

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
OROMIA IRRIGATION DEVELOPMENT AUTHORITY (OIDA)**

**THE STUDY  
ON  
MEKI IRRIGATION AND RURAL DEVELOPMENT PROJECT  
IN  
OROMIA REGION, ETHIOPIA**

**VOLUME I : MAIN REPORT**

**MARCH 2002**

**NIPPON KOEI CO., LTD.**

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US\$ 1.00 = Ethiopian Bir 8.577 = ¥ 121 as of 23<sup>rd</sup> November 2001

## PREFACE

In response to the request by the Government of Ethiopia, the Government of Japan decided to conduct the Study on the Meki Irrigation and Rural Development and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched the study team headed by Mr. Masayuki Koyama of Nippon Koei Co., Ltd. to Ethiopia, four times between August 2000 and March 2002.

The team held discussions with the Ethiopian officials concerned and conducted the field surveys in the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the projects and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Ethiopia for their close cooperation extended to the team.

March 2002



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Takao KAWAKAMI

President

Japan International Cooperation Agency

March 2002

Mr. Takao KAWAKAMI  
President  
Japan International Cooperation Agency  
Tokyo, Japan

## LETTER OF TRANSMITTAL

Dear Sir,

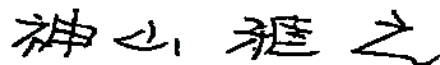
We are pleased to submit you herewith the development study report on the Meki Irrigation and Rural Development Project in Oromia Region, Ethiopia. This report presents all the results obtained through the master plan study conducted in both Ethiopia and Japan over a period of 18 months from August 2000 to March 2002.

The Phase-I study was carried out to verify the current conditions of the study area, identify development constraints, assess development potentials and formulate a draft master plan. The Phase-II study was carried out six (6) verification studies selected from the draft master plan. The verification studies provided valuable information for elaboration of the master plan. In addition, the verification studies contributed to capacity building for the Ethiopian counterpart personnel and generated the direct benefits for local farmers, who participated in the Study. All the results of the verification studies were fully taken into consideration for elaboration of the master plan. Finally, the Study concluded the master plan consisting of 21 projects under six (6) sectors, namely (i) irrigation development, (ii) rain-fed agriculture improvement, (iii) animal husbandry modernization, (iv) environmental conservation, (v) capacity building program and (vi) community development and cooperative promotion.

We believe that the master plan will contribute to (i) improvement of farmers' income and living standard and (ii) food security in the study area as a model project for future irrigation and rural development in Oromia Region. Moreover, the joint-efforts made by the JICA Study Team and the counterpart team initiated to prosper the cordial relations and goodwill between Japan and Ethiopia.

We wish to express our deep appreciation and sincere gratitude to your agency, the Ministry of Foreign Affairs, and Ministry of Agriculture, Forestry and Fisheries for the kind cooperation extended to us. We also wish to express our deep gratitude to the Embassy of Japan, JICA Ethiopia Office, the Oromia Regional State Government and other authorities concerned of the Government of Ethiopia for the close cooperation and assistance extended to us during our field investigations and studies.

Very truly yours,



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Masayuki KOYAMA  
Team Leader  
Meki Irrigation and Rural Development  
Project in Oromia Region  
Ethiopia



**LEGEND**

- International Boundary
- Regional Boundary
- Zonal Boundary
- Road
- Railway
- ~ River
- City

N  
W — — E  
S

0    100    200    300km  
Scale

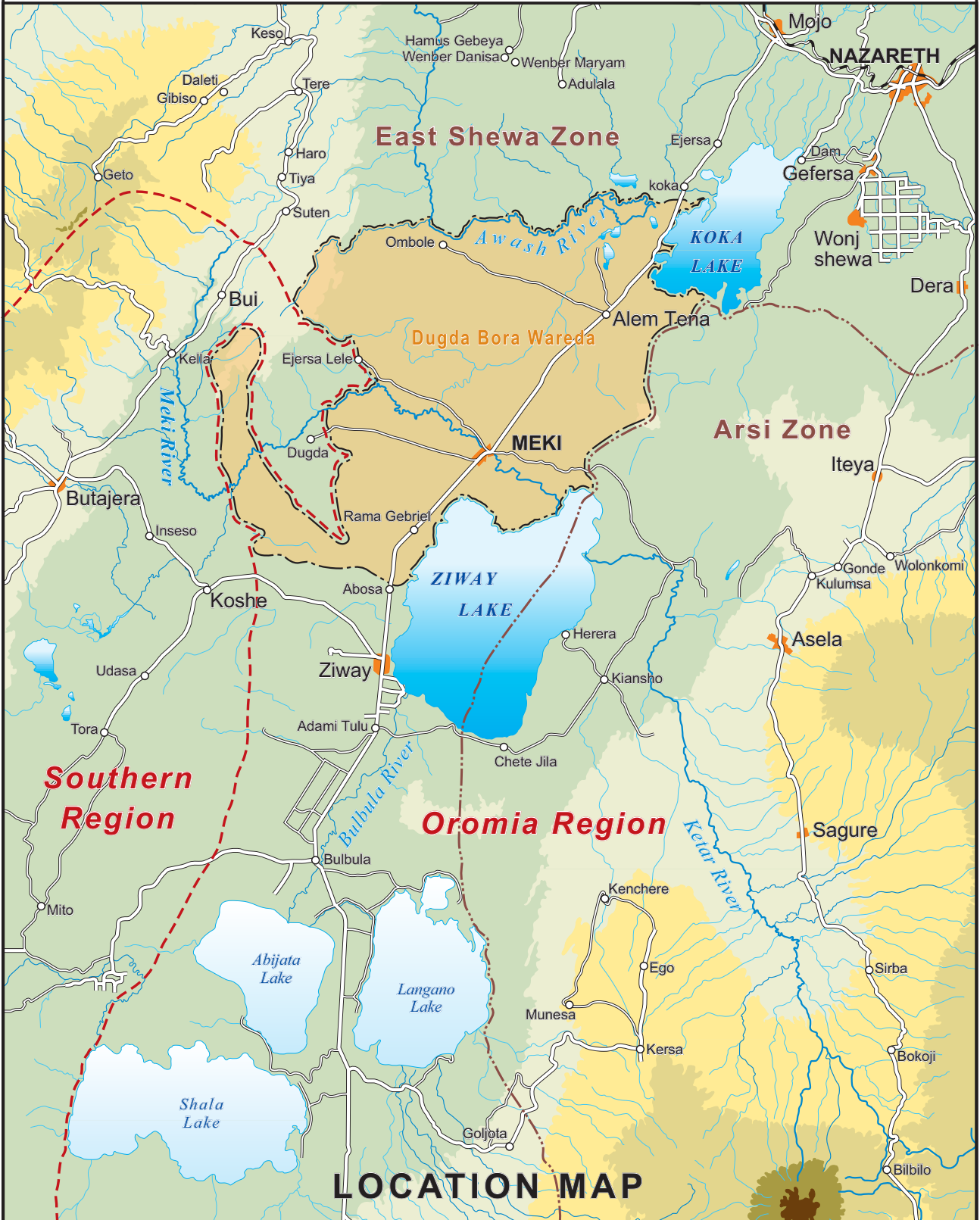
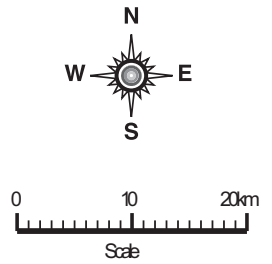


**MAP OF ETHIOPIA**



**Legend**

	Road		City
	Railway		River
	Regional Boundary		Lake
	Zonal Boundary		
	Wareda Boundary		





Interim Appraisal Workshop



Training of Analytical Meteorology



Workshop with Extension Workers



Rainfed Field (Teff)



Harvesting (Teff)



Threshing



On-farm Storage



Prevailing Cattle Grazing



Soil Erosion



Afforestation along The Gullies



Community Pond



The Meki River



Irrigated Fields along The Meki River



Small Pump Installed by A Private Investor



Irrigated Field Associated by NGO



Farm Interview





Community Awareness Creation



Participatory Rural Appraisal (PRA)



Problem Analysis



Village Resource Mapping



Discussion about Field Layout



Topo-survey by OIDA



Participatory Canal Construction



Canal Constructed



Irrigation Canal Completed



Pump House



Pump Installed by The Study



On-farm Water Management



Irrigated Cabbage



Street Vendors



Meki Open Market



Educational Tours of Extension Workers

## Summary

### I. Introduction

1. This Final Report is prepared pursuant to Clause VI of the Scope of Work (hereinafter referred to as “S/W”) for the Study on the Meki Irrigation and Rural Development Project in Oromia Region, Ethiopia (the Study) agreed upon between Oromia Irrigation Development Authority (OIDA), the Government of the Oromia Regional State (the State Government) and the Japan International Cooperation Agency (JICA) on 28th March, 2000. The Report presents all the study results worked out by joint efforts of the JICA Study Team and the Ethiopian counterpart team from September 2000 to March 2002. The Report presents the current conditions of the study area, the development constraints and potentials, the master plan and the verification studies. (1.1)
2. The study area is located in the center of Oromia Region, which is the largest region in Ethiopia with a total coverage of 353,007 km<sup>2</sup> or 34% of the national territory and provides livelihood to 22.35 million or 37% of the total national population. The study area is situated on the bottomland of the Rift Valley at El. 1,650 m with a total area of 400 km<sup>2</sup> around Meki town located at 130 km south of Addis Ababa. The study area administratively falls in Dugda Bora Wareda (district) in East Shewa Zone of Oromia Region. (1.2)
3. The objectives of the Study are (i) to formulate a master plan for rural development in Meki area of the Oromia Region considering its irrigation potential, and its overall goal is to be a model for other areas in the Region, and (ii) to conduct a technology transfer to the Ethiopian counterpart personnel, aiming to contribute to institutional building of OIDA in the course of the Study. (1.3)

### II. Project Background

4. The agricultural sector of Ethiopia plays a leading role in the growth of the national economy. It generates approximately 50% of Gross Domestic Products (GDP) and contributes employment opportunities to 74% of the total workable population. The rainfed agriculture is prevalent in the country, therefore, the food production is largely fluctuating due to erratic rainfalls. Moreover, food shortage is becoming chronic and will be accelerated by rapidly increasing population pressure for the years to come. The Government of the Federal Democratic Republic of Ethiopia (hereinafter referred to as “FDRE”) attaches a high priority to development of the agricultural sector and envisages achievement of (i) improvement of food sufficiency ratio, (ii) supply of raw materials to domestic industries, (iii) creation of employment opportunity, (iv) foreign currency saving and (v) environmental conservation. (2.1)

5. The Five Year Programs of the Ethiopian People's Revolutionary Democratic Front (EPRDF) for Development Peace and Democracy are officially accepted as a primary policy paper to direct the national development strategies in Ethiopia. The first five year program covered the period from 7<sup>th</sup> July 1995 to 6<sup>th</sup> July 2000, which is followed by the second five years program from 7<sup>th</sup> July 2000 to 6<sup>th</sup> July 2005. Both Programs envisage to encourage small holders by means of more intervention of crop credit schemes integrated with the research - extension linkage, rural infrastructure development, improvement of rural amenity and capacity building of human resources. The Programs define the principles of small holder focus policies. However, only a few documents have set rigid development plans and targets for the agricultural sector at the national level. In this regard, the Study is directed to focus on the development plans at the regional level. (2.2)
6. Ethiopia falls among the five poorest countries in the world. The UNDP Human Development Report ranks Ethiopia as 171 out of 174 countries. The urban and rural imbalance in the per capita income was also obvious, i.e. US\$217 for the urban areas and US\$ 159 for the rural areas. As for the minimum nutrition requirement of 2,200 calories per adult per day (WHO), the overall average of per capita nutrition intake was only 1,954 calories and 45.5% of the population were below the poverty line. The overall adult literacy rate was 22.3% in 1996. There is a significant gender gap as well as an urban and rural imbalance in literacy rate. The gross enrollment ratio at the primary level of education was 23%. (2.3.1)
7. Poverty reduction continues to be the core agenda of the country's development. The government policy is to be incorporated into Poverty Reduction Strategy Paper (PRSP). It will consist of four (4) building blocks, namely agricultural-development-led industrialization (ADLI), judiciary and civil service reform, decentralization and empowerment, and capacity building in public and private sectors. The zero draft (interim) of PRSP was prepared by FDRE in November 2000 and is currently under scrutiny by both the governmental and donor agencies. The social infrastructure development in Ethiopia and Oromia Region is basically under the control of FDRE and the Regional State Government. Currently, FDRE exerts the national budgetary arrangement for some sectors in line with the sector development programs (SDPs), in particular, three sectors of education, health and roads. Besides, FDRE has recently embarked on preparation of the SDP for the water sector. (2.3.1 and 2.3.2)
8. The prevalence of gender imbalance is pointed in several economic and social indicators in Ethiopia as well as in Oromia Region. Following the adoption of the constitution in 1995, the national policy has aimed to remove discrimination of all forms against women and barriers to their advancement. To implement the national policy on women, FDRE has also established the necessary institutional framework at the government, regional, zonal and woreda levels. Accordingly, a women's affairs subsector was established within

the Office of Prime Minister and women's affairs departments were established in key sector ministries. Similarly, Women's Affairs Bureau was established under the Oromia Regional State Government in order to implement gender mainstreaming, advocacy, capacity building, empowerment and grassroots group formation. (2.3.3)

9. Ethiopia's economy depends almost entirely on its renewable natural resources. These resources are being depleted at an unprecedented rate for subsistence living. A century ago, closed forest covered 40% of the country, but barely 4% is left today, suggesting that deforestation rate has been and continues to be very high. With an average annual rainfall of between 300-500mm, drought is a recurring feature in many parts of the country, where up to 50% or more of the livestock is decimated. The most devastating droughts were those of 1972-74, 1975-76, 1978-79, 1983-84 and 1990-91, during which over 2.7 million people in Oromia Region alone were affected. Deforestation and unsustainable land husbandry have resulted in accelerated runoff, reduction of ground water resources, increased sediment load of rivers, siltation of reservoirs and irrigation canals, and increased incidence of flooding. Both sheet and gully erosion is widespread in the country. Increasing water degradation and unavailability are also serious development issues in Ethiopia. This includes problems of high salinity and fluoride in water resources. (2.3.4)
10. The Government of Oromia Regional State (the State Government) was officially established in July 1996. It currently comprises five sectors, namely social, economic, administration and legal, military and women's affairs. The economic sector is further divided into eight (8) bureaus and two (2) authorities including OIDA. 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 in line with the national policy of food security. The government reform is currently in process. Under the new structure, OIDA situates under Higher Ministry of Rural Development and Agriculture as of November 2001. (2.4.1)
11. All activities of OIDA are under the control of the General Manager at the head office in Addis Ababa. Then, the zonal operation is entrusted to four (4) branch offices, namely Central, Eastern, Western and Southern branch offices, and further to the woreda offices. OIDA is organized by 720 staff in total consisting of 102 staff for the head office, 407 staff for four branch offices and 211 staff for 69 woreda offices as of November 2000. The technical staff accounts for 430 or 60% of the total staff. Engineering staff such as agricultural and irrigation engineers, hydrologists, geologists, etc. accounts for 195 staff or 84% of the total technical staff. The staff having college diploma or degree comprises around 52% of the total staff. (2.4.1)

12. In Oromia Region, the Government constructed 96 irrigation schemes during last two decades. The total command area of 96 schemes amounts to 9,644 ha giving an average of 100 ha per scheme. It is noted that only 58% of the area have been actually irrigated. This low performance implies that all the schemes are not well functioning and need urgent repairs and rectification. The scheme size ranges from 20 ha to 1,500 ha of the Meki-Ziway irrigation scheme, which is located in the study area. (2.4.2)
13. Rivers are the main water resource for the irrigation schemes in Oromia Region. Out of 96 schemes, 72 schemes obtain water from rivers. The intake facilities are represented by diversion weirs. Among 96 irrigation schemes, 67 schemes are run-of-river type with diversion weirs, while pumping irrigation is operated to a limited extent. (2.4.2)
14. 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. (2.4.2)

#### 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

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. (2.4.3)

### 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 centre	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

### III. The Project Area

15. The study area is located between latitude 8•03’N and 8•24’N and longitude 38•32’E and 39•02’E in the Ethiopian Rift Valley; a huge volcano-tectonic sunken block basically formed in the Tertiary period. The study area lies on the flat valley floor at an elevation of 1,655m. The vicinity of the Meki town comprises a plain sloping gently southeast towards the Ziway lake at an elevation of 1,636 m. The plain generally has a rather flat topography, varying its slope from 0.5 to 2.0 %. (3.1.1)
16. The Meki meteorological station is located at the center of the study area. It receives an average annual precipitation (1966-1999) of 774 mm. The annual rainfall is rather erratic. It ranges from a low of 344 mm in 1995 to a high of 1,091 mm in 1983. About 64% of the annual rainfall is recorded during the period from June to September. The drier months are from November to February, only 8% of the annual rainfall are recorded during this period. The heaviest precipitation usually falls during August with as much as 21% of the annual precipitation occurring during this period. (3.1.2)
17. The mean annual temperature is 20.3•C at Ziway station with mild temperature prevailing throughout the year, which is suitable for a wide range of tropical and subtropical crops. Mean monthly air temperature varies from 18.8 •C in December to 22 •C in May. Period from March to June is relatively warmer, when the mean temperature is generally above 21 •C. The air relative humidity is 66% on average. Average annual potential evapotranspiration is 1,658 mm, which is more than two times the annual rainfall. (3.1.2)
18. The Meki river originates in the highlands of Guraghe and flows a distance of about 100

km from the highlands at altitude of 3,600 m to 1,636 m before draining into the Ziway lake. The upper reaches of the basin are steep and mountainous, while the lower basin is flat with a broad valley. The total catchment area of the river near Meki town is 2,433 km<sup>2</sup>. According to discharge data recorded near Meki town (1965-1999), average annual discharge of the river is 291 MCM or 9.18 m<sup>3</sup>/s. The high discharge occurs during the months of August and September, while low discharge generally occurs during the dry season from December to February. The river discharge sometimes becomes zero during these months. (3.1.3)

#### Monthly Discharge of Meki river Near Meki Town

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

19. The main water sources for the Ziway lake are the flows of the Katar and Meki rivers. The water level of Ziway lake influences the outflow to the Bulbula river. The water level of the Ziway lake is controlled by a natural basalt bar on the Bulbula river lying about 6 km downstream from the river outflow at the lake. The Abijata lake is located in the Abijata-Shella National Park and particularly known for its migratory pelican and flamingo birds. The lake is recharged mainly by the Bulbula and Horakelo rivers. These rivers outflow or spill from the Ziway and Langano lakes respectively, therefore, the three lakes form an interconnected sub-system. (3.1.3)

#### Main Features of Rivers

S.N.	River	Station	Catchment Area (km <sup>2</sup> )	Annual Rainfall (mm)	Annual Discharge (MCM)	Runoff Coefficient	Drain Into Lake
1.	Meki	Meki Village	2,433	1,006	291	0.12	Ziway
2.	Katar	Abura	3,350	874	413	0.14	Ziway
3.	Kekersitu	Adamitulu	7,488		180		Abijata
4.	Horakelo	Near Bulbula	2,050		47		Abijata

#### Main Features of Lakes

S.N.	Lake	Lake Area (km <sup>2</sup> )	Storage Volume (MCM)	Mean Depth (m)	Altitude (m)	Catchment Area (km <sup>2</sup> )	Annual Inflow (MCM)
1.	Ziway	440	1,466	2.5	1,636	7,380	704
2.	Langano	230	3,800	17.0	1,590	2,006	
3.	Abijata	180	954	7.6	1,580	10,740	227
4.	Shalla	370	37,000	86.0	1,567	2,300	

20. The soils of the study area are classified broadly into four (4) groups according to the legend of the FAO/UNESCO system, namely Vertisols, Andosols, Fluvisols and Solonetz. Vertisols are clayey soils that swell when wet and shrink and crack when dry. They are the most predominant soils in the hilly area in the northwestern study area and used for teff



production. They are very deep, black, fine textured, and partly sodic phase. Andosols predominate on the Rift Valley floor originated from volcano lacustrine deposits with ashes, cinders, pumice and others. They are neutral to slightly alkaline, calcareous, deep and coarse loamy. Fluvisols are derived from alluvium on the lake shore and along the Meki river. They are derived from lacustrine alluvium and cover the lakeshore of Ziway and are deep, black poorly drained to well-drained, fine loamy and partly sodic. Solonetz is one of problem soils with high sodium content often observed in the study area. They sporadically occur on bottomlands and slight depression within the flood plains. (3.1.4)

21. Out of 146,882ha of Dugda Bora Wareda, 67,828ha or 46% is arable. The present land use of Dugda Bora Wareda is summarized below.

