

CHAPTER 1 IRRIGATION SECTOR OVERVIEW

1.1 History of Irrigation Development

1.1.1 Institutional Background in Ethiopia

Small-scale irrigation development was previously carried out by the surface water division of the Soil and Water Conservation Department (SWCD) of the Ministry of Agriculture (MOA). In 1984 the division was separated from SWCD and upgraded to the Irrigation Development Department (IDD). In 1987, the activities of MOA were being decentralised to zonal offices, and IDD staff was being transferred to strengthen the capacity of the zones. However, in 1992 a new Ministry of Natural Resources Development and Environmental Protection (MNRDEP) was created, with responsibility for soil and water conservation, rural water supply and sanitation. Although the MOA retained responsibility for providing agricultural support services, the IDD was dissolved and its responsibilities were transferred to regional Natural Resources Bureau. In August 1995, MNRDEP was dissolved and its responsibilities were shared between MOA and the Ministry of Water Resources (MOWR). Under the new arrangements, responsibility for irrigation development belonged to the Bureau of Water, Minerals, Energy Resources Development (BWMERD) while MOWR has an overall policy, planning and regulatory role in respect of water resources development. In October 1999, the Oromia Irrigation development Authority (OIDA) was organised to administrate the irrigation development in the Oromia Region.

1.1.2 Irrigation Development in Oromia Region

Oromia has 63 river systems and 688 tributary streams which annually generate 58 billion cubic meters of surface water, the equivalent of half the nation's surface water resources. Despite the large water resources potential, Oromia's agricultural sector is almost entirely dependent on rainfed farming. Irrigated agriculture constitutes just under 5 percent of the potential and about 2.14 percent of the total cultivated land. The implication of these figures is that irrigated agriculture has to go a long way before it can make a significant contribution towards regional food security.

In Oromia Region, it is said that out of the estimated 1.7 million ha of potential irrigable land, only 85,400 ha has been developed so far, which is about 5 % of the potential. The modern irrigation practice in many places has been introduced as late as mid 1980's when there was a country-wide drought affecting huge number of population.

In 1998, about 92,617 ha of land were under traditional and modern irrigation, while 2,426 ha were under construction. Feasibility studies on about 53,762 ha have been

carried out, while about 299,820 ha have been identified for possible development. Traditional irrigation schemes which are estimated to cover 48,816 ha constitute the major portion, followed by large-scale state farms consisting of 26,506 ha. All in all, the total developed and planned area, for the development of irrigated agriculture is estimated at 583,998 ha. The irrigated area under the traditional, small-scale, and large-scale irrigation scheme is summarised below.

Summary of Irrigation Area in Oromia Region as of 1997

Type of Irrigation	Area (ha)
Small-scale Irrigation	9,160
Modern Irrigation	
Traditional Irrigation	48,816
Large-scale Irrigation	27,426
Total	85,402

1.1.3 Type of Irrigation Development in Ethiopia

Four major categories of irrigation schemes are known to exist in Oromia. These are traditional, large-scale irrigation, modern irrigation schemes and private farms.

(1) Traditional Schemes

Traditional forms of irrigation have been practised in Oromia, particularly in western Wallagga and Harage. Such schemes are generally based on division structures constructed by peasants from mud, rocks, twigs or mixtures of these. The structures are generally washed away by floods during the rainy seasons and require maintenance or reconstruction at the end of each rainy season.

According to information from zonal offices, the total area covered by traditional schemes is estimated at 49,000 ha. There are variation in the distribution of the schemes among zones, the largest being in east Hararge followed by west Shewa. Sizes vary from scheme to scheme, but are generally less than 100 ha. Sizes are determined either by the availability of water or land, crops and agro-ecological zones.

The system of production is generally traditional and is similar to rainfed agriculture. The efficiency of water use by traditional schemes is low as surface irrigation without land levelling is used for distributing water. The main constraints limiting the productivity of traditional irrigation schemes are inadequate extension service due to shortages of extension agents with relevant skills, fertilisers and improved seeds. Therefore, the overall performance of traditional schemes, including crop productivity and the efficiency of water use, are generally low. This shows that there are considerable opportunities for improvement.

(2) Modern Communal Schemes

Communal schemes were constructed by the previous government in support of

communities, mainly in settlement areas. Following the drought of 1984, extensive efforts were made to popularise and develop irrigation schemes. As part of a programme of creating food security and increasing incomes, a series of micro and small-scale irrigation schemes were constructed throughout the region, mainly in settlement areas. Farmers were required to comply with and participate in implementing the programmes. The schemes were based on springs, streams and small rivers and vary in size from a few hectares to 200 ha. They were intended to use less complicated head works and water distribution systems. The existing modern communal schemes, cover an area of 16,840 ha of which about 7,882 were developed through community participation. About 2,622 ha have been abandoned and the construction of about 2,426 ha was in progress at the time of study.

(3) Irrigated State Farms

These are schemes that are run by state farms under the Federal Government. These farms are located in agro-ecological zones that are suitable for the production of sugar cane, fruits and vegetables. Six of these farms are operated as independent enterprises while three schemes, namely, the Nura Hira, Metri and Tibila are operated as a single enterprise as the Nura Hira Agricultural Development Enterprise. State farms in Oromia are generally large. The Wanji, Matehara and Finchaa sugar estates comprise a total area of 20,916 ha and produce about 240,700 tons of sugar annually. The nura Hira horticulture farm is similarly composed of three medium-sized farms, with a total area of 5,334 ha.

(4) Private farms

There are a few private farms which are of recent origin. They are limited to the rift valley area on the eastern shores of the Ziway Lake. Two small-scale schemes have been developed by abstracting water from the Ziway Lake. The Ethio-Frora was contracted by the investor from co-operative peasant farmers who owned and operated the scheme previously. The Teppo Valley scheme was also contracted from peasant farmers and developed on a previously rainfed farm. They cover an area of 455 ha and grow flowers, vegetables, beans and maize using sprinkler and drip irrigation, mainly for the export market.

1.1.4 Needs for Irrigation Development

Since the development of irrigated agriculture in Oromia is at its infancy, its contribution to food supply is insignificant. The demand for food, fibre and energy by the increasing population of Oromia and the country as a whole is expected to grow substantially in the years ahead. Rainfed agriculture through area expansion and intensification alone is not enough to provide the basic requirements of food, clothing and energy for the rising population. Hence, the development of irrigation will be essential to augment rainfed agriculture. In order to decrease dependence on rainfed agriculture, the Regional Government is in process of developing cost-effective irrigation schemes, especially in areas with less reliable rainfall.

1.2 Oromia Irrigation Development Authority (OIDA)

1.2.1 General

OIDA was established in July 1999 through reform of Oromia Water, Mines and Energy Resources Development Bureau. The establishment of OIDA aims at streamlining overall irrigation development services under the sole organizational framework. The main role of OIDA is to develop small and medium scale irrigation schemes for mitigation of food insecurity of the Region. According to “Oromia Regional State Irrigation Development Authority Establishment Proclamation, No. 30/1999,” the major objectives of OIDA are to:

- i. Undertake study, design and construction of irrigation schemes in suitable areas of the Region,
- ii. Contribute towards hastening the socio-economic development of rural community, and
- iii. Enable rural community to benefit from irrigation projects through participation in study, construction and administration.

1.2.2 Five Years Development Plan

Performance of the irrigation development in the previous 5 years is summarised below.

	Description of Activities	Unit	Performance
1	Study and Design	No.	94
2	Construction	No.	72
3	Land Development	Ha	6,050
4	Beneficiaries	HHF	17,839

A five-year development programme has been launched based mainly on potential sites identified on topographic maps. Feasibility studies and / or detailed designs have been completed for about 53,762 ha and an additional 299,820 ha have been identified for development. Priority has been given to areas with traditional irrigation schemes where basic skills in irrigation techniques are developed. As a matter of policy, schemes selected for development are based on gravity-fed systems. Within the framework of this policy, the highest number of schemes under construction, or schemes for which designs have been completed, are in Hararge, Wallagga, Shewa and Arsi.

In connection with provision of infrastructures, the Five Years Irrigation Development Plan in Oromia Region (2000-2004) to be undertaken by OIDA set an achievement targets as shown below.

5-years Plan for Irrigation Development

	Description of Activities	Target		
		Nos.	Area in ha	Others
1	Study and Design			
	Reconnaissance	348	27,460	-
	Feasibility Study	224	17,440	-
	Detailed Design	182	14,240	-
2	Construction	100	7,865	
3	Expected Beneficiaries	-	-	31,460 HHF
4	Watershed Management			
	Study	98	-	-
	Implementation	69	-	-
5	Water Management			
	Review of activities	110	-	-
6	Project Identification Survey	-	48,000	-

Source: Oromia Region 5-years Development Plan

The plan envisages that the irrigated areas will be increased by some 90% in the next 5 years. So as to achieve the target, the following annual plan are set per each branch office, and development stage.

Reconnaissance

Year	2000		2001		2002		2003		2004		Total	
Branch Offices	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)
West	17	1,275	25	2,375	26	2,450	20	1,500	21	1,575	109	9,175
Central	14	1,050	21	1,815	22	1,880	26	1,930	21	1,675	104	8,350
East	14	1,035	13	955	15	1,105	9	675	15	1,095	66	4,865
South	15	1,105	11	815	11	815	16	1,165	16	1,170	69	5,070
Total	60	4,465	70	5,960	74	6,250	71	5,270	73	5,515	348	27,460

Source: OIDA 5-years Development Plan

Feasibility Study

Year	2000		2001		2002		2003		2004		Total	
Branch Offices	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)
West	13	975	18	1,600	17	1,525	13	975	16	1,200	77	6,275
Central	11	825	13	1,095	16	1,315	17	1,265	15	1,125	72	5,625
East	6	445	7	515	7	520	6	450	8	585	34	2,515
South	9	670	7	520	6	445	10	730	9	660	41	3,025
Total	39	2,915	45	3,730	46	3,805	46	3,420	48	3,570	224	17,440

Source: OIDA 5-years Development Plan

Detailed Design

Year	2000		2001		2002		2003		2004		Total	
Branch Offices	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)
West	8	600	10	875	12	1,150	10	750	12	900	52	4,275
Central	7	525	11	945	13	1,165	14	1,040	13	975	58	4,650
East	6	445	6	440	7	520	6	450	8	585	33	2,440
South	8	595	7	520	6	445	9	655	9	660	39	2,875
Total	29	2,165	34	2,780	38	3,280	39	2,895	42	3,120	182	14,240

Source: OIDA 5-years Development Plan

Other than construction of the infrastructures, activities of OIDA include extension, watershed management, water management, and community participation. Those main activities in the plan are as follows

5-years Plan for Irrigation Development Activities

	Description of Activities	Target	
		Nos.	Area in ha
1	Extension		
	Selection of demonstration field	143	-
	Training for staff	520	-
	Multiplication of selected seeds	20	-
2	Watershed Management		
	Nursery center	45	-
	Follow-up of watershed management activities	295	-
	Training	520	-
3	Water Management		
	Follow-up study for irrigation schemes	617	-
	Training	69	-
4	Community Participation		
	Establishment of WUA	-	698
	Training for members of WUA	-	1,570
	Community participation for development	65,854	-

Source: Oromia Region 5-years Development Plan

1.3 Existing Irrigation Schemes in the Region

1.3.1 General

In Oromia Region, the Government constructed irrigation schemes with a total area of some 9,600 ha during a last few decades. In the year 2000, OIDA conducted the field investigation to evaluate the present performance of existing irrigation schemes and to clarify constraints and problems that have arisen in the schemes. The results of study and major finding of the JICA Study team are presented hereinafter. List of existing irrigation schemes with location map are presented in Table VI.1.1 and Figure VI.1.1.

1.3.2 Major Findings

Distribution of the existing irrigation scheme by each branch office is shown below.

Irrigation Area by Branch Office

Branch Offices	Nos. of Scheme	Planned Irrigation Area		Actual Irrigated Area		Percentage Achieved
		(ha)	(%)	(ha)	(%)	
Western	24	1,685	17.4%	514	9.2%	30.5%
Eastern	23	1,948	20.1%	1,456	26.2%	74.4%
Southern	12	1,188	12.3%	556	10.0%	46.8%
Central	37	4,823	50.0%	3,034	54.6%	63.0%
Total/Average	96	9,644	100.0%	5,560	100.0%	57.7%

An average command areas is characterized locally: 70 ha in the Western Branch office, 85 ha in the Eastern Branch Office, 99 ha in the Southern Branch Office, and 130 ha in Central Branch Office (except for the Meki Ziway Scheme). The above table indicated that only 60% of area have been utilized among the developed areas. The irrigation schemes managed by the Eastern Branch office show higher performance than those in the Western and Southern Branch.

Classification of Irrigation Scheme by Planned Irrigation Area

(Unit: Nos. of scheme)

Branch Office	Planned Irrigation Area (ha)							Total
	A < 50	50 ≤ A < 100	100 ≤ A < 150	150 ≤ A < 200	200 ≤ A < 250	250 ≤ A < 300	A ≤ 300	
Western	8	10	3	3	0	0	0	24
Eastern	8	10	2	1	1	0	1	23
Southern	1	6	3	0	2	0	0	12
Central	6	14	11	2	3	0	1	37
Total	23	40	19	6	6	0	2	96

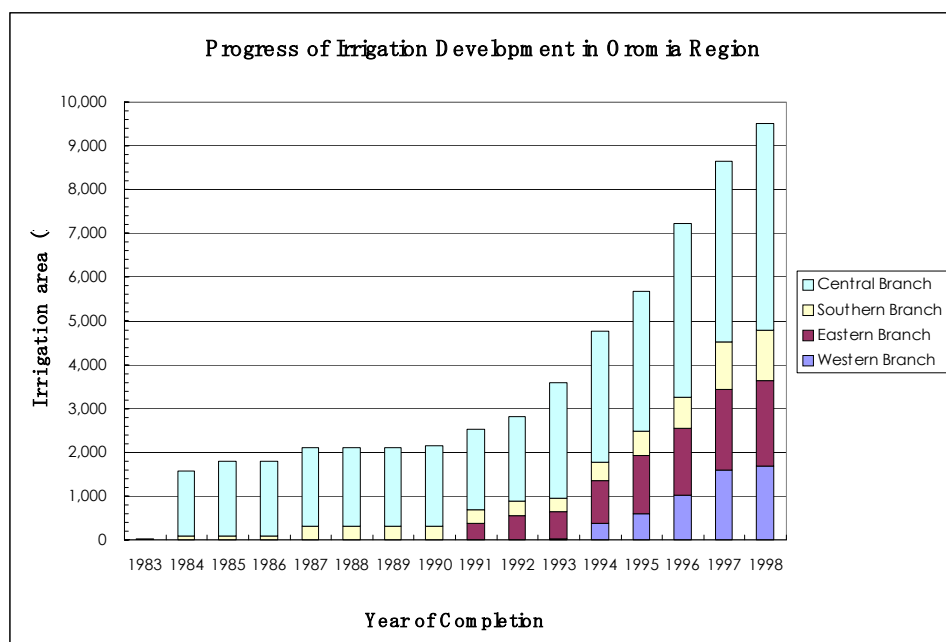
Sixty three scheme out of 96 schemes have a command area of less than 100 ha.

Present Performance of Irrigation Schemes

(Unit: Nos. of scheme)

Branch Office	Percentage of Actual Irrigable Area out of Planed Area (%)						Total
	P < 20	20 ≤ P < 40	40 ≤ P < 60	60 ≤ P < 80	80 ≤ P < 100	P ≤ 100	
Western	12	4	1	1	4	2	24
Eastern	1	1	5	2	4	10	23
Southern	6	0	0	1	2	3	12
Central	9	2	5	6	6	9	37
Total	28	7	11	10	16	24	96

It should be remarked that over half of schemes in the Eastern Branch Office cultivate more than the planned irrigation area. It is reported that some of the schemes were extended by farmers without considering dependable water potential that may cause water shortage even in the original planned areas.



It can be said that irrigation development has been accelerated since 1992, when the change of regime took place and MNRDEP is responsible for the development.

Irrigation Area by Water Source and Intake Scheme

Branch Office		Spring		River				Lake	Total
		Head Works	Pump	Head Works	Dam	Free Intake	Pump & Head Works	Pump	
Western Branch	Nos.	0	0	24	0	0	0	0	24
	Planned Area (ha)	0	0	1,685	0	0	0	0	1,685
Eastern Branch	Nos.	15	0	8	0	0	0	0	23
	Planned Area (ha)	861	0	1,087	0	0	0	0	1,948
Southern Branch	Nos.	0	0	11	0	1	0	0	12
	Planned Area (ha)	0	0	1,156	0	32	0	0	1,188
Central Branch	Nos.	8	0	24	3	0	1	1	37
	Planned Area (ha)	515	0	2,204	404	0	200	1,500	4,823
Total	Nos.	23	0	67	3	1	1	1	96
	Planned Area (ha)	1,376	0	6,132	404	32	200	1,500	9,644

Among 96 irrigation schemes, 67 schemes are run-of river type with head works. In the Eastern Branch office area, water sources for 15 irrigation schemes out of 23 schemes are spring.

Present Performance of Irrigation Schemes by Water Source

(Unit: Nos. of scheme)

Percentage Achieved	Spring	River					Lake	Total
	Head Works	Pump	Head Works	Dam	Free Intake	Pump & Head Works	Pump	
P < 20	2	0	23	0	1	1	1	28
20 ≤ P < 40	1	0	5	1	0	0	0	7
40 ≤ P < 60	2	0	8	1	0	0	0	11
60 ≤ P < 80	1	0	9	0	0	0	0	10
80 ≤ P < 100	6	0	9	1	0	0	0	16
100 ≤ P	11	0	35	0	0	0	0	24
Total	23	0	67	3	1	1	1	96

Relatively high development ratio is observed in the schemes, which depend on springs for water resources, contributed by their annual steady flow.

1.4 Implementing Procedure of Irrigation Project by OIDA

1.4.1 Project Identification

The application of the irrigation development by farmers is evaluated in the design and study team in the branch office and approved by the head of the study and design department in the head office for budgetary arrangement.

The reconnaissance study, for which the planning and design team in the branch offices is responsible, is carried out to support a decision on whether to proceed with further investigation on the basis of collected data. On the average, the total number of days required to conduct the study of a project takes 20 days.

1.4.2 Feasibility Study and Design

Out of the reconnaissance survey, promising sites will be selected based on the criteria for project selection. The work plan for feasibility studies and design are prepared by the study and design team in the branch office and approved by the head of the study and design department in the head office for budgetary arrangement.

Like reconnaissance study, the staff of the study and design team at the branch offices will conduct a feasibility study for the selected sites. At present, private consultants are being allowed to participate in conducting the studies to produce more number of irrigation schemes. Results of the feasibility study will be presented and discussed in the presence of department heads, team leaders, and other staff concerned. Feasibility study of a single project is supposed to take 45 days. At the end of feasibility studies, the study team will submit reports to the study and design team of the branch office. The team at the branch office will hold a meeting on the project. Then after, if the project is found to be feasible, it will be made to pass to the next stage, that is a design stage.

Design of schemes is composed of structural design, preparation of detailed hydraulic and structural design for head work and irrigation canals, preparation of

the detailed specification and cost estimate, and preparation of the operation and maintenance manual. It is supposed that design of project takes 50 days. The designs will be carried out through discussion with a design team leader, head of study and design department. Before finalising the design work, the project beneficiaries will be discussed over about the selected head work sites, command area, alignment of main, secondary, tertiary canals. A complete design report together with its working drawings will be submitted to the study and design team of the branch office. The study and design team leader and the branch manager will check the design. After the review of design, it will finally be approved at head office. The contract administration team of the construction department in the head office prepares a technical specification for the works. Before construction, agreement is signed between OIDA and WUA for contribution to the project.

1.4.3 Construction

The construction department is responsible for the management of all construction aspects at the head office level, which include construction planning and scheduling, control and monitoring of physical progress, labour, equipment and material inputs, safety control, reporting, and so on. The construction management team is in charge of preparing conditions to start construction works in time and to run smoothly construction activities of irrigation schemes on time. The team also determines whether materials and labours are in conformity with approved technical drawings and specification. The contract administration team is responsible to prepare tender documents for design work completed irrigation schemes and to arrange better condition for contractors through initiating them in irrigation construction works. The branch office is responsible for the overall construction activities. The monthly reported project report from each irrigation construction site will be compiled together and submitted to the head office. The construction engineer at site is responsible for the all day to day construction activities, including the works made by the farmer's contribution. At present, most of the works are conducted by OIDA, mobilising equipment, labour, and materials.

1.4.4 Operation and Maintenance

The completion of the construction works for the irrigation schemes are marked by physical handing over to WUA organised and legalised for operation and maintenance. Certificate of handing over the scheme signed by the Branch office manager of OIDA and the chairman of WUA have to be done after the completion of the works. The Original signed certificate will be handed to WUA while the copy remains with the Branch office of OIDA. The handing over ceremony will be carried out after checking up of accomplishment of the designed activities properly by concerned bodies like construction supervision, Irrigation management & extension management teams. All necessary designed documents will be attached

with the handing over format. Thereafter it will be the responsibility of the WUA to manage, operate and maintain the scheme through its executive committee. The extension & water management team in the branch offices carries out the technical support and guidance. A DA residing the scheme supports the WUA at the community level. OIDA have a plan to increase the number of the DAs to strengthen the support services. The maintenance work, which is beyond the WUA's capacity, will be conducted by OIDA upon their request. The application of the maintenance work is evaluated in the branch office and approved by the head of the extension and water management department in the head office for budgetary arrangement.

1.4.5 Manuals and Guidelines

Manuals and guidelines for planning, design, construction, and operation and maintenance of irrigation schemes are prepared by ESRDF fund. Further, recently, guidelines have been prepared under the special country program (SCP) of small irrigation development financed by IFAD

1.5 Community Development by OIDA

1.5.1 General

Farmers' involvement in decision making for planning, design, implementation, and monitoring and evaluation, is crucial to ensure effective operation and management of irrigation schemes by themselves. For this reason, the community development has been promoted by the community development department of OIDA so as to ensure smooth operation and effective implementation of the irrigation schemes, establishing beneficiaries organisations as water users' associations. The community development activities at various stages of the project development phases are described in the proceeding sections.

