managerial issues at ground.

To undertake such capacity-building program, two methodologies are employed; namely, (i) Participatory Rural Appraisal (PRA); and, (ii) On-the-job Training; in the implementation of Program II in the Study, that is WUA Support Program in Meki Area. The application of two methodologies has the following immediate objectives;

- 1) to identify and share relevant issues for sustainable irrigation scheme development and management among all stakeholders members concerned including OIDA wareda manager and experts, engineering expert, social and economic expert, applicant community members together with the JICA study team in PRA as operation study tool;
- 2) to provide OIDA engineer, social workers and community members with an educational opportunity through which local consultation mechanisms can be formulated through creating trust building on their relationships through PRA as educational tool; and,
- 3) to provide a planning forum for engineer and social worker where they can interact each other for plan formation of irrigation scheme through on-the-job training in which JICA study team consisting of both irrigation engineer and community organization can also share with and transfer their professional and operational knowledge to OIDA professionals.

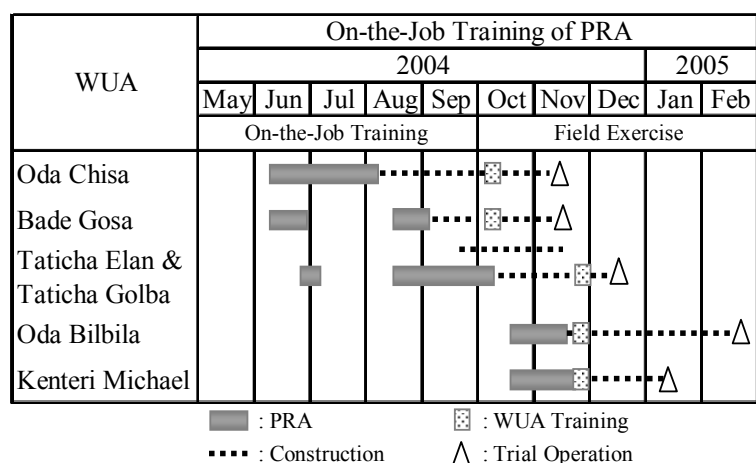
### 2.3.2 On-the-job Training of PRA

#### (1) Organization of on-the-job training

In addition to transfer of theoretical knowledge, the field experiences of PRA are utmost important for the OIDA staff. Therefore, the Study directed to provide the on-the-job training to the OIDA staff through the actual practices of PRA under Program II, in which five (5) WUAs were actually established.

PRA was carried out for three (3) WUAs as on-the-job training, where the JICA Study Team took leading roles to organize a series of the PRA sessions with the OIDA staff. The number of the three (3) was determined mainly by two factors; (i) availability of OIDA staff for the Study on an average with two days a week; and (ii) pace of understanding and internal arrangements of applicant group on issues tackled in a process of establishment of WUA at least for one week per issue.

By employing the experiences thus accumulated, the PRA sessions for the remaining two (2) WUAs were moderated by the OIDA staff in the following time frame.



**Time Frame of On-the-job Training of PRA**

(2) Participants in On-the-job Training

In Oromia region, within a nation-wide policy framework, decentralization policy has been implemented to provide a woreda office with autonomous power on project plan formulation, implementation and monitoring and evaluation of small-scale irrigation development and management in the irrigation sub-sector of water sector development program.

In this policy context, Program II has focused specifically on capacity-building of the OIDA Meki office with involvement of OIDA’s supporting staff from Central Branch office. Through this arrangement, the JICA Study in Program II intended for the following OIDA staff to whom knowledge and skills required for community-based irrigation development were shared and transferred by the study team:

Meki office staff

- 1) Head
- 2) Irrigation Engineer
- 3) Agronomist
- 4) Irrigation Development Agent

Supportive staff from OIDA Central Branch

- 1) Agricultural Economist
- 2) Surveyor

(3) Expected Outcomes from On-the-job Training

Program II was undertaken based on the results from the Meki study with three main objectives of (i) standardization of development procedure; (ii) capacity-building of OIDA staff; and (iii) direct benefits of users’ community through pilot project. In

other words, on-the-job training under Program II was organized to achieve the objective of capacity-building of OIDA staff in a process of further standardization of development procedure and maximization of pilot project benefits.

In this regard the following outcomes were expected from Program II.

- 1) Further elaboration of standardized development procedures to be resulted in the guideline for establishment of WUA including a proposed time frame and involvement of personnel of PRA;
- 2) OIDA staff who has actual experiences in a full process of PRA, to be resulted in familiarization with the developed guideline as well as equipped with ideas on problem solving on critical issues such as land re-allocation and even distribution of land and water.

### 2.3.3 Conclusion and Recommendation

#### (1) Recognition of Effectiveness and Practicability of PRA for Wareda OIDA Office

Following on-the-job training for four (4) WUA, it is proved that Wareda OIDA staff conducted a series of PRA session successfully for establishment of two (2) WUA in support of OIDA Central Branch office. It is also experienced that OIDA staff become well aware on how to deal with land re-allocation in the process including issues on who can be eligible for land re-allocation, involvement of official involvement of PA in the process to legalize land exchange, and the like.

In all the stage of plan formulation and implementation through PRA, flexible but effective interactions were made between engineers and social workers as well as between OIDA and WUA. One of the typical outcomes is an introduction of pipeline system replacing earth canal in Oda Chisa case (see Annex IV).

Wareda OIDA office reached to a stage where they have their capacity to supervise NGO's activities in an attempt of scheme sustainability, since it has already had reference cases of 9 WUAs.

The finalization of the guideline for establishment of WUA is highlighted as an outcome from PRA sessions for building capacity of OIDA to promote community-based small-scale irrigation development.

#### (2) Building Capacities of OIDA Wareda Office to Deal with Three Sources of Water

Following the Meki Study, the JICA Study team and Wareda OIDA office proved that the approach can be applied to local applicant groups with three different water

sources; namely, the Meki river, the Ziway lake and groundwater. Through the Study, applied approaches were found to be operational in local communities with these three different water sources. Specifically the OIDA Meki office built their capacities to deal with three different communities in terms of sources of water.

### (3) Technical Capacity-Building

Dealing with applicant communities with using groundwater, additional optimal technical design was devised through the PRA sessions. This optimized design is that one WUA consist of around 12 households to manage 3 hectare of command area with a mobile pump of 5 HP. In addition to the other type of optimized technical design, i.e., WUA consisting of around 20 household to manage 5 hectare of command area using a pump with 10 HP, Wareda OIDA office equipped them with two type of technical design for pump irrigation.

Apart from the above, PRA session facilitated a process to build capacity of Wareda Office to flexibly handle local conditions in consideration with efficient use of water and other resources available in local conditions. Oda Chisa is the typical example to accommodate pipeline system instead of earth canal.

### (4) Time Frame of PRA

Standardization of irrigation development procedure includes a set time frame required for PRA sessions for one community. Based on experiences both in on-the-job trainings and field exercise, it is found that a set of around 6 PRA sessions will be recommendable for establishment of a single WUA. The pace of it ensures understanding of project components and issues for its sustainability together with internal necessary arrangements involving recognition of executive committee of peasant association (hereinafter “PA”) especially on land exchange process. Standardization of the process in terms of time requirement can help Wareda Office to formulate annual plan of operation with budgetary proposal.

### (5) Increase in Awareness on Importance of Monitoring

The results from Project Benefit Monitoring and Evaluation (PBME) of Shubi-Sombo WUAs were mobilized into PRA sessions in on-the-job trainings, especially on recognition of official involvement of peasant association in land exchange process, ensuring even distribution of irrigation water, and project cost-sharing. Through this, Wareda OIDA staff is encouraged into emphasizing on project monitoring. Despite this, it is observed that Wareda Office has limited capacity to conduct monitoring and evaluation works because of full engagement in a region-wide water harvesting program, unexpected works like emergency work in

response to flood etc.. and other routine duties. Under such conditions, Wareda OIDA office is recommended to at least periodically monitor the following three aspects of individual irrigation scheme; (i) bank balance monitoring; (ii) water distribution to each plot in command area in reference with scheme layout; (iii) cropping monitoring of each plot in command area.

#### (6) Increase in Attention to Water Resource Management

The results from PBME of Shubi-Sombo WUAs indicate a case of shortage of water source that WUAs encountered. The first issue in the PRA was the presence of perennial flow of water source. At the same time rapid increase in number of pump for irrigation is studied, to be resulted in possible water resource conflicts within the area. Accordingly, confirmation of annual availability of water source shall be highlighted in the PRA in the future. As the result, it is expected that awareness on water resource management shall be raised with an expectation to establish of concept of water right, optimal distribution system of water, and institutional building on this issue.

## **2.4 Capacity Building for Project Benefit Monitoring and Evaluation (PBME)**

### **2.4.1 Objectives**

Around the concept of PCM, the monitoring and evaluation are utmost important stages in the entire project cycle. The methodology of PBME was transferred to the OIDA staff through its actual practices in the Shubi-Sombo schemes. The importance of the project monitoring is theoretically understood by the OIDA staff. However, PBME has not been sufficiently practiced by OIDA because of lack of experienced staff at the wareda level and limited budget including transportation facilities. Taking such limitations of OIDA into consideration Program I envisaged optimizing the frameworks of PBME at realistic level for OIDA and training up the OIDA wareda staff.

The Meki study assisted establishment of three (3) WUAs of the Shubi-Sombo schemes, namely Shubi, Sombo Genet and Sombo Aleltu, which were organized by 63 local farmers in Shubi Gamo PA. Within the framework of the Study, PBME was carried out to verify performance of their project management and identify further constraints encountered by WUA. The lesson learned to be obtained through PBME in the Shubi-Sombo WUAs were expected to be useful information for Programs II and III of the Study. With such a specific objective, PBME was carried out by the JICA Study Team in collaboration with the OIDA Central Branch Office and the OIDA Meki office. Throughout PBME the intensive training was provided to the

OIDA staff. On the basis of the experiences of participation in PBME for the Shubi-Sombo schemes, the OIDA staff was requested to play major role in the following PBME activities, i.e. baseline survey and PBME of six (6) WUAs established under Program II and baseline survey and PBME of three (3) rehabilitation schemes under Program III.

Through the study the following PBMEs were carried out.

- 1) PBME of Shubi-Sombo WUAs
- 2) PBME of Six (6) WUAs established in Meki area under Program II
- 3) PBME of three (3) existing schemed rehabilitated under Program III

#### 2.4.2 On-the-job PBME Training in the Shubi-Sombo Schemes

The periodical PBME for the Shubi-Sombo schemes was carried out throughout the Study. The followings are major practices performed by OIDA staff under supervision of the JICA Study Team.

- 1) Preparation of work design
- 2) Preparation of questionnaire and monitoring sheets
- 3) Interview survey with questionnaire to WUA board members and members
- 4) Data collection for PBME
- 5) Crop budget and farm income analyses
- 6) Computer training for data formatting and storing
- 7) Assessment

Through the Study three (3) PBMEs of Shubi-Sombo schemes were carried out in the different points of view as shown in the following time schedule.

- 1) 1st PBME : 2<sup>nd</sup> to 21<sup>st</sup> May 2003
- 2) 2nd PBME : 15<sup>th</sup> December 2003 to 6<sup>th</sup> January 2004
- 3) 3rd PBME : 4<sup>th</sup> to 15<sup>th</sup> June 2004

The 1<sup>st</sup> PBME was carried out in May 2003. The JICA Study Team directly provided the training to the OIDA staff selected from the Central Branch Office and the Meki office. It clarified the conditions of the WUA management in terms of logistics and financial operation and the performance of irrigation farming by individual members. The details are presented in Annex III on PBME for the Shubi-Sombo schemes. The WUA members face 14 constraints, which are categorized into four (4) major aspects; (i) conflicts derived from land exchange, (ii) lack of farm operation budget, (iii) shortage of water and (iv) insufficient knowledge for farm management.

The 1<sup>st</sup> PBME recognized the significant gap of fuel consumption between the upper and lower areas of the main canal over the three WUAs. Time required to water distribution significantly differs by distance from the pump set. Water shortage was derived not only from low discharge of the Meki river but also from ill effects of lack of irrigation knowledge. The Study undertook this issue and made attempt for urgent settlement so as to avoid frictions among the WUA members.

The 2<sup>nd</sup> PBME was carried out through further field investigation and farmers' interview in December 2003 with a focus on cause of low irrigation performance that had been pointed out during the 1<sup>st</sup> PBME. The interview was made to the WUA members of each of the Shubi-Sombo WUAs to clarify present conditions of land utilization and water distribution to each plot, while the field discharge measurement was conducted in collaboration with the staff of OIDA Meki office. Apart from the irrigation engineering aspects, the lengthy land problems were identified in the Shubi scheme. The results of the 2<sup>nd</sup> PBME are presented in Annex III.

The 3<sup>rd</sup> PBME was carried out to follow up the previous two (2) PBME on May 2004 focusing on the WUA management, farming activities and marketing, financial status, and land dispute of the Shubi WUA.

The participants in on-the job training are summarized as below.

**The Number of Participants**

Activity	Staff (Number of Participants)	Man-days
1st PBME	<ul style="list-style-type: none"> <li>• Agricultural Economist(1), Central Branch Office</li> <li>• Head(1), Expert(2), DAs(2) of OIDA Meki office</li> </ul>	43
2nd PBME	<ul style="list-style-type: none"> <li>• Head(1), Expert(2), DAs(2) of OIDA Meki office</li> </ul>	30
3rd PBME	<ul style="list-style-type: none"> <li>• Agronomist(1), Expert(1) of OIDA Meki office</li> </ul>	7
Total		80

#### 2.4.3 On-the-job PBME Training under Programs II and III

Establishment of six (6) WUA in Meki area under Program II and rehabilitation of three (3) schemes under Program III were completed by March 2004. The following PBME was carried out to clarify performance of schemes in cooperation with the OIDA Central Branch Office and the OIDA Meki office in May and June 2004.

1) PBME for Program II : 13<sup>th</sup> May to 3<sup>rd</sup> June 2004

2) PBME for Program III : 14<sup>th</sup> May to 6<sup>th</sup> June 2004

The PBME for Program II envisaged verifying a wide range of the indicators to assess the sustainability of community-based irrigation development in Meki with analyzing farm management at individual farmer level from agronomic and financial points of view.



The PBME for Program III was carried out to collect and analyze necessary information in terms of the verifiable indicators stipulated in the Project Design Matrix prepared by the JICA Study Team. It focused on the improvement of irrigation performance (actually irrigated area / plan command area) and WUA management after rehabilitation works.

The details of PBME are presented in Annex IV WUA Supporting Program in Meki (Program II) and Annex VI Rehabilitation of Existing Schemes (Program III). The participants in on-the job training are summarized as below.

**The Number of Participants**

Activity	Staff (Number of Participants)	Man-days
1) PBME for Program II	• Head(1), Expert(2), DAs(2) of OIDA Meki office	30
2) PBME for Program III	• Agro-economist(1) of OIDA Central Branch Office • DAs(5) of Tiyo and Munesa Wareda offices	40
Total		70

#### 2.4.4 Conclusion and Recommendation

It is observed that OIDA Meki office as well as OIDA wareda offices in Tiyo and Munesa have limited capacity to conduct monitoring and evaluation works because of full engagement in the region-wide water harvesting program and other routine duties. Taking such conditions into consideration the JICA Study Team recommended the OIDA Meki office, specifically in relation with Program II, to monitor at least the following three aspects of individual irrigation scheme; namely (i) bank balance monitoring; (ii) water distribution to each plot in command area in reference with scheme layout; (iii) cropping monitoring of each plot in command area. Besides, the JICA Study Team supplied (i) two motorcycles and (ii) a set of computer facilities for smooth execution of PBME. It is expected that the OIDA Meki office will continue PBME for nine (9) WUAs established under the Meki study and Program II of the Study.

The staff of the OIDA Meki office has basic knowledge of interview as well as questionnaire surveys enough for execution of PBME. As for knowledge of farm management, however, more training is required especially in crop budget analysis, which is essential in assessment of financial viability of the schemes. The accuracy of responses/answers by farmers are often subject to confirmation in terms of acreage, crop yield, seed rate, irrigation time, planting season, etc., thus interviewer should have enough agricultural background to detect and crosscheck its accurate answer.

## **2.5 Capacity Building for Irrigation Engineering**

### **2.5.1 Objective**

In a process of decentralization policy implementation, mandates of the respective offices of OIDA have been rearranged on aspects of irrigation project planning and management in accordance with levels of administration, e.g., branch office level and wareda office level. In relation with the JICA Study, it is recognized that Branch office has responsibilities for rehabilitation of existing schemes, while Irrigation development desk (OIDA) in wareda level is responsible for community-based irrigation development. Due to limitations of budget, staff, and time, however, those activities are required to be undertaken efficiently and effectively utilizing available small inputs and resources.

Despite resource constraints, it should be taken into account that an approach to irrigation planning and design in community-based irrigation development project is different from those approaches to medium or large scale irrigation scheme project from engineering points of views. Community-based approach requires more flexibility and expeditious to accommodate as much as possible specific local conditions into irrigation planning and design for ensuring project sustainability. For rehabilitation of existing scheme, the inventory survey of conditions of facilities is fundamentally important from the engineering points of view. Under resource constraints, it is more essential to specifically identify the most critical part of defects of facilities to be rehabilitated with strategic perspectives for improvement of irrigation performance. In other words, inventory survey results, which are normally classified in accordance with irrigation facility-structure, should be prioritized in order to realize maximization of rehabilitation effects.

In addition to the above, in view of limited water resources and fragile environmental conditions of the Rift Valley system, OIDA is in a position to take responsibilities for periodical monitoring of expanding irrigation water use and for judicious planning for protection of the eco-system. The Meki study recommended OIDA to embark on the hydrological environmental monitoring in line with [4-1] Environmental Monitoring Program as one of 21 programs composing the master plan.

In this context the following capacity building programs for irrigation engineering were carried out for OIDA staff through on-the-job trainings and workshop.

### Capacity Building Programs for Irrigation Engineering

No.	Capacity building program	Activities
1	Hydrology and water use analyses in Meki area	<ul style="list-style-type: none"> <li>• Collection of meteorological and hydrological data</li> <li>• Analyses of water constrains of Shubi-Sombo schemes</li> <li>• Inventory survey of small pump for irrigation using groundwater</li> <li>• Inventory survey of small pumps for irrigation in Meki area</li> </ul>
2	Small-scale irrigation facility planning	<ul style="list-style-type: none"> <li>• Planning and design of optimum specification of pump</li> <li>• Planning and design of optimum standard of irrigation facilities for community-based irrigation development</li> </ul>
3	Formulation of rehabilitation plan for existing schemes	<ul style="list-style-type: none"> <li>• Prioritization of rehabilitation of irrigation facility</li> <li>• Formulation of optimum standard of rehabilitation of irrigation facilities</li> </ul>

The participants in training programs are summarized as below.

### Participants in Training Programs

No.	Capacity building program	Staff (Number of Participants)	Man-day
1	Hydrology and water use analyses	<ul style="list-style-type: none"> <li>• Hydrologist(1), OIDA head office</li> <li>• Head(1), Expert(1), DAs(2) of OIDA head office</li> </ul>	50 man-days
2	Small-scale irrigation facility planning	<ul style="list-style-type: none"> <li>• Design engineer(2), OIDA head office</li> <li>• Head(1), Expert(2), DAs(2) of OIDA Meki office</li> <li>• Surveyor(2), central branch office</li> </ul>	40 man-days
3	Formulation of rehabilitation plan for existing schemes	<ul style="list-style-type: none"> <li>• Design engineer(2), OIDA head office</li> <li>• Design engineer(5), Central Branch office</li> <li>• Sociologist(2), Central Branch office</li> <li>• Surveyor(3), OIDA branch office</li> <li>• Head(2), Expert(4) DAs(5), Tiyo and Munesa Wareda office</li> </ul>	70 man-days

#### 2.5.2 Hydrology and Water Use Analyses

The small pump irrigation schemes in Meki were negatively affected by severe drought in 2002. The discharge of the Meki river was drastically decreased and did not allow local farmers to pump up sufficient water for irrigation farming. Since change of hydrological conditions thus directly affects sustainability of the community-based irrigation development in Meki, continuous observation of the river discharge is utmost important so as to avoid social unrest especially for vulnerable people.

Major water source for irrigation in Meki gradually changed from the Meki river to alternative water sources, i.e. lake water and groundwater due to the above-mentioned erratic and limited water availability of the Meki river. With such a background, hydrological observation and water use monitoring were taken up as capacity building program throughout the study period.

#### (1) Meteorological and Hydrological Data Collection

Under Program I, collection of rainfall and hydrological data around Meki area was conducted as a part of the capacity building programs. Rainfall data at two stations, namely Meki and Alem Tena, which are situated in the project area, was collected from the National Meteorological Services Agency (NMSA), while the two hydrological data of (i) River discharge of the Meki river; and (ii) Water level of the Ziway lake were collected from Ministry of Water Resource (MoWR).

The main water source of the Ziway lake is both the Meki and Ketar rivers. The Meki river is gauged at Meki town (CA = 2,433 km<sup>2</sup>), while the Ketar river is gauged near Abura (CA = 3,350 km<sup>2</sup>). The mean annual flows recorded at the two stations are 291 MCM for Meki and 413 MCM for Ketar, respectively. The total annual average inflow in the lake can be safely estimated by the sum of the Ketar and Meki river-flows as recorded at the gauging stations, which is about 704 MCM. Furthermore, the water balance of the Ziway lake is governed by outflow from the lake through the Bulbula river and evaporation from and precipitation on the lake surface.

The largest water consumer is the Meki-Ziway Irrigation Scheme. The Scheme is located at 5 km west of Meki Town. The scheme was established in 1989 with an intention to irrigate 3,000 ha, out of which 1,500 ha was to be a state farm and the rest was to be allocated to local farmers. In reality it is disclosed that only 216 ha are cultivated by 332 farm households in Bekele Girisa PA. Nine (9) pumps were installed in the pump station, but oftentimes only one pump was found in operation due to unavailability of spare parts of pumps resulted in malfunction of pumps. Each pump unit has capacity of 720 lit/sec and is operated by the staff employed by the OIDA Central Branch Office. According to the instruction of the JICA Study Team, the OIDA Meki office carried out the periodical monitoring of the operation records of the Scheme in order to assess the water consumption of the Scheme. The details of the study results are presented in Annex II on Hydrology and Water Use in Meki.

#### (2) Inventory Survey of Groundwater Irrigation in Meki

Under Program I, an inventory survey of groundwater irrigation was conducted as a part of the capacity building programs. The inventory survey of groundwater

irrigation was carried out in Dodo Wadere PA and Malima Bori PA in Dugda Bora District, where the groundwater irrigation is predominant type of irrigation. The OIDA Meki office carried out the inventory survey in collaboration with the OADB development agent (DA) assigned for both PAs from 6<sup>th</sup> August 2003 to 15<sup>th</sup> September 2003 according to the following work flow.

- 1) Interview to dug-well owners and pump owners in Dodo Wedere PA
- 2) Survey of dug-well location using GPS in Dodo Wedere PA
- 3) Interview to dug-well owners and pump owners in Malima Bori PA
- 4) Related data collection
- 5) Analyses and report preparation

The details of the study results are presented in Annex II on Hydrology and Water Use in Meki.

### (3) Inventory Survey of Small Pumps in Meki

The Meki study in 2001 identified that 181 units of small pumps were in use for irrigation purposes. Under Program I, the JICA Study Team and the OIDA Meki office continued to jointly conduct the inventory survey of existing small pumps with the involvement of peasant associations (PAs). It was found out that the number of pumps has drastically increased and current number of pumps in use accounted for 462 units. The inventory result should be interpreted directly supporting an idea that OIDA should be more actively involved in at least a continued periodical monitoring of water use by irrigation pumps and volume of water discharge of the Meki river as well as water level of the Ziway lake, since seasonal scarcity of Meki river water discharge has been reported to be resulted in insufficient irrigation water distribution to command areas in downstream communities. An issue of balancing between water use and management is becoming a public mandate of OIDA. The details of the study results are presented in Annex II on Hydrology and Water Use in Meki.

#### 2.5.3 Small-scale Irrigation Facility Planning

As an integral part of participatory community-base approach to irrigation development, on-the-job technical training was provided to the engineering staff of the OIDA Meki office. Main focus of technical training was stressed on how to devise and apply optimum designs suitable to local conditions, especially for required specification of pump sets and on-farm water distribution system. The details are stipulated in Annex IV on WUA Supporting Program in Meki (Program II).

#### 2.5.4 Formulation of Rehabilitation Plan for Existing Schemes

The other field of on-the-job technical training was also provided to the engineering staff of the OIDA Central Branch Office. The main focused areas of engineering aspects were on (i) operational framework and approach of technical planning for rehabilitation project; and (ii) specification of technical designs optimum for existing schemes. The details are stipulated in Annex VI on Rehabilitation of Existing Schemes (Program III).

## CHAPTER 3 ASSESSMENT ON CAPACITY BUILDING PROGRAMS THROUGH THE STUDY

### 3.1 Objectives

At the final stage of the Study, during this period, the JICA Study Team attempted to make a rapid assessment on impacts of capacity building programs upon OIDA organization and staff with the following immediate objectives:

- 1) To grasp general features of impacts of capacity building programs upon OIDA staff individuals as well as work performance of OIDA through their involvement;
- 2) To assess a degree of importance and significance of community-based approach to irrigation development implemented in Meki area, especially to assess a degree of awareness building among OIDA concerning community involvement in planning and importance of social workers;
- 3) To evaluate a degree of importance and significance of systematic approach to rehabilitation of existing schemes that deals with issues concerning categorization of existing schemes, problem analysis approach, scheme information management, roles of social workers, financial aspects of WUA management; and
- 4) To collect any comments and suggestions on capacity building program in general.

For assessment on attainment of these objectives, the questionnaire survey was carried out in accordance with the methodology describe as below.

### 3.2 Questionnaire and Respondents

#### 3.2.1 Methodology of the Questionnaire Survey

The questionnaire survey to OIDA staff was carried out in the following flow.

- |  |   |
|--|---|
| 1) Preparation of questionnaire                  | 24 <sup>th</sup> May to 30 <sup>th</sup> May 2004   |
| 2) Distribution and fulfillment of questionnaire | 31 <sup>st</sup> May to 12 <sup>th</sup> June 2004  |
| 3) Analyses and report preparation               | 14 <sup>th</sup> June to 18 <sup>th</sup> June 2004 |

The questionnaire was prepared and distributed to OIDA offices at the three administrative levels of Headquarters, Central Branch Office and the Wareda offices concerned. A total of 62 questionnaires were distributed, the breakdown of which are 30 copies of questionnaires given to the headquarters, 30 copies to Central Branch Office, 5 copies to OIDA Meki office, 10 copies to OIDA Munessa Wareda office, and 7 copies to OIDA Tiyo Wareda office.

The questionnaire was constructed with seven (7) structures; (i) general questions touching upon personal information of each respondent; (ii) questions related to general impact through the involvement of respondents; (iii) questionnaire related to Program II with an emphasis on an approach of community-based irrigation development in OIDA; and (iv) questionnaire concerned with Program III with a focus on systematic approach to rehabilitation; and (v) self-evaluation of capacity building program for OIDA organization and staff; (vi) comments on future support to OIDA; and (vii) general comments to the JICA Study Team.

### 3.2.2 Results of the Questionnaire Survey

#### (1) Respondents

Out of 62 questionnaires that were distributed, a total of 31 respondents were obtained. Relatively low rate of collection may be understood due to unavailability of OIDA staff who has been heavily engaged in regional-wide water harvesting project. The respondents are broadly categorized as presented below.

**Breakdown of 31 Respondents**

OIDA Office	Managerial	Engineer	Socio-economy
Headquarters	1	3	2
Central Branch Office	1	11	3
Wareda Offices	4	3	3

Out of 31 respondents, four respondents are reported to have not been involved in the JICA Study at all. Out of 27 respondents who were involved in the Study, 13 OIDA staff was fully or often involved in the Study, while 14 staff sometimes or rarely participated in the Study. Descriptions in the subsequent sessions are presented in reference with views of 27 respondents, who are involved in the Study. Hereinafter, all the detailed information is presented in Attachment -3.

#### (2) General Features of Self-assessment by OIDA Staff on Impacts of the Study

Through their self-assessment of impact of the Study by OIDA staff, general features are summarized and presented with the following points.

- 1) Fresh acquisition and appreciation of PCM method in irrigation development and rehabilitation works, especially in the context of strengthening WUA.
- 2) Practical acquisition of knowledge and skills required for community-based irrigation development
- 3) Realization of increase in water discharge through rehabilitation work within a short period
- 4) Building self-confidence of community-based approach in general and



application of irrigation design for standardization.

- 5) Increase in awareness on OIDA task to strengthen WUA both in irrigation development and rehabilitation.

### (3) Impacts of Program II

#### 1) Main findings

The main findings are presented as follows;

- a) An approach of community-based irrigation development is fairly acknowledged among OIDA staff recognizing its importance.
- b) Involvement of farmers from an initial stage of irrigation planning is recognized to be important among respondents.
- c) Roles of social workers in the community approach are evaluated to be important, while improvement of the status of social workers is assessed to be less achieved in the Study.
- d) Applicability of the guideline for establishment of WUA is fairly assessed.

#### 2) Roles of social workers for establishment of WUA

It is evaluated that social workers play highly important roles in awareness creation for farmers and community mobilization. In addition, it is suggested that social workers are also expected to be involved in agriculture extension for sustainable management of WUA.

#### 3) Important issues for sustainable irrigation scheme management

It is found that the following four issues are recognized to be highly important for sustainable management;

- a) Land distribution or allocation
- b) Saving for pump replacement cost
- c) Clear demarcation in responsibilities between OIDA and WUA
- d) Water management techniques

The respondents, who were involved in Program II, recognize that agriculture extension is more important rather than water management. There is a tendency where those who are not directly involved in Program II indicate water management as more important issue for sustainable management. Slight different views among respondents are found to exist.

### 3) Positive and negative impacts of Program II

All the comments are related to positive impact. Their comments are summarized as follows.

- a) Realization of income generation of WUA members
- b) Development of standard approach that may be encouraged to be applied to other donors and NGOs
- c) Recognition of complicated but essential issue of land allocation for establishment of WUA
- d) Building self-confidence of community approach and design based on tangible results at community level

### 4) Main constraints for OIDA to continue Program II

Through their self-assessment, five (5) main constraints are summarized and presented as follows;

- a) Financial constraint for purchase of pump
- b) Financial constraint for hiring professionals
- c) Shortage of skilled human resources
- d) Persistent less attention to social dimension of activities in planning process
- e) Complication of land reallocation

## (4) Impacts of Program III

### 1) Main findings

The main findings are presented as follows;

- a) It is obviously found that the importance of rehabilitation of existing schemes is assessed to be highly important.
- b) With regard to the JICA's problem analysis approach to rehabilitation work, the importance of the approach is fairly acknowledged.

### 2) Important issues identified through the Study

- a) Through the Study, the three issues are highly evaluated to be important for sustainable irrigation scheme management through rehabilitation works. Three issues are;

- Land exchange or reallocation for increase in number of WUA members
- Clarifying demarcation of responsibilities between OIDA and WUA
- Collection of regular water charge

All the respondents who were actually involved in the Study indicated the importance of land exchange or reallocation for maximization of beneficiaries.

- b) Following the above three issues, two issues are also recognized to be important in the context of strengthening WUA. Two issues are;
- Preparation of basic scheme information including scheme layout map, plot map, list for scheme management;
  - Facilitation of social worker for rehabilitation works

### 3) Positive and negative impacts of Program III

All comments are shown as positive impact. Their comments are summarized below.

- a) Realization of increase in water discharge
- b) Experience and realization of efficient rehabilitation work
- c) Strengthening of WUA in terms of (i) increase in a sense of ownership of WUA; (ii) increase in the number of WUA members; (iii) increase in capacity to utilize irrigation water.

### 4) Main constraints for OIDA to continue Program III

Three main constraints are summarized and presented as follows;

- a) Financial constraint to plan and implement rehabilitation work
- b) Improper availability of scheme basic information
- c) Weakness of monitoring work to check function of the scheme on time
- d) Wareda financial scarcity for development agent and extension worker

## 3.3 Self-assessment on Capacity Building

At the end of questionnaire, OIDA staff was asked to give their self-assessment to provide the JICA Study Team with their comments concerning two issues; (i) areas to be strengthened for OIDA future activities; and (ii) areas to require external support to OIDA

(a) Areas in need of strengthening

It is found that three (3) main areas of activities are paid more attention to be strengthened for OIDA in the future.

- 1) Research of irrigation technology
- 2) Community-based irrigation development
- 3) Water harvesting project

In addition to the above main areas, activity of agriculture extension in irrigation scheme is also felt-assessed to be important by those who are directly involved in Program II of the Study.

(b) Areas in need of external support

In parallel with the above question, OIDA staff was also asked to provide the JICA Study Team with prioritized areas where external support is required for OIDA. Respondents provided their views through which three (3) areas are generally in high attention as follows;

- 1) Research of irrigation technology
- 2) Capacity building for OIDA staff
- 3) Community-based irrigation development

Apart from the above three areas, supplementary views are also presented. Those who were involved in Program III placed more emphasis on an area of construction of new irrigation scheme as a view of construction engineer, while those actually involved in Program II presented their views that an area of agriculture extension in irrigation scheme is in need of external support.

## Tables

**Table 1.5.1 List of Construction Equipment of OIDA and Existing Condition (2003)**

No.	Equipment Type	No. of Equipment						Existing Condition				
		Head Office	Central Branch Office	Eastern Branch Office	Western Branch Office	Southern Branch Office	Total	Functional	Minor problem	Major problem	Out of use	Not known
I. Heavy Equipment												
1	Dozer		4	1	2	2	9	4	2	3		
2	Grader		1	2			3	2			1	
3	Loader		1	1	1		3	2		1		
4	Tractor		8	4	1	4	17	2	6	4		5
5	Trailer		3	2		2	7	5	1	1		
6	Dump Truck		14	13	6	7	40	20	6	8	6	
7	Mixer		2				2	2				
8	Welding Machine			2			2	1	1			
9	Compactor			1			1	0	1			
10	Dewatering Pump			4		3	7	6	1			
11	Excavator		1				1	1				
12	Scraper		2				2	1	1			
13	Dumper		1				1	1				
14	Flat bed Truck					1	1	1				
15	Crusher					1	1	1				
16	Backhoe loader					2	2	2				
17	Lowbed		1				1	1				
II. Light Equipment												
1	Pick up	12	10	14	11	5	52					52
2	Station Wagon	6	3	1	3		13					13
3	Motor Cycle	15			2		17					17

Source : OIDA Administration and Finance Service

**Table 2.2.1 Workshop Program on PCM Training**

Date	Main Contents of Program	Staff in Charge
18 August 2003 (Mon.) 09:00 – 09:30 09:30 – 09:35 09:35 – 10:00 10:00 – 10:45 10:45 – 11:00 11:00 – 12:30 12:30 – 14:00 14:00 – 15:30 15:30 – 15:45 15:45 – 17:00 17:00 – 17:30	Registration Opening Remark Self-introduction Orientation of Training Workshop & Administrative Matters Tea/Coffee Break Introduction to Participatory Community-based Development Lunch Break General Introduction of Project Cycle Management Tea/Coffee Break Participation Analysis and Problem Analysis Orientation to group exercise	Mr. Ninomiya and Mr. Kawai With Obbo Berhanu
19 August 2003 (Tue.) 08:30 – 17:30 (12:30 – 14:00 Lunch)	Group exercises for a) Basic Information; b) Participation Analysis c) Problem Analysis	
20 August 2003 (Wed.)	Presentation of Group Works and discussion Orientation for Field Exercise	
21 August 2003 (Thu.) 08:30 – 10:15 10:15 – 10:45 10:45 – 12:00 12:00 – 13:30 13:30 – 14:00 14:00 – 17:00 17:00 – 17:30	Move from Adama to Meki Arrangement of Accommodation and others Group preparation for Field Exercise Lunch Break Move from Meki to Shubi-Sombo area Session of Problem Identification and Analysis Move from Shubi-Sombo area to Meki Night in Meki	Obbo Berhanu, Obbo Andarge, Obbo Admasu With Mr. Ninomiya and Mr. Kawai
22 August 2003 (Fri.) 08:00 – 08:30 08:30 – 12:30 12:30 – 13:00 13:00 – 14:30 14:30 – 17:00 17:00 – 17:30	Move from Meki to Shubi-Sombo Session of Problem Analysis Tree Construction Move from Shubi-Sombo to Meki Lunch Break Presentation and discussion Closing	

**Table 2.2.2 List of Participants for Group Exercise on PCM Workshop**

**Group A**

Associate Resource Staff : Obbo Birhanu Hirpo Economist, Headquarters

No.	Name	Organization	Position
①	Mengistu Bose	Dugda Bora Wareda	Head/Agriculture Engineer
2	Zewudu Kasa	Central Branch	Rural Development Expert
3	Abebe Tadesse	Central Branch	Agriculturalist
4	Seyoam Haile	Tiyo Wareda	Expert
5	Deme Debela	Munessa Wareda	DA
6	Edae Hunde	Munessa Wareda	DA
7	Reta Mekonnen	Tiyo Wareda	DA

**Group B**

Associate Resource Staff : Obbo Andarge Senbeta Economist, Central Branch

No.	Name	Organization	Position
①	Dilbi Sheh Ali	Central Branch	Sociologist
2	Mesele Kasa	Central Branch	Construction Engineer
3	Bonsa Bekele	Munessa Wareda	Head/Agriculture Engineer
4	Ahamed Abudulahi	Dugda Bora Wareda	Expert
5	Misiganu Hidata	Munessa Wareda	DA
6	Gaddisa Urge	Tiyo Wareda	DA
7	Deressa Tafa	Dugda Bora Wareda	DA

**Group C**

Associate Resource Staff : Obbo Admasu Dabale Sociologist, Arsi Zone Head

No.	Name	Organization	Position
①	Arega Hordofa	Central Branch	Economist
2	Elias Wondimu	Central Branch	Construction Engineer
3	Teshome Mammo	Tiyo Wareda	Expert
4	Gaddiso Muno	Munessa Wareda	Expert
5	Gezahegn Teseme	Munessa Wareda	DA
6	Dadiyo Lenjiso	Dugda Bora Wareda	DA

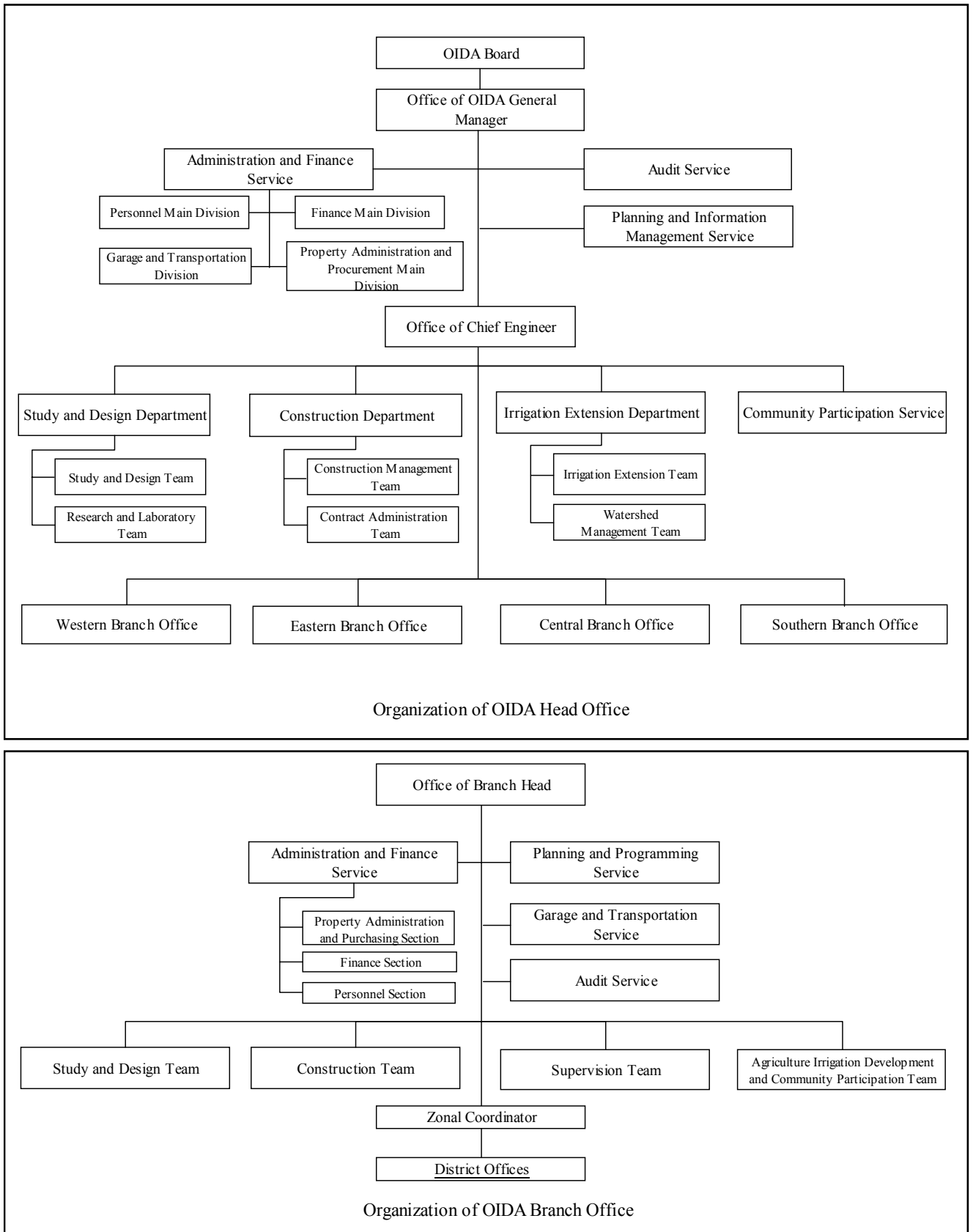
○ : The person to be assigned as a group leader



**Table 2.2.3 List of Participants : Training Workshop in PCM-Problem Analysis**

	Name	Sex	Age	Position	Place of Work	Profession	Education	Work Exp.
1	Teshoma Mammo	M	45	Expert	Tiyo Wareda	General Agriculture	Certifictate	8
2	Gadissa Ourge	M	24	IDA	Tiyo Wareda	General Agriculture	Diploma	3
3	Seyoum Haile	M	45	Expert	Tiyo Wareda	Agronomist	Diploma	4
4	Reta Mekkonnen	M	23	IDA	Tiyo Wareda	General Agriculture	Diploma	4
5	Mengistu Bosie	M	30	Head	Dugda Bora Wareda	Agricultural Engineer	BSc	4
6	Ahmed Abdulahi	M	30	Expert	Dugda Bora Wareda	Agricultural Extension	Degree	3
7	Deresu Tafa	M	23	IDA	Dugda Bora Wareda	General Agriculture	Diploma	3
8	Dediyo Lenjiso	M	38	IDA	Dugda Bora Wareda	N.A.	Certifictate	7
9	Bonsa Bekele	M	27	Head	Munesa Wareda	Irrigation Engineer	Advanced Diploma	2
10	Gadissa Munro	M	31	Expert	Munesa Wareda	General Agriculture	Diploma	0.2
11	Deme Debela	M	23	IDA	Munesa Wareda	N.A.	Diploma	4
12	Misigana Hidata	M	26	IDA	Munesa Wareda	General Agriculture	Diploma	3
13	Gezahegn Tesema	M	24	IDA	Munesa Wareda	General Agriculture	Diploma	4
14	Edea Hunde	M	27	IDA	Munesa Wareda	Irrigation Engineer	Diploma	3
15	Mesele Kassa	M	35	Expert	Central Branch	Consutruction Engineer	Diploma	15
16	Arega Hordofa	M	40	Senior Economist	Central Branch	Economist	M.A.	4
17	Dilbi Sheh Ali	M	49	Expert	Central Branch	Sociologist	BSc	8
18	Abebe Tadesse	M	29	Social Worker	Central Branch	General Agriculture	Diploma	3
19	Elias Wendimu	M	45	Construction Engineer	Central Branch	Agricultural Engineer	Diploma	23
20	Zewdu Kassa	M	36	Expert	Central Branch	Rural Economy and SD	Diploma	16

## Figures



**Figure 1.2.1 Organization Chart of OIDA Head Office and Branch Office (2004)**

Attachment - 1

## Training Material for PCM Workshop

# TRAINING WORKSHOP

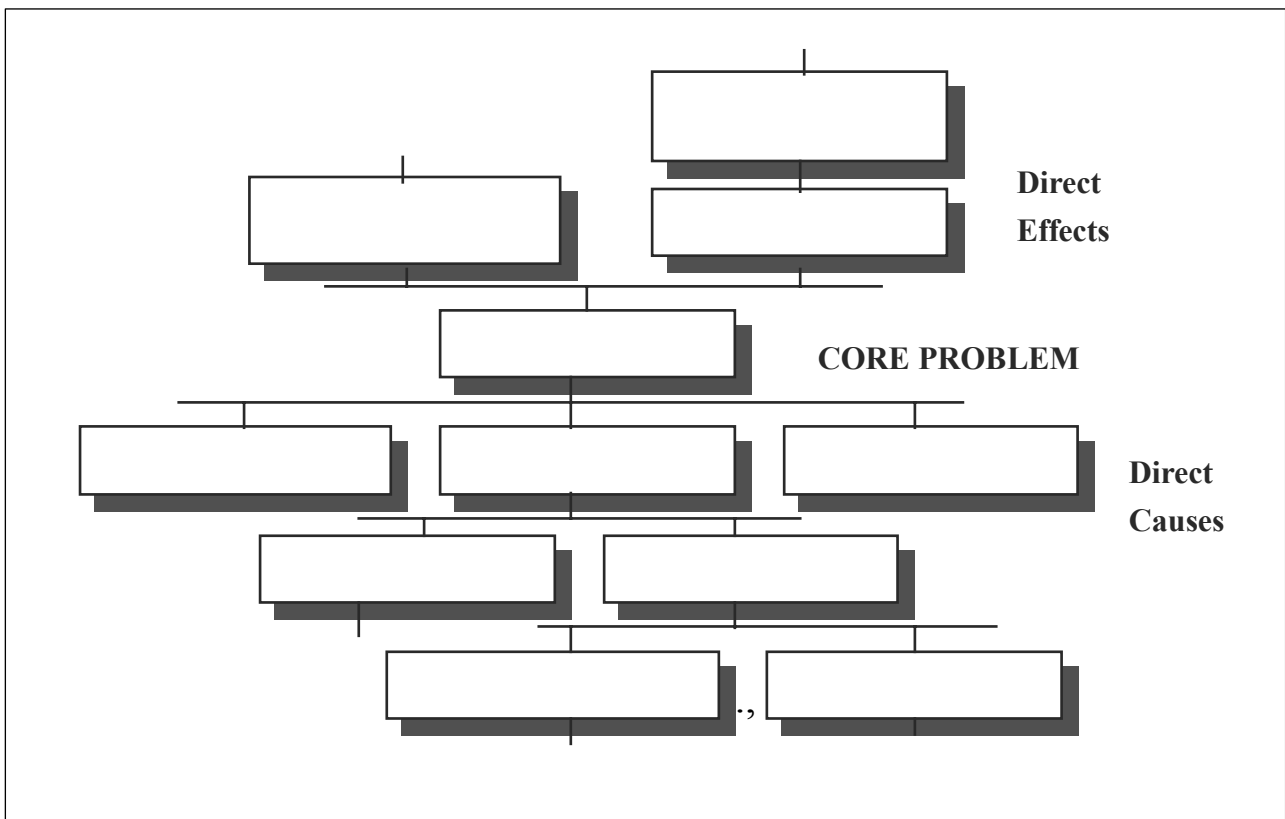
## ON

# PROJECT CYCLE MANAGEMENT

## (PCM)

~ Problem Analysis ~

### TRAINING MATERIAL



THE STUDY ON CAPACITY BUILDING PROGRAMS  
FOR COMMUNITY-BASED IRRIGATION DEVELOPMENT  
IN CENTRAL OROMIA REGION OF ETHIOPIA

NIPPON KOEI Co., LTD

# **WORKSHOP PROGRAMME**

JICA Study Team for the Study on Capacity Building Programs  
for Community-based Irrigation Development in Central Oromia Region, Ethiopia

**Training Workshop on Project Cycle Management (PCM) – Problem Analysis**  
**18 – 22 August 2003**  
**Adama and Meki**

**Workshop Programme**

**Introduction**

Since the beginning of 1990s, an issue of sustainability has been lying in a central concern for development project or programme. In other words development planners, sector engineers as well as development field workers face challenging tasks and duties in order to incorporate the issue of sustainability into an entire activity of planning, implementing and monitoring and evaluating innovative programme or project. Irrigation development programme or project is not exceptional.

Within a policy framework of irrigation development in Oromia Regional State, community-based irrigation planning and management becomes the principal modality of planning, implementation and monitoring and evaluation of irrigation schemes under Oromia Irrigation Development Authority (OIDA) in order to ensure project sustainability. In this context, central among pre-requisites for any innovative programme or project is the presence of a social unit capable of sustaining such programme. At present, with regard to operation and management, water users association (WUA) is responsible for operation and management of irrigation scheme under its given autonomous status, while OIDA is responsible for monitoring and provision of necessary advise to WUA. Hence, managerial capacity of WUA become one of determinant factors to ensure sustained operation and management of irrigation schemes in order to attain socio-economic goals of food security as well as surplus agricultural productions.

Despite the above policy emphasis, however, current performance of operation and management indicates less achievement than planned. In reference with the database formulated during JICA's Meki Study, the general features of the OIDA schemes' performance can be spelled out as follows;

- a) Actual irrigated area amounted to 58 % out of 9,644 ha of the planned area;
- b) Actual beneficiaries accounted for 58 % out of 26,984 households as planned;
- c) Water shortage problems were recognized in about 40 % of the schemes;
- d) WUA has not yet been established in 30 % of the schemes.
- e) Engineering information including design documents and drawings is not sufficiently available in over 50 % of the schemes.

Together with other factors, it can be said in general that irrigation performance in Oromia has not yet reach a stage where irrigation schemes are sufficiently managed by user community This requires more intervention of OIDA for improvement of the performance. In so doing, capacity building among OIDA staff is one of critical issues in order to systematically response to and meet such needs. In other words, planners, engineers as well as social workers of OIDA are required to equip themselves with systematic approaches and methods to improvement of performance of irrigation schemes.

Cognizant of this, OIDA is now organizing, in assistance with Japan International Cooperation Agency (JICA), a training workshop on Project Cycle Management (PCM) with an focus on its Problem Analysis, that is formulated as one of systematic planning and management tools, in order to meet needs of capacity building among its staff members in Central Branch.

## **Objectives**

The training workshop on PCM-Problem Analysis will be conducted with the three following objectives;

- i) To expose trainees on one of systematic planning tools known as Project Cycle Management(PCM) with a specific focus on problem analysis method;
- ii) To equip trainees with PCM problem analysis method through classroom exercise as well as field exercise; and,
- iii) To provide a forum to exchange experiences and views of training participants

## **Targets of Training Workshop**

The training workshop is intended for the following strategic targets for the Study Project entitled “the Study for Capacity Building Programs for Community-based Irrigation Development in Central Oromia Region of Ethiopia”.

- 1) OIDA Wareda Heads of Tiyo, Munesa and Dugda Bora
- 2) OIDA Wareda Experts of Tiyo, Munesa and Dugda Bora
- 3) OIDA Development Agents (DAs)
- 4) Other staff of OIDA Central Branch

In total, 20 participants are expected to participate in the training workshop.

**Duration**                    5 days from 18 – 22 August 2003

**Venue**                        Palace Hotel in Adama and Bakele Molla Hotel in Meki

## **Outline of Workshop Programme**

The training workshop has two components; (i) Programme I that touches upon general introduction of PCM-Problem Analysis through classroom exercises; and Programme II which is considered as field testing through actual field exercises that takes place in three actual WUAs in Shubi-Sombo area in Dugda Bora Wareda.

### Programme 1: General

- |        |  |
|--------|--|
| Day 1: | Orientation and Lecture                        |
| Day 2: | Classroom Exercise through Group Work          |
| Day 3: | Presentation of Group Results with Discussions |

### Programme 2: Specific to Shubi-Sombo area

- |        |                                      |
|--------|--------------------------------------|
| Day 4: | Move from Adama to Meki and PRA      |
| Day 5: | PRA and Presentation and Discussions |

## **Resource Persons and Associate Resource Staff**

### Resource Persons

Masanobu Ninomiya, Community Development and Organization, JICA Study Team  
Akira Kawai, Irrigation Engineer, JICA Study Team

### Associate Resource Staff

Obbo Berhanu Hirpo Economist, OIDA Headquarters  
Obbo Andarge Senbete, Economist, OIDA Central Branch)  
Obbo Admasu Dabale, Arsi Zone Head.

## **Expected Use of Outcomes**

- 1) General Use:            Application of Method to Irrigation Rehabilitation
- 2) Immediate Use:        Rehabilitation works in Kater, Sadi Sadi & Lafa and Gedamsso schemes



**Workshop Schedule (Tentative):**

Date	Main Contents of Programme	Staff in Charge
18 August 2003 (Mon.) 09:00 – 09:30 09:30 – 09:35 09:35 – 10:00 10:00 – 10:45 10:45 – 11:00 11:00 – 12:30 12:30 – 14:00 14:00 – 15:30 15:30 – 15:45 15:45 – 17:00 17:00 – 17:30	Registration Opening Remark Self-introduction Orientation of Training Workshop & Administrative Matters Tea/Coffee Break Introduction to Participatory Community-based Development Lunch Break General Introduction of Project Cycle Management Tea/Coffee Break Participation Analysis and Problem Analysis Orientation to group exercise	Mr. Kawai and Mr. Ninomiya With Obbo Berhanu
19 August 2003 (Tue.) 08:30 – 17:30 (12:30 – 14:00 Lunch)	Group exercises for a) Basic Information; b) Participation Analysis c) Problem Analysis	
20 August 2003 (Wed.)	Presentation of Group Works and discussion Orientation for Field Exercise	
21 August 2003 (Thu.) 08:30 – 10:15 10:15 – 10:45 10:45 – 12:00 12:00 – 13:30 13:30 – 14:00 14:00 – 17:00 17:00 – 17:30	Move from Adama to Meki Arrangement of Accommodation and others Group preparation for Field Exercise Lunch Break Move from Meki to Shubi-Sombo area Session of Problem Identification and Analysis Move from Shubi-Sombo area to Meki Night in Meki	Obbo Berhanu, Obbo Andarge, Obbo Admasu With Mr. Kawai and Mr. Ninomiya
22 August 2003 (Fri.) 08:00 – 08:30 08:30 – 12:30 12:30 – 13:00 13:00 – 14:30 14:30 – 17:00 17:00 – 17:30	Move from Meki to Shubi-Sombo Session of Problem Analysis Tree Construction Move from Shubi-Sombo to Meki Lunch Break Presentation and discussion Closing	

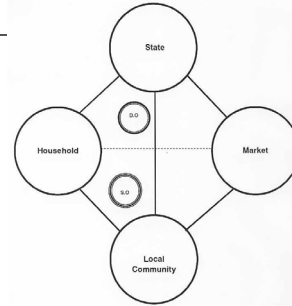
# **LECTURE NOTE**

**ACTIVITIES, RESOURCE ASPECTS and ELEMENTS OF HOUSEHOLD**

	Physical Aspect	Human Aspect	Monetary Aspect
<b>Production Activities</b>	Facilities/assets for production such as farm land, water, irrigation, etc	Labour force among members of household which may be utilized for production purposes	Products and production capitals in cash or kind
<b>Daily Life (Consumption) Activities</b>	Facilities for life such as housing, water supply, and the like	Household members who live together, form systems of collective actions and welfare and share the income	Consumption for welfare, education and the like
<b>Management Activities</b>	Rights of use, allocation and disposal of facilities for livelihood and production activities	Rights of assignment, i.e., to determine roles of each household members and the right to represent household	Rights of disposal and distribution, i.e., to determine levels to production and welfare through disposal and distribution of income/consumption and production capital

Source: United Nations Centre for Regional Development, ed. Toshiko Yogo and John F. Jones, New Training Design for Local Social Development, 1994, Japan

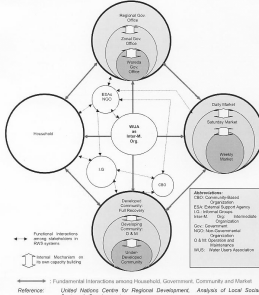
**Conceptual Diagram of Local Social System in Development**



D.D.: Development Organization  
S.O.: Social Organization

Source: United Nations Centre for Regional Development, Analysis of Local Social Systems in Development

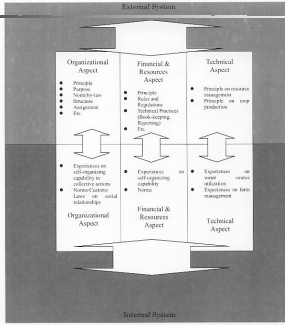
**Conceptual Diagram of Water Users Associations within Local Social Systems in Development - Illustration on Interactions -**



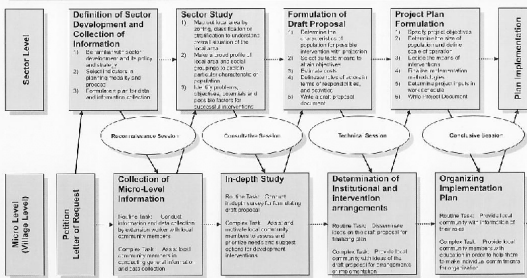
Reference: United Nations Centre for Regional Development, Analysis of Local Social Systems in Development, Planning Strategies for Rural Water Supply and Sanitation Development Project, 1994, Addis Ababa, Ministry of Water Resources, Ethiopia  
Source: World Bank Field Study, 1993, in three training centers in Local Social Development

Figure 10, Nairobi, Tanzania

**Three Basic Fields of Interaction in Intermediate Organization in Sub-sectors of water supply and irrigation**



**Selected Planning Process between Sector and Micro Levels**



Reference: United Nations Centre for Regional Development, Analysis of Local Social Systems in Development, Planning Strategies for Rural Water Supply and Sanitation Development Project, 1994, Addis Ababa, Ministry of Water Resources, Ethiopia  
Source: World Bank Field Study, 1993, in three training centers in Local Social Development

**CASE MATERIAL FOR  
PROBLEM ANALYSIS EXERCISE**

## *Case Material for Problem Analysis Exercise*

### **Introduction**

Obbo Kumssa Asfaw has been assigned by Oromia Irrigation Development Authority (OIDA) as development agent for several small-scale irrigation schemes located in Gemacho wareda since 1990 E.C. As of the month of Ginbot, 1995 E.C., five years have already passed since assignment, and then, Obbo Kumssa becomes very much familiar with all the schemes as well as local people and members of the respective water users associations. Obbo Kumssa Asfaw is currently challenging daily tasks with great interests in order to attain a significant degree of sustained management of the respective irrigation schemes.

One day in the month of Ginbot, Obbo Kumssa was called by Obbo Name, Head of OIDA Gemacho Wareda office, to attend an internal meeting. In the meeting, Obbo Kumssa was told about his new specific assignment to suggest a plan of actions for one existing scheme named Gindano scheme that is located in Bulbula Peasant Association. According to Obbo Name, a regular monthly meeting of Gemacho Wareda, in which OIDA Wareda office has a duty to attend as an integral part of development administration, reached a consensus that irrigation performance of Gindano scheme should be improved in order to attain area food security, and intervention by OIDA wareda office was recognized as one of urgent issues in Gemacho wareda. In this meeting, representatives from Cooperative Promotion Desk and Agricultural Desk also attended as usual.

Immediately after he got this specific assignment, Obbo Kumssa started organizing himself to prepare a proposal on the plan of actions for Gidano scheme. He reviewed all the available documents and records concerning Gidano scheme and conducted field visits to Gindano scheme two times in order to collect first-hand information of the scheme for understating existing issues to be tackled as well as articulating goal and objectives for improvement of irrigation performance of Gidano scheme.

### **Outline of Report on Main Findings on Gidano Scheme**

After the completion of document reviews as well as field works in the site, Obbo Kumssa began to prepare his report to be submitted to Obbo Name. His report, that consists mainly of two components; namely (i) findings and (ii) analysis for recommendations, provides a basis for further preparation of official report by Obbo Name to be submitted to the monthly Wareda meeting which is normally held on the date of 15 every month.

By the date of 1 Sene 1995 Obbo Kumssa has completed writing the first part of his report concerning main findings on the scheme, and he is now about to start writing the second part of his report on analysis for recommendation.

The outline of his findings is presented in the subsequence section.

Outline of Main Findings on Gidano Scheme by Obbo Kumssa Asfaw

**Report Title:** Main Findings on Gidano Scheme  
**Date of Report:** 1 Sene 1995 E.C.  
**Name of Reporter:** Obbo Kumssa Asfaw, DA for OIDA Gemacho Wareda Office

**Information Collection Methods taken:**

- (1) Review of Documents including (i) feasibility study report; (ii) project construction completion report; and (iii) Field findings entitled "Preliminary impact assessment of Gidano Scheme by IIDF (International Irrigation Development Fund).
- (2) Field Visits on 7 and 21 Ginbot 1995 E.C. through participatory rural appraisal methods including historical timeline, sketch mapping of the scheme, focus group discussions on WUA executive members as well as users groups by using semi-structured questionnaire, and field observation on the scheme.

**Main Field Findings:**

- (1) Historical timeline of Gidano Scheme

<u>Year</u>	<u>Events</u>
1969 E.C.	Creation of Bulbula Peasant Association <ul style="list-style-type: none"> <li>• Farm lands were reallocated to local households through newly formed Bulbula Peasant Association.</li> <li>• Due to the lifestyle of local people being as semi-pastoralist, some of households eventually held more than 12 ha, although the first re-distribution of land restricted size of land per household between 0.25 and 1 ha.</li> </ul>
1976 and 1977 E.C.	Drought led local community to famine. <ul style="list-style-type: none"> <li>• Two consecutive years of drought attacked area.</li> <li>• 99 % of area population sought food distribution.</li> <li>• 78 % of children under five years old were identified with malnutrition.</li> <li>• 287 people, out of 1,212 population, have died of starvation.</li> <li>• 72 % of livestock were lost by either death or sales in market at the cheapest price.</li> </ul> Government sent a team of experts to the area Government dispatched a team of experts and recognized an opportunity to use Gidano river for irrigation.
Ginbot 1980 E.C.	Assembly of Komayu safar elders in Bulbula PA Elders of Komayu safar in Bulbula Peasant Association assembled to discuss tragedy of local famine. Those

	<p>local people of Komayu safar were semi-pastoralists, their livestock of whom depends upon animal husbandry and cattle breeding. In this meeting, elders suggested that they should take serious consideration on suggestion made by government experts on irrigation. It implied that they somehow decided to change their livelihood patterns from semi-pastoral to sedentary agriculture.</p> <p>Submission of Petition to Wareda Office                  At the result from their assembly, Komayu elders consulted with Executive committee members of Bulbula Peasant associations and reached consensus to prepare their petition addressed to Wareda office for their developmental intervention. This petition included their suggestion in which Gidano river could be sought to be used for developmental work like irrigation.</p>
Ginbot 1983 E.C.	Downfall of Derg regime
1983 – 1987 E.C.	<p>Transitional form of government administration:                  At the end, Water, Mines and Energies Resource Development Office at the Federal as well as Regional and Zone levels were established.</p>
1985 E.C.	<p>Feasibility Study:                  BSTJ Zone Department Office of Water, Mines and Energies Resource Development sent a team of expert to conduct a feasibility study on irrigation development in Bulbula Peasant Association.</p> <p>In-depth Study:                  BSTJ Zone department office sent the second team of experts including surveyors to conduct detailed study on irrigation development in Bulbula Peasant Association. The team did not include either sociologist or economist for detailed survey.</p> <p>Submission of a Proposal:                  BSTJ Zone department office prepared a proposal on irrigation development in Bulbula Peasant Association for appraisal at the regional level.</p>
1986 E.C.	<p>Small-scale Irrigation Development Plan through IIDF                  Regional Bureau of Water, Mines and Energy Resource Development was consulted by International Irrigation Development Fund (IIDF) for formulating regional small-scale irrigation development plans.</p> <p>Pledge made by IIDF:                  IIDF made pledges to disburse their fund for small-scale irrigation development in Oromia region based on appraisal of project proposals submitted to regional bureau.</p> <p>Construction started:                  Regional Bureau in collaboration with BSTJ zone office sent a construction team to develop irrigation scheme</p>

	for Bulbula Peasant Association.
1986 – 1990 E.C.	<p>Construction works:</p> <ul style="list-style-type: none"> <li>• 200 local people of Bulbula Peasant Association were registered to provide voluntary-labour contributions towards construction works for the year from 1987 to 1988 E.C.. However, around 40 local people on an average attended daily construction works, and at the end of 1988 E.C. number of local people decreased at the daily rate of 12 people on average.</li> <li>• Since 1988 E.C., 150 daily labours were hired including local people at the daily rate of Birr 4.5 per day per capita. In addition to 150 daily labours, 30 women were also employed on a task basis at the rate of Birr 4.5 per m<sup>3</sup> of excavation or filling. During construction period, 20 masons were also employed on task basis at the daily rate of Birr 16 to 20 per day.</li> <li>• In Sene 1990 E.C., construction work was completed.</li> </ul> <p>Establishment of WUA:</p> <ul style="list-style-type: none"> <li>• BSTJ zone office dispatch a community participation worker in order to form Water Users Association (WUA) for Gidano scheme and elected executive committees in Sene 1995 E.C. He stayed for Gindano Scheme for 3 days for the establishment of WUA.</li> <li>• In accordance with physical structure as well as settlement patterns of local people, two separate WUAs were eventually established; namely, (i) Ginano I WUA; and, (ii) Gidano II WUA.</li> <li>• The Community Participation Worker provided two WUAs with brief orientation on duties and responsibilities on executive members, but no training in water distribution management, financial management, land use management or other fields of management required for irrigation management were provided due to non availability of field guides or manuals.</li> <li>• Due to non availability of official handing over sheet, the scheme was not officially handed over to the respective WUAs, resulting in no official document on handing over.</li> </ul>
1990 – 1993 E.C.	<p>WUA members actually engaged in irrigation farming:</p> <ul style="list-style-type: none"> <li>• As of 1990 E.C., only around 70 households were engaged in irrigation farming, while the rest of around 250 households were not involved.</li> <li>• In 1991 E.C., a few peasants who had experiences in irrigation farming came to Gidano Scheme to be engaged in irrigation farming with some households in Gidano scheme on share crop basis. They obtained slightly better harvests of maize through irrigation farming than rainfed agriculture.</li> </ul>



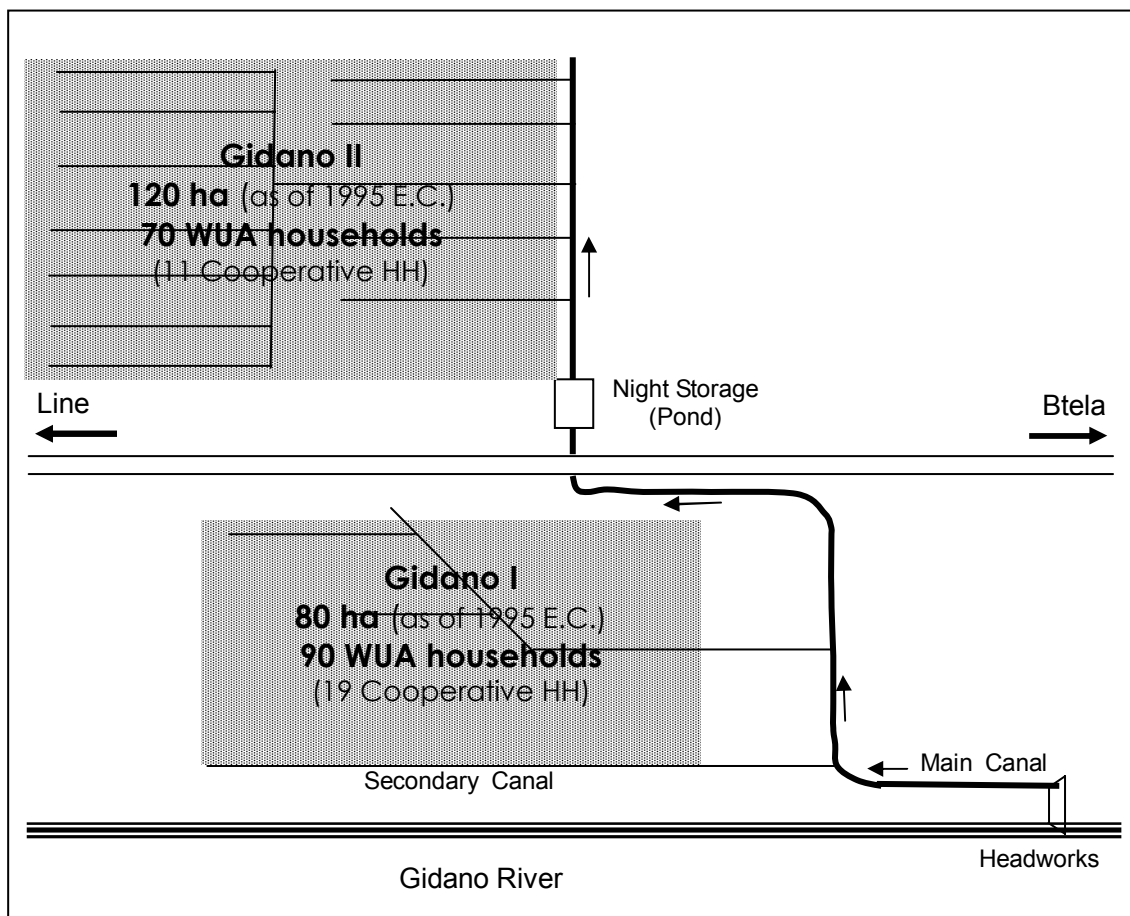
	<ul style="list-style-type: none"> <li>• Influenced by better outcomes from share cropping, number of households actually engaged in irrigation farming increased from around 70 to 120.</li> </ul> <p>No re-allocation or exchange of land for irrigation:</p> <ul style="list-style-type: none"> <li>• After the completion of construction, no land re-allocation or exchange had been conducted except a few cases in which land exchange were made within family members.</li> </ul> <p>Canal operation and maintenance:</p> <ul style="list-style-type: none"> <li>• For the first year after the completion of construction, some 60 member-households from 2 WUAs conducted clearance work on main canal.</li> <li>• Despite the above, clearance of main canals had been conducted once a year in dry season by 20 to 30 member households from two WUAs. But most of 20 to 30 households belonged to upper-stream safar (hamlet) of Gidano I WUA.</li> </ul> <p>Irrigation farming performance:</p> <ul style="list-style-type: none"> <li>• During this period since 1991 E.C., three cropping seasons were observed</li> <li>• For the first year, cereal, mainly maize, was grown. But its production were not well due to lack of farming experiences and skills of local people, many of whom shifted their livelihood style from semi-pastoralist to sedentary agriculturalist.</li> <li>• For the second year, described as above, there were involvement of experienced peasants who came from other area in order to conduct irrigation farming on share-crop basis. They cultivated command area to produce maize with better harvests.</li> <li>• In the third year in 1993 E.C., around 120 households were engaged in irrigation farming to produce maize as well as onion. Their performance indicated slightly better than rainfed farming.</li> </ul> <p>Conflicts between two WUAs</p> <ul style="list-style-type: none"> <li>• Since 1992 E.C., sporadic but constant disputes were raised between Gidano I WUA, upper-stream WUA, and Gindano II WUA, low-stream WUA on distribution of waters. However, no internal rules have been made to regulate distribution of water for irrigation.</li> </ul>
1994 E.C.	<p>Conduct of Preliminary Impact Assessment by IIDF:</p> <ul style="list-style-type: none"> <li>• Three main outcomes from Gidano Scheme are assessed; (i) better situation of household food security among those who are engaged in irrigation farming; (ii) easier access to water for drinking from canals than traditional source of river; and (iii) increase in workloads of both men and women during dry season.</li> <li>• Six main problems felt by those who are engaged in irrigation farming; (i) difficulties in acquiring seeds like</li> </ul>

	<p>onion; (ii) difficulties in securing financial resources to purchase farm inputs at the beginning of irrigation due to an absence of short-term credit; (iii) lack of skills in irrigation farming; (iv) difficulties in maintaining canals; (v) increase in malaria; and (vi) scarcity of grazing land for cattle feeding.</p> <p>Intervention of Wareda Cooperative Promotion Office</p> <ul style="list-style-type: none"> <li>• Based on outcomes from the IIDF's assessment report, a promotional campaign on cooperative was conducted in collaboration with OIDA wareda office</li> <li>• 30 households were identified as interests group</li> </ul>
Sene 1994 E.C.	Establishment of Gidano Water Users Cooperative by 30 household members
Hamle 1994 E.C.	<p>Re-organization of Gidano Water Users Association</p> <ul style="list-style-type: none"> <li>• Two water users associations of Ginano I and II were disorganized.</li> <li>• One Gidano Water User Cooperative is emerged amalgamating the previous two WUAs. All the executive committee members are elected from those households who are registered as cooperative member households.</li> </ul> <p>Repair of canal</p> <ul style="list-style-type: none"> <li>• A part of main canal located in the previously called Gidano I was damaged due to land sink. 30 WUA members registered as cooperative members made individual contributions in cash towards the repair. Cement was procured, stones were collected and mason work was done. The repair of damaged part is still uncompleted.</li> </ul>
Nehasse 1994 – Magabit 1995 E.C.	<p>IIDF rehabilitation programme assessment</p> <ul style="list-style-type: none"> <li>• IIDF made an assessment for rehabilitation in division boxes in Gidano II.</li> <li>• For this an technical idea was explained to local users by OIDA experts, together with an request to users to contribute an amount of around Birr 400 towards the work.</li> <li>• WUA members, however, failed to collect this money from around 65 households.</li> <li>• IIDF postponed their rehabilitation programme due to low participation of WUA members in rehabilitation work.</li> </ul> <p>Separation of Gidano WUA</p> <ul style="list-style-type: none"> <li>• Internal conflicts of interests between those 30 WUA members registered as cooperative and the rest of around 130 WUA members have been sharpened.</li> </ul> <p>Preparation of Database of WUA members</p> <ul style="list-style-type: none"> <li>• Obbo Kumssa Asfaw had prepared a database of WUA members in his routine work.</li> </ul>

	<ul style="list-style-type: none"> <li>In the database, the following information was collected: (i) Name of WUA member-household head; (ii) Size of household by sex; (iii) Size of plot for irrigation farming; (iv) Total size of land holding; (v) Type of main crops produced in irrigation farming</li> </ul> <p>Shortfall of rain in 1994 E.C.</p> <ul style="list-style-type: none"> <li>Food security became an urgent issue in Gemacho wareda.</li> </ul>
<p>Ginbot 1995 E.C.</p>	<p>Gemacho Wareda Meeting</p> <p>Field works by Obbo Kumssa Asfaw were undertaken.</p>

(2) Sketch mapping of scheme layout

Layout of Gidano Irrigation Scheme



Description on main features of Gidano Scheme:

- a) Source of water: Gidano River
- b) Command Area: Gidano I: 80 ha  
Gidano II: 120 ha
- c) Pond Capacity: 5,400 m<sup>3</sup>
- d) Discharge Rate of Canal: 185 litre/sec
- e) Discharge Rate of Pond: 105 litre/sec
- f) Structures: Main canal : 4.7 km in sub-total  
Lined canal 1.0 km (Gidano I, from headworks)

Unlined canal	1.5 km (Gidano I, to pond)
Unlined canal	2.2 km (Gidano II)
Secondary canal:	<u>6.1 km in sub-total</u>
	1.2 km (Gidano I)
	4.9 km (Gidano II)
Tertiary canal:	<u>13.2 km in sub-total</u>
	6.0 km (Gidano I)
	7.2 km (Gidano II)
Drainage canal:	<u>16.38 km in sub-total</u>
	7.2 km (Gidano I)
	9.18 km (Gidano II)
<u>Total Lengths of canals:</u>	<u>40.38 km</u>
Division Box:	18
Other structures (Drop, Culvert etc.)	

g) WUA member-households:

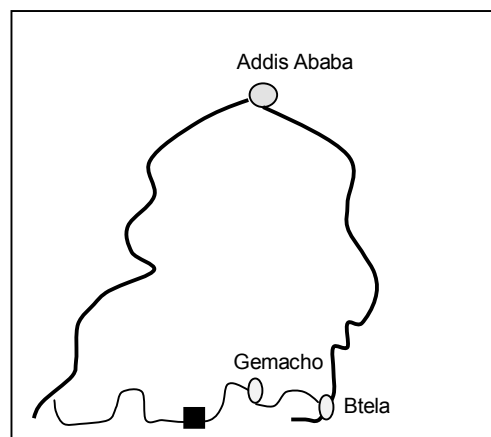
Total number:	160 households as of Ginbot 1995 E.C.
Registered HH as Cooperative:	<u>30 households in sub-total</u>
	11 HH (Gidano I)
	19 HH (Gidano II)
Non Cooperative HH:	<u>130 households in sub-total</u>
	71 HH (Gidano I)
	59 HH (Gidano II)

h) Main crops in irrigated farming

- (1) Carrot
- (2) Potato
- (3) Chilly
- (4) Maize
- (5) Papaya

i) Main crops in rainfed farming

- (1) Maize
- (2) Wheat
- (3) Teff
- (4) Sorghum
- (5) Chick pea



j) Location distance to market places

(1) Dodoma Saturday Market:	9 km
(2) Gemacho Saturday Market:	32 km (Wareda capital)
(3) Btela	64 km (Zone capital)
(4) Addis Ababa	227 km

k) Agro climatic zones in command area as well as Bulbula Peasant Association

- (1) Wayna-daga: ranging from 1,500 to 1,700 m a.s.l
- (2) Kolla: ranging from 1,200 to 1,500 m a.s.l

l) Administrative Location of Gidano scheme

Region:	Oromia Regional State
Zone:	BSTJ Zone
Wareda:	Gemacho Wareda
PA:	Bulbula Peasant Association

m) Demographic information of Bulbula Peasant Association

Total Household Number: approximately 982 and around  
Male Headed household registered: 372 HH  
Female headed household registered: 10 HH  
Landless households: around 600 HH

(3) Findings from Focus Group Meetings – findings apart from historical timeline

3-1) Water User Fee/Charge

- No regular water user fee or charge existed.
- Cash contributions are collected when necessary arises.
- Since the initial stage of the project, no discussions have been made on the issue of water user fee/charge.
- Both 30 cooperative WUA members and non-cooperative members are not familiar with a concept of water user fee, because most of them think water may be free of charge since gravity flow from Gidano river.