**Present Land Use of Dugda Bora Wareda**

Land Use Category	Coverage (ha)	Proportional Extent (%)
1) Farmland	67,828	46
2) Forest, shrub and bush	19,971	14
3) Grazing land	36,326	25
4) Others	9,758	7
Total	146,882	100

The natural vegetation of the study area is mainly of tropical savanna, dominantly acacia species occasionally interrupted by riverine broad trees and shrubs. Many of the acacia species provide valuable browse to goats but due to deforestation the density of these trees has diminished considerably. Under semi-arid climatic conditions, most grasses are greenish only in the rainy seasons. They provide huge grazing sources to the rural communities. (3.1.6)

22. The Wareda composes of two (2) urban centers and the rural areas divided into 54 Peasant Associations (PAs). The latest 1994 population census by Central Statistical Authority verified the population and households of the Wareda to be 134,454 and 28,688, respectively. Some 21% of the wareda population lives in both urban centers, while 79% are in rural areas. The average PA comprises 416 households or 1,970 persons. With an annual growth rate of 2.73%, the wareda population in 2000 will reach about 163,000 as presented below. (3.2.1)

### Population Projection for 2000

Category	Population (‘000)	Family Size	Land Area (km <sup>2</sup> )	Population Density (person/km <sup>2</sup> )
Ethiopia	63,495	4.83	1,097,000	58
Oromia Region	22,354	4.84	353,007	63
East Shewa Zone	1,990	4.82	13,624	146
Dugda Bora District	163	4.69	1,468	111
54 PAs	125	4.74	1,452	86
Meki Town	28	4.51	14	1,993
Alem Tena Town	10	4.52	2	4,843

23. Major ethnic group in the Wareda is Oromo that comprise 73% of the total population followed by Guragie (14%) and Amhara (8%). Around 95% of the wareda population believe Orthodox followed by Muslim (2%), Traditional (1.3%), Catholic (0.8%), and Protestant (0.6%). (3.2.1)
24. The administration of Dugda Bora Wareda is under the control of an Administrator and 15 councilors, which are elected every 5 years. PAs are headed by chairpersons, who are officially appointed by the Administrator upon prior consent of villagers and act as coordinators for administration of the relevant PA without compensation. The district administration office coordinates with the region’s district offices on weekly basis. The major issues include education quality and drop out issues with the Education Office, credit services and farmers’ debt with the Agricultural Development Office, the government revenue with the Finance Office, peace and security with the Police Office, etc. Other meetings are also held on security problem with the Police Office, disease outbreak with the Health Office, drought and hunger with the Agricultural Development Office, etc. The district administration budget is allocated fully by the State Government. The annual budget execution in 1998 - 2000 was Birr 210,600 (US\$25,000) on average, of which 61% were disbursed for salary of the staff and 39% for recurrent budget expenditures. Of the recurrent expenditure, 61% were spent for training, 28% for per diem, and 11% for office operation. (3.2.2)
25. The HHICES in 1995/96 verified the current positions of farm family economy in the Region. The respective medium class annual income for rural households was Birr 4,700, while the national average was Birr 4,000. The income sources for rural households in the Region are agriculture (72% of the total income) followed by gifts (14%) and non-agricultural income (6%). On the other hand, major expenditures were done on food (53% of the total expenditure) followed by rent, fuel, power and water (15%) and clothing and footwear (10%). (3.2.4)
26. Farming system in the study area is represented by “traditional livestock-based mixed-farming system”, in which crop production and animal husbandry are significantly supplemented by each other. The predominant crops are food grains and pulses including

teff, wheat, maize, barley and haricot beans. Their coverage amounted to 55,900 ha or 82% of the total arable land of 67,828ha. An intensive farming system with commercial horticulture production has also been practiced to a limited extent, i.e. 2.7% of the total arable land, along the Meki river and the lakeshores of Ziway, Elen and Koka. Cropping intensity of the wareda is as high as 83%. The crop production in the Wareda is annually compiled based on pre-harvest and post-harvest evaluation carried out by the District Agriculture Office. The random sampling survey is carried out at 3 to 5 HHs per crop per each PA. The cultivated area, unit yield and production of major crops in the past 6 years period of 1994/95 – 1999/2000 are summarized below. (3.3.3)

**Average Cultivated Area, Unit Yield and Production in Dugda Bora Wareda (94/95 – 99/00)**

Crop	Cropped Area (ha)	Production (ton)	Yield (ton/ha)
Teff	15,700	11,500	0.73
Maize	12,500	18,200	1.48
Wheat	12,200	20,700	1.53
Haricot bean	8,700	6,300	0.72
Barley	2,400	3,300	1.43
Sorghum	2,500	2,400	0.98
Field Peas	900	500	0.54
Lentil	200	100	0.21
Chickpea	800	200	0.41
Total	55,900	63,200	0.89

Source: Dugda Bora District Agriculture Bureau Office

27. The 1975 land reform legislation of the previous government made all lands as a public property and prohibited private land ownership. Farmers have been given only usufructuary rights up to 10 ha per household. The Constitution endorsed in December 1994 explicitly states that all rural and urban lands including natural resources belong to the government shall not be sold or exchanged. However, there are cases of illegal land leasing in the study area, especially in the highly demanded area where irrigation water is available. A typical farm household in the study area allocates his/her land to (i) homestead, (ii) crop production and (iii) fallow and grazing. Farmland usually consists of several scattered small plots. Over 75% of the householders have land of less than 2.0 ha. The average farmers in the Wareda have 1.5 ha of farmland. (3.2.2)
28. On Mondays and Thursdays, weekly markets are held in Meki town, while daily markets are held in Meki and Alem Tena towns on a small scale. The Monday and daily markets deal with farm produce and some daily commodities, mainly for local consumers. The Thursday markets are controlled by the Meki Municipal Office and are operated with about 2,000 vendors for livestock, food grains, vegetables and daily commodities, which are purchased by traders from other large towns as well as local consumers. The Meki

Municipal Office charges the registered middlemen a monthly rate of 6 Birr. Out of 67,000 tons of the total grain production in 1999/2000, 9,420 ton or 14 % were traded. Individual consumers trade about 70 % of marketed grains through the registered middlemen channels, while 20 % are through retailers and 10 % are through direct business. (3.3.7)

29. The small-scale pump irrigation is operated in the study area. Some 160 pumps have been introduced to Dugda Bora Wareda as of 2000. Out of 160 units, 75 units are installed along the Meki river and the Ziway lake. Large farmers or private investors, who do not own land, and supply irrigation water to local farmers, owned most of pumps. Irrigation benefits are shared between pump owners and farmers. With NGOs' support, 15 farmer groups operate on their plots on an individual basis but share the common service given by motorized pumps. Some of the groups establish farmers' groups assisted by the Department of Agriculture and the Department of Cooperative. The farmers groups are listed below. (3.4.3)

**Farmers Groups in Dugda Bora Warada**

No.	Name of WUA	PA	Members			Irrigation Area (ha)	Source of Water	Year of Establishment
			Male	Female	Total			
1	Lega Meki-1	Gemu Ssubi	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 Aba 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 Denber	34	1	35	10.9	Ziway lake	1998
10	Dodoata Denbel	Dodola Denber	15	-	15	18.1	Ziway lake	1997
11	Wayyo Gabriel	Wayyo Gabriel	19	5	24	13.8	Ziway lake	1996
12	Wedda Kelina	Wedda Kelina	30	1	31	8.6	Ziway lake	1998
13	Wayyo Serrit	Wayyo 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
	<b>Total</b>	-	441	59	500	404.6	-	-

30. 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 indisciplined water use along the Meki river. The government agencies including OIDA are expected, therefore, to be involved in the schemes positively, restricting and monitoring of the existing and new schemes in terms of water resources development. (3.4.3)

31. 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, and pumps having a capacity of 764 liter/sec./unit and a head of 16.3 m have been established. 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 was limited only to security control of the pumping station by the OWMEDB and the main canal system by OIDA. Without any subsidy, farmers were obliged to pay electricity supply charges against operation hours. Except for about 300 ha planted in 1990, the project has been lying idle since then. (3.4.2)

32. The animals of the Dugda Bora Wareda consist of 70,930 heads of oxen, 135,370 female cattle, 60,772 goats, 28,473 sheep and 240,178 poultry. Cattle in the study area are not controlled and are mostly unimproved indigenous Zebu and Sanga. They provide animal power for ploughing, transporting and threshing and also supply farmyard manure to soils. Males weigh around 360 kg and females, 280 kg. European breeds, especially Friesian and Jersey have been imported for many years and crossed with indigenous cattle in attempts to improve the productivity of the latter. The improved breeds are limited in number in the Region. Almost all sheep are indigenous types although several breeds have been identified. In Oromia, the fat tailed Menz and Arsi types predominate. They have generally evolved under harsh conditions of health, nutrition and climate and their output is low. Males weigh about 35 kg and females, about 25 kg. However, when crossed with Corriedale, output in the F1 generation has improved considerably. This does not appear to have been taken up by the small holder sector. Several types of goats have been identified, of which the Worre, Afar and Abergelle predominate in the Northern Rift Valley area of Oromia. They are generally small, with the male weighing between 30 and 40 kg and the female between 25 and 30 kg. (3.5.1)
33. Limited grazing sources are the largest constraint against local animal husbandry. Availability of grazing resources in Dugda Bora Wareda are widely ranged. This does not simply relate to the rainfall distribution within the Wareda, but this appear to be related less to natural grazing capacity of the area than to the level of grazing management in each PA. Those PAs where grazing is designated well, the community keeps natural pastureland from uncontrolled grazing so those oxen can be put there to gain condition before ploughing commences. In view of the highly over-grazed conditions of the natural pasture it is probably the only means by which grazing capacity can be assessed. Grazing

land does not include what is designated as bush and woodland, although it must be remembered that provides browse to goats. When it is considered that this type of vegetation, in a semi-arid agro-ecological region, should be stocked at rate of 8 ha per TLU (tropical livestock unit: 270 kg of live-weight), i.e. 0.13 TLU/ha, the whole area is severely overgrazed. Livestock pressure is very high at less than 0.25 TLU/ha. Crop residues left on farm after harvesting are available for any community members. (3.5.2)

34. Most farmers understand that grazing sources are free and can be obtained by natural grassland. The land use pattern of farmland is highly governed by crop production. Farmers seldom allocate farmland for forage production. There were no farmers growing herbaceous forages except for a few farmers producing cowpeas in their backyard and leucaena trees. (3.5.2)
35. There is one veterinary clinic in Meki town and one health post with 10 veterinary crushes distributed around the Wareda. This is grossly inadequate and according to the veterinary office, at least 10 more health posts should be established around the Wareda. In particular, vaccination and dosing levels are totally inadequate. According to the veterinary office, prophylactic drugs and chemicals have become unreliable and costly. Recently, a cost recovery exercise commenced to allow better consistency in supplies. (3.5.3)
36. Oxen are fed after plowing and threshing season for sale on the open market. The feeding strategy for fattening them appears to vary considerably with PA and does not appear to bear any relation to grazing status or proximity to the lake. The majority of farmers appear to depend on both grazing and crop residues for fattening their oxen, but there are some that depend only on grazing and some only on crop residues. Crop residues alone, in view of their poor quality, are not likely to produce a well-finished animal. Oxen are normally sold after three months of feeding in December to February. The average price for an ox sold on the open market is 780 Birr (range 650 to 1,700). This provides the farmer with the money to buy seed and fertilizer and in some cases, more oxen for ploughing for the next season. However, the cost of an ox, which are mostly thin and weak when bought, is an average of 588 Birr (range 450 to 900) for those who have to buy more draught oxen. (3.5.4)
37. Agricultural support system includes agricultural research, extension, credits and famine relief. The research and extension are the major activities under coordination among Federal Ministry of Agriculture, Oromia Bureau of Agriculture, Bureau of Cooperatives, OIDA, their relevant Zone and Wareda offices. Although the institution set-up of agricultural support systems is established, the day-to-day operation is not satisfactory due to limited financial sources and capacity of staff members concerned. Credit scheme is represented by Extension Package Program (EPP). It is noted that the NGO's activities in

credit operation are quite substantial. Sasakawa-Global 2000 deploys the nation-wide supporting system by reinforcing the research and extension linkage with credit operation. Famine relief also largely relies on the NGO's supports in Ethiopia. (3.6)

38. The road in Dugda Bora Wareda is categorized into three (3) classes, national road, district road and rural road and footpath, which are constructed and maintained by the Ethiopia Road Authority (ERA), the Oromia Rural Road Authority (ORRA), and rural community, respectively. There are 6 major roads in Dugda Bora Wareda, which are categorized into 3 classes in accordance with its pavement, such as asphalt-paved road, gravel-paved road and unpaved road. In the Wareda, the paved roads with a length of 97km have been equipped as shown below. (3.7.1)

**Road Network in Dugda Bora Wareda**

No.	Name of Road	Pavement	Length in the wareda	Responsible Organization	Remarks
1	Addis Ababa – Awassa Road	Asphalt Paved	59 km	ERA	Trunk road to link national capital to Southern Region under assistance of EU
2	Meki – Koshe – Butajera Road	Gravel Paved	24 km	ORRA	
3	Meki - Habra Road	Gravel Paved	14 km	ORRA	This road is constructed by Ethio-Italian grant aid.
4	Meki – Ejersa Lele Road	Unpaved	20 km	-	
5	Alan Tena – Ombole Road	Unpaved	21 km	-	In the 5-years development plan, ORRA has plan to upgrade the road.
6	Alan Tena – Habra Road	Unpaved	17 km	-	

39. The Wareda has a better road network compared with that of the Oromia Region and Ethiopia average in terms of road densities. Although there are some constraints in the rural roads, and the road network in the Wareda, it can be considered satisfactory in terms of quantitative level. Road extension per population and its coverage area is presented in the following table. (3.7.1)

**Road Extension per population and Covered Area**

	Road Extension per 1,000 persons	Road Extension per 1,000 km <sup>2</sup>
Dugda Bora Wareda	0.62km	66km
Oromia Region	0.50km	27km
Ethiopia	0.43km	21km
Africa	0.61km	50km

Source: The economy of Oromia, 1999

40. The water supply scheme in Meki Town is managed by the district office of water bureau, which depend on four deep wells, out of which only one is functioning now. Design works for rehabilitation and expansion of the scheme were completed in 1997 and the bureau is seeking external financing resources for its implementation. In the rural area, on the other hand, the number of water supply schemes managed by communities are 66,

consisting of 45 boreholes, 16 shallow wells and 2 hand dug wells. Beneficiaries for the schemes amount to some 112,000 (71.9%) of the population with a covering ratio of 72%. The wareda has the ratio over zonal average of 23% and the regional level of 16%. In connection with the rural water supply schemes, the bureau conducted an inventory survey to clarify the present condition of the schemes in terms of facilities and their management by communities. (3.7.2)

41. The major diseases prevailing in Dugda Bora Wareda include Urticaria, Malaria, Intestinal Parasites, Skin Disease, Eye Disease, Diarrhea, Anemia. Although the region has been placing emphasis on ensuring the primary health care, there are a limited number of health care facilities and health personnel. A large portion of the population neither has access to safe water nor sanitation facilities, which is afflicted by water-borne diseases. The major causes of morbidity are respiratory infection, malaria, skin infections, diarrheal and intestinal parasitic infections. Health center located in Meki town, and clinics, located in Alam Tena and major PA, are providing curative and preventive health care services including general consultation, prenatal and baby clinic, examination, treatment, family planning, immunization, health education and promotion of national health campaign (eradication of malaria and polio). A doctor and nurses are assigned to the health center while health assistants mainly run clinics. A health post is managed by a community health worker with basic training in health and mid-wifery. But the facility faces to budgetary and manpower problems in terms of number of staff and lack of training. In addition to the government service, in Alam Tena, the Catholic Church established a clinic in 1995. The number of patients visited the facilities in 1999 was reported to be 29,900 for first visit, and 31,900 for the repeated.

**Medical facilities and Personnel in Dugda Bora Wareda**

Facilities / Medical Personnel	Number of Facilities / Personnel	Ratio of Facilities, Medical Personnel to population		
		Dugda Bora Wareda	East Shewa Zone	Oromia Region
Health Centre	1	156,358	361,979	272,069
Clinic	13	12,027	54,845	23,826
Government	5	-	-	-
Private	7	-	-	-
NGO	1	-	-	-
Health Post	2	156,358	361,979	272,069
Drug Stores	10	15,636	Not available	Not available
Doctors	1	156,358	30,676	68,714
Nurses	5	31,272	10,969	22,149
Health Assistants	15	10,424	5,954	6,288
Health Worker	6	26,060	Not available	Not available
Sanitarian	1	156,358	Not available	Not available
Pharmacy Technicians	4	39,090	Not available	Not available

Source : Wareda Health Department, Meki, 1999 and Zonal Level Health Department in 1996



The above table shows that the wareda has the facilities above the zonal and the regional average while the personnel in the wareda does not reach those averages. The availability of health institution and staff does not ensure coverage of health care. However, as long as the facilities and personnel of health care are concerned, it can be seen that the Dugda Bora wareda is not inferior to the regional level. (3.7.3)

#### **IV. Development Constraints**

42. The development constraints against the irrigation sector of Dugda Bora Wareda are summarized below. (4.2)
  - 1) Lack of development strategy in the Meki area
  - 2) Inadequate operation and management (O&M)
  - 3) Insufficient support by OIDA
  - 4) Low crop productivity due to poor farming techniques
  
43. The development constraints against the crop sector of Dugda Bora Wareda are summarized below. (4.3)
  - 1) Improper farming practices
  - 2) Delayed inputs supply
  - 3) Low post-harvest efficiency
  - 4) Low bargaining power against middlemen
  - 5) Frequent drought disaster
  
44. The development constraints against the livestock sector of Dugda Bora Wareda are summarized below. (4.4)
  - 1) Prevailing local breeds of low productivity
  - 2) Shortage of forage crops
  - 3) Frequent outbreak of animal diseases
  - 4) Lack of animal husbandry techniques suited to the Meki area
  - 5) Farmers' low capacity
  
45. Environmental degradation process is accelerated in Dugda Bora Wareda. They are represented by the following aspects. (4.5)
  - 1) Increase of sediment loads in river water
  - 2) Low water retention capacity of catchment
  - 3) Deterioration of farmland
  - 4) Prevalence of water-born diseases
  
46. As development constraint, low incentives and capabilities among rural communities are identified as follows. (4.6)
  - 1) Lack of awareness creation by the local government agencies

- 2) Farmers' difficulties to access to public services
  - 3) Discouraged farmers
  - 4) Conventional society of rural community
  - 5) Low participation caused by financial constraints
47. Local farmers are facing insufficient fulfillment of basic human needs (BHN) resulting in poor living conditions and low socio-economic activities in the Meki area. (4.7)
- 1) Shortage of safe drinking water
  - 2) Stagnation of inter and inner transportation
  - 3) Insufficient health care services
  - 4) Insufficient schools
48. The OIDA's organizational and institutional constraints are summarized below. (4.8)
- 1) Financial loads to be expanded by staff recruitment
  - 2) Weak quality control in the direct force account project
  - 3) Unnecessary gap between community development and agricultural extension
  - 4) Needs for capacity building for watershed management works
  - 5) Needs for communication facilities between head office and local offices
49. The problem tree was constructed to present the cause-effect relations more clearly. The core problem is defined as "Low progress in agricultural and rural development in the Meki area. The direct causes comprise (i) limited progress in irrigation development, (ii) low and unstable rainfed crop production, (iii) low and unstable livestock production, (iv) low development incentives and capabilities among rural communities, (v) insufficient fulfillment of basic human needs (BHN), and (vi) accelerated environmental degradation. (4.9)

## **V. Water Resources Potential and Constraints**

50. The potential and constraint for water resources development were 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 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 others. The results of alternative study show that the dam schemes can irrigate larger area with 195% cropping intensity, from 5,500 ha for 30 m dam height to 9,700 ha for 40 m dam height. However, dam scheme will cause much reduction in Meki river flow to the Ziway lake, from 29.7% for 4,700 ha to 57.1% for 9,400 ha. 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 effect on downstream water resources system is discussed in the following sections. (5.2 and 5.3)

### Irrigation Development Potential of Meki River

Conditions of Project Works	Cropping Intensity (%)	Irrigable Area (ha)	Irrigation Area under 195% c.i. (ha)	Reduction of inflow to Ziway lake (%)
Diversion Weir	105	2,300	2,415	5.4
Dam(30m H)	195	4,700	9,165	29.7
Dam(35m H)	195	8,000	15,600	48.4
Dam(40m H)	195	9,400	18,330	57.1

### Effect of Meki River Water Intake on Downstream Lakes and Bulbula River

Conditions of Project Works	Reduction in Ziway Lake Storage (%)	Reduction in Outflow to Bulbula River (%)	Reduction in Abijata Lake Storage (%)	Reduction in Abijata Lake Area (%)
Diversion Weir	2	8	5	2
Dam(30m H)	10	43	26	11
Dam(35m H)	20	66	38	17
Dam(40m H)	24	76	41	20

51. As an alternative, the 2,300 ha of area can be irrigated with 105% cropping intensity by diversion weir. The results show a reduction of 5% in storage with diversion scheme and from 26% to 41% with dam schemes. The results also show that dam scheme can have significantly impacts on the water level of the Abijata lake. The reduction in water level can cause increase in the alkalinity of the lake, which may affect the birds such as Pelican and Flamingo. These are rough estimates to show the possible environmental impacts on the Abijata lake as the storage characteristics of the Abijata lake is assumed based on the previous study. (5.4)
52. The water balance study concludes that: (5.5)
- 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 the downstream reach of the river.
  - 2) Irrigation development with diversion weir scheme mainly for wet season on the Meki river will have less adverse environmental impacts.
  - 3) There is a possibility of development of 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 its impacts should be carefully studied before any expansion.