1.5.2 Planning Stage

At planning stage, communities are prepared to be introduces the on-going responsibility in obtaining general awareness on the approval to be made, which includes willingness and interests on the basis mental acceptance for future participation. The activities of OIDA during this period include to:

- Conduct assessments and managing issues concerning the communities
- Give awareness to the direct beneficiaries and surrounding communities
- Introduce project's proposal to the communities
- Mediate and facilitate study processes
- Advise local authorities and the communities on future expected role in the project's life

- Record and gather communities opinion, interest and willing to accept the projects with the ethics that considers and appreciates communities social value
- Confirm the communities petition moved with local authorities
- Introduce community self management strategies, which includes managing, organising and controlling roles of future projects participatory tasks
- Form project study committee
- Follow-up formed committee status till the commencement of project construction

1.5.3 Construction Stage

During project implementation period, communities are on a position to mobilise itself in the participation of project construction in labour and money by achieving capacity building and empowerment objectives. Communities' self-management are realised through exercise of authority. Responsibility and control of project progress status. Sense of ownership gets materialised and collective leadership also be maintained as result of self-mobilisation. The involvement of OIDA during this period is to:

- Introduce to communities and inform local authorities about commencement of project construction
- Organise the Committee formed during projects study by grouping them into construction teams
- Mediate and facilitate construction of the project
- Co-ordinate participation programme with the communities and team leaders
- Give awareness to the communities on the expected role of construction life-span
- Co-ordinates participation activities by controlling the altitudes towards labour utilisation and facilitate labour contribution from non beneficiaries when it is needed
- Control community self management styles. Which can be defined as the ways they exercise management of collective leadership that facilitates socio-economic development
- Records human labour in monetary terms
- Conducts close attention to the activities of team leaders and committee members
- Prepare and conduct training program for the committee members
- Co-ordinates and integrate food for work programme with community participation activities
- Reports all concerned activities
- Co-ordinate compensation payment of the individual peasants

1.5.4 O&M Stage

In operation and maintenance stage of an irrigation scheme, communities have to become fully responsible for management of the scheme, and have full authorities. The external agencies including OIDA act to ensure that the necessary technical and financial resources needed to support community managed system are in appropriate directions. The roles of the community participation department during this stage are to:

- Control and organise hand-over procedures of completed schemes to the communities
- Mediate and facilitate all concerned bodies with the communities
- Control and co-ordinates the strengthening of community management of irrigation schemes, such as formation of WUA in collaboration with BCD
- Strengthen community capacity in irrigation development planning
- Co-ordinate communities on continuing development strategies that contributes to an increment to irrigation utilisation
- Advise on the methods to be employed in the role of collective leadership so as to enable users to obtain a position to bring about socio-economic changes with the effect of the resulting system or gains of schemes construction around their social environment
- Give advice on the ways of communities property administration and water distribution
- Ensure community involvement in the field of O&M, to safeguard sustainability of the projects
- Report all concerned activities

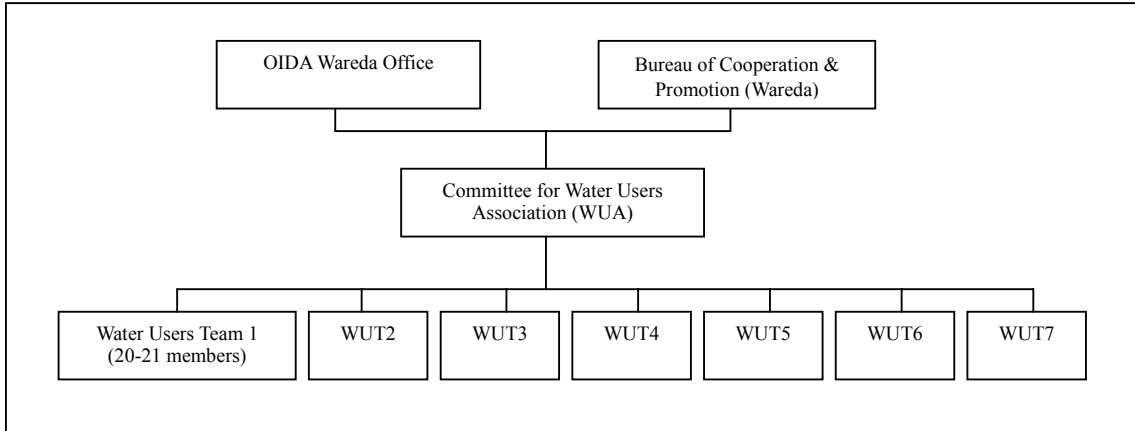
1.6 Water User's Association

1.6.1 General

In line with the principle to manage the irrigation schemes by farmers' community, a water users' association (WUA) has been organised. The WUA acts to allocate the supply of irrigation water, labour, cash or material requirement to keep the schemes go well. Without a capacity for organisation and decision making among the water users, it is simply not possible to manage a scheme successfully. This capacity helps users to develop an organisation capable of operation and maintenance of the scheme.

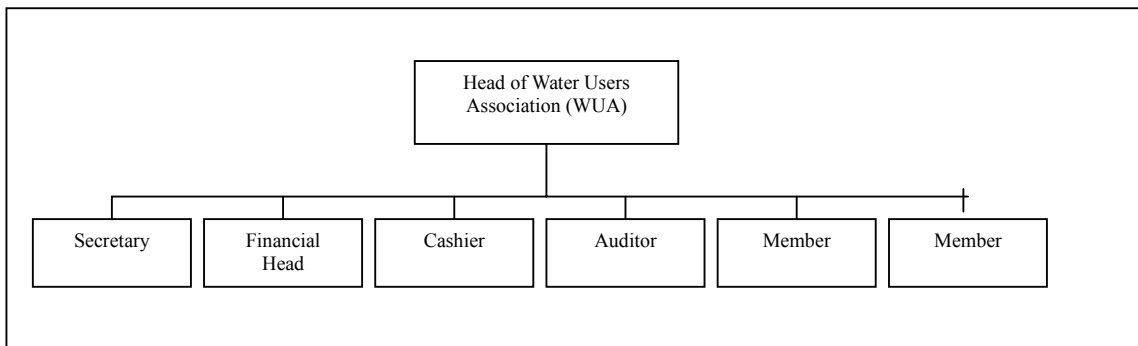
1.6.2 Organisation and Staffing

Establishment of WUA shall be on the basic principles of Oromia Bureau of Cooperative Development in accordance with proclamation 147/98. The WUA committee is established by Cooperation & Promotion Department of Orimiam MOA.



One scheme is to have one WUA. One WUA has to have executive committee members delegated from the sub-committees depending on the size of the scheme. The committee members are elected by the WUA members and appointed by the Bureau of Cooperation & Promotion and Bureau of Agriculture.

One WUA has several sub-committees and teams depending on the hydraulic nature of the scheme as shown below.



The Chairman, Financial Head and Cashier are responsible for the financial management. The Co-operation of WUA and Promotion Bureau make external auditing once a year.

The WUA set up the by-law and the operation rules of the irrigation facilities. Apart from the by-law and rules, the Committee occasionally prepares proposals when problems are arising from the project management.

1.6.3 Responsibility of WUA

WUA is established to effect the duties and responsibilities that have been set on to the agreement of the beneficiary communities, so that the management of the schemes can run smoothly. The main duties and responsibilities of WUA are that:

- Organise the beneficiaries in matters related with scheme development.
- Ascertain all issues that could be arising in the development process of the

- scheme are to the interests of the beneficiary members.
- Participate and play the major role in the process of project formulation and implementation
 - Develop by-laws in co-operation with the CPB & other stakeholders
 - Resolve issues related with land acquisition and resettlements among the beneficiaries.
 - Organise the training in Cupertino with the other stakeholders
 - Keep the necessary records and information's and participate in evaluating the physical and financial progress of the scheme and sign in the payment certificates prepared by the technical team.
 - Perform a continuous follow up in the overall process of project implementation and cooperation and work together with all the stakeholders as required.
 - Cover the entire costs except for the major structure like head works and major main canal structures
 - Maintain the scheme at a regular interval, perform the water distribution and operation activities
 - Organise the training requirements and ask for help using the liaison mechanisms that exists in the system
 - Perform proper management of the scheme in all aspects, in the aspects of the system, inputs utilisation, market aspects, agricultural practices.
 - Co-ordinate input and credit facilities
 - Search markets for output of the farmers and tried to overcome market fluctuations
 - Prepare general warehouse and protect production from any post harvest losses.
 - Give timely market information's to its members.

1.7 Operation and Maintenance

1.7.1 Water Distribution

A water master elected among WUA member is responsible for operating a head work gate or a pump while irrigation blocks are operated by a team leader represented by each block, controlling gates on diversion structures. As long as gravity irrigation scheme is concerned, irrigation water is abstracted continuously, keeping an intake gate opened constantly. As for a pump irrigation scheme, an operation hours of the pump is decided as per meeting among WUA members. A night pond is equipped in some schemes so as to carry out water distribution smoothly and equally.

1.7.2 Maintenance of Scheme

In principal, WUA is responsible for all maintenance works. By communal works or assignment for a particular area, farmers conduct the maintenance works. There

are two major maintenance activities carried by WUA: clearing and de-silting of canals. WUA members are also expected to clear the weeds, and to de-silt the canals by themselves. Besides these major activities, WUA members are also expected to attend to minor repairs for minor earthworks such as bund filling, and structures

There are two kinds of maintenance works. One is a communal works which all farmers are expected to attend. In principal, communal maintenance works is carried out in main canal de-silting and clearing without compensation for the attendance.

Another is a maintenance system, that work is a length of canal to be maintained are allocated according to the extents farmers cultivates. The maintenance works of the secondary and tertiary canals is conducted by this method. Usually, farmers attend the maintenance in the canals that are adjacent to their farmlands.

1.7.3 O&M Cost

Although members of WUA shall cover all O&M costs, they can not afford to money for allowance to a water master and material like cement. WUA has to depend on OIDA for the maintenance works beyond WUA's capacity.

1.8 Financial Assistance to OIDA

1.8.1 IFAD

The Special Country Programme – Phase II (SCP-II), is a continuation of the International Fund for Agricultural Development (IFAD) Special Country Program Phase – I (SCP-I). The first phase of the programme started in 1985 and continued to 1996 with the objective of developing 1,650 ha of new land and rehabilitation of 1,270 ha of existing traditional schemes in Arsi, Bale, East and West Harargie Zones of Orimiya Region and Sidama Zone of South Nations, Nationalities and Peoples Region.

As a continuation of phase – I (SCP), IFAD has initiated this phase II programme with the Ministry of Water Resources as a National Program Coordination Agency. The overall objective of the programme would be to improve the magnitude and reliability of incomes and food security of farming families in the programme regions by institutional capacity building, irrigation development and imprpved agricultural services. This would be coupled with with strengthening communities abilities to mobilise social and economic resources in their own interests. The target of small-scale irrigation component include the construction of 26, 19, 14 & 8 traditional expansion schemes in Amhara, Tigray, Oromia and SNNPR.

1.8.2 Ethiopian Social Rehabilitation Development Fund (ESRDF)

The IDA-funded ESRDF (Ethiopian Social Rehabilitation Development Fund) project was appraised in 1996. This provides an IDA credit of US\$ 242 million for investment in health, education, water supply and sanitation, and small scale irrigation. A flow of project implementation funded by ESRDF is shown in Figure VI.1.2.

The ESRDF-funded project is featured in the following aspects:

- Projects are mainly implemented in Amhara and Tigray Regions.
- Most ESRDF aided project are rural water supply, health, and education, being 2,232 projects out of 2,424.
- There are only 43 small-scale irrigation projects appraised and implemented.
- It is precondition that an application for a project should be prepared by farmers and OIDA.
- An appraisal for the project is carried out in accordance with the following conditions:
 1. Command area of the scheme should be less than 200 ha
 2. Economic internal rate of return should be more than 15 %
 3. The project should have an economical viability and technical soundness
 4. The project should have no significant natural and social environmental impact
 5. Beneficiaries should contribute 10% of construction cost, providing materials and labour force,
 6. The beneficiaries should carry out management of the scheme.
- Construction of infrastructures is eligible for the fund. At present, no running costs for the project can be financed by the fund.

CHAPTER 2 EXISTING IRRIGATION SCHEMES IN AND AROUND THE STUDY AREA

2.1 General

According to an intake type, irrigation schemes are classified into two categories; a pump irrigation scheme and gravity irrigation scheme. All existing irrigation schemes in Dugda Bora Wereda are pump irrigation schemes due to topographic constraints to promote a gravity type irrigation scheme.

The schemes are classified into three categories as per style of their scheme management. The first group is the schemes, which have been established and by the Government or government support with foreign aid. At present, OIDA provides support for the schemes in terms of operation and maintenance of facilities and scheme management.

The second group is the individual local farmers who get organised and seek assistance from NGOs to start an irrigated farm. They operate on their plots on an individual basis but share the common service given by the motor pumps, which are usually provided by NGOs.

The farmers groups in the first and second groups are listed below.

Farmers Groups in Dugda Bora Wereda

No.	Name of WUA	PA	Members			Irrigation Area (ha)	Source of Water	Year of Establishment
			Male	Female	Total			
1	Lega Meki-1	Gemu Shubi	10	-	10	32.5	Meki river	1997
2	Lega Meki-2	Bekere GIRRISA	19	5	24	6.0	Meki river	1998
3	Bekere GIRRISA	Bekere GIRRISA	130	5	135	218.0	Ziway lake	1997
4	Melka Cherecha	Welda Mekdela	34	-	34	14.1	Ziway lake	1998
5	Meika Korma	Welda Kelina	28	9	37	16.6	Ziway lake	1998
6	Melka Ada Godana	Welda Kelina	18	1	19	7.8	Meki river	1998
7	Oda Bokota	Oda Bokota	-	23	23	5.0	Meki river	1999
8	Teppo-140	Teppo Chareke	40	-	40	13.0	Ziway lake	1997
9	Cheleleka Denbel	Dodola Denbel	34	1	35	10.9	Ziway lake	1998
10	Dodota Denbel	Dodola Denbel	15	-	15	18.1	Ziway lake	1997
11	Wayo Gabriel	Wayo Gabriel	19	5	24	13.8	Ziway lake	1996
12	Wedia Kelina	Wedia Kelina	30	1	31	8.6	Ziway lake	1998
13	Wayo Seriti	Wayo Gabriel	28	4	32	17.0	Ziway lake	1999
14	Tuchi Denbel	Tuchi Denbel	16	-	16	15.3	Ziway lake	1996
15	Jara Wayu	Elen	20	5	25	8.0	Elen lake	1998
	Total	-	441	59	500	404.6	-	-

While there are three schemes categorised into the first group, namely Bekere GIRRISA, Teppo – 140, and Wayo Seriti, the others have been established by NGO assistance. Except for the Bekere GIRRISA located in the command area of the Meki-Ziway irrigation project, with a command area of less than 20 ha, they have been developed using surface water resources of the Meki river and the Ziway lake by use of small pumps.

The third group includes those who do not have any piece of land. They buy motor pumps and make an arrangement with those people who possess land, bringing their resources together to start a farm. The benefit from the farm is shared among the two parties in accordance with their specific agreement. As of November 2000, there are 160 motor pumps in the Dugda Bora Wareda, and 75 motor pumps along the Meki river, most of which are of 12 – 20 horsepower. According to the inventory survey made by OIDA in 2001, the number of the pumps increased to 180.

According to categories of the schemes discussed in the preceding paragraphs, six (6) representative irrigation schemes were selected in and around the study area in order to verify the current positions of the schemes and their constraints. Further, some private irrigation schemes in the Wareda are selected to study the third groups.

Irrigation Schemes Selected for Case Study

Type of Scheme	Government	NGO	Private
Pump	Meki-Ziway Wayo Seriti Dodicha *	Oda Bokota Melka Ada Godana	Some Schemes in the Wareda
Gravity	Areta Chufa *	-	-

Note : * Scheme is located out of Dugda Bora Wareda

All the selected schemes have different natures in terms of financial sources, irrigation system, water resources, and development scale. Their location is indicated in the next page. The major features of the schemes are summarized below.

Six (6) Irrigation Schemes in and around the Study Area

Name of Irrigation Scheme	Meki – Ziway	Small Scheme		Wayo Seriti	Dodicha	Areta Chufa
		Melka Ada Godana	Oda Bokota			
Wareda	Dugda Bora	Dugda Bora	Dugda Bora	Dugda Bora	Adami Tulu	Arsi
PA	Bekela Girisa	Welida Kelira	Oda Bokota	Wayo Gabriel	Dodicha	Areta Chufa
Financial Source	North Korea	Self-Help International	Self-Help International	ESRDF	ESRDF	IFAD
Members of WUA	150	18 (male) 1 (female)	23 (female)	32	150	370
Year of WUA Establishment	1985	1998	1999	2001	1998	1996
Commencement of Operation	1989	1998	1999	2001	2000	1996
Water Resources	Ziway Lake	Meki river	Meki river	Ziway Lake	Bulbula River	Chufa River
Facility	9 Pumps (5 m ³ /s)	Small Pump (12 HP)	Small Pump (12 HP)	Small Pump (2 Nos.)	Pumps (2 Nos.)	Headworks
Scheme Area (ha)	3,000 ha	5 ha	5 ha	17 ha	69 ha	100 ha
Actual Irrigation Area (ha)	300 ha	5 ha	5 ha	17 ha	-	86 ha
Crops	Maize	Vegetable	Vegetable	Vegetable	Vegetable	Maize, Vegetable

Source: Dugda Bora OIDA Wareda Office

2.2 Meki Ziway Irrigation Scheme

2.2.1 Outline of Scheme

The Meki-Ziway Irrigation Project is located 5 km west of Meki town. The project was established in 1989 under a technical assistance arranged with the previous government. It was envisaged to develop 3,000 ha, out of which 1,500 ha was to be a state farm, while the balance was to be allocated to local farmers. So far, 930 ha of land on the right bank of the lower Meki river has been developed, including intake channel from the Ziway lake, pump station, delivery pipeline, main, secondary, tertiary canals, and related structures. The pump station has nine (9) pumps, of which two (2) were reserved as stand-by, The pumps have a capacity of 764 liter/sec./unit and a head of 16.3 m have been established.

2.2.2 Operation and Maintenance

The project was ceased in 1992 due to the change of the government policy. In the previous period, free water was supplied to farmers under full control of the government. After the governmental reform, however, the responsibility of the government is limited only to security control of the pumping station by the OWMEDB and the main canal system by OIDA. Without any subsidy, farmers are obliged to pay electricity supply charges against operation hours. Except for some 300 ha planted in 1990, the project has been lying idle since then.

2.2.3 Major Findings

(1) Needs for Rehabilitation of the pumps and irrigation canal system

Two (2) sets of pumps out of nine (9) are currently functioning, while seven pumps need repairs. In order to activate the scheme to some extent, the rehabilitation work is necessary. It is suggested that an inventory survey to be conducted to clarify the defect of the scheme and to estimate cost for the rehabilitation and also availability of spare parts. It is noted that spare parts are not to international standard.

(2) Operation cost for the pump

Only 300 ha are activated out of 3,000 ha. Increase of farmers, who will commence cultivation in the remaining area, could relieve the burden for the farmers to pay the pump operation charge. It is worth, therefore, while considering the farmland re-allocated to farmers, who are residing outside of the scheme.

2.3 Small Irrigation Schemes Established by NGO

2.3.1 Outline of Scheme

Oda Bokota irrigation project was established in by self-help international (NGO) for 84 female members living in Oda Bokota PA. Construction of canal was commenced in 1992 by participation of all members and completed in 1994. After 4 years cultivation, the project was interrupted by a breakdown of the pump. In

1999, 26 members resumed irrigation farming, forming WUA. They have got legal entity by Oromia co-operative bureau, Dugda Bora Wareda branch.

Melka Ada Gonada project was established in 1999 to serve farm land of 7.8 ha in Welida Kelina PA.

2.3.2 Operation and Maintenance

Water abstracted by pumps is discharged to the raised earth canals, which convey the water to distribution canals. Irrigation is applied through furrows. The management of the schemes are described below.

Oda Bokota Irrigation Scheme

A committee of WUA consists of 7 members, namely chairman, vice chairman, secretary, cashier, inspector, and 2 committee members. The committee members meet weekly while all members meet monthly.

The WUA has already prepared rule and regulation and every members obey for this rule and regulation. For example if some body can't pay a monthly regular contribution on time, they pay a penalty of 10 Birr.

The command area is divided into some irrigation blocks. The blocks are formed based on their land location and each block contains three members. All members shall contribute 5 Birr/month and this money is deposited at the hand of elected cashier. The WUA spends the money for community works like wage of night guard, oil, pump maintenance, and others.

At the beginning of cultivation period, the committee members buy 10 liter fuel by use of communal money and it is used as a reserve in pump tanker of 40 liter capacity. They determine the average fuel consumption per member is equal to 6 liter. Whenever the members need to irrigate their land, they have to bring 18 liter fuel, which is a share of 3 members. The members hand over the fuel to a pump operator to irrigate their land.

Melka Ada Godana scheme

In Melka Ada Godana scheme, operation of pump and water distribution is entrusted to a water master employed by the group, with an allowance of Birr 50 per month. The water master attends to the water distribution work, forming canal bunds and furrows per each farm lot. Benefits from farmlands are shared by the members and the water master in accordance with the agreement. This system contributes to proper water distribution, even without concrete water diversion structures in these schemes.

2.3.3 Major Findings

(1) Needs for fund formation by farmers

In Oda Bokota scheme, from 1993 to 1997 for 4 years, the farmers have been cultivating their land by the donated pump. During this time, except labor cost, the NGO covered all production costs like seed, fertilizer, chemical, fuel, and wage of night guard (90 Birr/month) and pump operator (90 Birr/month). The situation lasted until 1997, when the pump was broken and the NGO have taken the pump for maintenance.

In 1999, the NGO showed the farmers the condition to resume the project as shown below.

- Those who willing to continue irrigation should pay 100 Birr/ members, and
- The collected money should be saved in bank account. The fund would be used as a reserve for pump maintenance.

This fact suggests that the NGO noticed that full support of the agricultural input to the farmers could increase farmers' dependency to external source and might lead to less sustainable irrigated farming. It is said that the actions taken by the NGO were appropriate even though 54 members withdrew from the project due to lack of money contribution. It is stressed that an alternative approach how to let the farmers get funds for the farming inputs shall be pursued.

(2) Little consideration of engineering aspect in planning stage

A pump, at first, provided NGO in Oda Bokota scheme is too small to be able lift water from the Meki river to upstream of canal discharging point. Then, farmers informed this problem to the NGO to replace the pump with more powerful one. This fact suggests that the irrigation scheme was formulated with little investigation of an engineering aspects, such as output of the pump, and required head and design discharge in the scheme.