3-2) No official document of handing over

- No file exists to keep an official document of handing over.
- 30 cooperative WUA members as well as the previous two WUA executive members of Gidano I and II do not know the presence of handing over documents and even they do not remember whether or not such handing over process took place before.

3-3) Unawareness of the initial plan

- Non of WUA members know any basic information of the initial project plan.
- They do not know targeted command areas of both Gindano I and II in hectare.
- They are not aware of the presence of any norms on how to regulate water distribution or allocate land per household for irrigation farming.

3-4) Incompletion of bylaw

- Gidano water user cooperative has its internal rules and regulations on penalty issues related to failure of attendance of meeting, damage of canal by member's own livestock, etc.
- Despite the above, no bylaw seems to be produced stating (i) Title of the scheme or project; (ii) Location Information; (iii) Operating boundary of the scheme; (iv) basic description of irrigation scheme (v) general purpose, objectives and duties of WUA; (vi) Eligibility of membership to WUA; (vii) Rights and Obligations of WUA members; (viii) General Assembly and its Authority and Responsibility (ix) Executive committee of WUA and its authority and responsibility; (x) Authority and duties and responsibilities of executive members; (xi) Land holding and distribution for irrigation farming; (xii) Amendment of bylaw; (xiii) internal regulations, and (xiv) general; (xv) effective date.

### 3-5) Unequal allocation and distribution of land to WUA member households

- In relation with no existing bylaw, there is no common norm among WUA members to regulate size of land holding by individual households.
- As result, the largest size of land holding by WUA member is 7 ha, while the smallest size of land holding is 0.13 ha.
- A few members know about a new proclamation of Oromia region stating restriction of land holding for irrigation through public intervention.
- Through interviews with larger holders, it is found that they are reluctant to conduct land exchange with small holders or rainfed farm households, some of whom are potential households for WUA. Extreme expressions made by large holder are that they do not want any piece of lands where monkey inhabits.

### 3-6) Constant conflicts of interests on water distribution

- It is expressed by some of WUA members from both cooperative and non-cooperative that constant conflicts of interests on water distribution have been existing between upper-stream community (Gidano I) and lower-stream community (Gidano II).
- Main complaints are always made by Gidano II community concerning shortage of water flow to night storage.

### 3-7) Less collective actions among household members in Bulbula PA

- Ethnic background:  
Ethnically speaking, more than 97 % of population belongs to Oromo ethnicity. However, specifically speaking, the majority of population can be broadly categorized into two sub-ethnic lines; (i) Komayu Gosa; and, (ii) Bha Gosa.
- Location coincidence:  
Gidano I is coincident with Komayu settlement area, while Gidano II is with Bha settlement area.
- Less collective actions for developmental works in the past:  
Based on the above ethnic background, it is found that less collective actions for developmental works have been undertaken jointly by Komayu and Bha. In other words, they do have less experience to work together resulting in no concrete entity or unit of consultation and management on resources.

### 3-8) Conflicts of interests between cooperative and non-cooperative WUA members

- Through an intervention by Wereda Cooperative office in collaboration with OIDA Wereda office, two WUAs of Gidano I and II were disorganized in 1994 E.C.
- After dismantling, one Gidano water users cooperative was formed.
- All the position of executive committee is placed by cooperative member households with less harmonization with non-cooperative member households.
- In the focus group meetings, it is found that strong words between cooperative and non-cooperative member households were exchanged.

- Non-cooperative WUA members say that cooperative members are dominating all the affairs of WUA without consultation and consent with non-cooperative members.
- On the other hand cooperative members say that non-cooperative members are very much reluctant to understand a new idea of cooperative which differs from the idea of Derg and hence to make a new challenge to irrigation farming through the provision of credits on farm inputs as well as information of marketing by cooperative.
- At the same time it is found that some of non-cooperative members are interested in becoming cooperative members. However, due to financial constraints that they have, they could not prepare Birr 50.00 for share of cooperative.

### 3-9) Less experience in agriculture in general and irrigation farming in particular

- Resulted from their lifestyle in the past on semi-pastoralist, most of them expressed their needs to acquire basic knowledge and skills on agriculture in general as well as irrigation farming in particular. Presently irrigation scheme contributes to ensure to some extent food security among those households who are engaged in irrigation farming. However, for instance, production yield of maize in irrigation farming indicates slightly more production than the normal yield in rainfed farming. In general performance of agricultural production in irrigation farming needs significant improvement.
- Contrary to this, it is in reality that some of members are still making complaints on decrease in grazing land for cattle feeding.

### 3-10) Difficulties in acquiring farm inputs

- Most of WUA members had difficulties in procurement of farm inputs like seeds, fertilizers and chemicals at the beginning of irrigation farming due to their financial constraints.
- Furthermore, majority of non-cooperative WUA members have no access to credit schemes offered by cooperative promotion office.

### 3-11) Increase in malaria case

- Female WUA members say that there have increased in malaria case through irrigation canals and night storage.
- As result, some of children under five-year old died of malaria.

### 3-12) Poor documentation and filing

- As described earlier, an official document on handing over is not available.
- Besides this, no project document is available in WUA.
- Both cooperative WUA and previous two WUAs say that they produce minutes of meetings, but most of the minutes are found not to be available.

### 3-13) Absence of bank account for WUA

- Since the establishment, WUA members had never been explained about necessity to open and maintain a bank account for their financial management.

- It was in 1994 E.C. when WUA members were advised to hold the bank account in the context of cooperative formulation and establishment.
- 30 cooperative WUA members are in a process of opening bank account, while the majority of non-cooperative WUA members have no access to the account.
- In addition to the above, most of WUA members expressed to great extent their views on time consuming work with troublesome on handling bank account, since the nearest bank is located at 32 km distance with no means of transportation.

(4) Physical conditions through transect walk on the scheme as well as command area

4-1) Headworks

- The scouring sluice gate which is installed at left side of weir body was damaged and causes leakage of water. According to the information from the gate keeper which is a member of WUA, a big rock hit the gate during flood time.
- It was observed that the weir body and apron have no serious problems.



Scouring sluice gate

4-2) Main canal

- The total length of the main canal system is 4.7 km, of which the first 1 km is a head race with lining treatment of stone masonry work. Flume type canal is adopted at this portion and any cracks were not observed.
- The main canal passes on middle of steep slope of the Gidano river valley. Sometimes stones fall into the canal and disturb the water flow according to the WUA board member.
- One repairing place was found at upstream of drop structure along unlined canal in Gidano I. Canal embankment was collapsed due to piping and WUA member repaired with wet masonry work according to the WUA board member.
- No other serious problem of the unlined main canal was observed, although weed infestation and erosion of slope inside canal were observed at some places.





#### 4-3) Secondary and tertiary canals

- All secondary and tertiary canals are unlined canal. There are heavy weed infestation and erosion of slope inside both canals at many places. It is recognized that WUA members have done very few maintenance works. This seriously causes decreasing in efficiency of water flow.



Tertiary canal (Gidano I)



Secondary canal (Gidano II)

#### 4-4) Division Box

- Steel gates were provided at only 2 division boxes in Gidano I. For other division boxes wooden stop-logs were distributed but during site inspection no stop-logs were observed.
- Some of WUA members are using stones or grass to control water distribution at outlet of division boxes instead of stop-logs. This results in uneven distribution of water.



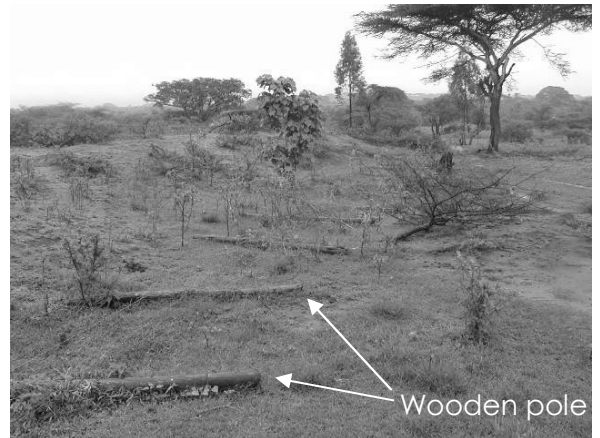
Division box with steel gate (Gidano I)



Division box (Gidano II)

#### 4-5) Night storage

- Fence for night storage is found to be damaged or partially dismantled.
- Some of WUA members say that fence has been damaged because wooden poles of fence have been decayed.
- But other WUA members say that fence was partially broken intentionally in order to take waters for drinking in the night.
- It is also recognized that WUA members have never discussed this issue so far in their monthly executive meeting with no comments made from WUA members.



Dismantled fence for night storage

#### 4-6) Other rural facilities

- No facilities in the community, such as a market, mill, school or clinic, were found.
- There is good access road with red ash pavement to Dodoma town which has the local trading and service center, approximately 9 km away.
- There is no service road for vehicle along main canal.

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## **The Next Task of Obbo Kumssa Preparation of his analytical views for recommendation**

Obbo Kumssa Asfaw summarized his findings from documents review and field works as above. Based on the above findings, he is now about to start writing the second part of his report on analysis for recommendations to be submitted to Obbo Name, Head of OIDA Wareda office.

However, Obbo Kumssa Asfaw thought that analysis for recommendations might require a framework by which he can systematically present his analytical comments to be used for recommendations. At the same time he also realized that he is not well equipped with such framework. He consulted this matter with Obbo Name. According to Obbo Name, it is said that some frameworks are in use for the formulation of project or innovative programmes. Obbo Name says that among those frameworks, a framework named Project Cycle Management (PCM) or Logical-framework or ZOOB is currently popular in use. Despite his useful comment, both Obbo Name and Obbo Kumssa are found by themselves not to be familiar with this framework.

At the time when they have been discussing the framework, Obbo Name had received a telephone call from OIDA East-Central branch office asking them to attend a training workshop on PCM – First session focusing on Problem Analysis to be held in Bcana in which OIDA East-Central Branch office is situated. According to the invitation, both Obbo Name and Obbo Kumssa obtained the opportunity to acquire knowledge and skills on PCM method, although the workshop focuses only on problem analysis, that is one of integral but essential part of methods.

## *Group Exercise No.1: Basic Information*

Action No.1: Read case material for problem analysis

Action No.2: Discuss and compile information concerning the present status of the scheme in terms of:

- a) Title of the scheme/or project
- b) Administrative location information
- c) Brief Profile of the Scheme
  - c-1) Year of application
  - c-2) Year of appraisal
  - c-3) Year of commencement of construction
  - c-4) Year of completion of construction
  - c-5) Year of establishment of WUA
  - c-6) Description of beneficiaries in command area
  - c-8) Proportion of beneficiaries within relevant administrative unit
  - c-7) Source of water for irrigation
  - c-8) Command area
  - c-9) Water discharge
  - c-10) Main structures of the scheme
  - c-11) Main crops in irrigation farming
  - c-12) Nearest markets
- d) Present status of operation and maintenance of irrigation
- e) Organization/institution of Design
- f) Organization/institution of Construction
- g) Presence of External Supporting Agency (ESA)

## *Group Exercise No.2: Participation Analysis*

- Action No.1: Read case material for problem analysis in reference with conceptual diagram of Water Users Association in Local Social Systems in Development
- Action No.2: List up all the names of stakeholders concerning planning, implementing and operating and managing of the scheme
- Action No. 3: Analyze level of participation of identified stakeholders in terms of a degree of activeness
- Action No. 4: Identify a target group that is main group(s) that is expected to manage the scheme and be capable of sustaining irrigation programme together with desired changes
- Action No. 5: Classify identified stakeholders including the target group broadly into two groups; namely (i) Institution; and, (ii) interests group, by using the following matrix

	Institution	Interests Group
Active		
Not Active		

Note: target group(s) is marked by asterisk.

- Action No.6: Discuss desired level of participation of stakeholders by using the same matrix.
- Action No.7: Prepare comparative views between the present and desired level of participation of stakeholders.

## *Group Exercise No.3: Problem Analysis*

- Action No. 1: In comparison with desired level of irrigation performance of WUA, several problems/issues are understood to exist in the scheme. In this regard, identify and list as many as problems in irrigation performance of WUA, remembering that a problem is not the absence of a solution but the difference between what is desired and what the current state of affairs is.
- Action No. 2: For each of the problems you have listed above, ask yourselves what are (could be) the major causes. Add any new problems that you have discovered to the list.
- Action No.3: Categorize those identified problems broadly into some groupings.
- Action No.4: Set up a core problem among identified problems.
- Action No.5: Conduct problem analysis indicating causal-relationships as well as cause-effect relationships with the core problems by constructing a problem analysis tree, checking to see that you have not overlooked linkage or other relevant causes or effects.
- Action No. 6: Review and finalize your logic to see if your cause-effect relationships in logical sequence
- Action No. 7: Make presentation of your structured problem analysis tree for conducting objective analysis for formulating strategic course of actions.

**REFERENCE MATERIAL FOR  
FIELD EXERCISE**

## *Reference Material for Field Exercise*

*- Results of Monitoring and Evaluation of Shubi-Sombo Scheme -*

### 1 Introduction

The JICA Study, which is named the Study on Meki Irrigation and Rural Development Project (hereinafter referred as “the Meki study”), assisted establishment of three (3) WUAs organized by 63 local farmers in the Shubi-Sombo area located along Meki river in Dugda Bora district in East Shoa Zone as shown in attachment - 1, and handed-over an irrigation pump to each WUA in November 2001. By May 2003, the WUA members have already experienced three cropping seasons. Within the framework of the Study, the project benefit monitoring and evaluation (PBME) was intensively carried out with special objectives to clarify performance of the project management and identify constraints encountered by WUA from both agronomic and engineering points of view. It is envisaged to obtain lesson learned through PBME in the Shubi-Sombo scheme, which will be valuable inputs to the PRA under further programs.

### 2 Monitoring Aspects

The interview and site inspection are the main tools for PBME. The interview was made to all 63 WUA members including the drop-outs and the WUA board members.

The monitoring aspects are as follows.

#### (1) WUA Members

No	Index	Monitoring Aspects
1	Profile of WUA member	Name, Age, Gender, Schooling years, Mear/Month to be member, Position of WUA
2	Cultivated Area (ha)	Total Cultivated Area, Rain-fed Area, Irrigable Area
3	Cultivated crops by season	2002 Rain-fed, 01-02Dry season, 2002 Wet season with irrigation, 02-03Dry season
4	Harvested area and yield	2002 Rain-fed, 01-02Dry season, 2002 Wet season with irrigation, 02-03Dry season
5	Type of seeds by crop: 1) procured (improved seeds, local seeds), 2) self-supply	Seeds (variety, quantity and price) by crop in 2002 Rainfed, 01-02Dry season, 2002 Wet season w/irrigation, 02-03Dry season
6	Application of Fertilizer (DAP, Urea, manure )	Application amount of fertilizer by crop and type of fertilizer and price in 2002 Rain-fed, 01-02Dry season, 2002 Wet season w/irrigation, 02-03Dry season, 2002
7	Application of Agro-chemicals : Herbicide, pesticide, fungicide	Application of agro-chemicals by crop and cost in the 2002 Rain-fed, 01-02Dry season, 2002 Wet season w/irrigation, 02-03Dry season
8	Labor	Family Labor, Employed worker, Debo(reciprocal help), crop sharing system
9	Sale for produce	Method of selling produce, quantity and sale price in the 2002 Rain-fed, 01-02Dry season, 2002 Wet season w/irrigation, 02-03Dry season
10	Gross Income	Gross income from the period of 01-02 Dry Season to 2002 Wet season
11	Payment of Pump Depreciation Cost	01-02Dry season, 2002 Wet season w/irrigation, and 02-03Dry season, and reason of unable to pay
12	Comment on Bank A/C for WUA Group Fund	Transparency, allotment of Pump Depreciation Cost, etc
13	Site location of irrigable plot	Confirmation of site location on the irrigation map in terms of upper stream, mid-stream and lower stream of the main canal
14	Water management	Irrigation interval by crop, hours required for irrigation, fuel consumption per each irrigation
15	Accessibility to extension worker	Access and frequency to OIDA and OADB Development Agents
16	Irrigation Farming	Constraints of irrigation farming faced by WUA members
17	Accomplishment of cropping and reason of crop failure	01-02Dry season, 2002 Wet season w/irrigation, and 02-03Dry season,



(2) WUA Committees

No	Index	Monitoring Aspects
1	WUA Board Profile	Name, Age, Schooling years, Members list
2	Basic information of WUA	WUA Established year, Official Hand-over time, Progress of WUA members, Main canal length, Annual Pump Depreciation Cost/member, Fuel cost for pump/Lt, Salary for pump guard/operator, Cost sharing (= WUA Participation Fee)
3	No of Members	Fluctuation of WUA members and reason
4	Accomplishment of Cropping Performance	Cultivated area per each cropping season and numbers of Cultivated farmers
5	WUA Meeting	Type of meeting and frequency, attendance of meeting, Agenda, meeting minutes
6	Secretary	Role, problem, solution
7	Water management	Role of block leader, water dispute, coordination
8	Land distribution	Problems, countermeasure taken
9	Pump operator	Role, Problems, countermeasures
10	Bank A/C	Profile of Bank A/C, Balance, Bank statement
11	Balance of income / expense on crop production of WUA	Balance of WUA in each cropping season
12	O&M cost of WUA	Income and expense of O&M, balance
13	Treasurer	Role, problem, countermeasures
14	Head of Finance	Role, problem, countermeasures
15	O&M activities of WUA	Detail of O&M, Frequency of O&M activities, Process of O&M work
16	Bylaw of WUA	Formulation of Bylaw and its process to formulate
17	Auditor	Role, Working process, problems, countermeasures
18	Irrigation farming	Process to select crop, production constraints
19	WUA Management (1)	Problems on WUA Management
20	WUA Management (2)	Reciprocal help among WUA members
21	Relation with the surrounding community	Some issue between WUA and surrounding community

#### 4 Results of Interviews to WUA Members

The results of PBME are stipulated in the following paragraphs.

(1) Profiles of WUA Members

Out of 59 respondents, only nine (9) members were provided the basic education, i.e. three (3) months training for reading and writing, while 22 members have no educational background. Three (3) members, who are the WUA board members playing key roles in the WUA management, have better academic background among the members.

(2) Farm Land Category and Area

The farmland is categorized broadly into rain-fed and irrigable lands. Irrigable land in Shubi and Sombo Genet is further divided into two, i.e. one under the Shubi-Sombo scheme and the other allotted to contract farming with private pump owners. The averaged land holding size ranges from 1.2 ha to 1.5 ha per household, of which 0.3 to 0.4 ha are cultivated under irrigation as seen in the following table.

Farm Land Category and Area in Shubi-Sombo Schemes

	WUA	Total Farmland (ha)	Averaged Farmland Size (ha)/FH	Rain-fed Land (ha)	Total Irrigable Farmland (ha)	Averaged Irrigable Land (ha) /FH	Irrigable land from OIDA & PPO
1.	Shubi	21.3	1.3	15.5	6.0	0.4	1 FH
2.	Sombo Genet	31.0	1.5	18.8	6.0	0.3	2 FH
3.	Sombo Aleltu	21.0	1.2	15.0	4.5	0.3	—

Source: JICA Study Team

Remark: PPO\*refers to private pump owner.

The average irrigated land in Shubi WUA is relatively high among three WUAs. Although the OIDA-WUA agreement defines that each member is equally allocated 0.25 ha per household, some

members manage more areas due to several reasons. In addition, both pump operator and pump guard in Shubi are allowed to cultivate 0.25 ha of irrigable land in stead of salary.

### (3) Crop Selection and Yield

Crops planted in the Shubi-Sombo scheme consist of food crops mainly for self consumption under rain-fed conditions, while cash crops such as vegetables and fruits are planted under irrigated conditions. The prevailing crops in the scheme are tabulated below.

Crop Selection in Shubi-Sombo Schemes

	WUA	Rain-fed farmland	Irrigation Farmland
1.	Shubi	Maize, Teff, Wheat	Chili, Cucumber, Cabbage, onion, Papaya
2.	Sombo Genet	Teff, Wheat, Maize, Barley	Chili, Maize, Papaya, Cabbage, Eggplant, Haricot bean, Tomato, Green bean, Cucumber
3.	Sombo Aleltu	Maize, Teff, Wheat	Papaya, Cabbage, Chili, Green bean, Local cabbage (kale), Coffee, Cucumber, Tomato

Source: JICA Study Team

#### 1) Rain-fed crops

Ethiopia was attacked by serious drought in 2002 and the rain-fed agriculture was hit by devastating blow. Maize sown in June 2002 in the Shubi-Sombo scheme was met with serious drought damage and resulted in crop failure over most of the beneficiaries. However, some harvest was gained from earlier sown maize (May), while the average yield of late sown teff (mid-late July) is about 0.5 ton/ha. Yield range of grain crops in the Shubi-Sombo area in the 2002 rainy season is presented below.

Average Yield of Rain-fed Crops (2002)

Rain-fed Crops	Yield Range (ton/ha)
Maize	0.0~1.6
Teff	0.0~0.4
Wheat	0.3~4.0
Barley	0.0

Source: JICA Study Team

#### 2) Irrigated crops

The yield ranges of the major irrigated crops are presented below.

Average Yield of Irrigated Crops (2002)

Unit : ton/ha

Crops	Shubi			Sombo Genet			Sombo Aleltu		
	1 <sup>st</sup> Dry	2 <sup>nd</sup> Wet	2 <sup>nd</sup> Dry	1 <sup>st</sup> Dry	2 <sup>nd</sup> Wet	2 <sup>nd</sup> Dry	1 <sup>st</sup> Dry	2 <sup>nd</sup> Wet	2 <sup>nd</sup> Dry
Onion	14	-	-	-	-	-	-	-	-
Cabbage	14 -25.6	4		4.8 -14	4.8-16	0.2 -11.6	4.8- 22	0.1 -	10.4
Chili	2.8 - 3.7	4		1.6-3.2	-	0.6 - 6.0	1.2 -4.0	-	0.4 - 2.2
Cucumber	2.1 -3.2	-		3.2	-	-	4.0	-	-
Tomato							8.0	2.4	-
Papaya	2 -16.8	0.6-3.6		-	1.6	2.0-4.5	0.4 - 4.0	0.4 -0.8	0.8-3.1

Source: OIDA Meki Office

Unit yield of papaya depends on tree age. Most of papaya trees in Shubi-Sombo are younger than one year after planting. Papaya yield usually indicates higher in the dry seasons than that of the rainy seasons because of continuous low temperature, which affects fruiting mechanism during the period of July-August

(4) Farming Practices

1) Rain-fed Crops

The farmers in the Shubi-Sombo scheme obtained seeds of grain crops such as maize, teff, wheat and barley at the local market in Meki. They are mostly of local varieties. Some crops are applied with chemical fertilizers obtained from Extension Package Program (EPP). Only 20 % of the WUA members applied herbicide (U-46 and 2.4D) to teff and wheat crops.

2) Irrigation Crops

In case of chili, tomato and cabbage, there are two sources to procure seeds and seedlings, i.e. local farmers and merchant. Merchants are mostly in Meki and only few from Addis Ababa. Papaya is locally propagated by self-supply method. Some members introduced an improved early matured variety of papaya according to the technical advice by District Agriculture Office. Coffee seedlings are available from Meki Nursery Center managed by District Agriculture Office.

High value cash crops such as onion, tomato and eggplant are fertilized with 100 - 200 kg /ha of DAP and 40 - 200 kg /ha of Urea. In contrast, most of cabbage, chili and papaya are cultivated without chemical fertilizers and a few papaya farmers dress manure in the papaya field. Most of the WUA members spray agro-chemicals on vegetable crops. The major agro-chemicals and target crops are as follows;

Agro-Chemicals Prevailing

Chemicals	Commercial Name	Crops Sprayed
Insecticide	Malatine	cabbage, chili, eggplant, tomato, cucumber
	Karate	chili, cabbage
	DDT	chili
Fungicide	Mencozeb	eggplant, tomato, cabbage, chili
	Kocide	eggplant, cabbage, tomato

Little agro-chemicals are sprayed on papaya, chili and local cabbage (kale). DDT, which is already banned in most of the countries, is still used. One of DDT users sprayed it for protecting crops from chilling damage via neighbor's advice. Obviously from this case, most of the WUA members have poor knowledge on agro-chemical use, and waste spray is observed.

(5) Irrigation

Two or three times of supplemental irrigation are dominant during the rainy season, while 7 to 30 days irrigation interval is prevailing during the dry season but it varies with WUA and individual basis. In the main canal of over 500 m long from upper to lower stream, 1.5 - 6 hours of time differences are observed in water delivery. Meanwhile, fuel consumption varies from 1.5 to 5.5 liters in each irrigation practice as well.

The following table showed the monitoring results on irrigation practice. The gap of irrigation practice on chili and cabbage cultivation was evident between the upper and lower stream of the main canal over the three WUAs. In cash crop production, only few households cultivate high input crops such as tomato and onion which require an intensive management with high production cost. Most of the WUA members are obliged to choose low input crops due to shortage of farming capital.

Comparison between Fuel Consumption between Upper and Lower Areas

WUA	Crops	Upper Canal (A)				Lower Canal (B)				Fuel Difference (B-A)
		Frequ-ency/ Irrigation Interval	Irriga-tion hours	Fuel con-sumed (lit)	Fuel cost/ Each (Birr)	Frequ-ency/ Irrigation Interval	Irriga-tion hours	Fuel con-sumed (lit)	Fuel cost/ Each (Birr)	One Cropping season (Birr)
Shubi	Cabbage	8/15	2	2	5.6	7/15	3	3~4	8.4~11.2	36~37
	Chili	8/15	2	2	5.6	9/15	3	3~4	8.4~11.2	30.8~56
Sombo	Chili	12/7	1.5	1	3	12/7	2.5	3	9	72
Genet	Cabbage	12/7	3	3	9	12/7	3~4	3.3	9.9	10.8
Sombo	Cabbage	16/7	2	2	6.2	12/7	5	5	15.5	86
Aleltu	Chili	16/4	1.5	1	3.1	5/12	6	5.5	17.1	36

Source: JICA Study Team, May 2003

#### (6) Farm Labor

The average farm family labor is 2.4 persons per household in Sombo Aleltu, while 3.5 for the other WUAs. Some members employ regular workers who live in together including meal and monthly salary ranging from 50 Birr to 110 Birr. Alternatively, some workers are temporarily allowed to cultivate farmland of employers from 0.13 ha to 0.25 ha in stead of cash.

Crop sharing system is also one of common options to the WUA members whose production resources such as land, labor, animal draught power, inputs and technology are insufficient. They usually halve produces each other. It has also a function to share market risk. No crop sharing holders are observed in the Shubi WUA.

“Debo” is defined as labor exchange custom of reciprocal help without cash payment in rural area. However, host farmer should provide meal and drinks for helpers and a new idea is rising that a cost for providing food and drinks is rational to use for employee, thus employing system in Sombo Aleltu is increasing.

#### (7) Marketing

Most of the WUA members are subsistent farmers without a surplus for sale. A few farmers sell a surplus to the regular markets in Meki. Otherwise, cash crops in the Shubi-Sombo scheme are sold mainly at farm gate.

The crop budget analyses were made for cabbage, onion, chili, papaya and tomato as presented in the following table.

Crop Budget Analyses for Major Crops

Item	Unit	Crop				
		Papaya	Tomato	Onion	Cabbage	Chili
<b>1. Gross Revenue</b>						
Unit of Area	ha	0.25	0.10	0.25	0.25	0.25
Harbested Yield	qt	8.1	10.0	35.0	35.0	9.7
Marketable Rate		0.95	0.95	0.95	0.95	0.95
Unit Sale Price	Birr/qt	130.0	100.0	70.0	30.0	210.0
Gross Revenue	Birr	1,000.4	950.0	2,327.5	997.5	1,935.2
<b>2. Production Cost</b>						
Hired Oxen Plowing	Birr	32.0	90.0	37.5	42.0	75.0
Hired Tractor	Birr	0.0	0.0	65.0	65.0	65.0
Seed	Birr	330.0	56.0	100.0	55.0	8.0
Fertilizer	Birr	0.0	0.0	74.5	0.0	0.0
Agro-chemicals	Birr	0.0	36.0	441.0	24.0	15.0
Labor	Birr	516.0	280.0	836.0	475.0	473.0
Fuel	Birr	468.1	144.0	29.0	84.0	105.0
Lubrication	Birr	0.0	0.0	0.0	0.0	0.0
Pump Replacement Cost	Birr	88.0	88.0	146.0	142.0	76.0
Total Production Cost	Birr	1,434.1	694.0	1,729.0	887.0	817.0
3. Net Revenue (1. - 2.)	Birr	-433.8	256.0	598.5	110.5	1,118.2
4. Break Even Point (Unit Sale Price)	Birr/qt	177.0	69.4	49.4	25.3	84.2
5. B/C Ratio (1. / 2.)		0.7	1.4	1.4	1.1	2.4

Source: JICA Study Team, May 2003

The analysis is based on the information obtained through individual farmer interview and supplemental data of standard requirement of farm labor, agro-chemicals, fertilizer and fuel for pump operation as well as average unit yield and its farm gate price. Some WUA members cultivating tomato could not reply properly about input they applied and costs. Therefore, insufficient data are supplemented by referring to the farm-household survey results from the Meki study. Interpretation of the outcome should be done under consideration of the following points.

- i. Production cost reported to the Meki OIDA office by the WUA refers to the total production cost without details. Further, each WUA member's farming practice was differed and generating difference of production cost, thus each case was examined.
- ii. Papaya was not reached to an economic production ages, thus small benefit to initial cost, and yield varied between the dry season and the rainy season.
- iii. The benefit was strongly affected by a market price.

Crop budget analysis verified (a) papaya is too young to produce benefit, thus B/C ratio is low, (b) a low input crop such as chili generates some profit depending on the current market price, (c) tomato and onion are also associated with market risk due to fluctuation of market price, and (d) production cost depends on each farmer's capital, and keeping sustainable yield level needs to build soil fertility (fertilizer, manure, rotation crop, intercropping, etc.). In case of cabbage production, a fluctuation of market price was very much between the rainy season and dry season, i.e., 10 Birr/qt in the 2002 wet season and 72 Birr/qt in the 2002-2003 dry season. Thus, grasping an annual price curve in Meki, guiding the WUA members to a market-oriented farming is essential for WUA so as to ship the produce at upward movement of sale price.

(8) Saving for Pump Replacement

The obligation of pump replacement is clearly mentioned in each WUA's bylaw and was to be paid to

WUAs at end of each cropping season. But performance of payment over three (3) WUAs have not been well, ranging from zero to 65 % against planned target. Details are presented below.

Members Paid Membership Fees for Pump Replacement

WUAs	Cropping Season	Paid Members		Unpaid Members	
		No of FH	(%)	No of FH	(%)
Shubi WUA	01-02 Dry Season	8	57	6	43
	02 Wet season	4	29	10	71
	02-03 Dry season	0	0	14	100
Sombo Genet WUA	01-02 Dry season	2	10	18	90
	02 Wet season	8	40	12	60
	02-03 Dry season	13	65	7	35
Sombo Aleltu WUA	01-02 Dry season	2	10	18	90
	02 Wet season	1	5	19	95
	02-03 Dry Season	9	45	11	55

Source: JICA Study Team

The Shubi WUA performed a better payment at the first dry season and showed a down ward payment over progressive cropping seasons. Meanwhile, both Sombo Genet and Sombo Aleltu show a reverse movement over progressive cropping seasons. The payment per capita is not calculated based on each irrigable plot size, thus many complaints were generated in Shubi where some member cultivated 0.5 to 1.0 ha irrigable plot but did not pay in direct proportion to land size. This sort of complains are not heard only in Shubi but also in other two WUAs, and some differences of the payment per capita among the WUA members are observed even in the 0.25 ha per capita. There are several reasons reported about background of the poor payment, and which are summarized below;

1) Influence of drought

Most of the WUA members have both rain-fed and irrigable plots. Drought caused severe crop failure in the rain-fed land, thus the income generated from irrigated plot was compensated to procure basic food grains but tailed in payment of replacement reserved for payment

2) Land exchange problem

At the beginning, the WUA members basically agreed to exchange land between landlord near the pump house and landlords far from the pump house in order to collect farmlands around of the pump house in a view of irrigation efficiency. However, various problems on land change system were taken place such as a) unable to crop from the beginning due to failure of irrigable plot acquirement, b) one partner lost an irrigable plot and unable to pay because of one-side cancellation of land exchange agreement by the opponent.

3) Gap of production resources among the WUA members

From a view of production resource such as land, labor and inputs, a gap of resources among the WUA members are observed in the area. The less resource members are forced to choose a crop sharing system to share limited production resources by making an agreement with a sharing partner. Therefore, the benefit from irrigable plot has to be halved and no surplus for a household economy, resulting in failure of the payment.

(9) Accessibility to Extension Service

Most of the WUA members replied that the OIDA Meki office followed up the WUAs members 2 to 4 times per month. Only 10 out of 63 WUA members received extension service from the District Agriculture Office (DAO). The frequency and contents of the services are 1 to 3 times about

guidance of EPP, lecture made by the Subject Matter Specialist of DAO, and distribution of input like fertilizer from DAO. Majority of the WUA members cultivate both rain-fed and irrigable plots, and faces a problem on pest and disease control, especially for horticultural crop production. Supporting this pest and disease control is beyond the ability of the OIDA Meki office. A joint supporting system should be examined in collaboration with SMS and DA in the DAO.

(10) Production constraints of irrigation farming in the WUAs

The WUA members have experienced three (3) cropping seasons since official hand-over. Monitoring was made on the beneficiaries about their production constraints based on their 3 cropping seasons. The monitoring results are presented in Table 1.

(11) Land dispute and case study of the dropout

The dropout members numbered in 14 since the Shubi-Sombo water users associations have launched (Shubi WUA: 3, Sombo Genet: 9, Sombo Aleltu: 2). Monitoring all dropout members was impossible in terms of time-constraints.

## 5 Results of Interviews to WUA Committees

(1) Agreement of the Shubi Sombo scheme

The irrigation pump and relevant irrigation facilities were handed over to the Shubi-Sombo WUAs in November 2001. The letter of agreement referring to the clear responsibility between WUA and OIDA was exchanged. The contents of agreement were summarized in the next page.

Major Features of the Shubi-Sombo Scheme at Hand-over

WUA	Shubi	Sombo Genet	Sombo Aleltu	Total
Projected command area(ha)	3.75	7.00	5.00	15.75
WUA members(FH)	15	28	20	63
Irrigable area / FH(ha)	0.25	0.25	0.25	
No of Beneficiaries	75	140	100	315
Length of main canal (m)	580	500	400	1,480
Water resource	Meki river	Meki river	Meki river	
Time to start PRA	July 10, 2001	July 11, 2001	September 1, 2001	
Time to reach agreement	August 27, 2001	August 21, 2001	September 20, 2001	

General Conditions of Agreement

OIDA's Obligations	WUA's Obligations
<ul style="list-style-type: none"> <li>✓ Procurement and installation of a small pump of some 10 HP for irrigation with spare parts</li> <li>✓ Design of irrigation facilities and irrigable area</li> <li>✓ Construction of pump house</li> <li>✓ Supporting and guidance on construction of main canal</li> <li>✓ Provision of initial training of the pump operation</li> <li>✓ Provision of guidance WUA establishment and management, such as water management, financial management, farming and marketing</li> <li>✓ Monitoring of performance of irrigation scheme</li> </ul>	<ul style="list-style-type: none"> <li>✓ Selection of committee members such as chairman, secretary, treasurer, auditor</li> <li>✓ Selection of pump operator</li> <li>✓ Coordination of irrigation farming land size of 0.25 ha per each member</li> <li>✓ Conducting land exchange among farmers so that every member can make benefit equally with irrigated farming</li> <li>✓ Construction of irrigation canals under supervision of OIDA</li> <li>✓ Operation and maintenance of the scheme such as procurement and management of fuel, repair and maintenance of the pump, water distribution, maintenance of canals</li> <li>✓ Opening the Bank A/C for group fund under WUA name</li> </ul>

Source: JICA Study Team, May 2003

## (2) Current Situations of WUA

The following table summarized the current situation of the 3 Water Users Associations as of May 2003, one and half years after hand-over.

Current Status of WUAs

	Basic Information	Shubi	Sombo Genet	Sombo Aleltu
1	Organized Year, Month	July 2001	July 2001	September 2001
2	Year of hand-over	November 2001	November 2001	January 2002
3	Number of Members at inauguration	15	28	20
4	Number of Dropout ( May, 2003)	3	9	3
5	Number of New members to join (as of May, 2003)	5	4	2
6	Total Number of WUA Members (May 2003)	17	23	19
7	Total canal length (m)	580m	Changed and rehabilitated by WUA	Changed and rehabilitated by WUA
8	Actual irrigable area (ha)	6.0	6.0	4.5
9	Annual Pump Replacement Cost per capita	292 Birr	152 Birr	175 Birr
10	Balance of Bank Deposit (as of May 2003)	2,251	2,872	2,175
11	Sale cost of one liter fuel in WUA	2.8 Birr	3.0 Birr	3.1 Birr
12	Collection of pump oil cost and interval of oil change period	/Collection of the money on every 2-3 months, /Change oil on every 300 hrs.	/Including oil cost in the fuel cost, /Change oil on every 200 hrs	/Including oil cost in the fuel cost, /Change oil on every 300 hrs
13	Revolving fund for fuel procurement (Birr)	140	260	272
14	Block Leader	Nil	3 Persons	Nil
15	Salary for pump guard	50Birr/Month	0.25ha for fees	60 Birr/month
16	Salary for pump operator	/At first, 60Birr /Month /At present, 0.25ha for salary	0.25ha for salary	60 Birr/month
17	Membership Fee for WUA members	150 Birr	100 Birr	100 Birr

Source: JICA Study Team, May 2003

### 1) Composition of the WUA committee

Each of three (3) WUAs have appointed chairman, secretary, treasurer, head of finance and inspector. Apart from these members, pump operators and block leaders are nominated. In case of Sombo Genet, three block leaders are responsible for coordination of water management. Generally, the WUA board members have relatively higher educational background than WUA members.

### 2) Annual saving amount for pump replacement

The number of WUA numbers has been decreased since the beginning of scheme operation except for Shubi WUA. The amount for pump replacement per capita varied from WUA to WUA because of amount per capita is based on the number of the WUA members. However, the number of the WUA members has changed since the beginning.

### 3) Salary for pump guard/operator

Sombo Genet WUA has adopted a system to allow pump guard to cultivate an additional 0.25 irrigable plot without charge for annual saving since the beginning. Shubi has paid pump guard 50 Birr per month. Pump operator is allowed to cultivate an additional 0.25 ha as observed in Sombo Genet WUA. Sombo Aleltu WUA has paid pump operator in cash salary due to no extra irrigable plot given to pump operator but it is supposed to shift from cash payment to investment of land right for cultivation of additional irrigable 0.25 ha soon.

### 4) Purchase cost for fuel and oil of pump



Three (3) WUAs have procured fuel via bulk buying. Fund for fuel purchase is originated from the group fund in the bank A/C deposit, which was generated from wage through labor contribution during the Meki study and used as partially revolving fund for fuel procurement. It is common in the Shubi-Sombo scheme that pump operators collect fuel cost from each member when he/she uses pump under the control of treasurer. Unit price of fuel applied to the WUA members varies by WUA. Its unit price of diesel is 2.75 Birr per liter in Meki and put a commission on it for procurement of oil in Sombo Genet and Sombo Aleltu, meanwhile Shubi WUA has taken a system to collect oil cost apart from a fuel cost.

#### 5) Members and their background

Since the number of WUA members has changed due to dropout or newly initiation into the WUA, the following table summarizes the major reason why the dropouts were generated.

WUA		Present	Background of Dropout
1	<u>Shubi</u> •3 dropouts •5 initiation	17	/Fear that the government might confiscate an individual farmer's land because the WUA was easily imagined as a collective farm in the socialist regime. / Planting crops on irrigable plots are difficult due to shortage of farming capital.
2	<u>Sombo Genet</u> •9 dropouts •4 initiation	23	/ Lack of eagerness on irrigation farming ( Low awareness of irrigation farming) /Fear that the government might confiscate individual farmer's land because WUA was easily imagined as a collective farm in the socialist regime. /Failed to get an irrigable plot due to complication of land exchange system and lost eagerness of farming /The weak of woman and old farmers are unable to cultivate 0.25 ha of irrigable plot and dropped out. /At first, considered that irrigation for the plot was impossible because of located at the end of the main canal, thus dropped out, but rejoined because of observing the WUA members to manage irrigation farming around of his plot.
3	Sombo Aleltu •3dropouts •2initiation	19	/Failed to get an irrigable plot due to complication of land exchange system and lost eagerness of farming / The delinquent is supposed to remove from the WUA via General Assembly.
Total		59	

Source: JICA Study Team

#### (3) WUA Meeting

The kind of WUA meeting over the 3 WUAs consists of General Assembly and WUA committee meetings. The following table shows a frequency of meeting, state of attendance, and agenda. In the 3 WUAs, the meeting is held via Oromiffa language, but meeting minutes is made in Amhari language in the three WUAs. In case of Sombo Genet, the meeting minutes of WUA committee meeting are not provided but other 2 WUAs do both meetings.

Meeting	WUA	Frequency	Attendance of Meeting and Agenda
1	General Assembly	Shubi	Irregular, 2 times/year on average •60% of the members participate • Application of new members, fuel and water distribution, transportation of fuel procured in Meki, announce of Committee's decision, other matter related to WUA
		Sombo Genet	Monthly •80% of the members participate • Cultivated crops, general issue, availability of credit from the supporting organs (OIDA, OADB, Cooperative Office), water distribution, acquisition of sprayer/credit of chemicals, bylaw
		Sombo Aleltu	5 times since the beginning •50-60% of the members participate • Selection of target crop (high input/low input crop), WUA member cultivating more than 0.25 ha, Credit for the member who is capable of repayment, saving cost for PDC, salary for pump operator/pump

Meeting	WUA	Frequency	Attendance of Meeting and Agenda
			guard, guidance for the delinquents of planting crops
2	Shubi	Irregular, Every 2 months on average	• All 5 members participate • PDC, Payment for pump guard, fuel/oil cost, water distribution
	Sombo Genet	Every 15 days	• All 5 members participate • Annual plan, Final examination against members who violated the bylaw
	Sombo Aleltu	Irregular	• 4 members out of 5 attends (1 member: sick) • Annual plan of cultivated crops, salary of pump guard, PDC, water management, illegal member cultivating more than 0.25 ha

Source: JICA Study Team

#### (4) Crop Selection Process by WUA Members

The following table summarized the monitoring results of the criteria of information source for selecting target crops of the irrigable plots.

Criteria of Crop Selection by WUA Members

WUA	Criteria of Selecting Target Crops/Information Source
1 Shubi	<ul style="list-style-type: none"> <li>/ No consideration for selecting target crops</li> <li>/ Selecting interesting crops based on farming experience</li> <li>/ Selection of “Green bean” was based on the farmer’s idea without consultation with any extension worker or supporting organizations.</li> <li>/ Price fluctuation curve is understood via mid-merchant. (Moreover, they understand the middle-men never gave real price information and also, they do not seek for the information actively).</li> <li>/ They regarded that OIDA Meki Office provided WUA with insufficient information on the market price than WUA expected, they also did not receive sufficient information from the Development Agents including OADB.</li> </ul>
2 Sombo Genet	<ul style="list-style-type: none"> <li>/ Crops which are expected with a good price in the local market (Thursday market, etc)</li> <li>/ Dispersing a market risk ( price drop )by promoting crop diversification</li> <li>/ Avoiding a market competition by observing the cultivated crops in and around of their living area</li> <li>/ Low input crops (cabbage, maize, chili, green bean, cucumber, sweet pepper) and high input crops (onion, tomato)</li> </ul>
3 Sombo Aleltu	<ul style="list-style-type: none"> <li>/ Crops which are expected with a good price</li> <li>/ Selecting target crops based on individual judgment without discussion in the WUA meeting</li> <li>/ Cabbage which increase a seasonal demand (at the time of fasting meat)</li> <li>/ Possible crops for planting in low input crops such as chili, maize, cabbage, green bean, papaya and cucumber</li> <li>/ Less water required crops such as papaya and others</li> </ul>

Source: JICA Study Team, May 2003

From the monitoring results, the criterion of selecting target crops by the WUA members relies on their experience which was confined to their living place, and no positive attitude seeking for market information outside to incorporate it into improvement on their farm management.

#### (5) Operation and Maintenance of Irrigation Facilities

##### 1) Logbook of Pump Operation

All three WUAs have two types of logbook for pump operation. This is instructed by OIDA Meki Office and the following items are recorded. Logbook “A” records a. date of use (year, month, date), b. name of pump operator, c. fuel type, d. operation hours, e. date of air-filter cleaning, f. inspection of irrigation pump, g. date of oil change (Sombo Aleltu). Logbook “B” records a. date of use, b. user name, c. consumed fuel amount, d. Signature by user

##### 2) Operation and Maintenance on the irrigation facilities

The monitoring results over the 3 WUAs on O&M work for the irrigation facilities are summarized in Table 2.

(6) Capability of WUA Committee Members

Monitoring about the role of each WUA committee position, working process, constraints and countermeasure by the WUA was made on secretary, treasurer, head of finance, inspector, and pump operator/block leader who were not WUA committee board members. The monitoring results are summarized in Table 3.

(7) Some Conflict with the Surrounding Community

The conflicts between WUAs and the surrounding communities were also reported by each WUA as summarized in Table 4.

## 6 Lesson Learned

So far monitoring was made over the WUA members and WUA Committee. From the monitoring results, the following lesson learned are extracted.

(1) Even distribution of land

The even distribution of irrigable plot which is fundamental production base is an essential issue in sustainable WUA management. Maximizing efficiency on irrigation practice in land exchange system was presented by the OIDA-JICA team. It is found out, however, that the principle of even distribution of land was not properly observed by a few WUA members, causing for occurrence of several dropouts of members.

1) Improper Observation of Land Exchange Agreement

One sided negligence on the principle of even distribution is the immediate cause for the cancellation of the initial land exchange agreement. Against undisciplined acts to be made by WUA members, it is possible to restrain such cases by involving a promising person such as the Chairperson of peasant association in a form of written agreement as witness.

2) Confirmation of Land cultivation right beforehand

In case of Mr. B, the surroundings thought he was a real land right holder, but a real land right holder was different and already passed away, thus it turned out that the land should be returned to the PA Office at the moment. When the PA office found the fact through the land dispute, the PA chairman confiscated the land and redistributed to a few applicants. To avoid such a case, confirming land right holder which are registered in the PA Office should be strictly checked before hand.

3) Grasp the irrigable plot size precisely

Payment of PDC per capita varies actually among the WUA members, and the complaints were generated on the injustice PDC which is not linked with irrigable plot size. In order to solve this issue, it is necessary for WUA to introduce a system of PDC linked with irrigable plot size by measuring each beneficiary's plot size.

(3) Guidance and training for the beneficiaries

It is reasonable that WUA committee members are generally nominated based on high schooling year, because of requiring literate skill. But most of the Board members have no experiences about WUA management, thus management skill taking charge of each position is not enough. Therefore, with implementation of optimum training for WUA management at hand-over, a regular training of WUA management should be carried out until WUA could stand on her own legs. In order to facilitate creation awareness for ownership on even land and water distribution, sustainable WUA management, a periodic training and guidance should be conducted for WUA members. For this purpose, a

training/guidance program should be formulated.

(4) Strengthening of Agriculture Extension

As a result of monitoring on production constraints over the three WUA members, the following constraints were reported.

- 1) Difficulty to employ casual workers and purchase of farming inputs due to shortage of farming capital
- 2) Insufficient expertise of irrigation farming including disease and pest control
- 3) Irrigation water shortage

The following options should be examined in order to solve the above constraints.

- 1) By registering WUA in the Cooperative Office, it is necessary for WUA to facilitate an availability of credit and marketing service from the Cooperative Union which is under the Cooperative Office
- 2) In accordance with existing extension system, a farmer's technical training should be facilitated by bringing the Farmers Research Group (FRG) to the Shubi-Sombo WUAs. Based on FRG frame for the WUAs, a joint supporting system between OIDA and OADB should be formed.

(5) Irrigation water resource and water management

1) Irrigation water source

The WUA members in Shubi-Sombo Project have already experienced the 3 cropping seasons including the 2 dry season crops since launch of the WUA. Last year was a serious drought year associated with shortage of Meki river discharge, and the beneficiaries encountered with serious water shortage over five months. Even water shortage usually occurs during January in normal year (Dry season in 2001~2002). From this lesson, a ground water development is necessary in order to secure an irrigation water resource from both river water and ground water.

2) Pump operation

Some personnel conflicts were observed between pump operator and WUA members through pump operation. This is generated from an unclear pump operation which user could not confirm a clear linkage between purchased fuel and operation hours. From now on, it is necessary for WUA to establish a system that both pump operator and user could confirm a clear pump operation.

3) Water Management

It is said that a serious water conflict at the beginning were mitigated since a rotational irrigation system was introduced. The issue is a big gap of irrigation practice about irrigation hours (2 to 4 times) and fuel consumption (2.5 to 6 times) between upper and lower stream in the main canal. Fuel cost generates a maximum 90 Birr of difference through a cropping season. Therefore, optimizing irrigation interval and minimizing canal loss should be verified through agronomical and engineering field test. Under the result of this verification study, the guidance should be carried out in order to make WUA members understand a fair charging system between upper and lower stream.

(6) Benefit of Irrigation Farming

In cabbage growers of Shubi-Sombo WUAs, there were some WUA members who gained a profit and lost due to slump of a market price. Production of horticulture crops is a sort of gamble farming and destiny of the vegetable growers. Countermeasure against this issue should be examined by combining 2 factors of 1) providing market information over the wide area to the beneficiaries and 2) promoting crop diversification to disperse a market risk.

(7) Countermeasure against Private Pump Owners

Some antagonism between private pump owners and OIDA-JICA financed WUAs are generated in the irrigation area of Meki river. Concerning agitation of aiming at inward-division of WUAs through the surrounding communities, the supporting organs should carry out a periodic monitoring to the beneficiaries, and convene meeting in accordance with necessity so as to clear up suspicion generated among WUA members.

(8) Issue of WUA Management

1) Fair charging system of PDC

For the WUA management, majority of the complaints generated from the WUA members were injustice of the PDC which was not linked with an irrigable plot size. An even charging system based on irrigable plot size should be introduced by measuring each beneficiary's irrigable plot size precisely.

2) Bank A/C for the Group fund

Concerning the current bank A/C of the WUAs opened in the Ethiopia Commercial Bank Meki Branch, shifting to the saving A/C should be examined to gain interest. A merit of saving A/C gaining 3 % interest generates a big merit for the WUA. For this purpose, it is necessary to examine the limiting condition on withdrawal of bank deposit and frequency withdrawal for the WUA management

**Table 1 Production Constraints of Irrigation Farming in the WUAs (1/2)**

WUA	Production Constraints of the WUA members
1 Shubi	<p><u>Labor:</u> /Supporting family via off-farming activity because of only one family labor making farming difficult</p> <p><u>Access to extension:</u> /Shortage of extension information from OIDA and OADB</p> <p><u>Production resources:</u> /Decrease in production because of delayed sowing via hiring animal traction power due to no self-animal power. /Expensive inputs and fuel cost of pump /Unable to acquire agro-chemicals on time due to shortage of stock</p> <p><u>Farming capital</u> /Unable to employ workers due to limited farming capital even insufficient of family labor</p> <p><u>Heavy Rain:</u> /Cucumber was spoiled due to heavy rain during the March-April 2003.</p> <p><u>Market:</u> /Production cost is high but market price is low.</p> <p><u>Irrigation water</u> /Shortage of irrigation water (Serious water shortage from November 2002 to March 2003 due to shortage of Meki river water flow.</p> <p><u>Problem of WUA Management:</u> /Unfair allotment of PDC per capita which is not based on an irrigable plot size /Weakness of WUA committee's fulfillment /Insufficiency of support to QUAs from OIDA Meki Office</p>
2 Sombo Genet	<p><u>Labor force:</u> /Shortage of farming capital to employ labors /Shortage of family labor force</p> <p><u>Access to Extension Service:</u> /Insufficient information on disease and pest control</p> <p><u>Farming Inputs</u> /As fuel cost is too expensive to generate benefit /As a sprayer is expensive, it is difficult for members to keep it by themselves. /It is difficult to obtain agro-chemicals on time (shortage of stock)</p> <p><u>Farming capital</u> /Farming capital for procurement is short. /As farming capital is insufficient, employing casual worker is difficult even family labor is not enough. /As farming capital is not enough, only low input crop is the option for cultivation (tomato and onion are unable to plant due to capital shortage)</p> <p><u>Farming Practice:</u> /As current farming practice is poor, a proper management for crop cultivation is difficult. /Most of the WUA members needs a training for irrigation farming because of inexperienced level. /Control of pest is a big issue (chili, cabbage, tomato, onion, papaya, etc)</p> <p><u>Shipping:</u> /Shortage of transportation means for produce (donkey car, etc)</p> <p><u>Abnormal Weather:</u> /Field crops were seriously damaged by hailstones.</p> <p><u>Irrigation water:</u> /Irrigation water was insufficient due to shortage of Meki river water (January to March) /Very high competition to irrigation water because of large WUA members (All WUA members could not plant at once) /Irrigation water is insufficient for the canal-end plot. /The installed pump has a capacity to irrigate 0.75ha/day in max. /Irrigation water is insufficient due to low capacity of the pump</p> <p><u>Market:</u> /Decrease of benefit caused by drop of sale price in market /Insufficient of market information</p> <p><u>Problems of WUA Management:</u> /Irrigation pump is equally utilized among the WUA members even though PC (Participation Fee) is not equally paid off; thus it is not fair. /Pump operator's operation is unfair because of giving priority to his relative and friends. /The WUA members imposed to fine due to neglect of bylaw do not pay the fine. /The farmland confiscated by the PA office, 0.75 ha is now not intensively utilized, thus visitors always mention it and criticize a present land use condition.</p>

Source: JICA Study Team

**Table 1 Production Constraints of Irrigation Farming in the WUAs (2/2)**

WUA	Production Constraints of the WUA members
3 Sombo Aleltu	<p><u>Labor force:</u>                      /Shortage of family labors</p> <p><u>Access to Agriculture extension service:</u>                      /Lack of proper farming practice on pest control                      /Lack of extension information/water management practice</p> <p><u>Farming Input:</u>                      /Limited to acquire improved seeds                      /Due to limited number of sprayers, it is difficult to spray agro-chemicals on time by renting it</p> <p><u>Farming capital:</u>                      /As farming capital is insufficient, the WUA members are forced to choose the low input crops such as chili and cabbage.                      /Insufficient farming capital force to adopt a crop sharing system for sharing production resources                      /Farming credit for tomato and onion are not available.                      /Unable to rent a sprayer due to lack of faming capital</p> <p><u>Cultural Practice:</u>                      /Pest damage on crops is serious.</p> <p><u>Rainfall</u>                      /Crop failure in rain-fed land due to drought/erratic rainfall, and it drives the members to purchase expensive food crops.                      /Low income caused by drought                      /As drought issue and irrigation farming are closely interrelated, crop failure in the rain-fed land could be compensated by irrigation farming.</p> <p><u>Market information:</u>                      /Shortage of market information</p> <p><u>Irrigation water source:</u>                      /Irrigation water shortage ( very high competition among the 20 WUA members)                      /As irrigation water source is insufficient, WUA wish to dig a shallow well in combination with mobile pump.                      /Water shortage continued from September 2002 to January 2003.</p> <p><u>Problem of WUA Management:</u>                      /Transparency on pump operation hour based on a procured fuel amount is not clear.                      /Fuel cost 3.1 Birr per liter is expensive.                      /There are 7 to 8 regular WUA members who do not pay the fuel cost at the time followed by irrigation practice.                      /Payment of PDC is a duty of WUA members but payment situation is very poor, and it was partially caused from serious drought. Moreover, PDC is not equally paid by the WUA members.                      /There are some WUA members who are reluctant to pay the PDC.                      /The bank A/C for the group fund should be shifted to a saving A/C because of no interest in a current A/C.                      /The WUA members want to use the deposit of Bank A/C as source of credit for the WUA members.                      /General Assembly is supposed to be convened on every 15 days in Bylaw but it is irregular when new WUA chairman is succeeded. Moreover, some WUA members are absented from WUA meeting.                      /Treasure interferers too much in duty of the pump operator.                      /Land distribution is not evenly carried out and a visual measurement for irrigable plot is dominant, which creates a problem of water distribution.                      /In the crop selection, no consensus could be reached among the WUA members.                      /The WUA committee makes follow-up of the cultivated crops less frequency.                      /Canal O&amp;M work by the WUA committee is not frequently followed.</p>

Source: JICA Study Team

**Table 2 Operation and Maintenance of Irrigation Facilities**

WUA		O&M Activity and Problems	
1	Shubi	Instruction channel	/Pump operator informs WUA chairman and secretary of the inspection results, and the issue reported is discussed by the WUA committee and make a decision of O&M work.
		Canal	/ Clearing the main canal (weeding, de-siltation) is carried out at rate of 6 times per year. / 8 WUA members out of 17 members usually join the O&M work. /The WUA committee guides the members who do not join the communal O&M work to join next time.
		Pump	/ Abnormal sound of Engine / Check the looseness of volt & nuts / Engine oil is changed on every 300 hours operation
2	Sombo Genet	Instruction channel	/ First, Pump operator informs WUA chairman and secretary of the inspection results, the WUA chairman instructs each block leader about canal clearing date.
		Canal	/ Canal clearing is done on every 15 days interval (weeding, de-siltation). All beneficiaries on each block-basis join the O&M work. / Wooden gate of the division box are not installed since the beginning, thus soil clods are used for water distribution.
		pump	/ Check an abnormal engine sound / Check color of exhaust gas / Check pump discharge / Engine oil is changed on every 200 hours operation. / As a spanner is spoiled, change of engine oil should be done in Meki city.
3	Sombo Aleltu	Instruction channel	/ First, Pomp operator informs the WUA committee of the inspection results, the WUA committee instructs each WUA member for implementation of O&M work
		Canal	/ Canal clearing (weeding, de-siltation) is done on every 15 days by group-basis / Repairing of pump house As a suction pipe section was large, it was renovated to narrow section in order to protect the pump from thief by spending 40 Birr from Treasurer's pocket money.
		Pump	/Check the looseness of volt & nuts /Change engine oil on every 300 hours operation /Cost of engine oil/liter=19.75Birr, oil tank cap of the pump =3liters (2.5 liters for gear box and 0.5 liter for air-filter)



**Table 3 Capability of WUA Members (1/3)**

WUA	Role, Present problem, Countermeasure	
<u>Shubi</u>	Secretary	<p><u>Role</u> :</p> <p>/Making WUA activity report based on OIDA Meki Office, Making meeting minutes, Convene WUA meeting</p> <p><u>Present Problem</u>:</p> <p>/Disability of reporting skill, disability of Oromiffa language in terms of reading and writing</p> <p><u>Countermeasure by WUA • OIDA</u></p> <p>/OIDA Meki Office accepts the meeting minute written in Amhari, and translates it into Oromiffa.</p>
	Treasurer	<p><u>Role</u>:</p> <p>/Deposit the money collected into Bank A/C, Payment of salary for pump guard, Entering of PDC on the account, Entering of WUA Participation Fee on the account, Entering monthly accounting on the account</p> <p><u>Working process</u></p> <p>/WUA member pays Treasurer for the PDC, Report delinquent to WUA chairman, WUA chairman makes a decision on each case</p> <p><u>Present Problem</u></p> <p>Payment of the PDC is very poor, and which resulted from low benefit of irrigation farming under the conditions on shortage of Meki River water and farming capital.</p>
	Head of Finance	<p><u>Role</u></p> <p>/Countersign the receipts submitted by Treasurer, Sanction of financial matter</p> <p><u>Present Problem</u></p> <p>/Limited knowledge and experience on accounting system,                      /No copy of the accounting documents with him                      /The necessary collection of the money (PDC, fuel, etc) are not collected on the fixed date.</p>
	Inspector	<p><u>Role</u></p> <p>/Auditing of finance and water management</p> <p><u>Working Process</u></p> <p>/Auditing finance via verbal communication only                      /Water management is audited on every 15 days in the field based on the watering schedule.</p> <p><u>Present Problems</u></p> <p>/Limited experience of entering accounting work makes him feel ignorance and feels to need training for capacity building.</p> <p><u>Countermeasure by WUA</u></p> <p>/Replace a capable person                      /Send him to join supplement training program</p>
	Pump Operator	<p><u>Role</u></p> <p>/Operation or pump, Entering Pump operation record, Purchase of fuel, O&amp; M of pump</p> <p><u>Present problem</u></p> <p>/Each WUA member pays for fuel cost after finishing pump irrigation, and the first treasurer lost the revolving fund (Fund for fuel procurement: 375 Birr) which developed into exchange of blow with the secretary. This ruin still continues.                      / As Treasurer is always absent, submitting the collected money from the users to the treasurer is problem.</p> <p><u>Countermeasure by WUA</u></p> <p>/ The treasurer should be replaced because accounting work appears to be confused if accounting work is imposed to the pump operator because of resulting in 2 treasurers.</p>

Source: JICA Study Team

**Table 3 Capability of WUA Members (2/3)**

WUA	Role, Present problem, Countermeasure	
Sombo Genet	Secretary	<p><u>Role</u>                      /Making application form of credit to the concerned organization, Making meeting minutes, Making WUA activity report (Canal clearing on every 21 days, other activity on every 3 months)</p> <p><u>Present Problem</u>                      Disability of making meeting minutes in Oromiffa language, Shortage of Office stationary (At present, receipt book/paper/pencil are purchased by the fund donated from the WUA member)</p> <p><u>Countermeasure by WUA</u>                      /Purchasing stationary is managed by collecting a contribution from the WUA members in General Assembly.                      /Reading skill of Oromiffa is assisted by school child in each household, and also Secretary needs to learn Oromiffa through reading practice.</p>
	Treasurer	<p><u>Role</u>                      /Issuing receipt for fuel procurement, collection of the PDC and entering it on accounting book, Entering Participation Fee of WUA members, Depositing the collected money into the Bank A/C, Disbursement of budget for fuel purchase</p> <p><u>Working process:</u>                      The PDC is paid for Treasurer of each WUA.</p> <p><u>Present Problem and countermeasures</u>                      /Delinquent of PDC is suspended to supply irrigation water.                      /The WUA member who are incapable of paying PDC due to drought damage is allowed to receive irrigation water under approval of WUA committee, and WUA committee gives warning to the members who are intentionally not paying PDC.                      / Office stationary is supplied by OIDA Meki Office, thus no need to procure by WUA itself.                      / Format of receipt is guided by OIDA Meki Office.</p>
	Head of Finance	<p><u>Role</u>                      /The head of finance has been sick since August 2002, thus the WUA chairman replied for him.                      /The role for the head of finance is to enter revenue and expense on accounting, sanction of budget execution.</p> <p><u>Present problems</u>                      /There is no specific comment because of the person in charge being absent due to sick. The secretary is acting for his position.</p> <p><u>Countermeasure by WUA</u>                      /The secretary is acting for the position of head of finance since the head of finance has been absent due to sick for long time.                      / WUA dismisses Head of Finance and selects a successor.</p>
	Inspector	<p><u>Role:</u>                      / Joining decision making meeting with other committee members, Understanding that role of inspector to audit a financial/property, other committee member acts for a position of inspector and no actual work is made so far. Even inquiring about role of inspector, there is no proper instruction.</p> <p><u>Countermeasure by WUA</u>                      / In response to Inspector's comment, the WUA committee members replied that Inspector had been absent due to countermeasure work of his land dispute.                      / WUA dismisses Inspector and nominate a successor</p>
	Pump Operator	<p><u>Role:</u>                      Pump operation, Recording pump operation, Collection of fuel cost from Members, Inform each Block leader of rotational irrigation schedule, Report water dispute to WUA Chairman / Committee members, Purchase of fuel</p> <p><u>Present Problem ;</u>                      / Spoiling of tool (spanner), Some conflict among the Pump Operator, and users, Disqualified pump capacity at the time of ample Meki river water,</p> <p><u>Countermeasure by WUA</u>                      /For the time being, oil change is done at workshop in Meki due to damaged spanner, and spoiled spanner should be replaced.</p>

Source: JICA Study Team

**Table 3 Capability of WUA Members (3/3)**

WUA		Role, Present problem, Countermeasure
Sombo Aleltu	Secretary	<p><u>Role</u>                      / Receive cash and enter expense on accounting book, Making WUA activity report to OIDA Meki Office, Making meeting minutes, making application of inputs to OIDA Meki Office, Discussion of finance with other WUA committee</p> <p><u>Present Problem</u>                      /Disability of writing skill of Oromiffa language, Too busy for managing 2.75 ha to do a secretary job</p> <p><u>Countermeasure by WUA</u>                      /The surroundings requested me to go to night school for studying Oromiffa language but no time.                      / OIDA Meki Office accepted the report written in Amhari version.</p>
	Treasurer	<p><u>Role</u>                      /Collection of PDC/fine/fuel cost, disbursement of fuel purchase by pump operator, deposit of collected money into Bank A/C</p> <p><u>Working Process</u>                      /WUA member pays Treasurer for PDC and reporting non-payer to WUA chairman</p> <p><u>Present Problem</u>                      /The treasurer is hated by the WUA members who are reluctant to pay the PDC.                      /Feel disability because of lack of reading/writing skill of language under limited basic education background.</p> <p><u>Countermeasure by WUA</u>                      /WUA considers each non-payment case of the PDC and allows to use irrigation water with guidance to pay it in case of irresistible force,                      / WUA is aware of treasurer's illiteracy and discussed about his problem in the WUA committee.                      /The General Assembly Meeting concluded that Treasurer could carry on his duty because of his integrity personality.</p>
	Head of Finance	<p><u>Role</u>                      /Computation of financial transaction</p> <p><u>Working Process</u>                      /Calculate sum of the receipts submitted by Treasurer in the meeting.</p> <p><u>Present Problem</u>                      /I could not accomplish my duty (role of head of finance) due to limited time and no report about                      /His problem was made to the WUA chairman yet.</p> <p><u>Countermeasure by WUA</u>                      /The WUA chairman explained that the head of finance did not fulfill his duty which was already reported to OIDA Meki Office. The OIDA Meki office also gave a same comment. Thus a final decision on his performance shall be made in the General Assembly Meeting.</p>
	Inspector	<p><u>Role:</u>                      /Management/monitor/auditing of irrigation facility, financial situation, and water management</p> <p><u>Working process</u>                      /The WUA members who illegally cultivate more than 0.25 ha have been reported to Meki OIDA Office in March, 2003. However, the said office was kept busy for the water harvesting project and no responded to the report.</p> <p><u>Present Problem</u>                      /Pomp operator/chairman has granted the WUA members who have cultivated more than 0.25ha irrigable plot.</p> <p><u>Countermeasure of WUA</u>                      /According to OIDA Meki Office, this inspector does not work in cooperation with other members due to his personal conflict, and does not carry out his assignment.</p>
	Pomp Operator	<p><u>Role</u>                      /Pomp Operation, O&amp;M work including oil change of pump, sale of fuel and recording of pomp operation, informing irrigation schedule of each block leader</p> <p><u>Present Problem</u>                      /Delay of payment for salary of pump guard/pump operator (Max 5 months), difficulty to collect fuel cost from the delinquent, Outbreak of violation to operate pump during the night by purchasing fuel by individual pocket money, conflict between treasurer and pomp operator, no transparency on pump operation, damaging gasket due to wrong operation</p> <p><u>Countermeasure by WUA</u>                      /Salary for pump operator is supposed to be paid by investing a right to cultivate an additional 0.25 ha of irrigable plot.                      /WUA made a decision to dismiss the pump operation with imposing a fine.</p>

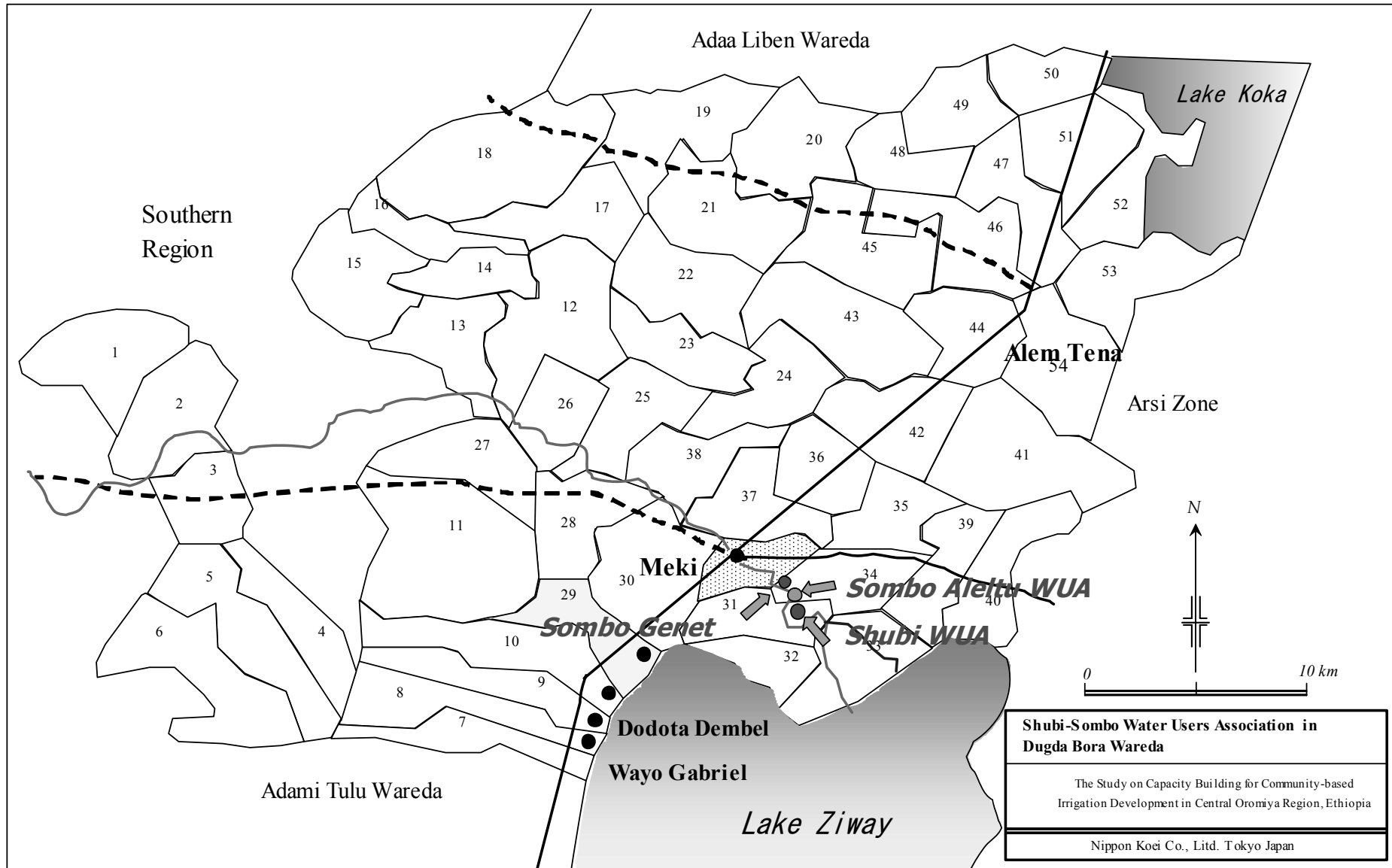
Source: JICA Study Team May, 2003

**Table 4 Some Conflicts with Surrounding Communities**

WUA		Conflicts with Surrounding Communities
1	Shubi	<ol style="list-style-type: none"> <li>1) A pump capacity is too small to cover a new demand generated from the surrounding farmers who want to join the WUA</li> <li>2) Land exchange system involves the non-beneficial-farmers in the surrounding community</li> <li>3) The surrounding communities make the WUA members fear that the Government confiscates their farm lands as a collective farm of the socialism.</li> <li>4) Some conflict with the WUA members is taken place because of the partial main canal (20 m) having been used by a private pump owner.</li> </ol>
2	Sombo Genet	<ol style="list-style-type: none"> <li>1) There are land dispute issues between the surrounding communities and the WUA member (Mr. Balda Tola and Mr. Sumale Rugo).</li> <li>2) Private pump owner do not want WUA to expand because of collision of interests, thus some conflict is existed between the WUA and the surrounding private pump owners.</li> <li>3) As anticipated future issue about kinship in the WUA, relatives may exchange land each other and it may cause some bias in this land exchange matter ( example : chairman and his wife, son etc)</li> </ol>
3	Sombo Aleltu	<ol style="list-style-type: none"> <li>1) The surrounding communities agitate the donor organ (JICA) confiscates the farm land from the WUA members; and this agitation seems to be generated through the private pump owners who have serious concern in the area along to the Meki river bank.</li> <li>2) The private pump owners do not feel happy about JICA-OIDA WUA formation because of losing their rights and interest, thus they create inner-conflicts of the WUA members in order to make them dispel suspicion by stirring them.</li> </ol>

Source: JICA Study Team May, 2003

I - A1 - 49



Item	Unit	Crop				
		Papaya	Tomato	Onion	Cabbage	Chili
<b>1. Gross Revenue</b>						
Unit of Area	ha	0.25	0.10	0.25	0.25	0.25
Harbested Yield	qt	8.1	10.0	35.0	35.0	9.7
Marketable Rate		0.95	0.95	0.95	0.95	0.95
Unit Sale Price	Birr/qt	130.0	100.0	70.0	30.0	210.0
Gross Revenue	Birr	1,000.4	950.0	2,327.5	997.5	1,935.2
<b>2. Production Cost</b>						
Hired Oxen Plowing	Birr	32.0	90.0	37.5	42.0	75.0
Hired Tractor	Birr	0.0	0.0	65.0	65.0	65.0
Seed	Birr	330.0	56.0	100.0	55.0	8.0
Fertilizer	Birr	0.0	0.0	74.5	0.0	0.0
Agro-chemicals	Birr	0.0	36.0	441.0	24.0	15.0
Labor	Birr	516.0	280.0	836.0	475.0	473.0
Fuel	Birr	468.1	144.0	29.0	84.0	105.0
Lubrication	Birr	0.0	0.0	0.0	0.0	0.0
Pump Replacement Cost	Birr	88.0	88.0	146.0	142.0	76.0
Total Production Cost	Birr	1,434.1	694.0	1,729.0	887.0	817.0
3. Net Revenue (1. - 2.)	Birr	-433.8	256.0	598.5	110.5	1,118.2
4. Break Even Point (Unit Sale Price)	Birr/qt	177.0	69.4	49.4	25.3	84.2
5. B/C Ratio (1. / 2.)		0.7	1.4	1.4	1.1	2.4

Attachment - 2

Results of Workshop

### Result of Group Exercises on Project Profiling : Exercise No.1:

Questions	Group A	Group B	Group C
a) Title of the scheme	a) Gidano Irrigation Scheme	a) Gidano	a) Gindano Small-Scale Irrigation Scheme (SSIS)
b) Administrative location information	b) Region: Oromia, Zone: BSTJ, Wareda: Gemacho Peasant Association: Bulbula	b) Region: Oromia, Zone: BSTJ, Wareda: Gemacho Peasant Association: Bulbula	b) Region: Oromia, Zone: BSTJ, Wareda: Gemacho, Peasant Association: Bulbula
c) Profile of the Scheme			
c-1) Year of Application	c-1) 1980 E.C.	c-1) 1980 E.C.	c-1) 1980 E.C.
c-2) Year of Appraisal	c-2) 1986 E.C.	c-2) 1985 E.C.	c-2) 1985 E.C.
c-3) Year of commencement of construction	c-3) 1987 E.C.	c-3) 1987 E.C.	c-3) 1987 E.C.
c-4) Year of completion of construction	c-4) 1990 E.C.	c-4) 1990 E.C.	c-4) 1990 E.C.
c-5) Year of establishment of WUA	c-5) 1990 E.C.	c-5) 1990 E.C.	c-5) 1990 E.C.
c-6) Description of beneficiaries in command area	c-6) Potential (Planned): 320 Households Actural : 160 Households in total (WUA: 130 HH + WUC: 30 HH)	c-6) 97 % of population is comprised of two Oromo tribes (Gosa); namely, Komayu and Bha. Life style is semi-pastoralist. Gidano I : (Komayu) 82 HH Gidano II: (Bha) 78 HH In total 160 HH users households (Cooperative HH: 30, Non-cooperativeHH:130)	c-6) Gidano I: WUA 71 HH + WUC 11 HH Gidano II: WUA 59 HH + 19 HH In total : 160HH
c-7) Propotion of beneficiaries within relevant administrative unit	c-7) Administrative unit: Peasant Association with 982 HH. No. of beneficiaries : 160 HH, $160 / 982 \times 100 = 16.3 \%$	c-7) 16.3 %	c-7) Administrative unit: Peasant Association with 982 HH. No. of beneficiaries : 160 HH, $160 / 982 \times 100 = 16.3 \%$
c-8) Source of water for irrigation	c-8) Gidano river	c-8) Gidano river	c-8) Gidano river
c-9) Command Area	c-9) Gidano I:80 ha, Gidano II: 120 ha, Total:200 ha	c-9) Gidano I:80 ha, Gidano II: 120 ha, Total:200 ha	c-9) Gidano I:80 ha, Gidano II: 120 ha, Total:200 ha
c-10) Water discharge	c-10) Discharge rate of canal: 185 l/s (Gidano I) Discharge rate of pond: 105 l/s (Gidano II)	c-10) Discharge rate of canal: 185 l/s (Gidano I) Discharge rate of pond: 105 l/s (Gidano II)	c-10) Discharge rate of canal: 185 l/s (Gidano I) Discharge rate of pond: 105 l/s (Gidano II)
c-11) Main structures of the scheme	c-11) Headwork (diversion), Canals: main canal:4.7 km, secondary canal: 6.1 km, tertiary canal: 13.2 km, drainage canal: 16.38 km = Total length of canal: 40.38 km, division box :18, drops, night storage, culverts	c-11) Headwork, main canal, secondary canal, tertiary canal, drainage canal, division box, drop and culvert, pond	c-11) Headwork, main canal, secondary canal, tertiary canal, drainage canal, division box, drop and culvert, pond
c-12) Main crops in irrigation farming	c-12) carrot, potato, chilly, maize, papaya	c-12) carrot, potato, chilly, maize, papaya	c-12) carrot(dacus carota), potato(irish), chillies (capsicum annum & capsicum frutsence), Maize (zeomays), papaya (carica papaya)
c-13) Neaest markets	c-13) Dodoma Saturday market (9 km), Gemacho Saturady market (32 kn) Btela market (64 km)	c-13) Dodoma Saturday market (9 km),	c-13) Dodoma Saturday market (9 km),



### Result of Group Exercises on Project Profiling : Exercise No.1:

Questions	Group A	Group B	Group C
d) Present status of operation and maintenance of irrigation	d) poor maintenance insufficient agricultural practices poor water management	d) - Less organized WUA - No fee collection - Clearing & minor maintenance are not timely performed ny all users - No proper distribution of water - Reluctancy to collect maintenance fees - Some structures are damaged	d) Present status of operation and maintenance of irrigation is so weak because of the following concrete problems. There are: 1) WUA has done very few maintenance. 2) No gates (stop logs for proper use of irrigation water 3) Pond fence is partially broken.
e) Organization/institution of design	e) BSTJ Zone Department of Water, Mines and Energy Resources Development	e) BSTJ Zone Department of Water, Mines and Energy Resources Development	e) BSTJ Zone Department of Water, Mines and Energy Resources Development
f) Organization/institution of construction	f) Regional Bureau of Water, Mines and Energy Resources Development in collaboration with Zonal Office of WMERD Beneficiary community	f) Regional Bureau of Water, Mines and Energy Resources Development in collaboration with Zonal Office of WMERD	f) Regional Bureau of Water, Mines and Energy Resources Development in collaboration with Zonal Office of WMERD
g) Presence of external supporting agency (ESA)	g) International Irrigation Development Fund	g) IIDF (funding agency)	g) IIDF. OIDA, Cooperative Promotion Office

Notes taken from floor discussions:

- 1) Year of appraisal:  
Both 1985 and 1986 are found to be correct. This depends upon official procedures on budget appraisal of Oromia government.
- 2) Items of Information  
Needless to say, these kinds of information are minimal and basic information required for each scheme. Each office should be advised to equip it with this kind of information per scheme.  
Furthermore, list of information formulated for the Meki Study is advised to be referred for effective preparation of database of the scheme. Data sheet is available in OIDA Head office.