## VI. Mater Plan

53. The master plan for the Meki Irrigation and Rural Development Project is formulated around the following three basic concepts, namely (i) integrated development, (ii) sustainable development, and (iii) model development. Poverty problems widely range with the complex structure of cause-effect relationships. In other words, several

approaches will be required for solving even a single problem. This implies needs of “holistic approach” (integrated development). Project performance is often minimized after donors and NGOs are phased out at the completion of project implementation. The project sustainability is one of the important aspects to be discussed when a project is formulated (sustainable development). Since the Meki area is located at 130 km south of Addis Ababa with easy access, the Project is envisaged as a model scheme to demonstrate the performance of the development activities. Experiences in the Meki area are expected to apply to other zones and woredas in the Oromia Region (model development). (6.1)

54. The master plan aims at directing all the development efforts to achieve the ultimate objectives, i.e. food security and poverty alleviation, along the long-term strategy. In a realistic sense, the Study defines the plan period to be the next decade of 2001-2010. (6.3.1)

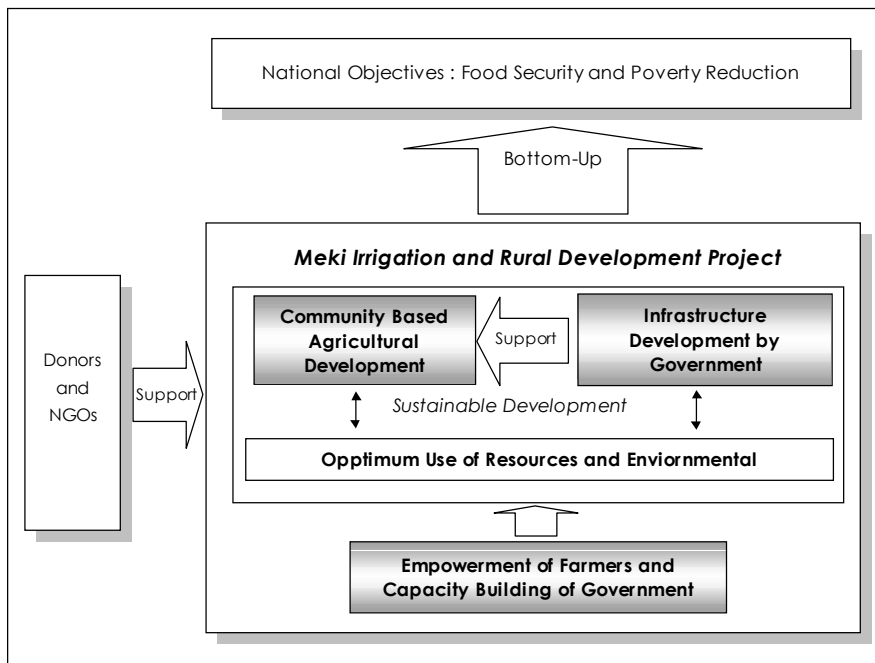
55. It is noted that the Meki area is rather in better conditions in terms of existing rural infrastructure. It is envisaged to optimize the government investment and avoid expansion of socio-economic gaps between the Meki area and other rural areas of the Region by intensive investment in the Meki area. It seems that infrastructure development in Meki area cannot be prioritized at least for the coming 10 years of the master plan in comparison with that of other areas of the Region. (6.3.2)

56. The 21 projects were preliminarily formulated to meet the requirement verified through the analysis of the development approaches. The selected 21 projects selected are listed below. (6.3.1)

1. Irrigation Development Program
  - 1-1 WUA Support Program
  - 1-2 Meki Irrigation and Rural Water Supply Project
2. Rain-fed Agriculture Improvement Program
  - 2-1 Semi-Arid Farming Improvement Project
  - 2-2 Community Seed Bank Project
  - 2-3 Post-Harvesting Techniques Improvement Project
  - 2-4 Community Pond Project
3. Animal Husbandry Modernization Program
  - 3-1 Demonstration Unit Project
  - 3-2 Forage Production Project
  - 3-3 Improved Breed Promotion Project
4. Environmental Conservation Program
  - 4-1 Environmental Monitoring Program

- 4-2 Seedling Center Project
- 4-3 Watershed Management Program
- 5. Capacity Building Program for OIDA and Wareda Staff
  - 5-1 OIDA Engineers Training Program
  - 5-2 OIDA Community Development Experts Training Program
  - 5-3 Wareda Staff Training Program
  - 5-4 Community Resource Mapping Project
- 6. Community Development and Cooperative Promotion Program
  - 6-1 Community Leader Training Program
  - 6-2 Visioning Workshop Program
  - 6-3 Drinking Water and Nutritional Improvement Program
  - 6-4 Community Center Project
  - 6-5 Grain Bank Promotion Program

57. The 21 projects can be categorized into three (3) components. The community-based agricultural development is the main component supported by infrastructure development by the government. Both activities are sustainable by human factors, namely empowerment of farmers and capacity building of the government staff. Donors and NGOs are supporters for implementation of the master plan. (6.3.2)



Basic Structure of Implementation of Master Plan

58. The project priority is assessed on a preliminary basis in order to set up the tentative implementation schedule. The selected 21 projects were qualitatively evaluated in terms of the following factors. (6.3.3)

- 1) Contribution to project objectives, namely food security and poverty alleviation.
- 2) Urgency among rural communities
- 3) Technical adaptability of OIDA
- 4) Technical adaptability of Bureau of Agriculture
- 5) Technical adaptability of farmers
- 6) Fund requirement
- 7) Time requirement
- 8) Duplication with on-going projects
- 9) Social risk
- 10) Environmental impact

Priority was given to such projects as the semi-arid farming technical improvement project, the WUA support program, the environmental monitoring program, the seedling center project, the community leader training program, the visioning workshop program for farmers empowerment, and the drinking water and nutritional improvement program. (6.4)

59. The Ethiopian Social Rehabilitation and Development Fund (ESRDF) was established in February 1996 under the initiatives of IDA. This fund aims at financing multi-sector poverty reduction projects and programs. The ESRDF has disbursed US\$ 88 million, out of US\$ 153 million earmarked from donors, for 1,740 projects consisting of 891 water supply and sanitation, 386 education, 340 health and capacity building and training since its establishment. So far around 5 million poor people were covered by the ESRDF projects. It is noted that performance of ESRDF in the irrigation sector is low, only 25 small-scale irrigation projects. The main reasons are (i) conditions of high internal rate of return (15%) and (ii) difficulties in community mobilization. (6.6.1)

60. Oromia Rural Development Fund (ORDF) is proposed to facilitate financial assistance for community-based irrigation development projects. The Fund will be released to peasants in the Meki area and further to be expanded to the whole Oromia Region. At the initial stage, the Fund will assist local farmers and communities who will participate in Water Users Associations (WUAs) under [1-1] WUA Support Program mentioned above. (6.6.2)

## **VII. Initial Environmental Examination (IEE)**

61. The Project is expected to improve the livelihood of the target group through improved

food security and reduced poverty through environmentally sustainable practices. The initial screening process indicated that 20 projects would give positive or neutral environmental benefits. However, only project “Meki Irrigation and Rural Water Supply Project” shows variable environmental impacts and requires IEE for further assessment of environmental impacts. (7.1)

62. The IEE is a requirement of the Environmental Policy of the FDRE. It has two components: screening and scoping. Screening is a preliminary environmental review to assess whether EIA is necessary or not for a proposed development project. And if needed, to decide the nature and magnitude of the proposed project’s potential environmental and social impacts and assigns the project to one of the three categories (Schedules) according to the EIA Guidelines of the FDRE. Once a project is categorized, a scoping process defines the project’s likely environmental impacts and the area of influence more precisely and develops terms of reference (TOR) for the EIA. As part of this process, information about the project is disseminated to local communities and NGOs, followed by consultations to help to focus the EIA on issues of concern at the local level. The IEE was conducted using existing data and experience in similar projects. To attain these objectives, the Study reviewed all relevant data and documents related to potential environmental impacts of the Project, especially, the Environmental Assessment Guidelines Document of: the FDRE (2000). (7.2.1)
  
63. The most crucial negative impact of the proposed project relates to diversion of water Meki River through an intake for irrigation. The diversion of water will lead into competition and conflicts from water users downstream due to change of river flow regime. The conflicts relate mainly to reduced flow for on-going irrigation activities, pastoral and domestic water uses depreciation of fish and fisheries, and reduction of waterfowl population (especially, Pelicans and Flamingo) in Lake Abijata-Shalla National Park, which is a proposed RAMSAR site. The adverse social impact of the Project relates to loss of land by the communities in the proposed irrigation area due to the planned influx of new farmers and the associated social discomfort. Although these impacts range from moderate to highly significant effects, they were identified during the limited period of the IEE, which is characterized by inadequate supporting data. Therefore, the IEE results are not considered decisive to approve or discredit the project viability at this stage. (7.2.4)

### **VIII. Verification Study**

64. The verification study (V/S) is expected to provide a lot of valuable information for confirmation and elaboration of the Mater Plan. In addition, the V/S envisaged contributing to the capacity building for the government staff, who will play key roles in the implementation of the Mater Plan in future and the direct benefits to target groups

through the implementation of the V/S. (8.1)

65. The following six aspects were selected. (8.2.2)
- 1) Capacity building of OIDA in hydrological data collection and analyses
  - 2) Establishment of a database of OIDA projects for systematic monitoring and evaluation
  - 3) Environmental monitoring – irrigation development and water use in the Meki area
  - 4) Preparation of establishment and operation guideline for WUA
  - 5) Community resource mapping
  - 6) Preparation of extension tools and research program for the Meki area
66. The V/S was carried out in the Third Fieldwork in Ethiopia of the Phase-II for six months from May to November 2001. The evaluation was made through the analyses of the monitoring records and actual performance of the activities at the workshop and discussed by all the attendants. The performance and results of the V/S were analyzed with special attentions to (i) information fed back to the M/S, (ii) contribution to capacity building for the government staff and (iii) direct benefits as pilot project. (8.3)
66. Program 1 aimed (i) to determine the present capacity and knowledge of the existing OIDA engineers on analytical hydrology for irrigation development, (ii) to optimize realistic target to meet the tasks of OIDA, and (iii) to select effective training programs necessary to fulfil the gap between (i) and (ii). The training program including 2-day general workshop for all participants and 2-weeks intensive training program on methodology of hydrological analysis for selected persons was carried out. The Program concluded that OIDA engineers need further training under the M/P as follows. (8.3)
- 1) Basic training of computer use for data analysis
  - 2) Estimation of missing data, crop water requirement, probability analysis, flood analysis, low flow analysis, and other hydraulic analysis needed for planning and design for irrigation development project.
  - 3) Preparation of Design Report
  - 4) Preparation of terms of reference for hydrological analysis
67. Program 2 aimed to establish the management information system for 96 existing irrigation schemes, of which overall irrigation performance is as low as 58%, so as to provide OIDA staff with data and information necessary for identification of prevailing constraints facing each of scheme including necessity of urgent rehabilitation works. The data and information collected through the field survey covered 27 items consisting of finance source, natural condition, water source, present condition of facilities, progress of project implementation, farming, activities of water users' association, assignment of OIDA DA. The database thus established will be utilized for more efficient scheme management and future rehabilitation program. (8.3)
68. The objective of Program 3 is to initiate the long-term environmental monitoring program specified in the draft master plan. Although OIDA is the most appropriate agency to



monitor irrigation water use in the Region, the budgetary arrangement and human resources are limited. The V/S envisaged formulating a realistic monitoring program under the given conditions. Three monitoring programs could be commenced during the V/S period as follows. (8.3)

- 1) The discharge measurement for the Meki and Bulbura rivers by the automatic water level recorders installed by the JICA Study Team.
  - 2) Irrigation water use by operation records of the Meki-Ziway irrigation scheme.
  - 3) Inventory survey of small pumps in the Meki river basin by the OIDA Wareda staff.
- 69 Program 4 aims to prepare a guideline for establish WUAs for small-scale irrigation development, focusing on standardization of community mobilization for establishment of the WUAs. The Community Mobilization Department of OIDA is responsible for establishment of the WUAs, assigning 31 social workers in the head office and the branch offices. Through the PRA, appropriate approaches and procedures from planning to construction have been discussed in three (3) rural communities of Shubi Gamo PA, which preferred to embark on a small-scale irrigation development. For each scheme, 20 householders with 5 ha of total farmlands were organized. A small pump and cost for civil works were provided by JICA, while OIDA arranged construction equipment. The number of beneficiary under the Program is 63 comprising of 315 family members, i.e. Shubi scheme (15H.H with 3.5ha), Sombo Genet scheme (28H.H. with 7.0ha) and Sombo Aleltu (20H.H. with 5.0ha). (8.3)
- 70 The objective of Program 5 was to collect and arrange the information of rural communities by means of Community Resources Map (CRM) and to seek potentiality to apply the map to rural. The V/S prepared the entire CRM covering 54 PAs of Dugda Bora Wareda by inputs of 27 DAs of OADB. Firstly, the applicability of CRMs was analyzed for the field of agricultural extension. The V/S demonstrated the applicability of CRMs for (i) data accumulation and application to sustainable extension activities, (ii) application to EPP, (iii) collection and provision of data in uniform manner, (iv) identification of bottom-up needs and (v) preparation of strategic extension program with development targets. (8.3)
71. The objectives of Program 6 were (1) to review the extension and research programs to improve farming practices in the semi-arid area, (2) to compile extension materials suitable for the Meki area, and (3) to verify the materials in the area. Because of low literacy rate in the area, it was foreseen that the extension materials to be applied in the area should be prepared visually by use of illustrate and photograph. The Study identified that the conversation language in the Meki area is Oromo but the written languages are Amharic for adults and Oromo for youth, who are given the primary education in Oromo language. The extension information sought by farmers are different by communities. Referring to the existing 55 extension materials, Extension Handbook for DAs and 14 subject leaflets were prepared and handed over to OADB. (8.3)

72. The number of the participants in each program is summarized below. (8.3)

Program	Persons	Man-day
1	10	118
2	42	359
3	37	374
4	120	816
5	32	1,435
6	27	356
Total	268	3,458

**The Study  
on  
Meki Irrigation and Rural Development Project  
Oromia Region, Ethiopia**

**Main Report**

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## Acronyms

ADLI	Agricultural-Development-Led Industrialization
AISE	Agricultural Input Supply Enterprise
BHN	Basic Human Needs
BOD	Biochemical Oxygen Demand
CCF	Christian Children Fund
CPD	Zonal Cooperative Promotion Department
DA	Development Agents
DAP	Duplicate Ammonium Phosphate
DPPB	Disaster Prevention Preparedness Bureau
DPPC	Disaster Prevention Preparedness Commission
EARO	Ethiopian Agricultural Research Organizations
EFSRA	Ethiopia Food Security Reserve Authority
EGTE	Ethiopian Grain Trade Enterprise
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPP	Extension Package Program
EPRDF	Five Years Programmes of the Ethiopian Peoples Revolutionary Democratic Front
ERA	Ethiopia Road Authority
ESDP	Education Sector Programme
ESE	Ethiopian Seed Enterprise
ESRDF	Ethiopian Social Rehabilitation and Development Fund
ESTC	Ethiopian Science and Technology Commission
ET <sub>0</sub>	Reference crop evapotranspiration
ETPS	Education and Training Policy and Strategy
F1	Hybrid
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
FG	Farm Group
FIDIC	Federation International Des Ingenious Conseils
GDP	Gross Domestic Products
HH	Household
HHICE	Household, Income, Consumption and Expenditures
HSDP	Health Sector Development Programme
IEE	Initial Environment Evaluation
IFAD	International Fund for Agricultural Development
JICA	Japan International Cooperation Agency
MCS	Meki Catholic Service
MEDaC	Ministry of Economic Development and Cooperation
MNRDEP	Ministry of Resources Development and Environment Protection
NARI	National Agricultural Research Institute
NFIA	National Fertilizer Industry Agency
NGO	Non-Governmental Organization
NSIA	National Seed Industry Agency
O&M	Operation and Maintenance
OIDA	Oromia Irrigation Development Authority
ORRA	the Oromia Rural Road Authority
OWMEDB	Oromia Water , Mine & Energy Resources Development Bureau
PA	Peasant Associations

PCM	Project Cycle Management
PRSP	Poverty Reduction Strategic Paper
RAB	Regional Agricultural Development Bureau
RCPB	Regional Cooperative Promotion Bureau
RRA	Rapid Rural Appraisal
RSDP	Road Sector Development Programme
S/W	Scope of Work
SDDP	Small Dairy Development Programme
SDPs	Sector Development Programmes
Self Help	Self Help Development International Co.
SG2000	Sasakawa Global 2000
SMS	Subject Matter Specialist
TLU	Tropical Livestock Unit (270 kg of live-weight)
TOR	Terms of Reference
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund (United Nations Children's Fund)
WC	Water Committee
WFP	World Food Program
WUA	Water Users Association

### **Abbreviation**

kg	kilogram
t	ton
qt	quintal (100 kilogram)
h	hour
mm	millimeter
cm	centimeter
m	meter
km	kilometer
ha	hectare
km <sup>2</sup>	square kilometer
m <sup>3</sup>	cubic meter
MCM	million cubic meter
mm/mon	millimeter per month
mm/d	millimeter per day
m/s	meter per second
m <sup>3</sup> /s	cubic meter per second
•C	degrees centigrade
%	percent
US\$	United States of America Dollar

## **CHAPTER 1 INTRODUCTION**

### **1.1 Authority**

This Final Report is prepared pursuant to Clause VI of the Scope of Work (hereinafter referred to as “S/W”) for the Study on the Meki Irrigation and Rural Development Project in Oromia Region, Ethiopia (hereinafter called the Study) agreed between Oromia Irrigation Development Authority (OIDA) and the Japan International Cooperation Agency (JICA) on 28th March, 2000. The S/W and the Minutes of Meeting on the S/W are attached to this report as Attachments 1-1 and 1-2, respectively.

The Study consisted of (i) data collection, (ii) identification of constraints and potentials including formulation of the draft master plan, (iii) execution of a verification study and (iv) finalization of the master plan in accordance with Clause IV in the S/W. This report presents all the results from the Study consisting of the Field Work in Ethiopia and the Home Office Work in Japan carried out from August 2000 to March 2002.

### **1.2 Study Area**

The study area is shown in the location map of the study area (see the opening page of this report). The study area administratively falls in Dugda Bora Wareda (district) in East Shewa Zone of Oromia Region.

The study area is located in the center of Oromia Region, the largest region in Ethiopia with a total coverage of 353,007 km<sup>2</sup> or 34% of the national territory and provides livelihood to 22.35 million or 37% of the total national population. The study area is situated on the bottomland of the Rift Valley (El. 1,650 m) with a total area of 400 km<sup>2</sup> around Meki town located 130 km south of Addis Ababa.

### **1.3 Objectives of the Study**

The objectives of the Study are;

- (1) To formulate a master plan for rural development in the Meki area of the Oromia Region considering its irrigation potential, and its overall goal is to be a model rural development area in the Region, and
- (2) To conduct technology transfer to the Ethiopian counterpart personnel, aiming to contribute to institutional building of OIDA in the course of the Study.

### **1.4 Scope of the Study**

The overall scope of the Study was defined in Clause V of the S/W as follows.

[Phase 1]

(1) Data collection

- 1) Collect and review the existing information relevant to the Study
- 2) Carry out field surveys and interviews together with supplementary data collection on the following aspects;
  - i. Natural conditions, i.e. topography, meteorology, hydrology, geology, soils, etc.
  - ii. Social and economic conditions, i.e. social and economic indices, land tenure, health and water supply, farmers' economy, etc.
  - iii. Present activities and potential of agricultural and livestock production
  - iv. Present conditions of post-harvest procedures and marketing channels of agricultural produces
  - v. Rural economy and rural credit
  - vi. Extension services/system
  - vii. Others relevant to the Study

(2) Identification of constraints and potentials

- 1) Analyze the collected information, and identify major constraints, problems and potentials
- 2) Conduct the Initial Environment Evaluation (IEE)
- 3) Prepare a draft master plan, taking into account the following components.
  - i. Water resources development
  - ii. Improvement of agricultural production
  - iii. Improvement of people's livelihood
  - iv. Public intervention (extension services, rural credits, etc.)
  - v. Institutional building
  - vi. Others
- 4) Select pilot activity/activities for a verification study.

[Phase 2]

(3) Formulation of Master Plan

- 1) Conduct a verification study by implementing selected activity/activities proposed in the draft Master Plan
- 2) Verify the rationality and effectiveness of the draft Master Plan
- 3) Finalize the Master Plan

(4) Conclusion of the Study and Recommendations

## 1.5 Steering Committee

A Steering Committee has been established for smooth and efficient execution of the Study. The Committee consists of the following organizations.

Ethiopian organisations represented:

- 1) Oromia Irrigation Development Authority (OIDA)
- 2) Bureau of Agriculture
- 3) Water, Mining, Energy Resource Development Bureau
- 4) Cooperative Promotion Bureau
- 5) Oromia Women Affairs Sector
- 6) Bureau of Health
- 7) Bureau of Planning and Economic Development
- 8) Ministry of Economic Development and Cooperation (MEDaC)

Japanese organisations represented:

- 1) JICA Study Team
- 2) Advisory study team
- 3) JICA Ethiopia office
- 4) Embassy of Japan

## 1.6 Study Schedule

The Study was executed according to the time schedule presented below.

	Phase-1 □ Formulation of Draft Master Plan □ j												Phase-2 □ Verification Study □ j												Phase-3 □ Evaluation □ j					
	1st Year 2000/2001												2nd Year 2001/2002																	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar										
	Work in Ethiopia			1st				2nd			3rd							4th												
Work in Japan	Preparatory Work				1st										2nd			3rd												
Reports	I/R				P/R(1)	I/R								P/R(2)	Df/R			F/R												

### (1) Preparatory Work and First Field Work

The Study was officially commenced in August 2000. The JICA Study Team arrived in Addis Ababa on 2<sup>nd</sup> September 2000 and submitted the Inception Report to the Ethiopian representatives. The report was explained and discussed on 5<sup>th</sup> September 2000. The Ethiopian representatives agreed to proceed to the Phase-I Study. The relevant Minutes of Meeting are attached to this report as Attachment 1-3.

The First Field Work in Ethiopia of the Phase-I Study was officially commenced on 8<sup>th</sup> September 2000. The Ethiopian representatives appointed counterpart personnel for each member of the Study Team. The members of both the Study Team and the Counterpart Team are listed in Table 1.1.1.

The Study has been carried out by joint efforts of the JICA Study Team and the

Counterpart Team throughout the study period. A weekly meeting was held between both parties every Monday in order to confirm mutual understanding on the work progress and schedule. The First Field Work was successfully performed as scheduled and was completed on 21<sup>st</sup> December 2000. At its completion, a steering committee meeting was held that discussed the work results stipulated in the Progress Report (1). The minutes of that meeting are attached to this report as Attachment 1-4.

(2) First Home Work

The Study Team performed the detailed studies on the draft master plan through the First Home Office Work in Japan from December 2000 to February 2001. The full results of the Phase-I Study are incorporated within this Interim Report.

(3) Second Field Work

The Study Team was sent to Ethiopia to execute the Second Field Work, in which the Interim Report was discussed by both Ethiopian and Japanese representatives and accepted on 9<sup>th</sup> March 2001 as Attachment 1-5. In addition, the discussion was held on the plan of operation of a verification study to be executed in Third Field Work of the Phase-II Study. The note of understanding was signed as presented in Attachment 1-6.

(4) Third Field Work

The Third Field Work commenced in May 2001 in order to carry out a verification study consisting of six (6) programs. The verification study was completed in November 2001. The results of the verification study was analyzed and compiled into the Progress Report (2). The minutes of that meeting are attached to this report as Attachment 1-7.

(5) Third Home Work

The Study Team reviewed and elaborated the draft master plan taking the results of the verification study into consideration. The project evaluation was made for all the 21 projects proposed under the master plan. The Draft Final Report presents all the study results.

## **CHAPTER 2 PROJECT BACKGROUND**

### **2.1 Agricultural Sector in Ethiopia**

The agricultural sector of Ethiopia plays a leading role in the growth of the national economy. It contributes employment opportunities to 74% of the total workable population and generates approximately 50% of Gross Domestic Product (GDP). The prevailing rainfed agriculture is prevalent in the country, therefore, food production fluctuates greatly due to erratic rainfall. Moreover, the food shortage is becoming chronic and will be accelerated by rapidly expanding population pressure in the years to come.