(3) No technical support by external organization

After providing the pump with initial training for operation, the NGO left the scheme, and no after-care for the scheme is available in the area.

(4) Needs for monitoring for water use

At present, success of the small-scale pump irrigation schemes leads to increase of application by farmers, who are anxious for new schemes. However, it should be mentioned that increase of the schemes might cause disordered water use along the Meki river. The government agencies including OIDA are expected, therefore, to be involved in the schemes positively, restricting and monitoring the existing and new schemes in terms of water resources development

2.4 Wayo Seriti Irrigation Scheme

2.4.1 Outline of Scheme

The Wayo Seriti Irrigation Scheme is located in some 15 km the south-west of Meki town. Water for the scheme is abstracted from the Ziway lake. The proposed irrigation scheme covers net irrigable area of 17 ha and will be mainly cultivated with vegetables. The number of the beneficiaries is 47. Construction of the scheme has been completed in 2001 financed by ESRDF. Two sets of pump were installed to feed the area.

2.4.2 Operation and Maintenance

The scheme is run in accordance with discussion and consensus by all members. All members participate in operation and maintenance works of the scheme. Further, decision of the group is made by members meetings when problems arise.

A committee of WUA consists of 7 members, namely chairman, vice chairman, secretary, cashier, inspector, and 2 committee members. A general meeting is held every month while committee members get together every two weeks. In the meetings, subjects, such as irrigation schedule, defects of irrigation facilities, selection of crop, and marketing are discussed.

A pump operator is selected among the WUA members. He receives Birr. 100 per month. The irrigation area is divided into 10 blocks for rotational irrigation. 5-days interval of irrigation is adopted in the scheme, supplying water a half day each block. The rotation rule is discussed and decided in the general meeting.

Fuel is purchased and managed by committee members. The pump operator keeps the records of fuel consumption, and members are charged according to the operation records. Maintenance of the pumps are made by mechanic residing in Meki. The cost for maintenance is collected, as it is needed.

It is observed that the irrigation canals is well maintained by the members of the WUA.

2.4.3 Major Findings

(1) Outstanding works for official hand-over

The official handover of the irrigation scheme is not yet made because there are some outstanding works to be taken. They include repair of delivery pipe of the pump and installation of off-take gates on the irrigation canals. OIDA are requested to complete the work as soon as possible.

(2) Shortage of money for farm input

Unlike the Teppo 140 scheme, which registers to the cooperative union and is entitled to access to credit, farmers in most schemes are in shortage of money for purchasing farm input, like fuel, fertilizer, chemical, and so on. They get the farm inputs from traders in advance, and repay in kind after harvest. Farmers pointed

out that they have little profit because they are obliged to get expensive input from the traders.

(3) Lack of O&M fund

Although the contribution is specified in a by-law or decided in a general meeting, most farmers are not able to afford contribution money for operation and maintenance of the schemes due to low profits from irrigated farming,. Thus, an allowance for a pump operator and lubricants can not be covered by budget of WUA.

(4) Dissatisfaction for irrigation farming

All the farmers in the scheme are not satisfied with performance of irrigation farming because the net benefit obtained from the irrigated agricultural products is less than they expected. They pointed out the marketing problem derived from fluctuation of price of the products and little guidance of marketing by OIDA. A sense, that the irrigated farming is accompanied with risk, is not observed due to insufficient awareness creation at the planning stage. Further, they are not aware of their responsibility for management of their irrigation schemes. The method of an awareness creation program on the above issues shall be standardised so that social workers of OIDA carried out the program systematically and satisfactorily.

(5) Conflict by land holding issue

The approach of OIDA in an irrigation scheme is to allocate irrigated land equally to each member. However, since no document specifying the agreement has been prepared and signed between OIDA and WUA members, much conflict arise after completion of the work. In fact, in the Wayo Seriti project, although some of large-scale land holders agreed to allocate their lands to their family members, this agreement was not performed yet. An agreement, therefore, specifying the responsibilities between OIDA and farmers, should be prepared for smooth implementation of the project.

(6) Support by government organization

Performance of the irrigation scheme depends on existence and capacity of DA dispatched from OIDA. One DA is assigned in the Wayo Seriti project, where the management of the scheme is being made properly. The DA is expected to advise farmers for farming practice and WUA management including preparation of by-law and financial management.

2.5 Dodicha Irrigation Scheme

2.5.1 Outline of scheme

The Dodicha Irrigation Scheme is located on the east of Addis Ababa – Awasa main road at 3 km branched off at Adamitulu town. Water for the scheme will be abstracted from the Bulbula river at the end of the level of the Ziway lake. The

proposed irrigation scheme covers net irrigable area of 69 ha and will be mainly cultivated with vegetables and cereal crops, such as maize. The scheme beneficiaries are 160 family heads or 3,628 persons.

The project area is divided into 31 tertiary units with maximum and minimum sizes of 4.2 ha and 0.70 ha, respectively. Continuous flow is applied to the canals serving tertiary units and within the tertiary unit the water supply is rotated among the individual fields. The discharge in the canal system is adjusted to the daily irrigation requirement. The type of irrigation is surface irrigation and the method of supply is by furrows. The water is supplied to the furrows either by siphon tube from tertiary canal or by a simple off-take that feeds the feeder ditch to the furrows.

Since Dodicha is a drought-affected area, the PA has applied to ESRDF in order to irrigate agriculture to eliminate or reduce food shortage in 1997 with the service area of 100 ha. Against the PA's application, ESRDF reduced the irrigation area from 100 ha to 69 ha due to fund limitation. The project was implemented by the Central Branch Office of OIDA. According to the agreement with OIDA, all the members directly participated in the canal excavation works and carrying construction materials.

2.5.2 Operation and Maintenance

The WUA of the Dodicha irrigation scheme was established under the assistance of both the Wareda administration office and the agricultural office. The members of the sub-committee, including secretary, financial head, cashier and auditors, as well as water users' team, were already appointed. The WUA has set up the by-law and operation rule for the irrigation facilities. Although the operation of the scheme is not commenced yet, responsibilities of operation and maintenance of the facilities are understood by the farmers as follows:

Pumps	:	Four pump operators who will be trained by OIDA
Gate on the canals	:	Seven team leaders for each water users' team
Canal	:	WUA members

2.5.3 Major Findings

(1) Communication gap between WUA and Government

As mentioned above, due to probably fund limitation, the PA was forced to reduce the project beneficiaries. Although the government officials were supposed to have enough discussion with the farmers, farmers appear to be still not convinced well of this issue. In addition, it is revealed that OIDA are expected to bear the initial running cost for the pump station in spite of the fact that all O&M cost shall be borne by the WUA. This fact suggests that strengthening of communication between farmers and the government as well as awareness creation to farmers is needed during the planning stage of the irrigation scheme.

(2) Hand over of the scheme

In the scheme, although the WUA members are satisfied with the quality of the project facilities, they stated that some concrete structures already have been damaged. Further, the hand over ceremony, which was due to be held in November 2000, was suspended because the pump functioned improperly and the gates attached to diversion structures on the canal were not installed yet. The WUA members are reluctant to take over the facilities until the outstanding works are done properly. In October 2001, the outstanding works have been completed and consequently training to the farmers for the pump operation was conducted. The immediate handing over of the facilities to the WUA is expected.

(3) Operation cost for the pump

In accordance with the agreement between OIDA and WUA, all running cost shall be borne by the WUA. However, the WUA members stated that lack of initial running cost for the pump might result in failure of scheme operation. As present funding sources such as ESDRF do not cover the initial running cost, some attempt to seek financial assistance during the period are needed so as to run the scheme successfully.

2.6 Areta Chufa Irrigation Scheme

2.6.1 Outline of Scheme

The Areta Chufa small-scale irrigation project is located in Areta Chufa PA in Arsi Zone. With the financial assistance of IFAD, the Project was embarked on in 1995/96 under the agreement between Bureau of Water, Mineral and Energy Resources Development and the Areta Chufa peasant association (PA). The community development was promoted by Cooperation & Promotion Department of Oromia MOA. Currently, the government responsibility is transferred to OIDA. The WUA is organised by 317 members. Gravity water is available throughout year from the Chufa river, i.e. stable perennial flow to the Katar river. The total scheme area (86 ha) is allocated to all the members at 0.25 ha per member. Two Development Agents (DAs) from OIDA and the Bureau of Agriculture are assigned to the scheme.

2.6.2 Operation and Maintenance

The committee members are elected by the WUA members and appointed by the Bureau of Cooperation & Promotion and Bureau of Agriculture. The Committee represents the beneficiaries with respect to all the matters concerning the WUA and the scheme. According to the annual plan of the WUA, the Committee follows, guides and accomplishes all the aspects of the WUA's activities regarding irrigation O&M with different external bodies.

The Chairman, Financial Head and Cashier are responsible for the financial

management. The Cooperation and Promotion Bureau carries out external auditing once a year. So far there is no problem arising from the financial management by the WUA committee.

The WUA set up the by-law and the operation rules of the irrigation facilities. Most of the WUA members understand these by-law and rules. Apart from the by-laws and rules, the Committee occasionally prepares proposals when problems are arising from project management.

The irrigation plan and schedule are agreed upon at the WUA meeting. The rotational irrigation by block is applied in the scheme. The main canal is operated by the chairman, while other structures including the division boxes and the pond are operated by group leaders and members. The intake gate is operated by a water master employed by the WUA.

The headworks maintenance is done by communal works. Major work items include cleaning, desilting, and weeding. Every three months, the maintenance work on the main canal is carried out also by communal work. Major work items are cleaning, desilting, weeding, and repair of embankment. The maintenance of secondary canals and field canals are done when required under the responsibility of individual farmers. The communal maintenance work is carried out by every member. It is agreed by all WUA members that any member who is absent from the work is obliged to pay 5 Birr per day to the WUA.

2.6.3 Major Findings

Although the Areta Chufa scheme is recognised as one of successful irrigation projects in the service coverage of the Central Branch Office of OIDA, some constraints and problem were found through the RRA session as described below.

(1) Water shortage

Irregular water shortage in the dry season is pointed out as a problem. The leakage problem is the central issue among the members. They believe that diverting water from the spring in the upstream area will be the best solution for water shortage. They accessed the government to solve the problems on water shortage, but so far no action has been taken.

(2) Uneven water distribution

The members are not fully satisfied with the water distribution, i.e. unfair gap between the upstream area and the downstream area. They point out that the problem is caused by illicit water distribution by members, leakage from the canals, malfunction of irrigation facilities due to defect during design or construction period. The members need keys for turnout gates to avoid illicit operations. This problem could be solved to some extents through strengthening the capacity of conflict management of the WUA supported by DA of OIDA. However the defect of the facilities shall be urgently investigated and necessary action for remedial works

would be taken.

(3) Maintenance Costs borne by WUA

In terms of the maintenance of the scheme facilities, the members requested; (i) construction materials such as cement; (ii) keys for turnout gates to avoid illicit operation; and (iii) machine to excavate siltation in the pond. Some members raised these issues to the government. But no assistance has yet been extended.

No firm idea about water charge is established among the WUA members. The WUA has solved most of the troubles in the past by contribution of labour. However, the WUA Committee is now preparing for introduction of water charge on the scheme operation, i.e. 5 Birr per year per member. Against this proposal, all the informants were not willing and replied in a very reluctant manner. The situation implies that in-depth discussions among the WUA are urgently required with technical advice from OIDA.

(4) For Further Sustainable Operation and maintenance

The success of the Areta Chufa irrigation scheme suggests an advantage of gravity irrigation scheme in terms of less maintenance costs than that of pump irrigation schemes. The maintenance works have succeeded due to members' labour contribution to some extents. In future, considering affordability of farmers, simple structures that would eliminate maintenance cost should be considered.

Division boxes should be provided at the head of each irrigation block to facilitate equal water distribution by rotational irrigation method. The tail-first rotation method would have effect for even distribution of water.

To ensure an advanced level of O&M and management of WUA, further support for operation and maintenance and community management would be needed by the government staff, such as settlement of uneven water distribution, operation and maintenance collection system. Thus, a capacity building programme for OIDA staff will be highly needed in order to support the WUA properly and efficiently.

2.7 Farmers with Private Investor

There are some farmers who have an experience of irrigation farming, sharing farming lands with a private pump owner, who is residing in the same PA or Meki. The farmers rent a part of their land to the owner, and the pump owner supply irrigation water to the farmers in return for land rental charge.

However, the farmers are not satisfied with this system due to frequent conflict with the pump owner regarding water distribution, and share of profits from the lands.

Further, because of shortage of money, the farmers are obliged to get their farm inputs from the owner in advance, and to repay in kind after harvest. The farmer mentioned that the farm inputs through the pump owner were more expensive than

those available in shops in Meki, and that it should result in loss even from irrigation farming.

Under the above circumstances, the farmers wish to organize a WUA so as to manage irrigation scheme, being independent from the pump owner.

It was observed, however, that the interviewed farmers had too much expectation for irrigation. In fact, they estimated their net benefit on the basis of the highest price of agricultural products in a year, and they were not aware of risk accompanied with irrigation farming due to decline of the price. Moreover, asked whether introduction of irrigation practice would resolve shortage of funds for farm input, they had little distinct prospects. It is essential for the farmers to have knowledge of marketing mechanism of the agricultural products.

Chapter 3 CONSTRAINTS AND APPROACH FOR IRRIGATION DEVELOPMENT

3.1 Development Constraints in the Meki River Basin

(1) Topographic constraints to promote a gravity type irrigation scheme

The agriculture activities in the study area have been constrained by erratic rainfall, resulting in low and unstable productivity. In order to solve the difficulties, several irrigation development projects have been formulated or implemented in the last few decades, by utilizing the water resources of Meki river or Lake Ziway.

As per the past lessons obtained from the existing schemes, it is broadly understood that a gravity type irrigation scheme has more advantages than pump irrigation scheme in terms of schemes' sustainability. Thus, in order to relieve the farmers, who are under rainfed cultivation, it is crucial to aim at a new water source development by gravity irrigation scheme. The gravity type irrigation development projects, utilizing of water resource of the Meki river, have been formulated but not realised yet.

The Meki river forms a deep v- shaped valley of 40-50 m in the upstream reach and a steep sided narrow gorge of 10-20 m in the alluvial plain, presenting a difficulty in construction of a diversion structure both technically and economically.

(2) Low sustainability and social impact in pump irrigation schemes

In the context of difficulty in the gravity irrigation scheme, pump irrigation schemes have been promoted by abstracting water from the Meki river, and are represented by the Meki-Ziway Irrigation scheme and small-scale irrigation schemes along the Meki river. However, as discussed in Section 3.4, under the present government policy, the farmers in the Meki-Ziway are facing difficulty in paying charge for the operation and maintenance cost, which has led to unsatisfactory performance of the scheme. Further, beneficiaries of small-scale schemes are located only in areas on the river and near the Lake Ziway, however most of the peasants in the study area who are living away from river or lake have not benefited by the scheme and remain in an unstable situation with rainfed cultivation.

(3) Absence of environmental justification in the river basin

The river basin, where the Meki river is located, is known as a closed river system. Water flowing in the basin finally drains into the Lake Abijata through the Lake Ziway. Although it was recognised that the water abstraction from the river might have a significant affect on such a fragile ecosystem in the basin, no irrigation development study has been conducted, focussing on the impact assessment quantitatively. In fact, the schemes along the Bulbula river, including the Dodicha Irrigation Scheme, as well as the Meki-Ziway Irrigation Scheme, have been carried out without environmental impact assessment. In addition, at present, success of

the small-scale pump irrigation schemes leads to increase of application by farmers, who are anxious for new schemes. However, it should be mentioned that increase of the schemes might cause disorderly water use along the Meki river. Without an optimum water resources development plan, it is risky to implement any large-scale development within the basin. Simultaneously, the government agencies including OIDA are needed to be involved in monitoring of water use in the existing and new schemes.

(4) Quality of irrigation facilities

It is observed that construction of some irrigation facilities is not made in accordance with design and technical specification. Compaction of canal bunds as well as night ponds is not carried out satisfactorily, and could cause heavy water leakage from them. As seen in the Dodicha Irrigation Scheme, the WUA members are reluctant to take over the responsibility of operation and maintenance of the scheme due to low quality of some of the facilities. The quality control system of OIDA, therefore, including field inspection, field measurement shall need strengthening so that the facilities could be handed-over to WUA successfully, and proper management could be ensured from WUA.

(5) Issues toward sustainable irrigation farming

OIDA staff pointed out that constraints for sustainable irrigation farming are insufficient awareness on scheme management, conflict on land holding, insufficient fund for farming, and unsatisfactory support system to farmers in terms of scheme management. OIDA staff is requested to inform the difficulty of irrigation farming through an awareness creation program. Further responsibilities of OIDA and farmers should be presented clearly in order to mitigate conflict after completion of the construction works.

(6) Communication gap between farmers and the government staff

It is observed that there is a communication gap between farmers and the government officials in terms of determination of command area and responsibilities of the two parties. The government officials were supposed to have had enough discussions with the farmers during the planning and implementation periods. This fact suggests that strengthening of communication between farmers and the government, as well as awareness creation program to farmers should be implemented.

(7) Land holding issue

It is pointed out that land holding is major prevailing constraint for irrigation development. Numbers of small-scale landowners with a small number of large-scale landowners could cause difficulty for censuses for delineation of irrigated lands. The large-scale landowners tend to entrust their farmlands to cultivators living out of the community, and are reluctant to share their land to the small-scale

landowners. This situation may cause conflict among the community and a decline of the irrigation scheme. It is also commented that the land issue derives from unsatisfactory legislation in terms of land and water rights.

(8) Fund arrangement for farming and scheme management

The maintenance works are being executed by members' labour contribution to the some extents. However, it is understood that the lack of the O&M fund is the most constraint in existing irrigation schemes. In the existing schemes, in fact, it is broadly observed that the farmers are reluctant or cannot afford to pay the maintenance cost. Moreover, creation of funds for farming will also be key issue for sustainable irrigation farming. Although the present funding sources do not cover the running cost, some attempts for seeking financial assistance during the initial period would be needed so as to run schemes successfully. However, the experience in the Oda Bokota scheme suggests that full support for the agricultural input to the farmers could spoil farmers' self-reliance. The farmers are expected to arrange the fund by themselves. As one of measures to tackle the issue, it is worth while considering payment for labour wages during construction period in stead of contribution of free labour force.

(9) Capacities for operation and maintenance by farmers

At present, farmers are trained on how to operate and maintain an irrigation scheme at the time of its hand-over. After the hand-over, the activities are carried out by farmers with the assistance of the government staff. However, the staff have an insufficient practical knowledge on water management including estimating water demand, method of gate operation, interval of irrigation, and monitoring and evaluation of water use. Therefore, these technologies are not transferred to the farmers, resulting in overuse of water resources. The capacity raising for the staff is urgently required so as to permit the farmers to proceed with optimum water management and to efficiently use available but limited water resources.

(10) Conflict management among farmers

Even in the Areta Chufa Irrigation Scheme in Arsi, where the management by the farmers is done well to some extent, uneven water distribution and illicit water tapping are reported to take place due to insufficient conflict management mechanism among the farmers. Further, some facilities are not functioning well due to lack of awareness of maintenance work. The DA residing in the scheme will be expected to act as a catalyst to enhance the function of conflict management within WUAs.

3.2 Constraints in Implementing Procedure of Irrigation Schemes by OIDA

(1) Needs to enhance the engineers' capacity for planning and design

Through discussion with engineers in OIDA, in terms of planning and design of irrigation schemes, special attention should be required to enhance their capacity in

the fields of hydrological study and design of structures, particularly for diversion weirs.

As for hydrological studies, especially on a small stream with a small catchment with very few measured records of discharge are available, it is difficult to assess the water potential in the basin. Estimated annual flow yields are based on intermittent measured data collected with a limited number of measuring equipment. It is noted that performance of existing irrigation schemes could be improved through proper hydrological analysis.

In connection with the structural design, it is noted that some structures do not serve their function successfully due to inadequate attention given to soil and geological conditions. Although guidelines for design work are available, manuals showing detail procedure of the design supported with worked examples, are needed to improve the engineers' capacity for design works.

(2) Needs to enhance capacity of social workers

A workshop with OIDA's social workers was held on 5th and 6th of July 2001 in order to evaluate their capacity of community mobilization and to interview their needs for the revised guideline. 9 social workers in the head office and 4 branch offices were present on the workshop.

Although they have experience of community mobilization for planning, design, construction, and operation and maintenance stages to some extents, their performances tend to depend on personal experience.

It is necessary for social works to get broad knowledge and information for irrigation farming, especially cost – benefit analysis of agricultural crops, e.g., benefit, production cost, and even – break point.

Further special care should be given to preparation of by-law and financial management to strengthen WUA management capacity in cooperation with the Bureau of Co-operatives.

(3) Needs to prepare criteria for project implementation

The application for construction of a new irrigation scheme managed by farmers is evaluated in the design and study team in the branch office and is approved by the head of the study and design department in the head office for budgetary arrangement. Similarly, the maintenance work, which is beyond the WUA's capacity, will be conducted by OIDA upon their request. The application for the maintenance work is evaluated in the branch office and approved by the head of the extension and water management department in the head office for budgetary arrangement. It is noted that criteria for project selection and prioritisation should be prepared for proper and transparent project program formulation.

(4) Needs of administration capacity to manage external resources

In recent years, opportunities to entrust planning and design works to foreign consultants have increased with the expansion of works. Thus, the capacity to manage them would be strengthened. This includes preparation of terms of reference, and methods to monitor their performance. Further, construction management and contract administration, including preparation and interpretation of general and technical specifications, monitoring of physical and financial progress, and quality control, should also be built-up as construction works will be carried out by private contractors instead of on OIDA's force account.

(5) Needs to establish monitoring and evaluation system

A guideline to monitor and evaluate performance of the existing irrigation scheme should be established in terms of technical and institutional points of view. To ensure smooth progress of the works, a reporting system with data collection and compilation method shall be set up between the head office and the branch offices. The data needed for monitoring and evaluation shall be updated regularly to enable the branch offices to forward latest information whenever the head office requires them.

(6) Needs of participatory planning approach

At present, the team of community mobilisation in the branch office conducts an awareness programme for rural communities. It may be commented that not only the sociologist but also the engineers should have sufficient knowledge and field experience of participatory planning approaches, such as Rapid Rural Appraisal and Participatory Rural Appraisal. The farmers in the irrigation schemes need to be motivated by appropriate facilitation by both socialists and engineers.