## Result of Group A on Participantion Matrix Group Exercise No.2: Participation Analysis

- (1) Working criteria on activeness of stakeholders
  - 1-1) Performance of duties and responsibilities
  - 1-2) Responsiveness
  - 1-3) Commitment
  - 1-4) Level of participation
  
- (2) Visioning on the future performance of the case scheme
  - 2-1) Improved and integrated scheme management
  - 2-2) Institutionalized and re-structured WUA and WUC
  - 2-3) Even and fair land distribution
  - 2-4) Improved extension services to beneficiaries
  
- (3) Participation Matrix on the Present Conditions stated in the Case Study

	Institution	Interested Group
Active	- IIDF (funding agency)	- WUC (30 households)
Not Active	- Peasant Association - Wareda Agricultural Desk - Wareda Cooperative Promotion Desk - Wareda OIDA	- WUA (130 households)

- (4) Participation Matrix on Desired Level of Stakeholder Participation

	Institution	Interested Group
Active	- Wareda OIDA - Wareda Cooperative Promotion Desk - Wareda Agriculture Desk - WUC	- WUA - Local community - Peasant Association
Not Active		

## Result of Group A on Participantion Matrix Group Exercise No.2: Participation Analysis

### (5) Comparative views between the Present and Desired Level

Stakeholder	Present	Desired Level
5-1) OIDA	<ul style="list-style-type: none"> <li>- poor extension service</li> <li>- low supervision and follow-up</li> <li>- poor capacity</li> </ul>	<ul style="list-style-type: none"> <li>- Improved extension services</li> <li>- Strong supervision</li> <li>- Improved capacity</li> </ul>
5-2) Cooperative Desk	<ul style="list-style-type: none"> <li>- Low promotion services</li> <li>- Insufficient credit service facilitation</li> <li>- Insufficient efforts on WUC registrat</li> </ul>	<ul style="list-style-type: none"> <li>- Strong promotion and awareness creation</li> <li>- Sufficient capacity to facilitate Credit service</li> <li>- Formation of bylaw</li> </ul>
5-3) Peasant Association	<ul style="list-style-type: none"> <li>- Insufficient intervention on land use issue</li> <li>- Less attention for scheme performan</li> </ul>	<ul style="list-style-type: none"> <li>- Effective facilitation on land allocation and distribution</li> <li>- Better attention to scheme performance</li> </ul>
5-4) WUA	<ul style="list-style-type: none"> <li>- Low participation on scheme management</li> <li>- Absence of rules and regulations</li> <li>- Poor irrigation skills</li> <li>- Inability to resolve land holding problems</li> <li>- Inability to resolve internal conflicts</li> <li>- Less attention to maintenance</li> </ul>	<ul style="list-style-type: none"> <li>- High participation in scheme management</li> <li>- Formulation and iadministration of rules and regulations</li> <li>- Conduct collective action to solve land holding problems</li> <li>- Collective actions to solve internal conflicts</li> <li>- Timely maintenace of scheme</li> <li>- Effective irrigation skills</li> </ul>
5-5) WUC	<ul style="list-style-type: none"> <li>- Not registered</li> <li>- Incomplete bylaws</li> <li>- Inability to access to credit facilities</li> </ul>	<ul style="list-style-type: none"> <li>- Institutionalized WUC</li> <li>- Completion and administration of bylaw</li> <li>- Easy access to credit facilities</li> </ul>
5-6) Local Community	<ul style="list-style-type: none"> <li>- Less attantion to the scheme</li> </ul>	<ul style="list-style-type: none"> <li>- active participation in irrigation development</li> </ul>

## Result of Group B on Participation Matrix Group Exercise No.2: Participation Analysis

(1) Participation Matrix on the Present Condition stated in the Case Study

	Institution	Interested Group
Active	- OIDA - Wareda Cooperative Promotion Desk	- WUA - IIDF (funding agency) - Share croppers
Not Active	- Wareda Agriculture Desk - Wareda Administration - Peasant Association	- Landless members

(2) Participation Matrix on the Desired Level of Stakeholder Participation

	Institution	Interested Group
Active	- OIDA - Wareda Agriculture Desk - Wareda Cooperative Promotion Desk - Peasant Association	- WUA - WUC - Funding Agency - Exporter
Not Active	- Wareda Natural Resources & Land Administration Desk - Wareda Administration	- Elders - Local middlemen

(3) Comparative views between the Present and the Desired Level

	Present	Desired Level
3-1) WUA	WUA carries out a few managerial activities.	WUA is desired to perform all the management activities.
3-2) WUC	Low level of activities and participation.	WUC is desired to be actively engaged in marketing and credit services
3-3) OIDA	Less technical and extension services	OIDA is desired to provide WUA with appropriate technical support
3-4) Cooperative Desk	Insufficient service provided	Cooperative is desired to support WUC in strengthening organization.
3-5) Agriculture Desk	Insufficient service provided	Agricultural extension services is to be provided sufficiently.
3-6) Administration Office	Insufficient service provided	More appropriate administrative roles should be played.
3-7) PA	Insufficient service provided	Internal administrative and legal matters should be handled by PA.
3-8) N.R & L.A	No involvement	Land reallocation should be done.
3-9) Share Crop	Actively involved	Minimized
3-10) Fund Agency	Less involvement	More funding support

## Result of Group C on Participation Matrix Group Exercise No.2: Participation Analysis

### (1) Chronological Analysis on Stakeholder Participation

Planning Stage	Construction Stage	Operation and Management Stage
<ul style="list-style-type: none"> <li>- IIDF (Funding agency)</li> <li>- BSTJ Zone Department of Water, Mines &amp; Energy Resources Development</li> <li>- Gemacho Wareda Office</li> <li>- Regional Bureau of WME</li> <li>- Government's Team of Expert</li> <li>- Elders</li> </ul>	<ul style="list-style-type: none"> <li>- Regional Offices of WMERD</li> <li>- BSRJ Zonal office of WMERD</li> <li>- Local people of PA</li> <li>- Daily labours and skilled labours</li> </ul>	<ul style="list-style-type: none"> <li>- WUA Gidano I and II</li> <li>- Irrigation experienced farmers from outside</li> <li>- Gemacho Wareda OIDA</li> <li>- Gemacho Wareda Coopetative Desk</li> <li>- Gemacho Wareda Agricultural Desk</li> <li>- WUC (30 households)</li> <li>- WUA (130 households) non-cooperative</li> </ul>

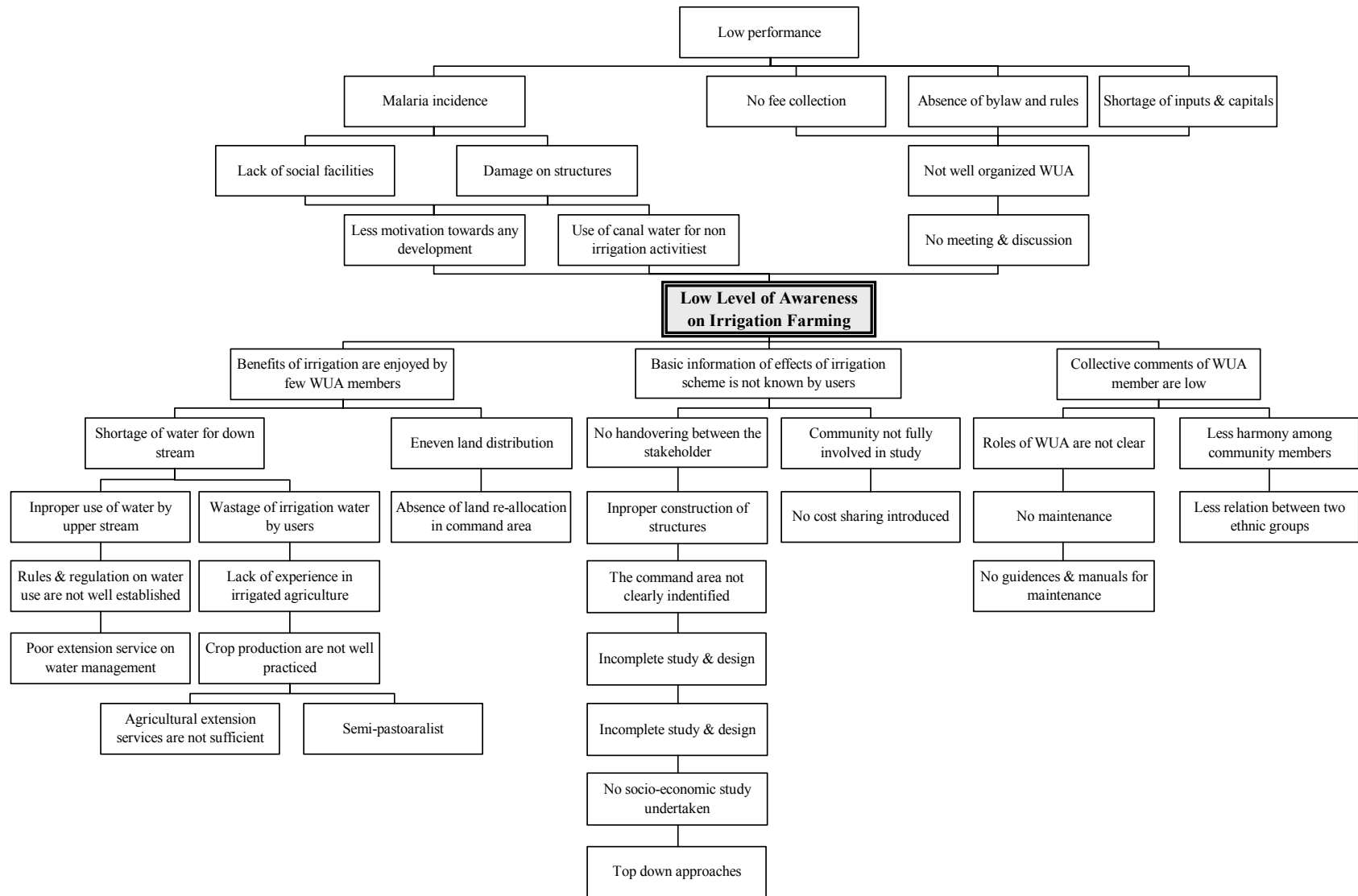
### (2) Participation Matrix on the Present Conditions stated in the Case Study

	Institution	Interested Group
Active		<ul style="list-style-type: none"> <li>- Irrigation farming experience farmers from outside</li> </ul>
Not Active	<ul style="list-style-type: none"> <li>- Gemacho Wareda OIDA</li> <li>- Gemacho Wareda Agricultural Desk</li> <li>- Gemacho Wareda Cooperative Desk</li> <li>- Gemacho Wareda Administration Office</li> <li>- Peasant Association</li> </ul>	<ul style="list-style-type: none"> <li>- WUA Gidano I and II</li> <li>- WUC (30 households)</li> <li>- Non-cooperative WUA (130 households)</li> <li>- IIDF (funding agency)</li> </ul>

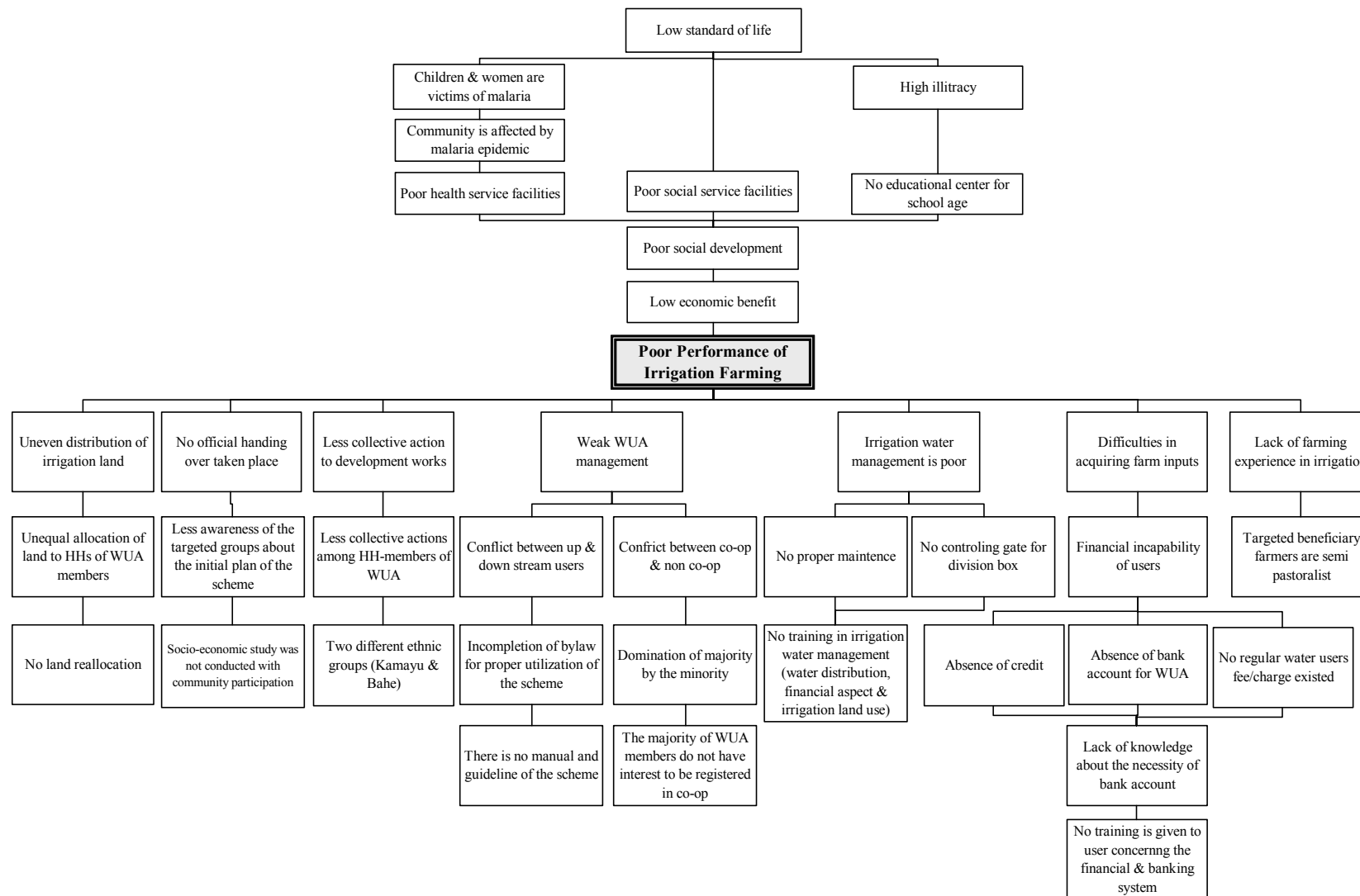
### (3) Comparative Views between Present and Desired Level of Stakeholder Participation

Stakeholder	Present	Desired Level
3-1) WUA (users)	- not active in all aspects of operation and management	- be active in operation and management of the scheme
3-2) Zone OIDA	- Unsatisfactory supervision	- Close supervision
3-3) Coopeative	- Weak in organizational promotion	- High promotion and motivation
3-4) PA	- Low participation	- High administrative support
3-5) Agriculture Desk	- No provision of extension services	- Supply of agricultural inputs with extension services
3-6) Wareda OIDA	- Close follow up with technical support	- Poor and unsatisfactory provision of follow-up and support





**Result of Group B on Problem Analysis Tree Group Exercise No.3: Problem Analysis**

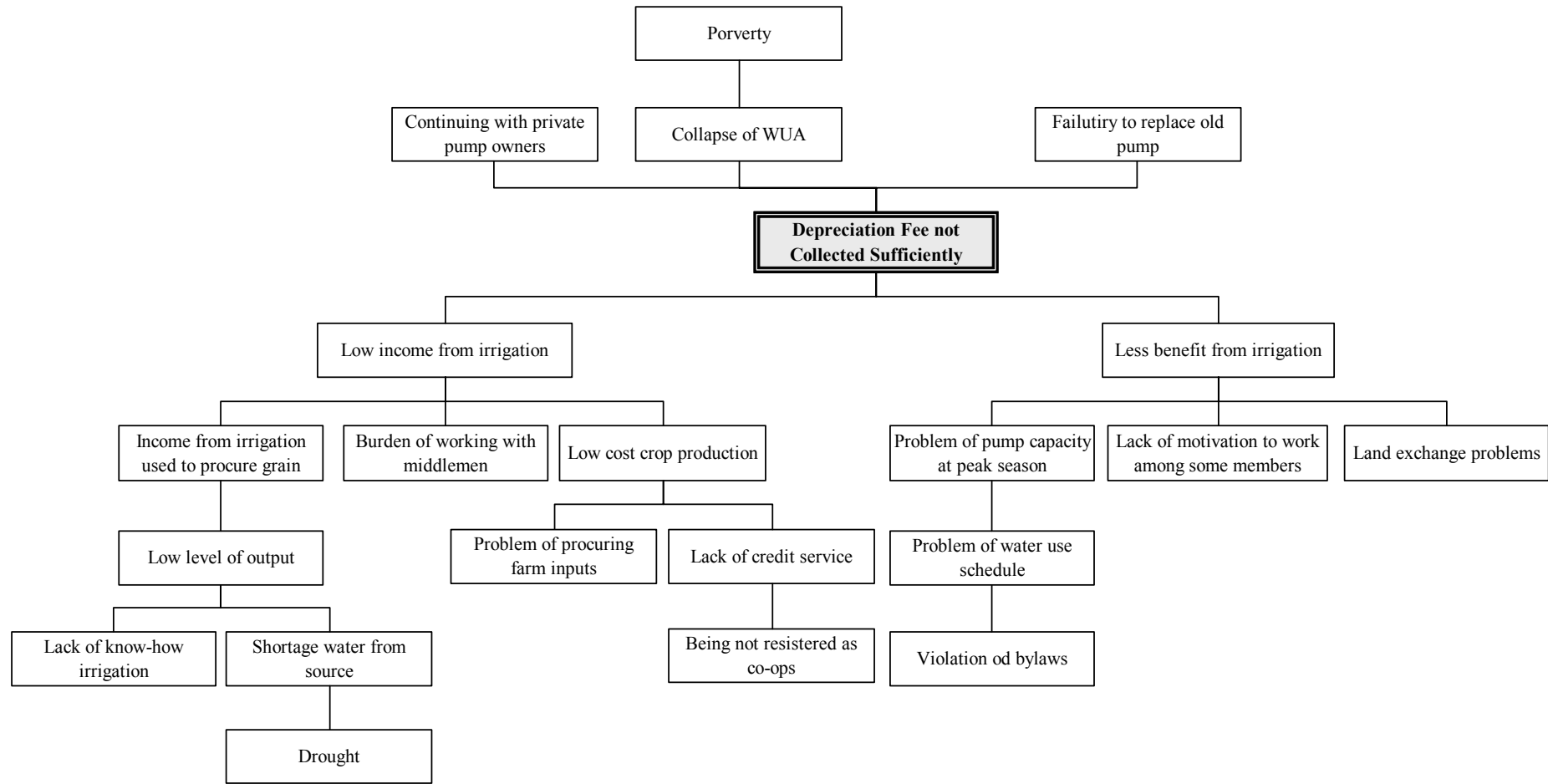


**Result of Group C on Problem Analysis Tree Group Exercise No.3: Problem Analysis**

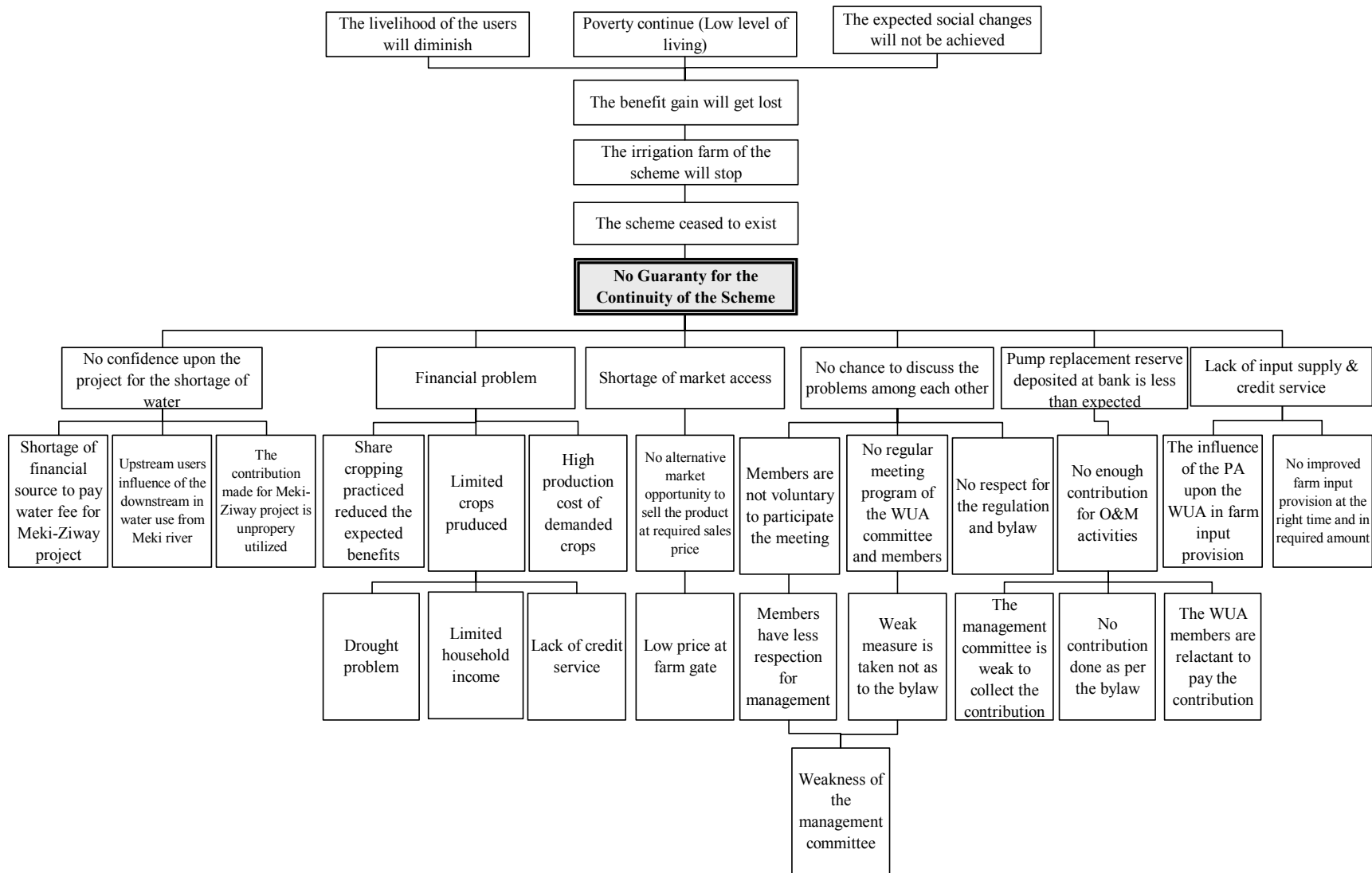




**Result of Group A on Problem Analysis Tree Field Exercise : Shubi**



**Result of Group B on Problem Analysis Tree Field Exercise : Sombo-Genet**



**Result of Group C on Problem Analysis Tree Field Exercise : Sombo-Alaltu**

Attachment - 3

## Questionnaire Survey to OIDA Staff

## QUESTIONNAIRE SURVEY TO OIDA STAFF

### 1. Objectives

The individual programs and activities of the JICA Study have been undertaken to be integrated into one core program of capacity-building for OIDA staff through the two main training modalities; namely (i) classroom and workshop training modality; and (ii) on-the-job training modality.

Employing classroom and workshop training modality, three (3) activities were undertaken as follow;

- 1) Project Cycle Management (PCM) Training Workshop
- 2) Project Monitoring Workshop (1), (2) and (3)
- 3) Workshop for Irrigation Engineering

Through these activities, the OIDA staff members learned analytical method in both theory and practice. Apart from the technical transfer, a series of workshops has been held in order to share information concerning work progress of the pilot projects under the Study and exchange views and opinions between the Study Team and OIDA staff.

In addition to these activities, seven (7) activities were carried out by employing on-the-job training modalities. These include;

- 1) Project Benefit Monitoring and Evaluation (PBME) of Shubi-Sombo Schemes (1), (2) & (3)
- 2) Farm Economy and Crop Budget Analyses
- 3) Irrigation Water Use Study in Meki
- 4) Establishment of six (6) WUA in Meki Area
- 5) Project Benefit Monitoring and Evaluation (PBME) of six (6) new schemes
- 6) Rehabilitation of three (3) existing schemes
- 7) Project Benefit Monitoring and Evaluation (PBME) of three (3) schemes

The OIDA staff members were fully involved and learned operational skills and techniques dealing with issues raised in actual process of project planning and implementation and monitoring by applying theoretical concepts into practice and sharing and exchanging views and opinions between the Team and OIDA staff.

In addition to these activities, the OIDA staff members were also fully involved in data collection and processing for report preparation in close consultation with the Study Team. Detailed description is presented in the table as below.

Categorization of JICA Study Programs in Training Modalities

Study Component	Main Training Modality used	
	On-the-Job Training Modality	Classroom and Workshop Training Modality
Program I	Project Benefit Monitoring and Evaluation (PBME) of Shub-Sombo Schemes (1), (2) & (3)	Project Cycle Management (PCM) Training Workshop
	Farm Economy and Crop Budget Analyses	Project Monitoring Workshop (1), (2) and (3)
	Irrigation Water Use Study in Meki	Workshop for Irrigation Engineering
Program II	Establishment of six (6) WUA in Meki Area	
	Project Benefit Monitoring and Evaluation (PBME) of six (6) new schemes	
Program III	Rehabilitation of three (3) existing schemes	
	Project Benefit Monitoring and Evaluation (PBME) of three (3) schemes	

At the final stage of the Study, during this period, the Study team attempted to make a rapid assessment on impacts of capacity-building programs upon OIDA organization and staff with the following immediate objectives:

- 1) To grasp general features of impacts of capacity-building programs upon OIDA staff individuals as well as work performance of OIDA through their involvement;
- 2) To assess a degree of importance and significance of community-based approach to irrigation development implemented in Meki area, especially to assess a degree of awareness building among OIDA concerning community involvement in planning and importance of social workers;
- 3) To evaluate a degree of importance and significance of systematic approach to rehabilitation of existing schemes that deals with issues concerning categorization of existing schemes, problem analysis approach, scheme information management, roles of social workers, financial aspects of WUA management; and,
- 4) To collect any comments and suggestions on capacity-building program in general

For attainment of these objectives, questionnaire survey was carried out in accordance with the methodology describe as below.

## **2. Methodology**

### **(1) Flow of activities**

The questionnaire survey to OIDA staff was carried out in the following flow.

- |  |                          |
|--|--------------------------|
| 1) Preparation of questionnaire and selection of respondents | May 24 to May 30, 2004   |
| 2) Distribution and fulfilment of questionnaire              | May 31 to June 12, 2004  |
| 3) Analyses and report Preparation                           | June 14 to June 18, 2004 |

### **(2) Preparation and distribution of questionnaire**

The questionnaire was prepared and distributed to OIDA offices at the three administrative levels of Headquarters, Central Branch office and the Wareda offices concerned. A total of 62 questionnaire were distributed, the breakdown of which are 10 copies of questionnaires given to Headquarters, 30 copies to Central Branch office, 5 copies to OIDA Dugda Bora Wareda office, 10 copies to OIDA Munessa Wareda office, and 7 copies to OIDA Tiyo Wareda Office.

### **(3) Contents of questionnaire**

The questionnaire was constructed with the main seven structures; (i) general questions touching upon personal information of each respondent; (ii) questions related to general impact through the involvement of respondents; (iii) questionnaire related to Program II with an emphasis on an approach of community-based irrigation development in OIDA; and (iv) questionnaire concerned with Program III with a focus on systematic approach to rehabilitation; and (v) self-evaluation of capacity-building program for OIDA organization and staff; (vi) comments on future support to OIDA; and (vii) general comments to the JICA Study Team.

For detailed contents of questionnaire, a form of questionnaire is presented in the next page.



*The study on capacity building programs for community-based irrigation development  
in central Oromia region in Ethiopia*

3. Program II : WUA Supporting Program in Meki Area

Q3.1	Do you realize the importance of Community-based Irrigation Development in OIDA's activities through the JICA Study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q3.2	How do you evaluate the approach of establishment of WUA with small pump in the Meki area done by JICA study team	Very effective 5	Effective 4	Unclear to answer 3	Ineffective 2	Very Poor 1	No information about Study 0	
Q3.3	Do you realize the importance of involvement of farmers from irrigation planning through the JICA Study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q3.4	Do you realize the importance of OIDA social workers for Community-based Irrigation Development through the JICA Study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q3.5	Do you feel the status of OIDA social workers are improved through the JICA study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q3.6	What kinds of activities shall social workers be involved for establishment of WUA? (Please select only three (3) items from the following column)							
	1. Awareness creation for farmers / 2. Community mobilization / 3. Irrigation planning & design 4. Construction management / 5. Monitoring of scheme / 6. Agriculture extension 7. Others ( )							
Q3.7	Do you think "Guideline for Establishment and Management of WUA" can be utilized in other wareda in Oromia Region?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q3.8	What is the most important issue for sustainable irrigation scheme management by WUA? (please select only three (3) items from the following column)							
	1. Land distribution or allocation / 2. Support for fund formation / 3. Saving for pump replacement 4. Water management / 5. Clarifying responsibilities between OIDA and WUA / 6. Participatory works by WUA / 7. Monitoring activities by OIDA and WUA / 8. Agriculture extension 9. Others ( )							
Q3.9	Please describe the positive and negative impacts to you or OIDA through Program II (WUA Supporting Program in Meki Area)							
	[Positive]							
	[Negative]							
Q3.10	What is constraint in OIDA to continue community-based irrigation development? (please describe, if any)							



4. Program III : Rehabilitation of Existing Irrigation Schemes

Q4.1	Do you realize the importance of rehabilitation or maintenance works of existing irrigation schemes in OIDA's activities through the JICA Study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q4.2	How do you evaluate the approach of categorizing existing schemes based on type of constrains proposed by JICA study team	Very effective 5	Effective 4	Unclear to answer 3	Ineffective 2	Very Poor 1	No information about Study 0	
Q4.3	How do you evaluate the rehabilitation approach of starting from Problem Analysis with WUA members facilitated by social workers (e.g. Gedamso )	Very effective 5	Effective 4	Unclear to answer 3	Ineffective 2	Very Poor 1	No information about Study 0	
Q4.4	How do you evaluate the effectiveness of preparation of scheme layout map, plot map, and list for scheme management? (e.g. water fee collection, land reallocation etc.)	Very effective 5	Effective 4	Unclear to answer 3	Ineffective 2	Very Poor 1	No information about Study 0	
Q4.5	Do you realize the importance of OIDA social workers for rehabilitation of existing schemes through the JICA Study?	Definitely yes 5	Yes 4	Unclear to answer 3	No 2	Not at all 1	No information about Study 0	
Q4.6	How do you feel the importance of regular collection of water fee by WUA for operation and maintenance of scheme?	Very important 5	Important 4	Unclear to answer 3	Not important 2	No need 1		
Q4.7	How do you feel the importance of clarifying demarcation of responsibilities between WUA and OIDA at handing over?	Very important 5	Important 4	Unclear to answer 3	Not important 2	No need 1		
Q4.8	How do you feel the importance of land exchange or reallocation to increase the number of beneficiaries in existing irrigation schemes?	Very important 5	Important 4	Unclear to answer 3	Not important 2	No need 1		
Q4.9	How do you feel the importance of systematic monitoring for existing schemes by OIDA through the JICA Study?	Very important 5	Important 4	Unclear to answer 3	Not important 2	No need 1		
Q4.10	What kinds of monitoring shall be carried by OIDA and WUA? (please select only three (3) items from the following column)	1. Actual irrigation area (ha) / 2. Number of beneficiaries / 3. WUA management 4. Operation and maintenance by WUA / 5. Water fee collection / 6. Farming activities / 7. Others ( )						
Q4.11	Please describe the positive and negative impacts to you or OIDA through Program III (Rehabilitation of Existing Irrigation Schemes)	[Positive]						

	[Negative]
Q4.11	What is the constraint in OIDA to continue rehabilitation works? (please describe, if any)

5. Capacity Building for OIDA

Q5.1	Do you feel there is any awareness creation in your or other OIDA staff's mind for irrigation development through JICA Study?	Definitely yes 5	Yes 4	No answer 3	No 2	Not at all 1
Q5.2	What kinds of awareness creation do you feel? (Please describe)					
Q5.3	Do you feel there is any capacity building of technical skills or performance of you or other OIDA's staff through JICA Study?	Definitely yes 5	Yes 4	No answer 3	No 2	Not at all 1
Q5.4	What kinds of capacity building do you feel? (Please describe)					
Q5.5	Do you feel there is any change or improvement of OIDA organization through JICA Study?	Definitely yes 5	Yes 4	No answer 3	No 2	Not at all 1
Q5.6	What kinds of change or improvement do you feel? (Please describe)					

6. Future Support to OIDA

Q6.1	<p>What activities shall OIDA strengthen in the future? (please select only three (3) items from the following column)</p> <ol style="list-style-type: none"> <li>1. Community-based irrigation development</li> <li>2. Rehabilitation of existing scheme</li> <li>3. Water harvesting project</li> <li>4. Research of irrigation technology</li> <li>5. Construction of new irrigation scheme</li> <li>6. Study and design of new irrigation scheme</li> <li>7. Agriculture extension in irrigation scheme</li> <li>8. Monitoring of existing scheme</li> <li>9. Monitoring of water resource and environment</li> <li>10. Other ( )</li> </ol>
Q6.2	<p>Which area does OIDA need supports? (please select only three (3) items from the following column)</p> <ol style="list-style-type: none"> <li>1. Community-based irrigation development</li> <li>2. Rehabilitation of existing scheme</li> <li>3. Water harvesting project</li> <li>4. Research of irrigation technology (Water saving irrigation / Crop diversification)</li> <li>5. Construction of new irrigation scheme</li> <li>6. Agriculture extension in irrigation scheme</li> <li>7. Monitoring of existing scheme</li> <li>8. Monitoring of water resource and environment</li> <li>9. Capacity building for OIDA staff</li> <li>10. Other ( )</li> </ol>

7. General Comments to the JICA Study (if any)

~ Thank you very much for your cooperation ~

### 3. Results of Questionnaire Survey

#### (1) Respondents

Out of 62 questionnaires that were distributed, a total of 31 OIDA staff responded by fulfilling questionnaires. Relatively low rate of collection may be understood due to unavailability of OIDA staff who has been heavily engaged in regional-wide water harvesting project. 31 respondents is in this report broadly categorised into three groups; namely; managerial staff including administrative staff; (ii) engineering professionals including irrigation engineer, agricultural engineer, construction engineer; hydraulic engineer; hydrologist; agronomist as well; and (iii) socio-economic professionals including economist, agricultural economist and social worker and development agent as well. These respondents are classified in accordance with the level of management that are Headquarters, Branch office and Wareda office. The breakdown of 31 respondents is presented as below.

Breakdown of 31 Respondents

OIDA Office	Managerial	Engineer	Socio-economy
Headquarters	1	3	2
Central Branch Office	1	11	3
Wareda Office	4	3	3

#### (2) General Features: Type of Involvement and Impressive Assessment on Impacts

##### Degree of Involvement in the JICA Study

Out of 31 respondents, 4 respondents are reported to have not been involved in the JICA Study at all. As result, out of 27 respondents who were involved in the Study, 13 OIDA staff was fully or oftentimes involved in the Study, while 14 staff sometimes or rarely participated in the Study.

The breakdown of their degree of involvement is presented as below.

Degree of Involvement of Respondents

Degree of Involvement	No. of Respondents	Ratio (%)
Fully involved	5	16.1
Often involved	8	25.8
Sometimes involved	4	12.9
Rarely involved	10	32.3
No involvement	4	12.9

In reference with the above result, descriptions in the subsequent session are presented in reference with views of 27 respondents who are involved in the Study.

On the other hand, in order to have closer perspectives of OIDA staff member on the JICA Study by having comparative views, 27 respondents are broadly categorized into three groups; (i) generally involved group of 27 respondents; (ii) fully or often involved group of 13 respondents; and (iii) program-specifically involved groups i.e., program II-specifically involved group of 4 respondents and Program III-specifically involved group of 9 respondents. It should be, however, noted herewith that size of sample is too small to have relevant comparative view.

### Type of Involvement

According to the results of questionnaire survey, the types of OIDA staff's involvement in the Study are tabulated as follows..

#### (a) Program wise

No.	Program of the Study	Result
1	PCM training program (Program I)	10
2	Project Monitoring Workshop (Program I)	13
3	Workshop for Irrigation Engineering (Program I)	2
4	Establishment of WUA in the Meki area (Program II)	10
5	Environmental Monitoring in the Meki Area (Program II)	5
6	Rehabilitation of Existing Irrigation Schemes (Program III)	13
7	Data collection and reporting	9
8	Others	2

#### (b) Activity wise

No.	Activities of the Program	Result
1	Site selection	6
2	PRA session / community mobilization	7
3	Engineering study	3
4	Inventory survey of irrigation facilities	4
5	Irrigation planning and design	4
6	Construction management	5
7	WUA training	4
8	Monitoring	7
9	Data collection	6
10	Attending Training or Workshop	16
11	Others	0

### Impression on impacts of programs

No.	Program of the Study	Result
1	PCM training program (Program I)	13
2	Project Monitoring Workshop (Program I)	13
3	Workshop for Irrigation Engineering (Program I)	2
4	Establishment of WUA in the Meki area (Program II)	8
5	Environmental Monitoring in the Meki Area (Program II)	3
6	Rehabilitation of Existing Irrigation Schemes (Program III)	9
7	Others	2

Through their self-assessment of impact of the JICA Study by OIDA staff, general features of are summarized and presented with the following points. Detailed comments are to be referred to the section 4.

- 1) Fresh acquisition and appreciation of PCM method in irrigation development and rehabilitation works, especially in the context of strengthening WUA.
- 2) Practical acquisition of knowledge and skills required for community-based irrigation development
- 3) Building self-confidence of community-based approach in general and application of irrigation design for standardization
- 4) Realization of increase in water discharge through rehabilitation work within a short period of time.
- 5) Increase in awareness on OIDA task to strengthen WUA both in irrigation development and rehabilitation.

### (3) Impacts of Program II

#### (a) General feature

With regards to Program II, six (6) questions were given through the survey. The results are presented as below

Results on Program II

No	Questionnaire	Category of Resonse	5	4	3	2	1	0	N	Total	Effetive	Score in %
Q3.1	Do you realize the importance of community-based irrigation development in OIDA's activities through the JICA Study?	General involved	11	11	0	0	0	1	4	27	22	87.50
		Fully or often involved	7	4	0	0	0	0	2	13	11	90.91
		Program-sepcifically	3	1	0	0	0	0	0	4	4	93.75
Q3.2	How do you evaluate the approach of establishment of WUA with small pump in the Meki area done by JICA study team	General involved	5	10	4	0	0	4	4	27	19	76.32
		Fully or often involved	3	7	0	0	0	1	2	13	10	82.50
		Program-sepcifically	1	3	0	0	0	0	0	4	4	81.25
Q3.3	Do you realize the importance of involvement of farmers from irrigation planning through the JICA Study?	General involved	10	7	2	0	0	4	4	27	19	85.53
		Fully or often involved	6	3	2	0	0	0	2	13	11	84.09
		Program-sepcifically	3	1	0	0	0	0	0	4	4	93.75
Q3.4	Do you realize the importance of OIDA social workers for community-based irrigation development through the JICA Study?	General involved	10	9	2	0	0	2	4	27	21	84.52
		Fully or often involved	4	7	0	0	0	0	2	13	11	84.09
		Program-sepcifically	3	1	0	0	0	0	0	4	4	93.75
Q3.5	Do you feel the status of OIDA social workers are improved through JICA study?	General involved	4	12	2	1	1	2	5	27	20	71.25
		Fully or often involved	2	7	0	1	0	0	3	13	10	75.00
		Program-sepcifically	1	3	0	0	0	0	0	4	4	81.25
Q3.7	Do you think "Guideline for Establishment and Management of WUA" can be utilized in other wardera in Oromia region?	General involved	5	12	0	1	2	3	4	27	20	71.25
		Fully or often involved	2	6	0	1	2	0	2	13	11	61.36
		Program-sepcifically	1	3	0	0	0	0	0	4	4	81.25

The main findings are presented as follows;

- 1) An approach of community-based irrigation development is fairly acknowledged among OIDA staff recognizing its importance.
- 2) Involvement of farmers from an initial stage of irrigation planning is also recognized to be important among respondents.
- 3) Roles of social workers in the community approach are also evaluated to be important, while improvement of the status of social workers is assessed to be less achieved in the Study.
- 4) Applicability of the guideline for establishment of WUA is fairly assessed

#### (b) Roles of Social Workers for establishment of WUA

The result is indicated as below.

	General Involved		Fully or often involved		Program -specifically	
	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)
1. Awareness creation for farmers	21	77.8	10	76.9	4	100.0
2. Community mobilization	19	70.4	9	69.2	3	75.0
3. Irrigation planning & design	4	14.8	2	15.4	1	25.0
4. Construction management	6	22.2	4	30.8	1	25.0
5. Monitoring of scheme	7	25.9	4	30.8	1	25.0
6. Agriculture extension	12	44.4	3	23.1	1	25.0
7. Others	0	0.0	0	0.0	0	0.0
Size of sample:	27		13		4	

With regard to roles of social workers that is one of focal points in the Study, it is evaluated that social workers play highly important roles in awareness creation for farmers and community mobilization. In addition to these, it is suggested that social workers are also expected to be involved in agriculture extension for sustainable management of WUA.

### (c) Important issues for sustainable irrigation scheme management

The result on this question is indicated as below.

	General Involved		Fully or often involved		Program -specifically	
	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)
1. Land distribution or allocation	14	51.9	10	76.9	3	75.0
2. Support for fund formation	2	7.4	0	0.0	0	0.0
3. Saving for pump replacement	16	59.3	6	46.2	3	75.0
4. Water management	17	63.0	8	61.5	1	25.0
5. Clarifying responsibilities between OIDA and WUA	9	33.3	6	46.2	2	50.0
6. Partipatory works by WUA	9	33.3	5	38.5	1	25.0
7. Monitoring activities	5	18.5	3	23.1	1	25.0
8. Agriculture extension	6	22.2	3	23.1	2	50.0
9. Others	0	0.0	0	0.0	0	0.0
Size of sample:	27		13		4	

Based on the results, the following findings are summarized as self-assessment of OIDA staff.

Through JICA Study, respondents have presented their views on important issues for sustainable irrigation scheme management. It is found that four (4) issues are recognized to be highly important for sustainable management as follows;

- 1) Land distribution or allocation
- 2) Saving for pump replacement
- 3) Clarifying responsibilities between OIDA and WUA
- 4) Water management

Apart from the above findings, slight different views among respondents are found to exist. Those staff involved actually in the Program II through on-the-job training paid more attention to agriculture extension rather than water management, while there is a tendency in which those who are not directly involved in the Program indicate water management as more important issue for sustainable management.

### (d) Positive and Negative Impacts of Program II

All the comments are related to positive impact. Their comments are summarized and presented as follows.

- 1) Realization of income generation of WUA members
- 2) Development of standard approach that may be encouraged to be applied to other donors and NGOs
- 3) Recognition of complicated but essential issue of land allocation for establishment of WUA
- 4) Building self-confidence of community approach as well as technical applied design based on tangible results at community level

For first-hand comments of OIDA staff, see the section 4.

### (e) Main constraints for OIDA to continue Program II

OIDA staff was asked to provide their views on any constraints for OIDA to maintain

activities of Program II.

Through their self-assessment, three main constraints are summarized and presented as follows;

- 1) Financial constraint
- 2) Less availability of reliable human resources
- 3) Organizational constraints of OIDA
- 3) Land use constraints

Following the above three major constraints, two subsequent issues are also indicated.

- 1) Persistent less attention to social dimension of activities in planning process
- 2) Complication of land reallocation

#### (4) Impacts of Program III

##### (a) General feature

With regards to Program III, nine (9) questions were given through the survey. The results are presented as below

Results on Program III

No	Questionnaire	Category of Resonse	5	4	3	2	1	0	N	Total	Effetive	Score in %	
Q4.1	Do you realize the importance of rehabilitation or maintenance works of existing irrigation schemes in OIDA's activities through Study?	General involved	15	8	0	0	0	1	3	27	23	91.30	
		Fully or often involved	6	5	0	0	0	0	0	2	13	11	88.64
		Program-sepcifically	5	4	0	0	0	0	0	0	9	9	88.89
Q4.2	How do you evaluate the approach of categorizing existing schemes based on type of constraints proposed by JICA Study team?	General involved	2	10	1	0	0	9	5	27	13	76.92	
		Fully or often involved	1	6	0	0	0	2	4	13	7	78.57	
		Program-sepcifically	1	6	0	0	0	1	1	9	7	78.57	
Q4.3	How do you evaluate the rehabilitation approach of starting from Problem Analysis with WUA members? (e.g., Gedamso)	General involved	7	8	1	2	0	6	3	27	18	77.78	
		Fully or often involved	3	5	0	2	0	1	2	13	10	72.50	
		Program-sepcifically	3	3	0	2	0	1	0	9	8	71.88	
Q4.4	How do you evaluate the effectiveness of preparation of scheme layout map, plot map, and list for scheme management?	General involved	8	8	0	0	0	6	5	27	16	87.50	
		Fully or often involved	6	4	0	0	0	0	3	13	10	90.00	
		Program-sepcifically	5	3	0	0	0	0	1	9	8	90.63	
Q4.5	Do you realize the importance of OIDA social workers for rehabilitation of existing schemes through the JICA study?	General involved	9	9	1	1	0	0	7	27	20	82.50	
		Fully or often involved	3	6	0	0	0	0	4	13	9	83.33	
		Program-sepcifically	3	5	0	0	0	0	1	9	8	84.38	
Q4.6	How do you feel the importance of regular collection of water fee by WUA for operation and maintenance of scheme?	General involved	12	10	0	0	0	0	4	26	22	88.64	
		Fully or often involved	6	4	0	0	0	0	3	13	10	90.00	
		Program-sepcifically	6	2	0	0	0	0	1	9	8	93.75	
Q4.7	How do you feel the importance of clarifying demarcation of responsibilities between WUA and OIDA at handing over?	General involved	15	8	0	0	0	0	4	27	23	91.30	
		Fully or often involved	8	2	0	0	0	0	3	13	10	95.00	
		Program-sepcifically	8	1	0	0	0	0	0	9	9	97.22	
Q4.8	How do you feel the importance of land exchange or reallocation to increase the number of beneficiaries in existing schemes?	General involved	18	4	0	0	1	0	4	27	23	91.30	
		Fully or often involved	10	0	0	0	0	0	3	13	10	100.00	
		Program-sepcifically	8	0	0	0	0	0	1	9	8	100.00	
Q4.9	How do you feel the importance of systematic monitoring for existing schemes by OIDA through the JICA Study?	General involved	10	11	1	0	0	0	5	27	22	85.23	
		Fully or often involved	4	6	0	0	0	0	3	13	10	85.00	
		Program-sepcifically	4	4	0	0	0	0	1	9	8	87.50	

The main findings are presented as follows;

- 1) It is obviously found that the importance of rehabilitation of existing schemes is assessed to be highly important.
- 2) With regard to the JICA's Problem Analysis approach to rehabilitation work, the importance of the approach is fairly acknowledged.

##### (b) Important issues identified through JICA Study

- 1) Through the JICA Study, the three issues are highly evaluated to be important for



sustainable irrigation scheme management through rehabilitation works. Three issues are;

- (i) land exchange or reallocation for increase in number of WUA members
- (ii) Clarifying demarcation of responsibilities between OIDA and WUA
- (iii) Collection of regular water fee

It is importantly noted herewith that all he who was actually involved in the JICA Study indicated the importance of land exchange or reallocation for maximization of beneficiaries.

- 2) Following the above three highly assessed important issues, two issues are also recognized to be important in the context of strengthening WUA as management unit. Two issues are;

- (i) preparation of basic scheme information including scheme layout map, plot map, list for scheme management;
- (ii) facilitation of social worker for rehabilitation works

(c) Positive and Negative Impacts of Program III

All comments have shown as positive impact. Their comments are summarized and presented as follows;

- 1) Realization of increase in volume of water discharge for all the schemes
- 2) Experience and realization of efficient rehabilitation work
- 3) Strengthening of WUA in terms of (i) increase in a sense of ownership of WUA; (ii) increase in the number of WUA members; (iii) increase in capacity to utilize irrigation water.

(d) Main constraints for OIDA to continue Program III

OIDA staff was asked to indicate any constraints for OIDA to maintain activities of Program III.

Through their self-evaluation process, three main constraints are summarized and presented as follows;

- 1) Financial constraint
- 2) Improper information management
- 3) Weakness in monitoring
- 4) Wareda financial constraints

(5) General Impact Assessment of Capacity-building for OIDA staff and Organization

OIDA staff was asked to provide the Study team with their general impact assessment of JICA Study on OIDA staff as well as OIDA organization. The results are presented as follows.

No	Questionnaire	Category of Resonse	5	4	3	2	1	N	Total	Effective	Score in %
Q5.1	Do you feel there is any awareness creation in your or other OIDA staff's ming for irrigation development through JICA Study?	General involved	6	15	1	0	2	3	27	24	73.96
		Fully or often involved	2	9	0	0	0	2	13	11	79.55
		Program II-sepcifically	0	3	0	0	0	1	4	3	75.00
		Program III-sepcifically	2	6	0	0	0	1	9	8	81.25
Q5.3	Do you feel there is any capacity building of technical skills or performance of you or other OIDA's staff through JICA study?	General involved	7	7	4	1	1	7	27	20	72.50
		Fully or often involved	1	5	1	1	0	5	13	8	68.75
		Program II-sepcifically	0	0	1	0	0	3	4	1	50.00
		Program III-sepcifically	1	5	0	1	0	2	9	7	71.43
Q5.5	Do you feel there is any change or improvement of OIDA organization through JICA Study?	General involved	1	13	3	1	1	8	27	19	65.79
		Fully or often involved	0	6	1	1	0	5	13	8	65.63
		Program II-sepcifically	0	1	1	0	0	2	4	2	62.50
		Program III-sepcifically	0	5	0	1	0	3	9	6	66.67

Views of OIDA staff concerning the above three points are summarized and presented as follows;

(a) Contents of awareness creation

Their views are summarized into the main four (4) points;

- 1) Realization of pump irrigation with community
- 2) Awareness creation on problem analysis approach
- 3) Sensitization on an issue of WUA management
- 4) Realization of organizational efficiency and works

(b) Contents of Capacity-Building on Technical Skills and Techniques

Their views are summarized into the main three (3) points;

- 1) Planning and management
- 2) Project monitoring and evaluation
- 3) Skills of social workers

(c) Any Changes or Improvement of OIDA through the JICA Study

Their views are summarized into the main three (3) points;

- 1) Recognition of small-scale irrigation and sustainability
- 2) OIDA's approach to project planning and implementation
- 3) Irrigation performance

(6) Self-assessment for the future OIDA

At the end of questionnaire, OIDA staff was asked to give their self-assessment to provide the JICA Study team with their comments concerning two issues; (i) areas to be strengthened for OIDA future activities; and (ii) areas to require external support to OIDA

(a) Areas in need of strengthening

The result of identification of areas to be strengthened for OIDA future activities are presented as below

	General Involved		Fully or often involved		Program II-specifically		Program III-specifically	
	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)
1. Community-based irrigation development	16	59.3	10	76.9	3	75.0	6	66.7
2. Rehabilitation of existing scheme	9	33.3	4	30.8	1	25.0	4	44.4
3. Water harvesting project	13	48.1	7	53.8	1	25.0	5	55.6
4. Research of irrigation technology	16	59.3	11	84.6	3	75.0	7	77.8
5. Construction of new irrigation scheme	5	18.5	4	30.8	1	25.0	4	44.4
6. Study and design of new irrigation scheme	6	22.2	2	15.4	1	25.0	2	22.2
7. Agriculture extension in irrigation scheme	10	37.0	2	15.4	2	50.0	0	0.0
8. Monitoring of existing scheme	7	25.9	3	23.1	1	25.0	2	22.2
9. Monitoring of water resource and environment	0	0.0	0	0.0	0	0.0	0	0.0
10. Other	0	0.0	0	0.0	0	0.0	0	0.0
Size of sample:	27		13		4		9	

It is found that three (3) main areas of activities are paid more attention to be strengthened for OIDA in the future.

- (i) Research of irrigation technology
- (ii) Community-based irrigation development
- (iii) Water harvesting project

In addition to the above main areas, activity of agriculture extension in irrigation scheme is also felt-assessed to be important by those who are directly involved in Program II of the Study.

(b) Areas in need of external support

In parallel with the above question, OIDA staff was also asked to provide the Study team with prioritized areas where external support is required for OIDA

	General Involved		Fully or often involved		Program II-specifically		Program III-specifically	
	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)	No	Ratio (%)
1. Community-based irrigation development	11	40.7	6	46.2	3	75.0	2	22.2
2. Rehabilitation of existing scheme	9	33.3	5	38.5	0	0.0	5	55.6
3. Water harvesting project	7	25.9	4	30.8	1	25.0	3	33.3
4. Research of irrigation technology	18	66.7	10	76.9	4	100.0	6	66.7
5. Construction of new irrigation scheme	9	33.3	6	46.2	1	25.0	6	66.7
6. Agriculture extension in irrigation scheme	6	22.2	2	15.4	2	50.0	0	0.0
7. Monitoring of existing scheme	4	14.8	2	15.4	1	25.0	1	11.1
8. Monitoring of water resource and environment	3	11.1	1	7.7	0	0.0	1	11.1
9. Capacity building for OIDA staff	16	59.3	8	61.5	2	50.0	6	66.7
10. Other	0	0.0	0	0.0	0	0.0	0	0.0
Size of sample:	27		13		4		9	

Respondents provided their views through which three (3) areas are generally in high attention as follows;

- 5) Research of irrigation technology
- 6) Capacity-building for OIDA staff
- 7) Community-based irrigation development

Apart from the above three areas, supplementary views are also presented. Those who were involved in Program III placed more emphasis on an area of construction of new irrigation scheme as a view of construction engineer, while those actually involved in Program II presented their views that an area of agriculture extension in irrigation scheme is in need of external support

**4. First-hand comments made by OIDA Staff**

(1) Main reasons on the impacts of their selected three programs (Results from Question No 2.5)

1) PCM Problem Analysis helps us for irrigation development and rehabilitation works

1-1 PCM workshop is found important in project planning mainly by identifying root causes of problems from which projects with obstacles can be derived. Establishment of WUA around Meki area increased my skill in conduction PRA sessions and how to involve communities in project preparation. From monitoring study and workshop designing questionnaires, evaluations performance of implemented scheme and recommend mitigations (Agriculture Economist)

- 1-2 To get core problem i.e. from many problems we find out the main problem which is "core problem" (Agricultural Engineer)
  - 1-3 I got a hint (clue) how to organize problem of WUA in cause effect structure and intervene systematically to solve these problems (Agricultural Engineer cum Wareda OIDA Head)
  - 1-4 PCM help me to be cell the problem tree and case study on PCM is very interesting to ward handling problem in practical life. Project monitoring and evaluation process and its workshop help me to know how to gather data and analyzing and inter printing them and also the way recommending it is very interesting and I get a good know how about it (Wareda Agronomist)
  - 1-5 Even though the duration of the workshop was short. It was accompanied by theory and practical session which help us during rehabilitation of the scheme for mobilizing community the other reasons. The lecture were also supported by teaching materials problem analysis etc. (Wareda Irrigation Development Agent)
- 2) Acquisition of knowledge and skills required for community-based irrigation development
    - 2-1 Establishment of WUA around Meki area increased my skill in conduction PRA sessions and how to involve communities in project preparation.(Agriculture Economist)
    - 2-2 I acquire enough knowledge how to organize irrigation communities in Meki area (pump irrigation) 2) It helps me how to know the performance of schemes and identify the problems encountered by users. (Agricultural Engineer cum Wareda OIDA Head)
  - 3) Building self-confidence of community-based approach and application of irrigation design
    - 3-1 I have designed the pump and the canals of the projects in Meki areas and I could observe that the schemes were of great benefit to the PA's. They could use the systems designed very well. (Hydraulic Engineer cum Team Leader)
  - 4) Realization of increase in water discharge through efficient rehabilitation work
    - 4-1 Discharge of water increased in all schemes that are rehabilitated (Water shortage deceased). Ownership sentiment created interims of share of responsibility. (Agriculture Economist)
    - 4-2 It is timely need to during radical progress of community's life on the basic knowledge of irrigation system. (Surveyor)
  - 5) Increase in awareness on OIDA task to strengthen WUA
    - 5-1 Specially in the rehabilitation program ways of maintaining the existing irrigation schemes by WUA was discussed and how the WUA could arrange and benefit from the schemes and small pumps irrigation management. (Agriculture Science cum Wareda OIDA Head)

- 5-2 In project monitoring and rehabilitation of scheme the impact of the program is make awareness creation and how to monitor by OIDA and what kind of monitoring activities done by WUA is clearly described how to make collect and use data, making of bye-low is clarified and it has to be done by WUA themselves (Wareda Irrigation Engineer)
- 5-3 It helps me how to know the performance of schemes and identify the problems encountered by users. (Agricultural Engineer cum Wareda OIDA Head)
- 5-4 About WUA establishment I have already got enough knowledge how to, select, aware, (profitability study of socio-economic condition of new WUA and other work to ward organizing new WUA. (Wareda Agronomist)
- 5-5 Because of rehabilitated the irrigation scheme and training is given, the farmers able to use effectively.(General Agriculture cum Wareda OIDA Head)
- 6) Others related to monitoring and training workshop in general
- 6-1 From monitoring study and workshop designing questionnaires, evaluations performance of implemented scheme and recommend mitigations (Agriculture Economist)
- 6-2 Got good knowledge and printed handouts valuable to my works regarding hydrology. Improved use of computers on hydrologic analysis (Irrigation Engineer)
- 6-3 Experience sharing during the workshop (Agriculture Economist)
- (2) Positive and negative impacts of Program II (Results of Question 3.9)
- 1) Realization of income generation of WUA members
- 1-1 Beneficiaries are earning enough income from their scheme (Agricultural Engineer cum Wareda OIDA Head)
- 2) Development of standard approach
- 2-1 I prefer and urge other NGOs (Donors) to adopt small scale irrigation projects. (Agricultural Engineer cum Wareda OIDA Head)
- 3) Recognition of complicated but essential issue of land allocation
- 3-1 Experience in establishing community based WUA origination. Understanding complicated issues like land allocation. Conduction PRA sessions brain storming from the grass root level.(Agriculture Economist)
- 4) Increase in self-confidence of community approach as well as technical design
- 4-1 I have the honor that I designed the schemes for the community and is sustainable.(Hydraulic Engineer cum Team Leader)
- 4-2 The program in Meki area which supports WUA is very good because it clearly the responsibilities of WUA and how monitoring and evaluation is done by WUA them selves, how mange the pump, how to collect the fee and problem tree is done by WUA them selves and they can solve their problems by themselves for future. (Wareda Irrigation Engineer)

- 4-3 The program helps me to know how to organize and follow up and evaluate the WUA procedural. Almost I get confidence to ward establishing new WUA If I doesn't get such type of work condition, I will get dissatisfaction toward my job, such type of condition should be continued. (Wareda Agronomist)
- 4-4 Increased effectiveness of the association in managing their irrigation system (Irrigation Engineer)
- 4-5 To teach the community about irrigation to have through knowledge and convince fully their controversy. (Surveyor)
- 4-6 Water management which is done by community (WUA) (Surveyor)

(3) Constrains for OIDA to continue Program II (Results of Question 3.10)

1) Financial constraints

- 1-1 1) Deficit of budget for pump purchase 2) Technical labour cost (deficit) (Branch Manager)
- 1-2 Budget (Hydraulic Engineer cum Team Leader)
- 1-3 Lack of budget to sustain irrigation scheme management. (Wareda Agronomist)
- 1-4 Source of fund (for such activates) 2) Logistic problem 3) Organization and co-ordination problems (Irrigation Engineer)
- 1-5 Fund is the critical issue (Wareda Irrigation Development Agent)
- 1-6 Nothing I understood except the budget constraint in relation to take professional man power at site or woreda level. (Agriculture Science cum Wareda OIDA Head)
- 1-7 Lack of finance (Wareda Irrigation Development Agent)
- 1-8 I think the OIDA need financial support and other facility towards new WUA development activity. Other alternative technology also introduce in the area. Towards agricultural extension and agronomy small scale center are important. (Wareda Agronomist)

2) Less availability of reliable human resources

- 2-1 lack of technical capacity (pump and accessories) for farmers. (Agricultural Engineer cum Wareda OIDA Head)
- 2-2 Less number of staff. (Branch Manager)
- 2-3 Lack of skilled manpower. (Wareda Irrigation Development Agent)
- 2-4 (1) Supports in facilitating the capacity-building of workers. (2) JICA's contribution in OIDA's project like maintenance. (Surveyor)
- 2-5 Capacity of OIDA to address all beneficiates (Irrigation Engineer)

3) Organizational constraints of OIDA

- 3-1 (1) Lack of well developed communication net work, with district OIDA office and WUA's. (2) Lack of knowing the make task and mandate of OIDA and other organization (Agriculture Economist)
- 3-2 More focusing on social organizing for self-reliance (Social worker)

- 3-3 Lack of commitment by the stakeholders in social aspects of project planning.  
(Agriculture Economist)
- 3-4 Strict study, investigation and follow up must be done (Senior Agronomist)
- 3-5 There is a gap between construction and implementation (extension) so OIDA has to minimize this gap. (Irrigation Engineer)
- 4) Land use constraints
  - 4-1 The main constraint is that associated with land issued (Agriculture Economist)
- (4) Positive and Negative Impacts of Program III (Results of Question 4.11)
  - 1) Realization of increase in volume of water discharge for all the schemes
    - 1-1 Discharge of water increased in all schemes that are rehabilitated (Water shortage deceased). Ownership sentiment created interims of share of responsibility.  
(Agriculture Economist)
    - 1-2 Improved effectiveness of schemes and hence efficient utilization of those schemes contributed or played role in securing food at household level.(Irrigation Engineer)
    - 1-3 Schemes which were not giving service due to lack of maintenance are expected to give service. So scheme sustainability is hereby ensured.(Hydraulic Engineer cum Team Leader)
    - 1-4 The irrigation maintenance is very important if not it is out of the use because some time maintenance is over the WUA. (Wareda OIDA Head)
    - 1-5 Satisfaction because of operation and maintenance activities. (Wareda Irrigation Development Agent)
  - 2) Experience and realization of efficient rehabilitation work
    - 2-1 (1) Supervision correctly follow (2)For the short time rehabilitation finished (3)Effectively use the truck and construction materials (Construction Engineer)
    - 2-2 Well learned how to take care for rehabilitation of existing irrigation schemes.(Surveyor)
  - 3) Strengthening of WUA management
    - 3-1 Due to rehabilitation, (1)Irrigable area and number of beneficiaries will increase (2)Irrigation scheme serve sustainable. (3)Food security sustainable at irrigation area.  
(Wareda OIDA Head)
    - 3-2 (1) Improving the capacity of water user association (WUA) to efficient water utilization as well as production exchange value. (2) Initiating other community for similar new scheme development. (N.A.)
    - 3-3 It invites the NGO's to rehabilitate the schemes, as a result. The number of beneficiaries increased as the same time the yield also increased. (Wareda Irrigation Development Agent)
    - 3-4 (1) Make the project functional just like new one (2) give awareness for WUA how to use their land and marketing system.(Irrigation Engineer)

- 3-5 Improving the life style of the farmers around the area.(Planning Head)
- 3-6 In rehabilitation of existing irrigation schemes is very good because it makes awareness creation on how to allocate the irrigation land and it makes awareness in monitoring and evaluation done by WUA. (Wareda Irrigation Engineer)
- 3-7 Irrigation canal maintenance is important for sustainability use of water recourses to improve the living standard of farmers.(Wareda Agronomist)
- 3-8 The rehabilitation work done on it programme, The supporting is good and following land distribution is in good progress.(Construction Engineer)
- 4) Other related comments
  - 4-1 This should be continued if possible (Senior Agronomist)
  - 4-2 It is positive, but before starting for construction the attitude, interest and fully participation of farmers on construction activity and to make use it available resource to it's best possible use should has to be assured by the beneficiary.(Agriculture Economist)
- (5) Constrains for OIDA to continue Program III (Results of Question 4.12)
  - 1) Financial constraint
    - 1-1 Budget, Scarcity of fund, Lack of resources (plural respondents)
    - 1-2 Lack of financial and technical support (social worker)
  - 2) Improper information management
    - 2-1 Absence of detailed information about the project to be rehabilitated e.g. (1) drawing feasibility study document, (2) operation and maintenance manual (3) information catalogs etc. Shortage of machinery (truck, tractors, service, grader etc.) (N.A.)
  - (3) Weakness in monitoring
    - 3-1 To check the constructed schemes on time before it exposed to great damage (Surveyor)
  - (4) Wareda financial constraint
    - 4-1 Lack of budget for extension workers (Wareda Irrigation Development Agent)
- (6) Contents of awareness creation through the JICA Study (Results of Question 5.2)
  - 1) Pump irrigation with community
    - 1-1 Possibility of scheme implementation with few staff (Branch Manager)
  - 2) Problem analysis approach
    - 2-1 Awareness on how to approach to schemes through problem analysis in evaluation and monitoring system for scheme sustainability (Irrigation Engineer)
    - 2-2 Discussing on problems through brainstorming which is very effective for future work.(Wareda OIDA Head)
    - 2-3 how to solve the problem through problem tree.(Wareda Irrigation Engineer)
    - 2-4 Specially in PCM and more in community management (Social Worker)



- 2-5 Since the JICA study team share his experience we have got a great knowledge especially on problem analysis, extension approach (participatory approach). In general they widen our minds to build awareness of and mobilize the community (Wareda Irrigation Development Agent)
- 3) WUA management
- 3-1 Establishing community based irrigation development through strengthening of WUA management.(Agricultural Economist)
- 3-2 Especially, the attitude towards land allocation. Each plot for irrigation farmer - this practice is good for overall management because each irrigation farmer must know his responsibility.(Senior Agronomist)
- 3-3 (1)How to create awareness of WUA (2) how to manage the WUA (Wareda Irrigation Engineer)
- 4) Organizational efficiency and works
- 4-1 Possibility of scheme implementation with few staff (Branch Manager)
- 4-2 JICA rehabilitate Ketar irrigation project in best quality with in short period of time (Wareda OIDA Head)
- 4-3 (1) clarification of responsibilities of OIDA and WUA (4)how to monitor and evaluate the scheme (Wareda Irrigation Engineer)
- (7) Contents of Capacity-Building on Technical Skills and Techniques (Results of Question 5.4)
- 1) (a) Participatory scheme planning (b) Data collecting and planning for the scheme planning (c)Data management (Branch Manager)
- 2) Project monitoring and evolution, Project study and design, Project appraisal (Economist)
- 3) Upgrading the skill of OIDA social workers (Agricultural Economist)
- (8) Any Changes or Improvement of OIDA through the JICA Study (Results of Question 5.6)
- 1) Small-scale irrigation and sustainability
- 1-1 (a)OIDA understands small scale irrigation schemes are more efficient than conventional ones. (b) OIDA get skill how to organize irrigation community and mobilization resources in sustainable manner (Agricultural Engineer cum Wareda OIDA Head)
- 1-2 Ways of organizing small groups of farmers to use small irrigation pumps so that it could be manageable by farmers. This is very good change. Trial of rehabilitation of schemes that are left without use is another good change and awareness creation through discussion, etc. (Wareda OIDA Head)
- 2) OIDA's approach to project planning and implementation
- 2-1 (a) Change in capacity of project planning (b) Approach in project rehabilitation planning (c) Approach in project implementation management (Branch Manager)

- 2-2 The basic attitude to evaluation our previous schemes or to correct technical strangeness on construction (Social Worker)
  - 2-3 (a) Clarifying responsibilities between OIDA and WUA (b) monitoring activities and evaluation done by OIDA and WUA (Wareda Irrigation Engineer)
  - 2-4 JICA study changes to mitigate some gaps between construction and implementation (Irrigation Engineer)
  - 2-5 Improved system of problem (identification, analysis and implementation intervention) (Irrigation Engineer)
  - 3) Irrigation performance
    - 3-1 Efficient use of irrigation water and the increment of beneficiaries through land exchanges (Wareda Agronomist)
  - 4) Other
    - 4-1 Engineering materials like book and software and computers (Irrigation Engineer)
- (9) General Comments to JICA Study
- 1) In relation with community-based approach to irrigation development
    - 1-1 The works of JICA study team is important for the facts that they are evolved in developing small community based projects and rehabilitation of existing schemes which are very important in making the rural communities food self-sufficient. (Hydraulic Engineer cum Team Leader)
    - 1-2 The discipline, principles and major activities you have stated above like (monitoring, evaluation, rehabilitation, establishing WUA's etc) were very relevant for the success of small scale irrigation projects) (Agricultural Economist)
  - 2) In relation with rehabilitation
    - 2-1 It is important as schemes that are not giving service due to lack of rehabilitation are expected to make the schemes operational (Hydraulic Engineer cum Team Leader)
    - 2-2 Ketar Irrigation development scheme rehabilitee in best quality with in short period of time we take pleasure in rehabilitation of this scheme. I thank you for rehabilitate this scheme but I ask you for the next time:- 1) We want to expand the irrigable area and increase the beneficiaries 2) We want to develop fruit production 3) There is shortage of manpower and there is no training general at the next programme help us on these three reasons (points) (Wareda OIDA Head)
    - 2-3 General comments to the JICA study group is that their workshop is very interesting and makes behavioral change to trainees and their rehabilitation work on scheme is good mostly but at end there is lack of budget and the work is not fully finished, according to the schedule. There is problem during the starting survey due to short period of time and then what to plan and design is not fully worked in inventory survey of schemes. Finally JICA study group has to be make handover program to

rehabilitate scheme. If for future JICA has to be works on research on irrigation and water harvesting project development then change of way of life is made on farmers who uses irrigation (Wareda Irrigation Engineer)

2-4 The rehabilitation program of JICA is good but if it is well planned and programmed more better (Senior Agronomist)

### 3) Needs of training and capacity building

3-1 Short training program for OIDA staff according to their profession more than a week has not being done. i.e. 1) On study and design 2) construction 3) Agricultural Extension etc. Participants are limited during your study. (Construction Engineer)

3-2 Really appreciate JICA's study regarding social workers and community base activates but JICA has to give a chance in capacity building for the higher classes i.e for study design and the construction staff as well.(Irrigation Engineer)

3-3 It will be good if JICA plan to strengthen the OIDA staff, specially the study and design team through trainings on recent software that enable the team effective and timely in study and design of irrigation schemes that are the basis for sustainability of schemes. It is also good if JICA focus on field visits for exchange of experience inter regional and further, to build skill of OIDA's staff.(Irrigation Engineer)

3-4 Short and long term training are expected to be provided us additionally to the profession.(Construction Engineer)

3-5 JICA has facilitated a simple capacity-building programs. We wish for the future JICA will do it's in our profession. (Surveyor)

3-6 Really, I found very necessary and important the activity conducted by JICA. However the system for your program especially on capacity building needs improvement. Please come to us with the new technology. Visit us with computerized irrigation development -soil study, Crop development, Watershed management, Environment impact assessment, Auto-Cad program etc. are very important (Senior Agronomist)

### 4) Needs in other fields

4-1 The discipline, principles and major activities you have stated above like (monitoring, evaluation, rehabilitation, establishing WUA's etc) were very relevant for the success of small scale irrigation projects) but on all what mentioned above and on other tasks JICA were expected to work more and needs to shows us tangible outcomes mainly in the fields of irrigation and water resource management aspects (Agricultural Economist)

4-2 current project are not related to extension activities, i.e. organizing (developing) and follow up credit users; supply of selected seeds and spray by credit; developing nursery site for demonstration for other similar community base schemes, which has a result of more encouragement to irrigation utilization for food self seficient

(N.A.)