The Government of the Federal Democratic Republic of Ethiopia (hereinafter referred to as “FDRE”) attaches the development priority to the agricultural sector and envisaged achievement of (i) improvement of food sufficiency ratio, (ii) supply of raw materials to domestic industries, (iii) creation of employment opportunities, (iv) foreign currency saving and (v) environmental conservation.

Due to the substantial government’s efforts, the GDP has grown at an annual average rate of 5.5% in the periods of 1992/93 to 1997/98 with sectoral growth rates of 3.4% for agriculture (4.9% for crop production).

### **2.2 Development Policies and Targets**

The Five Year Programs of the Ethiopian Peoples Revolutionary Democratic Front (EPRDF) for Development Peace and Democracy are officially accepted as the primary policy papers to direct the national development strategies in Ethiopia. The first five year program covered the period from 7<sup>th</sup> July 1995 to 6<sup>th</sup> July 2000, which was followed by the second five year program from 7<sup>th</sup> July 2000 to 6<sup>th</sup> July 2005. Both Programs envisage to encourage small holders by means of more intervention of crop credit schemes integrated with the research - extension linkage, rural infrastructural development, improvement of rural amenity and capacity building of human resources.

The Programs define the principles of small holder focus policies. However, only a few documents have set rigid development plans and targets for the agricultural sector at the national level. In this regard, the Study focuses on the development plans at the regional level.

## **2.3 Key Issues**

### **2.3.1 Poverty Reduction Strategic Paper (PRSP)**

#### **(1) Poverty in Ethiopia**

Ethiopia falls among the five poorest countries in the world. The UNDP Human Development Report ranks Ethiopia as 171 out of 174 countries. Poverty in Ethiopia is widespread and multi-faced. Poverty manifests itself in society through poor health, ignorance, environmental destruction, low education, unemployment, malnutrition, short life expectancy and high mortality ratios both for mothers and children. Therefore, poverty alleviation may be defined as improvement of important amenities of life including land, housing, food, employment, education, other social services as well as the ability of decision making on important matters in life. It is noted that poverty problems in Ethiopia widely range with the complex structure of cause-effect relationship.

FDRE embarked on a number of household surveys in 1995/96 to verify the household characteristics and to monitor the impact of its development policies and programs on the welfare of the people. According to the Household, Income, Consumption and Expenditures (HHICE) in 1995/96, the per capita income in Ethiopia was US\$ 167, which was one of the lowest in the world. The urban and rural imbalance in the per capita income was also obvious, i.e. US\$217 for the urban area and US\$ 159 for the rural area.

As for the minimum nutrition requirement of 2,200 calories per adult per day, the overall average of per capita nutrition intake was only 1,954 calories and 45.5% of the population were below the poverty line. The incidence of malnutrition among children is more crucial. The 1998 Health and Nutrition Survey revealed that 52% of all children aged 3 to 59 months were stunted and under acute malnutrition.

In 1994, the life expectancy at birth was 50.6 years of age. The current infant and child mortality rates were 105 per 1000 and 172 per 1000, respectively, which are the highest in the world.

The overall adult literacy rate was 22.3% in 1996. There is a significant gender gap in literacy rate. The female and male adult illiteracy rates were 77% and 55%, respectively. Imbalance between urban and rural areas is also recognized. Some 61% of the urban population were literate, while only 16% were literate in rural areas. The gross enrollment ratio at the primary level of education was 23%.

#### **(2) Poverty Reduction Strategic Paper (PRSP)**

Poverty reduction continues to be the core agenda of the country's development. The government policy is to be incorporated into Poverty Reduction Strategy Paper (PRSP). It will consist of four (4) building blocks, namely agricultural-development-led industrialization (ADLI), judiciary and civil service reform, decentralization and empowerment, and capacity building in public and private sectors. Among the four



(4) blocks, achievement of substantial progress of ADLI is probably the most urgent issue.

Ethiopia has been following a long-term strategy of ADLI adopted in the mid-1990s within the framework of draft PRSP. ADLI places the emphasis on agricultural growth as the first stage of the national economic development to encourage industrialization as the final goal of the country. To start with ADLI, agricultural growth is firstly envisaged to raise the level of national food self-sufficiency and followed by producing both export-oriented and industrial crops. FDRE attached the development priority for the improvement of food security at the household level as the most effective and direct way of poverty reduction in the country.

The zero draft (interim) of PRSP was prepared by FDRE was prepared in November 2000 and is currently under scrutiny by both the governmental and donor agencies. The final PRSP will be worked out in the coming months before the Study is completed in March 2002. However, it is believed that the Project will contribute to substantial parts of the PRSP' core objectives, namely poverty alleviation through food production and improvement of rural living conditions.

### **2.3.2 Sector Development Programs (SDPs)**

The social infrastructure development in Ethiopia and the Region is basically under the control of FDRE and the Regional State Government. Currently, FDRE exerts the national budgetary arrangement for some sectors in line with the sector development programs (SDPs), in particular, the three sectors of education, health and roads. Besides, FDRE has recently embarked on preparation of the SDP for the water sector. The current position of SDPs is summarized below.

#### **(1) Education**

FDRE adopted a new Education and Training Policy and Strategy (ETPS) in 1994. The policy and strategy focus on expanding access to educational opportunities to meet future needs in the social and economic development as a whole. The First Five-Year Education Sector Program (ESDP) is currently under implementation for the target year of 2001/2. The ESDP has been implementing construction and upgrading of primary schools and increased enrollment nationwide including the Oromia Region.

#### **(2) Health**

The Health Sector Development Program (HSDP) is also under implementation for the target period of 1997-2002, in which primary health care and referable hospitals are reinforced with medical staff training.

#### **(3) Roads**

The Road Sector Development Program (RSDP) set up a 10-year development plan to expand the road network by 80% by 2007. The priority is given to trunk roads, of

which the design is completed for 7,300 km and construction for 2,100 km (asphalt road). Rural road expansion will be carried out in line with the next RSDP period to synchronize with construction of national and regional road networks.

### **2.3.3 Gender in Development**

The prevalence of gender imbalance is pointed in several economic and social indicators in Ethiopia as well as Oromia Region. Following the adoption of the constitution in 1995, the national policy has aimed to remove discrimination of all forms against women and barriers to their advancement. To implement the national policy on women, FDRE has also established the necessary institutional framework at the government level, regional, zonal and woreda levels. Accordingly, a women's affairs subsector was established within the Office of Prime Minister and women's affairs departments were established in key sector ministries. Similarly, Women's Affairs Bureau was established under the Oromia Regional State Government in order to implement gender mainstreaming, advocacy, capacity building, empowerment and grassroots group formation.

Several activities are currently performed by Oromia Women's Affairs Bureau in cooperation with other bodies concerned. The performances in 1999/2000, which were presented in the regular meeting with the Prime Minister's Office held in August 2000, are summarized below.

#### **1) Advocacy and education of women**

Workshops, seminars and conferences were organized in 12 locations of the Region in association with donors, NGOs and the other government agencies such as Women's Affairs Department of Oromia Education Bureau. The activities aimed at advocacy and education on harmful traditional practices, family planning, women harassment and measures to be taken, horticulture, saving and credit, income generation, etc. In total, 14,700 women and men attended the functions.

#### **2) Capacity building and community-based projects**

Educational programs were provided on credit operation and income generation activities to 3,300 women at eight locations of the Region. The total credits released amounted to Birr 2.09 million directly assisted by donors and NGOs.

Nine (9) skill-training programs were organized at several locations. The training focused on tailoring, handicrafts, coffee seedlings raising, home economics, etc. Among them, 21 days training program was conducted in the Ziway training center to train 135 women in capacity building, income generation and cooperation.

#### **3) Promotion of gender-oriented projects**

With financial assistance of Ethiopian Social Rehabilitation and Development Fund (ESRDF), the existing 164 flourmills were either rehabilitated or replaced. The

farming (22 ha), sheep raising, bakery, tearoom and poultry farming.

#### **2.3.4 Environmental Conservation**

Ethiopia's economy depends almost entirely on its renewable natural resources. These resources are being depleted at unprecedented rate for subsistence living. A century ago, closed forest covered 40% of the country, but barely 4% is left today, suggesting that the deforestation rate has been, and continues to be, very high. The country's current biomass is estimated to vary between 10 and 50 m<sup>3</sup>/ha for woodlots, but due to open harvest system, their harvest has exceeded their annual incremental yields of 1.2 m<sup>3</sup>/ha due to expansion of agriculture, infrastructure and urban development.

At issue also is the threat of desertification, which is attributed to destructive developmental activities, inadequate and erratic rainfall and frequent droughts. With an average annual rainfall of between 300-500mm, drought is a recurring feature in many parts of the country, where up to 50% or more of the livestock is decimated. The most devastating droughts were those of 1972-74, 1975-76, 1978-79, 1983-84 and 1990-91, during which over 2.7 million people in Oromia Region alone were affected.

Deforestation and unsustainable land husbandry have resulted in accelerated runoff, reduction of ground water resources, increased sediment load in rivers, siltation of reservoirs and irrigation canals, and increased incidence of flooding. Both sheet and gully erosion is widespread in the country. Fertile soil losses are estimated at 42 tons/ha. It is estimated that soil erosion amounts to 1.5 billion tons per year in the whole country, and 0.5% of the highlands of Ethiopia is being eroded annually.

Increasing water degradation and unavailability are also serious development issues in Ethiopia. This includes problems of high salinity and fluoride in water resources. Water degradation can be attributed to lack of water management practices, lack of policy guidelines that should specify the modalities of water use for proper water and land management, the rights of downstream water users, water charges, and conservation of watersheds and watercourses. There is also inadequate monitoring and regulation of development activities that compete for water resources.

As for wildlife conservation, there is no policy for this sub-sector, such that elements that contribute to wildlife degradation are not effectively monitored or regulated. Major wildlife development issues include uncontrolled overgrazing and encroachment from nomadic pastoralists, uncontrolled fires, deforestation, poaching and illegal hunting, lack of infrastructures or communications, and inadequate compensation of local communities for conservation efforts.

The Ethiopian Rift Valley System has unique environmental issues. It is characterized by localized and limited quantities of water with fair to poor chemical qualities. All

streams are intermittent except for few perennials, which are often turbid with high sediment yield. Fluoride content in ground water is known to be the highest in the country, i.e. up to 10 ppm compared to WHO permissible level of 1.5 ppm, and salinity levels are as high as more than 3,000 ppm. Another problem is represented by high rates of sedimentation. For instance, sediment yield of the Koka lake in the northern fringe of Dugda Bora Wareda is the highest in the country, i.e. 2,300 tons/km<sup>2</sup>/year. In the Mojo area, the reservoir of the Metallitia dam was completely filled in two years as a result of gully erosion in the watershed.

Over-exploitation of natural resources is mainly because the net revenues currently being earned by the local population for conserving natural resources are quite inadequate to cover the opportunity costs of the land, i.e. the forgone benefits of alternative land uses. This creates economic incentives to destroy watershed including soil, water and vegetation at the expense of conservation. This is because the current economic and environmental policies in Ethiopia do not generate the scale of revenues needed to prevent the wide spread water and land degradation. Unless the compensation to landowners for not developing say, land in watersheds is raised adequately, significant water and degradation will continue as the opportunity cost of conservation increases.

## **2.4 Irrigation Sector of Oromia Region**

### **2.4.1 Oromia Irrigation Development Authority (OIDA)**

#### **(1) Organization and Staffing**

The Government of Oromia Regional State (the State Government) was officially established in July 1996. It currently comprises five sectors, namely social, economic, administration and legal, military and women's affairs. The economic sector is further divided into eight (8) bureaus and two (2) authorities including OIDA. The organization chart of the State Government is presented in Figure 2.4.1.

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 in line with the national policy of food security. According to "Oromia Regional State Irrigation Development Authority Establishment Proclamation, No. 30/1999," the major objectives of OIDA are to:

- 1) Undertake study, design and construction of irrigation schemes in suitable areas of the Region,
- 2) Contribute towards hastening the socio-economic development of rural community, and
- 3) Enable rural community to benefit from irrigation projects through

participation in study, construction and administration.

All the activities of OIDA are under the control of the General Manager at the head office in Addis Ababa. Then, the zonal operation is entrusted to four (4) branch offices, namely Central, Eastern, Western and Southern branch offices, and further to the woreda offices as shown in Figures 2.4.2 and 2.4.3. The Meki area is located within the coverage of the Central Branch Office.

The OIDA head office is organized into four (4) departments for study and design, construction, extension and watershed management and community participation, and four (4) service units for planning and programming, research and laboratory, administration, and finance and audit. Similarly, the branch offices are also organized into four (4) teams, namely study and design, construction, extension and water management, and community mobilization, and three (3) service units, namely planning and programming, administration and finance, garage and transport. Under the branch offices, the woreda extension offices are established at 69 districts out of 180 woredas in the Region.

OIDA is organized by 720 staff in total, consisting of 102 staff for the head office, 407 staff for four branch offices and 211 staff for 69 woreda offices as of November 2000. The technical staff accounts for 430 or 60% of the total staff. The staff having college diploma or degree comprises around 52% of the total staff. Engineering staff such as agricultural and irrigation engineers, hydrologists, geologists, etc. accounts for 195 staff or 84% of the total technical staff. The details of the staff structure are summarized in Table 2.4.1.

## (2) Budget Allocation

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

### Annual Budget of the Oromia Region

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

Source: Department of Finance, Oromia Region

Annual capital budget (investment) for the irrigation development during the period from 1997 to 1999 in the Region was about Birr 7.3 million on average that accounts

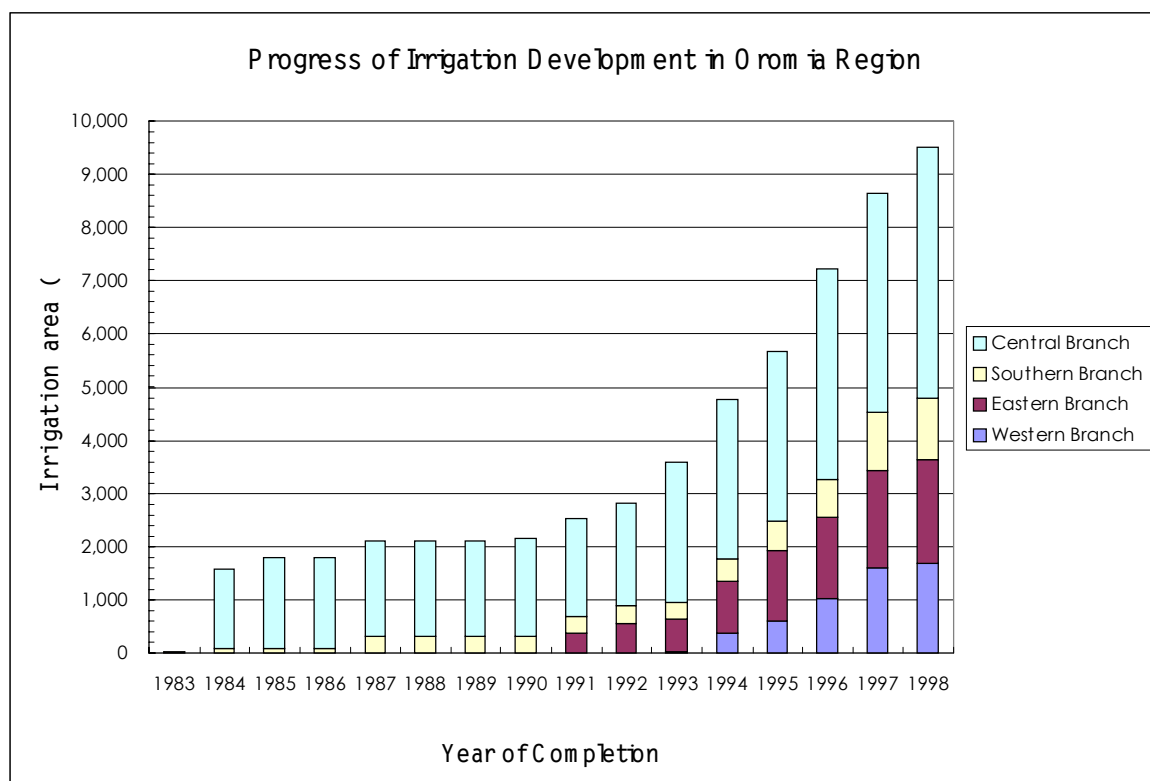
for 2% of the total economic sector investment of the Region, i.e. Birr 228.0 million. Both budget and share of irrigation development have been decreased year by year. from 22.5 million (6%) on average. In the period from 1993 to 1995, the average annual budget of the irrigation sector amounted to Birr 22.5 million or 6% of the annual capital budget.

Staff salary occupies the largest portion of the recurrent budget. As seen in the above table, the salary in the irrigation sector is as high as 45% of the total budget. This implies that staff recruitment for OIDA has to be carefully planned and executed taking into consideration expansion of financial loads.

## 2.4.2 Irrigation Schemes in the Region

### (1) General

In Oromia Region, the Government constructed 96 irrigation schemes during the last few decades. The total command area of 96 schemes amounts to 9,644 ha giving an average of 100 ha per scheme.



Source: Small Holders Modern Irrigation Schemes Evaluation Report, OIDA, 2000

The irrigation development has been accelerated since 1992, when the regime was changed and MNRDEP took full responsibility for the irrigation development.

In the year 2000, OIDA conducted the field investigation to evaluate the present performance of the existing irrigation schemes and to identify constraints and problems encountered each of the schemes. The existing irrigation schemes are listed

in Table 2.4.2 and their location is illustrated in Figure 2.4.4.

(2) Irrigation Schemes and Area

The distribution of the existing irrigation schemes is shown below.

**Irrigation Area by Branch Office**

Branch Office	Nos. of Schemes	Planned Irrigation Area		Actually Irrigated Area		Achievement (%)
		(ha)	(%)	(ha)	(%)	
Western	24	1,685	17%	514	9%	31%
Eastern	23	1,948	20%	1,456	26%	74%
Southern	12	1,188	12%	556	10%	47%
Central	37	4,823	51%	3,034	55%	63%
Total/Average	96	9,644	100%	5,560	100%	58%

Source: Small Holders Modern Irrigation Schemes Evaluation Report, OIDA, 2000

The Central Branch Office is the largest among four (4) branch offices. This branch currently controls 37 schemes with 4,823 ha or 51% of the OIDA's irrigation area. It is noted that only 58% of the area has been actually irrigated. This low performance implies that all the schemes are functioning well and need urgent repairs and rectification. The size of the Meki-Ziway irrigation schemes ranges from 20 ha to 1,500 ha with the average area of 100.46 ha. However, the actual irrigated area falls in a range between 0 ha and 518 ha with an average area of 57.9 ha. The most serious case is the Meki-Ziway irrigation scheme, which currently irrigates only 33 ha against the planned area of 1,500 ha.

In contrast, the actual irrigated areas exceed the planned area at some of the schemes, particularly in the Eastern Branch office area. It is reported that some of these schemes were extended by farmers without considering dependable water potential.

Out of 96 schemes, 63 schemes have a command area of less than 100 ha. The irrigation schemes are categorized by size of irrigation area as presented below.

**Classification of Irrigation Schemes by Size**

(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	300 • A	
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

Source: Small Holders Modern Irrigation Schemes Evaluation Report, OIDA, 2000

## (2) Water Sources and Irrigation Systems

River water is the main water resource of irrigation schemes in Oromia Region. Out of 96 schemes, 72 schemes obtain water from rivers. Only in the Eastern Branch office area, spring water is the main source. The intake facilities are represented by headworks. Among 96 irrigation schemes, 67 schemes are run-of-river type with headworks. This means that the gravity irrigation system is predominant in the Region, while pumping irrigation is adopted to a limited extent.

**Classification of Irrigation Schemes by Water Source and Irrigation System**

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

Source: Small Holders Modern Irrigation Schemes Evaluation Report, OIDA, 2000

### 2.4.3 Five Years Development Plan

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 annual plan is set for branch offices and for project activities as presented below.

#### Project Development Activities under 5-years Plan

Branch Office	Reconnaissance Study		Feasibility Study		Detailed Design	
	Proposed Schemes (Nos.)	Potential Development Area (ha)	Proposed Schemes (Nos.)	Potential Development Area (ha)	Proposed Schemes (Nos.)	Potential Development Area (ha)
Western	109	9,175	77	6,275	52	4,275
Eastern	104	8,350	72	5,625	58	4,650
Southern	66	4,865	34	2,515	33	2,440
Central	69	5,070	41	3,025	39	2,875
Total	348	27,460	224	17,440	182	14,240

Source: Oromia Region 5-years Development Plan

Other than construction of the infrastructure, 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

## CHAPTER 3 THE PROJECT AREA

### 3.1 Natural Resources

#### 3.1.1 Physiography and Geology

##### (1) Physiography and topography

The study area is located between latitudes 8•03'N and 8•24'N and longitudes 38•32'E and 39•02'E in the Ethiopian Rift Valley; a huge volcano-tectonic sunken block basically formed in the Tertiary period. The Ethiopian Rift Valley traverses in the SW-NE direction incising between the Ethiopian plateau and the Somalian plateau with a formation of a 35 to 80 km wide corridor between the faults. In the north of Nazareth, this corridor opens out into a triangle on the Afar, which is the junction of three tectonic directions, namely the Red Sea, the Gulf of Aden and the Ethiopian Rift. In the Quaternary, occurrence of heavy rains led to the formation of large lakes including the Ziway lake, which is charged by the Meki river.

The study area lies on the flat valley floor at an elevation of 1,655m. The vicinity of the Meki town comprises a plain sloping gently southeast towards the Ziway lake at an elevation of 1,636 m. The plain generally has a rather flat topography, varying its slope from 0.5 to 2.0 %. Within the plain, to the left bank of the Meki river, there is the Cheleleka swamp. The Meki river, which passes through the center of the town, has cut a steep sided narrow gorge of 10 to 20 m. The river originates in the Guraghe Mountains located in the northwest Meki town and flows southeast before draining into the Ziway lake. On the eastern side of the Ziway lake, the land rises to higher elevations up to the heights of Badda and Kada Mountains of Assela piedmont. On the western side of the lake, the slope is gentler.