Chapter 4 WATER RESOURCES POTENTIAL AND CONSTRAINTS

4.1 Basic Approach for Water Source Development

The agriculture activities in the study area have been constrained by erratic rainfall, resulting in low and unstable productivity. The Meki river has been exploited for the water source by the small-scale pump irrigation schemes. However, their beneficiaries are located only in areas near to the river and the Ziway Lake, and most of the peasants in the study area, who are having their land in other areas, are obliged to be in a unstable rainfed cultivation. In order to relieve the areas from the above circumstances, it is crucial to aim at a new water source development so that the land can be fed with water extensively.

There are two types of irrigation scheme; one is a pump irrigation scheme, and another is a gravity type irrigation scheme, in which water is abstracted by a diversion weir or a dam. As past lessons obtained from existing medium- and large-scale pump schemes are proved, the farmers' in these schemes could not afford the operation and maintenance cost, which have led to unsatisfactory performance of the schemes. It is obvious that a gravity type irrigation scheme has more advantage than a pump irrigation scheme in terms of schemes' sustainability.

In this chapter, potential and constraint for water resources development will be assessed, taking optimum use of existing water resource into consideration; the Meki river, as long as the development does not cause an adverse environmental effect on the river basin. The basic approach for formulation of the water source development plan is as follows:

- a) New irrigated area shall be fed by the gravity irrigation scheme, which water source is the Meki river,
- b) The possibility to construct a diversion weir or a dam on the Meki river shall be studied,
- c) A water balance model in the river basin shall be set, taking present water demand and existing hydrological data into account, and
- d) A water balance study shall be conducted so as to estimate an irrigable area, setting some development alternatives.

4.2 Candidate for New Water Sources

As discussed in the previous chapter, the Meki river is considered as a candidate for new water sources. The Meki river has an annual runoff as much as 290 million m³ in a year. The river also is featured by a considerable annual variation in runoff, reflecting rainfall pattern in its upstream reach. At the gauging station at Meki town, its mean monthly discharge is 9.2 m³/s, with a minimum monthly discharge of 0.90 m³/s in December, whereas it is 30 m³/s in August. It suggests that the Meki river could be expected as a new water source with double cropping irrigated

cultivation if a dam with a regulatory capacity is constructed. In other words, construction of a diversion weir may contribute mainly to supplemental irrigation in the rainy season.

The Study Team conducted the field investigation to seek locations of the water source facility, such as the diversion weir and the dam. The identified locations of the water resources are presented in Figure VI.4.1.

4.2.1 Proposed Diversion Weir Sites

Through the field investigation, two candidate sites for the diversion weir are identified on the Meki river. The alternatives for diversion weir sites are called by upstream plan and a downstream plan.

One candidate site as the upstream plan is located approximately 2 km upstream of the confluence point of the Meki river and Deke Neki river. The site is composed of tuff. The river cut a steep sided valley 30 to 40 m deep, forming a v-shaped valley with almost vertical or 1: 0.1 to 1: 0.2 side slope. The average gradients of the Meki river is 1/60, and the riverbed elevation is El. 1,710.0 m. Height of the weir would be 20 to 30 m from the river bed for the diversion of water. Further, since the site is located upstream, a head reach canal to convey water to the commanding area would be long, and deep-cut rock excavation works will be needed. The plan with the diversion weir ensures to irrigate high-elevated lands in the study area.

The another site for the downstream plan is located approximately 2.5 km upstream of Meki town. The river has cut a steep sided narrow gorge of 10 to 20 m deep. The average gradients of the Meki river is 1/500, and the riverbed elevation is El. 1655.0 m. Height of the weir would be 10 m from the riverbed. As the site is composed of lacustrine deposit, special attention would be paid for its foundation treatment and upstream river training to ensure stable the river course. This plan will make sure to irrigate land mainly below Meki town.

4.2.2 Proposed Dam Site

(1) Topography

The proposed dam site is located 48 km upstream from the Ziway Lake. The Meki river flows down on the plateau, forming a 30-40 m deep v-shaped valley with a width of some 1,000 m. The average gradient of the river is 1/600, and the riverbed elevation is El. 1,760.0 m. The abutment at the site is characterised by a steep slope with almost vertical or 1: 0.1 to 1: 10. Taking the topographic condition into consideration, it is possible to construct a dam with a height of 40m at the maximum.

(2) Lithology

The proposed dam site is covered by quarterly deposits specially pyroclastic deposits, such as welded tuffs, welded lapilli tuffs with a less percentage of unwelded tuff and

scoriaceous basalts, overlain by lacustrine deposits. Except the scoriaceous basalt which has been recovered in the right abutment of the drilled holes, all pyroclastic deposits are exposed on both banks of the Meki river. The left abutment is dominated by homogeneous welded lapilli tuffs while the right abutment is not for the fact that it is built from alternating layers of welded lapilli tuffs with welded tuffs which indicates a succession of deposit / flows. Geological section of the site is shown in Figure VI.4.2.

(3) Geological assessment

Series of SPT data taken in the boreholes at every and applicable depth of 1.0 m depicted that majority of the subsurface soils are in dense or hard state, ranging from 50 to 100. It can be said that the bearing capacity of the foundation is satisfactory for construction of the dam.

The water pressure tests are carried out in the sound rock layer of the boreholes to assess water tightness of the foundation. Results of the tests conducted in the boreholes with 15 m deep, indicated that the permeability coefficients are found at the range of 10^{-4} , equivalent to 15 lugeon. It is generally understood that the a foundation treatment, such as consolidation grout and curtain grout by cement milk, should be executed in order to improve permeability up to 10^{-6} (less than 5 lugeon). As long as the core drilling at the site is concerned, series of an impermeable rock were not observed on the abutments up to the depth of 20m. Though it is difficult to conclude the water tightness condition by a few tests, however, it can give a clue based on the obtained results, it is vital to point out that the test results shows need of large –scale foundation treatment. This fact could result in rising construction cost of the dam.

4.3 Water Balance Study

The objectives of the preliminary water balance study are to determine the optimum development scale for the irrigation area under the project and to maximise the irrigation benefits without significantly affecting the environment of the lakes system.

The water balance study linked with the Meki-Ziway-Abijata system was carried out under alternative cases (i) proposed dam and (ii) diversion dam on the Meki river. Based on the results of the water balance study, the evaluation of the potential irrigation area in the Meki Irrigation Project is made under the alternative conditions. Detail of the water balance study is presented in Appendix II.

Two alternative cropping patterns are taken for water balance study as shown below.

Cropping Pattern

Cropping Pattern	Cropping Intensity	Cropping Area (%)							
		Wet Season Crops				Dry Season Crops			
		Maize	Haricot B.	Wheat	Fruit	Wheat	Maize	Vegetables	Pulse
1.	105	33	30	35	2	2.5	-	2.5	-
2.	195	30	30	35	5	28.5	28.5	9.5	28.5

The monthly diversion requirements per 1000 ha for cropping intensity of 105% and 195% are presented in the following table.

Diversion Water Requirements

Cropping Intensity	Diversion Water Requirement (MCM/1000 ha)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
105%	0.15	0.12	0.19	0.17	0.12	0.67	0.93	1.28	2.22	1.13	0.08	0.05	7.11
195%	1.93	1.74	3.03	2.37	0.55	0.74	0.94	1.24	2.17	1.15	0.14	0.12	16.12

The water balance model is formulated based on the conceptual diagram of the water resources system that includes one storage/diversion dam, 3 lakes, and 5 rivers to supply water to the irrigation areas and Abijata Soda-Ash Enterprise. The computation of the water balance is performed on a monthly basis for a period of 21 years from 1979-1999.

Simulation study was carried out for the following four cases:

- Case 1 : Diversion Weir constructed on the Meki river
- Case 2 : Dam of 30 m height is constructed on the Meki river
- Case 3 : Dam of 35 m height is constructed on the Meki river
- Case 4 : Dam of 40 m height is constructed on the Meki river

The details of cases are summarized in the following table.

Case Study				
Case	Condition	Cropping Intensity (%)	Storage Capacity of Dam (MCM)	Dead Storage of Dam (MCM)
1.	Diversion Weir	105%	-	
2.	Dam (30 m height)	195%	78	25
3.	Dam (35 m height)	195%	125	25
4.	Dam (40 m height)	195%	170	25

The potential irrigation area is determined at 80% reliability under four alternative cases and presented in the following table.

Potential Irrigation Area					
Case	Condition	Cropping Intensity (%)	Potential Area (ha)	Total Irrigation Area (ha)	Reduction in Meki Flow to Ziway Lake (%)
1	Diversion Weir	105	2,300	2,415	5.4
2	Dam H=30m	195	4,700	9,165	29.7
3	Dam H=35m	195	8,000	15,600	48.4
4	Dam H=40m	195	9,400	18,330	57.1

The reduction in inflow to Ziway lake will result in reduction in water level of the

lake that will lead to reduction in Bulbula river outflow and the Abijata lake's water level. The effects of the Meki river water diversion on the downstream water resources system under different alternatives are presented in the following table.

Case	Condition	Reduction in Ziway Lake Storage (%)	Reduction in Outflow to Bulbula River (%)	Reduction in Abijata Lake Storage (%)	Reduction in Abijata Lake Area (%)
1.	Diversion Weir	1.6	8.0	5.1	2.0
2.	Dam H=30m	10.3	42.5	25.9	10.6
3.	Dam H=35m	19.6	66.4	37.5	17.1
4.	Dam H=40m	24.2	76.3	41.3	20.1

Higher dam heights significantly reduce the outflow to the Bulbula river and thereby, it will have significant affect on the water level of the Abijata lake. The reduction in fresh water will increase the alkalinity of the Abijata lake. The Abijata lake provides a feeding ground for Pelican, Flamingo and other birds, so they are also influenced by the reduction in water storage.

4.4 Conclusions and Recommendations

The following conclusions are made based on the water balance study results:

1. Any new irrigation development or expansion of the existing system on the Bulbula river could have serious environmental impacts on the Abijata lake as well as downstream reach of the river.
2. Irrigation development with diversion weir scheme mainly for wet season on the Meki river will have less adverse environment impacts.
3. There is a possibility of development 2,300 ha area with gravity irrigation for 105% cropping intensity on the Meki river.
4. The expansion of the Abijata Soda Ash Enterprise can cause reduction in water level of the lake, therefore it impacts should be carefully studied before any expansion.

The result of the water balance study revealed that irrigation development plan with the dam will have significant environmental impacts on the river basin.

Further, as indicated in section 4.2.2, it is predicted that construction of the dam needs the large-scale foundation treatment resulting in raising the cost.

It is, therefore, concluded that the plan with the diversion weir is adopted aiming at supplementary irrigation in the study area. The expected irrigable area is shown in Figures VI.4.3 and VI.4.4.

Recommendations on the future water resources development are as follows.

1. There is a need to monitor the Bulbula river discharge downstream of the Adami Tulu station and to set the maintenance flow to the Abijata lake based on the ecological requirements.
2. There is also a need to monitor the water use of various irrigation projects

located on the Ziway lake and Bulbula river and to develop water rights for each scheme.

3. A comparative study where to locate the diversion weir is recommended. The following table indicates comparison between the two alternatives.

Upstream Alternative	
Merits	Demerits
Relatively Reliable foundation	High-elevated weir
Stable river course	Much rock excavation along head reach
Downstream Alternative	
Merits	Demerits
Relative low-elevated weir	Relatively unstable foundation
Less excavation volume on a main canal	Unstable river course

The study includes geological investigation of the site, river morphology study on the Meki river, route survey for the headreach, and so on. Based on the results an optimum option is to be adopted taking into consideration technical and economical viewpoints.

Chapter 5 FRAMEWORK OF IRRIGATION DEVELOPMENT PLAN

5.1 Basic Concept

Based on the analysis of present condition of the study area and the potential study on water resources, a framework of irrigation development in the Master Plan with the target year of 2010 are set as follows:

- Gravity irrigation system is adopted for the new irrigation development. As the first phase of the development, the plan set the development area with a commanding area of 1000 ha, taking into consideration present organisation of OIDA.
- Strengthening programme of WUA is to be carried out in the existing and new pump irrigation schemes,
- The rehabilitation and improvement plan of the Meki-Ziway Irrigation scheme is not included in the master plan, but survey how to activate the scheme is recommended to be conducted urgently so as to utilise the present resources to the maximum extent

5.2 Components of Plan

Two sub-programmes are proposed, namely, WUA support programme, and Meki Irrigation and Rural Water Supply Project. The former is carried out to strengthen WUA through support to existing and new pumping irrigation scheme while the latter is to supply irrigation and domestic water in poverty area. The overall implementation schedule of them is shown below.

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
WUA Support Programme	Study & Design				Follow-up				
		Implementation							
Meki Irrigation and Rural Water Supply Project	Study & Design				Implementation				

Description of the sub-programmes is given in the proceeding chapters.

Chapter 6 WUA Support Programme

6.1 General

The purpose of the WUA support program is to strengthen WUA through support to existing and new pumping irrigation scheme. Target group is WUA and its members in small-scale irrigation schemes. A tentative implementation schedule of the program is as follows:

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
To existing WUA									
First Step		■							
To new Groups									
First Step		■							
Second Step			■	■					

The sub-programme is carried out with the following two steps:

First Step as institutional support

- Transfer of technology and support for O&M
- Institutional support for community development

Second Step as support for implementation and O&M

- Technical support and guidance for construction
- Transfer of technology and support for O&M

The expected outcome of the sub-programme is as follows:

- Strengthening of WUA's capacity
- Improvement of farmers' living standard and empowerment of WUA through participatory approach
- Improvement of OIDA's capacity for community development

6.2 Activities

6.2.1 Awareness creation by participatory approach

Purposes of an awareness creation program for farmers are:

- To inform responsibility of OIDA and WUA for project implementation
- To provide basic knowledge of the scheme management

Special attention shall be paid to land holding and financial issues in order to

achieve sustainable irrigation farming, such as issues land consolidation and exchange, saving of replacement cost of pump, and needs for group fund formation. Further, the farmers shall be aware of risk of irrigation farming, understanding marketing mechanism of agricultural product.

6.2.2 Capacity building for WUA establishment

(1) Selection of committee members

The committee is composed of the following members; Chairman, Secretary, Cashier, Auditor, and several committee members. Main tasks of the committee are (i) to prepare annual management plans and budget, (ii) to instruct and supervise activities implemented by the service section, (iii) to manage complaints and grievance from the farmers, (iv) to co-ordinate with other agencies and associates, and so on.

The chairman would make a good communication channel between OIDA staff and WUA, and co-ordinate the water delivery to all the canals. The cashier would collect the O&M fee from the farmers and keep financial records.

(2) Meeting and decision-making process

The general meeting is held at least annually, and has the following main activities:

- Election of the executive committee members and auditor,
- Approval of result of auditing,
- Approval of the annual management plan and budget,
- Determination of the amount of irrigation service charge,
- Revision of the contribution for the WUA management,
- Revision and enactment of articles and by-laws,
- Specific items requested by the members and committees, and so on.

(3) By-law and regulation

The establishment of articles and by-laws is essential for well functioning organisations as a legal body. They should be accepted and approved by the members of WUA. It will be necessary to prepare several standard articles and by-laws covering O&M of irrigation facilities with the relevant activities, so that WUAs can enact easily their own articles based on the standard one.

(4) Financial management (Book keeping and Audit)

The contribution money collected from the WUA members covers all necessary costs of the scheme management. The cost includes fuel and lubricants, allowance of a pump operator, and maintenance of the pump.

The cashier collects the money directly from the members, and the collected amount is deposited immediately in WUA's bank account. The cashier manages all these transactions, and auditors should check their collection.

The WUA committee is responsible for management and use of the fee. An auditor

is assigned apart from the executive committee. The auditor always checks the WUA's accounting including collection of the fee, and report those results at the general meeting.

6.2.3 Capacity Building for Scheme Construction

The irrigation canals shall be constructed by farmers' participation. OIDA staff would support WUA for design of facilities and technical guidance of construction.

6.2.4 Capacity Building for WUA Management

OIDA would support WUA for operation and maintenance of the irrigation facilities for the following aspects.

- Operation of pump
- Irrigation scheduling
- Water distribution to fields
- Regular maintenance of pump and irrigation canals
- Management of fuel and lubricant
- Deposit for replacement cost of the pump

As for crop production, capacities of WUA members shall be strengthened under guidance of OIDA for the following items:

- Selection of crops
- Decision of cropping schedule considering variation of marketing price of agricultural products
- Farming practice
- Cost analysis.

Chapter 7 MEKI IRRIGATION AND RURAL WATER SUPPLY PROJECT

7.1 General

Purpose of the Meki Irrigation and Rural Water Supply Project is to supply irrigation and domestic water in poverty area, targeting peasants residing in the Meki Area. The scheme is gravity type irrigation scheme construction a diversion weir in the Meki River. Tentative implementation schedule is shown below.

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mobilisation		▲						▲	
Awareness Creation		▨							
Survey, Planning & Design		▨	▨	▨					
Implementation					▨	▨	▨		
O & M of Irrigation Scheme								▨	▨

Main activities of the project consist of,

- Awareness creation and establishment of WUA
- Feasibility study
- Detailed design
- Implementation
- Operation and Maintenance

The expected outcome of the sub-programme is as follows:

- Increase of agricultural products
- Improvement of access to domestic water
- Living standard improvement and empowerment of WUA through participatory approach
- Improvement of OIDA's capacity for engineering and community development

For smooth implementation of the sub-programme, the following programmes should be functioned properly:

- Environmental monitoring programme
- Capacity building programme for OIDA staff
- Capacity building programme OIDA participatory development staff

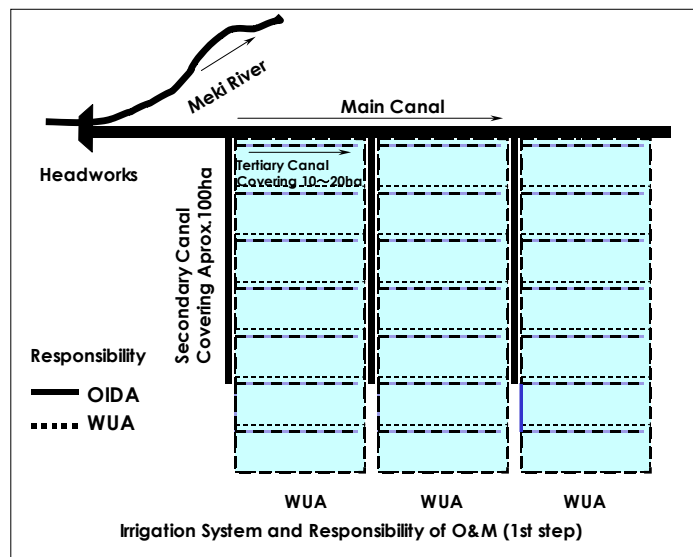
7.2 Basic Approach

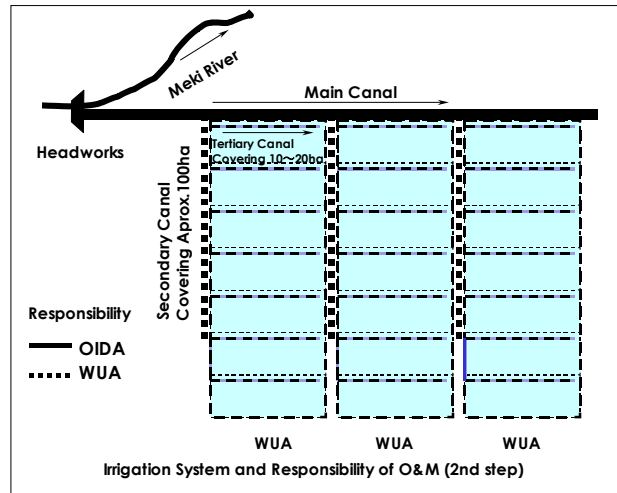
The irrigation development plan shall be formulated taking into consideration the lessons learned aiming to a sustainable irrigation system. A special focus shall be

given to the following matters:

- The canal systems which conveys irrigation water to fields through main, secondary, and tertiary canals would be designed as much as possible for easy water management
- Irrigation and drainage facilities would be provided for easy operation and maintenance by WUA
- Sufficient periods for awareness creation with participatory approach are to be taken for obtaining the farmers' consensus
- WUA should be organised based on traditional communities
- Periodically WUA's consensus for the programme shall be obtained
- Responsibility of O&M for both OIDA and WUA is specified clearly
- A stepwise handover of O&M responsibility is conducted taking into consideration capacity of WUA
- WUA should contribute to construction of tertiary canals

A schematic layout of the irrigation scheme with responsibility of O&M is presented as follows:





7.3 Awareness Creation Programme




7.3.1 General

In accordance with the policy of participatory management of the Project, OIDA is now handing over the responsibility of O&M to WUA. WUA is requested to play more important role for the participatory management of the Project including not only O&M of on-farm irrigation facilities but also supporting services for agriculture and community development.

Under such circumstances, securing further development and sustainability of the Project largely depend on the strengthening of the farmers' organisations. Accordingly, the immediate urgent matter to be implemented in the Project is the strengthening of the WUA to have enough capacity to carry out relevant activities including O&M of secondary and tertiary canals and supporting services by themselves, and to accelerate practical turnover programme.

In principle, present WUA established in the existing area would be applied to the Project area. Further, it is proposed that such additional sections, as a service section and an auditor, would be established considering future work coverage of WUA.

The implementation schedule of the awareness creation programme is as follows

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
Preparation of Community Resource Map									
Awareness Creation for Farmers									
Institutional Set-up of WUA									

7.3.2 Preparation of Community Resource Map

There should be various characteristics among the settler groups in terms of place of origin, maturity of their community, and experience of agriculture and farmers' group. Therefore, it is proposed that a data and information for the farmers will be compiled based on the data and information obtained from documents for settler selection, and additional interviews to the settlers, if necessary. Further, it is proposed to let farmers to prepare a community resource map, indicating boundary of community, location of land and water source in the community, land holding and tenure, and so on. It will also enable farmers to understand the present condition and constraints of their community.

7.3.3 Awareness Creation

(1) Workshop

It should be stressed that the awareness programme for the government officer as well as the farmers should be carefully implemented to let them the importance of water management and maintenance by farmers themselves. The programme will be carried out in two steps.

First, the programme for the government officer will be carried out in order to let them understand the participatory planning approach, and method and attitude to communicate with the farmers with a proper manner.