- 4-3 Please do the following things 1) To construct the road from Goljota to Sadi 24km. 2)To construct community base irrigation in i) around Gumgume ii)Duwe iii)Sade and Tufa 3) To maintain irrigation schemes of i) Deguga ii)Dellele iii) Meti (Wareda OIDA Head)

5) Others

- 5-1 Initially, this study team oriented the Authority to handover those vehicles used for this study, However nothing has yet seen and hence if it is found possible the team shall hand them over to OIDA so that the Authority can get relief of shortage of vehicles. If possible, propose to expand information technology to the concerned body, so that problem of information exchange can be solved between OIDA head office and branch offices as well as international organization supporting development of irrigation technology (Irrigation Engineer)
- 5-2 It is well appreciable in general view and preparing of workshop has to be continued. For it is the place where very good lesson can be learned from different direction for facilitating how to overcome for the obstacles occurred during the activity (Surveyor)
- 5-3 Community-based irrigation development should be amended for future. Capacity building for OIDA staff should be considered. The existing study should be clarified for OIDA staff. Generally the activities of JICA team shall be continued for future (Irrigation Engineer)

ANNEX II

HYDROLOGY AND WATER USE IN MEKI

## ANNEX II

### HYDROLOGY AND WATER USE IN MEKI

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## CHAPTER 1 INTRODUCTION

In view of limited water resources and fragile environmental conditions of the Rift Valley system, OIDA is in a position to take responsibilities for periodical monitoring of expanding irrigation water use and for judicious planning for protection of the eco-system. The Study for Meki Irrigation and Rural Development Project in Oromia Region Ethiopia (hereinafter “The Meki study) recommended OIDA to embark on the hydrological environmental monitoring in line with [4-1] Environmental Monitoring Program under the master plan.

In 2002, the irrigation schemes in Meki were hit by severe drought. The river discharge of the Meki river was drastically decreased and did not allow local farmers to pump up sufficient water for irrigation farming. Since change of hydrological conditions thus directly affects the sustainability of the community-based irrigation development in Meki, continuous observation of the river discharge is utmost important so as to avoid social unrest especially for vulnerable people.

Taking large fluctuation of water availability of the Meki river into consideration, potentials use of alternative water sources, i.e. lake water and groundwater, were also focused on. The Study firstly made the technical study of the irrigation development along the lakeshore of Ziway. Secondly the groundwater irrigation is also studied according to the suggestion by OIDA.

With the above-mentioned background, hydrological observation and water use monitoring were taken up as capacity building program throughout the study period. The following is the result worked out in the study period.

## CHAPTER 2 METEOROLOGY AND HYDROLOGY IN THE MEKI AREA


### 2.1 Meteorological and Hydrological Data Collection

#### (1) Rainfall Data

Rainfall data in the following period at two stations, which are in the project area, was collected from the National Meteorological Services Agency (NMSA).

**Collection Data**

No.	Station	Coordinates		Altitude	Collection Data			
		Latitude	Longitude		2000	2001	2002	2003
1	Meki	8° 09'N	38° 19'E	1,400 m				
2	Alem Tena	8° 18'N	38° 56'E	1,720 m				


Note:  : data is available

#### (2) Hydrological Data

Hydrological data in the following period was collected from Ministry of Water Resource office.

**Collection of Hydrological Data**

No.	River	Station	Coordinates		Drainage Area (km <sup>2</sup> )	Collection Data			
			Latitude	Longitude		2000	2001	2002	2003
1	Meki	Meki Village	8° 09'N	38° 50'E	2,433				
2	Ziway Lake	Bochessa	7° 54'N	38° 45'E	7,736				

Note:  : data is available

The Meki river discharge data from May to July 2002 is not available because the gauge station was reinstalled in this period.

### 2.2 Meteorological and Hydrological Monitoring

#### (1) Rainfall in Meki Area

Monitoring of rainfall at Meki area has continuously been carried out during the study period. The rainfall is the most important factors for agriculture activities. After the Meki study, the rainfall data from 2000 to 2003 was collected as follows.



**Monthly Rainfall at Meki Station (2000 – 2003)**

Year	Monthly Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average 1966-1999	14.9	38.6	55.2	60.9	66.9	81.5	172.0	150.5	88.1	36.7	6.9	1.9	774.2
2000	0.0	0.0	0.0	77.4	63.3	56.6	112.7	181.4	138.3	18.1	63.0	19.2	730.0
2001	0.0	44.1	147.7	15.3	113.6	50.3	180.5	154.8	47.6	0.0	0.0	0.0	753.9
2002	0.0	8.6	42.1	72.3	12.7	65.1	121.7	145.6	29.3	0.0	0.0	24.2	521.6
2003	31.3	N.A	86.5	166.5	9.7	44.5	269.4	94.5	15.7	0.0	0.0	55.5	N.A

Source: Rainfall data (2000-2003) : National Meteorological Services Agency  
Average rainfall data (1966-1999) : JICA Meki Study Report, 2002

**Monthly Rainfall at Alem Tena Station (2000 – 2003)**

Year	Monthly Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average 1987-1999	10.5	43.5	52.3	71.3	35.7	71.8	197.3	171.8	95.4	29.4	1.7	2.4	783.2
2000	0.0	0.0	0.0	127.1	89.0	51.7	207.8	142.0	155.8	52.7	54.0	N.A	N.A
2001	0.0	24.6	157.7	15.7	104.2	200.2	155.3	73.1	0.0	0.0	0.0	0.0	844.6
2002	1.5	35.4	24.3	82.9	11.3	45.0	N.A.	150.7	45.6	0.5	0.0	N.A	N.A
2003	19.0	16.4	116.9	54.0	29.4	84.6	392.5	105.4	96.5	0.0	0.0	21.7	936.4

Source: Rainfall data (2000-2003) : National Meteorological Services Agency  
Average rainfall data (1987-1999) : The Meki Study Report, 2002

In 2002 the annual rainfall is 521.6 mm against 774.2 mm in average (1966-1999) at Meki station, farmers experienced drought in this year.

**(2) River Discharge of the Meki River**

Monitoring of river discharge of the Meki river has continuously been carried out during this study period. In order to continue sustainable irrigation farming using pump monitoring of the river discharge is necessary.

The Meki river originates in the highland of Guraghe and travels a distance of about 100 km from the highlands at altitude of 3,600m to 1,636 m before draining into the Ziway lake. The upper reaches of the basin are steep and mountainous, while the lower basin is flat with broad valley. The total catchment area of the river near Meki town is 2,433 km<sup>2</sup>. According to the Meki study report, average annual discharge of the river near Meki town (1965-1999) is 291 MCM or 9.18 m<sup>3</sup>/s. Monthly discharge of the river at Meki town station is summarized as below.

**Average Discharge of the Meki River near Meki Town (1965 - 1999)**

Average River Discharge (m <sup>3</sup> /s)													Annual Volume (MCM)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
0.94	2.28	5.01	7.01	7.31	6.29	18.75	29.64	19.93	8.77	3.29	0.90	9.18	291

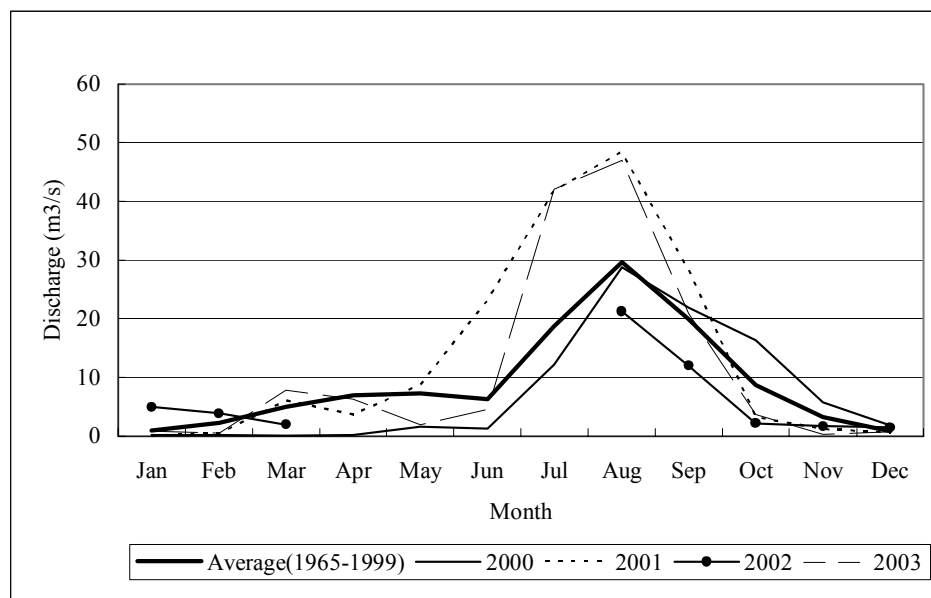
Source: JICA Meki Study Report, 2002

The high discharge occurs during the months of August and September, while lower discharge generally occurs during the dry season from December to February. The river discharge sometimes becomes zero during these months. The monthly discharge of the Meki river from 2000 to 2003 is presented in the following table and figure.

**Monthly Discharge of the Meki River near Meki Town (2000 – 2003)**

Year	Monthly Average River Discharge (m <sup>3</sup> /s)													Annual Volume (MCM)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Average 1965-1999	0.94	2.28	5.01	7.01	7.31	6.29	18.75	29.64	19.93	8.77	3.29	0.90	9.18	291
2000	0.17	0.13	0.07	0.24	1.60	1.28	12.20	28.79	21.94	16.37	5.77	1.83	7.58	240
2001	0.14	0.43	6.06	3.67	8.79	23.14	41.92	48.42	28.25	3.19	1.15	0.60	13.92	439
2002	4.94	3.87	1.97	-	-	-	-	21.28	12.03	2.16	1.69	1.42	-	-
2003	0.86	0.51	7.85	6.23	1.96	4.61	42.11	46.95	20.89	3.67	0.32	0.73	11.52	363

Source: Discharge data (2000-2003) : Ministry of Water Resource  
Average discharge (1965-1999) : JICA Meki Study Report, 2002



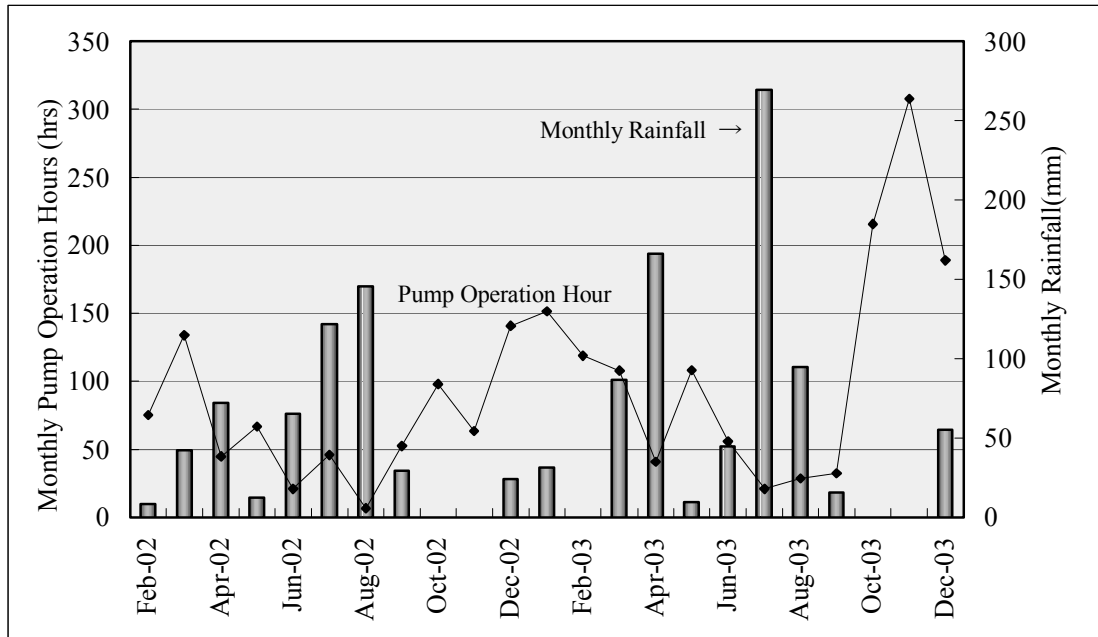
Source: Ministry of Water Resource, JICA Meki Study report

### Monthly River Discharge of the Meki River at Meki Town

## 2.3 Water Constrain for Irrigation in Shubi-Sombo Schemes

According to the monitoring of the Shubi-Sombo schemes most of WUA members experienced a serious drought problem associated with shortage of the Meki river discharge. The following graph presents monthly pump operation hours in the Sombo Genet WUA after handing over and monthly rainfall at the Meki station.

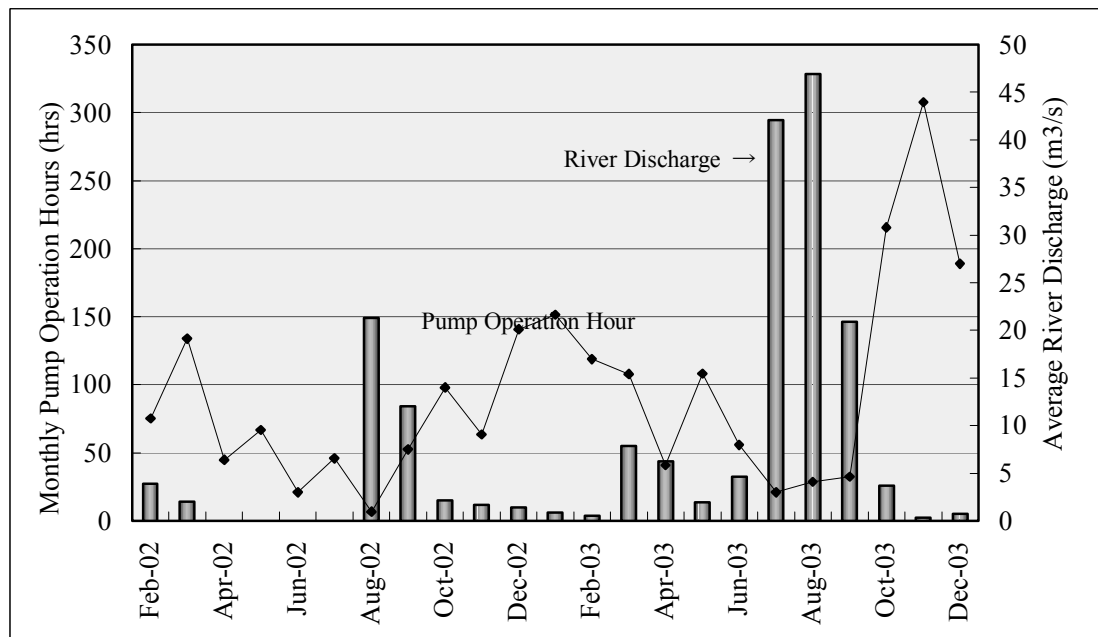
Pump operation hours is closely related to rainfall and increased during dry season from October to February.



**Monthly Pump Operation Hour in Sombo-Genet and Rainfall at Meki Town**

Source : Rainfall : National Metrological Service Agency (NMSA)  
 Pump Operation hours : Operation record in Sombo-Genet

On the other hand the Meki river discharge became lowest in peak dry season when farmers most needed irrigation water as shown in the following graph.



**Monthly Pump Operation Hour in Sombo-genet and the Meki River Discharge**

Source: River discharge : Ministry of Water Resource  
 Pump operation hour : Operation record in Sombo-Genet  
 Remark: River discharge farm Apr. - Jul.2002 and form Mar.2003 is not available

## 2.4 Water Level of the Ziway Lake

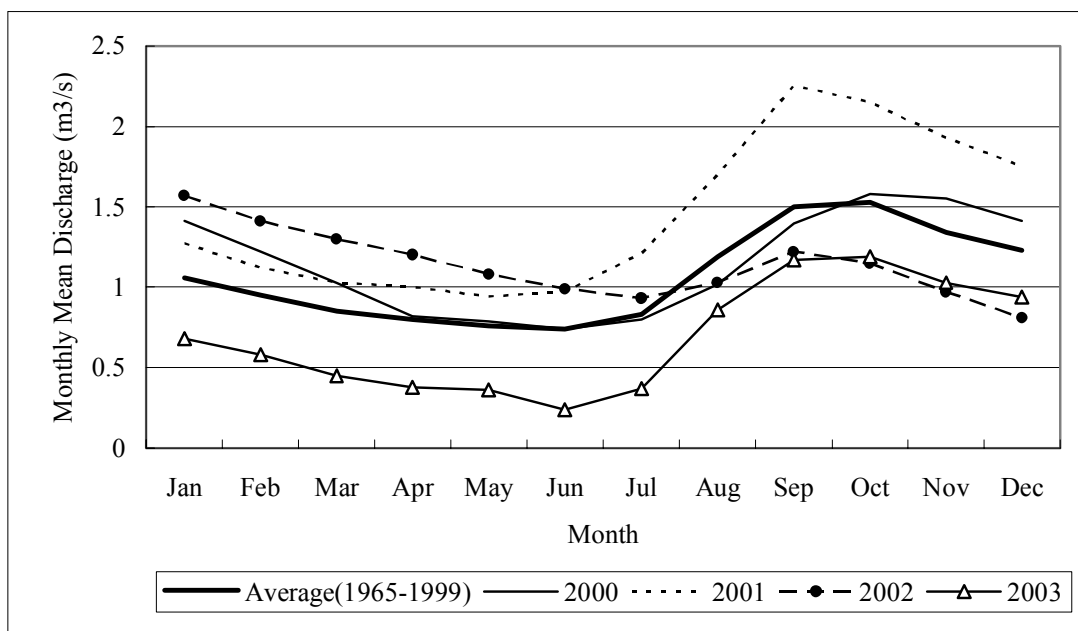
The main water source for the Ziway lake is the flows of the Ketar and Meki rivers. The Meki river is gauged at Meki town (CA = 2,433 km<sup>2</sup>), while the Ketar river is gauged near Abura (CA = 3,350 km<sup>2</sup>). The mean annual flows recorded at the two stations are 291 MCM and 413 MCM, respectively. The total annual average inflow in the lake can be safely estimated by the sum of the Ketar and Meki river flows as recorded at the gauging stations, which is about 704 MCM.

The water balance of the Ziway lake consists of inflow (the Bulbula river) and evaporation from and precipitation on the lake surface. The water level of the Ziway lake in from 2000 to 2003 is presented in the following table.

**Monthly Water Level of the Ziway Lake at Ziway**

Year	Mean Monthly Water Level (m)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average 1975-1999	1.06	0.95	0.85	0.80	0.76	0.74	0.83	1.19	1.50	1.53	1.34	1.23	1.07
2000	1.41	1.22	1.03	0.82	0.79	0.74	0.80	1.03	1.40	1.59	1.55	1.41	1.15
2001	1.27	1.12	1.03	1.00	0.94	0.97	1.21	1.70	2.25	2.15	1.93	1.75	1.45
2002	1.57	1.41	1.30	1.20	1.08	0.99	0.93	1.03	1.22	1.15	0.97	0.81	1.14
2003	0.68	0.58	0.45	0.38	0.36	0.24	0.37	0.86	1.17	1.19	1.03	0.94	0.68

Source: Water level (2000) : Ministry of Water Resource  
Average level (1975-1999) : JICA Meki Study Report, 2002



**Monthly Water Level of the Ziway Lake at Ziway**

## CHAPTER 3 IRRIGATION WATER USE IN MEKI AREA

### 3.1 Objectives of Monitoring of Irrigation Water Use

In view of limited water resources and fragile environmental conditions of the Rift Valley system, it is important to monitor expanding irrigation water use in the Meki area and plan protection of its eco-system. The Meki study recommended OIDA to embark on the hydrological environmental monitoring in line with [4-1] Environmental Monitoring Program under the master plan.

Program I provided the staff training for OIDA staff in monitoring of irrigation water use in Meki area. The following activities were carried out with the Dugda Bora Wareda Irrigation Development Desk (hereinafter “OIDA Meki office”).

#### Hydrological Observation and Participants

Activity	Periods	Staff	Man-day
1) Inventory survey of small pumps in Meki area	May 13 - June 16	• Head, Expert, DA of OIDA Meki office	30
2) Water consumption analyses of the Meki-Ziway irrigation scheme	May 14 - June 10	• Head, DA	7
3) Water use analyses in the Meki-Ziway water resources system	June 16 - June 18	• Head of OIDA Meki office	3

### 3.2 Inventory of Small Pumps in Meki Area

The Meki study in 2001 identified that 181 units of small pumps were used for irrigation purposes. Under Program I, the JICA Study Team and the OIDA Meki office jointly conducted the inventory survey of existing small pumps in collaboration with peasant associations (PAs). The number of pumps are drastically increased to 462 units. The details of the inventory survey are presented in Table 3.2.1 and summarized below.

#### Summary of Inventory of Small Pumps

Water Source	No. of Pump	Irrigated Area (ha)	Average Area per Pump (ha)
Meki River	193	397	2.1
Ziway Lake	46	515	11.2
Groundwater	223	649	2.9
Total	462	1,561	3.4

Source: OIDA Meki office

The approximate location of 462 pumps is shown in Figure 3.2.1 and the distribution of pumps by location is summarized below.

### Location of Small Pumps

Location (PA)	No. of pump				Irrigation area (ha)			
	Meki River	Ziway Lake	Ground water	Total	Meki River	Ziway Lake	Ground water	Total
Bekele Girrisa	115	1	97	213	213	21	214	448
Welde Mekdele	1	8	67	76	2	56	172	230
Shubi Gamo	59	0	1	60	128	0	1	129
Wolda Kalina	18	5	5	28	54	36	5	95
Dodo Wadara	0	0	27	27	0	0	101	101
Malima Bori	0	0	25	25	0	0	116	116
Darara Delecha	0	10	1	11	0	23	40	63
Others	0	22	0	22	0	379	0	379
Total	193	46	223	462	397	515	649	1,561

Source: OIDA Meki office

### 3.3 Water Consumption Analyses of the Meki-Ziway Irrigation Scheme

The Meki-Ziway Irrigation Scheme is located at 5 km west of Meki Town. The scheme was established in 1989 to irrigate 3,000 ha, out of which 1,500 ha was to be a state farm and the rest was to be allocated to local farmers. Currently only 216 ha are cultivated by 332 farm households in Bekele Girisa PA. Nine (9) pumps were installed in the pump station, but most of time only one pump was operated. Each pump unit has capacity of 720 lit/sec and is operated by the staff employed by the OIDA Central Branch Office.

The OIDA Meki office periodically monitors the operation records of the Meki-Ziway Irrigation scheme prepared by pump operator. After the Meki study the pumps were operated during the following periods according to the operation records. The operation records are presented in Table 3.3.1.

#### Pump Operation Periods

Pump No.	2002				2003				2004	
	Jan - Mar.	Apr. - Jun.	Jul - Sep	Oct - Dec.	Jan - Mar.	Apr. - Jun.	Jul - Sep	Oct - Dec.	Jan - Mar.	Apr. - Jun.
1										
2										
4										
5										

Note:  : Operation Periods

Out of nine (9) units of pumps, four (4) units of No.1, No.2, No.4, and No.5 are operated from 2002 to 2004 by turns. Since pumping capacity is 0.72 m<sup>3</sup>/s/unit, the total water volume pumped up is calculated as follows.

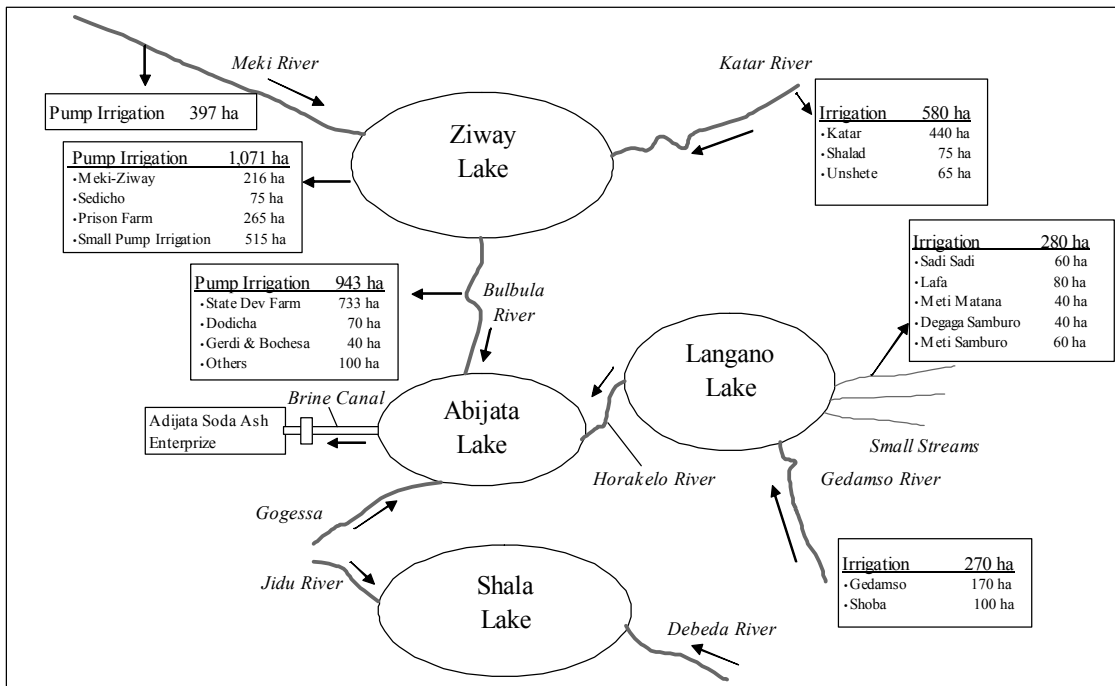
### Total Pumped Up Water Volume

Pump No.	2002		2003	
	Operation Hour	Water Volume(m <sup>3</sup> )	Operation hour	Water Volume(m <sup>3</sup> )
1	0:00	0	85:09	220,709
2	0:00	0	137:10	355,536
4	74:18	192,586	0:00	0
5	931:40	2,414,880	295:12	765,158
Total	1,005:58	2,607,466	517:31	1,341,403

This water consumption is equivalent to 0.37% in 2002 and 0.19% in 2003 of the annual inflow of the Meki and Ketar rivers to the Ziway lake, i.e. 704 MCM.

### 3.4 Water Use in the Meki-Ziway Water Resources System

In parallel, the Study in collaboration with OIDA collected the data of irrigation area in the Meki-Ziway water resources system. The water use for irrigation as of June 2004 is presented in the following figure.



Water Use for Irrigation in the Meki-Ziway Water Resources System

### 3.5 Inventory Survey of Groundwater Irrigation around Alem Tena

#### (1) Objectives

The inventory survey of groundwater irrigation was conducted as a preliminary study for implementation of groundwater irrigation development in Meki under Program II. The objectives are;

- 1) To clarify the current status of groundwater irrigation using pump, and
- 2) To standardize small-scale irrigation development using groundwater.

The objectives are;

## (2) Methodology

Inventory survey of groundwater irrigation was carried out in the following Dodo Wedere PA and Malima Bori PA in Dugda Bora District, where the groundwater irrigation is prevailing. The candidate groups for small-scale irrigation development using ground water under Program-II are located around the above-mentioned PAs and most farmers are using groundwater for irrigation as well as drinking purpose. Therefore the above two PAs were selected as target sites.

One OADB development agent (DA) is assigned for those PAs and his office is located at Kenteri town in the target sites. In order to conduct inventory survey efficiently the OIDA/JICA team organized the survey team in cooperation with OADB Dugda Bora wereda office. The inventory survey was carried out according to the following work flow.

6 <sup>th</sup> August	: Orientation and instruction to OADB DA by OIDA/JICA
6 <sup>th</sup> to 15 <sup>th</sup> August	: Interview to dug-well owners and pump owners in Dodo Wedere PA
6 <sup>th</sup> to 15 <sup>th</sup> August	: Survey of dug-well location using GPS in Dodo Wedere PA
16 <sup>th</sup> Aug. to 4 <sup>th</sup> Sep.	: Interview to dug-well owners and pump owners in Malima Bori PA
16 <sup>th</sup> Aug. to 4 <sup>th</sup> Sep.	: Survey of dug-well location using GPS in Dodo Wedere PA
6 <sup>th</sup> Aug to 15 <sup>th</sup> Sep.	: Analyses and report preparation

## (3) Inventory Survey items

The following information was collected.



## 1) Dug-well information

No	Survey outline	Survey Items
1	Location	P.A. name, Previous P.A. name, Locality name, Dug-well owner's name, Coordinates of dug-well, elevation
2	Physical information	Diameter of well, Total depth, Water depth, Pump setting depth (refer to the following illustration)
3	History of well	Record of first digging of well (Year, No. of participants, Construction period), Maintenance or repair works for well
4	Purpose of use	Purpose of use, No. of users, Irrigated area, Using pump and Pump no., First year of using pump, Main crop planted in irrigation land, Condition of contract with pump owner, Volume of water use
5	Water condition	Water availability, Condition of well in dry season, Water quality, Comments for water quality

## 2) Pump information

No	Survey outline	Survey Items
1	Location	P.A. name, Previous P.A. name, Locality name, Pump owner's name, Coverage of well No.
2	Pump specification	Pump model, origin, Horse power, Fuel type, Pipe diameter, Pipe length, Pipe type, Foot valve, Storage place of pump
3	Irrigation	No. of pump users, Total irrigation land by pump, Condition of contract with users,
4	Other information	Water availability, Condition of well in dry season, Water quality, Comments for water quality

### (4) Results of Inventory Survey

The results of inventory survey of groundwater irrigation are mentioned in the following paragraphs. The inventory data of existing dug-well and pump in Dodo Wedere and Malima Bori PAs are shown in Tables 3.5.1 to 3.5.4.

#### 1) Profile of dug-wells

The profiles of dug-well in the sites are shown in the following tables.

**Number and Density of Dug-well for Irrigation**

PA name	PA area (km <sup>2</sup> )	Number of well for irrigation purpose	Density of well (site/km <sup>2</sup> )
Dodo Wedera	27.6	32	1.16
Malima Bori	27.5	40	1.45
Total	55.1	72	1.31

Source: JICA Study Team, September 2003

### Physical Feature of Dug-well

PA	Diameter (m)			Depth to water level <sup>*1</sup> (m)			Water depth <sup>*1</sup> (m)		
	Max	Min.	Ave.	Max	Min.	Ave.	Max	Min.	Ave.
Dodo Wedera	10	1.0	3.1	12	1.2	5.7	7.5	0.5	2.1
Malima Bori	4.5	0.7	2.3	10	3.7	6.3	9.0	0.6	2.1

Source: JICA Study Team, September 2003

Note: \*1) ground water level is frequently changed depending on the survey date.

### Construction of Dug-well

PA	Construction year			Required man-day for construction (man-day)		
	Latest	Oldest	Mode	Max	Min.	Ave.
Dodo Wedera	2002	1987	1998	225	6	51
Malima Bori	2002	1985	1997	280	10	55

Source: JICA Study Team, September 2003

### Purpose of Dug-well

PA	For irrigation only	Irrigation and drinking	Irrigation and others (for livestock etc)	Total
Dodo Wedera	15 (47%)	15 (47%)	2 (6%)	32 (100%)
Malima Bori	26 (65%)	12 (30%)	2 (5%)	40 (100%)
Total	41 (57%)	27 (38%)	4 (5%)	72 (100%)

Source: JICA Study Team, September 2003

## 2) Profile of pump

The profiles of pump used in the sites are shown in the following tables.

### Number of Pump

PA	PA area (km <sup>2</sup> )	Number of pump	Density of pump (no./km <sup>2</sup> )
Dodo Wedera	27.6	23	0.83
Malima Bori	27.5	25	0.91
Total	55.1	48	0.87

Source: JICA Study Team, September 2003

### Pump Capacity (HP)

PA	Number of pump				
	< 5.0 HP	5.1-10.0 HP	10 HP <	No data	Total
Dodo Wedera	13 (57%)	2 (9%)	4 (17%)	4 (17%)	23 (100%)
Malima Bori	13 (52%)	5 (20%)	5 (20%)	2 (8%)	25 (100%)
Total	26 (54%)	7 (15%)	9 (19%)	6 (12%)	48 (100%)

Source: JICA Study Team, September 2003

### Type of Fuel for Pump

PA	Number of pump			
	Benzine (Gasoline)	Diesel	Others (Kerosine)	Total
Dodo Wedera	14 (61%)	8 (35%)	1 (4%)	23 (100%)
Malima Bori	12 (48%)	13 (52%)	0 (0%)	25 (100%)
Total	26 (54%)	21 (44%)	1 (2%)	48 (100%)

Source: JICA Study Team, September 2003

### Length of Delivery Pipe

PA	Max(m)	Min(m)	Ave(m)	Total(m)
Dodo Wedera	180	11	42	882
Malima Bori	150	6	43	1062
Total	180	6	42	1944

Source: JICA Study Team, September 2003

### Type of Delivery Pipe

PA	Number of pump owner			
	PVC	Hose	No Data	Total
Dodo Wedera	22 (96%)	1 (4%)	0 (0%)	23 (100%)
Malima Bori	20 (80%)	2 (8%)	3 (12%)	25 (100%)
Total	42 (88%)	3 (6%)	3 (6%)	48 (100%)

Source: JICA Study Team, September 2003

### Storage Place of Pump

PA	Number of pump		
	Pump owner's house	Pump user's house	Total
Dodo Wedera	18 (78%)	5 (22%)	23 (100%)
Malima Bori	18 (72%)	7 (28%)	25 (100%)
Total	36 (75%)	12 (25%)	48 (100%)

Source: JICA Study Team, September 2003

### 3) Irrigation area

The profiles of groundwater irrigation in this area are seen in the following tables.

#### Irrigation Area

PA	PA area (ha)	Irrigation area (ha)	Percentage of irrigation area by pump (%)
Dodo Wedera	2760	88.50	3.2%
Malima Bori	2750	115.75	4.2%
Total	5510	204.25	3.7%

Source: JICA Study Team, September 2003

#### Irrigation Area per Pump User

PA	Irrigation area (ha)	Number of pump users (HH)	Area / user (ha/HH)
Dodo Wedera	88.50	66	1.34
Malima Bori	115.75	94	1.23
Total	204.25	160	1.28

Source: JICA Study Team, September 2003

#### Number of Well per Pump

PA name	Maximum No. of well (well/pump)	Minimum No. of well (well/pump)	Average No. of well (well/pump)
Dodo Wedera	3	1	1.4
Malima Bori	4	1	1.6
Total	4	1	1.5

Source: JICA Study Team, September 2003

### Irrigation Area per Well

PA	Irrigation area (ha)	Number of well	Area / well (ha/well)
Dodo Wedera	88.50	32	2.77
Malima Bori	115.75	40	2.89
Total	204.25	72	2.84

Source: JICA Study Team, September 2003

### Irrigation Area per Pump

PA name	Irrigation area (ha)	Number of pump	Area / pump (ha/pump)
Dodo Wedera	88.50	23	3.84
Malima Bori	115.75	25	4.63
Total	204.25	48	4.25

Source: JICA Study Team, September 2003

#### 4) Crop selection

The following table shows the planted crop and area. Cash crops such as tomato and onion are mainly planted under irrigation.

### Main Crops Planted under Irrigation Farming

Crop	Cropping Area (ha)					
	Dodo Wedere PA		Malima Bori PA		Total	
	Rainy Season	Dry Season	Rainy Season	Dry Season	Rainy Season	Dry Season
Tomato	55.4	51.7	77.7	38.2	133.1	89.8
Onion	10.6	10.4	14.3	18.9	24.8	29.2
Pepper	7.4	5.5	4.9	9.9	12.3	15.4
Cabbage	10.7	5.1	5.9	7.4	16.7	12.5
Maize	3.4	4.7	2.0	4.7	5.4	9.4
Papaya	1.0	0.0	1.0	4.1	2.0	4.1
Haricot Bean	0.0	3.7	0.0	0.0	0.0	3.7
Total	88.5	81.1	105.8	83.2	194.3	164.1

Source: JICA Study Team, September 2003

#### 5) Water availability

All dug-well owners commented that groundwater is available throughout the year, but periodical maintenance and cleaning works are necessary especially during dry season. Although they commented yield of groundwater is enough for small-scale irrigation, pumping test shall be carried out to check the yield before implementation of groundwater irrigation under Program II.

#### 6) Water quality

Around 40% of dug-well owners use groundwater for drinking purpose as well as irrigation. Most of owners commented that groundwater contains some kind of mineral. It is necessary to carry out water quality test to check suitability of water for irrigation before implementation of groundwater irrigation under Program II.

# Tables

**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (1/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer	
1	Welde Mekdele	Gudeta Fufa	Yanmar	5.9 HP		✓		2.37		✓	✓		
2	Welde Mekdele	Ararso Gameda	Honda	5.5 HP			✓	2.25			✓		
3	Welde Mekdele	Bedo Ogeto	Honda	5.5 HP			✓	1.00	✓				
4	Welde Mekdele	Obsa Ogeto	Robin	5.0 HP			✓	1.00	✓				
5	Welde Mekdele	Tsegaye Tekle	Fiekl Marshal			✓		7.62		✓			
6	Welde Mekdele	Mulane Hunde	Robin	5.0 HP			✓	4.25		✓			
7	Welde Mekdele	Esra'el Ayalew	Robin	5.0 HP			✓	3.50		✓			
8	Welde Mekdele	Taferi Mengesha	Honda	5.5 HP			✓	1.87					
9	Welde Mekdele	Ashenafi Abera	Yamaha	5.0 HP			✓	10.62		✓			
10	Welde Mekdele	Ashenafi Abera	Robin	5.0 HP			✓				✓		
11	Welde Mekdele	Fenkessa Kekeba	Honda	5.5 HP			✓	4.75		✓		✓	
12	Welde Mekdele	Abeba Girazmach	Robin	5.0 HP			✓	2.25				✓	
13	Welde Mekdele	Abebayo Amare	Robin	5.0 HP			✓	3.00				✓	
14	Welde Mekdele	Abay Teka	Robin	5.0 HP			✓	3.75		✓		✓	
15	Welde Mekdele	Alemu Wolde	Robin	5.0 HP			✓	2.87		✓		✓	
16	Welde Mekdele	Degaga Koba	Honda	5.5 HP			✓	2.25	✓				
17	Welde Mekdele	Kafari Tufa	Robin	5.0 HP			✓	1.00	✓				
18	Welde Mekdele	Tesfaye Tiruneh	Lombardini	20.0 HP		✓		7.25					
19	Welde Mekdele	Tesfaye Tiruneh	Honda	5.0 HP			✓						
20	Welde Mekdele	Girma	Robin			✓		1.50		✓			
21	Welde Mekdele	Desta Bayisa	Lombardini	20.0 HP			✓	7.25		✓		✓	
22	Welde Mekdele	Desta Bayisa	Honda	5.5 HP			✓						
23	Welde Mekdele	Sisay Negasa	Honda	5.5 HP			✓	4.12		✓		✓	
24	Welde Mekdele	Sisay Negasa	Yamaha	5.0 HP			✓						
25	Welde Mekdele	Mokonin G/mariam	Yamaha	5.0 HP			✓	7.37		✓		✓	
26	Welde Mekdele	Mokonin G/mariam	Yamaha	5.0 HP			✓					✓	
27	Welde Mekdele	Mokonin G/mariam	Robin	5.0 HP			✓						
28	Welde Mekdele	Mohammed Bedawi	Robin	5.0 HP			✓	4.50		✓		✓	
29	Welde Mekdele	Yeshidagna Ababe	Robin	5.0 HP			✓	4.00		✓		✓	
30	Welde Mekdele	Kondale Gebu	Robin	5.0 HP			✓	2.00	✓				
31	Welde Mekdele	Gudeta Gebu	Honda	5.5 HP			✓	2.50	✓				
32	Welde Mekdele	Buta Kiltu	Honda	5.5 HP			✓	2.25	✓				
33	Welde Mekdele	Abe Kunbi	Robin	5.0 HP			✓	1.00	✓				
34	Welde Mekdele	Demis Alemu	Robin	5.0 HP			✓	4.62		✓		✓	
35	Welde Mekdele	Ayale Makurya	Robin	5.0 HP			✓	5.62		✓	✓		
36	Welde Mekdele	Muluye W/gyrgis	Honda	5.5 HP			✓	4.25		✓		✓	
37	Welde Mekdele	Muluye W/gyrgis	Robin	5.0 HP			✓						
38	Welde Mekdele	Tesfu Hayilu	Robin	5.0 HP			✓	2.00				✓	
39	Welde Mekdele	Eyasu Argaw	Robin	5.0 HP			✓	1.75		✓		✓	
40	Welde Mekdele	Yohannis Gensa	Honda	5.5 HP			✓	2.50		✓		✓	
41	Welde Mekdele	Degaga Roba and ☐Shonde Degaga	Robin	5.0 HP			✓	1.75		✓		✓	
42	Welde Mekdele	Tiglu Alemu	Robin	5.0 HP			✓	3.00		✓		✓	
43	Welde Mekdele	Addis Niguse	Robin	5.0 HP			✓	4.00		✓		✓	
44	Welde Mekdele	Kecha Boset	Robin	5.0 HP			✓	1.00	✓				
45	Welde Mekdele	Midekso Burka	Robin	5.0 HP			✓	1.25	✓				
46	Welde Mekdele	Bedaso Micho	Robin	5.0 HP			✓	1.25	✓				
47	Welde Mekdele	Biyo Horsie	Lombardin	20.0 HP			✓	5.00		✓	✓	✓	
48	Welde Mekdele	Belay Gasha	Robin	5.0 HP			✓	1.75		✓		✓	
49	Welde Mekdele	Ashenafi	Robin	5.0 HP			✓	2.12		✓		✓	
50	Welde Mekdele	Tamsgen Abdi	Robin	5.0 HP			✓	1.25		✓		✓	
51	Welde Mekdele	Siyum Teshome	Robin	5.0 HP			✓	3.25		✓		✓	
52	Welde Mekdele	Kacha	Honda	5.5 HP			✓	4.25		✓			
53	Welde Mekdele	Kacha	Robin	5.0 HP			✓						
54	Welde Mekdele	Mizba	Lombardini	20.0 HP			✓	5.00		✓		✓	
55	Welde Mekdele	Mizba	Honda	5.5 HP			✓						
56	Welde Mekdele	Tesfaye Korji	Honda	5.5 HP			✓	1.00	✓				
57	Welde Mekdele	Mindaye	Honda	5.5 HP			✓	1.25		✓			
58	Welde Mekdele	Mesay	Robin	5.0 HP			✓	1.50		✓			
59	Welde Mekdele	Asfa	Robin	5.0 HP			✓	1.75		✓		✓	
60	Welde Mekdele	Biru	Robin	5.0 HP			✓	2.50		✓		✓	
61	Welde Mekdele	Bariso Dalecha	Honda	5.5 HP			✓	2.00	✓				
62	Welde Mekdele	Wdde Degaga	Robin	5.0 HP			✓	2.62		✓			
63	Welde Mekdele	Wondafara					✓	1.87			✓		
64	Welde Mekdele	Kasa Afemu	Honda	5.5 HP			✓	3.25				✓	
65	Welde Mekdele	Kasa Afemu	Robin	5.0 HP			✓						
66	Welde Mekdele	Feteno Midekso	Robin				✓	1.25				✓	
67	Welde Mekdele	Bonsa Folie	Honda				✓	2.38	✓				
68	Welde Mekdele	Alemu Woldie	Robin				✓	5.50			✓		
69	Welde Mekdele	Nuri Muzebil	Robin				✓	5.00					
70	Welde Mekdele	Fontie Bariso	Lombardini			✓		2.25	✓				
71	Welde Mekdele	Ayalew Mekuria	China	15.0 HP		✓		3.75			✓		
72	Welde Mekdele	Bulisa Folie	China	20.0 HP		✓		3.00			✓		
73	Welde Mekdele	Birkutawit Dawit	China	49.0 HP		✓		27.13		✓			
74	Welde Mekdele	Birkutawit Dawit	Panker	32.0 HP		✓							
75	Welde Mekdele	Tesfaye Abdi	Lombardini	24.0 HP			✓	3.50		✓			
76	Welde Mekdele	Odai Chisa WUA	Lombardini	12.5 HP		✓		5.25	✓				Established by JICA
77	Shubi-Gemo	Abu Kushina	Lombardin			✓		2.50			✓		
78	Shubi-Gemo	Buta Kushina	Lombardin			✓		2.00	✓				
79	Shubi-Gemo	Abe Kebede				✓		2.00			✓		
80	Shubi-Gemo	Girma Mamo				✓		1.00	✓		✓		
81	Shubi-Gemo	Tamasgen Gimarim				✓					✓		

**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (2/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark	
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer		
82	Shubi-Gemo	Wosi Gulale	Lombardin					6.00				✓		
83	Shubi-Gemo	Giday Gegziaber	Lombardin	9.0 HP	✓			2.50				✓		
84	Shubi-Gemo	Kinfee Gebbru	Lombardin	9.0 HP	✓			2.00				✓		
85	Shubi-Gemo	Gebresilase	Lombardin	17.0 HP	✓			4.00	✓					
86	Shubi-Gemo	Teshome G/mariyam	Lombardin	10.0 HP	✓			12.00				✓		
87	Shubi-Gemo	Asefa G/mariyam	Lombardin	17.0 HP	✓			1.50	✓					
88	Shubi-Gemo	Abraham Haile	Lombardin	10.0 HP	✓			2.00				✓		
89	Shubi-Gemo	Bayana Badhaso	Lombardin	9.0 HP	✓			2.50				✓		
90	Shubi-Gemo	Bula Hayee	Lombardin	10.0 HP	✓			1.00				✓		
91	Shubi-Gemo	Mamo Abate	Lombardin	9.0 HP	✓			2.00	✓					
92	Shubi-Gemo	Ireso Kawo	Lombardin	6.0 HP	✓			1.00	✓					
93	Shubi-Gemo	Kufa Gude	Robin	5.0 HP	✓			1.50						
94	Shubi-Gemo	Warite Wushina	Robin	5.0 HP	✓			5.00	✓			✓		
95	Shubi-Gemo	Oda Tola	Robin	5.0 HP	✓			2.00	✓					
96	Shubi-Gemo	Kebede	Robin	5.0 HP	✓			1.00	✓					
97	Shubi-Gemo	Kinfe Gobanyow	Honda	5.5 HP	✓			2.00				✓		
98	Shubi-Gemo	Balay Kushina	Robin	5.0 HP	✓			2.00	✓			✓		
99	Shubi-Gemo	Nigusse Tesema	Robin	5.0 HP	✓			1.00				✓		
100	Shubi-Gemo	Zerhun Kasa	Robin	5.0 HP	✓			4.00	✓					
101	Shubi-Gemo	Ifa Asfaw	Robin	5.0 HP	✓			1.00				✓		
102	Shubi-Gemo	Tigistu Kafani	Lombardin	9.0 HP	✓			0.75	✓					
103	Shubi-Gemo	Getanh Mamo	Robin	5.0 HP	✓			0.75	✓					
104	Shubi-Gemo	Deme Geloha	Lombardin	6.0 HP	✓			1.00	✓					
105	Shubi-Gemo	Adara Balcha	Robin	5.0 HP	✓			1.00	✓					
106	Shubi-Gemo	Mamire Tasfa	Robin	5.0 HP	✓			2.00				✓		
107	Shubi-Gemo	Abu Nedi	Robin	5.0 HP	✓			1.00	✓					
108	Shubi-Gemo	Tuna Nedi	Robin	5.0 HP	✓			1.50	✓					
109	Shubi-Gemo	Dadi Jara	Lombardin	9.0 HP	✓			1.50				✓		
110	Shubi-Gemo	Tikse Tuchi	Lombardin	9.0 HP	✓			1.25	✓					
111	Shubi-Gemo	Ararso Furo	Robin	5.0 HP	✓			1.00						
112	Shubi-Gemo	Kabato Furo	Lombardin	9.0 HP	✓			3.00						
113	Shubi-Gemo	Bula Nure	Lombardin	6.0 HP	✓			1.00						
114	Shubi-Gemo	Faresa Ararso	Lombardin	6.0 HP	✓			1.00						
115	Shubi-Gemo	Biyo Worse	Lombardin	6.0 HP	✓			1.00						
116	Shubi-Gemo	Bonsa Tola	Robin	5.0 HP	✓			1.50	✓					
117	Shubi-Gemo	Dumesa Bayana	Robin	5.0 HP		✓		1.00	✓					
118	Shubi-Gemo	Damto Nigatu	Robin	9.0 HP	✓			1.50	✓					
119	Shubi-Gemo	Tarakagn Belay	Lombardin	9.0 HP	✓			2.00						
120	Shubi-Gemo	Chinko Dagne	Robin	5.0 HP	✓			1.00						
121	Shubi-Gemo	Zewudu Gutama	Robin	5.0 HP	✓			0.75	✓					
122	Shubi-Gemo	Kedir Godana	Honda	5.5 HP	✓			1.00	✓					
123	Shubi-Gemo	Habtamu	Lombardin	9.0 HP	✓			1.50				✓		
124	Shubi-Gemo	Kidane Kelilaw	Lombardin	9.0 HP	✓			1.00				✓		
125	Shubi-Gemo	Liqi Damoz	Lombardin	9.0 HP	✓			1.50				✓		
126	Shubi-Gemo	Mesle Mengesha	Hikimal	9.0 HP	✓			2.00				✓		
127	Shubi-Gemo	Belete	Hikimal	9.0 HP	✓			1.00				✓		
128	Shubi-Gemo	Muse Getanh	Hanima	9.0 HP	✓			1.50				✓		
129	Shubi-Gemo	Worku Wordofa	Lombardin	9.0 HP	✓			2.00	✓			✓		
130	Shubi-Gemo	Arusi Gari	Robin	5.0 HP	✓			2.00				✓		
131	Shubi-Gemo	Baharu Mamo	Lombardin	9.0 HP	✓			4.00				✓		
132	Shubi-Gemo	Ishetu Abarga	Lombardin	9.0 HP	✓			2.50				✓		
133	Shubi-Gemo	Gorfe	Robin	5.0 HP	✓			2.00				✓		
134	Shubi-Gemo	Sombo Genet WUA	Lombardin	12.5 HP	✓			6.50	✓					Established by JICA
135	Shubi-Gemo	Sombo Alaltu WUA	Lombardin	12.5 HP	✓			5.00	✓					Established by JICA
136	Shubi-Gemo	Shubi WUA	Lombardin	12.5 HP	✓			6.50	✓					Established by JICA
137	Wolda-Kalina	Huluka Dadi	Robin	5.0 HP	✓			1.00	✓					
138	Wolda-Kalina	Gobana Dadi	Robin	5.0 HP	✓			1.50	✓					
139	Wolda-Kalina	Sanbaro Dadi	Lombardin	12.0 HP	✓			3.00	✓			✓		
140	Wolda-Kalina	Koricho Giragn	Lombardin	20.0 HP	✓			10.00	✓					
141	Wolda-Kalina	Koricho Giragn	Lombardin	20.0 HP		✓		10.00		✓				
142	Wolda-Kalina	Bati Gudata	Lombardin	20.0 HP	✓			7.50	✓					
143	Wolda-Kalina	Bati Gudata	Lombardin	20.0 HP	✓			7.50		✓				
144	Wolda-Kalina	Tuji Kondale	Robin	5.0 HP	✓			1.00	✓					
145	Wolda-Kalina	Gudata Fitala	Robin	5.0 HP	✓			1.25	✓					
146	Wolda-Kalina	Abit Atinafe	Lombardin	20.0 HP	✓			1.50	✓	✓				
147	Wolda-Kalina	Abit Abdi	Robin	5.0 HP	✓			1.00	✓					
148	Wolda-Kalina	Melka Aba Godana	Lombardin	17.0 HP	✓			4.50	✓					
149	Wolda-Kalina	Bulisa Fole	Lombardin	20.0 HP	✓			2.00	✓					
150	Wolda-Kalina	Gobana Tushe	Robin	5.0 HP		✓		1.50	✓					
151	Wolda-Kalina	Huluka Dambal	Robin	5.0 HP	✓			1.00	✓					
152	Wolda-Kalina	Fole Bate	Lombardin	20.0 HP	✓			2.00	✓	✓				
153	Wolda-Kalina	Woldaw Chali	Robin	5.0 HP		✓		1.00	✓					
154	Wolda-Kalina	Uga Jalo	Robin	5.0 HP	✓			1.50	✓					
155	Wolda-Kalina	Uga Jalo	Chaina	22.0 HP		✓		0.50	✓					
156	Wolda-Kalina	Kalina Dambal	Lombardin	17.0 HP		✓		9.25	✓					
157	Wolda-Kalina	Melka Korma	Lombardin	35.0 HP		✓		9.00	✓					
158	Wolda-Kalina	Gobana Hola	Chain	20.0 HP		✓		3.00	✓					
159	Wolda-Kalina	Dugda Kalacha	Chain	20.0 HP	✓			4.50				✓		
160	Wolda-Kalina	Tuna Gada	Robin	5.0 HP		✓		1.00	✓					
161	Wolda-Kalina	Bedaso Hirpho	Robin	5.0 HP	✓			2.00	✓					
162	Wolda-Kalina	Gezehany Degaga	Robin	5.0 HP	✓			1.00	✓					

**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (3/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer	
163	Wolda-Kalina	Oda Tushe	Robin	5.0 HP	✓			1.50	✓				
164	Wolda-Kalina	Fitala Gabi	Robin	5.0 HP		✓		4.50	✓			✓	
165	Darara Delecha	Midakso Bariso	Changefa	5.0 HP		✓		2.00	✓				
166	Darara Delecha	Gobana Dadi	Honda	5.5HP		✓		2.00	✓				
167	Darara Delecha	Tikse Tuchi	Yamaha	5.0HP		✓		2.00	✓				
168	Darara Delecha	Roba Ido	Honda	5.5HP		✓		2.00			✓		
169	Darara Delecha	Gudata Kiltu	Robin	5.0 HP		✓		2.00	✓				
170	Darara Delecha	Wolde Kabato	Robin	5.0 HP		✓		3.00	✓				
171	Darara Delecha	Bula Ireso	Robin	5.0 HP		✓		3.00				✓	
172	Darara Delecha	Bariso Urgrsa	Agle	5.5HP		✓		2.00				✓	
173	Darara Delecha	Sime	Honda	5.5HP		✓		3.00				✓	
174	Darara Delecha	Dirshaye Charinat	Changefa	6.0HP		✓		2.00				✓	
175	Darara Delecha	Meskel Flower	Cummins				✓	40.00					
176	Tuchi Denbel	Tuchi Dinbel WUC	Lombardin	35.0 HP		✓		15.25	✓				
177	Tuchi Denbel	Dedo Lenjiso	Robin	5.0 HP		✓		2.50	✓	✓			
178	Tuchi Denbel	Meskel Flowre PLT	Lombardin	47.0 HP		✓		35.00		✓			
179	Tuchi Denbel	Bade Gosa WUA	Lombardin	12.5 HP		✓		4.75	✓				Established by JICA
180	Tuchi Denbel	Motuma Disasa	Lombardin	47.0 HP		✓		37.00		✓			
181	Tuchi Denbel	Mulgeta Abebe		35.3 HP		✓		22.00		✓			
182	Tuchi Denbel	Wade Hamda	Honda	5.5 HP		✓		2.00		✓			
183	Wayo Gebre'il	Wayo Gebre'il WUC	Lombardin	35.0 HP		✓		13.75	✓				
184	Wayo Gebre'il	Wayo Gebre'il WUC	Lombardin	5.5 HP		✓							
185	Wayo Gebre'il	Wayo Sariti WUC	Lombardin	47.0 HP		✓		17.00	✓				
186	Wayo Gebre'il	EABA PLT	ENERGO	60.0 HP		✓		80.00		✓			
187	Dodota Dembu	Boca Alamu	Honda	5.5 HP		✓		1.75	✓				
188	Abono Gebre'il	Alamayo	Silanz	24.0 HP		✓		40.00		✓			
189	Abono Gebre'il	Oda Bilbila WUA	Lombardin	12.5 HP		✓		4.50	✓				Established by JICA
190	Dodota Dembel	Dodota Dembel WUC	Lombardin	12.5 HP		✓		18.00	✓				
191	Dodota Dembel	Warginayi Jima	Yamaha	5.5 HP		✓		2.00		✓			
192	Dodota Dembel	Tasfaye G/maryannis	Mercury	8.0 HP		✓		6.50		✓			
193	Dodota Dembel	Celelaka Dembel WUC	Lombardin	13.0 HP		✓		11.00	✓				
194	Tepho Coroge	Tepho 140 WUC	Lombardin	24.0 HP		✓		13.00	✓				
195	Tepho Coroge	Wagane				✓		10.00		✓			
196	Tepho Coroge	Abebe				✓		8.00		✓			
197	Tepho Coroge	Tepho Valley farm		25.0 HP		✓		35.00		✓			
198	Dodo Wadera	Ayale Damate	Robin	3.0 HP			✓	3.00				✓	
199	Dodo Wadera	Fetala Hawas	Robin	5.0 HP			✓	1.50				✓	
200	Dodo Wadera	G/madin mangistuu	Robin	5.0 HP			✓	2.00				✓	
201	Dodo Wadera	Danele	Robin	5.0 HP			✓	1.50	✓				
202	Dodo Wadera	Salki Qunbi	Robin	5.0 HP			✓	8.00				✓	
203	Dodo Wadera	Gabiru	Robin	5.0 HP			✓	4.50		✓			
204	Dodo Wadera	Gamachu Nabi	Robin	5.0 HP			✓	6.00	✓				
205	Dodo Wadera	Nabe Buke	Robin	5.0 HP			✓	4.00		✓			
206	Dodo Wadera	Girma	Robin	5.0 HP			✓	4.00		✓			
207	Dodo Wadera	Hayile Tola	Robin	5.0 HP			✓	1.50	✓				
208	Dodo Wadera	Abara Golata	Robin	5.0 HP			✓	1.50				✓	
209	Dodo Wadera	Shita	Robin	N.A.			✓	5.00	✓				
210	Dodo Wadera	Bakela Mahurga	Robin	6.7 HP			✓	7.50	✓				
211	Dodo Wadera	G/Tasayi	-	23.7 HP			✓	5.00	✓				
212	Dodo Wadera	H/maryam G/ezigabhere	Lombardini	N.A.			✓	4.00	✓				
213	Dodo Wadera	Abidala	-	20.0 HP			✓	8.00	✓				
214	Dodo Wadera	Takila maryam	Lombardini	N.A.			✓	4.00	✓				
215	Dodo Wadera	Kalabi Tasefa	Merkure	20.0 HP			✓	4.00	✓				
216	Dodo Wadera	Yarde Kalabi	-	N.A.			✓	4.00	✓				
217	Dodo Wadera	Takelu Adara	Janbo	5.5 HP			✓	1.50	✓				
218	Dodo Wadera	Adunya Bekele	Slanzi	32.2 HP			✓	3.00	✓				
219	Dodo Wadera	Shanki Balayi	Robin	5.0 HP			✓	2.00		✓			
220	Dodo Wadera	Ameze G/hiwot	Robin	5.0 HP			✓	3.00				✓	
221	Dodo Wadera	Taticha Elan WUA	Robin	5.0 HP			✓	3.00	✓				Established by JICA
222	Dodo Wadera	Taticha Golba WUA	Robin	5.0 HP			✓	3.00	✓				Established by JICA
223	Dodo Wadera	Kenter Michael WUA	Robin	5.0 HP			✓	3.00	✓				Established by JICA
224	Dodo Wadera	Kenter Michael WUA	Robin	5.0 HP			✓	3.00	✓				Established by JICA
225	Malima bori	Elsa Market	Robin	7.4 HP			✓	3.00	✓				
226	Malima bori	Hadis Tusa	China	32.2 HP			✓	6.00	✓				
227	Malima bori	Takaste	Robin	7.4 HP			✓	6.00	✓				
228	Malima bori	Alamayu Kuma	Lombardini	7.0 HP			✓	4.00	✓				
229	Malima bori	Nadi Hundie	Robin	5.0 HP			✓	5.00	✓				
230	Malima bori	Kacha Oda	Robin	3.6 HP			✓	1.00	✓				
231	Malima bori	Tawalde Takile	Lombardini	16.1 HP			✓	6.00	✓				
232	Malima bori	Almaz	Robin	5.0 HP			✓	5.25	✓				
233	Malima bori	Mithaga Kore	Robin	5.0 HP			✓	18.00	✓				
234	Malima bori	Sanayit Uson	Lombardini	14.0 HP			✓	1.50	✓				
235	Malima bori	Damse Tana	Lombardini	7.0 HP			✓	6.00	✓				
236	Malima bori	Damse Tana	Lombardini	7.0 HP			✓	7.00	✓				
237	Malima bori	Dagaga Shube	Robin	5.0 HP			✓	14.00	✓				
238	Malima bori	Asafw Jima	Robin	5.0 HP			✓	1.50				✓	
239	Malima bori	Tola Gato	Robin	5.0 HP			✓	1.50				✓	
240	Malima bori	Bekona Guda	Robin	5.0 HP			✓	10.50		✓			
241	Malima bori	Tawandu Uhunen	China	N.A.			✓	2.00	✓				
242	Malima bori	Mal kamu Haru	Lombardini	16.1 HP			✓	2.00	✓				
243	Malima bori	Baba Honsa	Lombardini	16.1 HP			✓	3.00	✓				



**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (4/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark	
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer		
244	Malima bori	Cala Lagasa	Robin	5.0 HP			✓	2.00				✓		
245	Malima bori	Taye Lata	Honda	5.0 HP			✓	1.50				✓		
246	Malima bori	Haru Lata	Honda	5.0 HP			✓	1.00	✓					
247	Malima bori	Gamchu Badada	Robin	5.0 HP			✓	2.00	✓					
248	Malima bori	Jima Boxora	Robin	5.0 HP			✓	2.00				✓		
249	Malima bori	Adiddas	Janbo	N.A.			✓	4.00	✓					
250	Bekele GIRRISA	Ashenafi Shanko	Yanmar	10.0 HP	✓									
251	Bekele GIRRISA	Ashenafi Shanko	Robin	5.0 HP			✓	2.75					✓	
252	Bekele GIRRISA	Kero Fetenso	Robin	5.0 HP			✓	2.25					✓	
253	Bekele GIRRISA	Hagos Berehe	Robin	5.0 HP			✓	1.00					✓	
254	Bekele GIRRISA	Dejene	Honda	5.5 HP			✓	3.13		✓			✓	
255	Bekele GIRRISA	Ararso Bobe	Honda	5.5 HP			✓	1.38	✓					
256	Bekele GIRRISA	Asamino Nigatu	Lombardin	20.0 HP			✓	3.88		✓			✓	
257	Bekele GIRRISA	Getaneh Eshetu	Robin	5.0 HP			✓	1.13		✓			✓	
258	Bekele GIRRISA	Gobe Roba	Honda	5.5 HP			✓	1.50	✓					
259	Bekele GIRRISA	Teklu Adera	Robin	5.0 HP			✓	2.13				✓		
260	Bekele GIRRISA	Silu Adera	Robin	5.0 HP			✓							
261	Bekele GIRRISA	Silu Adera	Honda	5.5 HP			✓	7.00				✓		
262	Bekele GIRRISA	Midekso Doni	Yamaha	2.3kw			✓							
263	Bekele GIRRISA	Midekso Doni	Robin	3.7kw			✓	5.25	✓			✓		
264	Bekele GIRRISA	Temsgen W/Mariyam	Robin	5.0 HP			✓							
265	Bekele GIRRISA	Temsgen W/Mariyam	Honda	5.5 HP			✓	4.00				✓		
266	Bekele GIRRISA	Xindodo	Yamaha	2.3kw			✓	3.50				✓		
267	Bekele GIRRISA	Gerbicho Roba	Honda	5.5 HP			✓	1.50				✓		
268	Bekele GIRRISA	Tsgaye Kasa	Robin	5.0 HP			✓							
269	Bekele GIRRISA	Tsgaye Kasa	Honda	5.5 HP			✓	5.50				✓		
270	Bekele GIRRISA	Tagay Gebrie	Yamaha	5.0 HP			✓	1.50				✓		
271	Bekele GIRRISA	Abu Feyisa	Honda	5.5 HP			✓	2.00				✓		
272	Bekele GIRRISA	Tutie Abe	Honda	5.5 HP			✓	3.00				✓		
273	Bekele GIRRISA	Nuri Muzeinbi	Honda	5.5 HP			✓							
274	Bekele GIRRISA	Nuri Muzeinbi	Robin	5.0 HP			✓	4.50				✓		
275	Bekele GIRRISA	Muliye Mamo	Honda	5.5 HP			✓	6.00				✓		
276	Bekele GIRRISA	Heyitu Ago	Robin	5.0 HP			✓	1.75				✓		
277	Bekele GIRRISA	Abuka Tamru	Robin	5.0 HP			✓	3.00				✓		
278	Bekele GIRRISA	Abuka Tamru	Robin	5.0 HP			✓							
279	Bekele GIRRISA	Asenafi Abera	Robin	5.0 HP			✓							
280	Bekele GIRRISA	Asenafi Abera	Honda	5.5 HP			✓	4.50					✓	
281	Bekele GIRRISA	Mallesa Tefera	Honda	5.5 HP			✓	4.50				✓		
282	Bekele GIRRISA	Ayale Mekuria	Honda	5.5 HP			✓	3.00				✓		
283	Bekele GIRRISA	Girma Zeleke	Robin	5.0 HP			✓	1.25				✓		
284	Bekele GIRRISA	Deleegn Abebe	Robin	5.0 HP			✓	4.50				✓		
285	Bekele GIRRISA	Deleegn Abebe	Robin	5.0 HP			✓							
286	Bekele GIRRISA	Tolose Turi and Guta Korba	Honda	5.5 HP			✓	1.75	✓					
287	Bekele GIRRISA	Bete Midekso	Honda	5.5 HP			✓	1.75	✓					
288	Bekele GIRRISA	Doni Korjo	Robin	5.0 HP			✓	1.00	✓					
289	Bekele GIRRISA	Belisa Esosa	Robin	5.0 HP			✓	2.00				✓		
290	Bekele GIRRISA	Tarekegn	Robin	5.0 HP			✓	1.00				✓		
291	Bekele GIRRISA	Fejo Bonsa	Robin	5.0 HP			✓					✓		
292	Bekele GIRRISA		China	20.0 HP	✓			6.25	✓			✓		
293	Bekele GIRRISA	Bedasa Balcha	Honda	5.5 HP			✓							
294	Bekele GIRRISA		China	20.0 HP	✓			5.75	✓			✓		
295	Bekele GIRRISA	Jima Gobe	Honda	5.5 HP			✓	0.75	✓					
296	Bekele GIRRISA	Ararso Elemo	Honda	5.5 HP			✓	1.75				✓		
297	Bekele GIRRISA	Fitale Heye	Honda	5.5 HP			✓							
298	Bekele GIRRISA	Fitale Heye	Honda	5.5 HP			✓							
299	Bekele GIRRISA	Fitale Heye	China	20.0 HP	✓			7.00				✓		
300	Bekele GIRRISA	Akahu	Robin	5.0 HP			✓	1.25				✓		
301	Bekele GIRRISA	Biyo Hola	Honda	5.5 HP			✓							
302	Bekele GIRRISA	Biyo Hola	Honda	5.5 HP			✓							
303	Bekele GIRRISA	Biyo Hola	Yamaha	5.5 HP			✓							
304	Bekele GIRRISA	Biyo Hola	Yamaha	5.0 HP			✓	4.00	✓			✓		
305	Bekele GIRRISA	Fitale Oda	Robin	5.0 HP			✓	0.50	✓					
306	Bekele GIRRISA	Tsegaye Kasa	Honda	5.5 HP			✓	2.00				✓		
307	Bekele GIRRISA	Genene Sebsibe	China	20.0 HP	✓									
308	Bekele GIRRISA	Genene Sebsibe	Honda	5.5 HP			✓	2.00				✓		
309	Bekele GIRRISA	Bedase Debele	China	20.0 HP	✓			0.50	✓					
310	Bekele GIRRISA	Abyot Husen	Robin	5.0 HP			✓	2.00				✓		
311	Bekele GIRRISA	Raji Begna	Robin	5.0 HP			✓	2.00	✓					
312	Bekele GIRRISA	Abay Sime	Honda	5.5 HP			✓	4.00				✓		
313	Bekele GIRRISA	Bula Nure	Robin	5.0 HP			✓	1.00		✓				
314	Bekele GIRRISA	Jiru Doni	Honda	5.5 HP			✓	0.50	✓					
315	Bekele GIRRISA	Dan'el Ashebo	Robin	5.0 HP			✓							
316	Bekele GIRRISA	Dan'el Ashebo	Honda	5.5 HP			✓	5.50					✓	
317	Bekele GIRRISA	Mika'el	Yamaha	5.0 HP			✓							
318	Bekele GIRRISA	Mika'el	Honda	5.5 HP			✓	4.50				✓	✓	
319	Bekele GIRRISA	Maru Edo and Milo Edo	Robin	5.0 HP			✓	6.25		✓		✓	✓	
320	Bekele GIRRISA	Asamino Nigatu	Lombardin		✓									
321	Bekele GIRRISA	Asamino Nigatu	Honda	5.5 HP			✓	10.00		✓				
322	Bekele GIRRISA	Bershe Bokan	Honda	5.5 HP			✓	0.50	✓					
323	Bekele GIRRISA	Jana Hamdie	Honda	5.5 HP			✓	3.50					✓	
324	Bekele GIRRISA	Firew Hayihu	Robin	5.0 HP			✓	3.00		✓				

**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (5/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer	
325	Bekele GIRRISA	Firew Hayilu	Robin	5.0 HP			✓						
326	Bekele GIRRISA	Mukerem Abommed	Yamaha	5.0 HP			✓	2.00		✓			
327	Bekele GIRRISA	Nuri Muzabil and Yasn Mg	Robin	5.0 HP			✓	4.00		✓			
328	Bekele GIRRISA	Kedir Nageso	Robin	5.0 HP			✓	1.25		✓			
329	Bekele GIRRISA	Tofik Yasin	Robin	5.0 HP			✓	4.63					
330	Bekele GIRRISA	Tofik Yasin	Robin	5.0 HP			✓						
331	Bekele GIRRISA	Mesfin Nigusie	Robin	5.0 HP			✓	4.00					
332	Bekele GIRRISA	Nebiyu Asrat	China				✓	9.81		✓		✓	
333	Bekele GIRRISA	Nebiyu Asrat	China				✓						
334	Bekele GIRRISA	Lenjiso Dadi	Robin	5.0 HP			✓	3.88	✓			✓	
335	Bekele GIRRISA	Lenjiso Dadi	Robin	5.0 HP			✓						
336	Bekele GIRRISA	Desane Arsi	Honda	5.5 HP			✓	4.88		✓			
337	Bekele GIRRISA	Desane Arsi	Honda	5.5 HP			✓						
338	Bekele GIRRISA	Eshetu Teshome	Lombardin	8.4 HP			✓	4.00		✓			
339	Bekele GIRRISA	Tesfay Mitku	China	4"/			✓	2.00		✓			
340	Bekele GIRRISA	Gerele Lages and Malaka	Honda	5.5 HP			✓	2.50		✓			
341	Bekele GIRRISA	Tesfu	Robin	5.0 HP			✓	2.50		✓			
342	Bekele GIRRISA	JimmaShanko	Honda	5.5 HP			✓	2.75		✓		✓	
343	Bekele GIRRISA	Belayneh Giza	Honda	5.5 HP			✓	6.00				✓	
344	Bekele GIRRISA	Belayneh Giza	Honda	5.5 HP			✓						
345	Bekele GIRRISA	Belayneh Giza	Honda	5.5 HP			✓						
346	Bekele GIRRISA	Megerso Edo	Robin	5.0 HP			✓	0.75	✓				
347	Bekele GIRRISA	Desta Bayisa	Honda	5.5 HP			✓	1.50		✓			
348	Bekele GIRRISA	Abera (Endashe)	Honda	5.5 HP			✓	3.00		✓			
349	Bekele GIRRISA	Abeni Tamra	Robin	5.0 HP			✓	1.50		✓			
350	Bekele GIRRISA	Tesfaye Fiseha	Robin	5.0 HP			✓	1.50		✓			
351	Bekele GIRRISA	Legese	Honda	5.5 HP			✓	1.00		✓			
352	Bekele GIRRISA	Belay Gashew	Honda	5.5 HP			✓	2.00		✓			
353	Bekele GIRRISA	Tigstu Kefeni	Honda	5.5 HP			✓	1.50		✓			
354	Bekele GIRRISA	SOS	Electrical			✓		21.00		✓			
355	Bekele GIRRISA	Abay Ayele			✓			1.75		✓			
356	Bekele GIRRISA	Delelegn Mengesha			✓			2.25		✓			
357	Bekele GIRRISA	Kebede Belachew			✓			1.50		✓			
358	Bekele GIRRISA	Temesse Desyelew			✓			1.50		✓			
359	Bekele GIRRISA	L'ul Zemlak			✓			1.50		✓			
360	Bekele GIRRISA	Jemaheh Demise			✓			1.50		✓			
361	Bekele GIRRISA	Wagi Mola			✓			1.00		✓			
362	Bekele GIRRISA	Demise Worku			✓			0.75		✓			
363	Bekele GIRRISA	Tesfaye Tamiru			✓			1.50		✓			
364	Bekele GIRRISA	Ashagre Tage			✓			1.25		✓			
365	Bekele GIRRISA	Fayis Gurmu			✓			1.50		✓			
366	Bekele GIRRISA	Mengesha Wole			✓			1.75		✓			
367	Bekele GIRRISA	G/Mika'el Gobena			✓			0.75		✓			
368	Bekele GIRRISA	Medebo Mara			✓			1.00		✓			
369	Bekele GIRRISA	Degife Habte			✓			1.25		✓			
370	Bekele GIRRISA	Getachew Chrinet			✓			1.00		✓			
371	Bekele GIRRISA	Ehengere Habte			✓			1.00		✓			
372	Bekele GIRRISA	Tulu Bati			✓			0.75		✓			
373	Bekele GIRRISA	Hayilu Begashw			✓			0.75		✓			
374	Bekele GIRRISA	Birhenu Asefa			✓			0.75		✓			
375	Bekele GIRRISA	Midhego Doni			✓			2.25		✓			
376	Bekele GIRRISA	Bula Haye			✓			1.00		✓			
377	Bekele GIRRISA	Mifta Kemal			✓			1.00		✓			
378	Bekele GIRRISA	Ayela			✓			5.00	✓				
379	Bekele GIRRISA	Milo Ido			✓			4.50		✓			
380	Bekele GIRRISA	Belagah Negato			✓			14.00		✓			
381	Bekele GIRRISA	Ashanfi Negatu			✓			16.00		✓		✓	
382	Bekele GIRRISA	Nebiyu Asrat			✓			4.50				✓	
383	Bekele GIRRISA	Maykil			✓			6.00				✓	
384	Bekele GIRRISA	Turmo Asefa			✓			2.00		✓		✓	
385	Bekele GIRRISA	Bedhaso Debele			✓			3.00	✓			✓	
386	Bekele GIRRISA	Fitala Haye			✓			5.00		✓			
387	Bekele GIRRISA	Genena Sebsibe			✓			5.00		✓			
388	Bekele GIRRISA	Asamino Mlkonin			✓			2.00		✓			
389	Bekele GIRRISA	Biyyo Hala			✓			5.00		✓			
390	Bekele GIRRISA	Fitala Haawas			✓			5.00		✓			
391	Bekele GIRRISA	Tadesa Tabor			✓			2.00		✓			
392	Bekele GIRRISA	Abebe Tesfaye			✓			1.00		✓			
393	Bekele GIRRISA	Desta Bayisa			✓			3.25		✓			
394	Bekele GIRRISA	Tesfaye Giday			✓			1.00		✓			
395	Bekele GIRRISA	Asefa Deseta			✓			1.50	✓				
396	Bekele GIRRISA	Midhego Regasu			✓			0.75	✓				
397	Bekele GIRRISA	Alemi Robele			✓			0.50	✓				
398	Bekele GIRRISA	Biragu Tilahun			✓			2.00		✓			
399	Bekele GIRRISA	Matiyos Wakemo			✓			1.25		✓			
400	Bekele GIRRISA	Gugsa Yadeta			✓			1.00		✓			
401	Bekele GIRRISA	Legesa			✓			0.75		✓			
402	Bekele GIRRISA	Abebe Legesa			✓			0.75		✓			
403	Bekele GIRRISA	Girma Ayele			✓			1.25		✓			
404	Bekele GIRRISA	Dadicha Somano			✓			0.75	✓				
405	Bekele GIRRISA	Damena Maru			✓			1.25	✓				