##### (2) Geology

The geological foundation of the upper Meki basin includes ignimbrites, tuffs, waterlain, pyroclastic and occasional lacustrine deposits. The northwestern corner of the basin is underlain by ignimbrite, unwelded tuffs, ashflow, rhyolites and trachyte.

The geology in the lower Meki basin is composed predominantly of recent lacustrine deposits overlaying the Tertiary igneous rocks. Thin clayey soils overlie these deposits on the plain. The tertiary rocks are likely to consist of ignimbrites, tuffs and pyroclastics of the Dino Formation. The lower part of this formation comprises ignimbrites, tuffs, water lain pyroclastics and occasional lacustrine beds. The upper part consists of coarse, unwelded, pumiceous pyroclastics. Thickness of the Dino Formation generally exceeds 200m. The lacustrine deposits, which overlie the tertiary volcanic probably, exceed 50 m in thickness.

### 3.1.2 Climate

The climate in the study area and around the lakes is arid or semi-arid. However, it is humid to dry sub-humid in the river catchment areas in the highlands, west of Butajira and east of Assela. The climate of the basin is governed mainly by the movement of Equatorial low-pressure zones as summarized below.

**Rainfall Season in the Area**

S.N.	Season	Month	Location of Low Pressure	Wind Direction	Rainfall Condition
1	Dry	November to February	South of the Equator	Dry northeast Trade winds from the Arabian Peninsula	Dry
2	Light rain ( <i>Belg</i> )	March to June	Southern Sudan	Southeast winds from the Indian Ocean	Light and less reliable rainfall
3	Rainy ( <i>Meher</i> )	July to October	Arabian Peninsula & Central Asia	Moist southwest winds from the south Atlantic ocean and central Africa	Area receives most of its rains from July to September

Monthly rainfall data of 18 meteorological stations are collected and an annual isohyetal map is prepared in Figure 3.1.1. Average annual rainfall increases with altitude, it ranges from about 650 mm in the rift valley floor around the lakes to over 1,100 mm in the east and west highlands of altitude more than 2,000 m.

The Meki meteorological station is located at the center of the study area; it receives an average annual precipitation (1966-1999) of 774 mm. The rainfall data of the Meki station from 1966 to 1999 are plotted in Figure 3.1.2. The annual rainfall is rather erratic. It ranges from a low of 344 mm in 1995 to a high of 1,091 mm in 1983. About 64% of the annual rainfall is recorded during the period from June to September. The drier months are from November to February, only 8% of the annual rainfall is recorded during this period. The heaviest precipitation usually falls during August, as much as 21% of the annual precipitation occurring during this period. The seasonal variation of rainfall at the Meki station is illustrated in Figure 3.1.3.

The Meki meteorological station is categorized into a Class III station, which records only rainfall data. However, a complete set of data is recorded at the Class I Ziway meteorological station, located at almost the same altitude as that of Meki and about 30 km south of Meki town. The climate of the study area is characterized by the data from the Ziway meteorological station as presented in Figure 3.1.2. The mean annual temperature is 20.3 •C at Ziway station with mild temperature prevailing throughout the year, which is suitable for a wide range of tropical and sub-tropical crops. Mean monthly air temperature varies from 18.8 •C in December to 22 •C in May. Period from March to June is relatively warmer, when the mean temperature is generally above 21 •C. The air relative humidity is 66% on average, varying from 60%

(November) to more than 70% (July-September) on the monthly average. Average monthly wind speed varies from 1.48 m/s in September to 2.56 m/s June. Sunny months are from November to February, with duration, generally, from 9 to 10 hours/days; whereas in the rainy season sunshine duration decreases to around 6 to 7 hours/day. Average annual potential evapotranspiration is 1,658 mm, which is more than two times the annual rainfall.

### 3.1.3 Hydrology and Water Use

The northern rift valley sub-catchment has 7 major water bodies in its hydrologically closed basins; Meki river, Katar river, Ziway lake, Bulbula river, Horakelo river, Abijata lake, and Langano lake. There are also other numerous streams that drain into both Abijata and Langano lakes. The location of water bodies and streamflow gauging station is shown in Figure 3.1.4. Main features of the lakes are shown in the following table.

**Main Features of Lakes**

S.N.	Lake	Lake Area (km <sup>2</sup> )	Storage Volume (MCM)	Mean Depth (m)	Altitude (m)	Catchment Area (km <sup>2</sup> )	Annual Inflow (MCM)
1.	Ziway	440	1,466	2.5	1,636	7,380	704
2.	Langano	230	3,800	17.0	1,590	2,006	
3.	Abijata	180	954	7.6	1,580	10,740	227
4.	Shalla	370	37,000	86.0	1,567	2,300	

Source: Water Resources Base Line Survey, Oromia Economic Study, 1999

The Meki and Katar rivers replenish the Ziway lake, which in turn give rise to the outflow to the Bulbula river that flows south for 30 km before draining into the terminal Abijata lake. Other rivers, which flow into Abijata, are the Horakelo river from the Langano lake and the Gogessa river, a branch of the Gidu river draining from west of the Abijata. These lakes and rivers have interconnected systems and the constraints for water resources are complex. Therefore, the water resources development of the basin requires a judicious planning for protection of the fragile eco-system. The main features of rivers are presented in the following table.

**Main Features of Rivers**

S.N.	River	Station	Catchment Area (km <sup>2</sup> )	Annual Rainfall (mm)	Annual Discharge (MCM)	Runoff Coefficient	Drain Into Lake
1	Meki	Meki Village	2,433	1,006	291	0.12	Ziway
2	Katar	Abura	3,350	874	413	0.14	Ziway
3	Kekersitu	Adamitulu	7,488		180		Abijata
4	Horakelo	Near Bulbula	2,050		47		Abijata

Source: Water Resources Base Line Survey, Oromia Economic Study, 1999

- (1) Meki river

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

**Monthly Discharge of Meki river Near Meki Town**

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

Source: Ministry of Water Resources

The high discharge occurs during the months of August and September, while low discharge generally occurs during the dry season from December to February. The river discharge sometimes becomes zero during these months.

(2) Ziway Lake

The main water sources for the lake are the flows of the Katar and Meki rivers. The Meki river is gauged at Meki town (CA = 2,433 km<sup>2</sup>), while the Katar river is gauged near Abura (CA = 3,350 km<sup>2</sup>). The mean annual flows recorded at the two stations are 291 MCM and 413 MCM, respectively. The total catchment area of the Ziway lake is about 7,380 km<sup>2</sup>. The remaining catchment that is surrounding lake passing through swamp contributes little as the large part of the water evaporates before it contributes to the lake effectively. The total annual average inflow in the lake can be safely estimated by the sum of the Katar and Meki river flows as recorded at the gauging stations, which is about 704 MCM.

The water balance of the Ziway lake consists of inflow, outflow from the lake (Bulbula river) and evaporation from and precipitation on the lake surface. The water level of the lake is plotted in Figure 3.1.5.

(3) Bulbula River

The water level of Ziway lake influences the outflow to the Bulbula river. The upper part of the Bulbula river is also known as the Kekersitu river. The water level of the Ziway lake is controlled by a natural basalt bar on the Bulbula river lying some 6 km downstream from the river outflow at the lake. An average annual flow of 180 MCM flow down to the Abijata lake. The average lake water level and monthly discharge of the river recorded at the Adamitulu station are shown in the following table.

**Average Water Level of Ziway Lake and Outflow to Bulbula River**

Station Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Ziway Water Level (m)	1.06	0.95	0.85	0.80	0.76	0.74	0.83	1.19	1.50	1.53	1.34	1.23	1.07
River Q at Adami (m <sup>3</sup> /s)	4.07	2.56	1.23	1.34	1.27	1.38	1.98	6.16	13.68	15.09	11.84	7.50	5.70

Source: Ministry of Water Resources

#### (4) Abijata Lake

The Abijata lake is located in the Abijata-SHELLA National Park and particularly known for its migratory pelican and flamingo birds. The lake is recharged mainly by the Bulbula and Horakelo rivers. These rivers outflow or spill from the Ziway and Langano lakes respectively, therefore, the three lakes form an interconnected sub-system. The Bulbula river contributes about 125 MCM annually to the Abijata lake, while the Horakelo rivers from the Langano lake contributes about 46 MCM to the Abijata lake. The rest of the Abijata catchment contributes relatively little. The Gogessa river, which is a small eastern tributary of the Jidu river, has some old data from which the yield is estimated at 10 MCM. The other wetter catchment between Shala and Abijata with a catchment area of 60 km<sup>2</sup> and a runoff coefficient of 20% yields about 7 MCM. The remaining catchment of Abijata does not have any permanent drainage and only contribute water to the lake during heavy rains as overland flow. The Abijata lake is highly mineralized and is not important for use in irrigated agriculture. However, the Abijata Soda Ash Enterprise is extracting about 2 MCM of water annually for soda ash production from the lake water since 1990.

#### (5) Water Use

There are several small and medium scale irrigation schemes and state farms developed by abstraction of water from the Ziway lake, Bulbula, and Katar rivers. Figure 3.1.6 shows the water use for irrigation in the Meki-Ziway water resources system. Most of irrigation schemes in the area pump water from the Ziway lake or the Bulbula river. There is also some abstraction from the Meki and Katar rivers. The following table shows the irrigation system utilizing the water abstraction from lakes and rivers.

**Water Use in the Meki-Ziway System**

No.	Irrigation System	Irrigation Area (ha)	Water Source
1.	Katar Irrigation	420	Katar River
	Sheled	75	
2.	Pumping Schemes on Meki	157	Meki river
3.	Meki Ziway Project	380	Ziway Lake
	Ziway Prison Farm	265	
	Others	300	
4.	Ziway State Hort. Farm	733	Bulbula
	Dodicha	69	
	Gerbi and Bochessa	40	
	Others	100	

Source: Water Resources Base Line Survey, Oromia Economic Study, 1999

### 3.1.4 Soils

The soils of the study area were surveyed by the Land Use Planning Project, which were carried out by Land Use Planning and Regulatory Department of the Ministry of Agriculture in 1989 in association with FAO/UNDP. The survey was systematically carried out on the basis of physiographic interpretation of aerial photography and satellite imageries. The major soils of the study area are classified broadly into four (4) groups according to the legend of the FAO/UNESCO system, namely Vertisols, Andosols, Fluvisols and Solonetz.

#### 1) Vertisols

Vertisols are clayey soils that shrink and crack when dry. Pelli-Calcic Vertisols (Hidi series) are the most predominant in the hilly area (volcano-lacustrine terrace) in the northern study area. They are very deep, black, fine textured, partly sodic phase.

#### 2) Andosols

Andosols originate from volcano lacustrine deposits with ashes, cinders, pumice (gravels) lapilli or other vitric pyroclastic materials. Vitric Andosols (Meki series) are predominate on the Rift Valley floor. The soils are neutral to slightly alkaline, calcareous, deep, and have a coarse loamy texture. They cover the central part of the study area.

#### 3) Fluvisols

Fluvisols are derived from alluvium lying on the lakeshore and along the Meki river. Gleyic-Mollic Fluvisols (Abay series) are derived from lacustrine alluvium and cover the lakeshore of Ziway. They are deep, black, poorly drained, have a fine loamy texture, partly sodic and seasonally flooded for approximately 4 months. Calcaric Fluvisols and Mollic Fluvisol are also observed along the Meki river. They are well-drained loamy soils.

#### 4) Solonetz

Solonetz soils cause problems for management as they have a high sodium content. They are common in the study area. They occur sporadically in the bottomlands and slight depressions within the flood plains. In both Meki and Alem Tena towns, Mollic Solonetz derived from lacustrine deposits widely covers the flat land.

To confirm the existing study results, the Study conducted soil profile observations at three (3) representative sites and collected nine (9) soil samples for detailed laboratory tests to verify their physical and chemical properties. In parallel, 275 topsoil samples were collected to verify the spatial distribution of saline and alkaline soils across the entire Dugda Bora Wareda. The survey density is one sample per 600 ha. The samples were transported into the laboratory and analyzed for texture, soil pH and soil EC<sub>2.5</sub>. Soils are sand to sandy loam in texture, neutral to slightly alkaline (pH 5.5 to 7.2) and moderate in salinity.

### 3.1.5 Natural Vegetation

The natural vegetation of the study area is mainly tropical savanna dominated by acacia species occasionally interrupted by riverine broad trees and shrubs. Many of the acacia species provide valuable browse to goats but due to deforestation the density of these trees has diminished considerably. Under semi-arid climatic conditions, most grasses are greenish only in the rainy seasons. They provide huge grazing sources to the rural communities.

Where grass has been preserved for oxen grazing, a tall grass, *Hyparrhenia ruffa*, is predominant. Due to deterioration of the rangelands, palatable and digestible species have disappeared in most places and been replaced by unpalatable and indigestible species of low nutritional value.

### 3.1.6 Land Use

The present land use of the Wareda is classified into four (4) categories, namely (i) farmland, (ii) forest, shrub and bush, (iii) grazing land and (iv) others including residential, roads and swamp. The extent of each land use category is summarized below.

**Present Land Use of Dugda Bora Wareda**

Land Use Category	Coverage (ha)	Proportional Extent (%)
1) Farmland	67,828	46
2) Forest, shrub and bush	19,971	14
3) Grazing land	36,326	25
4) Others	9,758	7
Total	146,882	100

Source: Dugda Bora District Agriculture Bureau Office

## 3.2 Socio-economy

### 3.2.1 Demography

#### (1) Population

The Oromia Region is administratively divided into 12 zones and 180 waredas, which are further subdivided into about 10,000 peasant associations (PA), i.e. the lowest administrative unit. The study area administratively comes within the Dugda Bora Wareda of East Shewa Zone.

The Wareda contains two (2) urban centers and the rural areas divided into 54 Peasant Associations (PAs). The latest 1994 population census by the Central Statistical Authority verified the population and households of the Wareda to be 134,454 and 28,688, respectively as presented in Table 3.2.1. The population projection estimates the wareda population in 2000 to be about 163,000 as presented below.



### Population Project for 2000

Category	Population (‘000)	Family Size	Land Area (km <sup>2</sup> )	Population Density (person/km <sup>2</sup> )
Ethiopia	63,495	4.83	1,097,000	58
Oromia Region	22,354	4.84	353,007	63
East Shewa Zone	1,990	4.82	13,624	146
Dugda Bora District	163	4.69	1,468	111
54 PAs	125	4.74	1,452	86
Meki Town	28	4.51	14	1,993
Alem Tena Town	10	4.52	2	4,843

Source : 1994 population census, Central Statistical Authority

Dugda Bora Wareda as well as East Shewa Zone is rather densely populated in comparison with both the regional and the national averages. Within the Wareda the population densities vary widely among the PAs, between 169 and 36 according to the 1994 census. Spatial distribution patterns of the wareda population in 1994 is illustrated in Figure 3.2.1.

#### (2) Ethnic groups and religion

Major ethnic group in the Wareda is Oromo that comprises 73% of the total population followed by Guragie (14%) and Amhara (8%). Around 95% of the wareda population believe Orthodox followed by Muslim (2%), Traditional (1.3%), Catholic (0.8%), and Protestant (0.6%) as summarized below.

#### Ethnic Groups and Religion (1994)

Item	Dugda Bora Wareda	East Shewa Zone	Oromia Region	Ethiopia
Sampled Population (‘000)	134.5	1,668	18,474	53,132
I. Ethnic Groups (%)				
Oromo	72.8	69.6	85.0	32.1
Amhara	8.3	16.8	9.1	30.1
Guragie	14.1	3.7	0.9	4.3
Tigraway	0.8	1.3	0.4	6.2
Others	4.0	8.6	4.6	27.3
II. Religion (%)				
Orthodox	94.9	58.8	41.3	50.6
Muslim	2.3	35.0	44.3	32.8
Catholic	0.8	0.9	0.6	0.9
Protestant	0.6	3.5	8.6	10.2
Others	1.4	1.8	5.2	5.5

Source : 1994 population census, Central Statistical Authority

#### (3) Literacy rate

The overall literacy rate in the Wareda was 22% in 1994. The gender gap in the literacy rates was remarkable, i.e. 29% for male and 15% for female. As observed nationwide, lower literacy rates in rural areas are also recognized within the Wareda. The primary education in the rural area is conducted in the Oromo language. The literacy rates of the Wareda are summarized below.

### Literacy Rate in Age Ten Years and Over ( 1994)

Item	Dugda Bora Wareda	East Shewa Zone	Oromia Region	Ethiopia
Total	22	36	22	23
Male	29	42	29	30
Female	15	30	16	17
Rural Total	13	20	16	15
Male	19	27	23	22
Female	5	13	9	9

Source : 1994 population census, Central Statistical Authority

### 3.2.2 Administration at Wareda Level

All the administrative and development activities at the wareda level are performed by both the district administration office and nine (9) region's district offices.

#### (1) District administration office

The administration of Dugda Bora Wareda is under the control of an Administrator and 15 councilors, who are elected every 5 years. PAs are headed by chairpersons, who are officially appointed by the Administrator upon prior consent of villagers and act as coordinators for administration of the relevant PA without compensation.

Under the Administrator and the councilors, six units, namely (i) economy, (ii) social, (iii) peace and security, (iv) policy and administration, (v) women's affairs and (vi) administration and finance, perform the day-to-day operations. The total number of staff under these units is 14 as of November 2000. The councilors are responsible for coordination of such issues as economy, social, peace and women's affairs. The district administration office holds a monthly meeting with the entire PA chairpersons regarding peace and security, development, government revenue and credit services. The PA chairpersons have duties on community mobilization, security works and strengthening democracy. They report directly to the Administrator.

#### (2) Region's district offices

Oromia Regional State Government has the following nine region's district offices at the Dugda Bora Wareda, which deploy all the frontline activities on behalf of the Regional State Government. The total staff amounted to 226 officials in November 2000.

- 1) Agricultural Development Office, Agriculture Bureau
- 2) Irrigation Development Office, OIDA (Central Branch Office)
- 3) Cooperative Office, Cooperative Promotion Bureau
- 4) Health Office, Health Bureau
- 5) Education Office, Education Bureau
- 6) Finance Office, Finance Bureau
- 7) Police Office

- 8) District Court
- 9) District Attorney Office

The district administration office coordinates with the region's district offices on a weekly basis. The major issues include quality of education and drop-out issues with the Education Office, credit services and farmers' debt with the Agricultural Development Office, the government revenue with the Finance Office, peace and security with the Police Office, etc. Other meetings are also held on security problems with the Police Office, disease out-break with the Health Office, drought and hunger with the Agricultural Development Office, etc. The district administration office has no initiated projects at present.

The tax collection at the PA level is made directly by the Finance Office under the coordination with the district administration office and the PA chairpersons. The taxes comprise (i) direct tax for land use, business, and workers' income and (ii) indirect tax for service and sales. The Meki town municipality collects weekly market toll fees from traders and uses it as municipal revenue.

The district administration budget is allocated fully by the State Government. The annual budget execution in 1998 - 2000 was Birr 210,600 on average of which 61% were disbursed for salary of the staff and 39% for recurrent budget expenditures. Of the recurrent expenditure, 61% were spent for training, 28% for per diem, and 11% for office operation.

### **3.2.3 Economic Activities**

The population engaged in economic activities in East Shewa Zone accounts for 68% of the age group of 10 years and above in 1994, and was lower than that of Oromia Region (75%) and Ethiopia (72%). On the other hand, the percentage of unemployed population in the same Zone was 6%, which was higher than that of Oromia Region (2%) and Ethiopia (3%). Although there are no statistics available for Dugda Bora Wareda, the 1994 census indicated the unemployment population ratio in Meki town as 12%.

In Oromia Region, 93% of the total employment was created by the agriculture, forestry and fishery sectors in 1994 followed by the service sector such as wholesale and retail trade (2%), hotel and restaurant (2%), government employees (1%) and so on. Employment in the manufacturing sector was limited, being only 1% of the total employment. There are no large-scale manufacturers in the Wareda, while agriculture including livestock and fishery in and around the Ziway lake is the major industry in the Wareda.

The number of industrial establishments registered in the Wareda was 421. They include grain processing (52), bakery (7), repair shop (12), traders (25), retailers (215), hotel (11), restaurant (36), hospital and clinic (13), fuel station (3),

government offices (12), schools (31), telecommunication and electric supply (4). These 421 establishments assumed to generate employment for around 1,300 persons in the Wareda. The majority of grain processing factories are located at Meki (34 mills) and Alem Tena (9 mills) towns except for nine flourmills located in six PAs.

### 3.2.4 Farm Economy and Poverty Line

The HHICES in 1995/96 verified the current positions of farm family economy in the Region as presented in Tables 3.2.2 and 3.2.3. The respective medium class annual income and expenditure for rural households were Birr 4,700 and 5,300, respectively. They were marginally higher than those of the national average, i.e. Birr 4,000 and 4,400. It is noted that income and expenditure have been estimated separately in the survey. Therefore, the HHICES results do not mean that average HHs accumulate debt due to over-expenditure. The HHICES results are summarized below.

**Results of Household, Income, Consumption and Expenditures (1995/6)**

Items	Oromia Region (%)	Ethiopia (%)
I. Income	Birr 6,230	Birr 5,420
Household agricultural income	72	70
Income for gifts/obtained	14	15
Non-agricultural income	6	6
Others	8	9
II. Expenditure	Birr 6,540	Birr 5,570
Food	53	54
Rent, fuel, power, water, construction	15	16
Clothing, footwear	10	10
Others	22	20

Source: HHICES in 1995/96

The income sources for rural households in the Region are agriculture (72% of the total income) followed by gifts (14%) and non-agricultural income (6%). On the other hand, major expenditures are food (53% of the total expenditure) followed by rent, fuel, power and water (15%) and clothing and footwear (10%).

## 3.3 Crop Production

### 3.3.1 Agro-ecological Zones and Cropping Systems

#### (1) Agro-ecological zones

The agro-ecological zone of the study area is categorized into Semi-Arid 1 with erratic, unreliable and low rainfalls between 600 mm and 1,100 mm per annum (MoA 1998). The rainfall is characterized by a bimodal pattern with the long rainy seasons (*Meher*) from July to September and the short rainy seasons (*Belg*) from February to early May. The isohyetal map indicates higher rainfalls (from 850 mm to 1,100 mm) in hilly areas lying in the western to northwestern parts of the study area. On the

other hand, the western to northern shore of Ziway lake has explicitly more erratic and lower annual rainfall (700 to 750 mm). In particular, severe droughts are experienced in the southern shore of the Ziway lake.