Consequently, the workshops, in which the officers, the external staff, and the farmers participate, are held so that the farmers are aware of the importance of water management and maintenance of the secondary and tertiary canals, which should be carried out by WUAs themselves. The following issues would be taken into consideration in terms of above:

- irrigation schedules and methods,
- attendance to WUA meeting,
- attendance to preventive maintenance activities,
- participation in maintenance work of irrigation facilities.

- paying O&M fee, and
- participation in training course undertaken by OIDA.

(2) Awareness of WUA's Responsibility

The water management of irrigation system is handed over to the farmers organisations, which is covered by tertiary canals. The water management handed over to the organisation includes the following works.

- Water distribution
- Management of maintenance work
- Repair and maintenance of structure
- Collection of O&M fee

7.3.4 Institutional Set-up of WUA

In principle, the same procedures as those described in section 6.2.2 are employed in the institutional set-up of WUA.

7.4 Survey, Investigation and Design

The activities during the survey, investigation and design period are listed below.

Feasibility Study

- Mapping
- Field Investigation with farmers
- Formulation of Development Plan
- Environmental Impact Assessment
- Discussion with farmers

Detailed Design

- Field Investigation with farmers
- Formulation of Definite development plan
- Workshop with WUA
- Cost estimate and final development plan

Agreement of Cost sharing and O&M Responsibility of WUA

Pre-Implementation Activities

- Tender and its evaluation
- Guidance to WUA for land development and construction
- Support to WUA for preparation of action plan during implementation period

Implementation Schedule during Survey, Planning & Design Period is shown below

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
Description of work									
Feasibility Study (F/S)		■							
Detailed Design (D/D)			■						
Pre-Implementation Activities				■					

In order to promote farmers' participation in the construction of irrigation and drainage facilities, the following procedure will be followed:

- Guidance on participatory planning for the farmers
- Survey and Investigation in co-operation with farmers
- Workshops with farmers to formulate rehabilitation and improvement plans
- Detailed design and cost estimate by OIDA
- Agreement on implementation of work with farmers
- Tendering & Contract
- Training on construction management for farmers for proper monitoring of the work
- Agreement on farmers' contribution to construction work

7.5 Implementation

The construction works for irrigation and drainage facilities, such as headworks, and main, secondary, and tertiary irrigation canal system as well as land development of commanding area with an extent of 1000 ha, would be carried out in the following chart.

Phase	Phase-I				Phase-II				
	2002	2003	2004	2005	2006	2007	2008	2009	2010
Description of work									
Preparatory Works					■				
Headworks					■				
Main Canal					■				
Secondary & Tertiary Canals						■			
Land Development by WUA						■			
Joint Meeting by OIDA and WUA							■		
Hand-over of O&M Responsibility to WUA								▲	

The estimated period for the works is three years including mobilisation works. The progress of the construction works will be monitored by the construction management team of OIDA to grasp overall status of the programmes. The data are:

- a) Overall progress of construction of scheme facilities,
- b) Quality of construction works done by both OIDA and WUA, and
- c) Cost invested to the programmes.

In line with the concept for the participatory approach, the construction works for the tertiary canals will be contracted out to WUA as much as possible, with some of the costs covered by them providing labour. In such case, it will be required that the government staff would takes necessary quality control measures to keep the works implemented by farmers up to a normally acceptable level.

The quality of the farmer's construction works will be monitored with those progress through the monitoring system. Then, based upon the result of monitoring and evaluation, necessary technical guidance will be provided to farmers' organisations during the rehabilitation works.

7.5.3 Turnover Process of Facilities

The following steps are to be taken so that irrigation facilities can be handed over to the satisfaction of farmers:

- Joint inspection by the government officials and farmers to identify defects made by the contractor,
- Rectification work, if any,
- Preparation of documents for the hand-over, such as agreement, irrigation diagram, maps, and so on,
- Hand-over of facilities to farmers.

7.6 Operation and Maintenance

After completion of construction works, operation and maintenance of the scheme commences as shown in the following chart.

Phase	Phase-I				Phase-II					
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Establishment of Project Management Office							▲			
First Step of O&M										
Second Step of O&M										

The responsibilities of O&M in the schemes should be handed over gradually to WUA. It should be stressed that WUA can not bear all O&M activities from both technical and economical viewpoints. The responsibilities of O&M are to be shared by both OIDA and WUA as proposed below.

Responsibilities of O&M

Description	1 st stage	2 nd stage
Water Distribution		
- Headwork Sluice	OIDA	OIDA
- Main Canal Gate	OIDA	OIDA
- Secondary Canals Gate	OIDA	WUA
- Tertiary Canals	WUA	WUA
Maintenance		
- Headworks	OIDA	OIDA
- Main Canal	OIDA	OIDA
- Secondary Canals	OIDA	OIDA/ WUA
- Tertiary Canals	WUA	WUA

The stepwise turnover is carried out carefully taking progress of outstanding works and capability of the farmers' organisation into account. The documents necessary for the turnover, such as description of the canals with their related structures, water issue trees, shall be compiled by the engineers attached to the OIDA offices.

The undertaking of the both parties for each stage is,

1st step of O&M

Undertaking of OIDA

- Irrigation scheduling and planning
- O&M of headworks
- O&M of main & Secondary canals
- Monitoring and evaluation of Irrigation performance
- Support to O&M activities of WUA
- Support to establish the Federal WUA

Undertaking of WUA

- O&M of tertiary canals

2nd step of O&M

Undertaking of OIDA

- Irrigation scheduling and planning
- O&M of headworks and Main canal
- Maintenance of structures on secondary canals
- Monitoring and evaluation of Irrigation performance
- Support to O&M activities of WUA and Federal WUA

Undertaking of WUA

- O&M of secondary and tertiary canals
- Maintenance of earthworks on secondary canals

APPENDIX VI
IRRIGATION DEVELOPMENT

Tables

Table VI 1.1 List of Existing Irrigation Schemes in Oromia Region 1 / 3

Name of Scheme	Branch Office	Location		Command Area Development			Number of Beneficiaries			Construction Year (Completed)	WUA Status	Water Sources	Intake Structure
		Zone	District	Plan	Actual	%	Plan	Actual	%				
1 Kujur	Western Branch	W. Walaga	Najo	57.00	0.00	0.0	110	0	0.0	1998	D	River	Headworks
2 Borta			Sayo	40.00	7.00	17.5	120	31	25.8	1996	D	River	Headworks
3 Bondo			Sayo	50.00	8.00	16.0	150	25	16.7	1995	D	River	Headworks
4 Degaro			Nadijo	120.00	28.00	23.3	296	120	40.5	1997	D	River	Headworks
5 Gi'I			Gimbi	60.00	7.50	12.5	228	26	11.4	1996	D	River	Headworks
6 Sokoru			Rharasibu	30.00	25.00	83.3	267	37	13.9	1997	C	River	Headworks
7 Waja		E. Walaga	Limu	25.00	24.75	99.0	200	198	99.0	1996	D	River	Headworks
8 Dhangago-01			Jima-Rare	30.00	21.40	71.3	253	129	51.0	1995	C	River	Headworks
9 Jato-01			Jima-Rare	54.00	45.90	85.0	515	419	81.4	1994	D	River	Headworks
10 Gambela Tare			Guto-Wayu	150.00	58.80	39.2	235	86	36.6	1994	D	River	Headworks
11 Negeso			Bila-Sayo	30.00	30.00	100.0	128	160	125.0	1997	B	River	Headworks
12 Abono-02			Jima-Arjo	80.00	66.50	83.1	248	160	64.5	1995	B	River	Headworks
13 Tate			Leka-Dulacha	20.00	0.00	0.0	75	0	0.0	1993	In Active	River	Headworks
14 Jato-02			Guto-Wayu	60.00	0.00	0.0	157	0	0.0	1997	D	River	Headworks
15 Dhangago-02			Guto-Wayu	20.00	0.00	0.0	162	0	0.0	1997	D	River	Headworks
16 Gibe Lamu-01			Jima-Rare	53.00	53.00	100.0	250	54	21.6	1995	B	River	Headworks
17 Gibe Lamu-02			Bila-Sayo	60.00	23.40	39.0	250	37	14.8	1996	D	River	Headworks
18 Jare			Bila-Sayo	40.00	0.00	0.0	112	0	0.0	1998	In Active	River	Headworks
19 Koba Guda		Ilu Aba Bora	Gachi-Boracho	56.00	0.00	0.0	57	0	0.0	1996	In Active	River	Headworks
20 Nada Guda		Jima	Omo-Nada	120.00	31.00	25.8	340	48	14.1	1997	D	River	Headworks
21 Kawa			Dedo	120.00	54.00	45.0	270	54	20.0	1997	D	River	Headworks
22 Birbirsa			Qarsa	70.00	5.20	7.4	150	52	34.7	1997	D	River	Headworks
23 Abono			Sayo Chokorsa	160.00	0.00	0.0	300	0	0.0	1994	In Active	River	Headworks
24 Waro			Dedo	180.00	25.00	13.9	300	40	13.3	1996	D	River	Headworks
25 Arara-01	Eastern Branch	E. Harar	Kersa	40.00	50.00	125.0	276	276	100.0	1994	B	Spring	Headworks
26 Arara-02			Kersa	25.00	25.00	100.0	100	100	100.0	1994	B	Spring	Headworks
27 Babi Ali			Deder	46.00	60.00	130.4	130	220	169.2	1994	B	Spring	Headworks
28 Burka Deneba			Gurawa	76.00	76.00	100.0	215	216	100.5	1997	B	Spring	Headworks
29 Chulul			Goro Gutu	75.00	64.22	85.6	275	256	93.1	1996	C	Spring	Headworks
30 Erer Meda Talila			Deder	100.00	100.00	100.0	550	550	100.0	1995	B	Spring	Headworks
31 Galan Sadi			Melka Balc	100.00	100.00	100.0	360	360	100.0	1995	B	Spring	Headworks
32 Jarjartu			Gurawa	60.00	36.00	60.0	240	240	100.0	1996	B	River	Headworks
33 Mudana Silo			Gurawa	51.00	56.00	109.8	120	175	145.8	1998	B	Spring	Headworks
34 Melba			Meta	51.00	43.68	85.6	107	107	100.0	1998	B	Spring	Headworks
35 Ramis			Gurawa	60.00	51.00	85.0	273	273	100.0	1996	B	River	Headworks
36 Burka Burbursa			Deder	40.00	0.00	0.0	100	0	0.0	1995	In Active	Spring	Headworks
37 Said Ali			Kersa	46.00	71.00	154.3	160	270	168.8	1994	B	Spring	Headworks
38 Water-01			Kersa	60.00	60.00	100.0	130	130	100.0	1993	B	Spring	Headworks
39 Water-02	Eastern Branch	E. Harar	Kersa	71.00	60.00	84.5	150	150	100.0	1994	B	Spring	Headworks
40 Water-03			Kersa	40.00	40.00	100.0	260	260	100.0	1995	B	River	Headworks
41 Harewo			Meta	40.00	15.00	37.5	133	60	45.1	1995	B	Spring	Headworks
42 Amir Nur Decho		W. Harar	Tulo	40.00	17.00	42.5	80	28	35.0	1994	B	Spring	Headworks
43 Chafe Gurati			Tulo	60.00	34.75	57.9	86	139	161.6	1995	B	River	Headworks
44 Hirna			Tulo	70.00	40.00	57.1	80	63	78.8	1994	C	River	Headworks
45 Homicho			Bedesa	375.00	212.00	56.5	600	200	33.3	1991	D	River	Headworks

Table VI 1.1 List of Existing Irrigation Schemes in Oromia Region 2 / 3

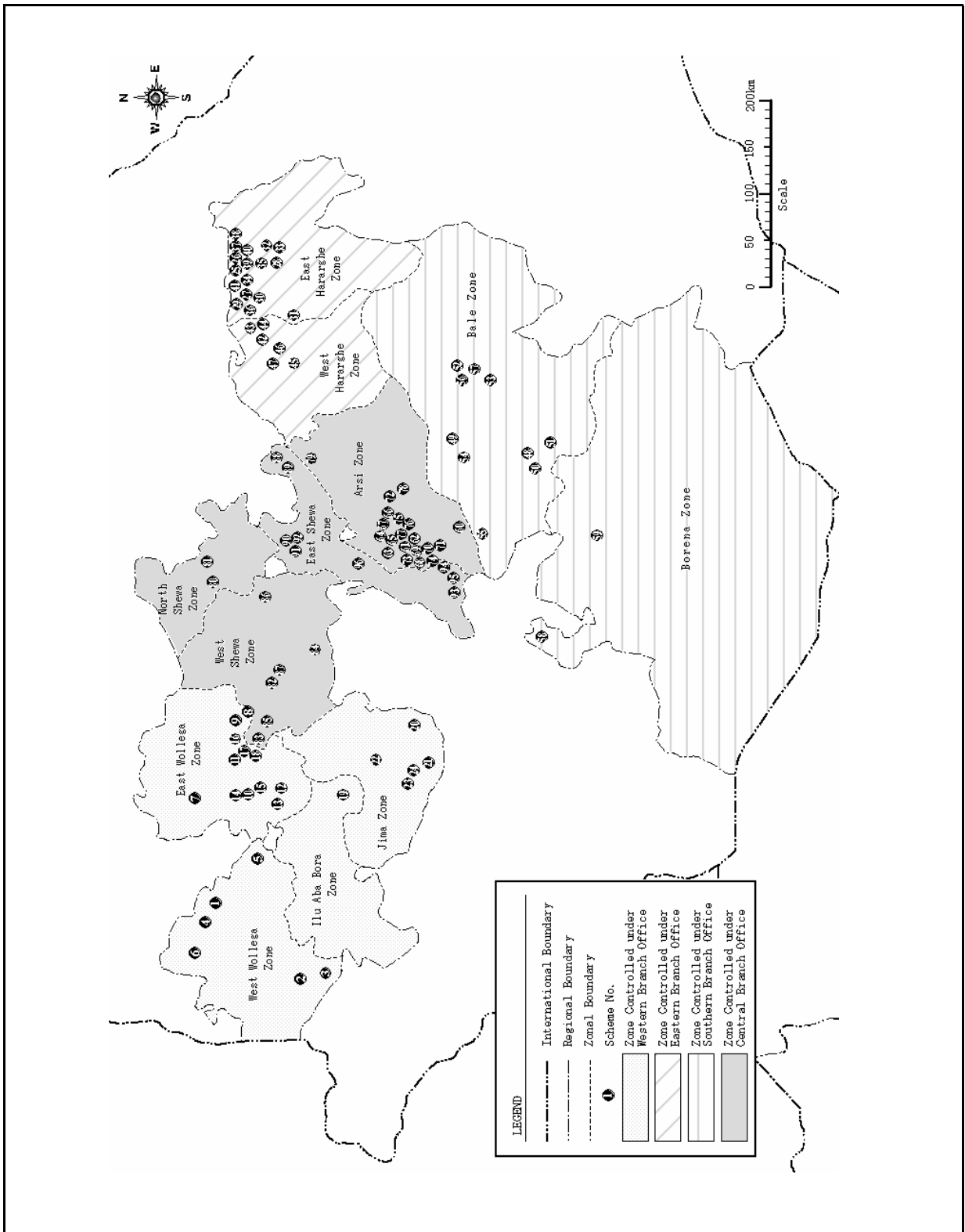
Name of Scheme	Branch Office	Location		Command Area Development			Number of Beneficiaries			Construction Year (Completed)	WUA Status	Water Sources	Intake Structure
		Zone	District	Plan	Actual	%	Plan	Actual	%				
46 Kaseheja			Chiro	187.00	139.00	74.3	748	556	74.3	1992	D	River	Headworks
47 Midhagudu			Tulo	235.00	105.25	44.8	250	53	21.2	1997	D	River	Headworks
48 Haya Oda	Southren Branch	Bale	Mana Angetu	100.00	96.04	96.0	220	178	80.9	1995	B	River	Headworks
49 Hora Boka			Sinana Dinsho	32.00	0.00	0.0	183	0	0.0	1983	In Active	River	Free Intake
50 Gomgoma			Mana Angetu	71.00	51.00	71.8	156	182	116.7	1994	C	River	Headworks
51 Chiri			Mana Angetu	50.00	50.00	100.0	140	152	108.6	1994	B	River	Headworks
52 Dinki			Ginir	200.00	168.75	84.4	450	265	58.9	1997	B	River	Headworks
53 Melko Buta			Goro	85.00	0.00	0.0	340	0	0.0	1984	In Active	River	Headworks
54 Shaya			Sinana Dinsho	230.00	0.00	0.0	271	0	0.0	1987	In Active	River	Headworks
55 Ukuma			Dodola	100.00	0.00	0.0	400	0	0.0	1997	In Active	River	Headworks
56 Arada Tare			Ginir	120.00	120.00	100.0	288	300	104.2	1996	B	River	Headworks
57 Oda-Roba			Ginir	70.00	70.00	100.0	120	200	166.7	1997	B	River	Headworks
58 Melka Hida		Borana	Galana-Abaya	70.00	0.00	0.0	136	0	0.0	1998	In Active	River	Headworks
59 Abeda Chambe			Adola	60.00	0.00	0.0	200	0	0.0	1996	In Active	River	Headworks
60 Kawa	Central Branch	Arsi	Gedeb	200.00	20.00	10.0	500	80	16.0	1985	C	River	Pump & Headworks
61 Meti Metana			Nunesa	40.00	30.40	76.0	160	140	87.5	1993	C	River	Headworks
62 Sadi Sadi			Nunesa	60.00	49.80	83.0	221	221	100.0	1995	C	Spring	Headworks
63 Arata Chufa			Zuway Dugda	100.00	100.00	100.0	317	317	100.0	1993	A	River	Headworks
64 Shalad-01			Tiyo	50.00	47.00	94.0	196	184	93.9	1995	A	Spring	Headworks
65 Shalad-02			Tiyo	25.00	0.00	0.0	100	0	0.0	1995	Not Active	Spring	Headworks
66 Bosha-01			Tiyo	100.00	80.00	80.0	233	320	137.3	1993	C	Spring	Headworks
67 Bosha-02			Tiyo	60.00	35.00	58.3	220	140	63.6	1994	C	Spring	Headworks
68 Shobo			Munesa	100.00	60.00	60.0	279	270	96.8	1993	C	Spring	Headworks
69 Gedamso-01			Munesa	80.00	57.60	72.0	250	73	29.2	1996	C	River	Headworks
70 Gedamso-02			Munesa	90.00	9.90	11.0	320	20	6.3	1997	C	River	Headworks
71 Lafa			Munesa	80.00	63.50	79.4	150	140	93.3	1997	C	River	Headworks
72 Sole Bakekise			Tena	100.00	40.00	40.0	300	150	50.0	1998	C	River	Headworks
73 Delali Sambaru			Munesa	60.00	40.00	66.7	160	164	102.5	1993	B	River	Headworks
74 Dagaga Sambaro			Munesa	40.00	20.00	50.0	60	40	66.7	1996	B	River	Headworks
75 Katar-01			Tiyo	100.00	100.00	100.0	400	120	30.0	1987	D	River	Headworks
76 Katar-02			Tiyo	130.00	43.00	33.1	200	200	100.0	1993	D	River	Headworks
77 Katar-03	Central Branch	Arsi	Tiyo	90.00	0.00	0.0	360	0	0.0	1992	Not Active	River	Headworks
78 Hasen Usman			Tena	230.00	280.00	121.7	527	1,000	189.8	1994	B	River	Headworks
79 Homba			Merti	100.00	10.00	10.0	400	40	10.0	-	C	River	Headworks
80 Teltele		N. Shoa	Detre Libanes	90.00	144.90	161.0	418	220	52.6	1996	C	Spring	Headworks
81 Lami			Yaya Gulale	30.00	56.20	187.3	200	225	112.5	1996	B	Spring	Headworks
82 Indris		w. Shoa	Ambo	175.00	380.00	217.1	875	1,087	124.2	1993	B	River	Headworks
83 Laku			Bako-Tibe	50.00	6.00	12.0	40	9	22.5	1994	D	River	Headworks
84 Walga			Wanchi & Walisc	150.00	517.50	345.0	637	1,070	168.0	1998	B	River	Headworks
85 Walshamo			Chaliya	50.00	0.00	0.0	160	0	0.0	1995	D	River	Headworks
86 Robi			Meta Robi	120.00	123.00	102.5	410	410	100.0	1998	C	River	Headworks
87 Chole			Ambo	100.00	200.00	200.0	464	500	107.8	1996	B	River	Headworks
88 Lugo		E. Shoa	Fentale	57.00	53.00	93.0	70	64	91.4	1996	B	River	Headworks
89 Sogido Bandira-01,02			Fentale	140.00	110.00	78.6	117	65	55.6	1998	C	River	Headworks
90 Godino			Adama	219.00	183.00	83.6	270	182	67.4	1996	C	River	Dam

Table VI 1.1 List of Existing Irrigation Schemes in Oromia Region 3 / 3

Name of Scheme	Branch Office	Location		Command Area Development			Number of Beneficiaries			Construction Year (Completed)	WUA Status	Water Sources	Intake Structure
		Zone	District	Plan	Actual	%	Plan	Actual	%				
91 Balbala			Adama	100.00	42.00	42.0	400	182	45.5	1996	C	River	Dam
92 Fultino			Adama	85.00	33.00	38.8	182	165	90.7	1998	C	River	Dam
93 Lafu			Shashamene	30.00	2.50	8.3	60	14	23.3	1996	D	River	Headworks
94 Kararo Arsi			Arsi Negele	42.00	38.00	90.5	253	85	33.6	1990	B	River	Headworks
95 Tiliku Debeda			Arsi Negele	50.00	25.40	50.8	200	101	50.5	1995	D	River	Headworks
96 Meki-Zway			Meki & Duguda-Bora	1,500.00	33.00	2.2	3,375	132	3.9	1984	D	Lake	Pump
Total				9,644.00	5,559.84	57.7	26,984	15,765	58.4				
Average				100.46	57.92	-	281	164	-				
Maximum				1,500.00	517.50	-	3,375	1,087	-				
Minimum				20.00	0.00	-	40	0	-				