**Table 3.2.1 List of Small Irrigation Pump in Dugda Bora Wareda (6/6)**

No.	PA	Pump Owner's Name or Farmer's Name	Type of Pump	Power	Source of Water			Cultivated land (ha)	Type of Agreement				Remark
					River	Lake	Well		Self owned	Lease contract	1/2 Share	1/3 Share for Farmer	
406	Bekele GIRRISA	Lungo Mokore			✓			0.50		✓			
407	Bekele GIRRISA	Solomon Teklu			✓			0.50		✓			
408	Bekele GIRRISA	Hayle Tihabu			✓			0.50		✓			
409	Bekele GIRRISA	Yilma Kondale			✓			1.50	✓				
410	Bekele GIRRISA	Legso Ararso			✓			1.75	✓				
411	Bekele GIRRISA	Tagesso Debitsu			✓			0.75		✓			
412	Bekele GIRRISA	Getu Mulat			✓			2.00		✓			
413	Bekele GIRRISA	Nega Yilada			✓			1.00		✓			
414	Bekele GIRRISA	Abebe Bekela			✓			1.50		✓			
415	Bekele GIRRISA	Matiwos Hayilu			✓			0.75		✓			
416	Bekele GIRRISA	Birhanu Gebeta			✓			0.75	✓				
417	Bekele GIRRISA	Kibe Tesema			✓			2.75		✓			
418	Bekele GIRRISA	Abebe Danale			✓			2.25		✓			
419	Bekele GIRRISA	Ishatu Gebiso			✓			1.00		✓			
420	Bekele GIRRISA	Kasa Anbaw			✓			3.25		✓			
421	Bekele GIRRISA	Giday Derbaw			✓			1.50		✓			
422	Bekele GIRRISA	Tigado Dysau			✓			1.00		✓			
423	Bekele GIRRISA	Belay Berehe			✓			1.75		✓			
424	Bekele GIRRISA	Temsgen Hayilu			✓			1.75		✓			
425	Bekele GIRRISA	Temsgen Alemu			✓			1.50		✓			
426	Bekele GIRRISA	Tadesse Binaro			✓			1.50		✓			
427	Bekele GIRRISA	Haeyile Tesema			✓			1.75		✓			
428	Bekele GIRRISA	Mesele Belay			✓			1.50		✓			
429	Bekele GIRRISA	Birhana Desalegn			✓			1.25		✓			
430	Bekele GIRRISA	Tolcha Euasu			✓			0.75	✓				
431	Bekele GIRRISA	Kebede Odela			✓			1.25		✓			
432	Bekele GIRRISA	Haron W/yesus			✓			2.50		✓			
433	Bekele GIRRISA	Nigusse Temane			✓			1.25		✓			
434	Bekele GIRRISA	Mokoro Hebrhan			✓			1.25		✓			
435	Bekele GIRRISA	G/Asdik Hayile			✓			0.75		✓			
436	Bekele GIRRISA	Degife Abebaze			✓			0.75		✓			
437	Bekele GIRRISA	Reda Sharewu			✓			1.25		✓			
438	Bekele GIRRISA	Gebre Welde			✓			0.75		✓			
439	Bekele GIRRISA	Hayilu Kebeda			✓			0.75		✓			
440	Bekele GIRRISA	Arebse Belay			✓			1.25		✓			
441	Bekele GIRRISA	Demtew Ayela			✓			1.00		✓			
442	Bekele GIRRISA	Seid Yimari			✓			0.75		✓			
443	Bekele GIRRISA	Gelan Ture			✓			0.75	✓	✓			
444	Bekele GIRRISA	Abebe G/abi			✓			0.75		✓			
445	Bekele GIRRISA	Awaga Abure			✓			0.75		✓			
446	Bekele GIRRISA	Amher Bogela			✓			0.75		✓			
447	Bekele GIRRISA	Abriham Asfaw			✓			0.75		✓			
448	Bekele GIRRISA	Tedese Abebe			✓			0.75		✓			
449	Bekele GIRRISA	Mokoro Kebero			✓			0.75		✓			
450	Bekele GIRRISA	Tilahun Wamenise			✓			1.00		✓			
451	Bekele GIRRISA	Megarsa Dedi			✓			0.75	✓	✓			
452	Bekele GIRRISA	Biru Tuja			✓			0.75	✓	✓			
453	Bekele GIRRISA	Mekannon Abebe			✓			1.75		✓			
454	Bekele GIRRISA	Abameke Tumebo			✓			2.00		✓			
455	Bekele GIRRISA	Desta Geten			✓			1.00		✓			
456	Bekele GIRRISA	Kebeda Berhun			✓			0.75		✓			
457	Bekele GIRRISA	Walde Genemo			✓			0.75		✓			
458	Bekele GIRRISA	W/yohannis Mitku			✓			0.75		✓			
459	Bekele GIRRISA	G/Asadij Caxfasi			✓			0.75		✓			
460	Bekele GIRRISA	Tekela Temema			✓			1.50		✓			
461	Bekele GIRRISA	Birhanu Legase			✓			1.50		✓			
462	Bekele GIRRISA	Husen Fuega			✓			1.50		✓			
	Total				193	46	223	1,561					

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (1/9)**

<b>Pump No.1</b>					<b>Year 2003</b>			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
7-Apr-03	8:00	13:00	5:00	24x0 + 5:00	103,764	103,914	150	150
11-Apr-03	13:50	17:02	3:12	24x0 + 8:12	103,914	104,010	96	246
12-Apr-03	7:15	12:45	5:30	24x0 + 13:42	104,010	104,171	161	407
16-Apr-03	7:00	8:40	1:40	24x0 + 15:22	104,171	104,221	50	457
18-Apr-03	7:20	10:30	3:10	24x0 + 18:32	104,221	104,314	93	550
7-May-03	15:00	19:10	4:10	24x0 + 22:42	104,314	104,430	116	666
8-May-03	6:30	8:00	1:30	24x1 + 0:12	104,430	104,471	41	707
9-May-03	7:05	13:39	6:34	24x1 + 6:46	104,471	104,653	182	889
10-May-03	7:30	11:30	4:00	24x1 + 10:46	104,653	104,761	108	997
11-May-03	7:10	12:25	5:15	24x1 + 16:01	104,761	104,918	157	1,154
12-May-03	7:45	12:15	4:30	24x1 + 20:31	104,918	105,053	135	1,289
13-May-03	7:30	10:55	3:25	24x1 + 23:56	105,053	105,155	102	1,391
19-May-03	6:50	12:00	5:10	24x2 + 5:06	105,155	105,309	154	1,545
20-May-03	7:05	10:10	3:05	24x2 + 8:11	105,309	105,400	91	1,636
21-May-03	8:40	15:00	6:20	24x2 + 14:31	105,400	105,588	188	1,824
23-May-03	7:10	12:10	5:00	24x2 + 19:31	105,588	105,738	150	1,974
24-May-03	8:57	13:20	4:23	24x2 + 23:54	105,738	105,869	131	2,105
25-May-03	9:00	11:35	2:35	24x3 + 2:29	105,769	105,945	176	2,281
27-May-03	7:40	12:30	4:50	24x3 + 7:19	105,945	106,090	145	2,426
28-May-03	8:10	14:00	5:50	24x3 + 13:09	106,090	106,266	176	2,602
Total				24x3 + 13:09				2,602

<b>Pump No.2</b>					<b>Year 2003</b>			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
9-May-03	7:10	11:10	4:00	24x0 + 4:00				
10-May-03	7:30	11:00	3:30	24x0 + 7:30				
11-May-03	7:15	12:15	5:00	24x0 + 12:30				
12-May-03	7:50	12:50	5:00	24x0 + 17:30				
13-May-03	7:35	10:55	3:20	24x0 + 20:50				
19-May-03	6:50	15:00	8:10	24x1 + 5:00				
20-May-03	7:10	14:50	7:40	24x1 + 12:40				
21-May-03	8:50	13:45	4:55	24x1 + 17:35				
23-May-03	7:15	12:15	5:00	24x1 + 22:35				
24-May-03	8:00	14:10	6:10	24x2 + 4:45				
25-May-03	8:30	14:30	6:00	24x2 + 10:45				
27-May-03	7:45	12:45	5:00	24x2 + 15:45				
28-May-03	8:00	12:20	4:20	24x2 + 20:05				
30-May-03	7:40	15:40	8:00	24x3 + 4:05				
31-May-03	8:10	15:40	7:30	24x3 + 11:35				
1-Jun-03	8:00	12:00	4:00	24x3 + 15:35				
2-Jun-03	7:45	15:00	7:15	24x3 + 22:50				
3-Jun-03	8:00	15:00	7:00	24x4 + 5:50				
11-Jun-03	7:40	13:00	5:20	24x4 + 11:10				
13-Jun-03	8:00	13:00	5:00	24x4 + 16:10				
14-Jun-03	7:35	12:20	4:45	24x4 + 20:55				
21-Jun-03	7:15	13:00	5:45	24x5 + 2:40				
22-Jun-03	7:35	12:05	4:30	24x5 + 7:10				
24-Jun-03	8:00	14:00	6:00	24x5 + 13:10				
25-Jun-03	8:00	12:00	4:00	24x5 + 17:10				
Total				24x5 + 17:10				

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (2/9)**

Pump No.2					Year 2004			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
13-Feb-04	7:35	15:00	7:25	24x0 + 7:25				
14-Feb-04	11:00	12:00	1:00	24x0 + 8:25				
15-Feb-04	7:30	12:00	4:30	24x0 + 12:55				
16-Feb-02	7:40	14:40	7:00	24x0 + 19:55				
17-Feb-04	7:00	10:00	3:00	24x0 + 22:55				
18-Feb-04	9:50	15:00	5:10	24x1 + 4:05				
19-Feb-04	7:50	12:00	4:10	24x1 + 8:15				
20-Feb-04	7:45	13:00	5:15	24x1 + 13:30				
21-Feb-02	8:00	12:00	4:00	24x1 + 17:30				
21-Feb-04	14:20	17:00	2:40	24x1 + 20:10				
22-Feb-04	7:25	12:40	5:15	24x2 + 1:25				
23-Feb-04	7:15	9:35	2:20	24x2 + 3:45				
24-Feb-04	7:30	11:50	4:20	24x2 + 8:05				
25-Feb-04	7:40	14:00	6:20	24x2 + 14:25				
26-Feb-04	7:15	12:15	5:00	24x2 + 19:25				
27-Feb-04	7:40	11:40	4:00	24x2 + 23:25				
27-Feb-04	14:00	15:20	1:20	24x3 + 0:45				
28-Feb-04	7:55	11:00	3:05	24x3 + 3:50				
29-Feb-04	8:00	12:00	4:00	24x3 + 7:50				
1-Mar-04	8:00	12:00	4:00	24x3 + 11:50				
2-Mar-04	7:50	12:00	4:10	24x3 + 16:00				
3-Mar-04	7:45	10:00	2:15	24x3 + 18:15				
4-Mar-04	7:25	11:35	4:10	24x3 + 22:25				
5-Mar-04	7:35	11:40	4:05	24x4 + 2:30				
6-Mar-04	7:25	12:15	4:50	24x4 + 7:20				
7-Mar-04	7:45	13:00	5:15	24x4 + 12:35				
8-Mar-04	8:00	12:30	4:30	24x4 + 17:05				
9-Mar-04	7:25	9:55	2:30	24x4 + 19:35				
10-Mar-04	7:40	11:00	3:20	24x4 + 22:55				
14-Mar-04	7:45	10:55	3:10	24x5 + 2:05				
15-Mar-04	7:50	11:00	3:10	24x5 + 5:15				
16-Mar-04	8:00	11:00	3:00	24x5 + 8:15				
17-Mar-04	7:40	11:40	4:00	24x5 + 12:15				
18-Mar-04	8:00	12:00	4:00	24x5 + 16:15				
22-Mar-04	7:20	13:30	6:10	24x5 + 22:25				
23-Mar-04	7:05	12:25	5:20	24x6 + 3:45				
24-Mar-04	7:30	11:30	4:00	24x6 + 7:45				
25-Mar-04	7:15	8:50	1:35	24x6 + 9:20				
27-Mar-04	7:15	10:55	3:40	24x6 + 13:00				
28-Mar-04	8:00	12:00	4:00	24x6 + 17:00				
29-Mar-04	8:00	11:00	3:00	24x6 + 20:00				
Total				24x6 + 20:00				

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (3/9)**

Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
25-Mar-02	15:20	17:27	2:07	24x0 + 2:07	38,202	38,267	65	65
26-Mar-02	7:47	10:03	2:16	24x0 + 4:23	38,267	38,339	72	137
27-Mar-02	10:15	11:47	1:32	24x0 + 5:55	38,339	38,387	48	185
28-Mar-02	8:04	10:38	2:34	24x0 + 8:29	38,387	38,468	81	266
29-Mar-02	7:57	11:17	3:20	24x0 + 11:49	38,468	38,562	94	360
1-Apr-02	8:29	11:38	3:09	24x0 + 14:58	38,562	38,662	100	460
2-Apr-02	7:07	10:15	3:08	24x0 + 18:06	38,662	38,757	95	555
3-Apr-02	7:15	9:35	2:20	24x0 + 20:26	38,757	38,829	72	627
3-Apr-02	12:04	13:44	1:40	24x0 + 22:06	38,829	38,882	53	680
7-Apr-02	6:43	9:10	2:27	24x1 + 0:33	38,882	38,958	76	756
7-Apr-02	13:50	15:20	1:30	24x1 + 2:03	38,958	39,005	47	803
8-Apr-02	7:20	10:20	3:00	24x1 + 5:03	39,005	39,100	95	898
8-Apr-02	13:08	14:04	0:56	24x1 + 5:59	39,100	39,130	30	928
9-Apr-02	7:18	10:00	2:42	24x1 + 8:41	39,130	39,216	86	1,014
10-Apr-02	7:35	10:35	3:00	24x1 + 11:41	39,216	39,311	95	1,109
11-Apr-02	7:35	10:35	3:00	24x1 + 14:41	39,311	39,406	95	1,204
11-Apr-02	11:28	12:48	1:20	24x1 + 16:01	39,406	39,448	42	1,246
13-Apr-02	7:40	11:00	3:20	24x1 + 19:21	39,448	39,552	104	1,350
14-Apr-02	7:30	10:06	2:36	24x1 + 21:57	39,552	39,633	81	1,431
15-Apr-02	7:18	10:35	3:17	24x2 + 1:14	39,633	39,736	103	1,534
16-Apr-02	7:09	8:50	1:41	24x2 + 2:55	39,736	39,791	55	1,589
17-Apr-02	7:09	10:19	3:10	24x2 + 6:05	39,791	39,893	102	1,691
17-Apr-02	13:00	15:15	2:15	24x2 + 8:20	39,893	39,964	71	1,762
18-Apr-02	7:25	10:05	2:40	24x2 + 11:00	39,964	40,049	85	1,847
18-Apr-02	12:00	14:15	2:15	24x2 + 13:15	40,049	40,119	70	1,917
19-Apr-02	7:15	9:15	2:00	24x2 + 15:15	40,119	40,181	62	1,979
19-Apr-02	11:33	13:25	1:52	24x2 + 17:07	40,181	40,239	58	2,037
20-Apr-02	7:50	10:50	3:00	24x2 + 20:07	40,239	40,333	94	2,131
21-Apr-02	7:50	8:53	1:03	24x2 + 21:10	40,333	40,367	34	2,165
22-Apr-02	8:12	10:20	2:08	24x2 + 23:18	40,367	40,435	68	2,233
24-Apr-02	7:40	10:40	3:00	24x3 + 2:18	40,435	40,522	87	2,320
Total				24x3 + 2:18				2,320

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (4/9)**

Pump No.5					Year 2002			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
29-Jan-02	7:30	10:35	3:05	24x0 + 3:05	48,798	48,875	77	77
31-Jan-02	8:00	12:00	4:00	24x0 + 7:05	48,875	49,010	135	212
1-Feb-02	7:00	11:30	4:30	24x0 + 11:35	49,010	49,144	134	346
2-Feb-02	7:30	12:00	4:30	24x0 + 16:05	49,144	49,278	134	480
6-Feb-02	7:00	12:00	5:00	24x0 + 21:05	49,278	49,428	150	630
7-Feb-02	7:00	8:40	1:40	24x0 + 22:45	49,428	49,478	50	680
8-Feb-02	7:00	8:45	1:45	24x1 + 0:30	49,478	49,531	53	733
9-Feb-02	6:43	11:17	4:34	24x1 + 5:04	49,531	49,669	138	871
11-Feb-02	6:45	10:52	4:07	24x1 + 9:11	49,669	49,792	123	994
11-Feb-02	12:30	14:00	1:30	24x1 + 10:41	49,792	49,837	45	1,039
12-Feb-02	7:02	10:14	3:12	24x1 + 13:53	49,837	49,933	96	1,135
12-Feb-02	12:10	13:45	1:35	24x1 + 15:28	49,933	49,981	48	1,183
13-Feb-02	6:55	10:30	3:35	24x1 + 19:03	49,981	50,090	109	1,292
13-Feb-02	12:25	14:00	1:35	24x1 + 20:38	50,090	50,138	48	1,340
14-Feb-02	7:00	10:30	3:30	24x2 + 0:08	50,138	50,243	105	1,445
15-Feb-02	6:55	11:00	4:05	24x2 + 4:13	50,243	50,366	123	1,568
15-Feb-02	12:48	13:33	0:45	24x2 + 4:58	50,366	50,389	23	1,591
16-Feb-02	7:20	11:10	3:50	24x2 + 8:48	50,389	50,502	113	1,704
21-Feb-02	8:40	11:10	2:30	24x2 + 11:18	50,502	50,577	75	1,779
21-Feb-02	11:40	13:45	2:05	24x2 + 13:23	50,577	50,639	62	1,841
22-Feb-02	6:50	11:10	4:20	24x2 + 17:43	50,639	50,767	128	1,969
23-Feb-02	7:00	10:40	3:40	24x2 + 21:23	50,767	50,878	111	2,080
23-Feb-02	13:00	14:15	1:15	24x2 + 22:38	50,878	50,916	38	2,118
24-Feb-02	7:15	12:45	5:30	24x3 + 4:08	50,916	51,081	165	2,283
25-Feb-02	7:27	11:00	3:33	24x3 + 7:41	51,081	51,188	107	2,390
25-Feb-02	11:55	13:00	1:05	24x3 + 8:46	51,188	51,221	33	2,423
26-Feb-02	7:20	11:30	4:10	24x3 + 12:56	51,221	51,346	125	2,548
26-Feb-02	12:25	13:25	1:00	24x3 + 13:56	51,346	51,376	30	2,578
27-Feb-02	7:18	8:29	1:11	24x3 + 15:07	51,376	51,412	36	2,614
1-Mar-02	7:06	11:30	4:24	24x3 + 19:31	51,520	51,651	131	2,745
1-Mar-02	12:30	13:50	1:20	24x3 + 20:51	51,651	51,689	38	2,783
2-Mar-02	7:10	11:30	4:20	24x4 + 1:11	51,689	51,818	129	2,912
2-Mar-02	12:02	13:22	1:20	24x4 + 2:31	51,818	51,858	40	2,952
4-Mar-02	16:00	17:12	1:12	24x4 + 3:43	51,858	51,894	36	2,988
11-Mar-02	7:05	13:05	6:00	24x4 + 9:43	51,894	52,072	178	3,166
12-Mar-02	6:50	11:04	4:14	24x4 + 13:57	52,072	52,198	126	3,292
12-Mar-02	12:03	13:03	1:00	24x4 + 14:57	52,198	52,228	30	3,322
13-Mar-02	7:07	11:07	4:00	24x4 + 18:57	52,228	52,346	118	3,440
13-Mar-02	12:00	13:16	1:16	24x4 + 20:13	52,346	52,384	38	3,478
14-Mar-02	6:50	11:05	4:15	24x5 + 0:28	52,384	52,511	127	3,605
14-Mar-02	12:00	12:14	0:14	24x5 + 0:42	52,511	52,517	6	3,611
15-Mar-02	8:20	13:20	5:00	24x5 + 5:42	52,517	52,665	148	3,759
16-Mar-02	6:53	10:49	3:56	24x5 + 9:38	52,665	52,778	113	3,872
17-Mar-02	6:43	10:43	4:00	24x5 + 13:38	52,778	52,895	117	3,989
18-Mar-02	7:33	12:43	5:10	24x5 + 18:48	52,895	53,047	152	4,141
19-Mar-02	7:33	12:13	4:40	24x5 + 23:28	53,047	53,185	138	4,279
20-Mar-02	7:30	12:00	4:30	24x6 + 3:58	53,185	53,317	132	4,411
21-Mar-02	7:05	9:40	2:35	24x6 + 6:33	53,317	53,393	76	4,487
22-Mar-02	7:40	11:20	3:40	24x6 + 10:13	53,393	53,501	108	4,595
23-Mar-02	7:05	11:05	4:00	24x6 + 14:13	53,501	53,618	117	4,712
25-Mar-02	8:45	13:00	4:15	24x6 + 18:28	53,618	53,744	126	4,838
26-Mar-02	7:10	11:00	3:50	24x6 + 22:18	53,744	53,856	112	4,950
26-Mar-02	11:50	13:20	1:30	24x6 + 23:48	53,856	53,900	44	4,994
27-Mar-02	7:10	11:22	4:12	24x7 + 4:00	53,900	54,025	125	5,119

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (5/9)**

Pump No.5					Year 2002			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
28-Mar-02	7:10	11:00	3:50	24x7 + 7:50	54,025	54,136	111	5,230
29-Mar-02	7:10	11:10	4:00	24x7 + 11:50	54,136	54,255	119	5,349
31-Mar-02	7:00	7:40	0:40	24x7 + 12:30	54,427	54,467	40	5,389
1-Apr-02	6:55	12:35	5:40	24x7 + 18:10	54,467	54,633	166	5,555
1-Apr-02	13:00	14:00	1:00	24x7 + 19:10	54,633	54,662	29	5,584
2-Apr-02	7:05	11:25	4:20	24x7 + 23:30	54,662	54,788	126	5,710
2-Apr-02	12:20	13:40	1:20	24x8 + 0:50	54,788	54,828	40	5,750
3-Apr-02	7:00	11:35	4:35	24x8 + 5:25	54,828	54,962	134	5,884
3-Apr-02	12:25	13:25	1:00	24x8 + 6:25	54,962	54,991	29	5,913
4-Apr-02	6:45	9:05	2:20	24x8 + 8:45	54,991	55,059	68	5,981
6-Apr-02	7:15	13:35	6:20	24x8 + 15:05	55,059	55,247	188	6,169
8-Apr-02	8:15	14:00	5:45	24x8 + 20:50	55,247	55,414	167	6,336
9-Apr-02	7:10	12:10	5:00	24x9 + 1:50	55,414	55,560	146	6,482
10-Apr-02	7:25	11:40	4:15	24x9 + 6:05	55,560	55,686	126	6,608
10-Apr-02	12:30	14:30	2:00	24x9 + 8:05	55,686	55,744	58	6,666
11-Apr-02	7:20	11:30	4:10	24x9 + 12:15	55,744	55,866	122	6,788
23-Apr-02	6:40	14:20	7:40	24x9 + 19:55	55,866	56,091	225	7,013
24-Apr-02	7:05	12:00	4:55	24x10 + 0:50	56,091	56,237	146	7,159
25-Apr-02	6:54	11:30	4:36	24x10 + 5:26	56,237	56,375	138	7,297
26-Apr-02	7:15	11:55	4:40	24x10 + 10:06	56,375	56,783	408	7,705
27-Apr-02	7:28	10:40	3:12	24x10 + 13:18	56,483	56,581	98	7,803
28-Apr-02	6:53	9:50	2:57	24x10 + 16:15	56,581	56,672	91	7,894
29-Apr-02	7:52	10:22	2:30	24x10 + 18:45	56,672	56,748	76	7,970
1-May-02	8:22	11:38	3:16	24x10 + 22:01	56,748	56,848	100	8,070
1-May-02	13:30	15:00	1:30	24x10 + 23:31	56,848	56,893	45	8,115
2-May-02	7:00	9:25	2:25	24x11 + 1:56	56,893	56,967	74	8,189
3-May-02	7:10	10:08	2:58	24x11 + 4:54	56,967	57,056	89	8,278
7-May-02	6:38	9:40	3:02	24x11 + 7:56	57,056	57,142	86	8,364
7-May-02	13:45	15:15	1:30	24x11 + 9:26	57,142	57,188	46	8,410
8-May-02	7:15	10:15	3:00	24x11 + 12:26	57,188	57,278	90	8,500
8-May-02	13:00	14:04	1:04	24x11 + 13:30	57,278	57,310	32	8,532
9-May-02	7:10	10:25	3:15	24x11 + 16:45	57,310	57,407	97	8,629
9-May-02	12:05	14:00	1:55	24x11 + 18:40	57,407	57,464	57	8,686
10-May-02	7:30	10:35	3:05	24x11 + 21:45	57,464	57,557	93	8,779
11-May-02	7:15	10:15	3:00	24x12 + 0:45	57,557	57,647	90	8,869
13-May-02	7:35	11:05	3:30	24x12 + 4:15	57,647	57,752	105	8,974
14-May-02	7:20	10:08	2:48	24x12 + 7:03	57,752	57,834	82	9,056
15-May-02	7:10	9:38	2:28	24x12 + 9:31	57,834	57,909	75	9,131
16-May-02	7:04	8:50	1:46	24x12 + 11:17	57,909	57,963	54	9,185
17-May-02	7:04	12:12	5:08	24x12 + 16:25	57,963	58,118	155	9,340
18-May-02	7:20	10:30	3:10	24x12 + 19:35	58,118	58,213	95	9,435
18-May-02	14:10	15:32	1:22	24x12 + 20:57	58,213	58,263	50	9,485
19-May-02	7:10	10:30	3:20	24x13 + 0:17	58,263	58,363	100	9,585
19-May-02	14:12	16:12	2:00	24x13 + 2:17	58,363	58,423	60	9,645
20-May-02	7:30	8:20	0:50	24x13 + 3:07	58,423	58,448	25	9,670
20-May-02	12:00	14:10	2:10	24x13 + 5:17	58,448	58,513	65	9,735
21-May-02	7:15	8:53	1:38	24x13 + 6:55	58,513	58,562	49	9,784
21-May-02	16:10	17:27	1:17	24x13 + 8:12	58,562	58,601	39	9,823
22-May-02	8:07	10:21	2:14	24x13 + 10:26	58,601	58,669	68	9,891
24-May-02	7:35	10:35	3:00	24x13 + 13:26	58,669	58,759	90	9,981
27-May-02	7:15	11:55	4:40	24x13 + 18:06	58,759	58,897	138	10,119
28-May-02	7:25	10:53	3:28	24x13 + 21:34	58,897	59,001	104	10,223
29-May-02	7:40	10:40	3:00	24x14 + 0:34	59,001	59,091	90	10,313
30-May-02	7:25	9:25	2:00	24x14 + 2:34	59,091	59,151	60	10,373



**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (6/9)**

Pump No.5					Year 2002			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
31-May-02	7:20	12:00	4:40	24x14 + 7:14	59,151	59,260	109	10,482
1-Jun-02	7:35	11:25	3:50	24x14 + 11:04	59,260	59,375	115	10,597
3-Jun-02	7:05	12:05	5:00	24x14 + 16:04	59,375	59,525	150	10,747
4-Jun-02	7:28	12:00	4:32	24x14 + 20:36	59,525	59,661	136	10,883
5-Jun-02	7:48	12:00	4:12	24x15 + 0:48	59,661	59,878	217	11,100
6-Jun-02	7:05	11:10	4:05	24x15 + 4:53	59,878	59,910	32	11,132
7-Jun-02	7:28	11:30	4:02	24x15 + 8:55	59,910	60,030	120	11,252
8-Jun-02	7:25	10:30	3:05	24x15 + 12:00	60,030	60,119	89	11,341
12-Jun-02	7:25	9:23	1:58	24x15 + 13:58	60,119	60,178	59	11,400
27-Jun-02	6:45	11:00	4:15	24x15 + 18:13	60,178	60,305	127	11,527
28-Jun-02	7:15	11:15	4:00	24x15 + 22:13	60,305	60,425	120	11,647
29-Jun-02	6:50	8:40	1:50	24x16 + 0:03	60,425	60,481	56	11,703
2-Jul-02	7:20	11:00	3:40	24x16 + 3:43	60,481	60,590	109	11,812
4-Jul-02	6:45	11:00	4:15	24x16 + 7:58	60,590	60,717	127	11,939
5-Jul-02	7:30	11:30	4:00	24x16 + 11:58	60,717	60,837	120	12,059
7-Jul-02	7:50	9:15	1:25	24x16 + 13:23	60,837	60,878	41	12,100
7-Jul-02	9:50	12:00	2:10	24x16 + 15:33	60,878	60,941	63	12,163
9-Jul-02	7:10	11:30	4:20	24x16 + 19:53	60,941	61,069	128	12,291
10-Jul-02	7:10	11:00	3:50	24x16 + 23:43	61,069	61,181	112	12,403
20-Jul-02	6:15	15:10	8:55	24x17 + 8:38	61,181	61,446	265	12,668
21-Jul-02	6:45	9:35	2:50	24x17 + 11:28	61,446	61,530	84	12,752
23-Jul-02	6:40	11:45	5:05	24x17 + 16:33	61,530	61,682	152	12,904
24-Jul-02	6:55	11:55	5:00	24x17 + 21:33	61,682	61,831	149	13,053
3-Aug-02	6:55	10:00	3:05	24x18 + 0:38	61,831	61,921	90	13,143
4-Aug-02	6:50	11:20	4:30	24x18 + 5:08	61,921	62,056	135	13,278
16-Aug-02	7:25	11:25	4:00	24x18 + 9:08	62,056	62,175	119	13,397
20-Sep-02	7:40	13:00	5:20	24x18 + 14:28	62,175	62,335	160	13,557
22-Sep-02	7:05	13:25	6:20	24x18 + 20:48	62,335	62,525	190	13,747
23-Sep-02	6:30	14:00	7:30	24x19 + 4:18	62,525	62,746	221	13,968
24-Sep-02	6:25	12:05	5:40	24x19 + 9:58	62,746	62,916	170	14,138
25-Sep-02	6:35	12:25	5:50	24x19 + 15:48	62,916	63,090	174	14,312
26-Sep-02	6:30	12:05	5:35	24x19 + 21:23	63,090	63,259	169	14,481
30-Sep-02	6:30	13:00	6:30	24x20 + 3:53	63,259	63,452	193	14,674
1-Oct-02	6:40	11:40	5:00	24x20 + 8:53	63,452	63,602	150	14,824
2-Oct-02	7:00	12:00	5:00	24x20 + 13:53	63,602	63,752	150	14,974
5-Oct-02	7:00	13:00	6:00	24x20 + 19:53	63,752	63,932	180	15,154
6-Oct-02	7:00	8:40	1:40	24x20 + 21:33	63,932	63,972	40	15,194
14-Oct-02	6:45	13:30	6:45	24x21 + 4:18	63,972	64,175	203	15,397
15-Oct-02	6:40	11:00	4:20	24x21 + 8:38	64,175	64,303	128	15,525
15-Oct-02	12:25	14:40	2:15	24x21 + 10:53	64,303	64,370	67	15,592
22-Oct-02	7:30	13:00	5:30	24x21 + 16:23	64,370	64,534	164	15,756
23-Oct-02	7:20	11:20	4:00	24x21 + 20:23	64,534	64,654	120	15,876
24-Oct-02	6:55	11:40	4:45	24x22 + 1:08	64,654	64,795	141	16,017
24-Oct-02	7:00	10:45	3:45	24x22 + 4:53	64,795	64,905	110	16,127
30-Oct-02	6:30	12:20	5:50	24x22 + 10:43	64,905	65,077	172	16,299
31-Oct-02	6:45	10:40	3:55	24x22 + 14:38	65,077	65,193	116	16,415
1-Nov-02	9:20	16:40	7:20	24x22 + 21:58	65,193	65,409	216	16,631
2-Nov-02	6:30	16:30	10:00	24x23 + 7:58	65,409	65,707	298	16,929
3-Nov-02	6:45	15:45	9:00	24x23 + 16:58	65,707	65,973	266	17,195
4-Nov-02	9:50	14:40	4:50	24x23 + 21:48	65,973	66,292	319	17,514
7-Nov-02	6:45	12:55	6:10	24x24 + 3:58	66,292	66,475	183	17,697
7-Nov-02	7:50	14:35	6:45	24x24 + 10:43	66,475	66,678	203	17,900
8-Nov-02	6:50	13:00	6:10	24x24 + 16:53	66,678	66,853	175	18,075
8-Nov-02	7:45	13:05	5:20	24x24 + 22:13	66,853	67,012	159	18,234

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (7/9)**

Pump No.5	Year 2002							
	Date	Time			Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
9-Nov-02	7:05	13:50	6:45	24x25 + 4:58	67,012	67,213	201	18,435
10-Nov-02	7:10	11:45	4:35	24x25 + 9:33	67,213	67,359	146	18,581
10-Nov-02	9:20	17:20	8:00	24x25 + 17:33	67,359	67,595	236	18,817
11-Nov-02	11:20	16:10	4:50	24x25 + 22:23	67,595	67,748	153	18,970
12-Nov-02	7:00	12:15	5:15	24x26 + 3:38	67,748	67,904	156	19,126
12-Nov-02	9:00	18:00	9:00	24x26 + 12:38	67,904	68,159	255	19,381
13-Nov-02	5:00	14:00	9:00	24x26 + 21:38	68,159	68,394	235	19,616
16-Nov-02	14:05	17:00	2:55	24x27 + 0:33	68,394	68,542	148	19,764
16-Nov-02	6:30	15:55	9:25	24x27 + 9:58	68,542	68,836	294	20,058
17-Nov-02	8:40	11:30	2:50	24x27 + 12:48	68,836	68,919	83	20,141
17-Nov-02	9:05	18:05	9:00	24x27 + 21:48	68,919	69,187	268	20,409
18-Nov-02	6:05	12:05	6:00	24x28 + 3:48	69,187	69,369	182	20,591
18-Nov-02	9:45	18:00	8:15	24x28 + 12:03	69,369	69,615	246	20,837
19-Nov-02	7:00	13:25	6:25	24x28 + 18:28	69,615	69,818	203	21,040
20-Nov-02	7:00	11:00	4:00	24x28 + 22:28	69,818	69,938	120	21,160
20-Nov-02	9:20	18:00	8:40	24x29 + 7:08	69,938	70,193	255	21,415
21-Nov-02	6:00	9:00	3:00	24x29 + 10:08	70,193	70,283	90	21,505
21-Nov-02	9:00	17:15	8:15	24x29 + 18:23	70,283	70,512	229	21,734
23-Nov-02	9:10	17:30	8:20	24x30 + 2:43	70,512	70,766	254	21,988
24-Nov-02	9:15	18:00	8:45	24x30 + 11:28	70,766	71,028	262	22,250
25-Nov-02	6:00	9:00	3:00	24x30 + 14:28	71,028	71,118	90	22,340
25-Nov-02	10:30	18:00	7:30	24x30 + 21:58	71,118	71,337	219	22,559
26-Nov-02	6:00	12:00	6:00	24x31 + 3:58	71,337	71,517	180	22,739
27-Nov-02	7:00	11:50	4:50	24x31 + 8:48	71,517	71,661	144	22,883
27-Nov-02	10:35	17:45	7:10	24x31 + 15:58	71,661	71,875	214	23,097
28-Nov-02	10:30	18:00	7:30	24x31 + 23:28	71,875	72,102	227	23,324
30-Nov-02	8:45	18:00	9:15	24x(31+1)+8:43	72,102	72,376	274	23,598
1-Dec-02	9:00	18:00	9:00	24x(31+1)+17:43	72,376	72,643	267	23,865
2-Dec-02	6:00	7:20	1:20	24x(31+1)+19:03	72,643	72,684	41	23,906
3-Dec-02	6:20	8:20	2:00	24x(31+1)+21:03	72,684	72,951	267	24,173
3-Dec-02	8:30	17:30	9:00	24x(31+2)+6:03	72,951	73,011	60	24,233
6-Dec-02	8:50	17:50	9:00	24x(31+2)+15:03	73,011	73,278	267	24,500
7-Dec-02	8:40	17:35	8:55	24x(31+2)+23:58	73,278	73,545	267	24,767
8-Dec-02	6:00	9:20	3:20	24x(31+3)+3:18	73,545	73,809	100	24,867
8-Dec-02	8:10	17:30	9:20	24x(31+3)+12:38	73,809	74,182	273	25,140
9-Dec-02	9:15	11:15	2:00	24x(31+3)+14:38	74,182	74,241	59	25,199
10-Dec-02	7:00	13:00	6:00	24x(31+3)+20:38	74,241	74,321	80	25,279
10-Dec-02	9:00	18:00	9:00	24x(31+4)+5:38	74,321	74,588	267	25,546
11-Dec-02	7:00	13:00	6:00	24x(31+4)+11:38	74,588	74,768	180	25,726
12-Dec-02	8:00	18:40	10:40	24x(31+4)+22:18	74,768	75,089	321	26,047
13-Dec-02	8:45	18:00	9:15	24x(31+5)+7:33	75,089	75,364	275	26,322
14-Dec-02	6:00	11:00	5:00	24x(31+5)+12:33	75,364	75,513	149	26,471
14-Dec-02	8:30	17:30	9:00	24x(31+5)+21:33	75,513	75,780	267	26,738
16-Dec-02	9:00	18:20	9:20	24x(31+6)+6:53	75,780	76,061	281	27,019
17-Dec-02	6:20	8:32	2:12	24x(31+6)+9:05	76,061	76,127	66	27,085
18-Dec-02	8:20	17:30	9:10	24x(31+6)+18:15	76,127	76,400	273	27,358
19-Dec-02	9:05	18:05	9:00	24x(31+7)+3:15	76,400	76,667	267	27,625
20-Dec-02	6:05	8:10	2:05	24x(31+7)+5:20	76,667	76,743	76	27,701
20-Dec-02	9:10	18:10	9:00	24x(31+7)+14:20	76,743	77,010	267	27,968
21-Dec-02	6:10	11:30	5:20	24x(31+7)+19:40	77,010	77,169	159	28,127
Total				24x(31+7)+19:40				28,127

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (8/9)**

Pump No.5					Year 2003			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
11-Jan-03	8:30	14:00	5:30	24x0 + 5:30	77,169	77,330	161	161
11-Jan-03	9:00	17:30	8:30	24x0 + 14:00	77,330	77,581	251	412
12-Jan-03	8:50	17:40	8:50	24x0 + 22:50	77,581	77,844	263	675
13-Jan-03	9:10	17:40	8:30	24x1 + 7:20	77,844	78,098	254	929
14-Jan-03	10:10	19:40	9:30	24x1 + 16:50	78,098	78,379	281	1,210
18-Jan-03	9:30	17:55	8:25	24x2 + 1:15	78,379	78,625	246	1,456
19-Jan-03	9:00	18:00	9:00	24x2 + 10:15	78,625	78,893	268	1,724
20-Jan-03	8:40	17:45	9:05	24x2 + 19:20	78,893	79,162	269	1,993
22-Jan-03	9:40	18:00	8:20	24x3 + 3:40	79,162	79,411	249	2,242
23-Jan-03	9:00	18:00	9:00	24x3 + 12:40	79,411	79,675	264	2,506
24-Jan-03	6:00	10:40	4:40	24x3 + 17:20	79,675	79,816	141	2,647
24-Jan-03	9:00	18:00	9:00	24x4 + 2:20	79,816	80,083	267	2,914
25-Jan-03	6:00	11:06	5:06	24x4 + 7:26	80,083	80,236	153	3,067
31-Jan-03	16:00	18:00	2:00	24x4 + 9:26	80,236	80,293	57	3,124
1-Feb-03	7:35	11:35	4:00	24x4 + 13:26	80,293	80,414	121	3,245
2-Feb-03	7:25	12:40	5:15	24x4 + 18:41	80,414	80,577	163	3,408
5-Feb-03	12:30	16:00	3:30	24x4 + 22:11	80,577	80,682	105	3,513
6-Feb-03	7:00	8:45	1:45	24x4 + 23:56	80,682	80,734	52	3,565
7-Feb-03	10:00	17:00	7:00	24x5 + 6:56	80,734	80,944	210	3,775
13-Feb-03	11:30	18:30	7:00	24x5 + 13:56	82,397	82,592	195	3,970
14-Feb-03	9:00	16:36	7:36	24x5 + 21:32	82,592	82,820	228	4,198
15-Feb-03	9:40	16:30	6:50	24x6 + 4:22	82,820	83,025	205	4,403
16-Feb-03	8:05	15:30	7:25	24x6 + 11:47	83,025	83,248	223	4,626
17-Feb-03	7:45	15:00	7:15	24x6 + 19:02	83,248	83,455	207	4,833
18-Feb-03	9:00	15:20	6:20	24x7 + 1:22	83,455	83,643	188	5,021
19-Feb-03	7:55	15:00	7:05	24x7 + 8:27	83,643	83,855	212	5,233
21-Feb-03	8:05	14:40	6:35	24x7 + 15:02	83,855	84,051	196	5,429
22-Feb-03	7:30	11:45	4:15	24x7 + 19:17	84,051	84,178	127	5,556
22-Feb-03	12:55	15:30	2:35	24x7 + 21:52	84,178	84,257	79	5,635
22-Feb-03	10:20	11:55	1:35	24x7 + 23:27	84,257	84,304	47	5,682
23-Feb-03	10:00	15:07	5:07	24x8 + 4:34	84,304	84,457	153	5,835
23-Feb-03	10:15	17:40	7:25	24x8 + 11:59	84,457	84,677	220	6,055
24-Feb-03	8:40	14:50	6:10	24x8 + 18:09	84,677	84,853	176	6,231
24-Feb-03	10:15	17:42	7:27	24x9 + 1:36	84,853	85,076	223	6,454
25-Feb-03	10:00	17:25	7:25	24x9 + 9:01	85,076	85,298	222	6,676
5-Mar-03	8:00	11:00	3:00	24x9 + 12:01	85,298	85,338	40	6,716
8-Mar-03	8:00	13:20	5:20	24x9 + 17:21	85,338	85,548	210	6,926
9-Mar-03	8:00	13:00	5:00	24x9 + 22:21	85,548	85,698	150	7,076
10-Mar-03	8:00	12:00	4:00	24x10 + 2:21	85,698	85,918	220	7,296
10-Mar-03	8:00	13:00	5:00	24x10 + 7:21	85,918	85,968	50	7,346
11-Mar-03	6:00	14:17	8:17	24x10 + 15:38	85,968	86,046	78	7,424
12-Mar-03	8:00	17:14	9:14	24x11 + 0:52	86,046	86,330	284	7,708
14-Mar-03	8:00	15:18	7:18	24x11 + 8:10	86,330	86,558	228	7,936
15-Mar-03	10:00	15:07	5:07	24x11 + 13:17	86,558	86,711	153	8,089
16-Mar-03	8:00	13:23	5:23	24x11 + 18:40	86,711	86,872	161	8,250
17-Mar-03	8:00	13:25	5:25	24x12 + 0:05	86,872	87,034	162	8,412
18-Mar-03	8:00	13:25	5:25	24x12 + 5:30	87,034	87,196	162	8,574
7-Apr-03	8:00	9:42	1:42	24x12 + 7:12	87,196	87,252	56	8,630
Total				24x12 + 7:12				8,630

**Table 3.3.1 Pump Operation Record of Meki-Ziway Irrigation Scheme (9/9)**

Pump No.5					Year 2004			
Date	Time				Kwh			
	Started	Stopped	Duration (hr)	Accum.(hr)	Started	Stopped	Consumed	Accum.
31-Mar-04	12:10	15:45	3:35	24x0 + 3:35	87,299	87,404	105	105
1-Apr-04	7:55	14:00	6:05	24x0 + 9:40	87,404	87,587	183	288
2-Apr-04	7:35	11:45	4:10	24x0 + 13:50	87,587	87,711	124	412
3-Apr-04	7:40	12:00	4:20	24x0 + 18:10	87,711	87,841	130	542
4-Apr-04	8:00	12:00	4:00	24x0 + 22:10	87,841	87,958	117	659
9-Apr-04	7:00	11:00	4:00	24x1 + 2:10	87,958	88,072	114	773
20-Apr-04	7:15	11:00	3:45	24x1 + 5:55	88,072	88,178	106	879
25-Apr-04	7:30	11:00	3:30	24x1 + 9:25	88,178	88,283	105	984
26-Apr-04	7:40	13:00	5:20	24x1 + 14:45	88,283	88,453	170	1,154
29-Apr-04	9:00	13:05	4:05	24x1 + 18:50	88,453	88,574	121	1,275
30-Apr-04	7:05	14:30	7:25	24x2 + 2:15	88,574	88,795	221	1,496
30-Apr-04	17:20	18:50	1:30	24x2 + 3:45	88,795	88,840	45	1,541
1-May-04	6:00	11:50	5:50	24x2 + 9:35	88,840	89,011	171	1,712
1-May-04	14:30	17:00	2:30	24x2 + 12:05	89,011	89,056	45	1,757
2-May-04	7:00	15:00	8:00	24x2 + 20:05	89,056	89,292	236	1,993
4-May-04	11:00	15:30	4:30	24x3 + 0:35	89,292	89,427	135	2,128
5-May-04	6:50	15:00	8:10	24x3 + 8:45	89,427	89,610	183	2,311
6-May-04	6:00	12:00	6:00	24x3 + 14:45	89,610	89,748	138	2,449
7-May-04	6:00	13:10	7:10	24x3 + 21:55	89,748	89,906	158	2,607
8-May-04	7:00	14:10	7:10	24x4 + 5:05	89,906	90,074	168	2,775
Total				24x4 + 5:05				2,775

**Table 3.5.1 Inventory Data of Existing Dug-Well in Dodo Wadera P.A. in Dugda Bora Wareda (1/3)**

Well No.	Date	Surveyor	1. Location				2. Physical Information							3. History				
			Wereda Name	P.A. Name	Locality	Dug-Well Owner's Name	Coordinates		Elevation (m)	Diameter of Well (m)	Total Depth (m)	Water Depth (m)	Pump Setting Depth(m)	Record of First Digging of Well			Maintenance / Repair Works	
							Latitude	Longitude						Year (G.C.)	No. of people for digging	Construction Period (days)	Frequency	Type of work
D-1	6-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Dodi Buta	498992	922512	1625	0.8	10	0.5		2001	2	5	Yearly	Excavation and clearing
D-2	6-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Ayale Damte	498854	922484	1628	2.3	6.4	1	3.3	1991	9	7	Yearly	Excavation and clearing
D-3	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Shawi matafarya	499004	922395	1593	0.8	10	1	-	1990	2	7	Yearly	Excavation and clearing
D-4	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Ayale Damte	499111	922455	1600	0.7	8.1	1	-	2002	2	3	Yearly	Excavation and clearing
D-5	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	G/mdin mangistu	498951	922313	1600	0.7	7.7	1.3	-	1991	2	6	Yearly	Excavation and clearing
D-6	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Asalafach Sume	498942	922303	1600	0.9	7	1.5	-	1990	2	4	Yearly	Excavation and clearing
D-7	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Birhanu Degafu	498920	922290	1599	0.7	7	1	-	1991	3	6	Yearly	Excavation and clearing
D-8	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Adamu Adana	498882	922273	1600	0.8	8	1.5	-	1992	3	7	-	Excavation and clearing
D-9	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Shifara Burka	498871	922261	1596	1	7.3	2.7	-	1991	2	4	Monthly	Excavation and clearing
D-10	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	warku Alamu	498843	922204	1597	0.9	6.4	0.5	-	1997	4	7	Yearly	Excavation and clearing
D-11	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	G/mdin mangistu	498730	922273	1595	4.5	7.5	4	2	1996	2	15	Yearly	-
D-12	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Fitolo Hawas	499021	922626	1537	1	8	1.5	3	2001	2	15	Yearly	Excavation and clearing
D-13	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Nago fetal	499133	922614	1538	1	0.9	1.5	-	2001	2	9	Yearly	Excavation and clearing
D-14	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	G/selase Ashabre	499062	922467	1536	0.9	8	0.5	-	1992	2	4	Yearly	Excavation and clearing
D-15	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	W/hana Tilawn	499044	922435	1535	0.7	7.9	1.5	-	1992	3	6	Yearly	Excavation and clearing
D-16	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Mulye W/gorgese	498978	922363	1621	0.8	8	0.5	-	1991	3	4	Yearly	Excavation and clearing
D-17	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Donele	497153	922526	1556	2.3	9.3	0.5	2.9	2002	6	25	Monthly	Excavation and clearing
D-18	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Salke kumbe	496911	922517	1597	1.2	5.1	1.1	1.3	2002	2	6	Monthly	Excavation and clearing
D-19	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Rufa oda	496636	922515	1599	2	4.2	0.5	0.5	2001	4	3	Yearly	Excavation and clearing
D-20	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Bulbula Damaa	496678	922675	1633	2.94	4.5	1	0.5	2001	4	-	Yearly	Excavation and clearing
D-21	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Gamachu Nabe	496390	922588	1600	1.5	2.3	1	0.5	2002	2	4	Monthly	Excavation and clearing
D-22	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Sima Barso	496676	922680	1630	2.3	2.1	2.5	0.5	2001	2	3	Yearly	Excavation and clearing
D-23	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Birke Hundee	496236	922697	1624	1.4	1.2	2.5	0.5	2000	1	2	Monthly	Excavation and clearing
D-24	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Farecha Nabe	496361	922511	1629	3.25	2.1	2	0.5	2001	2	7	Yearly	Excavation and clearing
D-25	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Fole Ayano	496143	922648	1625	2.5	2.1	2.6	0.5	2001	5	3	Monthly	Excavation and clearing
D-26	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Ayano Magera	496319	922944	1621	3.2	6	1.6	0.8	2001	3	7	Monthly	Excavation and clearing
D-27	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Hayile Tola	496424	923009	1625	2.7	6.6	1.2	0.7	2002	6	7	Monthly	Excavation and clearing
D-28	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Nabe Buke	496052	922577	1606	2.5	5.5	1.5	0.5	2001	2	7	Monthly	-
D-29	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Dadi Nabi	496033	922658	1601	2.6	4.5	1.5	0.5	2002	10	3	Yearly	Excavation and clearing
D-30	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Abara Galata	495775	922360	1610	1	3.7	1.5	0.5	2002	2	6	Monthly	Excavation and clearing
D-31	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Shita	498472	922026	1565	4.5	8.5	1.5	4.2	2002	4	20	Monthly	Excavation and clearing
D-32	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Bakele Makurya	498352	921860	1602	3.5	5	1.6	1.5	1987	4	7	Yearly	Excavation and clearing
D-33	11-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	G/Basify	497643	921007	1006	3	7	2.5	1.5	2001	15	14	Yearly	Excavation and clearing
D-34	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	H/maryam G/gizabher	497107	921563	1613	2.4	6.5	2.5	2.4	2002	6	28	Daily	Excavation and clearing
D-35	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Abidala	496942	921218	1610	10	3.7	2.5	4.1	1987	5	14	Monthly	Excavation and clearing
D-36	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Takila Maryam	497414	921264	1558	10	9	2.4	4	1987	15	15	Monthly	Excavation and clearing
D-37	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Kalabi Tasefa	497321	921389	1600	3	7.5	1.8	3.3	1991	2	7	Monthly	Excavation and clearing
D-38	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Yarde kalabi	497678	921671	1604	2.2	6.7	1.6	1.75	2002	6	7	Yearly	Excavation and clearing
D-39	11-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Takelu Adara	496305	921695	1623	1.6	8.6	1.5	1.9	2002	2	17	Yearly	Excavation and clearing
D-40	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Adunya Bakele	497950	921580	1600	3	7.3	3.2	2.5	1987	4	15	Yearly	Excavation and clearing
D-41	11-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Fetala Tufa	496620	922117	1625	1.2	5	1	1	2002	2	4	Yearly	Excavation and clearing
D-42	13-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Shanteco Balayi	498041	921788	1595	4	3.4	7.5	2.5	1998	2	7	Yearly	Excavation and clearing
D-43	13-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Amaze G/waite	498040	921791	1597	4	3.4	7.5	2.5	1998	2	7	Yearly	Excavation and clearing
D-44	14-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Adamu Adana	498851	922643	1620	2	12	1.5	5	2001	2	7	Yearly	Excavation and clearing
D-45	14-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Eyasu Asese	497850	921746	1565	4.2	8	2	3	1993	5	15	Yearly	Excavation and clearing

Source : Surveyed by OADB staff, 2003

**Table 3.5.1 Inventory Data of Existing Dug-Well in Dodo Wadera P.A. in Dugda Bora Wareda (2/3)**

Well No.	4. Purpose of Use				No. of Users (HH)	Irrigated Area (ha)	Using Pump	Pump No.	First Year of Using Pump (G.C.)	Main Crop planted in Irrigation Land		Condition of Contract with Pump Owner	Volume of Water Use
	Purpose of Use of Groundwater									Rainy season	Dry season		
	1	2	3	4									
D-1	Drinking	For Livestock	washing		2	-	No	-	-	-	-	25liter per day	
D-2	Irrigation				8	3	Yes	DP-1	1991	Tomato	Tomato	-	60liters use
D-3	Drinking	Domestic	For livestock		8	-	No	-	-	-	-	-	65 liters use
D-4	Drinking	For Livestock	washing		7	-	No	-	-	-	-	-	60 liters use
D-5	Drinking	Domestic	For livestock		9	-	No	-	-	-	-	-	55 liters use
D-6	Drinking	Domestic	For livestock		4	-	No	-	-	-	-	-	40 liters use
D-7	Drinking	Domestic			5	-	No	-	-	-	-	-	40 liters use for working drinking
D-8	Drinking	Domestic	For livestock		7	-	No	-	-	-	-	-	50 liters
D-9	Drinking	Domestic			-	-	No	-	-	-	-	-	200 liters for cooking and drinking
D-10	Drinking	Domestic			35	-	No	-	-	-	-	-	300 liters
D-11	Drinking	Domestic	Irrigation		4	2	Yes	DP-3	1996	Tomato	Tomato	-	40liters
D-12	Drinking	Irrigation	For livestock		2	1.5	Yes	DP-2	2001	Tomato,maize,pepper,onion,cabbage	Tomato,maize,cabbage,onion,pepper	50% sharing with pump owners	25 liters
D-13	For livestock				6	-	No	-	-	-	-	-	45 liters
D-14	Drinking	Domestic	Washing		18	-	No	-	-	-	-	-	65 liters
D-15	Drinking	For livestock	Washing		7	-	No	-	-	-	-	-	45liters
D-16	Drinking	Domestic	For livestock		6	-	No	-	-	-	-	-	45 liters
D-17	Irrigation	For livestock			1	1.5	Yes	DP-4	-	Tomato	Tomato onion	all material himself	0.5 ha land irrigated
D-18	Irrigation	For livestock			4	3	Yes	DP-5	-	Tomato	Tomato	Pump and land himself not with others	0.5 ha land irrigated
D-19	-				4	4	Yes	DP-5	2001	Tomato	Tomato	0.5 ha land irrigated, for only one day pay 100 birr for pump owner's	0.5 ha land irrigated
D-20	Drinking	Irrigation	For livestock		12	4	Yes	DP-6	2001	Tomato, Pepper, cabbage	Tomato, cabbage, pepper		0.5 ha irrigated
D-21	Drinking	Irrigation			1	1	Yes	DP-7	-	Tomato	Tomato	0.5 ha land irrigated pay 100 birr for land owner's only one year	0.25 ha land irrigated
D-22	Irrigation				2	0.5	Yes	DP-6	-	Tomato	Tomato	0.25 ha land irrigated pay 50 birr for pump owner's	0.5 ha land irrigated
D-23	Irrigation				12	3	Yes	DP-7	2002	Tomato	Tomato	For only one 0.5 ha pay 50 birr for pump owner's	0.5 ha land irrigated
D-24					2	2	Yes	DP-8	2001	Tomato	Onion, tomato, cabbage, pepper.		0.5 ha land irrigated
D-25	Irrigation				12	3	Yes	DP-9	2001	Tomato	Tomato	50% Sharing from pump owner's	0.5 ha land irrigated
D-26	Irrigation				4	1	Yes	DP-9	-	Tomato	Tomato	50% Sharing from pump owner's	0.5 ha land irrigated
D-27	Irrigation				1	1.5	Yes	DP-10	2002	Tomato	Onion, tomato	all material himself nor share others	0.5 ha land irrigated
D-28					1	2	Yes	DP-8	2001	Tomato	Tomato	all material himself nor share others	0.5 ha land irrigated
D-29	Irrigation				2	2	Yes	DP-7	2002	Tomato	Tomato	50% Sharing from pump owner's	0.25 ha land irrigated
D-30	Irrigation				4	1.5	Yes	DP-11	2002	Tomato	Onion	50% Sharing with pump owner's	0.5 ha land irrigated
D-31	Drinking	Irrigation	washing		1	5	Yes	DP-12	2002	Tomato, onion, pepper	Fosoliya (Haricot bean) Tomato, onion	Pump and land himself not sharing others	0.5 ha land irrigated
D-32	Drinking	Irrigation	for livestock		2	7.5	Yes	DP-13	-	Tomato, onion, cabbage, pepper, maize	Tomato, pepper, maize, onion	pump and land himself	0.5 ha land irrigated
D-33	Irrigation				1	5	Yes	DP-14	-	Tomato, onion	Tomato, maize	Pump and land himself not with others	0.5 ha land irrigated
D-34	Drinking	Irrigation	washing		1	4	Yes	DP-15	2002	Cabbage, Tomato	tomato		0.5 ha irrigated
D-35	Drinking	For Livestock	washing		1	8	Yes	DP-16	2001	Tomato, maize, onion, cabbage pepper	Tomato	No contract pump use but himself	0.5 ha irrigated
D-36	Drinking	For Livestock			1	4	Yes	DP-17	-	Tomato, onion, papaya, pepper	Tomato, Haricot bean		0.5 ha irrigated
D-37	Drinking	Irrigation	For livestock	Washing	1	4	Yes	DP-18	2001	Tomato, cabbage	Cabbage, tomato	Pump and land himself not with others	0.5 ha land irrigated
D-38	Drinking	Irrigation			1	4	Yes	DP-19	2002	Onion, cabbage	Tomato onion, pepper cabbage	Pump himself not contract from other	0.5 ha land irrigated
D-39	Drinking	Irrigation			1	1.5	Yes	DP-20	2002	Tomato		All material himself but not with other's sharing	0.5 ha land irrigated
D-40	Drinking	Irrigation			1	3	Yes	DP-21	2000	Tomato		Pump himself not contract from other	1 ha irrigated
D-41	Drinking	Domestic	Irrigation		1	1	Yes	DP-5	2002	Tomato			0.5 ha land irrigated
D-42	Irrigation				1	1	Yes	DP-22	2002	Tomato		Pump himself not with other	0.5 ha land irrigated
D-43	Irrigation				2	2	Yes	DP-23	1998	Tomato	Onion	Pump and land himself not with others	0.5 ha land irrigated
D-44	Irrigation				2	1	Yes	DP-22	2001	Tomato		0.25 ha land irrigated pay 50 birr for pump owner's only one day	0.5 ha land irrigated
D-45	Drinking				1	1	Yes	DP-23	2002	Tomato	Pepper, tomato	50% sharing with pump owner's	0.5 ha land irrigated

Source: Surveyed by OADB staff, 2003

**Table 3.5.1 Inventory Data of Existing Dug-Well in Dodo Wadera P.A. in Dugda Bora Wareda (3/3)**

5. Water Condition				
Well No.	Water availability	Condition of Dug-well in dry season	Water Quality	Comments for Water Quality
D-1	All time available	Excavation and clearing for some months	Good for irrigation	Good for irrigation. But not use because no pump
D-2	All time available	Excavation and clearing for some days	Cooking good for irrigation	Good for irrigation but not use because haven't pump
D-3	All time available	Excavation and clearing for some days	Poor for drinking Good for washing and cooking	Using 80 soil black construction
D-4	All time available	Excavation and clearing for some days	Poor for drinking	using for drinking but poor because hot water
D-5	All time available	Excavation and clearing for some days	Poor for drinking, cooking, washing	these water use for many works for example cattle, washing cloths
D-6	All time available	Excavation and clearing for some days	Poor for drinking washing cattle	poor for drinking because hot water
D-7	All time available	Excavation and clearing for some days	Poor for drinking, cooking, cattle	Dug well water poor for drinking because hot every time
D-8	All time available	Excavation and cleaning for some times	Poor for drinking, cooking and washing	Water poor for drinking because hot every time
D-9	All time available	Excavation and Clearing for some times	Poor for drinking ,cooking, washing	Dug well water use for drinking and soil block construction
D-10	All time available	Excavation and Clearing for some month every time	Poor for drinking, washing, cooking	Dug well water use for drinking and soil block construction
D-11	All time available	Excavation and clearing for some weeks	Poor for drinking washing, cooking	These water is poor for drinking because hot
D-12	All time available	Excavation and clearing for some months every time	Poor for drinking washing, cooking	These water not for irrigation but others
D-13	All time available	Excavation and Clearing for some month every time	Poor for drinking washing, cooking	Dug well poor for drinking because hot water every time
D-14	All time available	Excavation and clearing some weeks every time	Poor for drinking	Dug well poor for drinking because hot water
D-15	All time available	Excavation and clearing for some months every time	Poor for drinking, washing, cooking	These water poor for drinking because very hot
D-16	All time available	Excavation and clearing for some months	Poor for drinking washing cooking	this water use for cooking washing many material
D-17	All time available	Excavation and clearing for some months	Good for irrigation	Dug well have problem in rainy season because rain fall water get in dug well
D-18	All time available	Excavation clearing some for weeks	Good for irrigation	Dug well have problem in rainy season because rain fall water get in dug well
D-19	All time available	Excavation clearing some for 2 weeks	Good for irrigation	Dug well have problem in rainy season because rain fall water get in dug well
D-20	All time available	Excavation and clearing for some months	Poor for drinking , good for irrigation	Dug well have problem in rainy season because rain fall water get in dug well
D-21	All time available	Excavation and clearing for some months	Good for irrigation, washing, cooking	Dug well have problem in rainy season because rain fall water get in dug well
D-22	All time available	Excavation and clearing for some months	Good for irrigation, cooking, washing	Dug well have problem in rainy season because rain fall water get in dug well
D-23	All time available	Excavation and clearing for some months	Good for irrigation, cooking, washing	Dug well have problem in rainy season because rain fall water get in dug well
D-24	All time available	Excavation and clearing for some months	Poor for drinking, Good for Irrigation	This dug well water poor for drinking because 100% quality
D-25	All time available	Excavation and clearing for some months	Poor for drinking, washing, Good for irrigation, cooking	This water poor for drinking because 100% quality.
D-26	All time available	Excavation and clearing for some months	Poor for drinking, cooking, Good for irrigation, washing	Dug well water enough for all works bur poor for drinking because quality
D-27	All time available	Excavation clearing of some 3 weeks or month	Cooking Good for Irrigation, washing	Water is good for irrigation but not enough for drinking 100%
D-28	All time available	Excavation and clearing for some months	Cooking Good for Irrigation, washing	Dug well water is enough for irrigation
D-29	All time available	Excavation and clearing for some months	Cooking Good for Irrigation, for cattle	these water not for drinking because hot every time
D-30	All time available	Excavation and clearing for some months	washing, Good for irrigation cooking	Good for irrigation but not for drinking because hot water
D-31	All time available	Excavation and clearing for some months	good for drinking, washing, Good for irrigation	Water is enough for irrigation every time
D-32	All time available	Excavation and clearing	good for drinking, Good for irrigation	Dug well water is enough for irrigation every time
D-33	All time available	Excavation and clearing for some weeks	washing, Good for irrigation	Dug well water is enough for irrigation every time
D-34	All time available	Excavation and clearing for some time	Poor for drinking, washing, Good for irrigation,	Dug well water is enough for irrigation every time
D-35	All time available	Excavation and clearing for some time	good for drinking, washing, Good for irrigation	These water is enough for irrigation every time
D-36	All time available	Excavation and clearing	Poor for drinking, washing, Good for irrigation	Dug well water is enough for irrigation and cattle drinking
D-37	All time available	Excavation and clearing for some months	Poor for drinking, washing, Good for irrigation, cooking	These due well water is enough for irrigation and clearing many material
D-38	All time available	Excavation and clearing for some months	Poor for drinking, washing, Good for Irrigation, cooking	These water is enough for washing and cooking
D-39	All time available	Excavation and clearing for some months	washing, Good for Irrigation, clearing material	These dug well water use washing, cooking, and for irrigation
D-40	All time available	Excavation and clearing for some months	Poor for drinking, Good for Irrigation	This water poor for drinking because hot
D-41	All time available	Excavation and clearing	Poor for drinking washing, Good for irrigation, cooking	This water is enough for irrigation but not drinking because very hot
D-42	All time available	Excavation and clearing some 3 weeks	Poor for drinking, washing, Good for irrigation	These water poor for drinking because very hot
D-43	All time available	Excavation and clearing some for weeks	Poor for drinking, washing good for irrigation	Due well water good for irrigation
D-44	All time available	Excavation and clearing for some months and year	Poor for drinking, Good for Irrigation	Some time soil block construction
D-45	All time available	Excavation and clearing for some months	Poor for drinking, washing good for irrigation	This water volume is enough for irrigation

Source: Surveyed by OADB staff, 2003

**Table 3.5.2 Inventory Data of Existing Dug-Well in Malima Bori P.A. in Dugda Bora Wareda (1/3)**

Well No.	Date	Surveyor	1. Location					2. Physical Information							3. History				
			Wereda Name	P.A. Name	Previous P.A. Name	Locality	Dug-Well Owner's Name	Coordinates		Elevation (m)	Diameter of Well (m)	Total Depth (m)	Water Depth (m)	Pump Setting Depth(m)	Record of First Digging of Well			Maintenance / Repair Works	
								Latitude	Longitude						Year (G.C.)	No. of people for digging	Construction Period (days)	Frequency	Type of work
M-1	16-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Elsa Market	498462	921444	1549	2.00	7.50	1.50	3.10	2002	3	15	Monthly	Excavation & clearing
M-2	16-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Hadis Tusa	498403	921092	1560	2.00	9.50	1.50	3.00	2001	200	7	Monthly	Excavation & clearing
M-3	16-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Hadis Tusa	498345	921053	1560	2.00	8.50	1.50	2.00	2001	14	7	Monthly	Excavation & clearing
M-4	16-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Takaste	498161	920837	1563	2.50	8.50	2.00	4.00	2002	12	7	Monthly	Excavation & clearing
M-5	17-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Alamyu Gada	498008	920943	1565	2.00	7.00	1.50	2.00	1991	2	7	Monthly	Excavation & clearing
M-6	17-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Alamyu Kuma	497634	920789	1570	2.90	10.00	1.50	5.50	2002	10	5	Monthly	Excavation & clearing
M-7	17-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Nadi Hundie	498940	921912	1566	4.40	6.40	2.60	3.50	1995	2	28	Monthly	Excavation & clearing
M-8	17-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Almaz Hagosi	498998	922045	1565	4.50	8.00	2.50	3.50	1989	2	7	Monthly	Excavation & clearing
M-9	16-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Worobote	Zinash Tadasa	498549	921636	1542	2.00	8.00	1.00	0.50	1991	2	15	Monthly	Excavation & clearing
M-10	18-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Kacha Oda	500415	920548	1587	1.50	6.00	1.00	1.00	2002	2	7	Monthly	Excavation & clearing
M-11	18-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Tawalde Takile	500086	920680	1572	1.50	7.00	1.50	1.50	2002	3	20	Monthly	Excavation & clearing
M-12	18-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Almaz	499975	920770	1573	1.50	6.00	1.50	1.00	2002	3	15	Monthly	Excavation & clearing
M-13	19-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Mithaga Kare	499396	920804	1573	2.00	6.00	2.50	1.00	1987	2	15	Monthly	Excavation & clearing
M-14	20-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Bulbula Kare	499895	920805	1572	2.50	8.00	1.50	1.50	1995	2	25	Monthly	Excavation & clearing
M-15	20-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Gada Dagaga	499383	920970	1571	0.70	8.00	0.60	0.50	1997	2	5	Monthly	Excavation & clearing
M-16	20-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Sanayit Usan	499314	921418	1568	2.60	6.50	1.50	1.60	2000	5	15	Monthly	Excavation & clearing
M-17	20-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Tana Negatu	497916	920796	1567	2.00	6.00	3.00	2.00	1996	2	5	Monthly	Excavation & clearing
M-18	21-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Damse Tana	499485	921419	1567	2.50	7.00	2.00	0.50	1987	2	19	Monthly	Excavation & clearing
M-19	21-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Gama	Kobada Tana	499557	921479	1567	4.00	4.00	4.00	0.50	1999	3	15	Monthly	Excavation & clearing
M-20	23-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Dagaga shube	500110	922274	1558	3.00	5.00	2.00	1.50	1985	3	14	Yearly	Excavation & clearing
M-21	23-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Mada Dagaga	500363	922445	1558	3.65	7.24	1.50	1.50	1991	10	28	Yearly	Excavation & clearing
M-22	22-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Dori oda	499515	922308	1556	1.00	5.50	2.00	1.00	1999	5	7	-	Excavation & clearing
M-23	24-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Yami Jara	499651	922327	1557	2.00	7.00	1.60	1.50	1988	5	15	Yearly	Excavation & clearing
M-24	24-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Masarati	499820	922491	1562	1.30	9.00	1.60	1.50	1987	7	18	Monthly	Excavation & clearing
M-25	24-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Tufa Dagaga	500465	922299	1556	4.25	3.97	0.90	0.50	1996	-	-	Monthly	Excavation & clearing
M-26	25-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Yami Jara	499755	922235	1558	1.55	4.80	2.00	2.24	2001	16	8	Yearly	Excavation & clearing
M-27	25-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Tola Gafo	499934	922314	1557	2.20	4.58	1.10	0.80	2001	10	7	Monthly	Excavation & clearing
M-28	26-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Getacho Roresa	500029	923762	1611	2.00	6.00	1.50	1.00	2001	15	8	Monthly	Excavation & clearing
M-29	27-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Dhuga Boba	500878	922794	1611	1.80	5.00	2.00	0.50	2001	5	4	Monthly	Clearing dirty soil
M-30	26-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Sima Hawas	500879	922795	1610	1.60	4.00	2.00	0.50	2001	6	2	Monthly	Clearing dirty soil
M-31	25-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Bokana Guda	500788	922483	1558	2.50	5.50	2.00	2.00	1999	25	7	Monthly	Excavation & clearing
M-32	25-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Malima	Malima Kanteri	Tawandu Uhunon	500724	923150	1611	3.00	3.80	2.50	0.50	2002	6	2	-	Clearing dirty soil
M-33	26-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Tore	Malkamu Haru	499792	928608	1555	2.00	4.00	3.50	0.60	1999	8	-	Monthly	Dirty soil clearing
M-34	27-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Tore	Ababa Honsa	499796	928609	1556	2.00	6.00	1.60	1.00	2001	2	14	Monthly	Dirty soil clearing
M-35	28-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Tore	Cala Lagasa	500112	925568	1535	2.00	6.50	1.80	1.50	2000	2	9	Monthly	Excavation & clearing
M-36	28-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Tore	Taye Lata	500824	927925	1560	3.70	3.70	4.30	0.50	2002	55	11	Monthly	Excavation & clearing
M-37	29-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Bori	Haru Lata	-	-	1562	2.00	8.00	1.80	2.00	2002	2	7	Monthly	Excavation & clearing
M-38	30-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Bori	Gamachu Badada	501097	924882	1526	2.10	5.20	2.00	1.70	2001	4	10	Monthly	Dirty soil clearing
M-39	28-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Tore	Jima boxora	501012	924910	1522	1.50	6.30	2.00	1.40	2001	2	5	Monthly	Dirty soil clearing
M-40	27-Aug-03	Tefera Hundie	Dugda Bora	Malima Bori	Tore Bori	Bori	Adiddas	502012	925567	1536	2.10	3.70	9.00	2.70	1997	3	7	Monthly	Dirty soil clearing

Source: Surveyed by OADB Staff, 2003



**Table 3.5.2 Inventory Data of Existing Dug-Well in Malima Bori P.A. in Dugda Bora Wareda (2/3)**

Well No.	4. Purpose of Use				No. of Users (HH)	Irrigated Area (ha)	Using Pump	Pump No.	First Year of Using Pump (G.C.)	Main Crop planted in Irrigation Land		Condition of Contract with Pump Owner	Volume of Water Use
	Purpose of Use of Groundwater									Rainy season	Dry season		
	1	2	3	4									
M-1	Drinking	Irrigation	Washing		1	3.0	Yes	MP-1	2002	Onion, Tomato,Kiyare	Onion,Tomato, Birokol, White cabbage	Pump himself not with other use	0.5 land irrigated
M-2	Drinking	Irrigation	Washing		1	4.0	Yes	MP-2	2001	Tomato, Onion	Onion, Tomato	Him self no contract	0.5 land irrigated
M-3	Irrigation	Washing			1	2.0	Yes	MP-2	2001	Tomato, Onion	Onion, Tomato pepper	not contract, all material ready him self	0.25 land irrigated
M-4	Drinking	Irrigation			2	6.0	Yes	MP-3	2002	Tomato	Tomato, Onion	Him self no contract from other	0.5 land irrigated
M-5	Irrigation				2	1.0	Yes	MP-5	1991	Tomato	Tomato	0.25 ha irrigation for only pay 50 birr	0.25 ha irrigated
M-6	Drinking	Irrigation			1	4.0	Yes	MP-4	2002	Tomato, Onion	Onion, Papaya, Tomato,	not contract	0.5 land irrigated
M-7	Irrigation				1	2.0	Yes	MP-5	1995	Tomato, Pepper	Tomato,Pepper, Onion		0.25/ha irrigated
M-8	Irrigation				1	1.0	Yes	MP-5	1989	Tomato, Pepper	Onion, Tomato,Pepper,	all material himself not with other	0.25 ha irrigated
M-9	Irrigation	Washing			2	1.0	Yes	MP-5	1991	Tomato	Tomato	0.5 ha irrigated for pump contract 100 birr for only one use	0.25 ha irrigated
M-10	Irrigation				1	1.0	Yes	MP-6	2002	Tomato	Pepper Tomato		0.25 ha irrigated
M-11	Drinking	Irrigation			1	6.0	Yes	MP-7	2002	Tomato			0.5 ha irrigated
M-12	Irrigation				3	2.3	Yes	MP-8	2002	Tomato			0.5 ha irrigated
M-13	Irrigation				3	6.0	Yes	MP-9	1987	Tomato	Tomato	not contract	0.25 ha irrigated
M-14	Irrigation				4	8.0	Yes	MP-9	1995	Tomato,		0.25 ha irrigated pay 50 birr for only one day use	0.25 ha irrigated
M-15	Irrigation				2	1.5	Yes	MP-10	1997	Tomato	Onion		0.25 ha irrigated
M-16	Drinking	Irrigation	For livestock	Washing	1	3.0	Yes	MP-11	2000	Onion, Tomato, cabbage, pepper	Tomato, Papaya, Pepper, cabbage	All material ready himself not with others	0.5 ha irrigated
M-17	Irrigation				1	3.0	Yes	MP-11	1996		Tomato	not contract with other but himself ready management for working	0.25 ha irrigated
M-18	Drinking	Irrigation	Washing		1	5.0	Yes	MP-12	1997		Tomato, cabbage, pepper,	not contract	1 ha irrigated
M-19	Drinking	Irrigation	For livestock	Washing	1	2.0	Yes	MP-12	1999		Tomato	pump not contract because ready all material every time use	0.5ha irrigated
M-20	Drinking	Irrigation			4	6.0	Yes	MP-13	1988	Tomato Pepper Cabbage			0.25 ha irrigated
M-21	Drinking	Irrigation			1	2.0	Yes	MP-13	1991	Tomato			0.25 ha irrigated
M-22	Irrigation				1	1.5	Yes	MP-14	1999	Tomato			0.25 ha irrigated
M-23	Irrigation				1	1.5	Yes	MP-8	-	Tomato	Tomato, Onion		0.25 irrigated
M-24	Irrigation				2	4.0	Yes	MP-9	1987	Tomato		0.25 (25%) ha irrigated for only one day pay 50 birr for pump owner's	0.5 ha irrigated
M-25	Irrigation				4	6.0	Yes	MP-13	-	Tomato , Onion, maize	Maize, Onion, tomato		0.25 ha irrigated
M-26	Drinking	Irrigation			1	1.5	Yes	MP-8	2001	Tomato, Fama, Kiyar		0.25 ha irrigated for only one day pay 50 birr	0.5 ha irrigated
M-27	Irrigation				1	1.5	Yes	MP-15	2001	Tomato		0.25 ha irrigation for only one day pay 50 birr to pump owner's	0.25 ha irrigated
M-28	Irrigation				1	1.0	Yes	MP-16	2001	Onion,	Tomato, Papaya, Pepper, cabbage	50 birr pay for 0.25 ha irrigated only one day	0.5 ha irrigated
M-29	Irrigation				2	1.0	Yes	MP-16	2001	Tomato	Tomato	for 0.25 irrigation pay 50 birr only one day	0.25 ha irrigated
M-30					1	0.5	Yes	MP-16	2001	Tomato	Tomato, Papaya, Pepper, cabbage		0.25 ha irrigated
M-31	Drinking				4	8.0	Yes	MP-16	1999	Tomato	Maize, Pepper, Onion		1ha irrigated
M-32		Irrigation			1	2.0	Yes	MP-17	2002	Onion	Tomato	All material himself not with others	0.5 irrigated
M-33	Irrigation				2	2.0	Yes	MP-18	1999	Tomato Pepper Cabbage	Cabbage Tomato pepper		0.5 ha irrigated
M-34	Irrigation				1	3.0	Yes	MP-19	2001	Onion, Tomato, Cabbage	Cabbage, onion, Tomato, pepper, papaya		1 ha irrigated
M-35	Irrigation				2	2.0	Yes	MP-20	2001	Tomato	Tomato		0.25 ha irrigated
M-36	Irrigation				1	1.5	Yes	MP-21	2002	Tomato	Tomato	Him self	0.5 ha irrigated
M-37	Irrigation				2	1.0	Yes	MP-22	2002	Tomato, cabbage	Pepper	Him self no withers	0.5 ha irrigated
M-38	Irrigation				1	2.0	Yes	MP-23	2001	Tomato	Cabbage, Onion, Tomato		1ha irrigated
M-39	Irrigation				2	2.0	Yes	MP-24	2001	Tomato	Cabbage , onion, Tomato		0.5 ha irrigated
M-40					1	4.0	Yes	MP-25	1997	Tomato, papaya, onion, cabbage	Cabbage, onion, papaya, Tomato	himself	1 ha irrigated

Source: Surveyed by OADB Staff, 2003

**Table 3.5.2 Inventory Data of Existing Dug-Well in Malima Bori P.A. in Dugda Bora Wareda (3/3)**

5. Water Condition				
Well No.	Water availability	Condition of Dug-well in dry season	Water Quality	Comments for Water Quality
M-1	All time available	Excavation and clearing for some month	Poor for drinking, washing, cooking	Dug well water good for irrigation but kind of mineral water.
M-2	All time available	Excavation and clearing for some month	Poor for drinking, Cooking, Good for Irrigation, Washing	Dug well water enough for working every time but house acid this is mach for irrigation.
M-3	All time available	Excavation and clearing for some weeks or months	Poor for drinking, washing, Good for irrigation, cooking	Water have acid material therefore one problem for drinking.
M-4	All time available	Excavation and clearing for some weeks	Poor for drinking, washing, Good for irrigation, cooking	Dug well have mineral water (acid) not good for irrigation.
M-5	All time available	Excavation and clearing	Poor for drinking, washing, Good for irrigation cooking	These mineral water (acid) from 100%/ 0.25% have problem.
M-6	All time available	Clearing dug well every 3 weeks	Poor for drinking, Good for Irrigation	Dug well water kind of mineral water therefore 25% have problem.
M-7	All time available	Excavation and clearing for some month	Poor for drinking, washing, Good for irrigation cooking	Dug well water kind of mineral water therefore 25% have problem on irrigation.
M-8	All time available	Excavation and clearing for some months or weeks	Poor for drinking washing, Good for Irrigation, cooking	This is water enough for irrigation not good for drinking because kink of mineral water.
M-9	All time available	Excavation and clearing for some weeks	Poor for drinking washing, Good for Irrigation, cooking	This is water not quality because kind of mineral water.
M-10	All time available	Excavation and clearing for some weeks	Poor for drinking, Good for irrigation	These water volume enough so irrigation but this is mach for drinking and cooking.
M-11	All time available		Poor for drinking, Good for irrigation, cooking	Water enough for irrigation but decreases in dry season every years.
M-12	All time available	Clearing for some months	Poor for drinking, Good for irrigation	Dug well water 75% only clear because 25% have acid (mineral water)
M-13	All time available		Good for Irrigation	Water enough for irrigation but decreases in dry season every years.
M-14	All time available	Excavation and clearing for some month	Good for Irrigation	Dug well water not have quality because kind of mineral water.
M-15	All time available	Excavation and clearing for some 3weeks	Good for Irrigation	Volume of water enough for irrigation but decrease in dry season.
M-16	All time available	Excavation and clearing for some month	Poor for drinking, cooking Good for Irrigation, washing	These enough for irrigation not decrease in dry season because around river (rivers)
M-17	All time available	Excavation and clearing for every month	poor for drinking, cooking for food, Good for irrigation, washing	All every month dug well clearing because full by dirty soil.
M-18	All time available	not cotrat with other's	Poor for drinking, washing for cloths, Good for irrigation, cooking	Dug well water volume enough for irrigation every time
M-19	All time available	Excavation & clearing for sometime	Poor drinking Cooking Good for irrigation washing for material	dug well water volume enough for use but this is mach for irrigation because have acid mineral
M-20	All time available	Excavation clearing for some months every time	Poor for drinking, cooking, Good for Irrigation, Washing cloths	Dug well water not have quality because kind of mineral water (acid)
M-21	All time available		Good for Irrigation	Clear water use both irrigation and drinking because no have acid.
M-22	All time available	Clearing for year by year	Good for Irrigation	
M-23	All time available		Good for Irrigation	enough water for irrigation use every time
M-24	All time available	Clearing for every time	Good for irrigation	Enough water in dug well
M-25	All time available	excavation of clearing for every work time	Poor for drinking, cooking, Good for Irrigation, Washing cloths	We use this water only for irrigation because kind for mineral water (acid)
M-26	All time available	Excavation and clearing in but other around dug well	Poor for drinking, cooking, Good for Irrigation, washing	Dug well enough for irrigation but this is mach for drinking
M-27	All time available	Excavation and clearing for some months	Poor for drinking, Good for Irrigation	Dug well water enough for irrigation every time but 25% mineral water kind or acid.
M-28	All time available	Clearing dirty soil every work time	Good for Irrigation	Dug well water enough for irrigation but not use drinking because acid or mineral water
M-29	All time available	Excavation and clearing for some months every time	Poor for drinking, Good for Irrigation	Dug well water enough for work but full dirty soil in rainy season.
M-30	All time available	Clearing for some months dirty soil	Good for Irrigation	Dug well good but decrease in dry season every year
M-31	All time available	Clearing dug well from dirty soil every months	Good for drinking, cooking, Good for irrigation, Washing for cloths	Dug well water enough for irrigation but decrease during dry season
M-32	All time available	Excavation and clearing for some months every time	Good for Irrigation	Dug well water have problem because kind of mineral water ( acid )
M-33	All time available	Excavation and clearing for some months	Good for Irrigation	Water kind of mineral water therefore 25% have problem
M-34	All time available	Excavation and clearing for some months	Good for Irrigation	Water decrease during dry season some time
M-35	All time available	Dirty soil and other thing clearing for some months	Good for Irrigation	Water enough for irrigation every time
M-36	All time available	Dirty soil clearing for some weeks	Poor for drinking, cooking, Good for Irrigation, washing	Dug well water for irrigation but kind of mineral
M-37	All time available	Dirty soil clearing for some weeks	washing, Good for irrigation, cooking	these water 75% only because 25% have acid.
M-38	All time available	Excavation & clearing for some month	Poor for drinking, Good for Irrigation	Dug well water enough for irrigation.
M-39	All time available	Excavation & clearing for some month	Poor for drinking, Good for irrigation	Decrease in dry season rvery years.
M-40	All time available	Excavation & clearing for some month	Good for Irrigation	Water enough for irrigation but 25% mineral water.