Although several soil types are identified in and around the study area, they are generalized into two groups from an agricultural point of view. Clayey soils are more predominant on the hilly areas, while loamy sand to sandy loam soils occupy the valley floors. Soils on the lakeshores of Ziway and Koka are derived from volcanic lacustrine deposits, which are partly affected by seasonal inundation.

Crop selection by farmers is highly dependent upon soil type and rainfall. Teff is a leading crop on the hilly areas covered by heavy soils under higher rainfalls, while maize, wheat and barley are more prevalent on the valley floors with lower rainfalls. The distribution patterns of the leading crops were analyzed on the basis of cultivated acreage by PA for the 1999/00 cropping season. The crop distribution is schematically illustrated in Figure 3.3.1.

## (2) Farming system

Farming system in the study area is represented by “traditional livestock-based mixed-farming system”, in which crop production and animal husbandry are significantly complemented by each other. The predominant crops are food grains and pulses including teff, wheat, maize, barley and haricot beans. Crop residues are a vital supplemental fodder source for oxen, sheep, goats and donkeys. They are usually left on the farm after harvesting and available for the community. On the other hand, the crop production sub-sector relies highly on animals for drafting, transporting, and threshing as well as for manure sources. Furthermore, livestock provides animal products for home consumption and supplemental cash income.

An intensive farming system with commercial horticulture production has also been practiced to a limited extent along the Meki river and the lakeshores of Ziway, Elen and Koka. Horticultural production is managed mainly by private farmers, who are non-PA members.

Exchange of farm labour is prevalent in the study area as a traditional custom called “*Debo*”, which is a reciprocal help system and compensates each other only with food and beverage by host farmers. Large landholders with 10 ha and above often employ a few permanent workers such as a family member. In contrast, the “*Debo*” is not common among an association of irrigation farmers.

### **3.3.2 Land Holding and Tenure System**

The 1975 land reform legislation of the previous government made all lands as a public property and prohibited private land ownership. Farmers have been given only usufructuary rights up to 10 ha per household. The Constitution endorsed in December 1994 explicitly states that all rural and urban lands including natural

resources belong to the government and shall not be sold or exchanged. However, there are cases of illegal land leasing in the study area, especially in the highly demanded area where irrigation water is available. Land borrowers are either entrepreneurs, who are non-PA members living in the urban area or farmers eager to share the benefits with landowners. In common cases, offspring can not inherit farmland where no excess land is available in their PA. Consequently they are forced to make a lease agreement with landlords who are financially weak to manage their farmland.

Lease agreement is mainly on an annual-basis and the land rent varies from place to place and personal agreement. Thus in the study area the market price ranges from 100 to 200 Birr per ha in the rainfed area and from 300 to 800 Birr per ha in the irrigable area. This kind of lease agreement is not forwarded through the official channels. Therefore, it is difficult for the authority concerned to grasp the actual positions.

According to the sample survey conducted by the District Agricultural Office, the land holding size of farmers in the Wareda is presented below.

**Percentage of Farm Households by Farmland Size in Dugda Bora Wareda**

less than 1 ha	1 – 2 ha	2 – 4 ha	4 – 6 ha	6 – 8 ha	8 – 10 ha
25 %	50 %	10 %	7 %	5 %	3 %

Source: Dugda Bora District Agriculture Bureau Office

A typical farm household in the study area allocates the land to (i) homestead, (ii) crop production and (iii) fallow and grazing. Farmland usually consists of several scattered small plots. The farmers in the Wareda have an average of 1.5 ha of farmland.

### **3.3.3 Crops and Production**

#### **(1) Crop Selection**

According to the District Agriculture Bureau Office, the major crops prevailing in the study area are as below;

- 1) Cereal crops : maize, teff (*Eragostis tef*), wheat, barley, and sorghum,
- 2) Pulse crops : haricot beans (*Phaseolus vulgaris*), horse beans (*Vicia faba L*), peas (*Pisum sativum L*), chickpeas (*Cicer arietinum L*), and lentil (*Lens culinaris Medik*)
- 3) Vegetables crops : tomato, red onion, cabbage, Ethiopian cabbage (*Brassica oleracea var viridis*), chili pepper, sweet pepper, carrot, beet root (*Beta vulgaris*), watermelon, cucumber, eggplant, sugarcane and garlic

4) Fruits and tree crops : mango, avocado, papaya, orange, coffee

(2) Cultivated area, unit yield and production

The crop production in the Wareda is annually compiled based on pre-harvest and post-harvest evaluation carried out by the District Agriculture Office. The random sampling survey is carried out at 3 to 5 HHs per crop per each PA. The cultivated area, unit yield and production of major crops in the past 6 years period from 1994/95 to 1999/2000 are presented in Tables 3.3.1 and 3.3.2, and summarized below.

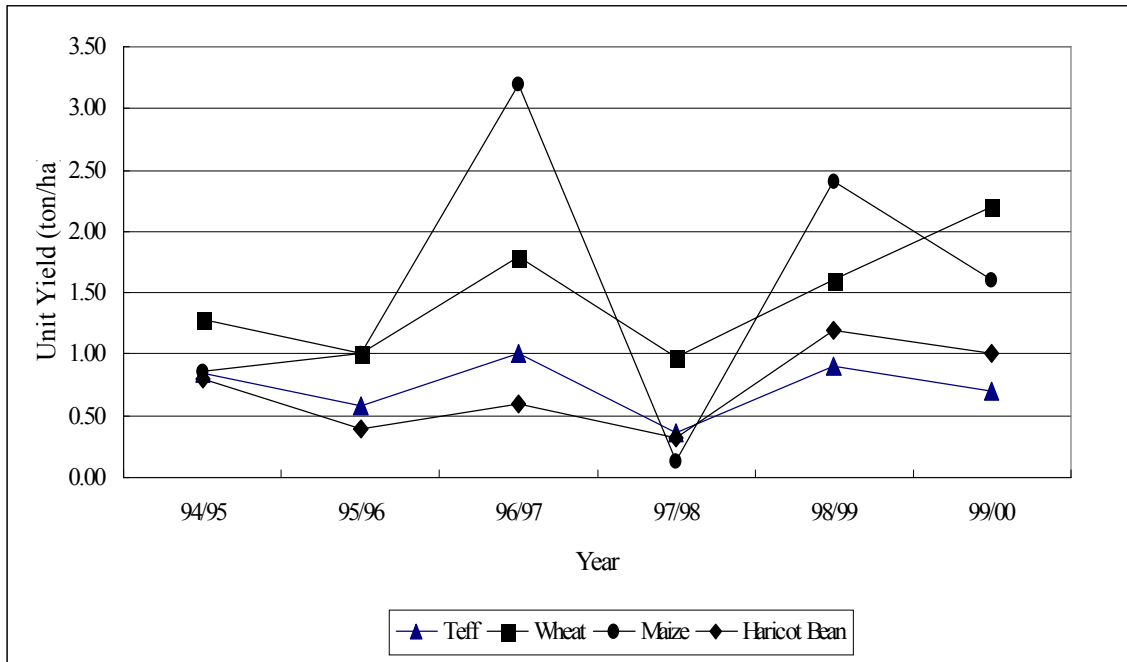
**Average Cultivated Area, Unit Yield and Production in Dugda Bora Wareda (94/95 – 99/00)**

Crop	Cropped Area (ha)	Production (ton)	Yield (ton/ha)
Teff	15,700	11,500	0.73
Maize	12,500	18,200	1.48
Wheat	12,200	20,700	1.53
Haricot bean	8,700	6,300	0.72
Barley	2,400	3,300	1.43
Sorghum	2,500	2,400	0.98
Field Peas	900	500	0.54
Lentil	200	100	0.21
Chickpea	800	200	0.41
Total	55,900	63,200	0.89

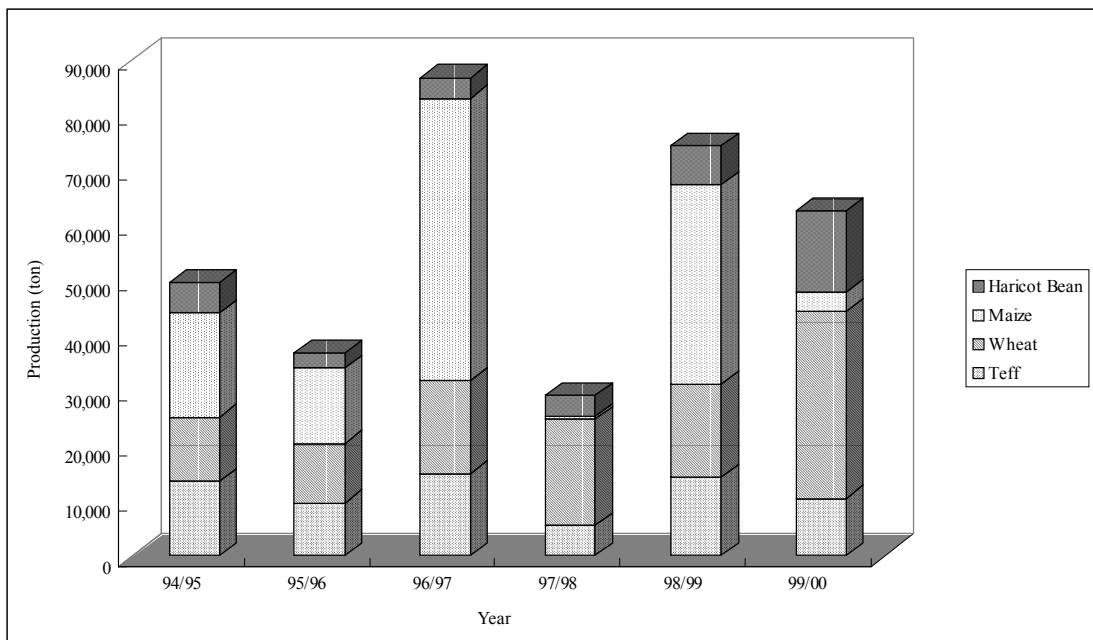
Source: Dugda Bora District Agriculture Bureau Office

The total cultivated area of Dugda Bora Wareda extends to 68,000 ha of which 55,900 ha (82 %) are allocated to cereals and legumes. Out of the total food crops, four major crops occupy 49,100 ha or 88% consisting of teff (28%), wheat (22 %), maize (22%) and haricot beans (16%). Horticulture crops occupy less than 3 % under irrigated conditions. It is noted that the crop intensity in the study area is as high as 83% in 2000/01.

As usual, in rain-fed agriculture, the crop yield fluctuates from year to year. The yield and production of major crops in the said period is illustrated below.



**Crop Yield in 1994/95 – 1999/2000**



**Crop Production in 1994/95 – 1999/2000**

### 3.3.4 Cropping Patterns

The cropping system is predominantly on a rain-fed basis and crop rotation is not systematically practiced. The cropping patterns are illustrated in Figure 3.3.2 and summarized as follows.

Hilly area : Teff and wheat represent the main crops in the hilly areas, and these are followed by maize and barley. Other crops such as haricot beans, sorghum, horse



beans, field peas, and chickpea are planted on a limited extent. Chickpeas are planted in early September and harvested at around the end of December with utilization of the residual soil moisture in the area where Vertisols are developed.

Central Meki area : Most of grain crops are planted in the months from May to June and harvested in October and November.

Lakeshore : The northern lakeshore of Ziway is covered by fertile heavy clays, which are locally known as “*Kotticha*”. This low-lying area is seasonally flooded. Some local farmers adapt their cropping calendar to an inundation cycle and practice a double cropping per year. For example, maize and chickpeas are planted in dry season by utilizing soil residual moisture after the floods recede. A double cropping pattern is practiced in the inundation area around the Ziway lake, and single cropping with local cabbage and chickpeas in Lake Cheleleka.

In the Ziway lake, the extent of inundation area depends on annual rainfall amounts and is thus change from year to year. Farmers plant maize in early April and harvest in July and August. However, if floods come earlier before July, they rush to harvest green maize by the end of June. Then chickpeas or haricot beans are planted in the middle of October when substantial soil moisture is still available.

On the other hand, a single cropping with local cabbage and chickpea is practiced on inundation area around Lake Cheleleka (PA). Farmers start planting in mid-August after floods recede.

### **3.3.5 Farming Practices**

The traditional rain-fed farming relies highly on draught animal for plowing, inter-tillage locally called “*Shilshalo*”, transportation of farm produce and threshing operations. The sequence of the farming practices prevailing in the study area is summarized below.

#### **(1) Plowing**

Farmland is ploughed usually by a pair of oxen with traditional plow called “*Maresha*” three or four times for teff and two to three times for maize, barley and wheat and once or twice for sorghum and pulse crops. Minimum or conservation tillage is not common in the study area. Tractor hire service is available but is very expensive, e.g. 260 Birr/ha, for subsistent farmers.

#### **(2) Sowing**

Sowing is done manually with high seeding rates. The reason for high seeding rates has originated from farmer’s traditional drought coping strategy to increase survival rate and secure a good crop stand. A higher rate increases a number of good stands and consequently increased biomass, which can be utilized as supplemental animal feeds in case of poor rainfalls.

(3) Weed control and application of fertilizers

Weed control is practiced by hand with limited use of herbicides such as 2,4 D and U-46 for teff and wheat. Maize and sorghum are treated at knee-high stage by hand weeding and inter-tilling by ox-plow "*Maresha*" in order to thin the plant population, suppress weeds and retain soil moisture by softening soils. Weeding is not practiced for pulses.

Most of subsistent farmers do not apply chemical fertilizers for sorghum and pulses but uses cow-dung manure. In contrast, chemical fertilizers are obtained through the Extension Package Program (EPP) or other credit source and used for grain cash crops such as teff and wheat. The details of EPP are mentioned in Appendix V on Agricultural Supporting System.

(4) Harvesting, transportation, threshing and winnowing

Except for maize and sorghum, most of the grain crops are cut with sickles and bundled. The bundles are sun-dried either on farm or in homesteads. Threshing is done by oxen trampling on spread bundles and cleaned by hand winnowing. Meanwhile, pulses are pulled out by hand and stacked on farm until dried or brought to threshing ground for drying. Threshing is done by oxen followed by hand winnowing as for grain crops. Maize is harvested by hand and brought to homestead by donkey carts for shelling by beating cob with stick or near motor-driven corn sheller place.

(5) Utilization of crop residue and cow-dung

Crop residues left on farm are utilized as open grazing sources for community. Maize and sorghum stalks are used as a fuel source or construction material for hut after feeding tender part to animals. Straws of teff, wheat and barley are also used as important supplemental feeding materials followed by threshing process and pulses as well. Thus, crop residues are rarely incorporated into soils. Cow-dung in the study area is used for plastering materials of traditional storage bin, hive and circular plot of threshing place and fuel source after drying. Most interviewed farmers reported that about 90 % of cow dung are returned to field.

### 3.3.6 Post-harvest

(1) Storing and milling

Majority of farmers have traditional storage bins called "*Gotera*", made of woven wood and bamboo splits, in homestead and with 15 to 20 quintals capacity. Harvested grains are stored in "*Gotera*" or sacs either in-house or open place. However, cash crops such as teff, wheat, haricot beans, and surplus of farm produce are immediately sold to middlemen after processing grains. Grains are milled at the nearest flourmills. They are cooked as main diet "*Injera*", locally brewed beer "*Tella*" and sprit called "*Areke*". Pulses are also used as an ingredient of "*Injera*",

soup or roasting.

(2) Agro-processing and storing

No agro-industries are observed in and around the study area. The post-harvest facilities are small-scale flourmills operated by private millers. There are also some flourmills, which are not registered. Concerning the post harvest facility, there are two large-scale storages in the study area which are operated by the Ethiopia Grain Trade Enterprise (ETGE), a profit-oriented state enterprise, which for 5,000 tons capacity and the wareda office of OADB for 500 tons capacity. The former is currently rented to the Ethiopia Food Security Reserve Authority (EFSRA).

### **3.3.7 Marketing and Pricing**

(1) Major markets

There are four (4) primary markets in Meki and Alem Tena towns. On Monday and Thursday, weekly markets are held in Meki town, while daily markets are held in Meki and Alem Tena towns at small scale. The Monday and daily markets are dealt with farm produces and some daily commodities mainly for local consumers. The Thursday markets are controlled by the Meki Municipal Office and are operated with some 2,000 vendors for livestock, food grains, vegetables and daily commodities, which are purchased by traders from other large towns as well as local consumers. The Meki Municipal Office charges the registered middlemen a monthly rate of 6 Birr.

(2) Marketing

Out of 67,000 tons of the total grain production in 1999/2000, 9,420 ton or 14 % were traded through local marketing channels. Individual consumers trade about 70 % of marketed grains through the registered middlemen, while 20 % are through retailers and 10 % are through direct business. EGTE plays a pivotal role in the export of surplus grains and control floor prices of grains in the market, has occasionally participated to purchase food grains, especially haricot beans from Meki area.

Quantities of major grains annually traded in the study area can be estimated through the taxation system controlled by Meki Municipal Office. Vegetables and fruits are directly traded with local consumers as well as middlemen from outside. Thus no official census is available.

The Study Team, as presented in Table 3.3.3, surveyed the producers' prices of farm products in October and November 2000. Selling prices are seasonally changed but little difference among the buyers (middlemen) because of a tacit agreement made among the middlemen. The commission charge per quintal of grain usually ranges from 10 to 20 Birr.

### 3.3.8 Indigenous Knowledge for Drought Coping Strategy

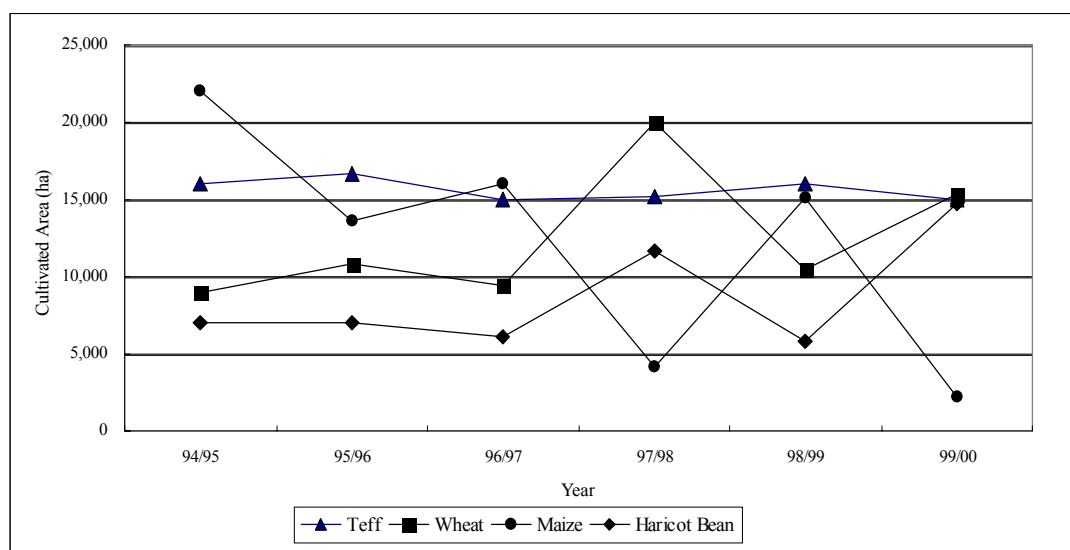
Local farmers have traditional knowledge to mitigate drought damages to crop. The indigenous drought coping strategies sustained among subsistent farmers are summarized below:

#### (1) Flexible sowing time adjusted to rainfall patterns

Farmers carefully select rain-fed crops taking into account the rainfall amounts during onset of the rainy seasons. Indigenous strategy to cope with drought problem is to adjust a sowing time of grain crops according to rainfall pattern. If the rains in the *Berg* season (short rainy season) are enough and dry spells occur later in the *Meher* season (long rainy season), severe moisture stress causes a mass mortality and no option to avoid drought at the silking/tasseling growth stage.

In the Meki area, except in hilly areas, maize is firstly sown between late April and early May but immediately incorporated into soils if sufficient rains are not anticipated during this period. Farmers generally sow barley, wheat or haricot beans, which have a lower crop water requirement than maize.

It can be seen from the crop area of haricot bean, which increased to 14,730 ha in the 1999/2000 season due to less rain, however, decreased to 6,350 ha in the 2000/01 year with good rains. Due to such an alternation in crop selection, the planted areas of crops fluctuate largely as shown below.



Cultivated Area in 1994/95 – 1999/2000

#### (2) High seed rate more than recommended rate

Most of the farmers interviewed by the Study Team employ higher seed rates as presented below:

### Seed Rates for Major Crops

Crop	Recommended (A) (kg/ha)	Farmers' Seed Rate (B)	
		(kg/ha)	B/A (%)
1. Maize line	25	-	-
broadcast	30	40-120	133-400
2. Haricot beans	20-30	100	333-500
3. Teff	30	50	166
4. Wheat	75	100	133

Source : JICA Study Team

Seed rates range from 133 % to 500% of the MoA's recommendation. Higher seed rates are believed to ensure good crop stand and to secure biomass production to be utilized as supplemental animal feed if a dry spell occurs later.

(3) Contour ditches

On sloping farmlands with teff, wheat and barley, even in flat fields, regular ditches are observed at 2 – 3 m intervals parallel to contour lines. Such ditches detain surface runoff to help infiltrate rainwater into soils and protect the soil from erosion. On flat fields, ditches serve as drainage to avoid death of seedlings due to water logging in the field.

(4) Traditional low terrace along contour lines – “*Fanya Juu*”

Low bunds of 30 cm to 50 cm high are mounded along contour lines within grain fields - especially for teff and wheat. They function to trap soil particles and cut down surface runoff.

(5) Process of rough thinning/weeding – “*Shilshallo*”

A rough thinning and weeding operation known as “*Shilshallo*” by using ox-plow is applied to sorghum and maize field at the knee high stage. This practice eliminates excess plants and weeds, conserves soil moisture by making soils softer, and prevents crops from lodging.

(6) Application of cow-dung to salinity affected area

In the area surrounding the Ziway lake, soil salinity problems are observed. Farmers often cope with the problems by applying cow-dung manure, which appears to have some effect to alleviate soil salinity and results in some harvest.