APPENDIX VI
IRRIGATION DEVELOPMENT

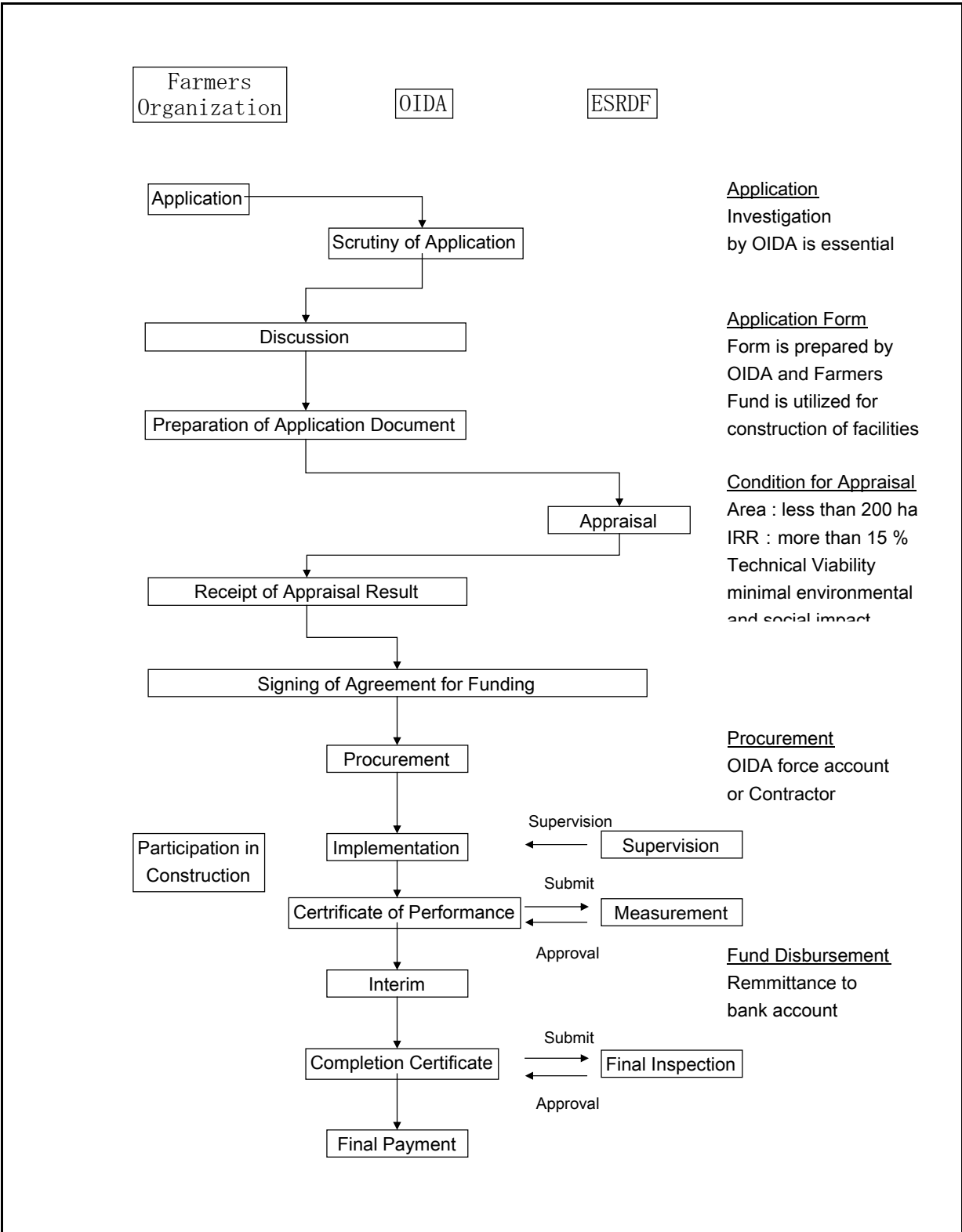
Figures



The Study for
 Meki Irrigation and Rural Development Project
 in Oromia Region, Ethiopia

Japan International Cooperation Agency

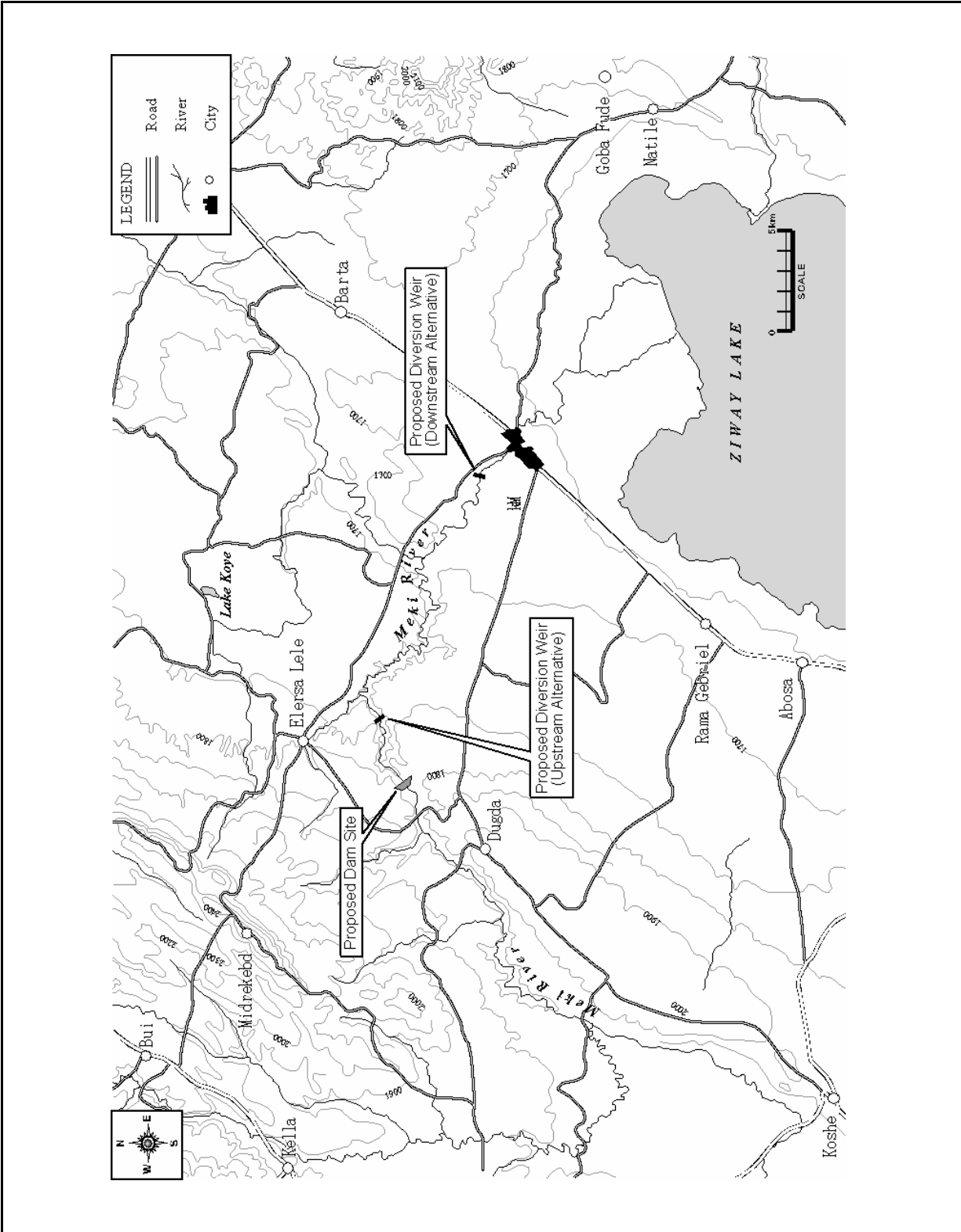
Figure VI.1.1
 Location of the Existing Irrigation Schemes
 in Oromia Region



The Study for
Meki Irrigation and Rural Development Project
in Oromia Region, Ethiopia

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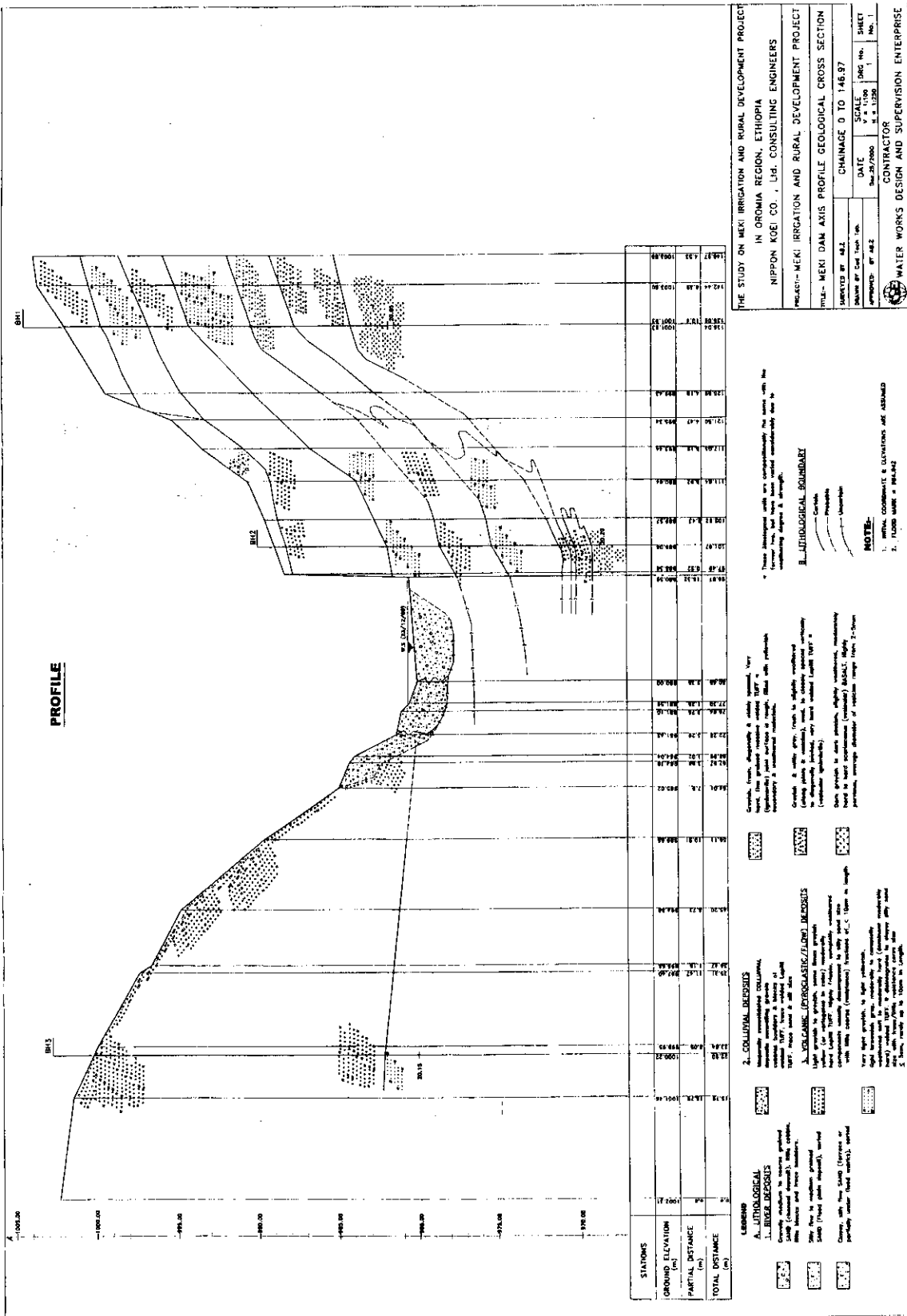
Figure VI.1.2
Work Flow of ESRDF-assisted
Small-scale Irrigation Development Project



The Study for
 Meki Irrigation and Rural Development Project
 in Oromia Region, Ethiopia

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Figure VI.4.1
 Location of Candidate Water Resources
 Facility

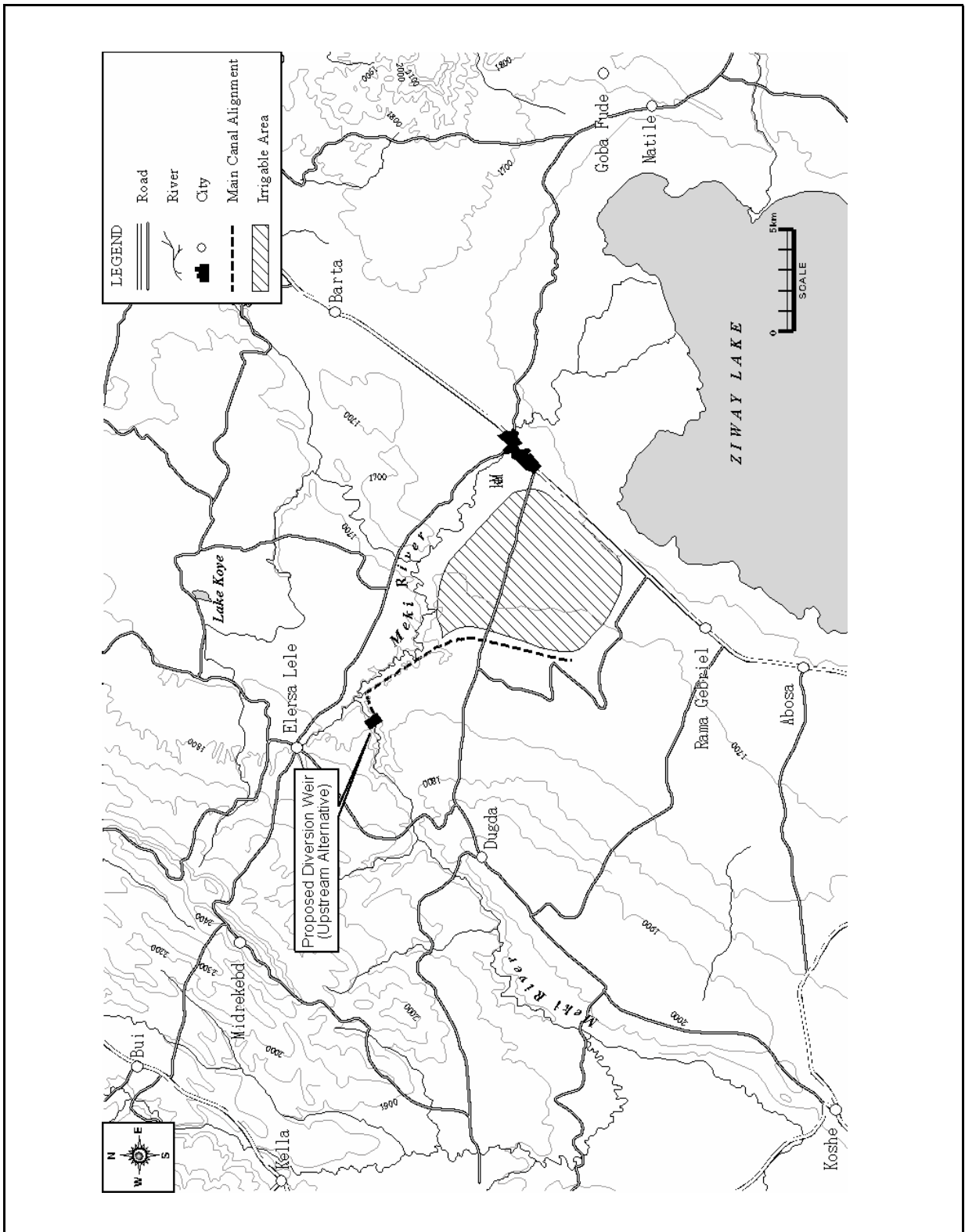


The Study for
 Meki Irrigation and Rural Development Project
 in Oromia Region, Ethiopia

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Figure VI.4.2

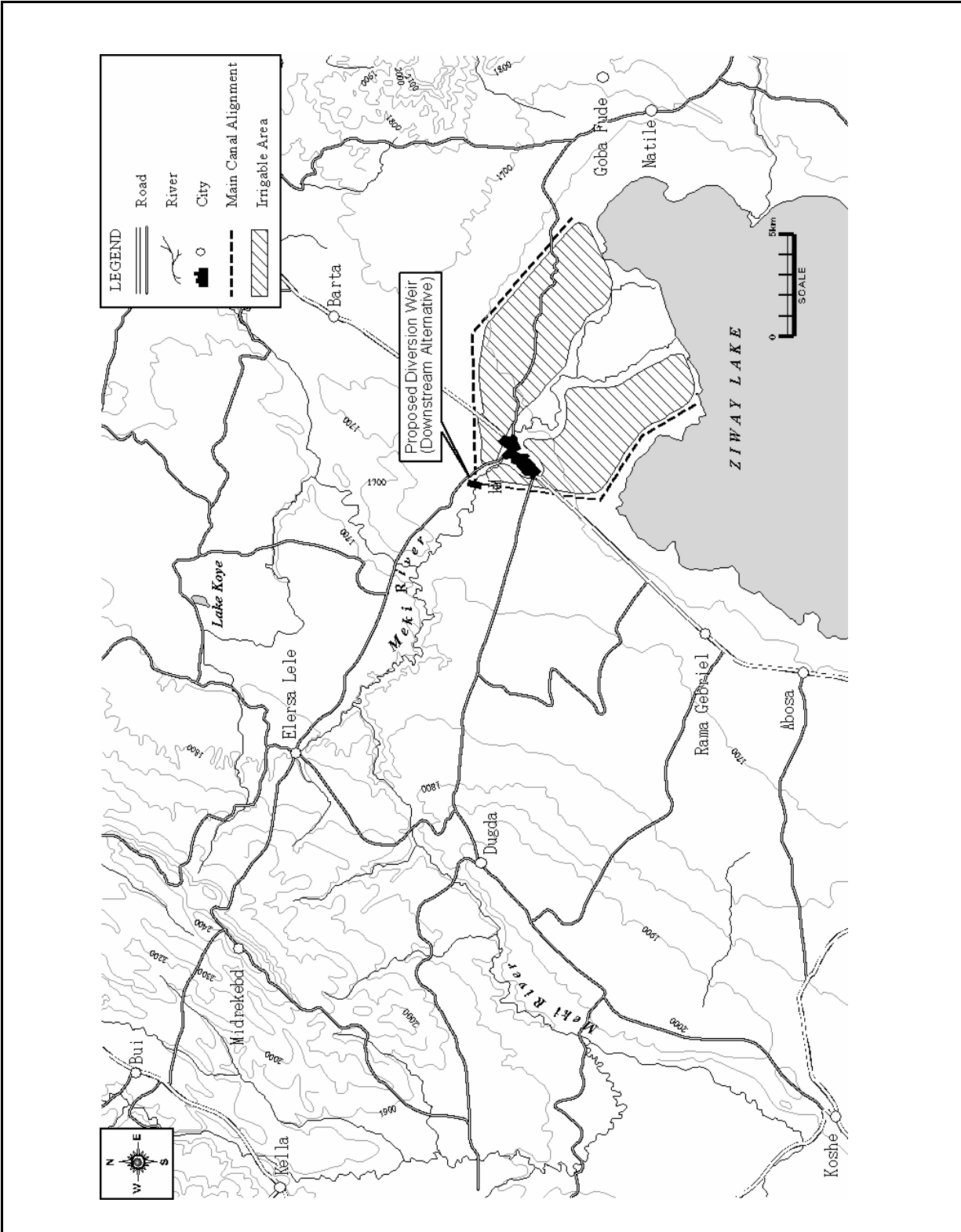
Geological Profile of the Proposed Dam Site



The Study for
 Meki Irrigation and Rural Development Project
 in Oromia Region, Ethiopia

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Figure VI.4.3
 Location of Irrigation Area by Diversion
 Weir (Upstream Alternative)



The Study for
 Meki Irrigation and Rural Development Project
 in Oromia Region, Ethiopia

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Figure VI.4.4
 Location of Irrigation Area by Diversion
 Weir (Downstream Alternative)

APPENDIX VI
IRRIGATION DEVELOPMENT

Attachments

Attachment-1 Rapid Rural Appraisal (RRA) – Dodicha Irrigation Water Users Association (WUA)

1. GENERAL

Date	:	24 th October 2000
Peasant Association (PA)	:	Dodicha PA, Adami Tulu Wareda, East Shoa, Oromia Region
Informant	:	Water Users Association (WUA)
Facilitator	:	Mr. Teshoma Atnafie, Chief C/P OIDA
Assistants & Observers	:	Mr. M. Kouyama, Team Leader for the JICA Study Team Mr. T. Igawa, Irrigation and Rural Infrastructure Expert (JICA) Mr. Y. Fukasaka, Rural Development Expert (JICA) Mr. Y. Niikawa, Design Engineer (JICA) Mr. Abera Chala, C/P for Irrigation and Rural Infrastructure Expert Mr. Melesa Kare, C/P for Rural Development Expert The local consultants team
Location	:	The scheme is located along the Bulbula river at 6 km downstream from Lake Ziway.

2. OBJECTIVES

The Dodicha small-scale irrigation project (SSIP) is one of the 67 on-going projects of OIDA. With the financial assistance of ESRDF, the Project was embarked on in 1999 under the agreement between Bureau of Water, Mineral and Energy Resources Development and the Dodicha peasant association (PA). The government responsibility was transferred to OIDA during the construction period. The community development as well as construction work is promoted by the Central Branch Office of OIDA in Adama (Nazareth). The canal construction and the pump installation are nearly completed. The scheme will be officially taken over from OIDA to the WUA at the end of November 2000. The main objective of the RRA is to verify scope of responsibility of both OIDA and the Water Users Association (WUA) in the project O&M, which will govern project sustainability in future. In addition, the RRA aims at clarification of financial status and the living conditions of the WUA members. In response to the request by the JICA Study Team, seven (7) committee members and 70 WUA members got together on the school ground of Dodicha PA from 10:30 AM to 2:30 PM on 24th October 2000.

3. METHODOLOGY

The RRA was initiated by the discussion with the WUA committee in order to clarify the general information of the project (Session I). In parallel, focus group discussion was held (Session II). The attendants were separated into five (5) groups, i.e. four (4) men groups and one (1) women group. At the end of the RRA, all the attendants held the general discussion.