Source: Surveyed by OADB Staff, 2003

**Table 3.5.3 Inventory Data of Existing Pump in Dodo Wadera P.A. in Dugda Bora Wareda (1/2)**

Pump No.	Survey Date	Surveyor	1. Location					2. Pump Specification											
			Warada Name	P.A. Name	Locality Name	Pump Owner's Name	Coverage of Well No.	Pump Model	Origin	Horse Power		Fuel Type	Pipe Diameter(inch)		Pipe Length(m)		Pipe Type	Foot Valve	Storage Place of Pump
										(kW)	(HP)		Suction Pipe	Delivery Pipe	Suction Pipe	Delivery Pipe			
DP-1	7-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Pump Owner 1	2	Robin	Japan	2.24	3.0	Benzine	3	3	7	12	PVC	without	pump owner's house
DP-2	6-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Mekel Safar	Pump Owner 2	12	Robin	Japan	3.7	5.0	Benzine	3	3	6.5	120	PVC	without	pump owner's house
DP-3	8-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Papaya Safar	Pump Owner 3	11	Robin	Japan	3.7	5.0	Benzine	3	3	6.5	12	PVC	without	pump owner's house
DP-4	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 4	17	Robin	Japan	3.7	5.0	Benzine	3	3		12	PVC	without	pump owner's house
DP-5	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 5	18,19,41	Robin	Japan	3.7	5.0	Benzine	3	3	7	66	PVC	without	pump owner's house
DP-6	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 6	20,22	Robin	Japan	3.7	5.0	Benzine	3	3	7	12	PVC	without	pump owner's house
DP-7	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 7	21,23,29	Robin	Japan	3.7	5.0	Benzine	3	3	7	12	PVC	without	pump owner's house
DP-8	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 8	24,28	Robin	Japan	3.7	5.0	Benzine	3	3	7	12	PVC	without	pump owner's house
DP-9	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 9	25,26	Robin	Japan	3.7	5.0	Benzine	3	3	7	12	PVC	without	pump owner's house
DP-10	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 10	27	Robin	Japan	3.7	5.0	Benzine	4	4	7	40	PVC	without	pump owner's house
DP-11	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 11	30	Robin	Japan	3.7	5.0	Benzine	3	3	6		PVC	without	pump owner's house
DP-12	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 12	31	Robin	Japan	N.A.	N.A.	Diesel	4	4	7	12	Hose	with	User's house
DP-13	9-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 13	32	Robin	Japan	5	6.7	Benzine	5	5	7	12	PVC	without	pump owner's house
DP-14	11-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 14	33	-	China	17.65	23.7	Diesel	4	4	7	36	PVC	with	User's house
DP-15	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 15	34	Lombardini	Italy	N.A.	N.A.	Diesel	4	4	6.5	11.2	PVC	with	User's house
DP-16	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 16	35	-	China	14.9	20	Diesel	6	6	9		PVC	with	pump owner's house
DP-17	10-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 17	36	Lombardini	Italy	N.A.	N.A.	Diesel	4	4	8	180	PVC	without	User's house
DP-18	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 18	37	Merkure	India	8	20	Diesel	3	3	6	24	PVC	with	pump owner's house
DP-19	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 19	38	-	England	N.A.	N.A.	Diesel	6	6	8	120	PVC	with	pump owner's house
DP-20	11-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Tatecha Elan	Pump Owner 20	39	Janbo	India	4.1	5.5	Kerosene	3	3	8	12	PVC	without	User's house
DP-21	12-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 21	40	Slanzi	Italy	24	32.2	Diesel	4	4	7	135	PVC	with	pump owner's house
DP-22	14-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 22	42,44	Robin	Japan	3.7	5.0	Benzine	3	3	7.5	12	PVC	without	pump owner's house
DP-23	14-Aug-03	Tefera Hundie	Dugda Bora	Dodo Wadera	Safar Usan Masa	Pump Owner 23	43,45	Robin	Japan	3.7	5.0	Benzine	3	3	8	18	PVC	without	pump owner's house

Data Source : Surveyed by OADB staff, 2003

**Table 3.5.3 Inventory Data of Existing Pump in Dodo Wadera P.A. in Dugda Bora Wareda (2/2)**

Pump No.	3. Irrigation		Condition of Contract with Users	4. Other information
	No. of Pump Users(HH)	Total Irrigation Land by Pump(ha)		
DP-1	8	3	50% sharing with land owner's	For tomato medicine and other material credit from other therefore only thing sharing 50%
DP-2	2	1.5	50% sharing with land owner's	For tomato medicine and other material credit from other therefore only thing sharing 50%
DP-3	4	2	50% sharing with land owner's	For tomato medicine, material works credit from others anything share from that
DP-4	1	1.5	Pump owner's himself not with other.	All material ready for work not sharing from other
DP-5	9	8	50% sharing with land owner's	For tomato, Onion, Pepper, Cabbage need medicine, Benzine DAP and Urea by credit there fore sharing 50%
DP-6	14	4.5	0.25 ha land irrigation for only one pay 50 birr for the pump owner's	all material credit from other and anything sharing 50%
DP-7	15	6	Land and other all material himself not sharing with other	all material ready himself no credit from other
DP-8	3	4	0.25 ha land irrigated pay 50 birr for pump owner's for only one day use	all material credit for work from other's and any thing sharing 50%
DP-9	16	4	0.25 ha land irrigation pay 50 birr for pump owner's	For work all material credit form other and sharing 50%
DP-10	1	1.5	all material himself not share others	all material ready himself not from other's
DP-11	4	1.5	50% sharing with land owner's	For tomato medicine ,material credit from other therefore any thing sharing 50%
DP-12	1	5	Land and himself not with other	Dug well water is enough for irrigation but this match for drinking
DP-13	2	7.5	all material himself not, with others	Dug well water poor for drinking because hot
DP-14	1	5	Pump and land himself not sharing form other	Dug well poor for drinking because hot water
DP-15	1	4	All material himself	Dug well poor for drinking because hot water
DP-16	1	8	Land and pump himself	Dug well water is poor for drinking because hot
DP-17	1	4	All works him self not share other's man	These water is poor for drinking because hot
DP-18	1	4	All material himself not contract	Dug well water is poor for drinking because hot
DP-19	1	4	All material himself but not with others	Dug well water is poor for drinking but use for cattle, washing, clear material and cooking
DP-20	1	1.5	All material himself but not with others	Dug well water is enough for irrigation every time
DP-21	1	3	All material himself not contract with other's man	This water enough for irrigation every
DP-22	3	2	0.5 ha land irrigation for only one use pay 100 birr for pump owner's	Dug well water volume enough 1/2 land irrigated
DP-23	3	3	0.5 ha land irrigated for only one use pay 50 birr	Dug well water enough for irrigation and other use washing, cooking, for cattle drinking, soil block construction

Data Source : Surveyed by OADB staff, 2003

**Table 3.5.4 Inventory Data of Existing Pump in Malima Bori P.A in Dugda Bora Wareda (1/2)**

Pump No.	Survey Date	Surveyor	1. Location					2. Pump Specification											
			Warada Name	P.A. Name	Locality Name	Pump Owner's Name	Coverage of Well No.	Pump Model	Origin	Horse Power		Fuel Type	Pipe Diameter(inch)		Pipe Length(m)		Pipe Type	Foot Valve	Storage Place of Pump
										(kW)	(HP)		Suction Pipe	Delivery Pipe	Suction Pipe	Delivery Pipe			
MP-1	16-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Worobote	Pump Owner 1	1	Robin	Japan	5.5	7.4	Diesel	4	4	8.0	16.7	Hose	with	User's house
MP-2	16-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Worobote	Pump Owner 2	2,3	China	China	24	32.2	Diesel	6	6	8.0	54.0	PVC		Pump owner's house
MP-3	16-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Worobote	Pump Owner 3	4	Robin	Japan	5.5	7.4	Diesel	4	4	7.5	18.0	PVC	with	Pump owner's house
MP-4	17-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Worobote	Pump Owner 4	6	Lombardini	Italy	5.2	7	Diesel	3	3	7.0	15.0		with out	Pump owner's house
MP-5	17-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 5	5,7,8,9	Robin	Japan	3.7	5	Benzine	3	3	7.0	12.0	PVC	with out	Pump owner's house
MP-6	18-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 6	10	Robin	Japan	2.65	3.6	Benzine	3	3	7.0	27.0	PVC	with out	Pump owner's house
MP-7	18-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 7	11	Lombardini	Italy	12	16.1	Diesel	4	4	7.0	150.0	PVC	with	User's house
MP-8	18-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 8	12,23,26	Robin	Japan	3.7	5	Diesel	3	3	7.0	18.0		with out	Pump owner's house
MP-9	19-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 9	13,14,24	Robin	Japan	3.7	5	Benzine	3	3	7.0	18.0	PVC	with out	Pump owner's house
MP-10	20-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 10	15	Lombardini	Italy	10.4	14	Diesel	4	4	7.3	12.0		With	User's house
MP-11	21-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 11	16,17	Lombardini	Italy	5.2	7	Diesel	3	3	8.0	72.0	PVC	With	User's house
MP-12	21-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Gama	Pump Owner 12	18,19	Lombardini	Italy	5.2	7	Diesel	3	3	8.0	72.0	PVC	With	User's house
MP-13	23-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 13	20,21,25	Robin	Japan	3.7	5	Benzine	3	3	6.0	12.0	PVC	with out	Pump owner's house
MP-14	22-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 14	22	Robin	Japan	3.7	5	Benzine	3	3	6.5	12.0	PVC	with out	Pump owner's house
MP-15	25-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 15	27	Robin	Japan	3.7	5	Benzine	3	3	6.0	12.0	PVC	with out	Pump owner's house
MP-16	26-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 16	28,29,30,31	Robin	Japan	3.7	5	Benzine	3	3	6.0	6.0	PVC	with out	Pump owner's house
MP-17	25-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Malima Kenteri	Pump Owner 17	32	China	China	N.A.	N.A.	Diesel	3	3	12.0	25.0	Hose	with	Pump owner's house
MP-18	26-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 18	33	Lombardini	Italy	12	16.1	Diesel	4	4	6.0	96.0	PVC	with	Pump owner's house
MP-19	27-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 19	34	Lombardini	Italy	12	16.1	Diesel	4	4	7.0	96.0	PVC	with	User's house
MP-20	28-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 20	35	Robin	Japan	3.7	5	Benzine	3	3	7.0	24.0	PVC	with out	Pump owner's house
MP-21	28-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Bori	Pump Owner 21	36	Honda	Japan	3.7	5	Benzine	3	3	8.0	18.0	PVC	with out	Pump owner's house
MP-22	29-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Bori	Pump Owner 22	37	Honda	Japan	3.7	5	Benzine	3	3		126.0	PVC	with out	Pump owner's house
MP-23	29-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 23	38	Robin	Japan	3.7	5	Benzine	3	3	7.0	12.0	PVC	with out	Pump owner's house
MP-24	28-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 24	39	Robin	Japan	3.7	5	Benzine	3	3	7.0	12.0	PVC	with out	Pump owner's house
MP-25	27-Aug-03	Tefera Hundie	Dugda Bora	Malima bori	Tore	Pump Owner 25	40	Janbo	India	N.A.	N.A.	Diesel	4	4	8.0	126.0	PVC	with out	User's house

Source : Surveyed by OADB staff, 2003

**Table 3.5.4 Inventory Data of Existing Pump in Malima Bori P.A in Dugda Bora Wareda (2/2)**

Pump No.	3. Irrigation		Condition of Contract with Users	4. Other information
	No. of Pump Users(HH)	Total Irrigation Land by Pump(ha)		
MP-1	1	3	all material ready himself not contract use from others	Dug well water enough for working every time but have acid this is mach for irrigation
MP-2	2	6	himself no contract with other's	These water enough during rainy season but decrease in dry season.
MP-3	2	6	all material himself ready	
MP-4	1	4	himself not contract with others	all material ready myself not problem for working wvery time
MP-5	6	5	not contact	
MP-6	1	1	not contact	Dug well water have one problem this is during dry season very decrease
MP-7	1	6	not contact	These water not good for drinking because kind of mineral water.
MP-8	5	5.25	not contact	Dug well water have problem because in dry season very secrease.
MP-9	9	18	not contact	Dug well water use only for irrigation because this water kind of mineral water (acid)
MP-10	2	1.5	all matreial himself not with others	all every months dug well clearing because full by dirty soil.
MP-11	2	6	all matreial himself not with others	all every months dug well clearing because full by dirty soil.
MP-12	2	7	all matrial himself	Dug well water volume enough for use but this is mach for irrigation because have acid mineral
MP-13	9	14	not with others	Dug well water use both irrigation and drinking because clear
MP-14	1	1.5	50%Sharing with pump owners	
MP-15	1	1.5	I use all material with other's because shareing 50%	
MP-16	8	10.5	all material myself but only motor by contrat	Volume of water enough for work but decrease in dry season
MP-17	1	2	all material himself not with other's	this is water enough for working by pump but some time decrease
MP-18	2	2	all material ready himself not with other's	Dug well water enough for irrigation not decrease in dry season because around river
MP-19	1	3	all material himself ready for work	Water these mach for irrigation because kind of mineral water
MP-20	2	2	50% shareing from others	Dug well water decrease in dry season some time
MP-21	1	1.5	50% shareing with others	
MP-22	2	1	all material himself not use from others	
MP-23	1	2	all himself no with other	Dug well water have one problem during dry season very decrease.
MP-24	2	2	50% shareing with others	Water volume enough for irrigated
MP-25	1	4	all material and management himself reasy for work	all every months dug well clearing because full by dirty soil.

Source: Surveyed by OADB staff, 2003

## Figures

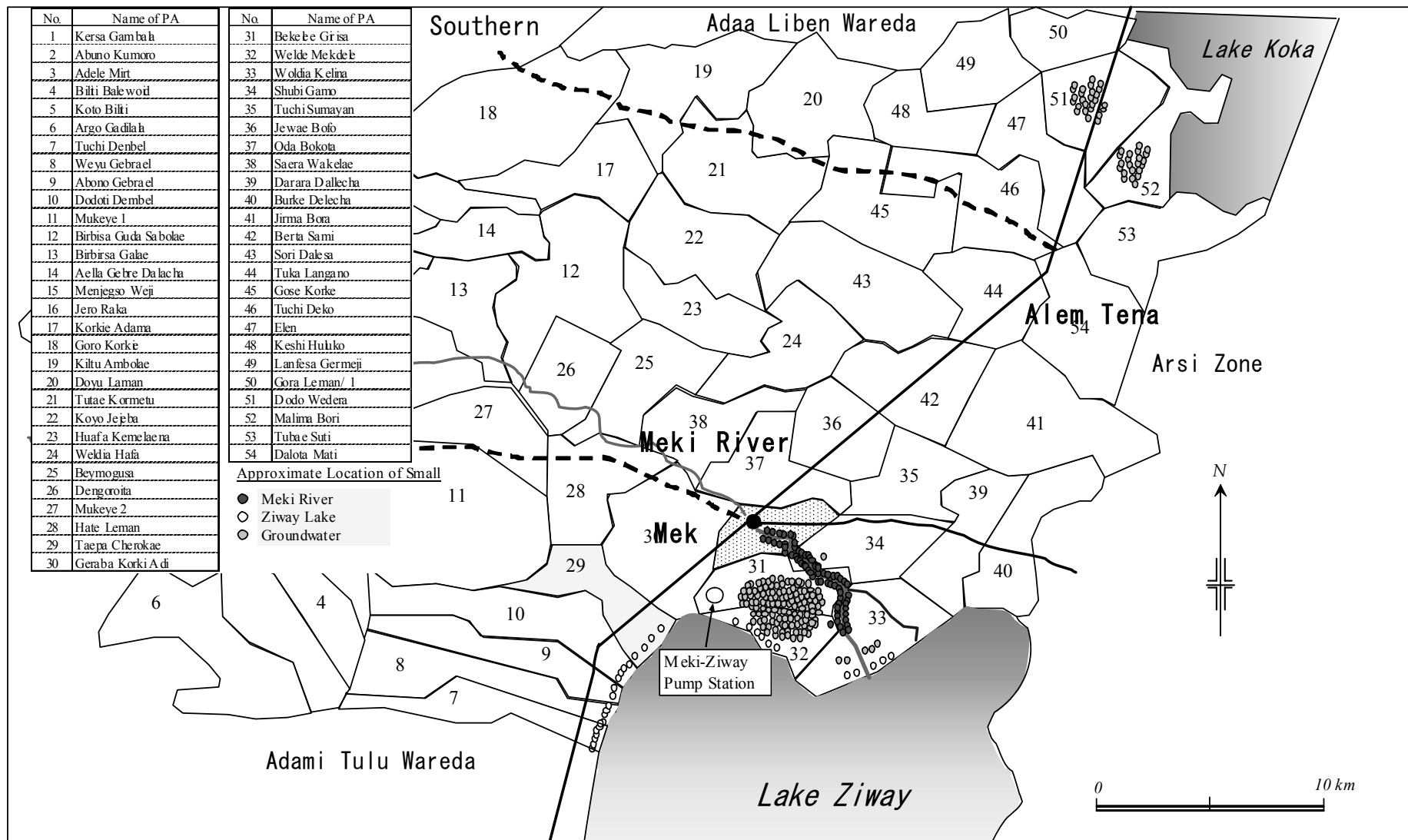


Figure 3.2.1 Location of Small Pumps for Irrigation in Dugda Bora Wareda



ANNEX III

PBME FOR THE SHUBI-SOMBO SCHEMES

## ANNEX III

### PBME FOR THE SHUBI-SOMBO SCHEMES

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## CHAPTER 1 HISTORICAL BACKGROUND OF THE SHUBI-SOMBO SCHEMES

The Study for Meki Irrigation and Rural Development Project in Oromia Region Ethiopia carried out from August 2000 to February 2002 (hereinafter, “the Meki study”) assisted establishment of three WUAs organized by 63 local farmers in Shubi Gamo Peasant Association (PA) and handed-over an irrigation pump to each WUA in November 2001. The general descriptions of three WUAs at the point of establishment are summarized below.

**Major Features of the Shubi-Sombo WUAs**

WUA	Shubi	Sombo Genet	Sombo Aleltu	Total
Projected command area(ha)	3.75	7.00	5.00	15.75
WUA members(HH)	15	28	20	63
Irrigable area/HH(ha)	0.25	0.25	0.25	
No of Beneficiaries	75	140	100	315
Length of main canal (m)	580	500	400	1,480
Water resource	Meki river	Meki river	Meki river	
Time to start PRA	10 July 2001	11 July 2001	1 September 2001	
Time to reach agreement	27 August 2001	21 August 2001	20 September 2001	

Source : JICA Study Team, May 2003

## CHAPTER 2 WORK SCHEDULE AND PERFORMANCE

The Project Benefit Monitoring and Evaluation (PBME) carried out three times by the JICA Study Team. The purpose of PBMEs was to clarify present situation of WUA management, irrigation performance and farming activity, and to identify their problems.

The 1<sup>st</sup> PBME was carried out in May 2003. It clarified the conditions of the WUA management in terms of logistics and financial operation and the performance of irrigation farming by individual members.

The 2<sup>nd</sup> PBME focused on causes of low irrigation performance pointed out during the 1<sup>st</sup> PBME through further field investigation and farmers' interview in December 2003. The interview was made to the WUA members of each WUAs to clarify present conditions of land utilization and water distribution to each plot, while the field discharge measurement was conducted in collaboration with the staff of Dugda Bora Wareda Irrigation Development Desk (hereinafter " OIDA Meki office").

The 3<sup>rd</sup> PBME was carried out in May 2003 by the study team in collaboration with the staff of the OIDA Meki office. The interview made to WUA committee and members of each WUA to clarify WUA management, farming activity by individual farmers and transition of land dispute problem after 2<sup>nd</sup> PBME. The schedule and major point of view of PBMEs are summarized below.

**Schedule and Major Point of View of PBMEs**

PBME	Schedule	Major Point of View
1 <sup>st</sup> PBME	From 2 May 2003 to 21 May 2003 (20 days)	- WUA Management and its constrain - Farming Activity
2 <sup>nd</sup> PBME	From 15 December 2003 to 6 January 2004 (23 days)	- Irrigation performance - Land dispute and settlement
3 <sup>rd</sup> PBME	From 4 June 2004 to 15 June 2004 (12 days)	- WUA Management and its problem - Farming Activity - Transition of Land dispute

## CHAPTER 3 1<sup>st</sup> PBME IN MAY 2003

### 3.1 Objectives

By May 2003, the WUA members in Shubi-Sombo schemes had already experienced three cropping seasons. Within the framework of the Study, the 1<sup>st</sup> PBME was intensively carried out with special objectives to clarify performance of the project management and identify constraints encountered by WUA from both agronomic and engineering points of view. Lesson and learned obtained through 1<sup>st</sup> PBME was utilized to PRA under Program II and III of the study.

### 3.2 Methodology

#### 3.2.1 Survey Schedule

The 1<sup>st</sup> PBME was carried out according to the following work flow.

- 1) Interview to 63 WUA members (site inspection) : 2<sup>nd</sup> to 10<sup>th</sup> May 2003
- 2) Interview to three WUA board members : 12<sup>th</sup> to 14<sup>th</sup> May 2003
- 3) Interview to the OIDA Meki office : 15<sup>th</sup> May 2003
- 4) Supplemental survey : 16<sup>th</sup> to 21<sup>st</sup> May 2003
- 5) Analyses and report preparation : 16<sup>th</sup> to 21<sup>st</sup> May 2003

The interview and site inspection are the main tools for PBME. The interview was made to all 63 members including the drop-outs, the WUA board members and the OIDA Meki office as a supporting organ. In view of the study efficiency, 63 members were split into 13 groups each of which comprised four or five members.

#### 3.2.2 Monitoring Aspects

The WUAs in the Shubi-Sombo schemes had already experienced three crop seasons since November 2001, namely dry season (December 2001 - March 2002), rainy season (June 2002 - September 2002), and dry season (December 2002 - March 2003). The data and information concerning WUA management and performance of irrigation farming by each member are collected for each of three crop seasons.

The monitoring aspects are summarized below.

(1) WUA Members

No	Index	Monitoring Aspects
1	Profile of WUA member	name, age, gender, education, duration after obtaining membership, position of WUA
2	Cultivated Area (ha)	total cultivated area, rain-fed farmland, irrigable area
3	Cultivated crops by season	both rain-fed and irrigated farming for the last three crop seasons
4	Harvested area and yield	both rain-fed and irrigated farming for the last three crop seasons
5	Type of seeds by crop: 1) procured (improved seeds, local seeds), 2) self-supply	Seeds (variety, quantity and price) by crop
6	Application of Fertilizer (DAP, Urea, manure)	application amount of fertilizer by crop and type of fertilizer and price
7	Application of chemicals	application of pesticide, fungicide and herbicide by crop and cost
8	Labor	family labor, employed worker, <i>debo</i> (reciprocal help), crop sharing system
9	Sale for produce	method of selling produce, quantity and sale price
10	Gross Income	gross income in each crop season since November 2001
11	Payment for renewal of pump	in each crop season since November 2001 and reason of failures
12	Comment on bank A/C for WUA group fund	transparency, allotment of renewal of pump, etc
13	Site location of irrigable plot	confirmation of site location on the irrigation map in terms of upper stream, mid-stream and lower stream of the main canal
14	Water management	Irrigation interval by crop, hours required for irrigation, fuel consumption per each irrigation
15	Accessibility to extension worker	Access and frequency to OIDA and OADB Development Agents
16	Irrigation Farming	Constraints of irrigation farming faced by WUA members
17	Accomplishment of cropping and reason of crop failure	in each crop season since November 2001

(2) WUA Board Members

No	Index	Monitoring Aspects
1	WUA Board Profile	name, age, education, members list
2	Basic information of WUA	starting year, official hand-over, progress of WUA members, main canal length, annual pump renewal deposit/member, fuel cost for pump/lit, salary for pump guard/operator, cost sharing
3	No of Members	fluctuation of WUA members and reason
4	Accomplishment of Cropping Performance	cultivated area per crop season and numbers of cultivated farmers
5	WUA Meeting	type of meeting and frequency, attendance of meeting, agenda, record keeping and minutes of meeting
6	Secretary	role, problem, solution
7	Water management	role of block leader, water dispute, coordination
8	Land distribution	problems, countermeasure taken
9	Pump operator	role, problems, countermeasures
10	Bank A/C	profile of bank A/C, balance, bank statement
11	Balance of income / expense on crop production of WUA	balance of WUA in each cropping season
12	O&M cost of WUA	income and expense of O&M, balance
13	Treasurer	role, problem, countermeasures
14	Head of Finance	role, problem, countermeasures
15	O&M activities of WUA	details of O&M, frequency of O&M activities, process of O&M work
16	Bylaw of WUA	formulation of Bylaw and its process to formulate
17	Auditor	role, Working process, problems, countermeasures
18	Irrigation farming	process to select crop, production constraints
19	WUA Management (1)	problems on WUA management
20	WUA Management (2)	reciprocal help among WUA members
21	Relation with the surrounding community	some issue between WUA and surrounding community

### (3) OIDA Meki Office

No	Index	Monitoring Aspects
1	Staff profile	name, age, specialty, position
2	Organization structure	organization chart, list of WUAs and scale in the command area
3	Budget	annual budget (salary, recurrent cost)
4	Responsibility	routine work
5	Countermeasures to request	request from Shubi-Sombo WUAs and its countermeasures, constraints
6	Farmers training	contents of farmers training for Shubi-Sombo WUAs, and other WUAs
7	Land distribution	on-going land issue in Shubi WUA

### 3.3 Results of 1<sup>st</sup> PBME

The results of 1<sup>st</sup> PBME are presented in Attachment-1 and summarized below.

#### 3.3.1 Results of Interviews to WUA Members

##### (1) Profiles of WUA Members

Out of 59 respondents, only nine members were provided primary education, while 22 members have no educational background. Three members, who are the WUA board members playing key roles in the WUA management, have higher educational background among the WUA members.

##### (2) Farm Land Category and Area

The farmland is categorized broadly into rain-fed and irrigable farmlands. Irrigable farmland in Shubi and Sombo Genet is further divided into two, i.e. one under the Shubi-Sombo schemes and the other allotted to contract farming with private pump owners. The averaged land holding size ranges from 1.2 ha to 1.5 ha per household, of which 0.3 to 0.4 ha are irrigable as seen in the following table.

**Farm Land Category and Area in Shubi-Sombo WUA members**

WUA	Total Farmland (ha)	Averaged Farmland Size (ha/HH)	Rain-fed Farmland (ha)	Total Irrigated Farmland (ha)	Averaged Irrigated Land (ha/HH)	Irrigated land from OIDA & private pump owners (HH)
Shubi	21.3	1.3	15.5	6.0	0.4	1
Sombo Genet	31.0	1.5	18.8	6.0	0.3	2
Sombo Aleltu	21.0	1.2	15.0	4.5	0.3	—

Data Source : JICA Study Team

Remark: PPO\*refers to private pump owner.

The average holding size of irrigated farmland in Shubi WUA is slightly higher among three WUAs. Although the agreement between OIDA and WUA defines that each member is equally allocated 0.25 ha per household, some members manage more areas due to several reasons. In addition, both pump operator and pump guard in Shubi are allowed to cultivate 0.25 ha of irrigable farmland in stead of salary.



### (3) Crop Selection and Yield

Food crops in the Shubi-Sombo area are planted mainly for self consumption on rain-fed farmland, while vegetables and fruits are planted for cash income under irrigated conditions. The prevailing crops in the Shubi-Sombo area are tabulated below.

#### Crop Selection in Shubi-Sombo Area

WUA	Rain-fed farmland	Irrigated farmland
1. Shubi	Maize, Teff, Wheat	Chili, Cucumber, Cabbage, onion, Papaya
2. Sombo Genet	Teff, Wheat, Maize, Barley	Chili, Maize, Papaya, Cabbage, Eggplant, Haricot bean, Tomato, Green bean, Cucumber
3. Sombo Aleltu	Maize, Teff, Wheat	Papaya, Cabbage, Chili, Green bean, Local cabbage (kale), Coffee, Cucumber, Tomato

Data Source: JICA Study Team

#### 1) Crops on rain-fed farmland

Ethiopia was attacked by serious drought in 2002 and the rain-fed agriculture was hit by devastating blow. Maize sown in June 2002 in the Shubi-Sombo area was met with serious drought damage and resulted in crop failure over most of the beneficiaries. However, some harvest was gained from maize earlier sown in May, while the average yield of late sown teff (mid-late July) is about 0.5 ton/ha. Yield range of grain crops in the Shubi-Sombo area in the 2002 rainy season is presented below.

#### Average Yield of Crops on Rain-fed Farmland (2002)

Crops under rain-fed farmland	Yield Range (ton/ha)
Maize	0.0 - 1.6
Teff	0.0 - 0.4
Wheat	0.3 - 4.0
Barley	0.0

Data Source : JICA Study Team

#### 2) Crops on irrigated farming

The yield ranges of the major irrigated crops are presented for each season below.

#### Average Yield of Irrigated Crops for Last Three Crop Seasons\* (2002) Unit : t/ha

Crops	Shubi			Sombo Genet			Sombo Aleltu		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Onion	14	-	-	-	-	-	-	--	-
Cabbage	14 -25.6	4	-	4.8 -14	4.8-16	0.2 -11.6	4.8- 22	0.1 -	10.4
Chili	2.8 - 3.7	4	-	1.6-3.2	-	0.6 - 6.0	1.2 -4.0	-	0.4 - 2.2
Cucumber	2.1 -3.2	-	-	3.2	-	-	4.0	-	-
Tomato	-	-	-	-	-	-	8.0	2.4	-
Papaya	2 -16.8	0.6-3.6	-	-	1.6	2.0-4.5	0.4 -	0.4 -0.8	0.8-3.1
							4.0		

Source: : OIDA Meki Office

Remarks: \* 1<sup>st</sup> - dry season (December 2001 - March 2002), 2<sup>nd</sup> - rainy season (June 2002 - September 2002), and 3<sup>rd</sup> - dry season (December 2002 - March 2003)

Unit yield of papaya depends on ages of trees. Most of papaya trees in Shubi-Sombo area are younger than one year after planting. Papaya yield usually indicates higher in the dry seasons than that of the rainy seasons because of continuous low temperature during the period of July-August, which affects fruiting mechanism.

(4) Farming Practices

1) Crops on rain-fed farmland

Members of the Shubi-Sombo schemes obtained seeds of such grain crops as maize, teff, wheat and barley at the local market in Meki. They are mostly of local varieties. Some crops are applied with chemical fertilizers obtained from Extension Package Program (EPP). Only 20 % of the WUA members applied herbicide (U-46 and 2.4D) to teff and wheat crops.

2) Crops on irrigated farmland

In case of chili, tomato and cabbage, there are two sources to procure seeds and seedlings, i.e. local farmers and merchants. Merchants are mostly in Meki and only a few from Addis Ababa. Papaya is locally propagated by self-supply method. Some members introduced an improved early matured variety of papaya according to the technical advice by the OADB wareda office. Coffee seedlings are available at the Meki nursery center managed by OADB wareda office.

High value cash crops such as onion, tomato and eggplant are fertilized with 100 - 200 kg/ha of DAP and 40 - 200 kg/ha of Urea. In contrast, most of cabbage, chili and papaya are cultivated without chemical fertilizers and a few farmers dress manure to papaya field. Most of the WUA members spray agro-chemicals on vegetables. The major agro-chemicals and target crops are as follows;

**Agro-Chemicals prevailing in the Shubi-Sombo Schemes**

Chemicals	Commercial Name	Crops Sprayed
Insecticide	Malatine	cabbage, chili, eggplant, tomato, cucumber
	Karate	Chili, cabbage
	DDT	chili
Fungicide	Mencozeb	eggplant, tomato, cabbage, chili
	Kocide	eggplant, cabbage, tomato

Source: JICA Study Team

Little agro-chemicals are sprayed on papaya, chili and local cabbage (kale). DDT, which is already banned in most of the countries, is still used. One of DDT users sprayed it for protecting crops from chilling damage via neighbor's advice. Obviously from this case, most of the WUA members have poor knowledge on agro-chemical use, and waste spray is observed.

#### (5) Irrigation

Two or three times of supplemental irrigation are dominant in the rainy season. Prevailing irrigation interval is between seven days and 30 days during the dry season but varies by WUA and individual member. The length of the main canal is over 500 m from the pump to the end of the main canal. Time requirement in water distribution significantly differs by distance from the pump. It takes only 1.5 hours for plots in upper stream of the main canal to complete on-farm irrigation, while it takes 6 hours for plots in lower stream. Meanwhile, fuel consumption varies from 1.5 liters to 5.5 liters in each irrigation practice as well. The facts will be confirmed by the JICA Study Team in the further investigation on site.

The following table shows the monitoring results on irrigation practice. The significant gap of fuel consumption is recognized between the upper and lower stream of the main canal over the three WUAs. Only a few households cultivate high input crops such as tomato and onion which require an intensive management with high production cost. Most of the WUA members are obliged to choose low input crops due to shortage of farming capital.

**Comparison of Fuel Consumption between Upper and Lower Areas**

WUA	Crops	Upper Areas (A)					Lower Areas (B)					Fuel Difference (B-A)
		Freq- uency (time/se- ason)	Irriga- tion Inter- val (day)	Irriga- tion hours (hr)	Fuel con- sumed (lit)	Fuel cost/ Each (Birr)	Frequ- ency (time/se- ason)	Irriga- tion Inter- val (day)	Irriga- tion hours (hr)	Fuel con- sumed (lit)	Fuel cost/ Each (Birr)	One Cropping season (Birr)
Shubi	Cabbage	8	15	2	2	5.6	7	15	3	3~4	8.4~ 11.2	36~37
	Chili	8	15	2	2	5.6	9	15	3	3~4	8.4~ 11.2	30.8~56
Sombo Genet	Chili	12	7	1.5	1	3	12	7	2.5	3	9	72
	Cabbage	12	7	3	3	9	12	7	3~4	3.3	9.9	10.8
Sombo Aleltu	Cabbage	16	7	2	2	6.2	12	7	5	5	15.5	86
	Chili	16	4	1.5	1	3.1	5	12	6	5.5	17.1	36

Source: JICA Study Team, May 2003

#### (6) Farm Labor

The average farm family labor is 2.4 persons per household in Sombo Aleltu WUA, while 3.5 for the other WUAs. Some members employ regular workers who live in together including meal and monthly salary ranging from Birr 50 to Birr 110.

Alternatively, some workers are temporarily allowed to cultivate farmland of employers from 0.13 ha to 0.25 ha in stead of cash.

Crop sharing system is also one of common options to the WUA members whose production resources such as land, labor, animal draught power, inputs and technology are insufficient. They usually halve produces each other. It has also a function to share market risk. No crop sharing holders are observed in the Shubi WUA.

*Debo* is a labor exchange custom of reciprocal help without cash payment in rural area. However, host farmers have to provide meal and drinks for helpers.

#### (7) Marketing

Most of the WUA members are subsistent farmers without a surplus for sale. A few farmers sell a surplus to the weekly markets in Meki. Otherwise, cash crops in the Shubi-Sombo scheme are sold to middlemen at farm gate.

The crop budget analysis was made for cabbage, onion, chili, papaya and tomato as presented in Table 3.3.1. The analysis is based on the information obtained through individual farmer interview and supplemented by referring to the farm-household survey results from the Meki study.

Crop budget analysis verified (a) papaya is too young to produce benefit, thus B/C ratio is low, (b) a low input crop such as chili generates some profit depending on the current market price, (c) tomato and onion are also associated with market risk due to fluctuation of market price, and (d) production cost depends on each farmer's capital, and keeping sustainable yield level needs to build soil fertility (fertilizer, manure, rotation crop, intercropping, etc.). In case of cabbage production, a fluctuation of market price was significantly between the rainy season and the dry season, i.e., Birr 10 per quintal (qt. 100 kg) in the 2<sup>nd</sup> season (wet season) and Birr 72/qt in the 3<sup>rd</sup> season (dry season). To guide the WUA members to a market-oriented farming is essential so as to ship their produce at upward movement of sale price.

#### (8) Saving for Pump Replacement Cost

The obligation of saving for pump replacement cost is clearly mentioned in the bylaw of WUA. Each member is to pay to WUA at end of each cropping season. But performance is stagnant as ranges from nil to 65 % against planned target. Details are presented below.

### The Number of Members paid Pump Replacement Cost

WUAs	Crop Season	Paid Members		Unpaid Members	
		No of members	(%)	No of members	(%)
Shubi WUA	1 <sup>st</sup> : 01-02 Dry Season	8	57	6	43
	2 <sup>nd</sup> : 02 Wet season	4	29	10	71
	3 <sup>rd</sup> : 02-03 Dry season	0	0	14	100
Sombo Genet WUA	1 <sup>st</sup> : 01-02 Dry Season	2	10	18	90
	2 <sup>nd</sup> : 02 Wet season	8	40	12	60
	3 <sup>rd</sup> : 02-03 Dry season	13	65	7	35
Sombo Aleltu WUA	1 <sup>st</sup> : 01-02 Dry Season	2	10	18	90
	2 <sup>nd</sup> : 02 Wet season	1	5	19	95
	3 <sup>rd</sup> : 02-03 Dry season	9	45	11	55

Source: JICA Study Team

The Shubi WUA performed a better payment at the 1<sup>st</sup> season and showed a downward payment over progressive crop seasons. In contrast, both Sombo Genet WUA and Sombo Aleltu WUA show a reverse movement over progressive cropping seasons. The payment per capita is not calculated based on each irrigable plot size, thus many complaints were arising in Shubi where some members cultivated 0.5 to 1.0 ha irrigable plot but did not pay proportionally to land size. Such complaints were not identified only in Shubi but also in other two WUAs, and some differences of the payment per capita among the WUA members are observed even in the 0.25 ha per capita. Several reasons were reported about background of the poor payment. They are summarized below.

#### 1) Influence of drought

Most of the WUA members have both rain-fed and irrigated plots. Drought caused severe crop failure in the rain-fed plot, thus the income generated from irrigated plot was compensated to procure basic food grains and failed in payment.

#### 2) Land exchange problem

At the beginning, the WUA members basically agreed to consolidate land near pump by exchanging land among members in order to enhance irrigation efficiency. However, various problems arose from land change such as a) unable to crop from the beginning due to failure of irrigable plot acquisition and b) one partner lost an irrigable plot and unable to pay because of one-side cancellation of land exchange agreement by the opponent.

#### 3) Gap of production resources among the WUA members

A gap of production resource such as land, labor and inputs among the WUA members was observed in the area. Some members with less resource were forced to choose a crop sharing system to share limited production resources by making an agreement with a sharing partner. Therefore, the benefit from

irrigable plot has to be halved and no surplus for a household economy, resulting in failure of the payment.

(9) Accessibility to Extension Service

Most of the WUA members replied that the OIDA Meki office followed up the WUAs members twice to four times per month. Only 10 out of 63 WUA members received extension service from the OADB Meki office. The services were about guidance of EPP, lecture made by the Subject Matter Specialist, and distribution of input like fertilizer. Meanwhile, most of the WUA members answered that a support made by the OIDA Meki office was mainly focused on water management and some guidance of farming practice. Majority of the WUA members cultivate both rain-fed and irrigable plots, and face a problem on pest and disease control, especially for horticultural crop production. Supporting this pest and disease control is beyond the ability of the OIDA Meki office.

(10) Production Constraints of Irrigation Farming in the WUAs

The WUA members had experienced three crop seasons since official hand-over in November 2001. Monitoring was made for the WUA members about their production constraints. The monitoring results are presented in Table 3.3.2.

(11) Land Dispute and Case Study of the Dropout

The dropout members amounted to 14 in total consisting of three in Shubi, nine in Sombo Genet and two in Sombo Aleltu. Among 14 dropouts, four cases in Sombo Genet were monitored as presented in Table 3.3.3.

3.3.2 Results of Interviews to WUA Board Members

(1) Agreement of the Shubi Sombo Scheme

The irrigation pump and pump houses were handed over to three (3) WUAs in November 2001. The agreement referring to the clear responsibility between WUA and OIDA was exchanged. The contents of agreement were summarized below.

**General Conditions of Agreement**

OIDA's Obligations	WUA's Obligations
<ul style="list-style-type: none"> <li>✓ Procurement and installation of a small pump of some 10 HP for irrigation with spare parts</li> </ul>	<ul style="list-style-type: none"> <li>✓ Selection of committee members such as chairman, secretary, treasurer, auditor</li> </ul>
<ul style="list-style-type: none"> <li>✓ Design of irrigation facilities and</li> </ul>	<ul style="list-style-type: none"> <li>✓ Selection of pump operator</li> </ul>
<ul style="list-style-type: none"> <li>✓ irrigable area</li> </ul>	<ul style="list-style-type: none"> <li>✓ Coordination of irrigation farming land size of 0.25 ha per each member</li> </ul>

OIDA's Obligations	WUA's Obligations
<ul style="list-style-type: none"> <li>✓ Construction of pump house</li> <li>✓ Supporting and guidance on construction of main canal</li> <li>✓ Provision of initial training of the pump operation</li> <li>✓ Provision of guidance WUA establishment and management, such as water management, financial management, farming and marketing</li> <li>✓ Monitoring of performance of irrigation scheme</li> </ul>	<ul style="list-style-type: none"> <li>✓ Conducting land exchange among farmers so that every member can make benefit equally with irrigated farming</li> <li>✓ Construction of irrigation canals under supervision of OIDA</li> <li>✓ Operation and maintenance of the scheme such as procurement and management of fuel, repair and maintenance of the pump, water distribution, maintenance of canals</li> <li>✓ Opening the Bank A/C for group fund under WUA name</li> </ul>

Source: JICA Study Team, May 2003

## (2) Situations of WUA

The current situations as of May 2003 of the three WUAs are summarized below.

### General Status of WUAs (May 2003)

No.	Basic Information	Shubi	Sombo Genet	Sombo Aleltu
1.	Starting date	July 2001	July 2001	September 2001
2.	Year of hand-over	November 2001	November 2001	January 2002
3.	No. of Members at inauguration	15	28	20
4.	No. of Dropout	3	9	3
5.	No. of New members to join	5	4	2
6.	Total No. of WUA Members	17	23	19
7.	Total canal length (m)	580m	Extended by WUA due to change in plot allocations (members)	Extended by WUA due to change in plot allocations (members)
8.	Actual irrigable area (ha)	6.0	6.0	4.5

### Management Rules of WUAs (May 2003)

No.	Basic Information	Shubi	Sombo Genet	Sombo Aleltu
1.	Pump replacement cost/members	Birr 292	Birr 152	Birr 175
2.	Balance of Bank Deposit	Birr 2,25	Birr 2,872	Birr 2,175
3.	Fuel charge in WUA (liter)	Birr 2.8	Birr 3.0	Birr 3.1
4.	Collection of pump oil cost and interval of oil change period	Collection of money every 2-3 months. Change oil every 300 hrs.	Including oil cost in the fuel cost. Change oil every 200 hrs	Including oil cost in the fuel cost. Change oil every 300 hrs
5.	Revolving fund for fuel procurement	140 Birr	260 Birr	272 Birr
6.	Block Leader	Nil	3 members	Nil
7.	Salary for pump guard	Birr 50 per month	0.25ha for fees	Birr 60 per month
8.	Salary for pump operator	Birr 60 per month 0.25ha as salary	0.25ha as salary	Birr 60 per month
9.	Membership Fee	Birr 150	Birr 100	Birr 100

Source: JICA Study Team, May 2003

#### 1) Composition of the WUA committee

Each of three WUAs has appointed chairman, secretary, treasurer, head of finance and inspector. Pump operators and block leaders are nominated apart from these members. In case of Sombo Genet, three block leaders are responsible for coordination of water management. Generally, the WUA board members have relatively higher educational background than other WUA members.

#### 2) Annual saving amount for pump replacement

The WUA numbers have been decreased since the beginning of operation except for Shubi WUA. The pump replacement cost per capita varied by WUA because of amount is based on the number of the WUA members. However, the fees have not been changed since the beginning.

#### 3) Salary for pump guard/operator

Sombo Genet WUA has adopted a system to allow pump guard to cultivate an additional 0.25 ha of irrigable plot without any charge. Shubi WUA has paid pump guard 50 Birr per month. Pump operator is allowed to cultivate an additional 0.25 ha as observed in Sombo Genet WUA. Sombo Aleltu WUA has paid salary to pump operator in cash due to no extra irrigable plot given to pump operator but it is supposed to shift from cash payment to investment of land right for cultivation of additional irrigable 0.25 ha soon.

#### 4) Procurement cost for fuel and oil for pump

Three WUAs have procured fuel in bulk. Fund for fuel procurement is originated from the group fund in the bank A/C deposit, which was generated from wage through labor contribution during the Meki study and used as partially revolving fund for fuel procurement. It is common in the Shubi-Sombo schemes that pump operators collect fuel cost from each member when he/she uses pump under the control of treasurer. Unit price of fuel varies by WUA. Its unit price of diesel is 2.75 Birr per liter in Meki plus a commission on it for procurement of oil in Sombo Genet and Sombo Aleltu WUAs, meanwhile Shubi WUA has taken a system to collect oil cost apart from a fuel cost.

#### 5) Members and their background

Since three (3) WUAs were established, the number of members has changed because of dropout or newly initiation into the WUA. The major reasons of dropouts are summarized below.



### WUAs Members (May 2003)

	WUA	Present	Background of Dropout
1	Shubi • 3 dropouts • 5 initiation	17	<ul style="list-style-type: none"> <li>✓ Fear that the government might confiscate an individual farmer's land because the WUA was easily imagined as a collective farm in the socialist regime.</li> <li>✓ Planting crops on irrigable plots are difficult due to shortage of farming capital.</li> </ul>
2	Sombo Genet • 9 dropouts • 4 initiation	23	<ul style="list-style-type: none"> <li>✓ Lack of eagerness on irrigation farming ( Low awareness of irrigation farming)</li> <li>✓ Fear that the government might confiscate individual farmer's land because WUA was easily imagined as a collective farm in the socialist regime.</li> <li>✓ Failed to get an irrigable plot due to complication of land exchange system and lost eagerness of farming</li> <li>✓ The weak of woman and old farmers are unable to cultivate 0.25 ha of irrigable plot and dropped out.</li> <li>✓ At first, considered that irrigation for the plot was impossible because of located at the end of the main canal, thus dropped out, but rejoined because of observing the WUA members to manage irrigation farming around of his plot.</li> </ul>
3	Sombo Aleltu • 3dropouts • 2initiation	19	<ul style="list-style-type: none"> <li>✓ Failed to get an irrigable plot due to complication of land exchange system and lost eagerness of farming</li> <li>✓ The delinquent is supposed to remove from the WUA via General Assembly.</li> </ul>
Total		59	

Source: JICA Study Team

### (3) WUA Meeting

The WUA meeting mainly consists of general assembly meeting and WUA committee meeting. The following table shows a frequency of meeting, state of attendance, and agenda. The meeting is held via Oromiffa language, but minutes of meeting is made in Amharic language. In case of Sombo Genet WUA, the minutes of meeting of WUA committee are not provided but other 2 WUAs do both meetings.

### WUAs Meetings (May 2003)

Meeting	WUA	Frequency	Attendance of meeting and agenda
1	Shubi	Irregular, 2 times/year on average	<ul style="list-style-type: none"> <li>• 60% of the members participate</li> <li>• Application of new members, fuel and water distribution, transportation of fuel procured in Meki, announce of Committee's decision, other matter related to WUA</li> </ul>
	Sombo Genet	Monthly	<ul style="list-style-type: none"> <li>• 80% of the members participate</li> <li>• Cultivated crops, general issue, availability of credit from the supporting organs (OIDA, OADB, Cooperative Office), water distribution, acquisition of sprayer/credit of chemicals, bylaw</li> </ul>
	Sombo Aleltu	5 times since the beginning	<ul style="list-style-type: none"> <li>• 50-60% of the members participate</li> <li>• Selection of target crop (high input/low input crop), WUA member cultivating more than 0.25 ha, Credit for the member who is capable of repayment, saving cost for PDC, salary for pump operator/pump guard, guidance for the delinquents of planting crops</li> </ul>
2	WUA Committee	Shubi	<ul style="list-style-type: none"> <li>Irregular, Every 2 months on average</li> <li>• All 5 members participate</li> <li>• PDC, Payment for pump guard, fuel/oil cost, water distribution</li> </ul>

Meeting	WUA	Frequency	Attendance of meeting and agenda
	Sombo Genet	Every 15 days	<ul style="list-style-type: none"> <li>• All 5 members participate</li> <li>• Annual plan, Final examination against members who violated the bylaw</li> </ul>
	Sombo Aleltu	Irregular	<ul style="list-style-type: none"> <li>• 4 members out of 5 attends ( 1 member: sick)</li> <li>• Annual plan of cultivated crops, salary of pump guard, PDC, water management, illegal member cultivating more than 0.25 ha</li> </ul>

Source: JICA Study Team

#### (4) Crop Selection Procedure by WUA Members

The following table summarized the monitoring results of the criteria of information source for selecting target crops on the irrigable plots.

##### Criteria of Crop Selection by WUA Members

WUA	Criteria of Selecting Target Crops/Information Source
1 Shubi	<ul style="list-style-type: none"> <li>✓ No consideration for selecting target crops</li> <li>✓ Selecting interesting crops based on farming experience</li> <li>✓ Selection of “Green bean” was based on the farmer’s idea without consultation with any extension worker or supporting organizations.</li> <li>✓ Price fluctuation curve is understood via mid-merchant. (Moreover, they understand the middle-men never gave real price information and also, they do not seek for the information actively).</li> <li>✓ They regarded that OIDA Meki Office had little information on the market price, further they did not expect the Development Agents including OADB about market information.</li> <li>✓ In response to a question about collection of market information by accessing DA or OADB Office, they said “No”.</li> </ul>
2 Sombo Genet	<ul style="list-style-type: none"> <li>✓ Crops which are expected with a good price in the local market (Thursday market, etc)</li> <li>✓ Dispersing a market risk ( price drop )by promoting crop diversification</li> <li>✓ Avoiding a market competition by observing the cultivated crops in and around of their living area</li> <li>✓ Low input crops (cabbage, maize, chili, green bean, cucumber, sweet pepper) and high input crops (onion, tomato)</li> </ul>
3 Sombo Aleltu	<ul style="list-style-type: none"> <li>✓ Crops which are expected with a good price</li> <li>✓ Selecting target crops based on individual judgment without discussion in the WUA meeting</li> <li>✓ Cabbage which increase a seasonal demand (at the time of fasting meat)</li> <li>✓ Possible crops for planting in low input crops such as chili, maize, cabbage, green bean, papaya and cucumber</li> <li>✓ Less water required crops such as papaya and others</li> </ul>

Source: JICA Study Team, May 2003

The criteria for selection of target crops rely on their experience which was confined to their living place, and no positive attitude seeking for market information outside to incorporate it into improvement on their farm management.

(5) Operation and Maintenance of Irrigation Facilities

1) Logbook of pump operation

All three WUAs have two types of logbook for pump operation. This is instructed by the OIDA Meki office and the following items are recorded. Logbook “A” :records date of use (year, month, date), name of pump operator, fuel type, operation hours, date of air-filter cleaning, inspection of irrigation pump, date of oil change (Sombo Aleltu WUA) . Logbook “B” records a. date of use, user name, consumed fuel amount, and signature by user.

2) Operation and maintenance on the irrigation facilities

The monitoring results on O&M work for the irrigation facilities are summarized in Table 3.3.4.

(6) Capability of WUA Board Members

Interviews about the role of each WUA board members, working process, constraints and countermeasure by the WUA were made to secretary, treasurer, head of finance, inspector, and pump operator/block leader who were not WUA board members. The monitoring results are summarized in Table 3.3.5.

(7) Some Conflict with the Surrounding Community

The conflicts between WUAs and the surrounding communities were also reported by each WUA as summarized in Table 3.3.6.

3.3.3 Results of Interviews to the OIDA Meki Office

(1) Profile of the OIDA Meki Office

1) Staff

The OIDA Meki office has been established in October 2000, and consisted of an office head in charge of O&M, two subject matter specialists (SMS: agriculture, soil& water conservation), and two DAs in charge of the Shubi-Sombo schemes and the Meki-Ziway irrigation scheme.

2) Transportation means

At present, the office has equipped with one motor cycle donated by NGO, and one bicycle assisted by JICA Study Team. The motor cycle is mainly used by the office head, on the other hand, the bicycle is not suitable to use on dirt road. Therefore, SMS and DA usually move on foot or by donkey taxi in the command area, thus it hinders the OIDA staff from fulfilling their duty.

### 3) Irrigation schemes in Meki area

There are 18 irrigation schemes in Meki area. Out of 18, six schemes including the Shubi-Sombo scheme are intensively supported. Two full time DAs have been assigned. The remaining 12 schemes are categorized as ordinarily supported schemes without full-time DA, thus supporting activity is made under request-basis as described in Part (5) of Attachment-3.

### 4) Annual budget

The annual budget slightly decreased from Birr 66,000 (US\$ 7,670) in 2001 to Birr 62,000 (US\$ 7,200) in 2002. Among them, the personnel costs was account for 88 %, meanwhile the recurrent cost was only 12 %, which consisted of office O&M cost, office supply, communication and per diem for the OIDA staff. Therefore, only small amount of per diem is capitalized as activity cost without any capital cost for development survey. Thus, all irrigation schemes in Meki area are invariably the beneficiary payment about O&M cost.

## (2) Supporting Activity of the Irrigation Project in the Command Area

The routine work of OIDA Meki office for the supporting activity on the irrigation projects in the command area is summarized as following 12 duties.

- a. Strengthening of management capacity of WUA
- b. Implementation of internal bylaw for six WUAs
- c. Guidance of O&M work and water management practice
- d. Facilitation of input supply to the 15WUAs
- e. Auditing work to the six WUAs
- f. Assisting the Shubi-Sombo schemes in terms of WUA management record
- g. Coordination work on inner conflicts of the six WUAs
- h. Training and facilitation work for t the Shubi-Sombo schemes and Wayo Seritti WUA about beneficiary payment cost (PDC, fuel, others)
- i. Monitoring work for the Shubi-Sombo schemes and ESRDF-OIDA financed Wayo Seritti WUA activities
- j. Supporting the WUAs in terms of making farming activity report
- k. Supporting activity of the water management for the 18 WUAs
- l. Development work of the water harvesting project under joint program with the District Agriculture Office

## (3) Countermeasure on Shortage of Farming Capital for Input Procurement

The WUAs of the Shubi-Sombo schemes complain about shortage of farming capital. The OIDA Meki office suggests that the WUAs would be legalized by registering with

the Cooperative Office. Registering with the said office, the WUAs are qualified to receive farming credit and are able to ship the produce in collective way by joining the Cooperative Union, an extra-governmental organization. The following conditions should be met.

- 1) Registration fee
- 2) Formulation of internal bylaw
- 3) Saving of the beneficiary payment based on irrigable plot size (Birr 50/0.25ha)
- 4) Provision of the functions as legal entity such as office function, financial record, system of book record, official stamp of WUA, others)
- 5) Selection of WUA committee members

The legalized WUA is able to receive credit on farming inputs from the Cooperative Office, and of which credit consist of the following two types such as cash and in kind.

- 1) Cash : Birr 400 - 500 per crop, onion and tomato which are high input crops are Birr 600- 800.
- 2) In kind : seeds and seedlings, fertilizer, agro-chemicals, fuels, oil

#### (4) Accomplishment of Guidance/Training of WUA by OIDA

According to the Guideline prepared by the Meki study OIDA Central Branch Office was requested to train the WUA board members just after handing-over. OIDA Meki office conducted one day training program mentioned below to the three WUA board members only.

- 1) How to keep financial matter
- 2) How to keep pump operation record

Apart from this training program, OIDA Meki office has conducted an intensive training program to the 13 irrigation schemes (154 WUA board members) in collaboration with other supporting organizations such as Cooperative Office, Cooperative Union, and OIDA Ziway office. The cost spent for this intensive training was around Birr 1,000 per WUA including handout. The training subjects and burden sharing among the supporting organs are as follows.

- 1) OIDA Meki office      Water management, O&M work of Pump, Quality control of Crop
- 2) Cooperative Office    Keeping financial record
- 3) Cooperative union     Marketing of horticulture crops
- 4) OIDA Ziway office    Crop protection

#### (5) Partiality of Land Distribution of the Shubi WUA

Some members of Shubi WUA have ignored the agreed land holding size of 0.25

ha/HH. The OIDA Meki office had several meetings with Shubi WUA but no progress was made. To the contrary, Shubi WUA has requested the OIDA Meki office to approve 0.5 ha per capita from 0.25 ha of irrigable plot. The office suspends this request and has issued three warning letters to the WUA but no improvement is observed.

### **3.4 Farm Economy and Crop Budget Analysis**

#### **3.4.1 Objectives**

Farm economy and crop budget analyses were conducted as a supplemental study for PBME. The present study aims at collecting more detailed information in addition to those from PBME in order to quantify of benefits from irrigation project of the Shubi-Sombo schemes more clearly and to evaluate how much the community-based irrigation development contribute to poverty alleviation and food security.

It is noted that the project analysis will be carried out as continuous manner in line with long-term monitoring strategy. As an initial practice, therefore, the present study envisaged to select and set up “benchmark farmers (BMF)” within the scheme. The present study is still going on and will work out a guideline at the final stage of the Study.

#### **3.4.2 Benchmark Farmers**

Three BMFs were selected for each of three WUAs. Their selection criteria are summarized below.

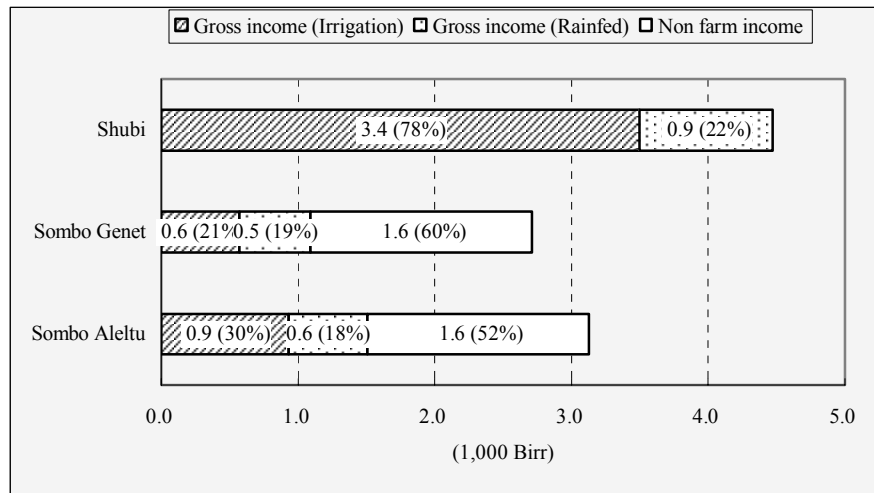
- 1) BMFs have relatively higher educational background in order to ensure reliability of information and accuracy of the analysis.
- 2) BMFs have strong intention to continue the on-going irrigation farming as WUA members in order to enable OIDA the long-term monitoring.

Due to low sample number, i.e. 63 members, it is difficult to categorize the members into several clusters. Taking the above-mentioned criteria into consideration, they were simply selected on the basis of information of PBME and general attitude to the interviewer of OIDA during PBME. The household characteristics of nine BMFs are presented in Table 3.4.1. They consists eight male and one female household. Their ages range from 36 to 64. The landholding size varies from 1.75 ha to 4.0 ha, of which 0.25 ha is located within the Shubi-Sombo scheme.

### 3.4.3 Farm Economy

#### (1) Income Source and Value

Revenue sources of BMF are farm and non farm activities as shown in the following figure.

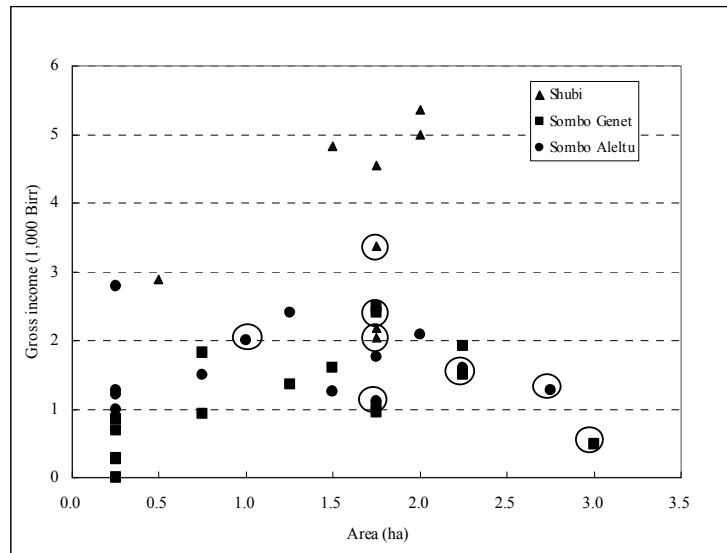


**Composition of Farm Family Income**

All the BMFs produce grain crops for home consumption by allocating 1.00 ha to 2.25 ha of rain-fed farm. In this analysis, values of grains consumed by family are counted as farm income. On the other hand, crops under irrigated conditions are fully sold. As seen in the above figure, BMFs in Shubi WUA obtained the gross revenue of Birr 4,500 in the period of November 2001 to March 2003, of which 3,400 Birr or 78% are generated by irrigation farming. In contrast, the farm income in other two (2) WUAs is Birr 2,700 to Birr 3,100, of which income from irrigation farming is as low as Birr 1,000 or less. It is noted that non-farm income of BMFs in those two (2) WUAs is substantial. The source of non-farm income is sand sale by a group consisting of 19 farmers. Five BMF joined this activity to earn Birr 50 to 80 per week.

The analysis gave an interesting result in comparison with the current WUA status mentioned in Section 3.3.2. In Sombo Genet and Sombo Aleltu, 65% and 45% of the WUA members paid in the last crop season the saving deposits for future pump renewal giving the total deposit in the bank accounts of Birr 2,872 and Birr 2,175 respectively. On the other hand, none of the Shubi members paid the deposits and only Birr 2,251 is in the bank account.

The relationship between landholding size and gross farm income is illustrated below.



Remarks : circles indicate BMFs

### Relationship between Landholding Size and Gross Farm Income

#### (2) Cropping Calendar

The records of cropping calendars for nine BMFs are illustrated in Figure 3.4.1. It is obvious that the land use intensity of rain-fed farm is very low, i.e. single cropping, while the irrigated land is intensively utilized.

#### (3) Farm Inputs and Labor Consumption

Use of chemical fertilizers and agro-chemicals by BMF are presented in Table 3.4.2 and 3.4.3. Hired labor is common in Meki. BMFs allocated considerable amount to wages to hired labor as presented in Table 3.4.4 and summarized below.

**Unit Yield and Farm Gate Prices of BMF**

Farmer No.	A: Labor Expenses (Birr)	B: Gross Income (Birr)	A/B (%)
1	2,240	11,790	19.0
2	766	1,795	42.7
3	440	1,038	42.4
4	570	1,225	46.5
5	1,496	2,855	52.4
6	1,227	3,796	32.3
8	212	1,555	13.6
9	90	200	45.0

*Debo* is also source of farm labor for BMFs (refer to Section 3.3.1). Four BMFs spent some amounts for *Debo* as seen below.



### Expenses for Debo in Four (4) BMF

WUA Members No.	Crop	Work	MD	Provided	Estimate (Birr)
2	Cucumber	Transplanting	10	Meal (Teff 25kg, Wat) Drink (Areke (alcohol made by Maize))	50
	Cabbage	Transplanting	10	Meal (Teff 25kg, Wat) Drink (Areke (alcohol made by Maize))	50
	Chili	Transplanting	9	Meal (Teff 25kg, Wat) Drink (Areke (alcohol made by Maize))	50
	Wheat	Threshing	3	Meal (Teff, Wat) Drink (Areke (alcohol made by Maize))	N.A.
	Maize	Weeding	15	Meal (Teff, Wat) Drink (Areke (alcohol made by Maize))	75
5	Teff	Sowing	N.A.	N.A.	N.A.
	Papaya	Transplanting	6	N.A.	N.A.
7	Maize	Weeding	7	Meal (Maize, Haricot bean) Coffee, Tela (alcohol)	20
	Wheat	Plowing	3	Coffee, Tela (alcohol)	7
	Wheat	Sowing	3	Meal (Maize, Haricot bean) Coffee, Tela (alcohol)	15
8	Maize	Sowing	9	Meal Drinks (Tela 2 galon, Areke 12 bottle)	40 100
	Chili	Transplanting	15	Meal Drinks (Tela 2 galon, Areke 12 bottle)	40 100
	Teff	Sowing	10	Meal Drinks (Tela 2 galon, Areke 12 bottle)	40 100
	Chili	Transplanting	5	Meal Drinks (Tela, Areke)	20 50

Source: JICA study team

#### (4) Irrigation Farming

PBME verified that irrigation benefits are governed largely by price mechanism of produces, e.g. cabbage prices for 10 Birr/qt in the 02 wet season and 72 Birr/qt in the 02-03 dry season. In the present study, unit yield also are also largely fluctuated by BMF as seen in the table below.

#### Unit Yield and Farm Gate Prices of BMF

BMF	Crop	Area (ha)	Yield (qt/pot)	Yield (kg/ha)	Farm Gate Price (Birr/qt)
1	Cucumber	0.25	10	4,000	50
7		0.25	2	800	20
2	Chili	0.25	1.08	430	20~50
2		0.25	0.54	220	30~50
5		0.25	0.52	210	100~150
6		0.50	19.05	3,810	150~225
8		0.25	14.50	5,800	215
2	Cabbage	0.25	10	4,000	35
3		0.25	25	10,000	35
3		0.25	30	12,000	35
4		0.125	12	9,600	55
5		0.25	9	3,600	10
5		0.25	12	4,800	35~50
4	Eggplant	0.125	1.16	930	50~80
4	Haricot bean	0.25	2	800	200
1	Papaya	0.50	207	41,400	10~100
5		0.50	45	9,000	10~100
7		0.25	109	43,600	20~150
1	Onion	0.25	31	12,400	80
1	Green bean	0.25	10	4,000	40
9	Tomato	0.125	0.32	256	N.A.

Source : JICA Study Team

### (5) Rain-fed Farming

The records of rain-fed farming are summarized below.