## 3.4 Irrigation

### 3.4.1 General

Several types of the irrigation schemes are recognized in and around the Meki area. They have different natures in terms of financial sources, irrigation system, water

resources, and development scale. In order to verify the current positions of the schemes and their constraints, five (5) representative irrigation schemes were selected. Their location is indicated in the next page. The major features of the schemes are summarized below.

#### Five (5) Irrigation Schemes in and around the Study Area

Description	Meki – Ziway	NGO Schemes		Dodicha	Areta Chufa
		Melka Aba Godana	Oda Bokota		
Wareda (Zone)	Dugda Bora (East Shoa)	Dugda Bora (East Shoa)	Dugda Bora (East Shoa)	Adami Tulu (East Shoa)	Ziway Dugda (Arsi)
PA	Bekela Girisa	Welida Kelira	Oda Bokota	Dodicha	Areta Chufa
Financial Source	The Democratic People's Republic of Korea	Self-Help International	Self-Help International	ESRDF	IFAD
Members of WUA	150	18 (male) 1 (female)	23 (female)	150	370
Year of WUA Establishment	1985	1998	1999	1998	1996
Commencement of Operation	1989	1998	1999	2000	1996
Water Resources	Ziway Lake	Meki river	Meki river	Bulbula River	Chufa River
Facility	9 Pumps (5 m <sup>3</sup> /s)	Small Pump (12 HP)	Small Pump (12 HP)	Pumps (2 Nos.)	Headworks
Scheme Area (ha)	3,000 ha (Plan)	5 ha	5 ha	69 ha	100 ha
Actual Irrigation Area (ha)	300 ha	5 ha	5 ha	-	86 ha
Main crops	Maize	Vegetable	Vegetable	Vegetable	Maize, Vegetable

Source: Dugda Bora OIDA Wareda Office

### 3.4.2 Meki-Ziway Irrigation Scheme

#### (1) Outline of Scheme

The Meki-Ziway Irrigation Scheme is located 5 km west of the Meki town. The scheme 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 and tertiary canals, and related structures. The pump station has nine (9) pumps, of which two (2) were reserved as stand-by. Each pump unit has capacity of 764 liter/sec. with a head of 16.3 m.

**Five (5) Selected Irrigation Schemes for the Study**

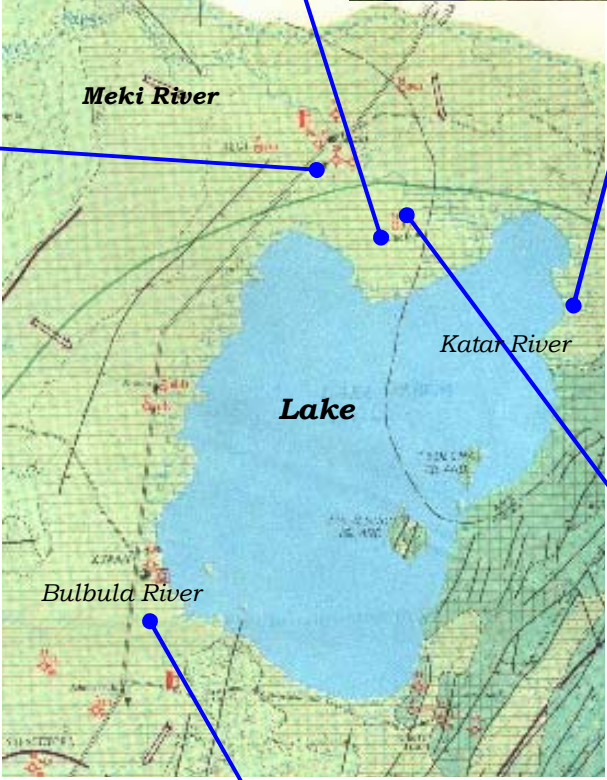
**Meki-Ziway**



**Areta Chufa**



**Oda Bogota**



**Melka Aba Godana**



**Dodicha**



Z



(2) Operation and Maintenance

From 1989 to 1991, the scheme provided free water to farmers under full control of the government. Since the governmental reform, however, the responsibility of the government has been limited only to security control. Currently, the facilities are under the responsibility of OIDA. Without government subsidy, farmers are obliged to pay electricity supply charges against operation hours. Except for some 300 ha, the irrigable farmland and facilities have been lying idle since then.

(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 (7) 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.

### 3.4.3 Small Irrigation Schemes by Farmers

(1) Outline of Scheme

There are two types of individual farmers who run irrigated farming along the Meki river and the Ziway lakeshore. One 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. More pumps tend to be introduced to the Wareda. According to the inventory survey made by OIDA in 2001, the total number of the pumps increased to 180.

Another 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. Some of the groups establish farmers groups (water users association) assisted by the Department of Agriculture and the Department of Cooperative under the Wareda Administration Office. The farmers groups are listed below.



### Water Users Association in Dugda Bora Warada

No.	Name of WUA	PA	Members			Irrigation Area (ha)	Source of Water	Year of Establishment
			Male	Female	Total			
1	Lega Meki-1	Gemu Ssubi	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 Aba 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 Denber	34	1	35	10.9	Ziway lake	1998
10	Dodoata Denbel	Dodola Denber	15	-	15	18.1	Ziway lake	1997
11	Wayyo Gabriel	Wayyo Gabriel	19	5	24	13.8	Ziway lake	1996
12	Wedda Kelina	Wedda Kelina	30	1	31	8.6	Ziway lake	1998
13	Wayyo Serrit	Wayyo 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
	<b>Total</b>	-	441	59	500	404.6	-	-

Except for Bekere GIRRISA located in the command area of the Meki-Ziway irrigation project, they have been developed using surface water resources of the Meki river and the Ziway lake by use of small pumps.

#### (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 schemes are 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.

In some schemes, pump operation and water distribution are entrusted to water masters 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. Irrigation benefits are shared between the members and the water master according to their agreement. This system contributes to proper water distribution, even without concrete water diversion structures in these schemes.

#### (3) Major Findings

At present, success of the small-scale pump irrigation schemes leads to motivate more farmers, who are anxious to embark on irrigation farming. However, it should be

noted that increase of schemes might result in 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

#### **3.4.4 Dodicha Irrigation Scheme**

##### **(1) Outline of scheme**

Dodicha is a drought-prone area and has suffered from frequent crop failures. 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.

The scheme is located on the east of Addis Ababa – Awasa main road at 3 km branched off at Adamitulu town. Water for the scheme is abstracted from the Bulbula river at the end of the level of the Ziway lake. The scheme covers a net irrigable area of 69 ha and is cultivated mainly 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.

##### **(2) Operation and Maintenance**

The WUA 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

### (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 are 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 gates attached to diversion structures on the canal have not been installed. The scheme was taken over at completion of outstanding works in middle of 2001.

#### 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.

### **3.4.5 Areta Chufa Irrigation Scheme**

#### (1) Outline of Scheme

The Areta Chufa scheme is located in Areta Chufa PA in Ziway Dugda Wareda of Arsi Zone. With the financial assistance of IFAD, the Project was embarked on in 1995/96 under the agreement between WMERDB and the Areta Chufa 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 nearly 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) Operation and Maintenance

The committee members are elected by the WUA members and appointed by the

OCPB and OADB. 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. OCPB 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 under the responsibilities of 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.

### (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 identified 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 and leakage from the canals. 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.

### 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 (O&M)

The successful O&M of the Areta Chufa 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.

## 3.4.6 Lesson Learned

Present condition of existing irrigation scheme discussed in the previous section show the following constraints:

- Lack of an O&M fund
- Improper design of facilities
- Insufficient awareness of farmers on operation and maintenance

To solve the above-mentioned constraints, the following measures have to be taken into consideration:

- To minimise the Operation and Maintenance cost
- To design user-friendly irrigation facilities

- Strengthen O&M training for WUA
- Further Government support for WUA management

It is also remarked that capacity building for engineering staff is needed to enhance participatory planning approach.

### 3.5 Animal Husbandry

#### 3.5.1 Breeds and Population

Cattle prevailing in Ethiopia are mostly unimproved indigenous Zebu, Sanga or Intermediate Sanga/Zebu types. Recognized breeds include Boran, Fogera, Horro, Sheko, Abigar and Danakil. Boran is renowned as a beef breed well beyond the boundaries of Ethiopia.

The animal population of the Dugda Bora Wareda is summarized below.

Livestock species	Number
Oxen	70,930
Female cattle	135,370
Goats	60,772
Sheep	28,473
Horses	525
Donkeys	12,164
Poultry	240,178

In Oromia, the most common breed is Arsi, which is small and unproductive for milk. Males weigh around 360 kg and females, 280 kg. European breeds, especially Friesian and Jersey have been imported for many years and crossed with indigenous cattle in attempts to improve the productivity of the latter. The improved breeds are limited in number in the Region.

Almost all sheep are indigenous types although several breeds have been identified. In Oromia, the fat tailed Menz and Arsi types predominate. They have generally evolved under harsh conditions of health, nutrition and climate and their output is low. They weigh 35 kg for male and 25 kg for female on average. However, when crossed with Corriedale, output in the F1 generation is improved considerably. This does not appear to have been taken up by the small holder sector.

Several types of goats have been identified, of which the Worre, Afar and Abergelle predominate in the Northern Rift Valley area of Oromia. They are generally small, with the male weighing between 30 and 40 kg and the female between 25 and 30 kg.

The national poultry flock comprises about 99% indigenous birds that are mostly managed under a scavenging system with the remaining 1% being imported exotic breeds that are usually managed intensively.

### 3.5.2 Feed Sources

#### (1) Grazing capacity and stocking rate

Grazing condition was a subjective assessment given by the wareda livestock experts and the veterinary assistants. Figure 3.5.1 shows the grazing capacity estimated by the local experts. This does not relate to the rainfall distribution within the Wareda. This appeared to be related less to natural grazing capacity of the area than to the level of grazing management in each PA. It appears that in those PAs where grazing is designated well, the community keeps natural pastureland from uncontrolled grazing so those oxen can be put there to gain condition before ploughing commences. In view of the highly over-grazed conditions of the natural pasture it is probably the only means by which grazing capacity can be assessed.

Grazing land does not include what is designated as bush and woodland, although it must be remembered that this (albeit severely deforested) provides browse to goats. When it is considered that this type of vegetation, in a semi-arid agro-ecological region, should be stocked at a rate of 8 ha per TLU (tropical livestock unit: 270 kg of live-weight), i.e. 0.13 TLU/ha, the whole area is severely overgrazed. Livestock pressure is as high as 0.25 TLU/ha.

In the rainy season, some farmers supplement their cattle on grazing such as rapeseed cake, bean seed cake, wheat bran and brewers waste from local breweries. Presumably the remainder of crop residues from the previous harvest and the partition between grazing only or grazing with supplement appears to be variable within and between groups. The grazing pattern showed that, in most of these PAs, grazing was divided between “home” grazing in the PA and grazing by the lakes or rivers.

In the dry season, PAs existing far from the lake depend more heavily on crop residues and hay than those near the lakes do. The PAs near the lakes appear to depend almost exclusively on grazing at the lakes, where the river is also used, while those PAs far from the lakes depend more heavily on grazing at the river.

#### (2) Crop residues

The quantity of crop residue is estimated to be produced from an average sized cropping land in the Wareda. Ratio of residue yield to grain yield was taken from figures provided by ILCA, 1993. Planted area and yield of each crop were taken from a report provided by the District Agricultural Office. This is variable between farmers and PAs but provides an average estimate over the whole Wareda.

A total of 2.6 tons of crop residue is produced per annum by an average farmer with 1.5 ha of farmland in the Wareda. The district livestock expert reports that there are no farmers who cut and store their crop residues immediately after harvesting but allow uncontrolled grazing of crop residues after stacking teff hay. After grazing the rest of crop residues, the remainder-maize stalks, mostly, are cut and stacked in the

back yard but no treatment with urea or molasses is applied. However, some farmers feed their oxen the maize stalks treated with brewers grain, i.e. residue from home brewed beer.

Most farmers store teff hay but the remainder of the crop residues are left standing for uncontrolled grazing by the livestock, which takes up to one month on average. The rest of the ungrazed residue (maize and sorghum stalks) are cut and stacked on the ground. There is no treatment of crop residue.

(3) Forage production

There were no farmers growing herbaceous forages except for a few farmers producing cowpeas in their backyard and leucaena trees. Average farmers feed one branch a day to their oxen. The district livestock expert also reported being aware of possibly 10 farmers in the wareda who also grew Sesbania trees. Overall, the number of farmers growing forage or tree forage appears to be insignificant in terms of supplementing their livestock with good quality feed in the dry season.

### 3.5.3 Veterinary Services

There is one veterinary clinic in Meki town and one health post with 10 veterinary crushes distributed around the Wareda. This is grossly inadequate and according to the veterinary office, at least 10 more health posts should be established around the Wareda. Table 3.5.1 shows the planned and actual activities of the veterinary wareda office over three years, where in virtually all activities, the actual number achieved was well below the targeted number.

In particular, vaccination and dosing levels are totally inadequate. According to the veterinary office, prophylactic drugs and chemicals have become unreliable and costly. Recently, a cost recovery exercise commenced to allow better consistency in supplies.

The most prevalent disease outbreaks in the Wareda appear to be Anthrax, Black Leg (Quarter Evil), Pasteurellosis and Lumpy Skin Disease in cattle; sheep and goat pox in sheep and goats and African Horse Sickness in horses. Table 3.5.2 shows the number of outbreaks, the locations where they occurred and number of locations where vaccinations were carried out. Clearly, vaccinations are only carried out in reaction to outbreaks and not as herd prophylaxis. Tick borne disease occurs only infrequently probably due to the enzootic stability achieved in the indigenous population of livestock. Spraying or applying acaricide with a soft cloth is carried out when tick burdens are heaviest, in the late rains, mainly to prevent damage to hides or severe loss of body condition. Internal parasites are a major cause of mortality in this area because of the large population of animals that congregate around bodies of water during the dry season. Dosing is an essential activity, especially at the beginning and end of the dry season and especially in sheep and cattle. In poultry, Newcastle disease occurs sporadically but the most important cause of mortality in poultry is coccidiosis in young pullets or cockerels.



The survey shows that mortality in all groups is low, with a mean of 0.5 (range 0 to 6) per annum. Most deaths appear to occur at the end of the rains, which is the normal time in the tropics and are partly attributed to “disease” and partly to nutritional causes.

Clearly farmers far from the lake use prophylaxis significantly more than those near the lake but even within this group, tick control is not considered an important measure, when most farmers only apply tick acaricide once, when the tick burden is at its heaviest, i.e. January. Surprisingly, dosing for internal parasites, which should be a greater challenge for those animals near the lake, where fluke is an important cause of weakening condition, is carried out more in animals far from the lake. It appears that herd prophylaxis is not adequate, probably for reasons given under the general information on the Wareda and could be improved through an increase in animal health posts.

#### **3.5.4 Animal Products**

##### **(1) Cattle- beef**

Oxen are fed after plowing and threshing season for sale on the open market. The feeding strategy for fattening them appears to vary considerably with PA and does not appear to bear any relation to grazing status or proximity to the lake. The majority of farmers appear to depend on both grazing and crop residues for fattening their oxen, but there are some that depend only on grazing and some only on crop residues. Of note, however is that farmer’s perception of whether their fattened oxen are “very fat” or “little fat” show that in general, where grazing is good, the farmers consider their oxen to be very fat. Crop residues alone, in view of their poor quality, are not likely to produce a well-finished animal. Oxen are normally sold after three months of feeding from December to February. The average price for an ox sold on the open market is 780 Birr (range 650 to 1,700). This provides the farmer with the money to buy seed and fertilizer and in some cases, more oxen for ploughing for the next season. However, the cost of an ox, which are mostly thin and weak when bought, is an average of 588 Birr (range 450 to 900) for those who have to buy more draught oxen.

##### **(2) Milk**

Mean number of cows is proportional to mean size of the herd but actual numbers of cows are surprisingly low. This suggests that aside from the oxen, there are large numbers of young cattle in the large herds. Oxen take priority under present management conditions. In fact, cows are reported to be second in importance to oxen. Farmers never use cows for draught purposes but are kept only for breeding and milk.

According to the farm interview of 258 HHs under the Study, most farmers (74%) depend on a “village” bull to serve their cows, some (36%) have their own bulls and a

very small percentage (5%) use artificial insemination (AI) in order to produce crossbred cows. It is difficult to estimate the true number of crossbred cows in the Wareda according to the livestock expert. The livestock extension expert of the OADB reports a total number of 340 in the Wareda. Among the farmers interviewed, only three farmers reported owning one crossbred cow each.

Cows tend to calve at the end of the rains, i.e. September to December, when grazing and crop residues are in reasonable supply, and there is milk for the calf, but calving times appear quite widely distributed nevertheless. If cows calve in the wet season or towards the end of the dry season, the calf is more susceptible to disease and malnutrition. This therefore is likely to be the reason for high calf mortality.

Cows lactate for an average of 6.5 months with a range of 4 to 8 months, giving an average of 1.5 liters a day with a range of 0.5 to 3. This yield appears to be consistent throughout lactation. Per week, the average amount of fresh milk kept for family use (children) is only 0.75 litres (about 0.1 litres a day) ranging from 0 to 4 litres. An average of 2.5 litres (range 0 to 10 litres) are kept for making butter for sale (yoghurt, or soured milk, is made from the skimmed milk and fed to the children, or made into “*Ibe*” or “*Ayeeb*” cheese. An average of 2.4 litres are made into “*Ibe*” cheese for sale per week. The average price of butter is 17.5 Birr/kg (range 0 to 45) and cheese is 5.2 Birr/kg (range 0 to 30). It is notable that butter and cheese sold through the dairy development program milk units (marketing cooperatives) sell for 28 and 35 Birr/kg, respectively.

All farmers interviewed expressed a wish to sell more cheese and butter through the use of cross bred cows but were apparently unaware of the need to produce high quality forage for sustained milk yield and optimum fertility.

### (3) Sheep and Goats.

The average number of sheep over all PAs in the farm survey is 4.6 (range 0 to 40), while that of goats over all PAs in the farm survey is 5.4 (range 0 to 35). Distribution of sheep and goats appears to be similar throughout all PAs. The reasons for keeping sheep and goats are in order of importance:

- 1) Cash for household requirements
- 2) Fear of death through disease or drought of livestock (insurance)
- 3) To buy other animals

Sheep and goats are not milked, nor does the household eat them, even on holiday occasions. An average number of two sheep are sold annually (range 0 to 20) for an average price of 101 Birr per sheep (range 11 to 200). An average number of 2.5 goats are sold annually (range 0 to 35). The average price for goats is 85 Birr (range 45 to 100). While sheep and goats are not managed well, particularly on nutrition, they are dosed for internal parasites twice a year by 67% of farmers in all PAs. However, kid and lamb mortality is high in all PAs (average 55%).

### (4) Donkeys and horses.

No farmers were reported to own horses or mules. The average number of donkeys per farm is 1.2 (range 0 to 6). An average of 0.3 donkeys is sold per farm annually (range 0 to 6) at an average price of 254 Birr (range 180 to 445). Donkeys are kept for pack transport but some are sold every year.

(5) Poultry-eggs

An average number of 8.9 hens (range 0 to 50) are owned by each household in all PAs. From these hens, an average of 3.5 eggs per day is produced (range 0 to 35). This provides a laying average of less than 50%, which is low. The average number of eggs given to the family for consumption per day is 1.7 (range 0 to 40), while the number of eggs sold every week averages 7 (range 0 to 49) at an average price of 0.25 Birr/egg (4 eggs per Birr). Chickens are not eaten by the family except at very special occasions like weddings and are normally eaten with “*Injira*” as “*Doro wat*”.

No supplement is given to poultry; they are left to scavenge. All farmers expressed an interest in increasing the number of eggs to sell but were not able to say how they could feed crossbred poultry, as they were themselves short of grain

### **3.6 Agricultural Support Services**

#### **3.6.1 General**

The agricultural support services include research, extension, credit, farm input supply, marketing, and famine relief. Ministry of Agriculture (MoA) takes a sole responsibility of all these institutional support services in Ethiopia. According to the long-term strategies and targets agreed with MoA, Ethiopian Agricultural Research Organization (EARO) takes substantial parts of the research activities. As for agricultural extension, MoA acts as a policy maker and provides technical supports to the regional governments as executive organs. The institutional farm credits in Ethiopia are represented by Extension Package Program (EPP). MoA controls the operation of EPP in collaboration with donors at the national level, while OADB undertakes its full responsibilities from distribution of packages to collection of repayment. OCPB is another organ, which promotes the rural credits to the registered cooperative members. Although the government envisages to penetrate the financial supports to peasants through cooperatives’ channels, the performance is still low. There are institutional organizations to promote import and distribution of domestic markets of farm inputs such as seed and fertilizer. Disaster Prevention and Preparedness Committee (DPPC) is an institutional organization against the natural disasters and social disorders especially for famine relief by keeping close relationship with World Food Program (WFP) and NGOs.

#### **3.6.2 Research**

Ethiopian Science and Technology Commission (ESTC) is an advisory body for prime minister, which concerns policy planning in science and technology. EARO

manages all the agricultural research centers. In East Shewa zone, which includes Dugda Bora, there are three (3) research centers: Melkassa and Debre Zeit national research centers, and Adami Tulu regional research center. Melkassa RC in Nazareth has contributed to the rural development particularly in the central rift valley. It substantially contributes to crop research on fruits, maize, haricot bean, etc. Debre Zeit RC near Addis Ababa is a national center for teff research. Adami Tulu RC, south of Dugda Bora, is a livestock research center. Technological transfer is coordinated by Research-Extension-Farmers Linkage Advisory Councils organized at federal, regional, and zonal levels, respectively. The feedback from farmers is also planned in the zonal level council as schematically presented in Figure 3.6.1. Remarkable research achievements are published by EARO.

### **3.6.3 Extension Service**

The extension services in Dugda Bora Wareda are executed under the control of the wareda office of OADB by deploying Subject Matter Specialists (SMS) and DAs. The total number of DAs of the Wareda is 27. Every DA covers two PAs where 800 farm households with 2,500 ha of farmland are distributed on average. The numbers of DA have rapidly increased with EPP development since 1995. About 80% of DA were appointed after 1996 in order to meet the additional duties for EPP.