4. SESSION I DISCUSSION WITH WUA COMMITTEE

4.1 Key Informants

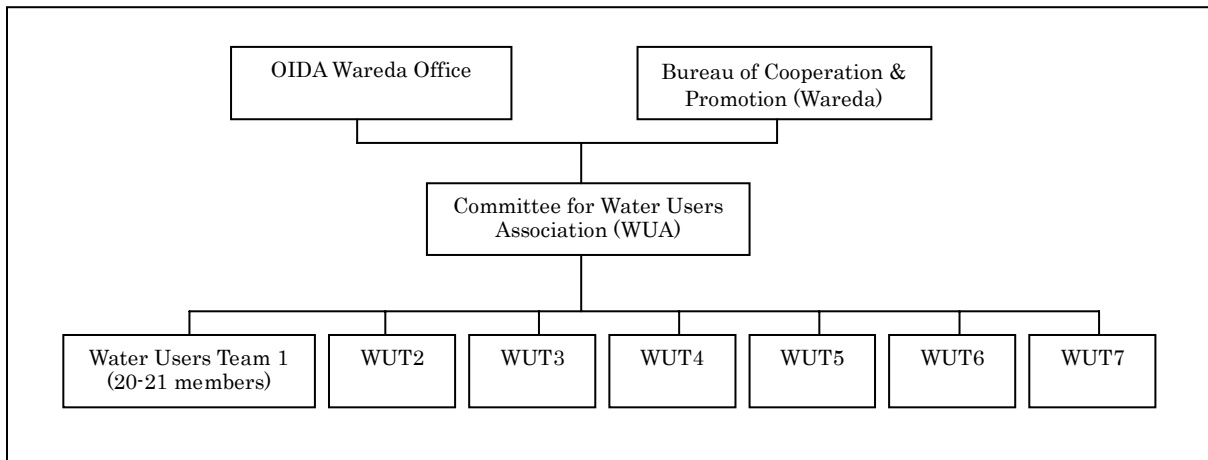
The key informants were Mr. Ambo Godana, the Head of WUA, who is 40 years old with the educational background of Grade 6th and Mr. Feyissa Huluka, the Secretary. The discussion was made under the chairmanship of Mr. Abera Chala.

4.2 Historical Background and Legal Status of the Scheme

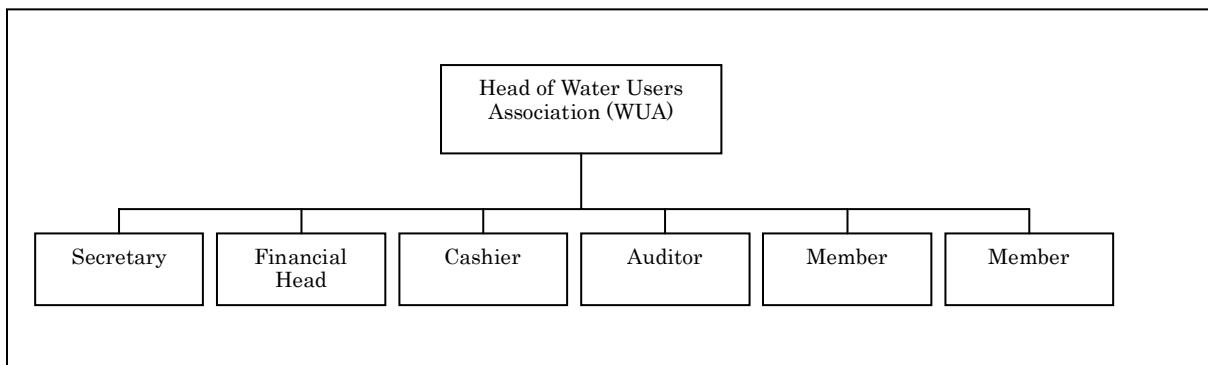
The WUA of the Dodicha SSIP was established in March 1998 by obtaining the assistance from both the Wareda administration office and the agricultural office. Seven (7) members organize the WUA committee. The association will be given the legality on 9th November 2000.

4.3 Organization

The organization charts of the WUA and the WUA Committee are illustrated below.



Organization Chart of WUA



Organization Chart of WUA Committee

4.4 Committee Members

The committee members are elected by the WUA members and appointed by the Wareda administration office and the Wareda agricultural office. The Committee is also assisted by the Bureau of Cooperation & Promotion.

The committee members are not paid by the WUA members but their premium and transportation cost is compensated from the WUA's account.

4.5 Roles and Responsibilities of the Committee

As a representative of the association/beneficiaries, the Committee accomplishes all the aspects of the WUA's activities regarding the irrigation O&M.

4.6 By-law and Rules

The WUA set up the by-law and the operation rules of the irrigation facilities. Most of the WUA members understand these by-law and rules. Apart from the by-law and rules, proposals are occasionally prepared by the Committee when problems are arising from the project management. WUA members always scrutinize these proposals and approve them.

4.7 Operation and Maintenance (O&M)

Needless to say, the Committee has not yet faced the serious problems arising from the irrigation activities

since they are not operational. The O&M is in principle under the responsibility of the Committee. As for maintenance and repairing work, the Committee does not request each WUA member to share the relevant cost but pay it by the WUA account. In case of major maintenance including trouble shooting, the WUA will report and consult the OIDA Wareda office.

The WUA is not well informed about the after-sale services. When the WUA encounters troubles in day-to-day project operation, they intend to contact with neither suppliers nor contractor directly but to report Oromia ESRDF and Central Branch Office of OIDA.

The WUA explains that they do not have any information to estimate an annual budget because the O&M is not actually started. Tentatively the WUA mutually agreed to collect the annual charge of 100 Birr from each of WUA members.

The financial head of the Committee is responsible for the financial matters of the WUA. Each member comes to the WUA office and pay against the official bills of annual charge. The account is controlled by all the committee members, i.e. Head of WUA, the Secretary and Cashier. The external auditing is done once a year by an auditor who comes from Oromia Bureau of Cooperation and Promotion.

4.8 Environmental Changes

(1) Water quality

The WUA members pointed out frequent outbreak of malaria in recent years. In addition, bilharzia and *Jardia* (parasite causing diarrhea) in the Bulbula river are prevailing. The turbidity of river water is increased especially in dry seasons in recent years. The WUA members consider that these adverse phenomena are beyond their control and necessity of input of OIDA experts.

(2) Soil salinity

The WUA members recognize soil degradation by salt accumulation as a result of continuous irrigation water supply. They assess soil salinity by abnormal symptom on vegetable leaves. If such symptom is identified, farmers are to report the OIDA staff and/or the Wareda agricultural office. Through the past experience, the farmers know that application of cow dung and composts is effective to mitigate the salinity problems.

(3) Soil conservation

The WUA members understand necessity of soil conservation measures such as check dams and afforestation with eucalyptus and acacia species.

(4) Pests, disease and vermin's

The WUA members complain the crop damages by *Temchi* (insects) and hippopotamus in recent years.

4.9 Decision-Making

The WUA committee holds regular meeting every second week and adhoc meetings for urgent issues. It is noted that women members are also invited to these meetings. The main topics in the previous meeting include (i) internal rules and regulation and (ii) to accept new members. Since the project is not yet operational, no serious dispute was arising from the meeting.

4.10 Monitoring and Report

Three (3) pump operators selected among the members were provided the skill training. They are in a position to report the day-to-day performance of the pump operation to the Committee. As for irrigation system, each WUT is to report the Committee. For these reporting purposes, the WUA decided to keep records of O&M, meeting, accounting and others.

The Committee will continue the project monitoring and report every six (6) months to the nearest OIDA representatives.

4.11 Problems and Needs

(1) Unsatisfied Basic Human Needs (BHN)

The WUA members identified several problems due to lack of the basic rural infrastructures. There are no drinking water supply projects by the government. No any NGOs have activities. In the past, the PA requested NGO to extend their support to the PA although no response was received. Other problems include lack of public transportation services, no sources of selected seeds, fertilizers and insecticides for irrigation farming, lack of health care and school facilities, and lack of storage for farm inputs, etc.

(2) Lack of initial operation cost

The food security of the PA seems very reliable due to recurrent drought. The most crucial issue for most of the WUA members is procurement of food. Their current financial status does not allow procuring the fuel for the pump operation after taking-over of the project. Farmers pointed out the necessity of strong supports from the government to meet the initial operation cost.

(3) Necessity of training and guidance

The Committee identified the necessity the following training and guidance to the members.

- 1) how to manage the irrigation water
- 2) how to manage his daily farm activities including marketing
- 3) how to take loan and saving
- 4) how to manage WUA
- 5) how to use extension package

4.12 Water Master

Three (3) candidates were already selected for pump operators and will be provided technical training. They are:

- 1) Geribe Boona - Grade 6th, no experience
- 2) Debba Gaguro - Grade 5th, one-year experience
- 3) Jemal Bedhaso - Grade 9th, no experience

5. SESSION II GROUP DISCUSSION

5.1 Key Informants

The sample size, i.e. 70 attendants consisting of 64 men and six (6) women, was too large to obtain the detailed information of the key informants. The attendants were separated into five (5) groups from A to E consisting of four (4) men groups and one (1) women group. Five (5) interviewers of the local consultants were attached to each of five groups and carried out the interview and discussion according to the survey sheets. In view of the gender imbalance, the female sociologist participated in the women group meeting. The JICA study team and OIDA C/P attended in the meeting as observers and provided additional questions in order to reveal attendants' intentions at detail.

5.2 Household Characteristics

The household characteristics of the key informants, i.e. the WUA members, are presented in Table 1. The results are summarized below.

Age of household	42 years old
Household members	9.2 persons
Land holding size	1.13 ha
Farm land size	0.99 ha
Income source	farming, animal husbandry and casual employment

Farm income	Birr 1,533
Off-farm income	Birr 121
Total income	Birr 1,654
Monthly expenditure	Birr 128
Items of expenditure	food, tax, clothes, school fees, medical cares, medicines, etc.

Some important aspects of the household characteristics are also presented in Figure 1. Although the significant correlation is not statistically confirmed, annual income tends to increase according to farm family size and land holding size.

5.3 Meal Survey

Groups A and C were requested to provide the information concerning meals. Five (5) members of Group A stated that only maize was consumed three times a day, while Group C verified their meals in the previous day at detail as follows.

No.	Breakfast	Lunch	Snack	Supper
C-1	Bread (wheat) + Tea	Ingera (teff) + Shiro Wat	-	Ingera (teff) + Wat (potatoes)
C-7	Ingera (maize) + Shiro Wat	Ingera (maize) + Shiro Wat	-	Bread + Butter + Milk
C-13	Roasted maize	Kita (maize) + Cabbage	-	Kita (maize)* + Cabbage
C-17	Bread (maize) + Milk	Ingera (maize) + Milk	-	Bread (maize) + Milk
C-20	Bread (maize) + Tea	Bread (maize) + Milk	-	Bread (maize) + Milk

5.4 Seasonal Calendars

(1) Weather

The climatic changes were questioned to each group. Although some differences are recognized between groups, the farmers basically understand the rainy seasons start in March – April and end in September.

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B	Moderate		Hot+ Rainy		Cold + Rainy			Hot+Dry		Moder.		
C	Dry		Rainy					Dry				
D	Hot + Dry		Rainy					Dry with some rains		Dry		

(2) Social activities

The seasonal calendars drawn by the key informants show their cultural and regional events through the year. The members of Group B are mostly Muslim and indicated the Muslim events in May and December. In Dodicha, the period from November to March is the wedding season. The school starts in September, when the farmers suffer from lack of fund for school fee before onset of actual harvesting season in October.

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B	Wedding			Arafa Id Al Adaha					School starts till July			Ramadan Id Al Fater Wedding
D	Wedding										Wedding	

(3) Economic activities (farming activities)

The general sequence of the farming activities was clarified by the key informants. Most of farmers start land preparation in February. Cereals and beans are sown in April to July and harvested in September to January.

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B	-	Land preparation		Sowing (maize)		'shilsh alo'	Sowing (teff, green beans)	Weed control	-	Harvesting beans	Maize cutting	Harvesting teff + maize collect.
C	Cleaning land					Sowing		Weed control	Harvesting			
D	Harvesting/Threshing	Land prep.	Ploughing	Sowing (maize)		Sowing (barley, wheat, teff)	Sowing (teff)	Weed control	Harvesting (barley, wheat, haricot beans)		Threshing	

(4) Common illness

The out-break of illnesses is highly coincident with the weather conditions in the area. Water-borne diseases are represented by malaria, which is predominant in hot months from September to December.

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B	Fengil (chicken disease)		Furra (oxen disease) Lukuche (goat disease)						Malaria Yellow fever	Malaria		Aba Senga Aba Gorba (cattle disease)
C	Pneumonia								Malaria and Pneumonia			
D	Aba Senga (cattle disease)					Malaria						

5.5 Daily Activities

The daily activities by gender were analyzed by group. Farmers allocate nearly 10 hours to farming activities. Although men groups (A, B, C) could not stipulate the daily activities of their wives, women group (E) listed the sequence of their domestic works. It is mentioned that farming activities are shared by husbands and wives, while most of domestic works including fetching water are allocated to wives.

Group A			Group B (Muslem)			Group C			Group E		
Husbands	Time	Wives	Husbands	Time	Wives	Husbands	Time	Wives	Husbands	Time	Wives
Sleeping	3:00 AM		Sleeping	3:00 AM		Sleeping	3:00 AM	Sleeping		3:00 AM	Sleeping
	4:00 AM		Go to mosque	4:00 AM			4:00 AM			4:00 AM	
	5:00 AM		Worshipping in mosque	5:00 AM			5:00 AM			5:00 AM	
	6:00 AM		Back to home	6:00 AM			6:00 AM	Wake-up		6:00 AM	Fetching water/Cooking
Wake-up	7:00 AM	Wake-up	Go to grazing land	7:00 AM		Wake-up	7:00 AM	Cooking		7:00 AM	Preparation of meals
Breakfast	8:00 AM	Breakfast	Farming	8:00 AM		Breakfast	8:00 AM	Breakfast		8:00 AM	Cleaning, Milking cow
Farming	9:00 AM	Animal raring		9:00 AM		Farming	9:00 AM	Cooking		9:00 AM	Breakfast/Go to market
	10:00 AM	Cooking		10:00 AM			10:00 AM			10:00 AM	Taking cattle to field
	11:00 AM			11:00 AM			11:00 AM			11:00 AM	Making butter
	12:00 PM	Preparing lunch	Lunch at home	12:00 PM			12:00 PM			12:00 PM	Lunch/Fetching water
Lunch on farm	1:00 PM	Lunch on farm	Go to mosque (solat)	1:00 PM		Lunch	1:00 PM	Lunch		1:00 PM	Go to mill
	2:00 PM		Farming	2:00 PM		Farming	2:00 PM	Fetching water/		2:00 PM	Back to home
Farming	3:00 PM	Back to home		3:00 PM			3:00 PM	Cooking		3:00 PM	Spinning
	4:00 PM	Fetching water		4:00 PM			4:00 PM			4:00 PM	
	5:00 PM	Foodstuffs collection		5:00 PM		Feeding ox	5:00 PM			5:00 PM	Fetching water
	6:00 PM	Animal raring	Collecting cattle	6:00 PM			6:00 PM			6:00 PM	Preparing coffee/Taking bath
Animal raring	7:00 PM		Go to mosque (solat)	7:00 PM		Supper	7:00 PM	Supper		7:00 PM	Washing children/Cooking
	8:00 PM	Cooking	Back to home	8:00 PM		Sleeping (11 hrs)	8:00 PM	Sleeping (10 hrs)		8:00 PM	Supper
Supper	9:00 PM	Supper	Supper	9:00 PM			9:00 PM			9:00 PM	Sleeping (9 hrs)
Sleeping (9 hrs)	10:00 PM	Sleeping (9 hrs)	Sleeping (6 hrs)	10:00 PM			10:00 PM			10:00 PM	
	11:00 PM			11:00 PM			11:00 PM			11:00 PM	
	12:00 AM			12:00 AM			12:00 AM			12:00 AM	
	1:00 AM			1:00 AM			1:00 AM			1:00 AM	
	2:00 AM			2:00 AM			2:00 AM			2:00 AM	

5.6 Cropping Calendar

The cropping calendars were prepared by Groups B and D as follows.

Crops	Practices	Dry Months		Rainy Months						Dry Months			
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maize (Group D)	Land preparation		→										
	Ploughing			→									
	Sowing				→								
	Digging with hoe					→							
	Weeding										→		
	Harvesting											→	→
(Group B)	Ploughing			→	→								
	Sowing					→							
	Harvesting										→	→	
Teff (Group D)	Land preparation+												
	Ploughing						→						
	Sowing							→					
	Weeding								→				
	Harvesting										→	→	
(Group B)	Ploughing						→						
	Sowing							→					
	Harvesting										→	→	
Barly/Wheat/ Harricot beans (Group D)	Land preparation+												
	Ploughing						→						
	Sowing							→					
	Weeding								→				
Barly/Wheat (Group B)	Ploughing						→						
	Sowing							Wheat	Barly	→			
	Harvesting										→	→	
Green Beans (Group B)	Ploughing						→						
	Sowing							→					
	Harvesting										→	→	

5.7 Farm Inputs and Tools

(1) Farm implements

The farm implements were listed by the farmers. They include draft oxen, ard (maresha), hoe, cutlass, yoke, axe, shovel, sickel, etc.

(2) Fertilizers

The farmers of Groups A, C and E replied that no chemical fertilizers are used, while those of Groups B stated that 100 kg of DAP and Urea in total are the standard application rates for green beans, maize, barley, wheat and teff (this application rate may not be based on actual experience but on their theoretical knowledge). Only the farmers of Group D clarified their actual application records.

DAP (di-ammonium phosphate) contains % of N and % of phosphate, while Urea contains 46% of nitrogen. The application of DAP+Urea (50kg+50kg) to 1.0 ha means kg of N and kg of P₂O₅.

Farmer	Crop	Planted Area (ha)	Fertilizers	Amount (kg)
D-1	Barley	0.50	-	0
	Maize	0.25	-	0
	Teff	0.75	-	0
D-2	Maize	1.00	-	0
	Harricot beans	0.50	-	0
	Teff	0.25	-	0
D-4	Wheat	1.00	DAP+Urea	50+50
	Teff	0.25	DAP+Urea	25+25
D-8	Maize	1.00	DAP+Urea	50+50
	Harricot beans	0.50	DAP	50
	Teff	0.25	DAP	25
D-17	Wheat	0.50	DAP	50
	Teff	0.50	DAP	50

(3) Agro-chemicals

The farmers of Groups B and D use herbicides and insecticides.

(4) Hired labour

The farmers of Groups A, C and E do not hire the labors for farming practices, while those of Groups B and D

hire the labour. Out of 35 farmers of Groups B and D, nine (9) farmers in total hired the labors last year for weeding and harvesting. The wage is paid in cash, i.e. Birr 6 a day.

5.8 Pests and Diseases

The farmers suffer from weed infestation. For grain crops including maize, teff, barley and wheat, weed control is the most labour intensive practice, i.e. 24 man-day for one ha. This means that the average farmers devote nearly two weeks for weed control (2 persons x 12 days). Other pests are smut (wag) and worms, i.e. armyworms (Temich) and American ball worms.

5.9 Preference for Irrigated Crops

Since irrigation water is not yet supplied, the farmers can not estimate the potential yields. However, the farmers of Group C expect to increase the maize yield from the current yield of 2.0 ton/ha to 4.0 ton/ha under irrigated conditions. The farmers envisage to plant horticulture crops in the scheme in future. They include tomatoes, cabbage, onion, kale, etc. They also want to irrigate sugar cane.

5.10 Marketing and Prices

The farmers sell products either to middlemen or directly in open markets within Adami Tulu Wareda including the nearest towns. The producers' prices (highest) of the major crops are as follows.

Crop	Birr/Qt	Highest Season
Maize	200	July
Wheat	200	June
Teff (white)	300	July
Teff (black)	260	July
Barley	200	June
Sorghum	150	-
Haricot beans	240	October

5.11 Animal Husbandry

The farmers rear several kinds of animals for additional income sources, draft animal power, consumption, etc. They rely largely on natural grazing sources, while animal feed production is seldom done except for collection of crop residues such as teff straw and shells of haricot beans. The farmers are aware of some countermeasures for improvement of animal products. They are introduction of crossbred animals and expansion of managed pastures although no actions have been taken.

5.12 Indigenous Knowledge

The farmers of Group D introduced their traditional soil protection measures on sloping land, i.e. terracing and drainage techniques. There is also traditional irrigation system.

5.13 Agricultural Supports

(1) Extension

The development agent (extension worker) lives and works within the PA, the farmers can contact whenever they are required. The DA provides the farming techniques especially for rain-fed crop production and weed control.

(2) Supports required

The farmers expressed the necessity of demonstration of modern agricultural techniques with use of farm inputs. In this connection, they requested the credit schemes to facilitate procurement of fertilizers and seeds. They also want to know the access to agro-chemical suppliers.

The farmers are worried by lack of initial investment for procurement of fuel for pump operation. They

requested the support for fuel supply until the project will properly take off.

(3) Cooperative activities

Instead of modern cooperatives, there are traditional cooperative schemes such as “Djigge”, which are undertaken during ploughing, harvesting and threshing.

5.14 Drinking Water

The drinking water source of the farmers is the Bulbula river. Fetching water is women’s responsibility. It takes about one hour for a round trip between a village and the river. They complain the water quality, i.e. high turbidity. They prefer to drink groundwater from boreholes. They have applied the support for drinking water supply to the government and NGOs although no reply was received.

5.15 Primary Health Care

There are a clinic within the distance of one (1) hour walk from the PA and the Ziway health center (3 hours). It is very rare for the farmers to see medical doctors even though they are sick. The farmers strongly request the government to establish the public health facilities in the PA.

5.16 Education

The farmers interviewed replied that all the children in the PA go to school. They said that literacy rate in the PA is high enough to access the government supports.

5.17 Environment

The PA has been attacked drought for last years. River water and groundwater are decreased. The main cause of soil erosion is strong wind prevailing in the PA. For wind breaker, the local tree species called “ajo” are used.

6. SESSION III GENERAL DISCUSSION

6.1 Communities’ Intention to Project Planning and Design

Dodicha PA started applying the financial assistance of ESPDF in 1997 for establishment of the community-based irrigation scheme with the service area of 100 ha. After the application was received, a series of meeting (more than five times) was held between ESPDF and PA in order to discuss the following issues.

- 1) Urgent needs of irrigation development after crop failures by serious drought
- 2) Site selection of pumping station and construction method of canals
- 3) Expansion of irrigation area

Against the PA’s application, ESPDF reduced the irrigation area from 100 ha to 69 ha probably due to fund limitation. Due to this reduction, the PA was forced to reduce the project beneficiaries. The issue on irrigation land has been the most crucial among the PA. The PA members recognized that almost all of their requests were incorporated into the project planning except for the land issue. Finally, out of 918 households of the PA members, 150 households were involved in the WUA and all of them agreed to contribute either their labour force or in kind to the construction works.

6.2 Communities’ Involvement during Implementation Period

The project is directly constructed by Central Branch Office (Construction Team) of OIDA. According to the agreement with OIDA, all the WUA members joined the construction, especially for canal excavation, carrying the construction materials such as stones sands and steel pipes. The WUA members mentioned that they suffered from food shortage due to serious drought and lack of farm inputs during the project implementation.