**Unit Yield of Crops on Rain-fed Farmland**

BMF No.	Crop	Area (ha)	Yield (qt)	Yield (kg/ha)	Average (kg/ha)
1	Maize	0.75	4.0	533	415
2		1.00	10.0	1,000	
3		1.00	6.0	600	
4		0.75	0.0	0	
5		0.75	4.0	533	
6		0.75	0.0	0	
7		1.50	0.0	0	
8		0.75	8.0	1,067	
9		0.25	0.0	0	
1	Teff	0.75	6.0	800	386
3		0.25	1.5	600	
4		0.50	0.0	0	
5		0.75	3.5	467	
6		0.50	1.5	300	
8		0.75	2.5	333	
9	0.25	0.5	200		
2	Wheat	0.50	10.0	2,000	740
3		0.25	1.7	680	
4		0.50	1.5	300	
5		0.50	4.0	800	
6		0.50	3.0	600	
7		0.75	3.0	400	
9		0.25	1.0	400	
8	Chili	0.25	36.0	14,400	14,400

Source: JICA study team

### (6) Contracts with Private Pump Owners

Five BMFs manage the contract farming with private pump owners under the conditions as presented below.

**Contract Farming with Private Pump Owners**

BMF No.	Crop	Area	Net income	Contract condition
4	Tomato	1 ha	(estimate) 3,600Birr	900Birr (a quarter of net income from the land)
4	Onion	1.5 ha	(estimate) 32,000Birr	8,000Birr (a quarter of net income from the land)
5	Papaya	0.5 ha	N.A.	It is the contract that land owner supply 0.5ha land to PPO and land owner can irrigate own land 0.5ha (papaya).
6	N.A.	1 ha	6,000Birr	6,000Birr/1ha/10year (1998--)
7	N.A.	0.625ha	500Birr	200Birr/0.25ha/year
9	N.A.	0.5 ha	300Birr	150Birr/0.25ha/year

Source: JICA study team

### (7) Crop Budgets

The details of the crop budgets are presented in Table 3.4.5.

## CHAPTER 4 2<sup>nd</sup> PBME IN DECEMBER 2003

### 4.1 Objectives

In 1<sup>st</sup> PBME, the significant gap of fuel consumption was reported between the upper and lower reaches of the main canal over the three WUAs. Time required to water distribution significantly differs by distance from the pump set. It takes only 1.5 hours for plots in upper stream of the main canal to complete on-farm irrigation, while it takes 6 hours for plots in lower stream. In addition, fuel consumption varies from 1.5 liters to 5.5 liters as per each farm plot practice as well.

The 2<sup>nd</sup> PBME aimed at analyzing cause of low irrigation performance pointed out during the 1<sup>st</sup> PBME through further field investigation and farmers' interview, and setting up the proposed countermeasures which can maximize efficiency of water management.

### 4.2 Methodology

The 2<sup>nd</sup> PBME was carried out according to the following schedule.

- 1) Interview to farmers and field investigation : 15<sup>th</sup> to 17<sup>th</sup> December 2003
- 2) Field discharge measurement : 18<sup>th</sup> to 20<sup>th</sup> December 2003
- 3) Supplemental survey : 24<sup>th</sup> to 26<sup>th</sup> December 2003
- 4) Analysis and report preparation : 29<sup>th</sup> December 2003 to 6<sup>th</sup> January 2004
- 5) Workshop for Irrigation Engineering : 13<sup>th</sup> January 2004

The interview was made to the committee board members of three (3) schemes to clarify present conditions of land utilization and water distribution to each farm plot while the field discharge measurement was conducted in collaboration with the staff of the OIDA Meki office. The results of the monitoring and evaluation are presented hereinafter.

### 4.3 Irrigation Water Use and Measures

#### 4.3.1 Condition of Command Area

##### (1) General Condition

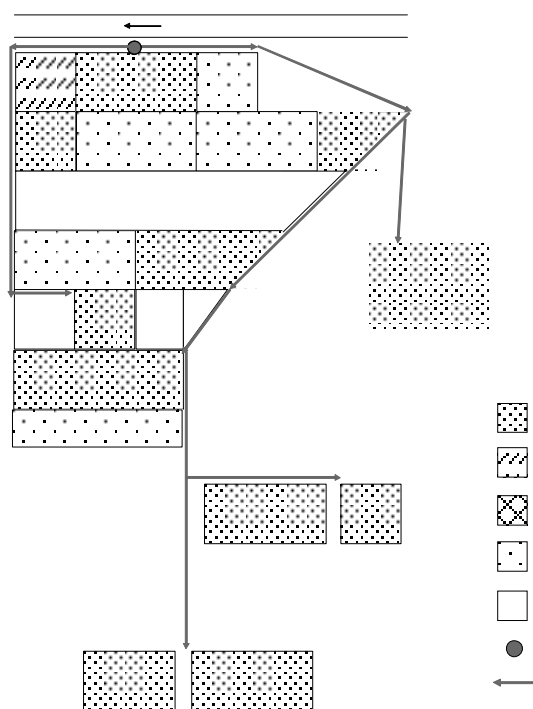
The command area with the number of WUA members in each scheme changed during last 2 years due to drop-out or newly initiation in WUA as shown below.

### Features of Schemes established in the Meki Study

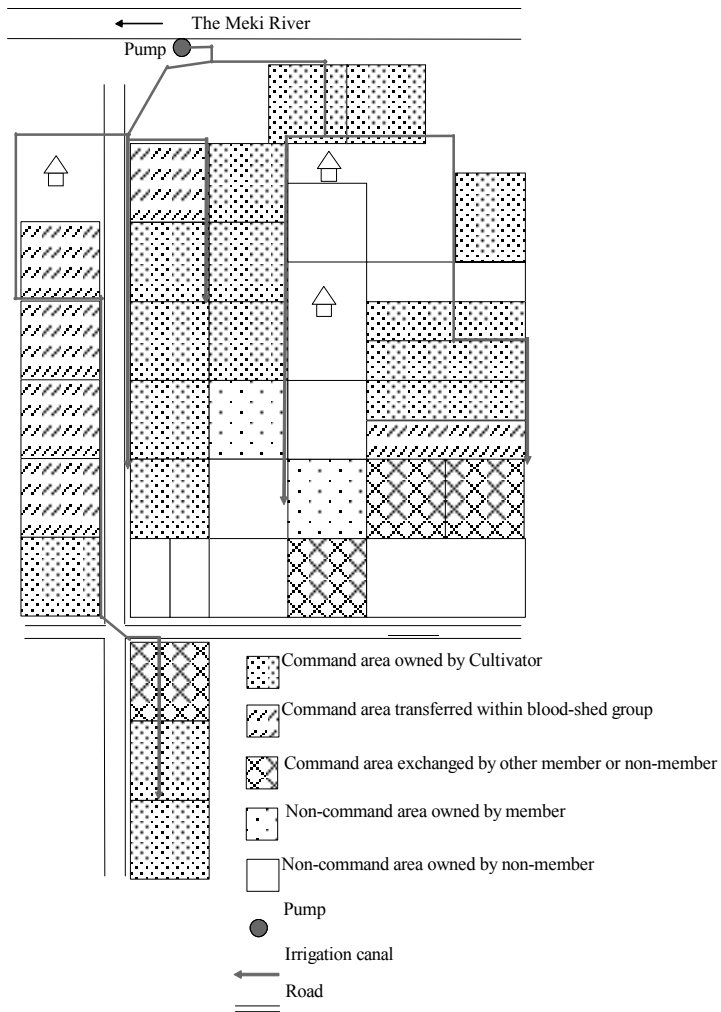
Description	Shubi	Sombo Genet	Sombo Aleltu	Total
<u>Original</u>				
Area (ha)	3.75	7.00	5.00	15.75
No. of members	15	28	20	63
<u>May 2003</u>				
Area (ha)	6.00	6.00	4.50	17.00
No. of members	17	23	19	59

#### (2) Condition of Command Area

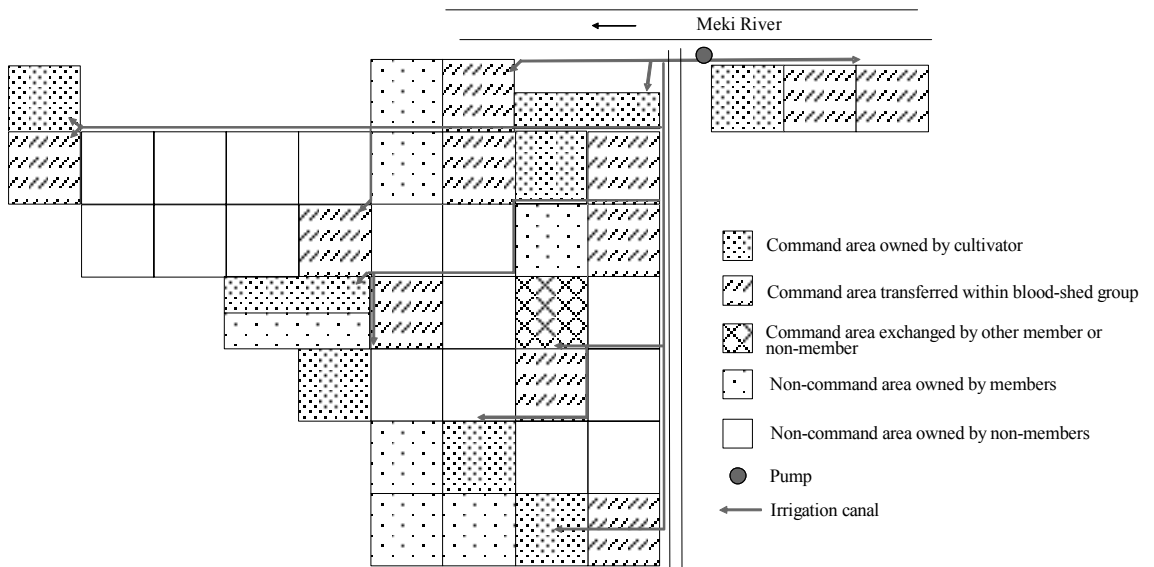
Land use of the 3 schemes as of December 2003 is indicated in the following pages, showing land classification, such as command area owned by cultivators, command area transferred within blood-shed group, non-command area owned by WUA members, and non-command area owned by non-members.



**Present Land Utilization (Shubi WUA : December 2003)**



**Present Land Utilization (Sombo Genet WUA : December 2003)**

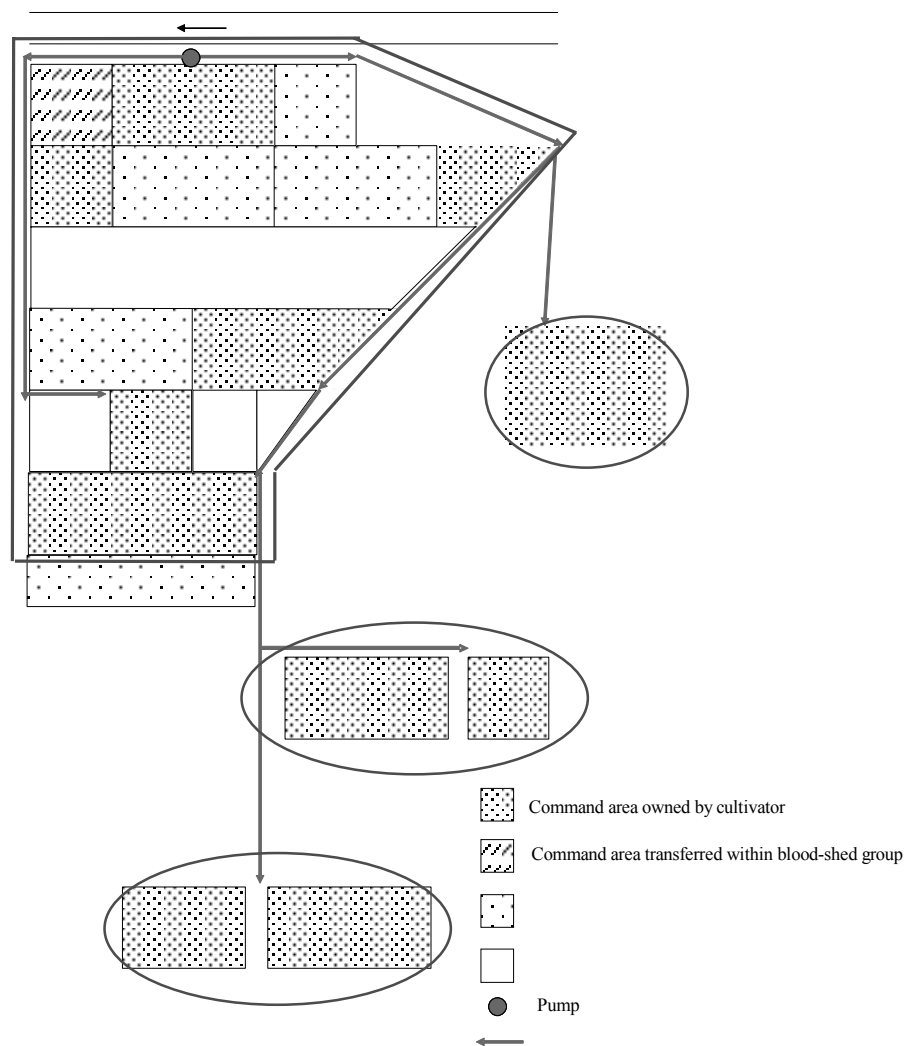


**Present Land Utilization (Sombo Aleltu WUA : December 2003)**

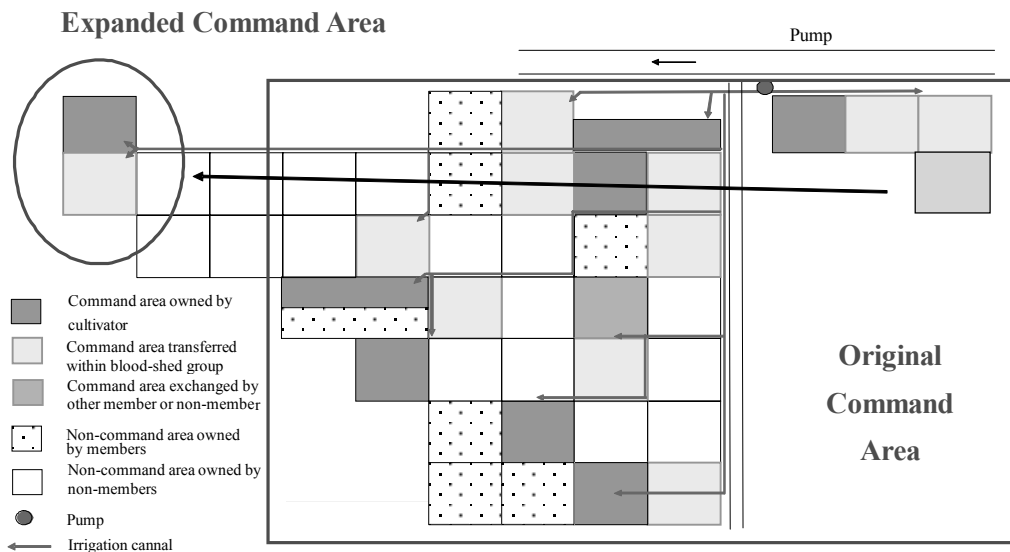
#### 4.3.2 Expansion of Command Area

Throughout the farmers' interview, it was revealed that the command area has been expanded because of a failure of land exchange and consolidation, which should be promoted so as to improve irrigation efficiency and cultivation by new members out of the original command area. The land expansion resulted in an extension of the irrigation canals.

In Shubi and Sombo Aleltu WUAs, some farmers failed to exchange the farm lands with other members and they were obliged to irrigate their own lands located out of the original command area.

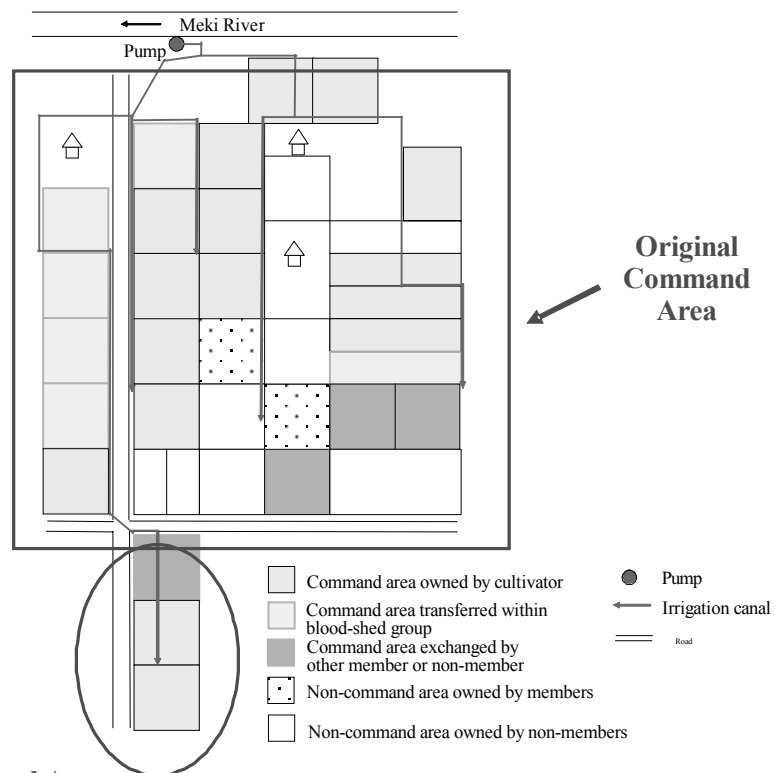


**Failure of Land Exchange (Shubi WUA : December 2003)**



**Failure of Land Exchange (Sombo Aleltu WUA : December 2003)**

Meanwhile, some farmers, who joined the Sombo Genet WUA recently, have started irrigated farming in their lands, which were not located in the original command area.

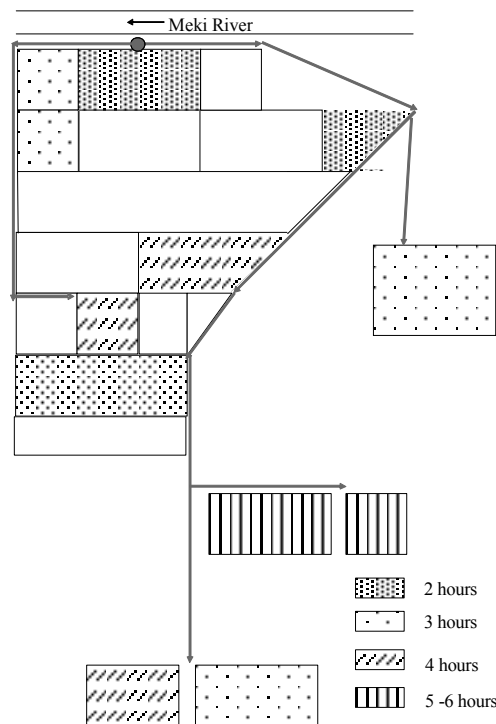


**Expanded Command Area for New Member**

**Entry of New Members out of the Original Command Area (Sombo Genet WUA : December 2003)**

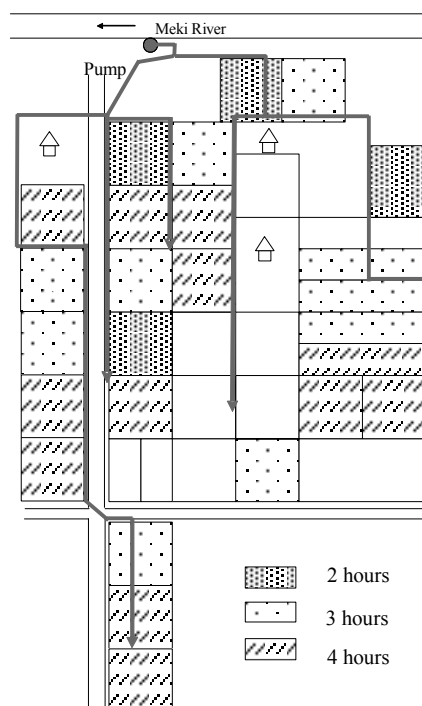
### 4.3.3 Irrigation Time

In the Shubi scheme, the farm plots located out of the original command area have difficulties to irrigate because the canal was obliged to be extended.



**Irrigation Time for Each Farm Plot (Shubi WUA : December 2003)**

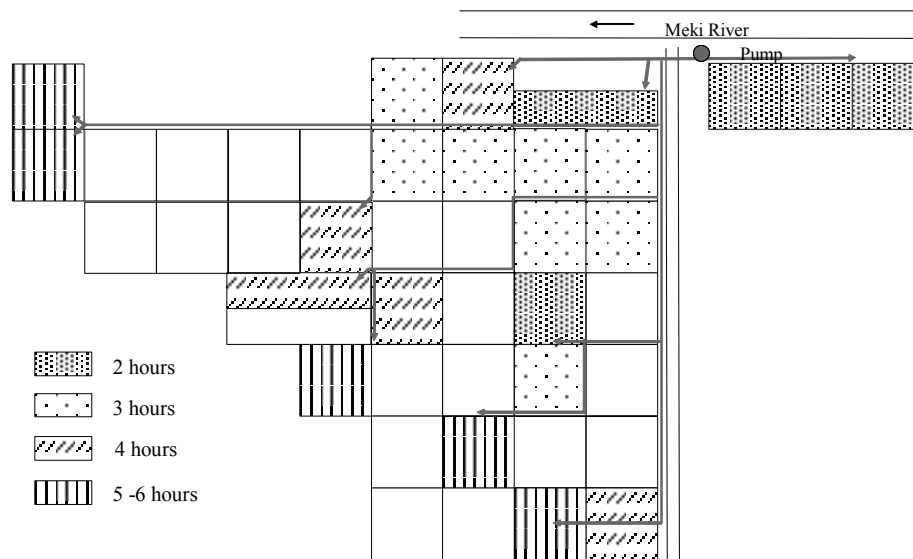
In the Sombo Genet scheme, irrigation water can be distributed to every farm plot within 4 hours as shown below.



**Irrigation Time for Each Farm Plot (Sombo Genet WUA : December 2003)**



In Sombo Aleltu WUA, it was observed that the farm plots, which it took 6 hours to irrigate, were out of the original command area. This is because the canals to feed water into the farm plots run with a gentle gradient.



**Irrigation Time for Each Plot (Sombo Aleltu WUA : December 2003)**

#### 4.3.4 Field Discharge Measurement

In the Sombo Aleltu WUA, at the end of the existing canal, in which it took six (6) hours to irrigate farm plots in downstream reaches, the field discharge measurement was carried out and verified that some 70% of water was lost during conveyance. The canal that runs along the Meki river has too gentle gradient to convey water to their plots. The canal was constructed without technical guidance of OIDA.

### 4.4 Land Dispute and Its Settlement in Shubi WUA

#### 4.4.1 Land Problems in the Shubi WUA

The project agreement signed between OIDA and WUA in August 2001 clearly states that each member allows to cultivate only 0.25 ha within the scheme area. The project monitoring in May 2003 clarified that the scheme area had been expanded from 3.75 ha for 15 members (0.25 ha/member) in November 2001 to 6.00 ha for 17 members (0.35 ha/member) in May 2003. This implied that some of members cultivate more than 0.25 ha.

Since the first crop season in 2002, the OIDA Meki office was aware of irresponsible expansion of irrigated land by some members. The OIDA office advised WUA as well as relevant members, who occupy more than 0.25 ha, to make a proper arrangement of land allocation within the WUA members. However, any improvement was not

observed. In fact, the relevant members refused further land exchange. Then OIDA office wrote warning letters to WUA three (3) times in total.

The OIDA Meki office made a consultation to the wareda administration office in order to find an appropriate legal settlement. Finally, the decision was made among the wareda offices to exert the authority against this violation to the agreement. The pump was temporarily removed from the scheme on 13<sup>th</sup> November 2003. In response to the petition of WUA, however, the pump was returned to WUA after a few days with sympathy to other innocent farmers who follow the agreement.

With high expectation on further WUA's efforts to immediate actions, the monitoring was continued by the JICA Study Team and the OIDA office. However, no positive actions were observed. On 9<sup>th</sup> and 11<sup>th</sup> February, the joint meetings were held. The attendants are the WUA members, the OIDA Meki office, the wareda administration office, the PA Chairman, the wareda rural development office and the JICA Study Team.

#### 4.4.2 Settlement

In the second meeting held on 11<sup>th</sup> February 2004, first of all, it was confirmed that all the WUA members have still high intention not to terminate the project and continue the irrigation farming by obtaining irrigation water from the existing pump under the project. Any possible solutions were discussed by all the members. During the meeting, current conditions of the plot layout and land owner of each plot were verified as illustrated in Figure 4.4.1.

The scheme is currently cultivated only by 11 members with 4.25 ha at the average area of 0.38 ha per member. Out of the existing 11 members, six (6) members occupy 3.00 ha (67%). After discussion, each of the said six (6) members accepted to transfer 0.25 ha of 0.50 ha to a new member. New members were selected among the bloodshed group of the existing members. New members are independent household head with age of over 20 years old. Added one (1) member, WUA attained the mutual consensus to reorganize WUA by 18 members (11 + 6 + 1) with 4.5 ha. Since the scheme area is sized 5.0 ha, the remaining 0.5 ha (5.0 ha - 4.5 ha) is still available for other two (2) members. The agreed plot allocation is presented in Figure 4.4.2.

It should be noted that the membership fees were overdue for a long time due to falling morals among the WUA members (see Figure 4.4.3). According to the agreement, WUA has to save Birr 3,500 a year for replacement of a pump after eight (8) years, i.e. the procurement cost of a pump is Birr 28,000 and the anticipated useful time of a pump is eight (8) years. It was also confirmed that all the members will clear outstanding bills of membership fee and pump replacement deposits within five (5) months.

## CHAPTER 5 3<sup>rd</sup> PBME IN MAY 2004

### 5.1 Objectives

The 3<sup>rd</sup> PBME was carried out in this reporting period to follow up the previous two PBME after January 2004 focusing the following indicators.

- 1) WUA management
- 2) Farming activities and marketing
- 3) Financial status
- 4) Land dispute of the Shubi scheme

### 5.2 Methodology

The interview survey supplemented by the questionnaire was carried out for (i) three (3) WUAs and (ii) 27 WUA members including nine (9) benchmark farmers (BMF). The survey was organized and conducted in May to June 2004 by the JICA Study Team by obtaining the assistance from the OIDA Meki office.

### 5.3 Results of 3<sup>rd</sup> PBME

#### 5.3.1 WUA Management

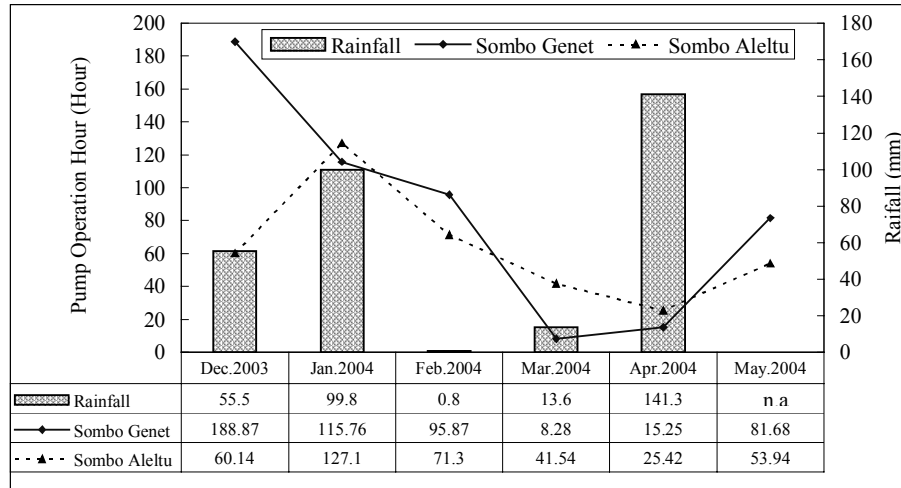
The operation records and accounting books are rather well kept by all the WUAs. The meetings are regularly held by Sombo Genet WUA, while no regular meetings are held by other two WUAs. The member changes are frequent. The past current conditions of the WUA members are summarized below.

**Changes in WUA Members in Shubi-Sombo WUAs**

WUA	Shubi	Sombo Genet	Sombo Aleltu	Total
November 2001	15	28	20	63
May 2003	16	23	20	58
December 2003	17	-	-	-
May 2004	18	23	18	59

Source : JICA Study Team

The 3<sup>rd</sup> PBME was carried out in May 2004 immediately after harvesting of dry season crops sown in December 2003 to January 2004. The pump irrigation schemes along the Meki river suffered from serious water shortage. The field inspection in May 2004 identified approximately 80 pumps along the lower reaches of the Meki river between the Meki town and the Shubi-Sombo schemes. All those pumps were not operated in May 2004. The operation records of Sombo Genet and Sombo Aleltu schemes also showed sharp decrease of the pump operation hours in February and March 2004.



Note: The rainfall data of Meki station for January and February are not collective. So, rainfall data of Ziway station was applied for January and February

### Pump Operation Hour and Rainfall in Sombo Genet and Sombo Aleltu WUAs

Consequently, the complaints of the members of the Shubi-Sombo schemes were unnecessarily made against WUA board member. It is noted that 26% of respondents are not satisfied with the WUA committees as presented below.

#### Satisfaction with WUA Board Member

WUA	Totally Satisfied	Satisfied	Not Satisfied	No Answer	Total
Shubi	0	1	4	0	5
Sombo Genet	2	8	0	1	11
Sombo Aleltu	0	4	2	1	7
Total	2 (9%)	13 (57%)	6 (26%)	2 (9%)	23 (100%)

Source : JICA Study Team

The water dispute with private pump owners as well as non-WUA members was reported in both Shubi and Sombo Aleltu WUAs. They sought further groundwater development for irrigation purposes.

### 5.3.2 Farming Activities and Marketing

Irrigated crops selected for last dry season (December 2003 - May 2004) are presented below.

#### Crop Selection for Irrigated Plots

WUA	Cabbage	Chili	Papaya	Maize	Onion
Shubi	3	2	2	0	1
Sombo Genet	7	3	2	0	0
Sombo Aleltu	2	3	3	1	0
Total	12 (41%)	8 (28%)	7 (24%)	1 (3%)	1 (3%)

Source : JICA Study Team

Cabbage and chili are recognized as low profitable crops, while tomato and onion are high value crops in Shubi-Sombo schemes. Over 80% of the respondents answered that onion is the most profitable crop followed by tomato (10%). Both crops need qualified seeds and agro-chemicals especially fungicides. Due to lack of reserve for procurement of farm inputs, the members selected cabbage and chili. Both crops occupied 69% of the total scheme areas. It is also considered that farmers are negative to take risk of high value crops, which need high investment under the current conditions of unstable discharge of the Meki river.

Although the WUA members confront such severe circumstances under dry conditions, all of 27 members are satisfactory with both crop production and farm income as follows.

#### Crop Production after Project

WUA	Highly Increased	Increased	Not Increased	Total
Shubi	0	6	0	6
Sombo Genet	6	6	0	12
Sombo Aleltu	3	6	0	9
Total	9 (33%)	18 (67%)	0 (0%)	27 (100%)

#### Farm Income after Project

WUA	Highly Increased	Increased	Not Increased	Total
Shubi	0	6	0	6
Sombo Genet	3	9	0	12
Sombo Aleltu	1	8	0	9
Total	4 (15%)	23 (85%)	0 (0%)	27 (100%)

Source : JICA Study Team

### 5.3.3 Financial Status

The balances of bank accounts are one of important monitoring indicators in terms of deposits for pump replacement. With reference to bank statements, their financial status was verified as follows.

#### Balance of Bank Accounts in Shubi-Sombo WUAs

WUA	Balance (Birr)			
	Shubi	Sombo Genet	Sombo Aleltu	Total
November 2001	1,000	1,300	0	2,300
May 2003	2,251	2,272	2,175	6,698
December 2003	3,395	3,337	3,140	9,872
May 2004	3,395	3,337	3,340	10,072

Source : JICA Study Team

The balance of bank account of Sombo Aleltu WUA was slightly increased, while in balance of other WUAs were not changed.

#### 5.3.4 Land Dispute of the Shubi WUA

The land dispute in Shubi is not settled yet although they agreed to re-organize the land reallocation in a series of meeting at presence of Wareda Administrator and PA chairman. The unit of the WUA committee of Shubi is adversely affected by this land issue. The intensive monitoring is still required.

## CHAPTER 6 LESSON LEARNT

### 6.1 Even Distribution of Land

The even distribution of irrigable plots is an essential issue in sustainable WUA management. Maximizing efficiency on irrigation practice in land exchange system was presented in the PRA by the JICA/OIDA. However, the principle of even distribution of land was not properly observed.

#### (1) Improper observation of land exchange agreement

One-sided negligence on the principle of even distribution is the immediate cause for the cancellation of the initial land exchange agreement. Against undisciplined acts to be made by WUA members, it is possible to restrain such cases by involving a promising person such as the PA chairperson in a form of written agreement as witness.

#### (2) Confirmation of land cultivation right beforehand

In case of Sombo Genet WUA, one of WUA members was not a real land right holder of the plots within the command area, while a real land holder has already passed away. The land is returned to the PA office and sustained at the moment. When the PA office found the fact through the land dispute, the PA chairman confiscated the land and redistributed to a few applicants. To avoid such a case, land right holders, which are registered in the PA office, should be confirmed.

### 6.2 Guidance and Training for the Members

It is reasonable that WUA board members are generally nominated taking into consideration their high educational background. But most of the board members have no experiences about WUA management, thus management skill taking charge of each position is not enough. Therefore, with implementation of optimum training for WUA management at hand-over, a regular training of WUA management should be carried out until WUA could stand on her own legs. In order to facilitate awareness creation for ownership on even land and water distribution, sustainable WUA management, a periodic training and guidance should be conducted for WUA members. For this purpose, a training/guidance program should be formulated.

### 6.3 Strengthening of Agriculture Extension

As a result of monitoring on production constraints, the following constraints were reported.

- 1) Difficulty to employ casual workers and purchase of farming inputs due to shortage of farming capital
- 2) Insufficient expertise of irrigation farming including disease and pest control
- 3) Irrigation water shortage

The following options should be examined in order to solve the above constraints.

- 1) It is recommendable for WUA to facilitate an availability of credit and marketing service from the Cooperative Union.
- 2) In accordance with existing extension system, a farmer's technical training should be facilitated. It is proposed to apply the Farmers Research Group (FRG) to the Shubi-Sombo schemes. Based on FRG frame for the WUAs, a joint supporting system between OIDA and OADB should be formed.

#### **6.4 Irrigation Water Resource and Water Management**

##### **(1) Irrigation water source**

The year 2001 was a serious drought year associated with shortage of the Meki river discharge, and the beneficiaries encountered with serious water shortage. Water shortage occurs irregularly during the period from January to March (January in 2001/02, March in 2003/04) . From this lesson, development of other water resource is necessary in order to secure stable irrigation water supply.

##### **(2) Pump operation**

Some personnel conflicts were observed between pump operator and WUA members, who could not agree a relationship between purchased fuel amount and operation hours. From now on, it is necessary for WUA to establish a system that both pump operator and members could confirm a clear pump operation.

#### **6.5 Benefit of Irrigation Farming**

Cabbage growers of Shubi-Sombo WUAs gained a profit and lost due to slump of a market price. Production of horticulture crops is a sort of speculative farming. Countermeasure against this issue should be examined by combining two factors; 1) providing market information over the wide area to the beneficiaries and 2) promoting crop diversification to disperse a market risk.

#### **6.6 Countermeasures against Private Pump Owners**

There are some frictions between private pump owners and the Shubi-Sombo WUAs. It is necessary for OIDA to carry out a periodic monitoring to the WUAs, and convene



meeting in accordance with necessity so as to clear up suspicion generated among WUA members.

## **6.7 Technical Optimization of Irrigation Facilities**

In the verification study, the key to project sustainability was supposed to be “low cost with simple irrigation facilities” so as to enable farmers maintain the facilities easily, that is earth canals with minimized related structures. In other words, it was expected that the intensive water utilization and equal water utilization could be realized through land exchange and consolidation among the WUA members, taking advantage of their traditional norms. However, the present situation suggests that it is difficult to get the consensus for land exchange and consolidation among the WUA members.

From the engineering viewpoint, therefore, the irrigation facilities should be optimized to distribute limited water source fairly to the WUA members. It would include:

- To adopt a pipe distribution system instead of earth canals, and
- To strengthen technical guidance to WUA.

## Tables

**Table 3.3.1 Crop Budget Analyses for Major Crops**

Item	Unit	Crop				
		Papaya	Tomato	Onion	Cabbage	Chili
<b>1. Gross Revenue</b>						
Unit of Area	ha	0.25	0.10	0.25	0.25	0.25
Harbested Yield	qt	8.1	10.0	35.0	35.0	9.7
Marketable Rate		0.95	0.95	0.95	0.95	0.95
Unit Sale Price	Birr/qt	130.0	100.0	70.0	30.0	210.0
Gross Revenue	Birr	1,000.4	950.0	2,327.5	997.5	1,935.2
<b>2. Production Cost</b>						
Hired Oxen Plowing	Birr	32.0	90.0	37.5	42.0	75.0
Hired Tractor	Birr	0.0	0.0	65.0	65.0	65.0
Seed	Birr	330.0	56.0	100.0	55.0	8.0
Fertilizer	Birr	0.0	0.0	74.5	0.0	0.0
Agro-chemicals	Birr	0.0	36.0	441.0	24.0	15.0
Labor	Birr	516.0	280.0	836.0	475.0	473.0
Fuel	Birr	468.1	144.0	29.0	84.0	105.0
Lubrication	Birr	0.0	0.0	0.0	0.0	0.0
Pump Replacement Cost	Birr	88.0	88.0	146.0	142.0	76.0
Total Production Cost	Birr	1,434.1	694.0	1,729.0	887.0	817.0
3. Net Revenue (1. - 2.)	Birr	-433.8	256.0	598.5	110.5	1,118.2
4. Break Even Point (Unit Sale Price)	Birr/qt	177.0	69.4	49.4	25.3	84.2
5. B/C Ratio (1. / 2.)		0.7	1.4	1.4	1.1	2.4

Source : JICA Study Team, May 2003

**Table 3.3.2 Production Constraints of Irrigation Farming in the WUAs (1/2)**

WUA	Production Constraints of the WUA members
1 Shubi	<p><u>Labor :</u> /Supporting family via off-farming activity because of only one family labor making farming difficult</p> <p><u>Access to extension :</u> /Shortage of extension information from OIDA and OADB</p> <p><u>Production resources:</u> /Decrease in production because of delayed sowing via hiring animal traction power due to no self-animal power. /Expensive inputs and fuel cost of pump /Unable to acquire agro-chemicals on time due to shortage of stock</p> <p><u>Farming capital</u> /Unable to employ workers due to limited farming capital even insufficient of family labor</p> <p><u>Heavy Rain :</u> /Cucumber was spoiled due to heavy rain during the March-April 2003.</p> <p><u>Market:</u> /Production cost is high but market price is low.</p> <p><u>Irrigation water</u> /Shortage of irrigation water (Serious water shortage from November 2002 to March 2003 due to shortage of Meki river water flow.</p> <p><u>Problem of WUA Management :</u> /Unfair allotment of PDC per capita which is not based on an irrigable plot size /Weakness of WUA committee's fulfillment /Weakness of OIDA Meki Office to support WUAs</p>
2 Sombo Genet	<p><u>Labor force :</u> /Shortage of farming capital to employ labors /Shortage of family labor force</p> <p><u>Access to Extension Service :</u> /Insufficient information on disease and pest control</p> <p><u>Farming Inputs</u> /As fuel cost is too expensive to generate benefit /As a sprayer is expensive, it is difficult for members to keep it by themselves. /It is difficult to obtain agro-chemicals on time (shortage of stock)</p> <p><u>Farming capital</u> /Farming capital for procurement is short. /As farming capital is insufficient, employing casual worker is difficult even family labor is not enough. /As farming capital is not enough, only low input crop is the option for cultivation ( tomato and onion are unable to plant due to capital shortage)</p> <p><u>Farming Practice :</u> /As current farming practice is poor, a proper management for crop cultivation is difficult. /Most of the WUA members needs a training for irrigation farming because of inexperienced level. /Control of pest is a big issue (chili, cabbage, tomato, onion, papaya, etc)</p> <p><u>Shipping :</u> /Shortage of transportation means for produce (donkey car, etc)</p> <p><u>Abnormal Weather :</u> /Field crops were seriously damaged by hailstones.</p> <p><u>Irrigation water :</u> /Irrigation water was insufficient due to shortage of Meki river water (January to March) /Very high competition to irrigation water because of large WUA members (All WUA members could not plant at once) /Irrigation water is insufficient for the canal-end plot. /The installed pump has a capacity to irrigate 0.75ha/day in max. /Irrigation water is insufficient due to low capacity of the pump</p> <p><u>Market :</u> /Decrease of benefit caused by drop of sale price in market /Insufficient of market information</p> <p><u>Problems of WUA Management :</u> /Irrigation pump is equally utilized among the WUA members even though PC (Participation Fee) is not equally paid off; thus it is not fair. /Pump operator's operation is unfair because of giving priority to his relative and friends. /The WUA members imposed to fine due to neglect of bylaw do not pay the fine. /The farmland confiscated by the PA office, 0.75 ha is now not intensively utilized, thus visitors always mention it and criticize a present land use condition.</p>

Source: JICA Study Team

**Table 3.3.2 Production Constraints of Irrigation Farming in the WUAs (2/2)**

WUA	Production Constraints of the WUA members
3 Sombo Aleltu	<p><u>Labor force :</u> /Shortage of family labors</p> <p><u>Access to Agriculture extension service :</u> /Lack of proper farming practice on pest control /Lack of extension information/water management practice</p> <p><u>Farming Input :</u> /Limited to acquire improved seeds /Due to limited number of sprayers, it is difficult to spray agro-chemicals on time by renting it</p> <p><u>Farming capital :</u> /As farming capital is insufficient, the WUA members are forced to choose the low input crops such as chili and cabbage. /Insufficient farming capital force to adopt a crop sharing system for sharing production resources /Farming credit for tomato and onion are not available. /Unable to rent a sprayer due to lack of faming capital</p> <p><u>Cultural Practice :</u> /Pest damage on crops is serious.</p> <p><u>Rainfall</u> /Crop failure in rain-fed land due to drought/erratic rainfall, and it drives the members to purchase expensive food crops. /Low income caused by drought /As drought issue and irrigation farming are closely interrelated, crop failure in the rain-fed land could be compensated by irrigation farming.</p> <p><u>Market information :</u> /Shortage of market information</p> <p><u>Irrigation water source :</u> /Irrigation water shortage ( very high competition among the 20 WUA members) /As irrigation water source is insufficient, WUA wish to dig a shallow well in combination with mobile pump. /Water shortage continued from September 2002 to January 2003.</p> <p><u>Problem of WUA Management :</u> /Transparency on pump operation hour based on a procured fuel amount is not clear. /Fuel cost 3.1 Birr per liter is expensive. /There are 7 to 8 regular WUA members who do not pay the fuel cost at the time followed by irrigation practice. /Payment of PDC is a duty of WUA members but payment situation is very poor, and it was partially caused from serious drought. Moreover, PDC is not equally paid by the WUA members. /There are some WUA members who are reluctant to pay the PDC. /The bank A/C for the group fund should be shifted to a saving A/C because of no interest in a current A/C. /The WUA members want to use the deposit of Bank A/C as source of credit for the WUA members. /General Assembly is supposed to be convened on every 15 days in Bylaw but it is irregular when new WUA chairman is succeeded. Moreover, some WUA members are absented from WUA meeting. /Treasure interferers too much in duty of the pump operator. /Land distribution is not evenly carried out and a visual measurement for irrigable plot is dominant, which creates a problem of water distribution. /In the crop selection, no consensus could be reached among the WUA members. /The WUA committee makes follow-up of the cultivated crops less frequency. /Canal O&amp;M work by the WUA committee is not frequently followed.</p>

Source: JICA Study Team

**Table 3.3.3 Land Dispute and Case Study of Dropout (1/2)**

(1) Mr. S in Sombo Genet WUA

1	Name	Mr. S	33	Male	Schooling year: 6years
2	WUA member	July, 2001	Position/WUA		
3	Marital Status	Married: Bigamy( 2 wives live in Sombo Aleltu, separately)			
4	Background of dropout from the WUA				
<p>(1) Beginning of the WUA</p> <ul style="list-style-type: none"> <li>• Mr. S cultivated wheat at his irrigable 0.25 ha until September 2002.</li> <li>• OIDA Meki Office advised him to proceed with land exchange with Sombo Aleltu WUA because of OIDA hearing from his wish to quit Sombo Genet WUA.</li> <li>• Mr.S made a land exchange agreement with Mrs. C who lived in Sombo Genet.</li> <li>• The land of which Mrs. C offered was located out of the irrigable command area.</li> <li>• Mr. S seemed to imagine that an irrigable plot in Sombo Aleltu was acquired but he failed to get a plot and further rejected to be a WUA member from Sombo Aleltu.</li> <li>• Thus Mr. S claimed Mrs. C to get it back with making an appeal to the PA Office.</li> <li>• The PA chairman dismissed it because of both parties agreed on the land exchange.</li> <li>• The letter of the land exchange agreement proved clearly both assent it under authorization of the general assembly.</li> <li>• His land obtained from Mrs.C is adjacent to the plot owned by his spouse in Sombo Aleltu.</li> <li>• His application to the both WUAs were rejected.</li> </ul> <p>The PA office detected this land issue as of April 2003 and passed on the issue.</p>					

(2) Mr. B in Sombo Genet WUA

1	Name	Mr.B	35 years	Male	Schooling Year: 7
2	WUA Registration	July 2001	WUA Position		
3	Marital Status	Married			
4	Background of dropout from the WUA				
<p>(1) Beginning of the WUA</p> <ul style="list-style-type: none"> <li>• He could not get any irrigable plot since the beginning of WUA.</li> <li>• It was originated from the ex-land owner, Mr. Ba's land located at the near pump house where was confiscated by the PA chairman.</li> <li>• The PA chairman realized that a real land owner left PA and passed away, who made a land exchange agreement with Mr. Ba. The chairman confiscated his land and distributed to other applicants.</li> <li>• Since that land dispute, Mr. B had been put a condition without irrigable plot.</li> <li>• Mr. B tried to negotiate with other land owners in the command area but not reached to agreement, and dropped out.</li> </ul>					

(3) Mrs. A in Sombo Genet WUA

1	Name	Mrs.A	37years	Male	Schooling Year: 0
2	WUA Registration	July 2001	WUA Position		
3	Marital Status	Widow			
4	Background of dropout from the WUA				
<p>(1) Beginning of the WUA</p> <ul style="list-style-type: none"> <li>• At the beginning of WUA, a 0.25 ha of irrigable plot was allocated to her.</li> <li>• She looked for crop sharing partner for 3 months because of her husband passed away 5 years ago and nursing her kids who were schooling, with rearing live stocks.</li> <li>• Meanwhile Mr. O who was an opponent of land exchange started cropping in her plot without permission, and continues this situation till now.</li> <li>• The letter of land exchange agreement is kept by the Secretary and Pump Operator.</li> <li>• Mr. O was Chairman of WUA and she could not sue him, meanwhile nursing of 3 kids who were schooling and the live stocks kept her away from farming.</li> <li>• The OIDA Meki office appealed this issue to the PA Office, and which promised to take a proper measure, and replied to leave the issue to Wereda Administrative Office if failed to solve, but no progress observed.</li> <li>• Since this land issue, Mrs. A has no action taken actively. This is a typical case which indicates an actual woman's situation in the rural community</li> </ul>					

**Table 3.3.3 Land Dispute and Case Study of Dropout (2/2)**

(4) Mr. M in Sombo Genet WUA

1	Name	Mr. M	55 years	Male	Schooling year: Basic Education only (3 months)
2	WUA Registration	July 2001	WUA Position		
3	Marital Status	Married (Bigamy : 2 wives live in Sombo Aleltu and one of them is WUA member.			
4	Background of dropout from the WUA				
<p>(1) Beginning of the WUA</p> <ul style="list-style-type: none"> <li>• At the beginning of WUA, Mr. M got a 0.25 ha of irrigable plot by making land exchange agreement with Mr. D.</li> <li>• However, Mr. D one-sidedly cancelled and transferred a right to his mother when Mr. M harvested his first crop.</li> <li>• Hid mother possessed a papaya farm in Sombo Aleltu and also sought for plot in Sombo Genet.</li> <li>• Mr. D lived in Sombo Alelt, and his mother lived in Sombo Genet.</li> <li>• Meanwhile, Mr. M could not get any progress even though he tried to discuss with Mr. D.</li> <li>• Mr. M submitted a copy of land exchange agreement letter to the PA chairman without appearance of himself. In this background, his spouse, WUA member living in Sombo Aleltu where his farm plot was adjacent to his spouse plot, thus he appeared to move to Sombo Aleltu.</li> <li>• Here, the content of the Land Exchange Agreement refers no contract period but it generally means “permanent” as conventional wisdom.</li> </ul>					

(5) Land dispute issue of Mr. Ba in Sombo Genet WUA

1	Name	Mr. Ba	54 years	Male	Schooling year: 4years
2	WUA Registration	July 2001	WUA Position		
3	Marital Status	Married			
4	Progress of Land dispute				
<p>(1) Beginning of the WUA</p> <ul style="list-style-type: none"> <li>• Mr. Ba had cultivated the 0.75 ha of farm plot beside of the Pump house and refused to make land exchange agreement with a member, and of which land dispute was learnt by the PA Chairman, thus PA Chairman confiscated Mr. Ba's 0.75 ha.</li> <li>• PA Chairman band his right of cultivation and confiscated his land in January 2002.</li> <li>• This land dispute begun from the fact that Mr. X was a real land owner.</li> <li>• Mr. B made an agreement of land exchange with Mr. X who left PA and passed away, thus the WUA member who was rejected by Mr. Ba about land exchange sued him to the PA Office as mentioned.</li> <li>• The contract of Land exchange agreement lapsed, therefore PA Chairman asked . Ba to return his plot to the PA Office and confiscated the said land and redistributed it to 3 to 4 applicants.</li> <li>• At present, Mr. Ba managed a nursery beds in partial his land. Moreover, he intentionally browsed cattle to disturb the farmers doing rain-fed farming.</li> <li>• Mr. Ba insisted his right to cultivate the said land and has sued against the PA chairman.</li> </ul>					

Note: All the information mentioned above are collected through the interview to the WUA members by JICA Study Team

**Table 3.3.4 Operation and Maintenance of Irrigation Facilities**

WUA		O&M Activity and Problems	
1	Shubi	Instruction channel	/Pump operator informs WUA chairman and secretary of the inspection results, and the issue reported is discussed by the WUA committee and make a decision of O&M work.
		Canal	/ Clearing the main canal (weeding, de-siltation) is carried out at rate of 6 times per year. / 8 WUA members out of 17 members usually join the O&M work. /The WUA committee guides the members who do not join the communal O&M work to join next time.
		Pump	/ Abnormal sound of Engine / Check the looseness of volt & nuts / Engine oil is changed on every 300 hours operation
2	Sombo Genet	Instruction channel	/ First, Pump operator informs WUA chairman and secretary of the inspection results, the WUA chairman instructs each block leader about canal clearing date.
		Canal	/ Canal clearing is done on every 15 days interval (weeding, de-siltation). All beneficiaries on each block-basis join the O&M work. / Wooden gate of the division box are not installed since the beginning, thus soil clods are used for water distribution.
		pump	/ Check an abnormal engine sound / Check color of exhaust gas / Check pump discharge / Engine oil is changed on every 200 hours operation. / As a spanner is spoiled, change of engine oil should be done in Meki city.
3	Sombo Aleltu	Instruction channel	/ First, Pump operator informs the WUA committee of the inspection results, the WUA committee instructs each WUA member for implementation of O&M work
		Canal	/ Canal clearing (weeding, de-siltation) is done on every 15 days by group-basis / Repairing of pump house As a suction pipe section was large, it was renovated to narrow section in order to protect the pump from thief by spending 40 Birr from Treasurer's pocket money.
		Pump	/Check the looseness of volt & nuts /Change engine oil on every 300 hours operation /Cost of engine oil/liter=19.75Birr, oil tank cap of the pump = 3 liters (2.5 liters for gear box and 0.5 liter for air-filter)



**Table 3.3.5 Capability of WUA Members (1/3)**

WUA	Role, Present problem, Countermeasure		
<u>Shubi</u>	Secretary	<p><u>Role</u> :</p> <p>/Making WUA activity report based on OIDA Meki Office, Making meeting minutes, Convene WUA meeting</p> <p><u>Present Problem</u> :</p> <p>/Disability of reporting skill, disability of Oromiffa language in terms of reading and writing</p> <p><u>Countermeasure by WUA • OIDA</u></p> <p>/OIDA Meki Office accepts the meeting minute written in Amhari, and translates it into Oromiffa.</p>	
		Treasurer	<p><u>Role</u> :</p> <p>/Deposit the money collected into Bank A/C, Payment of salary for pump guard, Entering of PDC on the account, Entering of WUA Participation Fee on the account, Entering monthly accounting on the account</p> <p><u>Working process</u></p> <p>/WUA member pays Treasurer for the PDC, Report delinquent to WUA chairman, WUA chairman makes a decision on each case</p> <p><u>Present Problem</u></p> <p>Payment of the PDC is very poor, and which resulted from low benefit of irrigation farming under the conditions on shortage of Meki River water and farming capital.</p>
			Head of Finance
		Inspector	
			Pump Operator

Source: JICA Study Team

**Table 3.3.5 Capability of WUA Members (2/3)**

WUA	Role, Present problem, Countermeasure	
Sombo Genet	Secretary	<p><u>Role</u> /Making application form of credit to the concerned organization, Making meeting minutes, Making WUA activity report (Canal clearing on every 21 days, other activity on every 3 months)</p> <p><u>Present Problem</u> Disability of making meeting minutes in Oromiffa language, Shortage of Office stationary (At present, receipt book/paper/pencil are purchased by the fund donated from the WUA member)</p> <p><u>Countermeasure by WUA</u> /Purchasing stationary is managed by collecting a contribution from the WUA members in General Assembly. /Reading skill of Oromiffa is assisted by school child in each household, and also Secretary needs to learn Oromiffa through reading practice.</p>
	Treasurer	<p><u>Role</u> /Issuing receipt for fuel procurement, collection of the PDC and entering it on accounting book, Entering Participation Fee of WUA members, Depositing the collected money into the Bank A/C, Disbursement of budget for fuel purchase</p> <p><u>Working process:</u> The PDC is paid for Treasurer of each WUA.</p> <p><u>Present Problem and countermeasures</u> /Delinquent of PDC is suspended to supply irrigation water. /The WUA member who are incapable of paying PDC due to drought damage is allowed to receive irrigation water under approval of WUA committee, and WUA committee gives warning to the members who are intentionally not paying PDC. / Office stationary is supplied by OIDA Meki Office, thus no need to procure by WUA itself. / Format of receipt is guided by OIDA Meki Office.</p>
	Head of Finance	<p><u>Role</u> /The head of finance has been sick since August 2002, thus the WUA chairman replied for him. /The role for the head of finance is to enter revenue and expense on accounting, sanction of budget execution.</p> <p><u>Present problems</u> /There is no specific comment because of the person in charge being absent due to sick. The secretary is acting for his position.</p> <p><u>Countermeasure by WUA</u> /The secretary is acting for the position of head of finance since the head of finance has been absent due to sick for long time. / WUA dismisses Head of Finance and selects a successor.</p>
	Inspector	<p><u>Role :</u> / Joining decision making meeting with other committee members, Understanding that role of inspector to audit a financial/property, other committee member acts for a position of inspector and no actual work is made so far. Even inquiring about role of inspector, there is no proper instruction.</p> <p><u>Countermeasure by WUA</u> / In response to Inspector's comment, the WUA committee members replied that Inspector had been absent due to countermeasure work of his land dispute. / WUA dismisses Inspector and nominate a successor</p>
	Pump Operator	<p><u>Role :</u> Pump operation, Recording pump operation, Collection of fuel cost from Members, Inform each Block leader of rotational irrigation schedule, Report water dispute to WUA Chairman / Committee members, Purchase of fuel</p> <p><u>Present Problem :</u> / Spoiling of tool (spanner), Some conflict among the Pump Operator, and users, Disqualified pump capacity at the time of ample Meki river water,</p> <p><u>Countermeasure by WUA</u> /For the time being, oil change is done at workshop in Meki due to damaged spanner, and spoiled spanner should be replaced.</p>

Source: JICA Study Team

**Table 3.3.5 Capability of WUA Members (3/3)**

WUA	Role, Present problem, Countermeasure
Sombo Aleltu	<p><u>Role</u> / Receive cash and enter expense on accounting book, Making WUA activity report to OIDA Meki Office, Making meeting minutes, making application of inputs to OIDA Meki Office, Discussion of finance with other WUA committee</p> <p><u>Present Problem</u> /Disability of writing skill of Oromiffa language, Too busy for managing 2.75 ha to do a secretary job</p> <p><u>Countermeasure by WUA</u> /The surroundings requested me to go to night school for studying Oromiffa language but no time. / OIDA Meki Office accepted the report written in Amhari version.</p>
	<p><u>Role</u> /Collection of PDC/fine/fuel cost, disbursement of fuel purchase by pump operator, deposit of collected money into Bank A/C</p> <p><u>Working Process</u> /WUA member pays Treasurer for PDC and reporting non-payer to WUA chairman</p> <p><u>Present Problem</u> /The treasurer is hated by the WUA members who are reluctant to pay the PDC. /Feel disability because of lack of reading/writing skill of language under limited basic education background.</p> <p><u>Countermeasure by WUA</u> /WUA considers each non-payment case of the PDC and allows to use irrigation water with guidance to pay it in case of irresistible force, / WUA is aware of treasurer's illiteracy and discussed about his problem in the WUA committee. /The General Assembly Meeting concluded that Treasurer could carry on his duty because of his integrity personality.</p>
	<p><u>Role</u> /Computation of financial transaction</p> <p><u>Working Process</u> /Calculate sum of the receipts submitted by Treasurer in the meeting.</p> <p><u>Present Problem</u> /I could not accomplish my duty (role of head of finance) due to limited time and no report about /His problem was made to the WUA chairman yet.</p> <p><u>Countermeasure by WUA</u> /The WUA chairman explained that the head of finance did not fulfill his duty which was already reported to OIDA Meki Office. The OIDA Meki office also gave a same comment. Thus a final decision on his performance shall be made in the General Assembly Meeting.</p>
	<p><u>Role :</u> /Management/monitor/auditing of irrigation facility, financial situation, and water management</p> <p><u>Working process</u> /The WUA members who illegally cultivate more than 0.25 ha have been reported to Meki OIDA Office in March, 2003. However, the said office was kept busy for the water harvesting project and no responded to the report.</p> <p><u>Present Problem</u> /Pomp operator/chairman has granted the WUA members who have cultivated more than 0.25ha irrigable plot.</p> <p><u>Countermeasure of WUA</u> /According to OIDA Meki Office, this inspector does not work in cooperation with other members due to his personal conflict, and does not carry out his assignment.</p>
	<p><u>Role</u> /Pomp Operation, O&amp;M work including oil change of pump, sale of fuel and recording of pump operation, informing irrigation schedule of each block leader</p> <p><u>Present Problem</u> /Delay of payment for salary of pump guard/pump operator (Max 5 months) , difficulty to collect fuel cost from the delinquent, Outbreak of violation to operate pump during the night by purchasing fuel by individual pocket money, conflict between treasurer and pump operator, no transparency on pump operation, damaging gasket due to wrong operation</p> <p><u>Countermeasure by WUA</u> /Salary for pump operator is supposed to be paid by investing a right to cultivate an additional 0.25 ha of irrigable plot. /WUA made a decision to dismiss the pump operation with imposing a fine.</p>

Source: JICA Study Team May, 2003

**Table 3.3.6 Some Conflicts with Surrounding Communities**

WUA		Conflicts with Surrounding Communities
1	Shubi	<ol style="list-style-type: none"> <li>1) A pump capacity is too small to cover a new demand generated from the surrounding farmers who want to join the WUA</li> <li>2) Land exchange system involves the non-beneficial-farmers in the surrounding community</li> <li>3) The surrounding communities make the WUA members fear that the Government confiscates their farm lands as a collective farm of the socialism.</li> <li>4) Some conflict with the WUA members is taken place because of the partial main canal (20 m) having been used by a private pump owner.</li> </ol>
2	Sombo Genet	<ol style="list-style-type: none"> <li>1) There are land dispute issues between the surrounding communities and the WUA member (Mr. Balda Tola and Mr. Sumale Rugo).</li> <li>2) Private pump owner do not want WUA to expand because of collision of interests, thus some conflict is existed between the WUA and the surrounding private pump owners.</li> <li>3) As anticipated future issue about kinship in the WUA, relatives may exchange land each other and it may cause some bias in this land exchange matter ( example : chairman and his wife, son etc)</li> </ol>
3	Sombo Aleltu	<ol style="list-style-type: none"> <li>1) The surrounding communities agitate the donor organ (JICA) confiscates the farm land from the WUA members; and this agitation seems to be generated through the private pump owners who have serious concern in the area along to the Meki river bank.</li> <li>2) The private pump owners do not feel happy about JICA-OIDA WUA formation because of losing their rights and interest, thus they create inner-conflicts of the WUA members in order to make them dispel suspicion by stirring them.</li> </ol>

Source: JICA Study Team May, 2003

**Table 3.4.1 Household Characteristics (1/3)**

Survey Items			Shubi								
			Farmer No.1			Farmer No.2			Farmer No.3		
1	Beneficiaries	Name									
		Age	44			42			45		
		Sex	Male			Male			Male		
		Academic Career	4 years			10 years			6 years		
		Month/Year to join WUA	Jul-01			Jul-01			Jul-01		
	Position/WUA Board										
2	Family member	Member	Age	Education /occupation	Member	Age	Education /occupation	Member	Age	Education /occupation	
		Wife	35	2 year	Wife	32	12 years/teacher	Wife	35	Basic education	
		Son	27	1 year	Son	23	8 years	Mother	75	no	
		Son's wife	20	2 year	Son	20	7 years	Son	18	Private college	
		Son	23	10 years	Son	14	5 years	Son	14	7 years	
		Son's wife	18	10 years/teacher	Son	10	5 years	Son	12	7 years	
		Son	21	7 years	Son	8	3 years	Son	10	no	
		Son	16	5 years	Son	7	Kinder garden	Son	7	4 years	
		Daughter	18	5 years	Daughter	17	6 years	Daughter	9	1 year	
		Daughter	12	3 years				Daughter	9	3 years	
								Daughter	8	3 years	
								Daughter	13	8 years	
						Daughter	6	6 years			
3	Farm Land	Total area (ha)	2.25 ha			1.75 ha			1.25 ha		
		Rain fed area (ha)	1.5 ha	Teff, Maize		1.5 ha	Maize, Wheat, Tomato		1 ha	Maize, Teff, Wheat	
		Irrigated area (ha)	0.75 ha	Papaya, Cucumber, Onion, Green bean		0.25 ha	Chili, Cabbage, Cucumber, Papaya, Green bean		0.25 ha	Cabbage, Chili, Green bean	
		Remark	-			(Sharing system)			(Sharing system)		
		Share 0.5ha with private pump owner and cultivating tomato in 2002									
4	Farming tool	Cart	1			-			-		
		Hoe	1			2			2		
		Sickle	1			3			3		
		Axe	1			2			2		
		Shovel	1			-			-		
		Spryer	-			-			-		
		Knife	1			1			1		
5	Livestock	Ox	2			2			2		
		Veal	3			-			-		
		Cow	3			1			1		
		Heifer	1			-			-		
		Chicken	3			1			1		
		Goat	-			1			1		
		Pig	-			1			1		
		Sheep	-			2			2		
Donkey	1			1			1				
6	Item of non farm income				Income from salary of wife. Income of cultivation tomato under contract with PPO was 500Birr.						
7	Farm income	7,236			-344			-50			
	Non farm income (Nov.2001~Mar.2003)	0			2,552			0			
	Net Revenue of Household	7,236			2,208			-50			

**Table 3.4.1 Household Characteristics (2/3)**

Survey Items		Sombo Genet									
		Farmer No.4			Farmer No.5			Farmer No.6			
1	Beneficiaries	Name									
		Age	50			36			53		
		Sex	Male			Male			Male		
		Academic Career	Basic Education			3 years			4 years		
		Month/Year to join WUA	Jul-01			Jul-01			Jul-01		
	Position/WUA Board										
2	Family member	Member	Age	Education /occupation	Member	Age	Education /occupation	Member	Age	Education /occupation	
		Wife	48	no	Wife	30	no	Wife	46	Basic Education	
		Son	22	6 years	Son	8	no	Son	20	no	
		Son	12	1 year	Son	2	no	Daughter	17	3 years	
		Wife	39	no	Daughter	12	4 years	Daughter	8	no	
		Daughter	22	no	Daughter	11	2 years	Wife	44	no	
		Daughter	20	3 years	Wife	28	4 years	Son	19	5 years	
		Daughter	18	2 year	Daughter	3	no	Son	17	6 years	
		Daughter	13	no	Daughter	1	no	Son	10	2 years	
		Son	28	no	Mother	50	no	Daughter	20	8 years	
		Son	25	5 years	Brother	25	1 year	Wife	48	no	
		Wife	30	2 years	Brother	20	no	Daughter	20	7 years	
		Son	3	no	Sister	13	no	Daughter	18	7 years	
Son	1	no				Daughter	14	5 years			
3	Farm Land	Total area (ha)	4 ha			3.25 ha			3.25 ha		
		Rain fed area (ha)	1.75 ha	Maize, Teff, Wheat, Chili		2 ha	Maize, Teff, Wheat		1.75 ha	Maize, Teff, Wheat	
		Irrigated area (ha)	0.25 ha	Haricot bean, Papaya, Cabbage, Eggplant		0.25 ha	Chili, Cabbage, Tomato		0.5 ha	Chili, Maize, Cabbage	
			(Sharing system)			(Sharing system)			-		
		Remark	Share 2ha with private pump owner			Rent out 0.5ha to PPO and share 0.5ha with PPO to cultivate papaya			He has 0.25ha irrigated land as salary of guard. Rent out 1ha to PPO		
4	Farming tool	Cart	1			1			-		
		Hoe	3			1			2		
		Sickle	2			1			1		
		Axe	1			2			1		
		Shovel	-			-			-		
		Spryer	-			-			-		
		Knife	1			1			1		
5	Livestock	Ox	4			3			2		
		Veal	6			4			1		
		Cow	6			5			3		
		Heifer	5			3			3		
		Chicken	10			-			10		
		Goat	-			-			-		
		Pig	-			-			-		
		Sheep	-			-			8		
Donkey	-			1			-				
6	Item of non farm income	Community activity (sale sand)	(45Birr/week)			Community activity (sale sand)			(45Birr/week)		
		Rent out land contract (total 8,900Birr in 2002)				Rent out land contract (6000Birr/1ha/10year)					
7	Farm income		-210			-290			1,286		
		Non farm income (Nov.2001~Mar.2003)	10,580			2,340			2,540		
		Net Revenue of Household	10,370			2,050			3,826		

**Table 3.4.1 Household Characteristics (3/3)**

Survey Items		Sombo Aleltu									
		Farmer No.7			Farmer No.8			Farmer No.9			
1	Beneficiaries	Name									
		Age	37			38			64		
		Sex	Male			Male			Female		
		Academic Career	7 years			5 years			6 years		
		Month/Year to join WUA	Sep-01			Sep-01			Sep-01		
	Position/WUA Board										
2	Family member	Member	Age	Education /occupation	Member	Age	Education /occupation	Member	Age	Education /occupation	
		Wife	38	no	Wife	N.A.	no	Husband	80	no	
		Daughter	20	1 year	Son	18	2 years	Son	30	no	
		Daughter	14	3 years	Son	11	6 years	Son's wife	26	no	
		Daughter	10	Primary	Son	6	no	Granddaughter	7	no	
		Son	6	no	Son	3	no	Granddaughter	3	no	
		Son	3	no	Son	1	no	Son	28	no	
		Wife	26	no	Daughter	2	no				
		Daughter	15	Primary	Son	20	5 years				
		Daughter	10	Primary	Son	18	3 years				
		Daughter	6	Primary							
		Daughter	4	1 year							
		Daughter	1.5	no							
3	Farm Land	Total area (ha)	3.375 ha			1.75 ha			2.25 ha		
		Rain fed area (ha)	2.25 ha	Maize, Wheat		1.5 ha	Chili, Maize, Teff		1.5 ha	Maize, Teff, Wheat, Tomato	
		Irrigated area (ha)	0.25 ha	Papaya		0.25 ha	Chili, Maize		0.25 ha	Tomato, Chili, Ethiopian cabbage,	
			(Sharing system)			(Sharing system)			(Sharing system)		
		Remark	Sharing 0.25ha and Rent out 0.625ha to private pump owner						Rent out 0.5ha to private pump owner		
4	Farming tool	Cart	1			1			0		
		Hoe	5			1			1		
		Sickle	-			-			1		
		Axe	2			1			-		
		Shovel	4			-			-		
		Spryer	-			-			-		
		Knife	2			1			0		
5	Livestock	Ox	2			2			1		
		Veal	3			1			2		
		Cow	4			2			1		
		Heifer	4			3			-		
		Chicken	6			-			1		
		Goat	-			-			-		
		Pig	-			-			-		
		Sheep	-			-			-		
Donkey	1			1			-				
6	Item of non farm income	Community activity (sale sand) (45Birr/week)				Community activity (sale sand) (45Birr/week)			Rent out land contract (150Birr/0.25ha/year)		
		School grant for child (100Birr)									
		Rent out land contract									
7	Farm income		1,660			600			-135		
		Non farm income (Nov.2001~Mar.2003)	2,940			2,340			300		
		Net Revenue of Household	4,600			2,940			165		

**Table 3.4.2 Use of Fertilizers and Expenditure of BMFs**

BMF No.	Crop	Area(ha)	Fertilizer	Amount	Price (Birr)	Total (Birr)	Gross income	Rate (%)
1	Onion	0.250	DAP	50kg	130	250	11,790	2
			Urea	50kg	120			
2	Chili	0.250	Manure	N.A.	0	135	1,795	8
	Cabbage	0.250	Manure	N.A.	0			
	Wheat	0.500	DAP+Urea	50kg	135			
3	Maize	1.000	Manure	N.A.	0	170	1,038	16
	Wheat	0.250	DAP	25kg	50			
	Cabbage	0.250	Urea	25kg	60			
	Cabbage	0.250	Urea	25kg	60			
4	Eggplant	0.125	DAP	50kg	115	350	1,225	29
			Urea	50kg	115			
	Haricot bean	0.250	Urea	25kg	57.5			
			DAP	25kg	62.5			
5	Chili	0.250	Manure	N.A.	0	0	2,855	0
	Cabbage	0.250	Manure	N.A.	0			
	Papaya	0.500	Urea	8kg	N.A.			
6	Chili	0.250	Manure	N.A.	0	35	3,796	1
	Maize	0.250	Manure	N.A.	0			
	Chili	0.500	Manure	N.A.	0			
	Maize	0.750	Manure	N.A.	0			
	Wheat	0.500	Urea	25kg	35			
7	Papaya	0.250	Manure	N.A.	0	0	4,700	0
	Cucumber	0.250	Manure	N.A.	0			
	Maize	1.500	Manure	N.A.	0			
8	Chili	0.250	Manure	N.A.	0	0	1,555	0
9	Tomato	0.125	Manure	N.A.	0	0	200	0



**Table 3.4.3 Use of Agro-Chemical and Expenditure of BMFs**

BMF No.	Crop	Area(ha)	Agro-chemical	Amount	Price(Birr)	Total (Birr)	Gross income	Rate (%)
1	Teff	0.750	24D	1L	42	222	11,790	1.9
	Cucumber	0.250	Malatine	1L	60			
	Onion	0.250	Malatine	1L	60			
	Green bean	0.250	Malatine	1L	60			
2	Chili	0.250	Malatine	0.8L	48	173	1,795	9.6
	Cabbage	0.250	Malatine	0.8L	48			
			Aspor	80g	20			
	Chili	0.250	Malatine	0.4L	24			
	Cucumber	0.250	Malatine	0.2L	12			
	Wheat	0.500	24D	0.5L	21			
3	Maize	1.000	U46	1L	50	146	1,038	14.1
	Teff	0.250	U46					
	Wheat	0.250	U46					
	Cabbage	0.250	Malatine	0.6L	36			
	Cabbage	0.250	U46	N.A.	48			
	Chili	0.250	Malatine	0.2L	12			
4	Cabbage	0.125	Malatine	0.3L	18	146	1,225	11.9
			Rodmil	250g	20			
	Eggplant	0.125	Malatine	N.A.	26			
			Rodmil	N.A.	50			
	Wheat	0.500	24D	0.2L	16			
	Teff	0.500	24D	0.2L	16			
5	Chili	0.250	Malatine	0.4L	24	215	2,855	7.5
			DDT	N.A.	24			
	Cabbage	0.250	Malatine	0.8L	48			
			Aspor	80g	20			
	Cabbage	0.250	Malatine	0.4L	24			
	Maize	0.750	24D	0.5L	75			
	Wheat	0.500	24D	0.4L				
	Teff	0.750	24D	0.3L				
6	Maize	0.250	24	0.3L	15	182	3,796	4.8
	Chili	0.500	Malatine	N.A.	38			
			DDT	N.A.	50			
			Aspor	N.A.	30			
	Teff	0.500	U46	0.2L	14			
	Maize	0.750	U46	0.3L	21			
	Wheat	0.500	U46	N.A.	14			
7	Cucumber	0.250	Malatine	0.9L	45	89	4,700	1.9
	Maize	1.500	U46	0.5L	24			
	Wheat	0.750	U46	0.4L	20			
8	Maize	0.750	U46	0.6L	36	188	1,555	12.1
	Chili	0.250	DDT	0.4L	20			
	Teff	0.750	U46	0.9L	54			
	Chili	0.250	DDT	0.2L	12			
			Aspor	0.6L	54			
			Malatine	0.2L	12			
9	Maize	0.250	U46	0.2L	12	92	200	46.0
	Teff	0.250	U46	0.4L	24			
	Wheat	0.250	U46	0.4L	24			
	Chili	0.125	Malatine	0.2L	12			
	Ethiopian cabbage	0.250	Malatine	N.A.	20			

**Table 3.4.4 Use of Hired Labor and Expenditure of BMFs**

BMF No	Number/MD	Work	Unit	Price (Birr)	Total (Birr)	Gross income	Rate (%)
1	1 person	Care of papaya	85Birr/month	1445	2240	11790	19.0
	80MD	Tilling of onion	6Birr/ MD	480			
	39MD	Harvesting of onion	7Birr/ MD	273			
	7MD	Harvesting of green bean	6Birr/ MD	42			
2	20MD	Harvesting of chili	6~7Birr/ MD	136	766	1795	42.7
	3MD	Harvesting of cabbage	6~7Birr/ MD	28			
	3MD	Transplanting of papaya	8Birr/ MD	24			
	1 person	Care of papaya	70Birr/month	350			
	11 MD	Harvesting of chili	6Birr/ MD	66			
	12MD	Tilling of cucumber	6Birr/ MD	72			
	-	Harvesting of wheat	90Birr/harvesting	90			
3	-	Harvesting of teff	40Birr/0.25ha	40	440	1038	42.4
	-	Harvesting of wheat	40Birr/0.25ha	40			
	5MD	Transplanting of cabbage	8Birr/ MD	40			
	12MD	Tilling of cabbage	8Birr/ MD	96			
	4MD	Harvesting of cabbage	8Birr/ MD	32			
	4MD	Tilling of cabbage	8Birr/ MD	32			
	4MD	Transplanting of chili	8Birr/ MD	64			
	12MD	Tilling of chili	8Birr/ MD	96			
	4	1 person	Care of cabbage	60Birr/month			
6MD		Transplanting of cabbage	5Birr/ MD	30			
15MD		Tilling of cabbage	10Birr/ MD	150			
4MD		Harvesting of cabbage	10Birr/ MD	40			
5MD		Tilling of Eggplant	12Birr/ MD	60			
1 person		Plowing of wheat	50Birr/plowing	50			
5	10MD	Transplanting of chili	5Birr/ MD	50	1496	2855	52.4
	30MD	Tilling for chili	7Birr/ MD	210			
	30MD	Harvesting of chili	7Birr/ MD	210			
	10MD	Transplanting of cabbage	7Birr/MD	70			
	15MD	Tilling of cabbage	7Birr/MD	105			
	1 person	Care of papaya (rainy)	100Birr/month	600			
	11MD	Harvesting of cabbage	6Birr/ MD	66			
	-	Harvesting of wheat	40Birr/0.25ha	80			
	-	Harvesting of teff	35Birr/0.25ha	105			
6	-	Plowing of chili	30Birr/time	90	1227	3796	32.3
	8MD	Transplanting of chili	8Birr/MD	64			
	-	Plowing of maize	10Birr/time	40			
	-	Tilling of maize	10Birr/time	10			
	8MD	Harvesting of maize	8Birr/MD	64			
	2 person	Care of chili	80Birr/person	160			
	30MD	Transplanting of chili	8Birr/MD	240			
	16MD+α	Tilling of chili	8Birr/MD	223			
	6MD	Plowing of teff	10Birr/MD	60			
	2MD	Harvesting of teff	10Birr/MD	20			
	2MD	Threshing of teff	8Birr/MD	16			
	1 person	Care of maize	40Birr/month	80			
	6MD	Tilling of maize	10Birr/MD	60			
	6MD	Plowing of wheat	10Birr/MD	60			
	5MD	Harvesting of wheat	8Birr/MD	40			
8	4MD	Harvesting of teff	8Birr.MD	32	212	1555	13.6
	6MD	Transplanting of chili	5Birr/MD	30			
	30MD	Harvesting of chili	5Birr/MD	150			
9	9MD	Tilling of ethiopian cabbage	10Birr/MD	90	90	200	45.0

**Table 3.4.5 Crop Budget (1/9)**

Farmer No.1 (Shubi)

Crop: Maize (Rainfed Land) Jun.-Oct.2002

1.. Income	
Maize (0.5ha) 4 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed (Self-produced)	0 Birr/ 0.75qts
(2) Fertilizer	Birr
(3) Agro-chemical	Birr
(4) Labor	Birr
<hr/>	
Sub-total(b)	0 Birr
3.. (a) - (b) =	
	0 Birr
	( 0 Birr /1ha)

Crop: Teff (Rainfed land) Aug.-Oct. 2002

1.. Income	
Teff (0.75ha) 6 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed (Self-produced)	0 Birr/36kg
(2) Fertilizer	Birr
(3) Agro-chemical 2-4D	42 Birr/1liter
Renting splay and Labor	6 Birr
<hr/>	
Sub-total(b)	48 Birr
3.. (a) - (b) =	
	-48 Birr
	( -64 Birr /1ha)

Crop: Papaya (Irrigated Land) 1996~

1.. Income	
Papaya (0.5ha) 207 qts × (10~100) Birr/qt =	8,410 Birr
Sub-total(a)	8,410 Birr
2.. Expenditure	
(1) Seedling(Transplaned in1996(0.125ha) and 1999(0.375ha))	Birr
(2) Fertilizer	0 Birr
(3) Agro-chemical	0 Birr
(4) Irrigation Fuel(2.7~3.0Birr×3liter×2times/month)	277 Birr
(5) Labor (Tilling)	500 Birr
Permanent labor (85Birr/month×17months)	1445 Birr
(6) Guard for community pump	115 Birr
(7) Pump Maintenance and Replacement cost	230 Birr
<hr/>	
Sub-total(b)	2,567 Birr
3.. (a) - (b) =	
	5,843 Birr
	( 11,686 Birr /1ha)

Crop: Cucumber (Irrigated Land) Nov.2001~Jan.2002

1.. Income	
Cucumber (0.25ha) 10 qts × 50 Birr/qt =	500 Birr
Sub-total(a)	500 Birr
2.. Expenditure	
(1) Seed (Self-produced)	0 Birr
(2) Fertilizer	0 Birr
(3) Agro-chemical (Malatine)	60 Birr/1.0liter
Rental spray(2Birr/each)	10 Birr
(4) Irrigation Fuel (2.7Birr×2liter×6times)	32.4 Birr
(5) others	-----
<hr/>	
Sub-total(b)	102 Birr
3.. (a) - (b) =	
	398 Birr
	( 1590 Birr /1ha)

Crop: Onion (Irrigated Land) Oct.2002~Jan.2003

1.. Income	
Onion (0.25ha) 31 qts × 80 Birr/qt =	2,480 Birr
Sub-total(a)	2,480 Birr
2.. Expenditure	
(1) Seed (Improved)	250 Birr/1kg
(2) Fertilizer DAP	130 Birr/0.5qts
Urea	120 Birr/0.5qts
(3) Agro-chemical Malatine	60 Birr/1liter
Rodmil	200 Birr/1kg
Rental spray (2Birr/each)	32 Birr
(4) Irrigation Fuel(2.7Birr×2liter×10times)	54 Birr
(5) Labor (Tilling)(80MD)	480 Birr
(Harvesting)(7Birr×39MD)	273 Birr
<hr/>	
Sub-total(b)	1,599 Birr
3.. (a) - (b) =	
	881 Birr
	( 3,524 Birr /1ha)

Crop: Green bean (Irrigated Land) Feb.-Apr.2003

1.. Income	
Green bean (0.25ha) 10 qts × 40 Birr/qt =	400 Birr
Sub-total(a)	400 Birr
2.. Expenditure	
(1) Seed	60 Birr/10kg
(2) Fertilizer	0 Birr
(3) Agro-chemical Malatine	60 Birr/1.0liter
Rental spray(2Birr/each)	8 Birr
(4) Irrigation Fuel (2.8Birr×2liter×12times)	67.2 Birr
(5) Labor (Harvesting)(6Birr×7MD)	42 Birr
<hr/>	
Sub-total(b)	237 Birr
3.. (a) - (b) =	
	163 Birr
	( 651 Birr /1ha)

Gross Income	11,790 Birr
Total Production Cost	4,554 Birr
Net Income	7,236 Birr

**Table 3.4.5 Crop Budget (2/9)**

Farmer No.2 (Shubi)

Crop: Chili (Irrigated Land) Dec.2001--Apr.2002		Crop: Cabbage (Irrigated Land) Apr.--Jun.2002	
<b>1.. Income</b> Chili (0.25ha) 1,080 kg × 0.20-0.35 Birr/kg = 351 Birr Sub-total(a) 351 Birr		<b>1.. Income</b> Cabbage (0.25ha) 10 qts × 35 Birr/qt = 350 Birr 2 cart × 30 Birr/qt = 60 Birr Sub-total(a) 410 Birr	
<b>2.. Expenditure</b> (1) Seed 5 Birr/250g (2) Fertilizer Manure 0 Birr (3) Agro-chemical Malatine(4 times) 48 Birr/0.8liter Rental spray(8Birr/each) 32 Birr (4) Irrigation Fuel(2.7Birr×3liter×12times) 97 Birr (5) Labor (Harvesting) 136 Birr Dabo (Transplanting) 50 Birr (6) Guard for community pump 100 Birr (7) Pump Maintenance and Replacement cost 150 Birr Sub-total(b) 618 Birr		<b>2.. Expenditure</b> (1) Seed 45 Birr/250g (2) Fertilizer Manure 0 Birr (3) Agro-chemical (Malatine) 48 Birr/0.8liter (ASPOR) 20 Birr/80g Rental spray(4Birr/each) 16 Birr (4) Irrigation Fuel (2.8Birr×3liter×7times) 58.8 Birr (5) Labor Dabo (Transplanting) 50 Birr (Harvesting) 28 Birr Sub-total(b) 266 Birr	
3.. (a) - (b) = -267 Birr (-1,069 Birr /1ha)		3.. (a) - (b) = 144 Birr (- 577 Birr /1ha)	
<b>Crop: Papaya (Irrigated Land) Aug.2002--</b>		<b>Crop: Chili (Irrigated Land) Sep.2002--Jan.2003</b>	
<b>1.. Income</b> Papaya (0.125ha) 0 qts × 0 Birr/qt = 0 Birr Sub-total(a) 0 Birr		<b>1.. Income</b> Chili (0.25ha) 540 kg × (0.30-0.50) Birr/kg = 234 Birr Sub-total(a) 234 Birr	
<b>2.. Expenditure</b> (1) Seedling (0.25Birr/Seedling from MOA) 125 Birr/500seedling (2) Fertilizer Birr (3) Agro-chemical Birr (4) Irrigation Birr (5) Labor (Transplanting) 24 Birr Permanent Labor (70Birr/2month) 350 Birr Sub-total(b) 499 Birr		<b>2.. Expenditure</b> (1) Seed 5 Birr/50g (2) Fertilizer 0 Birr (3) Agro-chemical Malatine 24 Birr/0.4liter Rental spray 6 Birr (4) Irrigation Fuel (2.8Birr×2liter×12times) 67.2 Birr (5) Labor (Harvesting)(6Birr×11MD) 66 Birr (Dabo for Transplanting) 40 Birr Sub-total(b) 208 Birr	
3.. (a) - (b) = -499 Birr (-1,996 Birr /1ha)		3.. (a) - (b) = 25.8 Birr (- 103 Birr /1ha)	
<b>Crop: Cucumber (Irrigated Land) Feb.--Mar.2003</b>		<b>Crop: Wheat (Rainfed land) Jun.--Nov.2002</b>	
<b>1.. Income</b> Cucumber (0.25ha) 0 qts × 0 Birr/qt = 0 Birr Sub-total(a) 0 Birr (Note: Because of heavy rain)		<b>1.. Income</b> Wheat (0.5ha) 5 qts × 160 Birr/qt = 800 Birr 5 qts × 0 Birr/qt = 0 Birr Sub-total(a) 800 Birr (Note: Half wheat is self consumption)	
<b>2.. Expenditure</b> (1) Seed (16Birr/25g) 96 Birr/4packs (2) Fertilizer 0 Birr (3) Agro-chemical Malatine 12 Birr/0.2liter Rental spray 4 Birr (4) Irrigation Birr (5) Labor (6Birr×12MD) 72 Birr Sub-total(b) 184 Birr		<b>2.. Expenditure</b> (1) Seed (Self-produced) 0 Birr/36kg (2) Fertilizer (DAP+Urea) 135 Birr/50kg (3) Agro-chemical 2-4D 21 Birr/0.5liter Renting spray 8 Birr (4) Labor (Harvesting) 90 Birr (Dabo for threshing) 50 Birr Sub-total(b) 304 Birr	
3.. (a) - (b) = -184 Birr (-736 Birr /1ha)		3.. (a) - (b) = 496 Birr (- 992 Birr /1ha)	
<b>Crop: Maize (Rainfed Land) May--Nov.2002</b>			
<b>1.. Income</b> Maize (1ha) 10 qts × 0 Birr/qt = 0 Birr Sub-total(a) 0 Birr (Note: Self consumption)			
<b>2.. Expenditure</b> (1) Seed (Self-produced) 0 Birr/80kg (2) Fertilizer Birr (3) Agro-chemical Birr (4) Labor (Dabo) 60 Birr Sub-total(b) 60 Birr			
3.. (a) - (b) = -60 Birr (-60 Birr /1ha)			
Gross Income 1,795 Birr Total Production Cost 2,139 Birr Net Income -344 Birr			

**Table 3.4.5 Crop Budget (3/9)**

Farmer No.3 (Shubi)

Crop: Maize (Rainfed Land) May.-Dec.2002

1.. Income	
Maize (0.5ha) 6 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	128 Birr/80kg
(2) Fertilizer Rental cart to carry manure	18 Birr
(3) Agro-chemical U-46	50 Birr/1liter
Renting spray	5 Birr
(4) Labor	Birr
Sub-total(b)	201 Birr
3.. (a) - (b) =	-201 Birr
	( -402 Birr /1ha)

Crop: Teff (Rainfed land) Jul.-Nov.2002

1.. Income	
Teff (0.25ha) 1.5 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed (Self-produced)	0 Birr/25kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	Birr
Renting spray	5 Birr
(4) Labor (Harvesting)	40 Birr
Sub-total(b)	45 Birr
3.. (a) - (b) =	-45 Birr
	( -180 Birr /1ha)

Crop: Wheat (Rainfed Land) Jul.-Dec.2002

1.. Income	
Wheat (0.25ha) 1.7 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	90 Birr/50kg
(2) Fertilizer DAP	50 Birr/25kg
(3) Agro-chemical U-46	Birr
Renting spray	5 Birr
(4) Labor (Harvesting)	40 Birr
(5) others	
Sub-total(b)	185 Birr
3.. (a) - (b) =	-185 Birr
	( -740 Birr /1ha)

Crop: Cabbage (Irrigated Land)(Sharing system) Feb.-Jul.2002

1.. Income	
Cabbage (0.25ha) 25 qts × 35 Birr/qt =	875 Birr
3 cart × 25 Birr/qt =	75 Birr
Income of Shareholder	475 Birr
Sub-total(a)	475 Birr
2.. Expenditure	
(1) Seedling (Improved) (4 seed bed)	120 Birr
(2) Fertilizer Urea	60 Birr/25kg
(3) Agro-chemical Malatine	36 Birr/0.6liter
Renting spray	15 Birr/4times
(4) Irrigation Fuel (2.8Birr×5liter×7times)	98 Birr
(5) Labor (Transplanting)	40 Birr
(Tilling)	96 Birr
(Harvesting)	32 Birr
(6) Rental cart for transportation	15 Birr
Expenditure of Shareholder	256 Birr
Sub-total(b)	256 Birr
3.. (a) - (b) =	219 Birr
	( 876 Birr /1ha)

Crop: Cabbage (Irrigated Land) (Sharing system) Sep.2002-Jan.2003

1.. Income	
Cabbage (0.25ha) 30 qts × 35 Birr/qt =	1050 Birr
3 cart × 25 Birr/qt =	75 Birr
Income of Shareholder	562.5 Birr
Sub-total(a)	563 Birr
2.. Expenditure	
(1) Seed (Improved)	50 Birr/250g
(2) Fertilizer Urea	60 Birr/25kg
(3) Agro-chemical U-46	48 Birr
Renting spray	20 Birr
(4) Irrigation Fuel (2.8Birr×5liter×12times)	168 Birr
(5) Labor (Tilling)	32 Birr
(6) Pump maintenance and replacement cost	140 Birr
Expenditure of Shareholder	259 Birr
Sub-total(b)	259 Birr
3.. (a) - (b) =	304 Birr
	( 1,214 Birr /1ha)

Crop: Chili (Irrigated Land) (Sharing system) Feb.-Mar.2003

1.. Income	
Chili (0.25ha) 0 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: due to disease)	
2.. Expenditure	
(1) Seedling (4 seed bed)	50 Birr
(2) Fertilizer	Birr
(3) Agro-chemical (Malatine)	12 Birr/0.2liter
Renting spray	5 Birr
(4) Irrigation Fuel (2.8Birr×5liter×4times)	56 Birr
(5) Labor (Transplanting)	64 Birr
(Tilling)	96 Birr
Expenditure of Shareholder	142 Birr
Sub-total(b)	142 Birr
3.. (a) - (b) =	-142 Birr
	( -566 Birr /1ha)

Gross Income	1,038 Birr
Total Production Cost	1,088 Birr
Net Income	-50 Birr

**Table 3.4.5 Crop Budget (4/9)**

Farmer No.4 (Sombo Genet)

Crop: Cabbage (Irrigated Land) Jan.-May.2003

1.. Income		
Cabbage (0.125 ha) 12 qts × 55 Birr/qt =	660 Birr	
Sub-total(a)	660 Birr	
2.. Expenditure		
(1) Seed	90 Birr/75g	
(2) Fertilizer	0 Birr	
(3) Agro-chemical Malatine	18 Birr/0.3liter	
Rodmil	20 Birr/0.25kg	
Rental spray	9 Birr	
(4) Labor (60Birr/month×1 peason×4month)	240 Birr	
(5Birr×6 persons)(transplanting)	30 Birr	
(10Birr×5 person×3day)(tilling)	150 Birr	
(10Birr×2 person×2day)(harvesting)	40 Birr	
(5) Irrigation (3Birr/liter×3liter/time×9times)	36 Birr	
Pump Maintenance and Replacement cost	270 Birr	
Sub-total(b)	903 Birr	
3.. (a) - (b) =	-243 Birr	( -1944 Birr /1ha)

Crop: Eggplant (Irrigated Land) (Sharing System) Feb.-May.2003

1.. Income		
Eggplant (0.125ha) 1163 kg× (0.5-0.8) Birr/kg =	729.1 Birr	
Income of Shareholder	364.5 Birr	
Sub-total(a)	364.5 Birr	
2.. Expenditure		
(1) Seed	80 Birr/30kg	
(2) Fertilizer Urea	115 Birr/50kg	
DAP	115 Birr/50kg	
(3) Agro-chemical Malatine	26 Birr	
Rodmil	50 Birr	
Rental spray	12 Birr	
(4) Labor (10Birr/day×5person+a)(Tilling)	60 Birr	
(5) Irrigation (3Birr/liter×3liter/time×16times)	144 Birr	
	Birr	
	Birr	
Expenditure of shareholder	301 Birr	
Sub-total(b)	301 Birr	
3.. (a) - (b) =	63.53 Birr	( 508.2 Birr /1ha)

Crop: Haricot bean (Irrigated Land) (Sharing System) Feb.-May.2002

1.. Income		
Haricot bean (0.25ha) 2 qts × 200 Birr/qt =	400 Birr	
Income of Shareholder	200 Birr	
Sub-total(a)	200 Birr	
2.. Expenditure		
(1) Seed	30 Birr/30kg	
(2) Fertilizer Urea	57.5 Birr/25kg	
DAP	62.5 Birr/25kg	
(3) Agro-chemical	0 Birr	
(4) Labor	0 Birr	
(5) Irrigation (3Birr/liter×3liter/time×7times)	63 Birr	
Expenditure of shareholder	106.5 Birr	
Sub-total(b)	106.5 Birr	
3.. (a) - (b) =	93.5 Birr	( 374 Birr /1ha)

Crop: Wheat (Rainfed Land) Jul.-Nov.2002

1.. Income		
Wheat (0.5 ha) 1.5 qts × 0 Birr/qt =	0 Birr	
Sub-total(a)	0 Birr	
(Note: Self consumption)		
2.. Expenditure		
(1) Seed	0 Birr	
(2) Fertilizer	0 Birr	
(3) Agro-chemical 2-4D (with rental spray)	16 Birr/0.2liter	
(4) Labor (Plowing)(50Birr/month×1 person)	50 Birr	
(5) others	Birr	
	Birr	
Sub-total(b)	66 Birr	
3.. (a) - (b) =	-66 Birr	( -132 Birr /1ha)

Crop: Maize (Rainfed Land) May.-Jul.2002

1.. Income		
Maize (0.75ha) 0 qts × 0 Birr/qt =	0 Birr	
Sub-total(a)	0 Birr	
(Note: due to drought)		
2.. Expenditure		
(1) Seed	0 Birr/50kg	
(2) Fertilizer	0 Birr	
(3) Agro-chemical	Birr	
(4) Labor	Birr	
Sub-total(b)	0 Birr	
3.. (a) - (b) =	0 Birr	( 0 Birr /1ha)

Crop: Teff (Rainfed land) Aug.-Sep.2002

1.. Income		
Teff (1ha) 0 qts × 0 Birr/qt =	0 Birr	
Sub-total(a)	0 Birr	
(Note: due to drought)		
2.. Expenditure		
(1) Seed	42.5 Birr/0.25kg	
(2) Fertilizer	Birr	
(3) Agro-chemical 2-4D (with rental spray)	16 Birr/0.2liter	
(4) Labor	Birr	
Sub-total(b)	58.5 Birr	
3.. (a) - (b) =	-58.5 Birr	( -58.5 Birr /1ha)

Gross Income	1,225 Birr
Total Production Cost	1,435 Birr
Net Revenue	-210 Birr

## Table 3.4.5 Crop Budget (5/9)

Farmer No.5 (Sombo Genet)

Crop: Chili (Irrigated Land) (Sharing system) Feb.-Jun 2002

1.. Income			
Chili (0.25ha)	520 kg ×	(1-1.5) Birr/kg =	640 Birr
Chili Seedling			40 Birr
Income of Shareholder			340 Birr
Sub-total(a)			340 Birr
2.. Expenditure			
(1) Seed		20 Birr/1kg	
(2) Fertilizer Manure		0 Birr	
(3) Agro-chemical Malatine(4 times)		24 Birr/0.4liter	
DDT		24 Birr	
Rental spray(1Birr/each)		4 Birr	
(4) Irrigation Fuel(3Birr×3liter×18times)		162 Birr	
(5) Labor (Transplanting)(10MD)		50 Birr	
(Tilling)(30MD)		210 Birr	
(Harvesting)(30MD)		210 Birr	
(6) Pump Maintenance and Replacement cost		50 Birr	
Expenditure of Shareholder			377 Birr
Sub-total(b)			377 Birr
3.. (a) - (b) =			-37 Birr
			( -148 Birr /1ha)

Crop: Cabbage (Irrigated Land) (Sharing system) Jul.-Aug 2002

1.. Income			
Cabbage (0.25ha)	9 qts ×	10 Birr/qt =	90 Birr
	7 cart ×	20 Birr/qt =	140 Birr
Income of Shareholder			115 Birr
Sub-total(a)			115 Birr
2.. Expenditure			
(1) Seed		50 Birr/250g	
(2) Fertilizer Manure		0 Birr	
(3) Agro-chemical (Malatine)		48 Birr/0.8liter	
(ASPOR)		20 Birr/80g	
Rental spray(4Birr/each)		16 Birr	
(4) Irrigation Fuel (2.8Birr×3liter×7times)		58.8 Birr	
(5) Labor (Transplanting)(10MD)		70 Birr	
(Tilling)		105 Birr	
Expenditure of Shareholder			184 Birr
Sub-total(b)			184 Birr
3.. (a) - (b) =			-69 Birr
			( -276 Birr /1ha)

Crop: Papaya (Irrigated Land) 1997-

1.. Income			
Papaya (0.5ha)	44.75 qts ×	(10-100) Birr/qt =	2,145 Birr
Sub-total(a)			2,145 Birr
2.. Expenditure			
(1) Seedling (Self produced in 1997)		0 Birr/800seedling	
(2) Fertilizer Urea		Birr/8kg	
(3) Agro-chemical		0 Birr	
(4) Irrigation (100Birr/2weeks,-Dec 2002)		1,400 Birr	
(2.1Birr×10liter×6times,Jan 2003-)		126 Birr	
(5) Labor (Dabo for Transplanting)		50 Birr	
Permanent Labor (100Birr/month in rainy seas)		600 Birr	
Sub-total(b)			2,176 Birr
3.. (a) - (b) =			-31 Birr
			( -62 Birr /1ha)

Crop: Cabbage (Irrigated Land)(Sharing system) Nov.2002-Jan 2003

1.. Income			
Cabbage (0.25ha)	12 qts ×	(35-50) Birr/qt =	510 Birr
(sold to consumer)			50 Birr
Income of Shareholder			255 Birr
Sub-total(a)			255 Birr
2.. Expenditure			
(1) Seed		5 Birr/50g	
(2) Fertilizer		0 Birr	
(3) Agro-chemical Malatine		24 Birr/0.4liter	
Rental spray		6 Birr	
(4) Irrigation Fuel (2.8Birr×2liter×12times)		67.2 Birr	
(5) Labor (Harvesting)(6Birr×11MD)		66 Birr	
(Dabo for Transplanting)		40 Birr	
Expenditure of Shareholder			104 Birr
Sub-total(b)			104 Birr
3.. (a) - (b) =			151 Birr
			( 604 Birr /1ha)

Crop: Maize (Rainfed Land) Apr.-Nov 2002

1.. Income			
Maize (0.75ha)	4 qts ×	0 Birr/qt =	0 Birr
Sub-total(a)			0 Birr
(Note: Self consumption)			
2.. Expenditure			
(1) Seed (Self-produced)		0 Birr/70kg	
(2) Fertilizer		0 Birr	
(3) Agro-chemical 2-4D (75Birr/1.5liter for all crops)		75 Birr/0.5liter	
Renting spray		3 Birr	
Sub-total(b)			78 Birr
3.. (a) - (b) =			-78 Birr
			( -104 Birr /1ha)

Crop: Wheat (Rainfed land) (Sharing system) Jul.-Nov 2002

1.. Income			
Wheat (0.5ha)	4 qts ×	0 Birr/qt =	0 Birr
Sub-total(a)			0 Birr
(Note: Half wheat is self consumption and another is for shareholder)			
2.. Expenditure			
(1) Seed (Self-produced)		0 Birr/100kg	
(2) Fertilizer		0 Birr	
(3) Agro-chemical 2-4D		0 Birr/0.4liter	
Renting spray		6 Birr	
(4) Labor (Harvesting)		80 Birr	
(Dabo for threshing)		50 Birr	
Expenditure of Shareholder			68 Birr
Sub-total(b)			68 Birr
3.. (a) - (b) =			-68 Birr
			( -91 Birr /1ha)

Crop: Teff (Rainfed Land) Aug.-Nov 2002

1.. Income			
Teff (0.75ha)	3.5 qts ×	0 Birr/qt =	0 Birr
Sub-total(a)			0 Birr
(Note: Self consumption)			
2.. Expenditure			
(1) Seed (Self-produced)		0 Birr/30kg	
(2) Fertilizer		0 Birr	
(3) Agro-chemical 2-4D		0 Birr/0.3liter	
Renting spray		3 Birr	
(4) Labor (Dabo)		50 Birr	
(Harvesting)		105 Birr	
Sub-total(b)			158 Birr
3.. (a) - (b) =			-158 Birr
			( -211 Birr /1ha)

Gross Income	2,855 Birr
Total Production Cost	3,145 Birr
Net Income	-290 Birr

**Table 3.4.5 Crop Budget (6/9)**

Farmer No.6 (Sombo Genet)

Crop: Chili (Irrigated Land) Jan.-Feb.2002

1.. Income	
Chili (0.25ha) 0 kg × 0 Birr/kg =	0 Birr
Sub-total(a)	0 Birr
(Note: Because of heavy rain)	
2.. Expenditure	
(1) Seed	60 Birr/3 Seedbed
(2) Fertilizer Manure	0 Birr
(3) Agro-chemical	0 Birr
(4) Irrigation Fuel(3Birr×3liter×18times)	0 Birr
(5) Labor (Plowing)	90 Birr
(Transplanting)(8MD)	64 Birr
(6) Pump Maintenance and Replacement cost	40 Birr
(7) Salary of Guard	17 Birr
Sub-total(b)	271 Birr
3.. (a) - (b) =	-271 Birr ( -1,084 Birr /1ha)

Crop: Maize (Irrigated Land) May.-Aug.2002

1.. Income	
Maize (0.25ha) 8.8 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	48 Birr/30kg
(2) Fertilizer Manure	0 Birr
(3) Agro-chemical 24D	15 Birr/0.3liter
Rental spray(2Birr/each)	6 Birr
(4) Irrigation Fuel (3Birr×3liter×7times)	63 Birr
(5) Labor (Plowing)	40 Birr
(Tilling)	10 Birr
(Harvesting)(8MD)	64 Birr
(6) Pump Maintenance and Replacement cost	100 Birr
Sub-total(b)	346 Birr
3.. (a) - (b) =	-346 Birr ( -1384 Birr /1ha)

Crop: Chili (Irrigated Land) Oct.2002-Mar.2003

1.. Income	
Chili (0.5ha) 19.05 qts × (150-225) Birr/qt =	3,796 Birr
Sub-total(a)	3,796 Birr
2.. Expenditure	
(1) Seedling (Self produced)	48 Birr/6kg
(2) Fertilizer Manure	0 Birr
(3) Agro-chemical Malatine	38 Birr
DDT	50 Birr
ASPOR	30 Birr
Rental spray(2Birr/each)	8 Birr
(4) Irrigation Fuel (3Birr×3liter×12times)	108 Birr
(5) Labor (Plowing)(80Birr/person)	160 Birr
(Transplanting)(30MD)	240 Birr
(Tilling)(16MD+ α )	223 Birr
(Harvesting)	269 Birr
Sub-total(b)	1,174 Birr
3.. (a) - (b) =	2,623 Birr ( -5,245 Birr /1ha)

Crop: Teff (Rainfed Land) Jul.-Oct.2002

1.. Income	
Teff (0.5ha) 1.5 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	40 Birr/20kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	14 Birr/2cup
(4) Labor (Plowing)(6MD)	60 Birr
(Harvesting)	20 Birr
(Threshing)	16 Birr
Sub-total(b)	150 Birr
3.. (a) - (b) =	-150 Birr ( -300 Birr /1ha)

Crop: Maize (Rainfed Land) Jul.-Aug.2002

1.. Income	
Maize (0.75ha) 0 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Because of no rain)	
2.. Expenditure	
(1) Seed (Self-produced)	90 Birr/60kg
(2) Fertilizer Manure	0 Birr
(3) Agro-chemical U46 (with renting spray and labor)	21 Birr/0.3liter
(4) Labor (Rental oxen for Plowing)	90 Birr
Permanent labor (40Birr/month)	80 Birr
(Tilling)(6MD)	60 Birr
Sub-total(b)	341 Birr
3.. (a) - (b) =	-341 Birr ( -455 Birr /1ha)

Crop: Wheat (Rainfed land) Jul.-Oct.2002

1.. Income	
Wheat (0.5ha) 3 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	80 Birr/60kg
(2) Fertilizer Urea	35 Birr/25kg
(3) Agro-chemical U46	14 Birr
(4) Labor (Plowing)(6MD)	60 Birr
(Harvesting)(5MD)	40 Birr
Sub-total(b)	229 Birr
3.. (a) - (b) =	-229 Birr ( -458 Birr /1ha)

Gross Income	3,796 Birr
Total Production Cost	2,511 Birr
Net Income	1,286 Birr



**Table 3.4.5 Crop Budget (7/9)**

Farmer No.7 (Sombo Aleltu)

Crop: Papaya (Irrigated Land) Aug.2001~		Crop: Cucumber (Irrigated Land) May~Jul.2002	
1.. Income		1.. Income	
Papaya (0.25 ha) 109 qts × (20~15) Birr/qt =	4,660 Birr	Cucumber (0.25ha) 2 qts × 20 Birr/qt =	40 Birr
Sub-total(a)	4,660 Birr	Sub-total(a)	40 Birr
2.. Expenditure		2.. Expenditure	
(1) Seedling (Transplanted in2001,august)	210 Birr/700seedling	(1) Seed	64 Birr/100g
Transport	22 Birr	(2) Fertilizer Manure	0 Birr/3boxes
(2) Fertilizer Manure	0 Birr	(3) Agro-chemical (Malatine)	45 Birr/0.9liter
(3) Agro-chemical	0 Birr	(4) Irrigation Fuel (3Birr×4liter×3times)	36 Birr/12liter
(4) Labor (1 emplyyee 120Birr/month)	2,160 Birr		
(5) Irrigation Fuel } Privete pump owner	3 Birr/10liter/2 times		
Oil }	18 Birr		
Fuel and oil (Community pump)	123 Birr		
(3Birr×5liter×3times+3.1Birr×5liter×5times)			
Pump Maintenance and Replacement cost	236 Birr		
Sub-total(b)	2,771 Birr	Sub-total(b)	145 Birr
3.. (a) - (b) =	1,889 Birr	3.. (a) - (b) =	-105 Birr
	( 7,556 Birr /1ha)		( -420 Birr /1ha)

Crop: Maize (Rainfed Land) Jul~Sep.2002		Crop: Wheat (Rainfed land) Aug.~Dec.2002	
1.. Income		1.. Income	
Maize (1.5ha) 0 qts × 0 Birr/qt =	0 Birr	Wheat (0.75ha) 3 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr	Sub-total(a)	0 Birr
(Note: due to drought)			
2.. Expenditure		2.. Expenditure	
(1) Seed	0 Birr/ 1.5qts	(1) Seed (Self produced)	0 Birr
(2) Fertilizer Manure	0 Birr	(2) Fertilizer	0 Birr
(3) Agro-chemical (U-46)	24 Birr/0.5liter	(3) Agro-chemical (U-46)	20 Birr/0.4liter
Renting splay and Labor	18 Birr	Renting splay and Labor	12 Birr
(4) Labor (Dabo for plowing)	10 Birr	(4) Labor (Dabo for plowing)	10 Birr
(Dabo for weeding)	10 Birr	(Dabo for sowing)	20 Birr
Sub-total(b)	62 Birr	Sub-total(b)	62 Birr
3.. (a) - (b) =	-62 Birr	3.. (a) - (b) =	-62 Birr
	( -41 Birr /1ha)		( -83 Birr /1ha)

Gross Income	4,700 Birr
Total Production Cost	3,040 Birr
Net Income	1,660 Birr

**Table 3.4.5 Crop Budget (8/9)**

**Farmer No.8 (Sombo Aleltu)**

Crop: Maize (Rainfed Land) May.-Dec.2002

1.. Income	
Maize (0.75ha) 8 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	0 Birr/75kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	36 Birr/0.6liter
Rental Spray	6 Birr
(4) Labor (Dabo for sowing)	140 Birr
Sub-total(b)	182 Birr
3.. (a) - (b) =	-182 Birr
	( -243 Birr /1ha)

Crop: Chili (Rainfed land)(Sharing System) Mar.-Oct.2002

1.. Income	
Chili (0.25ha) 36 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	35 Birr/2.5kg
(2) Fertilizer	0 Birr/ kg
(3) Agro-chemical DDT	20 Birr/0.4liter
Rental Spray	4 Birr
Mlatine	6 Birr/0.1 liter
Aspor	9 Birr/0.1 liter
(4) Labor (Dabo for Transplanting)	140 Birr
Sub-total(b)	107 Birr
Expenditure of Shareholder	107 Birr
3.. (a)/2 - (b)/2 =	-53.5 Birr
	( -214 Birr /1ha)

Crop: Teff (Rainfed Land) Aug.-Oct.2002

1.. Income	
Teff (0.75 ha) 2.5 qts × 0 Birr/qt =	0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed	45 Birr/30kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	54 Birr/0.9liter
Rental Spray	9 Birr
(4) Labor (Harvesting)(4MD)	32 Birr
(Dabo for sowing)	140 Birr
Sub-total(b)	280 Birr
3.. (a) - (b) =	-280 Birr
	( -373 Birr /1ha)

Crop: Chili (Irrigated Land) (Sharing system) Feb.-May.2003

1.. Income	
Chili (0.25ha) 14.5 qts × 215 Birr/qt =	3,110 Birr
Income of Shareholder	1,555 Birr
Sub-total(a)	1,555 Birr
2.. Expenditure	
(1) Seedling	75 Birr/2 seedbed
(2) Fertilizer Manure	0 Birr/3boxes
(3) Agro-chemical DDT	12 Birr/0.2liter
ASDOR	54 Birr/0.6liter
Malatine	12 Birr/0.2liter
Rental Spray	10 Birr
(4) Labor (Transplanting)(6MD)	30 Birr
(Harvesting)(30MD)	150 Birr
(5) Irrigation (3.1Birr/liter)	192 Birr/62liter
Pump Maintenance and Replacement cost	236 Birr
Expenditure of Shareholder	386 Birr
Sub-total(b)	386 Birr
3.. (a) - (b) =	1,169 Birr
	( 4,678 Birr /1ha)

Gross Income	1,555 Birr
Total Production Cost	955 Birr
Net Income	600 Birr

**Table 3.4.5 Crop Budget (9/9)**

Farmer No.9 (Sombo Aleltu)

Crop: Maize (Rainfed Land) May.-Jul.2002

1.. Income	
Maize (0.5ha)	0 qts × 0 Birr/qt = 0 Birr
Sub-total(a)	0 Birr
(Note: due to drought)	
2.. Expenditure	
(1) Seed	0 Birr/30kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	12 Birr/0.2liter
Rental Spray	2 Birr
(4) Labor	Birr
(5) others	Birr
Sub-total(b)	14 Birr
3.. (a) - (b) =	-14 Birr ( -28 Birr /1ha)

Crop: Teff (Rainfed land) Aug.-Dec.2002

1.. Income	
Teff (0.75ha)	0.5 qts × 0 Birr/qt = 0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed (Self produced)	0 Birr/10kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	24 Birr/0.4liter
Rental Spray	4 Birr
(4) Labor	Birr
(5) others	Birr
Sub-total(b)	28 Birr
3.. (a)/2 - (b)/2 =	-14 Birr ( -18.7 Birr /1ha)

Crop: Wheat (Rainfed Land) Jun.-Nov.2002

1.. Income	
Wheat (0.25 ha)	1 qts × 0 Birr/qt = 0 Birr
Sub-total(a)	0 Birr
(Note: Self consumption)	
2.. Expenditure	
(1) Seed (Self produced)	0 Birr/33kg
(2) Fertilizer	0 Birr
(3) Agro-chemical U-46	24 Birr/0.4liter
Rental Spray	4 Birr
(4) Labor	Birr
(5) others	Birr
Sub-total(b)	28 Birr
3.. (a) - (b) =	-28 Birr ( -112 Birr /1ha)

Crop: Tomato (Irrigated Land)(Shareing System) Apr.-Jul.2002

1.. Income	
Tomato (0.125ha)	320 kg × N.A. Birr/qt = N.A. Birr
Sub-total(a)	Birr
2.. Expenditure	
(1) Seedling	Birr
(2) Fertilizer Manure	Birr
(3) Agro-chemical	Birr
(4) Labor	Birr
(5) Irrigation	Birr
Sub-total(b)	0 Birr
3.. (a) - (b) =	0 Birr ( 0 Birr /1ha)

Crop: Chili (Irrigated Land)(Shareing System) Feb.-Aug.2002

1.. Income	
Chili (0.125 ha)	542 kg × N.A. Birr/kg = 0 Birr
Income of Shareholder	0 Birr
Sub-total(a)	0 Birr
2.. Expenditure	
(1) Seed	0 Birr
(2) Fertilizer	0 Birr
(3) Agro-chemical Malatine	12 Birr/0.2liter
Rental Spray	2 Birr
(4) Labor	Birr
(5) Irrigation (3.1Birr/liter×3liter/time×3times)	28 Birr
Pump Replacement cost	95 Birr
Pump operator cost (6Birr/month)	36 Birr
Expenditure of shareholder	86.45 Birr
Sub-total(b)	86.45 Birr
3.. (a) - (b) =	-86.5 Birr ( -692 Birr /1ha)

Crop: Ethiopian cabbage (Irrigated Land)(Shareing System) Dec.2002-Mar.2003

1.. Income	
E/cabbage (0.25ha)	N.A. kg × N.A. Birr/qt = 400 Birr
Income of Shareholder	200 Birr
Sub-total(a)	200 Birr
2.. Expenditure	
(1) Seed	24 Birr/13g
(2) Fertilizer	Birr
(3) Agro-chemical Malatine	20 Birr
Rental Spray	2 Birr
(4) Labor (10Birr/day×3days×3person)	90 Birr
(5) Irrigation (3Birr/liter×3liter/time×10times)	90 Birr
Pump Replacement cost	95 Birr
Pump operator cost (6Birr/month)	36 Birr
Expenditure of shareholder	178.5 Birr
Sub-total(b)	178.5 Birr
3.. (a) - (b) =	21.5 Birr ( 86 Birr /1ha)

Gross Income	200 Birr
Total Production Cost	335 Birr
Net Income	-135 Birr

## Figures

Farmer No.1 (Shubi)

Irrigation or Rained land	2001		2002										2003								
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Irrigation 0.75ha	Papaya 0.5ha																				
	Cucumber, 0.25ha													Onion, 0.25ha		Green bean, 0.25ha			Cucumber		
Rainfed 1.5ha																					
	Teff, 0.25ha																				
	Teff, 0.25ha																				
	Teff, 0.25ha																				
Maize, 0.5ha																					
Maize										Maize 0.75ha											

Farmer No.2 (Shubi)

Irrigation or Rained land	2001		2002										2003											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July			
Irrigation, 0.25ha			Chili, 0.25ha			Cabbage, 0.25ha													Papaya, 0.125ha		Cucumber, 0.25ha		Green bean,	
Rainfed 1.5ha																								
	Maize, 1ha																							
	Maize, 1ha																							
			Tomato (with PPO) 0.5ha			Wheat, 0.5ha																	Wheat	

Farmer No.3 (Shubi)

Irrigation or Rained land	2001		2002										2003											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July			
Irrigation, 0.25ha						Cabbage, 0.25ha													Cabbage, 0.25ha		Chili, 0.25ha		Green bean 0.25ha	
Rainfed 1ha																								
	Maize, 0.5ha																							
	Teff, 0.25ha																							
										Wheat, 0.25ha														

Farmer No.4 (Sombo Genet)

Irrigation or Rained land	2001		2002										2003												
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July				
Irrigation, 0.25ha			Haricot bean, 0.25ha													Papaya, 0.25ha		Cabbage, 0.125ha		Eggplant, 0.125ha		Green bean			
Rainfed 1.75ha																									
	Maize, 0.75ha																								
	Teff 1ha																								
										Wheat, 0.5ha (rainfed farm, not with PPO)											Tomato 0.5ha				
Irrigation land with PPO 2 ha																									
				Tomato 1ha																		Onion 1.5ha		Onion 1ha	
																				Tomato 0.5ha					

Farmer No.5 (Sombo Genet)

Irrigation or Rained land	2001		2002										2003											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July			
Irrigation, 0.25ha			Chili, 0.25ha			Cabbage, 0.25ha													Cabbage, 0.25ha		Tomato, 0.25ha		Tomato, 0.25ha	
Rainfed 2ha																								
	Maize, 0.75ha																							
	Wheat, 0.5ha																							
										Teff, 0.75ha											Wheat 0.25ha		Teff	
Irrigation (with private pump owner) 1ha	Papaya, 0.5ha																							
	Papaya (Renting to private pump owner) 0.5ha																							

Figure 3.4.1 Cropping Calendars of BMFs (1/2)

Farmer No.6 (Sombo Genet)

Irrigation or Rained land	2001		2002										2003									
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	
Irrigation 0.5ha				Chili				Maize, 0.25ha						Chili, 0.5ha								Cabbage
Rainfed 1.75ha									Teff, 0.5ha													
									Wheat, 0.5ha													Wheat
									Maize 0.75ha													Maize 0.675ha
Irrigation land with PPO 1ha	Rent out land to Private pump owner 1ha																					

Farmer No.7 (Sombo Aleltu)

Irrigation or Rained land	2001		2002										2003									
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	
Irrigation, 0.25ha	Papaya, 0.25ha																					
Rainfed 2.25ha									Maize, 1.5ha													Maize 1.5ha
										Wheat, 0.75ha												Wheat
									Cucumber, 0.25ha						Haricot bean, 0.25ha							Cucumber
Irrigation with PPO 0.925ha	Rent out land to PPO 0.675ha																					

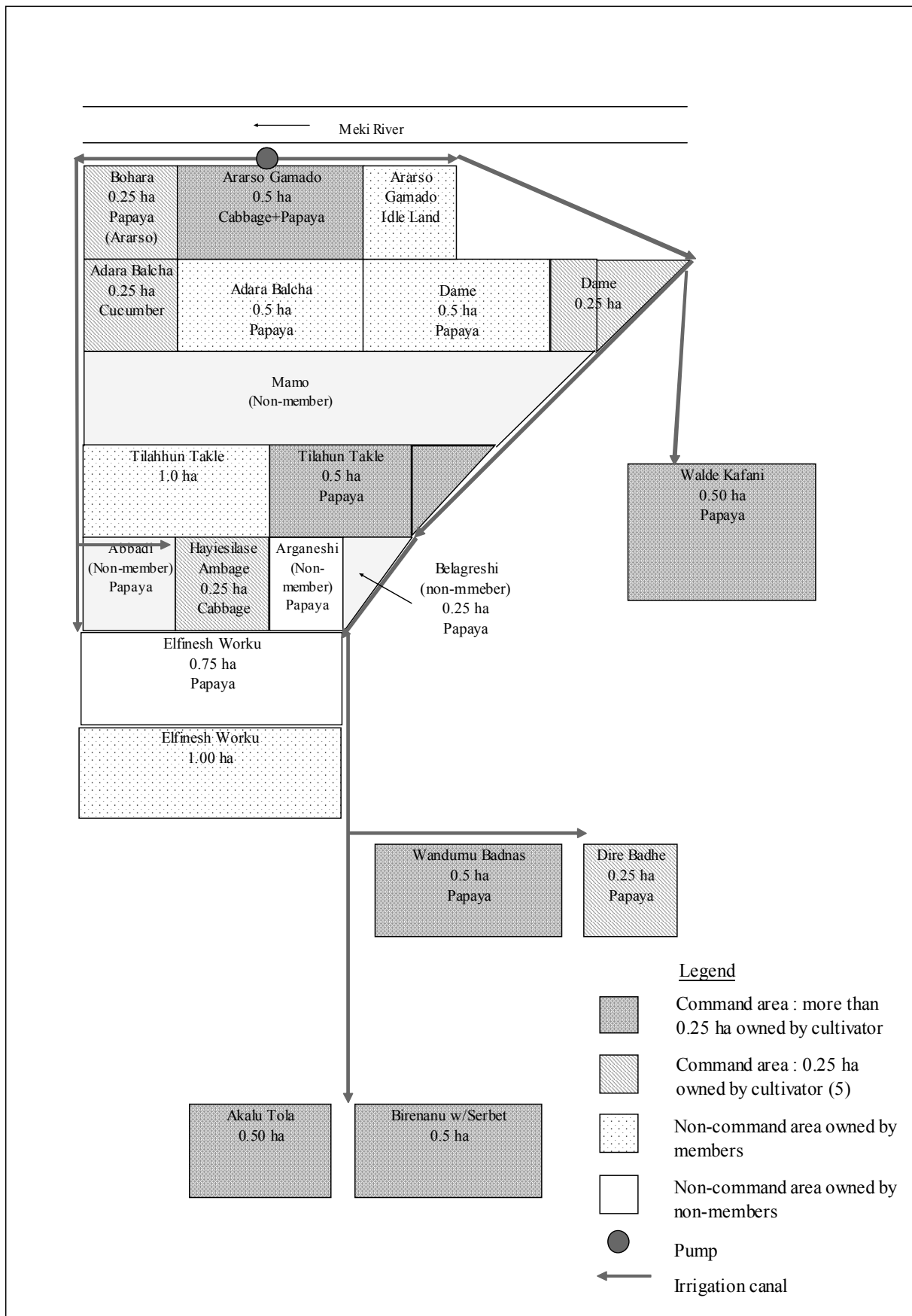
Farmer No.8 (Sombo Aleltu)

Irrigation or Rained land	2001		2002										2003									
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	
Irrigation, 0.25ha																Chili, 0.25ha				Maize, 0.25ha		
Rainfed 1.5ha						Chili, 0.25ha																Maize 1ha
							Maize, 0.75ha															
										Teff, 0.75ha												Teff

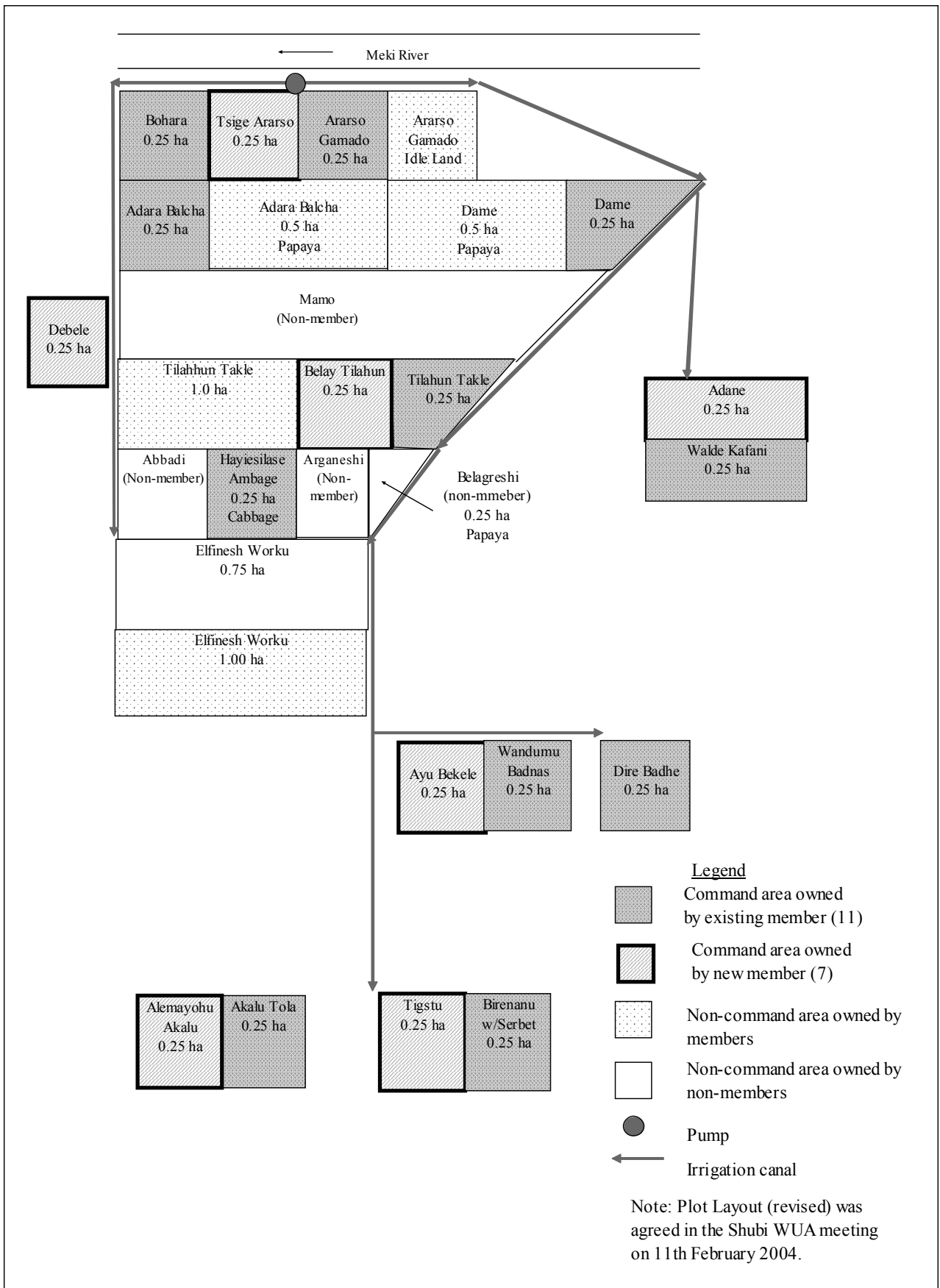
Farmer No.9 (Sombo Aleltu)

Irrigation or Rained land	2001		2002										2003									
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	
Irrigation, 0.25ha								Tomato, 0.125ha									Ethiopian Cabbage, 0.25ha		Papaya 0.25ha		Cabbage 0.125ha	Chili
Rainfed 1.5ha								Maize, 0.5ha											Tomato (with PPO) 0.5ha			
										Teff, 0.75ha												
										Wheat, 0.25ha										Maize, 0.25ha		
Irrigation with PPO 0.5ha	Rent out land 0.5ha																					

Figure 3.4.1 Cropping Calendars of BMFs (2/2)

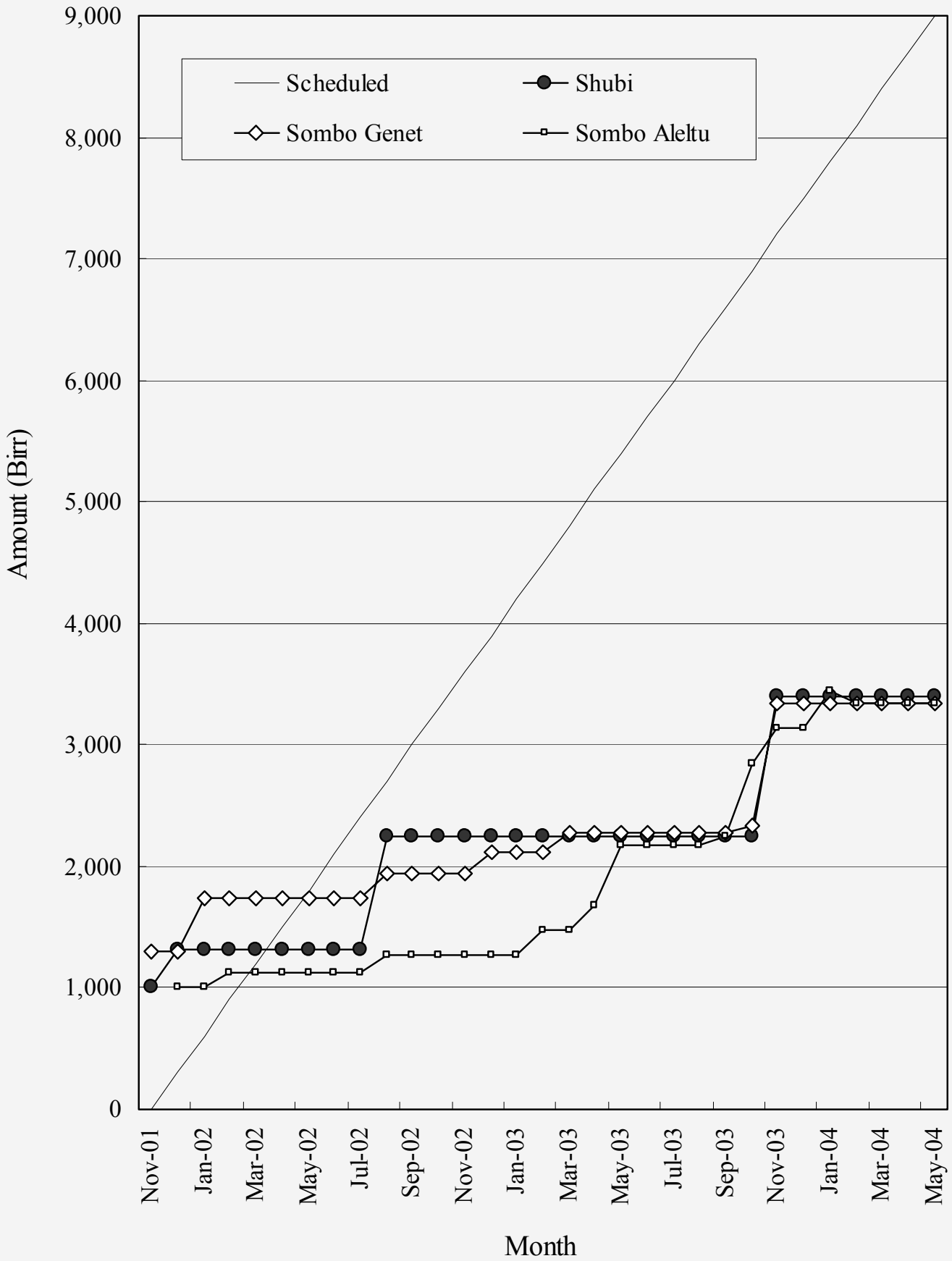


**Figure 4.4.1 Plot Layout of Shubi (Before settlement)**



**Figure 4.4.2 Plot Layout of Shubi (After Settlement)**

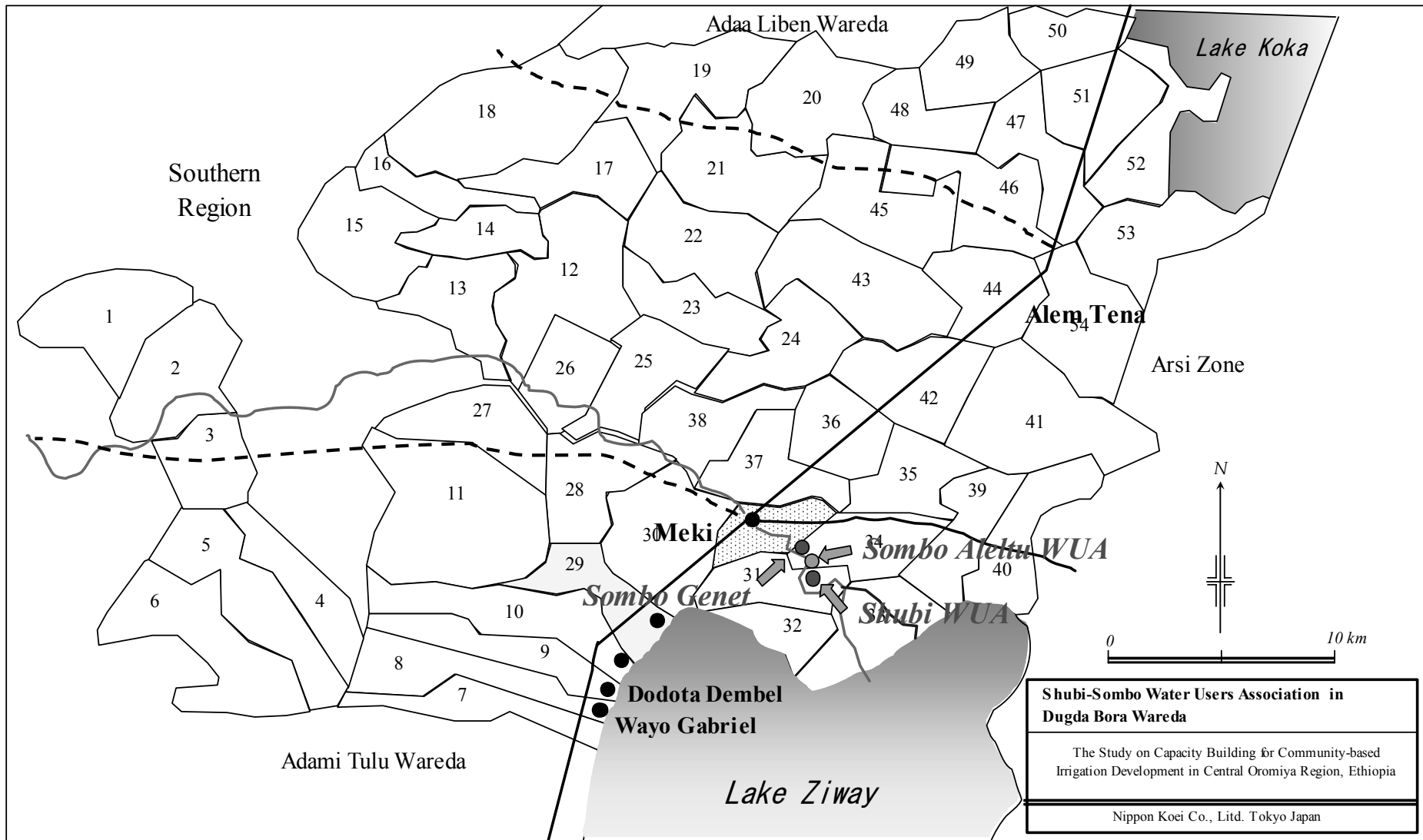




**Figure 4.4.3 Record of Bank Account**

Attachment-1

Results of 1<sup>st</sup> PBME of the Shubi-Sombo schemes



<b>WUA Name</b>	Shubi WUA
<b>Date</b>	13-May-03
<b>Interviewer</b>	Kurita/Andarge and OIDA Meki Staff

### Cultivated Farmland in Shubi Water Users Association

#### 1. WUA Member List

Position	Name	Elected Month, Year	Landlord Yes, No	Age	Academic career (year)	Total land (ha)	Rainfed land(ha)	Irrigated land/Project (ha)	Irrigated land/private (ha)	For Rent (ha)	Crop Sharing system	Regular Employee <sup>*1)</sup> (Birr/month)
CM1		Jul-01	No	32	11th Grade	1.5	1	0.5				80
CM2		Jul-01	Yes	42	4th	2	1.5	0.5				70
CM3		Jul-01	No	47	2th	1.75	1.5	0.25				
CM4		Jul-01	No	42	10th	1.75	1.5	0.25				
CM5		Jul-01	No	44	4th	2.25	1.5	0.75				80
CM6		Jul-01	Yes	22	7th	0.5	0	0.5				100
CM7												
Members Name 1		Jul-01	Yes	47	Basic education	1.75	1.25	0.5				
2		Jul-01	Yes	70	Basic education	2	1.5	0.5				85
3		Jul-01	No	50	Nil	1.25	1	0.25				
4		Jul-01	No			1.25	1	0.25				
5		Jul-01	No	50	-	1.25	1.25	0				
6		Jul-01	No	41	6th	1.75	1.5	0.25				
7		Apr-03	Yes	32	12+1	1	0.5	0.5				110
8		Nov-02	No	28	8th	0.25	0	0.25				60
9		Feb-03	No					0.25				
10		May-03	No		Rejoined Basic Education	0.75	0.5	0.25	*2)0.25			
11		Apr-03		48	Basic education	0.25	0	0.25				
13												
14												
15												
16												
17												
Total (ha)						21.25	15.5	5.75				
Average (ha)						1.4	1.0	0.4				

Note: \*1) Salary is paid by cash, \*2) The irribable plot is out of the command area and irrigated by other pump.

<b>WUA Name</b>	Sombo Genet WUA
<b>Date</b>	14-May-03
<b>Interviewer</b>	KURITA/ANDARGE

### Cultivated Farmland in Sombo Genet Water Users Association

**1. WUA Member List**

Position	Name	Elected Month, Year	Landlord Yes, No	Age	Academic career (year)	Total land (ha)	Rainfed land(ha)	Irrigated land/Project (ha)	Irrigated land/private (ha) <sup>*3)</sup>	For Rent (ha)	Crop Sharing System	Regular Employee (Birr/Month) <sup>*1)</sup>	Regular Employee (ha) <sup>*2)</sup>
CM1		Jul-01	Yes	50	2th	3	1.25	0.25	1.5			160 (2 P)	
CM2		Jul-01	No	27	7th	0.75	0.25	0.5			2 persons	50	
CM3		Jul-01	No	36	3rd	1.75	0.5	0.25		1		50	
CM4		Aug-02	Yes	52	2nd	1.75	0.5	0.25		1			
CM5		Aug-02	Yes	54	4th	2.25	1	0.5		0.75		50	
CM6		Jul-01	No	26	Basic Education								
CM7		Jan-03	No	20	4th	0.25	0	0.25			Yes for Irr <sup>*4)</sup>		
Members	Name												
1		Jul-01		46	Nil								
2		Jul-01		20	5th	0.75	0.5	0.25					
3		Apr-03		48	6th (rejoining)	2	1.75	0.25	1				
4		Jul-01		75	Nil	1.25		0.25		1			
5		Jul-01		60	Basic Education	1.75	1.25	0.5					
6		Jul-01		50	Nil	1.75	0.5	0.25		1			
7		Jul-01		16	4th	0.25	0	0.25					
8		Jul-01		22	Nil	1.25	1	0.25					0.25 ha
9		Jul-01		50	Nil	1	0.75	0.25			Yes for RF <sup>*5)</sup>		
10		Jul-01		80	Nil								
11		Jul-01		16	Nil	0.25	0	0.25					
12		Jul-01		40	Basic Education	1.5	1.25	0.25					0.125 ha
13		Oct-02		20	Nil	0.25	0	0.25			yes for Irr		
14		Nov-02		36	Nil	2.25	2	0.25					
15		Jul-01		60	Nil	2.5	2.25	0.25				70	
16		Nov-02		63	Nil	2.25	2	0.25					
17		Jul-01		37	Nil	2.25	2	0.25					
18													
19													
Total (ha)						31	18.75	6	2.5	4.75			
Average (ha)						1.4	0.9	0.3					

Note: <sup>\*1)</sup> Salary is paid by cash, <sup>\*2)</sup> Salary is paid by Land, <sup>\*3)</sup> Plot irrigated from non-JICA-OIDA pump <sup>\*4)</sup> "Yes for Irr" refers to crop sharing for the irrigation plot, <sup>\*5)</sup> "Yes for RF" refers to crop sharing for rainfed land.



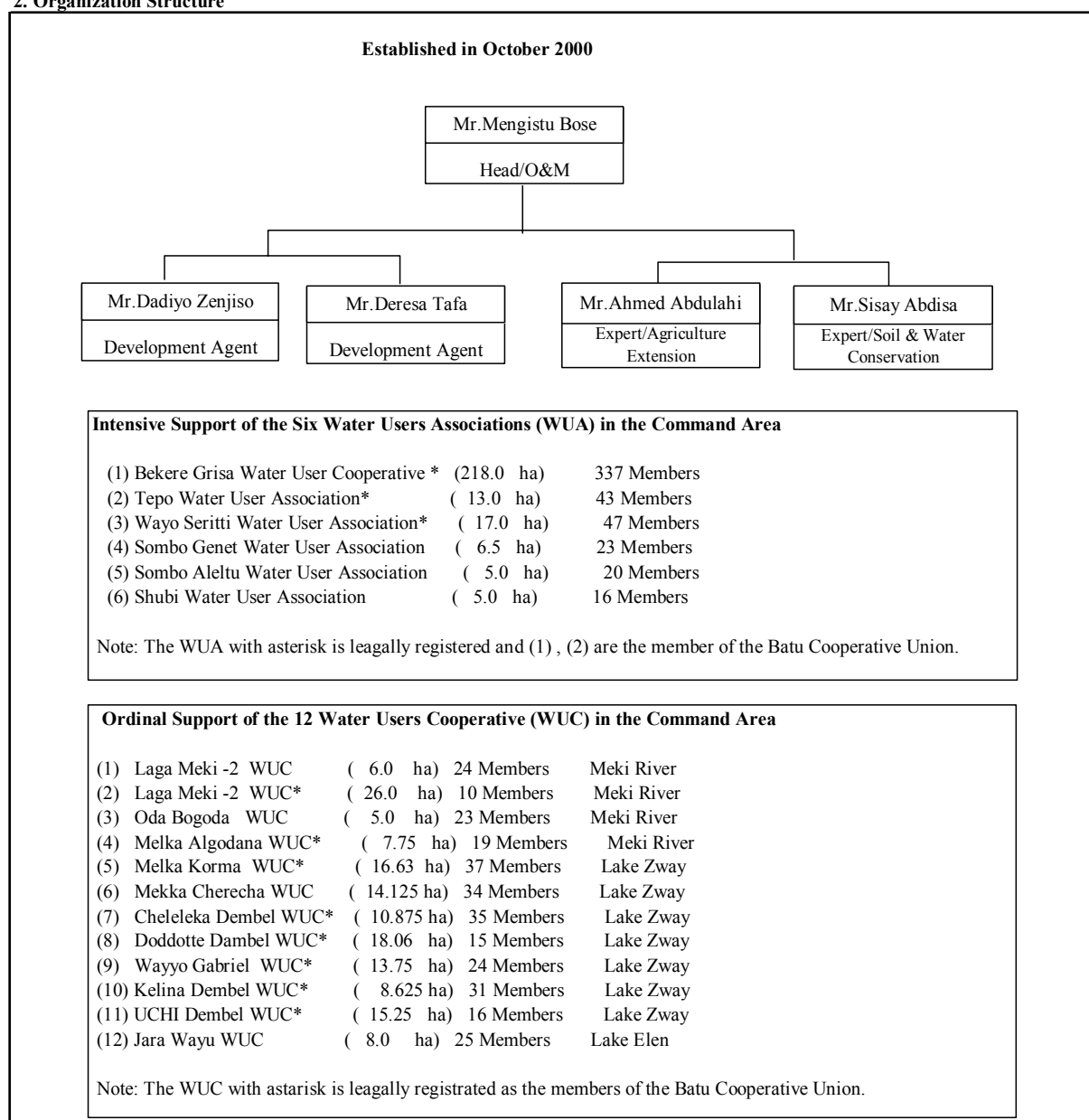
<b>Meki OIDA Office</b>	
<b>Date</b>	16-May-03
<b>Interviewer</b>	Kurita/JICA Study Team

### 1. Staff List in Meki OIDA Office

Position	Name	Specialty	Age	Academic Carrier *
Head	Mengistu Bosie	Agri/Engineering	30	12+5
Agronomist	Ahmed Abdulahi	Agri/Extension	28	12+4
Soil & water Conser.	Sisay Abdisa	Agri/Engineering	27	12+5
Development Agent	Dadiyo Zenjiso	Agriculture	38	12
Development Agent	Deresa Tafa	General Agriculture	23	12+2

Note: Academic carrier refers to 12 years up to high school and 2 - 5 years for higher study.

### 2. Organization Structure



### 3. Annual Budget of Meki OIDA Office

Fiscal Year	2000*	2001*	2002	2003
1. Salary	Not	57,887	54,840	
2. Recurrent Budget	Available	8,096		
> Stationary			250	
> Telephone, electricity, water			600	
> Per Diem			4,540	
> Publishing			0	
> O&M Cost( for office, motorcycle, bicycle )			1,610	
> Contract works			0	
> Sanitation			0	
> Procurement of fixed assets			0	
> Training			0	
3. Capital Budget		0	0	
Sub-total Birr)		65,983	61,840	
Sub-total US\$)		7,672	7,191	

Remark: 1) Fiscal Year : From July to June, Exchange rate is based on 8.6 Birr/USD.

2) The budget for 2000 and 2001 was disbursed from the OIDA Central Branch Office, while the one for 2002 was from the Wareda Administration Office. Decreasing of the salary from the 2001 is due to decrease of Staff numbers of OIDA Meki Office.

### 4. Specify the Routine Supporting Activities to the 3 WUAs after Hand over (Itemize)

- (1) Strengthening the WUA Committee's management capacity
- (2) Implementation of internal bylaw of the 16 WUAs
- (3) Giving guidance of water management practice, operation & maintenance work to the WUA
- (4) Promotion of input supply to the 15 WUAs (including Credit)
- (5) Auditing the 6 WUA's performance
- (6) Assisting recording system (financial work, pump operation record) of the OIDA - JICA WUA Projects
- (7) Coordination work of inner conflicts for the 6 WUA projects
- (8) Training & facilitating payment of the internal cost (pump depreciation cost, fuel, others) for the Wayo Seritti & 3 OIDA - JICA Water Users Associations
- (9) Assist recording & reporting of farming activity for the 8 WUAs
- (10) Assist water management practice of the 18 WUAs
- (11) Developing the water harvesting project under a joint program with District Agriculture Office and Natural Conservation Office headed by Mr. Tolera
- (12) Monitoring work for the 3 OIDA-JICA WUAs and Wayo Seritti WUA financed by ESRDF

### 5. Request or Complaints from the 3 WUAs and Countermeasures taken

WUA Name	Description
Shubi	1. Complaints from WUA
	1) Land use problem, 2) Water management Problem (conflict between Pump operator and secretary ) , 3) Shortage of input & credit due to shortage of capital, 4) Conflicts among the WUA committee members, 5) Low frequency of following-up by OIDA Meki Office for the 3rd cropping season
	2. Countermeasures taken by OIDA Meki Office as per each issue mentioned above
	1) & 4): Discussed with the WUA members and guided them to follow the bylaw. The OIDA office has warned the WUA three times by letter with copy for the PA office by August 2002 but the WUA has not changed itself.
	2) & 4) : Consulted personally for the issue and contacted the WUA committee, but no progress. As for water management problem, two factors such as shortage of river water and uneven land size for irrigable area per farm household contribute to causing problem. One of alleviating water shortage is to improve a canal cross-section into trapezoid shape.
	3): As for input/credit issue, Meki OIDA Office tried to facilitate by contacting NGOs, District Agriculture Office, and Dugda Bora Credit Service (NGO), but no progress so far. Dugda Bora Credit Service (DBCS) focuses on only the drought affected area in collaboration with Wareda Office.
	5): Regarding a low frequency of following-up, OIDA Meki Office is limited due to the following factors;
	a. A shortage of vehicle/motorcycle for movement is vital mean of following up the WUAs but at present, only one motor cycle in the Office is exclusively used by the Office Head.
	b. Donkey taxi costs 6 Birr in a round trip to visit the WUAs, while the bicycle is difficult to operate during the rainy season and off-road.
	c. OIDA Meki Staff usually visit sites on-foot or horse taxi to fulfill their activities..



<b>Sombo Genet</b>	<p>1. Complaints from WUA</p> <p>1) Land exchange dispute between the PA chairman and Mr. Balda Tola</p> <p>2) Shortage of inputs/Credit due to shortage of farming capital</p> <p>3) Shortage of Meki River water</p> <p>4) Long vacancy of the WUA committee position (Head of Finance, committee member, Inspector; three members were dropped out due to land exchange disputes)</p> <p>5) Water management Problem due to irrigation schedule</p> <p>6) Low frequency of following up WUA by the Meki OIDA Office</p> <p>7) Low pumping capacity of the installed pump</p> <p>2. Countermeasures taken by the OIDA Meki Office as per each issue mentioned above</p> <p>1) Left the PA Office &amp; Wareda Administration Office with the land dispute</p> <p>2) This issue was similarly managed as Shubi case, but no progress observed. ( the proposal was applied to the external organs )</p> <p>3) Advised them to dig a shallow well within the WUA command area, and change the planting season to avoid November - January ( only this severe drought year)</p> <p>4) Advice to convene the general assembly meeting for facilitating missing WUA board members</p> <p>5) Guided them to fomulate three irrigation blocks in order to apply a rotational irrigation system, and then water dispute was moderated.</p> <p>6) As for shortage of means for movement/man power, Mr. Dadiyo is in charge of JICA-OIDA Projects. Low-frequency to follow-up is due to the same reason mentioned above.</p> <p>7) Low capacity of the installed pump</p> <p>In a view of size of the command area and a discharge of the pump capacity, the complaint is not applicable in a normal river water level. The factor affected for the irrigable area is comprised of water head and length of canal, thus 10 hours operation per day can irrigate one hectare of command area in a day. Meanwhile, an optimum interval of canal cleaning work should be less than 3 weeks, otherwise water conveyance efficiency decreases due to weeding and siltation.</p>
<b>WUA Name</b>	<b>Description</b>
<b>Sombo Aleltu</b>	<p>1. Complaints from WUA</p> <p>1) Long vacancy of the WUA committee post (4 months vacancy of the chairman post)</p> <p>2) Collapse of the pump operator due to lost of the revolving fund (230 Birr)</p> <p>3) Shortage of inputs/credit due to shortage of farming capital</p> <p>4) Low frequency of following up WUA by the Meki OIDA Office</p> <p>5) Water shortage of Meki River Water</p> <p>6) Water management problem</p> <p>2. Countermeasures taken by the OIDA Meki Office on the issue mentioned above</p> <p>1) In case of the chairman demise, rural society needs at least 3 months for mourning and not recommend to select a successor immediately.</p> <p>2) Ex-pump operator, Mr. Darsu Fajo confessed to embezzle 230 Birr for medical fee of his daughter and refunded it with penalty of 50 Birr.</p> <p>3) This issue was similarly managed as Shubi case, but no progress observed. ( the proposal was applied to the external organs )</p> <p>In this regards, a crop sharing system is widely prevailing in the WUA members due to the following reasons:</p> <p>a. Share the production resource</p> <p>b. Share know-how of farming pracitce each other</p> <p>c. Share a market risk equally</p> <p>In this sense, papaya crop is a minimum risky crop in the area.</p>

Source: JICA Study Team, May 2003.

#### 6. Possible Solution about shortage of Capital for Input

Most of the WUAs complain about shortage of their capitals for procurement of input such as fertilizer, seeds, and chemicals. In order to moderate their constraints, OIDA Meki Office suggested that a status of the WUA should be legalized by registering WUAs to attain corporate rights through the Cooperative Office. In this regards, the WUA has to be examined to meet the requirements for the following points;

- (1) Registration Fee
- (2) Cost sharing (50 Birr/0.25 ha for irrigation farm)
- (3) Formation of internal bylaw
- (4) Function of legal entity such as financial record, recording system, official stamp, and etc.
- (5) Selection of WUA committee members

The WUA attained a legal status followed by appraisal of application could get a credit of farming inputs (cash or in kind). and intensive training program of the basic WUA management skil, thus it is necessary for collecting more detail information and consideration for legalization of the WUAs.

**7. Supplemental Training to WUA Members by OIDA (Board Members)**

(1). Specify Training Items given to WUAs just after hand over ( refers to the Guideline Chap 6.9 " *Action for the next step* " in Page 56.

The training for the WUA committee members was not carried out by the Central Branch Office/OIDA, but Meki OIDA Office gave one day training about a) Financial guidance for recording method, b) how to record pump operation log book to the 3 WUA committee members, respectively.

A part from the 3 OIDA-JICA WUAs, the Meki OIDA Office made the 5 days intensive training for 13 WUAs committees (154 Committee members) in collaboration with the cooperative office, cooperative union, and OIDA Zway office.

The major subjects and key organizations were as follows;

1) OIDA Meki Office

Water management, O&M work of Pump, Crop quality control (Cooling system by using charcoal )

2) Cooperative Office

How to record financial matter

3) Cooperative union

Marketing of horticulture crops

4) OIDA Zway Office

Crop protection

With respect to conducting training programs on the WUAs, a budget is required. For instance, the 5 days intensive training program cost 11,071 Birr with distribution of hadout materials for the 10 WUAs;

**8. In case of Shubi WUA, describe the progress of land collection made by the Landlord and solution measure taken so far by the OIDA Meki Office.**

With respect to land issue, the OIDA Meki Office had a series of discussions with WUA members in their general assembly, but no progress was made. Further, Shubi WUA board requested the Meki OIDA Office to give an approval of 0.5 ha per capita for irrigable plot. But Meki OIDA Office has suspended the request.

In spite of warning 3 letters to the WUA, Shubi WUA appears to be no change without respect to the Bylaw.