6.3 Hand over of Schemes

In principle, the WUA members are satisfied with the quality of the project facilities. However, some concrete structures such as drops are already cracked. They are worried by their capability of materials for repairing these defects. They request provision of cement and other materials for repair works before hand-over. They also stated that the scheme construction is not completed yet and is not willing to take over the facilities not completed.

The official hand-over of the facilities is scheduled at the end of November 2000 according to the written agreement with OIDA.

OIDA already selected four (4) trainees (2 for each pump) among the WUA member and provided the initial training. In addition to the training, the members understand that the following services of OIDA will be envisaged after hand-over.

- 1) Training and farm guidance to farmers at demonstration plot (0.5 ha) prepared by the WUA
- 2) Farm input supply
- 3) Preparation of O&M manual

6.4 Operation and Maintenance Plan

The WUA members understand that extension workers from OIDA at the Wareda level will train team leaders and water masters. The O&M schedule will be prepared by the WUA itself.

The farmers recognize that the responsibilities for O&M are allocated as follows.

- 1) Pumps : four (4) pump operators (WUA members) who will be trained by OIDA in near future
- 2) Gate : seven (7) team leaders for each of water users teams (WUT)
- 3) Canal : WUA members

The WUA members also understand that they have responsibilities to cost implication of O&M. The annual rate of water charge is already discussed and set. The water charge as cash will be collected by Cashier of the Committee and controlled by the Committee.

In case those problems occur, the WUA members will communicate with the Central Branch Office of OIDA through the channels of DA and the Wareda OIDA staff.

Attachment-2 Rapid Rural Appraisal (RRA) – Areta Chufa Irrigation Water Users Association (WUA)

1. GENERAL

Date	:	8 th November 2000
Peasant Association (PA)	:	Areta Chufa PA, Ziway Dugda Wareda, East Shoa, Oromia Region
Informant	:	Water Users Association (WUA)
Facilitator	:	Mr. Abera Chara, C/P OIDA for Irrigation and Rural Infrastructure
Assistants & Observers	:	Mr. M. Kouyama, Team Leader for the JICA Study Team Mr. T. Igawa, Irrigation and Rural Infrastructure Expert (JICA) The local consultants team
Location	:	The scheme is located along the Chufa river, a tributary of the Katar river, at the point of 41 km from Meki in east and 21 km from Asela in southwestern.

2. OBJECTIVES

The Areta Chufa small-scale irrigation project of a gravity irrigation system is one of the 67 on-going projects of OIDA. With the financial assistance of IFAD, the Project was embarked on in 1995/96 under the agreement between Bureau of Water, Mineral and Energy Resources Development and the Areta Chufa peasant association (PA). The community development was promoted by Cooperation & Promotion Department of Oromia MOA. Currently, the government responsibility is transferred to OIDA. The Water Users Association (WUA) is organized by 317 members. The total scheme area (86 ha) is allocated to all the members at 0.25 ha per member. The scheme layout is as illustrated in Fig.1. Two (2) Development Agents (DAs) from OIDA and the Bureau of Agriculture are assigned to the scheme.

The Areta Chufa scheme is recognized as one of successful irrigation project in the service coverage of the Central Branch Office of OIDA. The gravity water is available throughout year from the Chufa river, i.e. stable perennial flow to the Katar river. The main objective of the RRA is to verify the main reason of the successful performance of the project. In addition, the RRA aims at clarification of financial status and the living conditions of the WUA members. In response to the request by the JICA Study Team, two (2) committee members and some 20 WUA members got together at the intake of the scheme from 10:30 AM to 2:30 PM on 7th November 2000.

3. METHODOLOGY

The RRA was initiated by the village resource mapping and transect walks with all the attendants, which were followed by discussion with the WUA committee. The WUA Committee was interviewed according to the questionnaire focusing on the O&M system (Session I), while two groups held discussion on the current activities and further development needs (Session II).

4. SESSION I DISCUSSION WITH WUA COMMITTEE

4.1 Key Informants

The key informant was Mr. Mesta Dafi, the Head of WUA, who has the educational background of Grade 8th and speaks in English. Mr. Mohamed Araba and Mr. Lefew Nagash, the committee members, also participated in the discussion. The direct interview and discussion was lead by Mr. Abera Chala in association with the JICA Study Team and the local consultants.

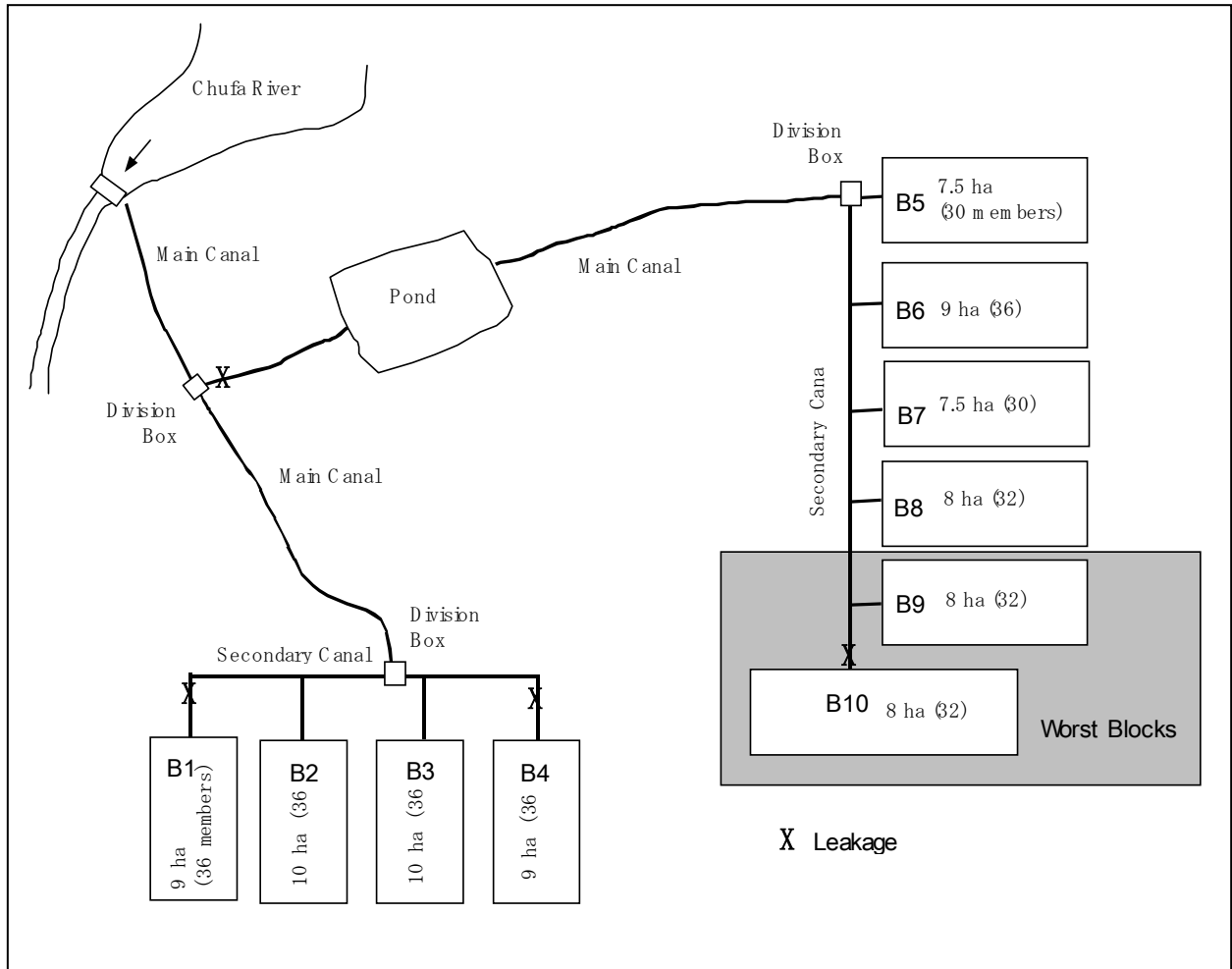


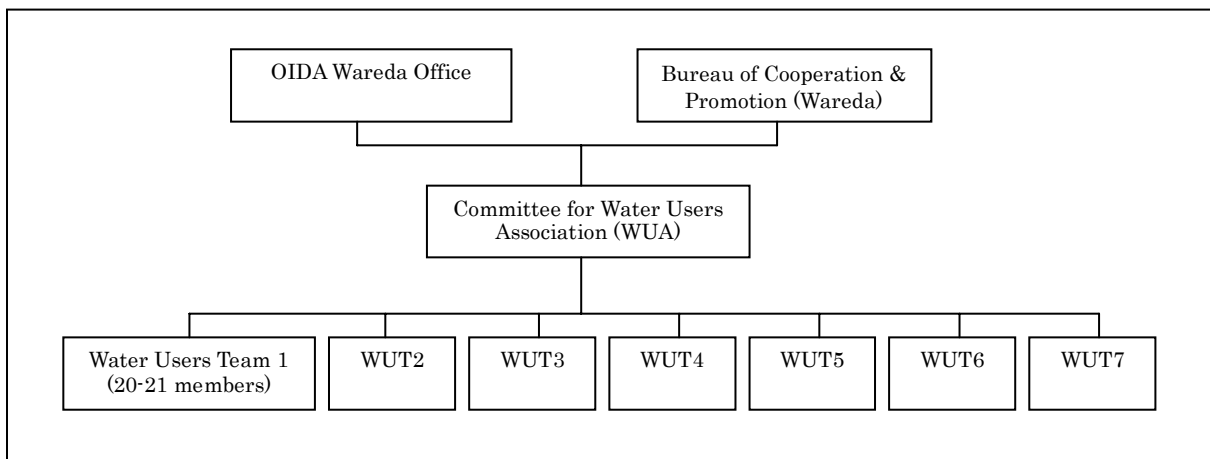
Fig. 1 General Layout of Areta Chufa Scheme

4.2 Historical Background and Legal Status of the Scheme

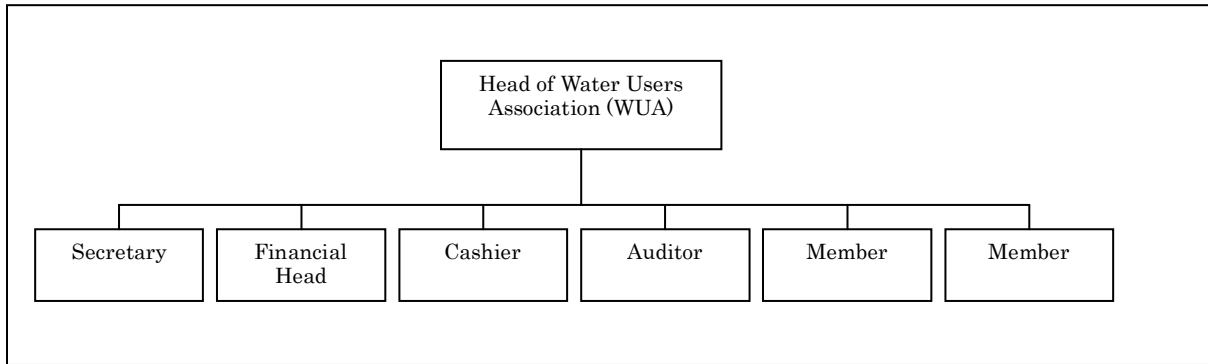
The project started in 1995/96 and constructed by the Bureau of Water, Mineral and Energy Resources Development by obtaining the financial assistance from IFAD. The water committee was structured by Cooperation & Promotion Department of Orimia MOA. Six (6) members organize the WUA committee.

4.3 Organization

The organization charts of the WUA and the WUA committee are illustrated below.



Organization Chart of WUA



Organization Chart of Areta Chufa WUA Committee

4.4 Committee Members

The committee members are elected by the WUA members and appointed by the Bureau of Cooperation & Promotion and Bureau of Agriculture.

The WUA members do not pay salary to the committee members but their per diem and transportation cost are being paid from the WUA's budget.

4.5 Roles and Responsibilities of the Committee

The Committee represents the beneficiaries with respect to all the matters concerned the WUA and the scheme. According to the annual plan of the WUA, the Committee follows, guides and accomplishes all the aspects of the WUA's activities regarding the irrigation O&M with different external bodies.

The Chairman, Financial Head and Cashier are responsible for the financial management. Although the WUA planned to open a bank account by the name of WUA, no action has been taken yet. The Cooperation and Promotion Bureau make external auditing once a year. So far there is no problem arising from the financial management by the WUA committee.

4.6 By-law and Rules

The WUA set up the by-law and the operation rules of the irrigation facilities. Most of the WUA members understand these by-law and rules. Apart from the by-law and rules, the Committee occasionally prepares proposals when problems are arising from the project management. The WUA members always scrutinize these proposals and approve them.

4.7 Operation and Maintenance (O&M)

In principle, the whole members of the WUA participate in an annual O&M work three times a year. Block members as required maintain the command areas. Major maintenance work for canal lining, headwork maintenance and major structures is under the responsibility of the OIDA Central Branch Office.

The WUA members do not pay annual O&M fee in cash but in contribution of labour force. The maintenance of the main canal is done three times per year by all of 317 beneficiaries. If all the benefices are participating in the maintenance activities, it can be completed within a day. There is leakage (seepage) problem between bedrock (basalt) and filled materials along the bed of main canal for about 60 m. The WUA recognizes the necessity of canal lining to prevent from leakage problems.

Due to heavy rain in 1999/2000, the canal system was damaged by erosion. Urgent repair is required.

They have a plan to collect the water charge of 5 Birr a year from the WUA members but they do not have any financial sources at present.

4.8 Environmental Conservation

The WUA Committee pointed out high turbidity of the Chufa river. In order to avoid deterioration of water quality, they try to prohibit washing in the river in association with the DA assigned by OIDA. Otherwise, so far no serious problems by water quality are identified.

Soil salinity problems are not recognized in the scheme area.

4.9 Decision-Making

The WUA committee holds regular meeting once per two weeks and adhoc meetings for urgent issues. It is noted that women members are also invited to these meetings. All the members get together on bi-monthly basis to discuss the scheme management. Both male and female members attend the meeting. Women actively participate in the discussion. The main topic is an annual irrigation plan. There is no dispute but the members sometimes argue each other cause of irrigation water shortage.

4.10 Monitoring and Report

The WUA Committee keeps record on daily O&M, meeting, accounting and so on. They monitor the system at the beginning of the Ethiopian new year and register the members. They previously reported to Cooperation and Promotion Bureau but now to the DA assigned to the project by OIDA.

4.11 Problems and Needs

(1) Rehabilitation of canals and related structures

Leakage problems cause the current dispute on the water shortage in the downstream block, i.e. Block 10. According to the site inspection by the JICA Study Team, the current problem is also caused by the turnout from the secondary canal to the B10 tertiary canal, of which bed is lower than the tertiary canal bed in relative elevation. Due to this structural problem, irrigation water can not flow into the tertiary canal. Although further study is required, this defect can not easily be rectified only by farmers. The technical and financial assistance of OIDA is urgently required.

They pointed out use of spring water as an alternative solution. There is a spring in upstream area of the PA. There is an idea among the WUA to divert water from this spring. No further detailed information was given during the interview.

(2) Basic Human Needs (BHN)

The community accessed several NGOs, i.e. Omonia Self Help Organization (OSHO) and Ethio-Italy, to obtain the assistance for drinking water supply. The Ethio-Italian is currently undertaking the Areta Chufa Village. They also clarified the needs of rehabilitation of the existing small clinic and elementary school.

(3) Agricultural supports

The WUA Committee pointed out urgent needs on farm inputs supply and improved marketing system. The scheme is 30 km from Asela town, the capital of Arsi Zone and 10.5 km from Adama. Long distance from these urban centers adversely affects difficulties in transportation of both inputs and products.

(4) Training

The Committee verified the necessity of technical training on modern irrigation farming techniques not only for farmers but also for water master.

4.12 Water Master

One (1) gate operator is assigned for headworks operation. He completed Grade 6th and trained on irrigation and natural resources management. The Committee recognizes the needs of more training since he is not capable to manage the whole irrigation system as per design. They commented that poor water management

is one of the reasons of water shortage.

5. SESSION II GROUP DISCUSSION

5.1 Key Informants

The RRA obtained 20 key informants. Due to Moslem cultural background, only two women attended. The attendants were separated into two (2) groups. Three (3) interviewers of the local consultants and DA were attached to each of two groups and carried out the interview and discussion according to the survey sheets. In addition, nine (9) average farmers were selected to interview about their income & expenditure conditions (Table 4.1). The JICA study team and OIDA C/P attended in the meeting as observers and provided additional questions in order to reveal attendants' intentions at detail.

Table 4.1 Household Characteristics of WUA Members in Areta Chufa Scheme

Serial No.	Name	Sex	Age	Marriage Status	Position HH	HH Members	Occupation	Land Hold (ha)	Farm Land (ha)	Income Source	Income (Birr/Year)			Expend. (Birr/m)	Major Items for Expenditure
											Farm	Off-Farm	Total		
1	G.D.	M	48	Married	Head	18	Farmer	1.75	0.25	Farming	700	0	700	100	Food, Clothes, Medicine, Tax
2	T.B.	M	42	Married	Head	12	Farmer	1.75	0.25	Farming	1,200	0	1,200	120	Food, Clothes, Medicine, Tax
3	Y.C.	M	31	Married	Head	8	Farmer	1.25	0.75	Farming	1,200	0	1,200	110	Food, Clothes, Medicine, Tax
4	K.C.	M	30	Married	Head	7	Farmer	1.25	0.25	Farming	1,150	0	1,150	130	Food, Clothes, Medicine, Tax
5	G.D.	M	43	Married	Head	13	Farmer	1.25	0.25	Farming	1,300	0	1,300	100	Food, Clothes, Medicine, Tax
6	S.A.	F	55	Married	Wife	9	Farmer	1.00	0.25	Farming	800	0	800	112	Food, Clothes, Medicine, Tax
7	C.W.	M	50	Married	Head	7	Farmer	1.25	0.25	Farming	1,200	0	1,200	130	Food, Clothes, Medicine, Tax
8	A.H.	M	27	Married	Head	5	Farmer	1.25	0.50	Farming	1,400	0	1,400	140	Food, Clothes, Medicine, Tax
9	H.N.	M	65	Married	Head	12	Farmer	1.00	0.50	Farming	1,000	0	1,000	116	Food, Clothes, Medicine, Tax

5.2 History of WUA

(1) Planning and design stage

The government side initiated the project. During the planning and design stage the government set up the meeting to create community awareness on irrigation development and to provide the technical guidance on procedure of construction, O&M, etc. The basic agreement on participatory development was thus attained. The members agreed that some of their intention was incorporated into the final plan but some were not.

(2) Construction stage

The members participated in the construction activities. The major works include land clearing, stone carrying, canal excavation, etc.

(3) Hand over

The hand over agreement was prepared. However, not all the members know the official status of the hand over agreement.

(4) O&M manual

Some informants replied that there are O&M manual only for selected facilities but not for the entire scheme. They said that the manual is understandable. In contrast, some answered that no paper is available but the demonstration was done before taken over to the WUA.

(5) Training

The training was carried out for irrigation scheme maintenance and agricultural marketing. However, the

training was theoretical and no practical training was done.

5.3 Irrigation Planning and Scheduling

The irrigation plan and schedule are agreed at the WUA meeting. The rotational irrigation by block is applied in the scheme. The irrigation water supply to the scheme was operated to adjust to two crop seasons in last year. Firstly, water was supplied to rainy season crop only during planting (sowing) season and secondly to dry season crop throughout the crop seasons.

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maize	Ploughing		Sowing				Harvesting					
Wheat					Ploughing		Sowing			Harvesting		
Teff					Ploughing		Sowing				Harvesting	
Onion					Harvesting							Sowing
Tomato			Harvesting									Sowing

5.4 Water Distribution

The main canal is operated by the chairman, while other structures including the division boxes and the pond are operated by group leaders and members.

The members are not fully satisfied with water distribution, i.e. unfair gap between the upstream area and the downstream area. Irregular water shortage in the dry season is also pointed out. The leakage problem is the central issue among the members. They believe that diverting water from the spring in upstream area will be the best solution for water shortage. They accessed the government to solve the problems on water shortage, but so far no action was taken.

5.5 Maintenance of Irrigation Facilities

The headworks maintenance is done by communal works. Major work items include cleaning, desilting and weeding. Every three months, the maintenance work for the main canal is carried out also by communal work. Major work items are cleaning, desilting, weeding and repair of embankment. The maintenance of the secondary canals and field canals are done when required under the responsibility of individual farmers.

In terms of the maintenance of the scheme facilities, the members requested (i) construction materials such as cement, (ii) key for turnout gates to avoid miss-operation, and (iii) machine to excavate siltation in the pond. Some of members raised these issues to the government. But no assistant has been extended yet.

The communal maintenance work is carried out by every member. It is agreed by all the WUA members that member who absent from the work is obliged to pay 5 Birr per day to the WUA.

5.6 Cost for Operation and Maintenance

No rigid idea about water charge is established among the WUA members. The WUA has solved most of the troubles in the past by contribution of labour forces. However, the WUA Committee is now preparing introduction of water charge to the scheme operation, i.e. 5 Birr per year per member. Against this proposal, all the informants are not willing and replied very reluctant answer. The situation implies that deep discussion will be urgently required among the WUA by obtaining the technical advice from OIDA.

5.7 Communication with the government

There are two DAs in the scheme. One is from Bureau of Agriculture and the other from OIDA. The members intend to contact the DA from OIDA if some problems arise in the scheme operation. The members expect that the DA from OIDA will play important role as a liaison to communicate with the government. As for agricultural aspects such as farm inputs, crop production, etc., they always contact the DA from Bureau of Agriculture.

5.8 Conflict Management within WUA

(1) Imbalance of water distribution

Due to lack of key for gates for the division boxes, anybody can open and close gates. The gates are sometimes stolen. These irresponsible manners often cause imbalanced water distribution. Canal leakage is another serious issue. The problems can be solved by provision of keys and cements for canal lining.

(2) Destruction of irrigation facilities

Illicit water tapping is not observed in the scheme. Due to water shortage, however, irrigation facilities are destroyed in some blocks. No actions to solve the problem were taken before.

(3) Special agreement

The following aspects are agreed among the WUA members.

- ✓ To use the water equally by sharing
 - ✓ Not to open and close without the agreement of the members
 - ✓ Member creating problems will be punished by the members and dismissed from the members
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