The DA activities are broadly categorized into two parts, namely EPP and the regular extension activity (REA) although only a little time is available for DA to work for REA since EPP was introduced. In principle, REA is carried out by applying the improved Training and Visit (T&V) system, in which DAs visit selected leading farmers instead of groups. Each DA divides his/her extension block into eight (8) sub-blocks and selects six (6) contact farmers for each sub-block. This means that 48 contact farmers are selected under each DA. According to the instructions from the OADB wareda office, DAs transfer the extension messages to 48 contact farmers during two (2) weeks.

On the other hand, DAs concentrate training of “Graduate Farmers”, who have experienced two (2) crop seasons with EPP and completed credit repayment. The details of EPP are mentioned in Section 3.6.4 on Credit Operation.

The monthly and seasonal (every four months) training programs are envisaged to be provided to DAs. However, few programs are held when donors’ supports are available. It was identified that the DAs suffer from insufficient agronomic knowledge and tools.

### **3.6.4 Credit Operation**

#### **(1) Extension Package Program (EPP)**

The EPP was introduced to Ethiopia in 1994 and applied for 40,000 plots of 0.5 ha/plot with technical assistance of SG2000 in 1995. Since 1996, the number of EPP

has sharply increased, especially after 1998 as presented in Table 3.6.1. EPP in Dugda Bora has also developed since 1998, and covered over 10,000 plots in 2000. EPP plots per DA count up to more than 400, which seems to be over the limit of the DA service capacity. The OADB wareda office has an idea to improve the EPP system to hand over the monetary part of EPP to co-operatives so that DAs have more time to work on daily activities of REA.

The financial source of EPP is budgeted by Ministry of Finance. OADB are responsible for tenders in selection of input suppliers. Down payment or advanced payment in EPP loan is directed to be 25% by OADB, however, actual rate of the down payment in East Shewa zone has been raised up to 35-50% in 2000. The recovery rate of EPP loans is as high as 97% in Oromia Region and 78% at Dugda Bora in 1999/2000.

(2) Crop credits by cooperatives

There are two types of co-operatives in Dugda Bora Wareda, namely Meki Union Co-operatives organized by irrigation water users and Cooperative Association. The Meki Union co-operative is composed of 15 WUAs and sells fertilizer, vegetable seeds, and agro-chemicals with 40% down payment. Co-operative Associations exist in two administrative blocks and are composed of 10 PAs. They sold 15 ton of DAP last crop year (2000/01).

(3) Crop credits by NGOs

The crop credit schemes operated by NGOs are also available in Dugda Bora Wareda in order to assist peasants for farm input procurement for such crops as maize, wheat, teff, and tomato. The major NGOs include Meki Catholic Secretariat (MCS) and Christian Children's Fund (CCF ).

(4) Others

National Commercial Bank (NCB ) at Meki town operates short-term loans for entrepreneur farmers. Farmer-to-farmer seed lending and/or exchange in neighborhoods can constantly be seen in general. Seed growers or producers of new crop varieties lend around 15% of the produce as seeds to other farmers (see Tables 3.6.2 and 3.6.3).

### **3.6.5 NGOs Activities in Dugda Bora**

According to the NGO list given by Oromia DPPB, there are 37 NGO projects in East Shewa zone. Meki Development Project by Self-help International had been executed with an integrated approach including eight (8) components, i.e. crop production, livestock, soil conservation, health, rural water supply, women association, education and farmers' training for eight (8) years in 1992 to 1999. MCS started relief activities in the drought year of 1984. On the basis the assessment in 1992, their activities have concentrated on three programs since 1997 till today: (i)

Tuchi Sumeyan project (1997- 2000); (ii) Micro-finance, women saving and credit bank (1998- ); and (iii) Mother & child health/food assisted child survival program (1998- ). CCF has given financial support to children with the parents of those children organized into a saving & credit association with agricultural support and consumers' credit, health education, latrine construction, capacity building, etc.

### **3.6.6 Cooperatives Promotion**

There were 150 co-operatives before the beginning of 1970's. Under the socialist system in 1974-1991, thousands of various co-operative societies had flourished across the country in line with the Soviet Union & Eastern Europe style, but all had failed. The actual co-operative activities have been restructured and strengthened by four regulations in 1994, 1997, 1998 and 1999. There are 351 co-operative associations that were restructured. Union co-operatives are also organized at six places, one having a saving and credit co-operative. Major activities in co-operatives are: (1) Farm input supply; (2) Production credit; (3) Marketing of farm produce, (4) Mill factory; (5) Rental service of tractor or combine; (6) Consumer credit; (7) Promotion of irrigation farming; etc. In Dugda Bora, a co-operative office was already completed, however, another co-operative room is still in the agricultural office. Out of a total of 440 PAs in East Shewa zone, 310 PA are already organized into co-operative associations, that is, 132 PAs are not organized (44 PA in Dugda Bora). Union co-operatives are organized at three places. Oromia RCB is now making a second five-year plan for 2000-2004.

### **3.6.7 Marketing of Farm Input**

National Seed Industry Agency (NSIA) has started a five-year plan, i.e. Farmers Based Seed Production and Marketing Scheme (FBSPMS) with help of World Bank in accordance with EPP since 1997 (see Tables 3.6.4 and 3.6.5). Improved seed production by FBSPMS is dominated by two crops: wheat and maize. However, improved seeds of both crops introduced in Dugda Bora account for only 30% of the total EPP seeds. The coverage of improved wheat and maize seeds was limited only to 1,349 ha or 2.25% of total food crop area in 2000. There were no improved seeds of teff and haricot bean, which are important cash crops for farmers. Thus shortage of improved seed is the crucial constraint of EPP. NFIA reported that crop yield would not be improved as long as local seeds were used. The average yield when local seed are used decreases by 50% for maize, 40% for wheat, and 10% for teff in comparison with those with improved seed packages as presented in Table 3.6.6.

The fertilizer consumption in Oromia from 1995 to 2000 is presented in Table 3.6.7. The national average of fertilizer consumption by small farmers is 34 kg/ha in 2000, while the regional average is 37kg/ha. In East Shewa, the fertilizer consumption has gradually decreased in the said period although the package numbers released under EPP has sharply increased. The retail prices of fertilizer have increased since 1998

although the import prices are going down as presented in Table 3.6.8.

Around 90% of agro-chemicals are consumed by state farms and entrepreneur farms. The use of agro-chemical by small farmers is limited; fungicide and pesticide by vegetable farmers, and herbicide by grain crop farmers.

### 3.7 Rural Infrastructure

#### 3.7.1 Roads

The roads in Dugda Bora Wareda are categorized into three (3) classes, national roads under the responsibility of Ethiopia Road Authority (ERA), district roads and rural roads under Oromia Rural Road Authority (ORRA), and footpaths under rural community, respectively.

There are six (6) major roads in Dugda Bora Wareda, which are categorized into 3 classes in accordance with its pavement, such as asphalt-paved road, gravel-paved road and unpaved road. In the Wareda, paved roads with a length of 97 km have been provided as shown below.

**Road Network in Dugda Bora Wareda**

No.	Name of Road	Pavement	Length in the wareda	Responsible Organization	Remarks
1	Addis Ababa – Awassa Road	Asphalt Paved	59 km	ERA	Trunk road to link national capital to Southern Region under assistance of EU
2	Meki – Koshe – Butajera Road	Gravel Paved	24 km	ORRA	
3	Meki - Habra Road	Gravel Paved	14 km	ORRA	This road is constructed by Ethio-Italian grant aid.
4	Meki – Ejersa Lele Road	Unpaved	20 km	-	
5	Alan Tena – Ombole Road	Unpaved	21 km	-	In the 5-years development plan, ORRA has plan to upgrade the road.
6	Alan Tena – Habra Road	Unpaved	17 km	-	

Source: JICA Study Team

In order to grasp the transportation methods and condition of the roads in the Wareda, an Origin–Destination survey was carried out by the study team at Meki and Alem Tena market on each market day. Transportation methods and average time in hours to access to markets in dry season and rainy season are shown in the following table.

### Transportation Methods and Average Hour to Access to Markets

Transportation	Meki Market			Alam Tena Market		
	Nos. of interviewee	Average hour to access market		Nos. of interviewee	Average hour to access market	
		Dry Season	Rainy Season		Dry Season	Rainy Season
Donkey	3	1.8 h	2.5 h	17	1.6 h	2.5 h
Donkey cart	12	1.6 h	2.3 h	1	2.0 h	2.5 h
House cart	5	1.0 h	1.8 h	2	1.0 h	1.5 h
On foot	37	1.9 h	2.5 h	35	1.7 h	2.6 h
Bus <sup>1)</sup>	5	2.4 h	2.6 h	11	1.3 h	1.3 h
Car	1	0.3 h	0.3 h	1	2.5 h	3.5 h
Others <sup>2)</sup>	5	-	-	3	-	-
<b>Sub-total</b>	68	-	-	70	-	-
From outside	7	-	-	21	-	-
<b>Total</b>	75	-	-	91	-	-

1) : The bus is not regular route bus but hired by business basis.

2) : Others consisted by bicycle and mule

Source: JICA Study Team

Layout map of the major roads and accessibility to the two markets are shown in Figure 3.7.1. Contour lines in the map show times taken from houses of the interviewee to the markets on foot. Some 40% of inhabitants living in the area the Wareda seldom access the two big towns, which can be reached within 3 hours on foot. The result shows that main transportation method in the Wareda is donkey, donkey cart and on foot while motorized transport is not yet widely available in the area.

There is a difference of 45 minutes on average for transportation on foot in the dry and rainy seasons. Asked if the road conditions differ in rainy and dry seasons, some 22% of the interviewee answered that they took the major road in the rainy season instead of the rural roads and the footpath, which they usually take in dry season. It suggests that transportation within the Wareda in the rainy season is constrained by a relatively bad condition of the rural roads and the footpaths as indicated in the following table.

#### Constraints of the Roads in Rainy Season in Dugda Bora Wareda

Constraints	Meki	Alam Tena	Total
Muddy Road Condition	52	57	109
River/Gully Crossing	7	31	38
Water Logging on Road	2	16	18
No problem	10	9	19

Multiple answers

Source: JICA Study Team

Road extension per population and its coverage area are presented in the following table.



### Road Extension per population and Covered Area

	Road Extension per 1,000 persons	Road Extension per 1,000 km <sup>2</sup>
Dugda Bora Wareda	0.62km	66km
Oromia Region	0.50km	27km
Ethiopia	0.43km	21km
Africa	0.61km	50km

Source: The Economy of Oromia, 1999

The above table shows that the wareda has a better road networks compared with that of the Oromia Region and the Ethiopia average in terms of road densities. Although there are some constraints in the rural roads, and the road network in the Wareda, it can be considered satisfactory in terms of quantitative levels.

#### 3.7.2 Domestic Water Supply

The main source for drinking water in Dugda Bora Wareda is groundwater. The groundwater table is around EL.1,620 m throughout the Wareda. The water supply to Meki town is under the responsibility of the OWMERDB wareda office. There are four (4) deep wells, out of which only one is currently functional. The design works for rehabilitation and expansion of the existing facilities was completed in 1997, while financial arrangement is required for its implementation.

The coverage of rural water supply in East Shewa Zone and Oromia Region are as low as 23% and 16%. The OWMEERDB conducted an inventory survey in 1999 to clarify the present condition of the rural water supply in Dugda Bora Wareda. In the rural area, there are 66 water supply facilities managed by communities, i.e. 45 boreholes, 16 shallow wells and 2 hand dug wells as illustrated in Figure 3.7.2. Their total installation capacity is to meet the domestic water demand for 117,000. However, out of 66 wells, 26 wells are not functional. Besides, 19 wells are deteriorated and need maintenance works. Therefore, actual coverage of rural water supply in Dugda Bora Wareda is much lower than the installation capacity.

**Condition of the Rural Water Supply Scheme in Dugda Bora Wareda**

Water Source			Engine Type		
	Status*	nos.		Status*	nos.
Borehole	•	11	Diesel or Electrical Engine	•	8
	•	17		•	14
	×	17		×	10
	Sub-Total	45		Sub-Total	32
Shallow Well	•	7	Wind Mill	•	5
	•	2		•	5
	×	7		×	13
	Sub-Total	16		Sub-Total	23
Hand Dug Well	•	0	Hand Pump	•	5
	•	0		•	0
	×	2		×	3
	Sub-Total	2		Sub-Total	8
No Data		3	No Data		3
Total		66	Total		66

Status • : Functioning with no problem, • : Functioning with some problems  
 × : Not functioning

Source: Oromia Water, Mining, Energy Development Bureau

Windmills are also prevailing in the Wareda. Most of them were installed with assistance from NGOs. It should be noted that more than 50% of the existing windmills are not functional. Lack of spare parts is one of the most critical problems for windmills.

In order to operate and maintain the wells, Water Committees are organized with assistance from OWMERDB. The committee is responsible for operation and maintenance of motor engines, overhead tanks, water points and cattle troughs, and the collection of water charges. In addition, special attention is paid to keep animals away from the water points to prevent them from pollution by animals' excreta. Water master collects water charges, that is 5 to 15 cents per 25 liters from beneficiaries. The committees deposit collected money in their bank accounts to cover O&M cost including salary of water master. OWMERDB has made much effort to assist the committee by dispatching a maintenance team upon the request of the committee.

It was also observed that some of the wells were abandoned due to water quality problems such as a high concentration of fluoride and salinity as widely recognized in the existing wells within the Rift Valley. High fluoride contents could cause dental and skeletal fluorosis. To eliminate constraints, it is recommended to study more use of surface water in the Wareda.

### 3.7.3 Health Care Service

Although the Oromia Health Bureau promotes the primary health care in the rural area of the Region, insufficient facilities and health personnel are still crucial issues. Majority of rural population does not have immediate access to safe water and sanitation facilities. Therefore, they suffer from water-borne diseases. The major causes of morbidity are respiratory infection, malaria, skin infections, diarrheal diseases and intestinal parasitic infections. Prevailing diseases in Dugda Bora Wareda are presented below.

**Prevailing Diseases in Dugda Bora Wareda in 1999**

Rank	Diagnosis	No. of patients *	%
1	Urticaria	4,973	16.6
2	Malaria	3,035	10.1
3	Intestinal Parasites	2,842	9.5
4	Skin Disease	2,362	7.9
5	Eye Disease	1,851	6.2
6	Diarrhea	1,245	4.2
7	Anaemia	1,025	3.4
8	Gastritis	894	3.0
9	Injury	821	2.7
10	Tonsilitis	750	2.5
	Others	10,110	33.8
	Total	29,908	100.0

Source : Meki Health Center

The table below shows mortality rates from the 1994 population and housing census. In terms of infant mortality, under-five mortality and expectation of life at birth, Meki town shows lower values that those in East Shewa Zone and Oromia Region.

**Mortality in the Study Area**

Area	Sex	Infant mortality	Under-five mortality	Lif expect. at birth
Oromia Region	M + F	118	173	50.4
	M	128	182	49.2
	F	108	164	51.7
East Shewa Zone	M + F	128	190	48.6
	M	139	198	47.3
	F	117	181	49.9
Meki Town	M + F	154	229	44.4
	M	179	260	41.1
	F	127	195	48.4
Ziway Town	M + F	96	137	54.8
	M	110	154	52.7
	F	82	120	57.0

Source : 1994 Population and Housing Census

Remarks:

Infant Mortality: the probability of dying between birth and the first birthday per 1000 live births

Under-five mortality: the probability of dying between birth and the fifth birthday per 1000 live births

Expectation of life at birth:the average number of years a new born baby is expected to live if he/she is exposed throughout its life to the prevailing pattern of age specific death rates

The responsibility for front line service for health care is under the health department of wareda. The health care facilities are categorized into 1) health center (1 in number), 2) district clinic (5), 3) private clinic (7), 4) health post (2) 4) drug store (10). The health center located in Meki town, and clinics located in Alam Tena and major PA, are providing curative and preventive health care services including general consultation, prenatal and baby clinic, examination, treatment, family planning, immunization, health education and promotion of national health campaign (eradication of malaria and polio). A doctor and nurses are assigned at the health center while health assistants mainly run clinics. A community health worker with basic training in health and midwifery manages each health post. But the facility faces budgetary and manpower problems in terms of the number of staff and lack of training. In addition to the government service, in Alam Tena, the Catholic Church established a clinic in 1995. The number of patients that visited the facilities in 1999 was reported to be 29,900 first visits, and 31,900 repeat visits.

The number of medical facilities, personnel and ratios of facilities/medical personnel to population in the wareda, zone and region are shown below, and the location of the medical facilities are shown in Figure 3.7.3.

**Medical facilities and Personnel in Dugda Bora Wareda**

Facilities / Medical Personnel	Number of Facilities / Personnel	Ratio of Facilities, Medical Personnel to population		
		Dugda Bora Wareda	East Shewa Zone	Oromia Region
Health Center	1	156,358	361,979	272,069
Clinic	13	12,027	54,845	23,826
Government	5	-	-	-
Private	7	-	-	-
NGO	1	-	-	-
Health Post	2	156,358	361,979	272,069
Drug Stores	10	15,636	Not available	Not available
Doctors	1	156,358	30,676	68,714
Nurses	5	31,272	10,969	22,149
Health Assistants	15	10,424	5,954	6,288
Health Worker	6	26,060	Not available	Not available
Sanitarian	1	156,358	Not available	Not available
Pharmacy Technicians	4	39,090	Not available	Not available

Source : Wareda Health Department, Meki, 1999 and Zonal Level Health Department in 1996

The above table shows that the wareda has the facilities above the zonal and the regional average while the personnel in the wareda does not reach those average. The availability of health institution and staff does not ensure coverage of health care. However, as far as the facilities and personnel of health care are concerned, it can be

seen that the Dugda Bora wareda is not very inferior to the regional level.

A preventive health care service is being carried out by the staff in the department in spite of shortage of staff and equipment. It includes construction of latrine and refuse disposal, inspection of pit latrine, refuse disposal, water source, small-scale industries, food & drink establishment, prison & school health service, vaccination service, and malaria control campaign. Especially, in 1999, the department had malaria control programme in 20 PAs, spraying DDT in houses and mosquito breeding sites and distributing chloroquine and fansidar to the inhabitants. However, those activities were constrained by poor community participation.

The present condition of the health care service in the wareda suggest that it is important to strengthen the health post, with a front-line health care institution and awareness of the communities, for preventive health care.

### 3.7.4 Education

Education plays a crucial role in the process of social and economic development. In this context, while the focus is on expanding primary education, the structure of education is diversified into technical and vocational education, the expansion of which takes place in parallel with the expansion of primary education. An enrollment ratio and the total literacy rate evaluate level of education. The net enrollment ratio is defined as the ratio of the number of pupils of eligible age at a particular level to the total population of the corresponding age group. Ratios of pupils to total number of school-aged children for each grade compared to those of East Shewa Zone and Oromia region are shown below.

**Ratios of Pupil to Total Number of School-aged Children and Literacy (%)**

		Primary School	Junior Secondary School	Senior Secondary School	Total Literacy
Dugda Bora Wareda	Male	9.65	3.09	2.02	28.74
	Female	9.36	2.87	1.90	15.05
	Total	9.51	2.98	1.96	21.99
East Shewa Zone	Male	18.98	8.79	10.17	42.40
	Female	18.42	10.31	10.75	29.64
	Total	18.70	9.55	10.46	36.04
Oromia Region	Male	11.86	4.32	4.23	29.29
	Female	9.62	4.41	4.07	15.56
	Total	10.76	4.37	4.15	22.40

Source: The 1994 Population and Housing Census of Ethiopia Result for Oromia Region

In terms of all indicators, East Shewa Zone has ratios roughly twice as high as those of the regional average, while Dugda Bora District, which is within the East Shewa Zone, has the same values as the region.

There are 27 primary schools and 3 junior high schools in the district for 17,232 pupils administrated by the wareda education department (location of the schools are shown in Figure 3.7.4). There is only one senior secondary school, which belongs to

the Catholic Church. The pupil population in the primary, junior and high schools is indicated below.

**Pupil in Dugda Bora Wareda (1992/93 – 1999/2000)**

Year	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
Primary & junior high school population	2,751	3,196	2,894	5,272	7,501	10,094	14,814	17,232
Senior secondary school population	287	338	399	264	278	278	313	359

Source: Wareda Education Department , Meki 1999

Although the population of the senior secondary school shows slight variations during the period, the population of primary and junior high schools has drastically increased, requiring a commensurate increase in schools and school facilities. The shortage of schools and teachers can be seen in the following table.

**Status of Primary School, Students and Teachers**

	No. of Schools	No. of Students	No. of Teachers	Students / school	Students / teacher
Dugda Bora Wareda	27	17,232	248	638	69
E. Shewa Zone	301	115,504	3,557	384	32
Oromia Region	4,108	1,401,508	35,585	341	39

Source: Wareda Education Department, Meki 2000 and Zonal Level Education Department in 1996

In response to high needs of school facilities, 2 primary schools are under construction while one junior high school is being upgraded. In the wareda, other than government activities, UNICEF and NGOs play an important role in the education sector. UNICEF is conducting a capacity building programme for communities as well as schools, such as awareness programme to community, gender issues and children's rights. An NGO, the Christian Children's Fund, builds and manages kindergartens and constructs primary schools and employs teachers. After construction these are eventually transferred to the government. It is reported that the dropout ratio of 27% in 1998/99 has drastically declined to 18% in 1999/2000. This is because of the awareness activities, expansion of the number of classes and employment of additional teachers.

The Alam Tena vocational training center conducts training courses for tailoring, carpentry, spinning and weaving, and blacksmith.

Although there are still a lot of constraints in the sector, such as a shortage of teachers, schools, classrooms, and insufficient training of teachers, the educational administration with external support by UNICEF and NGOs has been established.

## CHAPTER 4 DEVELOPMENT CONSTRAINTS AND NEEDS

### 4.1 Analytical Methods

Chapter 4 aims at identification of region-specific constraints against and needs for the agricultural and rural development in the Meki area by means of the following analytical approaches.

- 1) Review of the existing literature, reports and other documents
- 2) Field observation with stakeholders
- 3) Project Cycle Management (PCM) workshop with OIDA focusing on institutional and organizational constraints in the existing irrigation schemes
- 4) A series of subject workshops with OIDA and other agencies concerned
- 5) Interviews with and questionnaires to local administrators and officers at the zonal and wareda levels
- 6) Interviews with and questionnaires to farmers
- 7) Rapid Rural Appraisal (RRA) at several community levels in association with local consultant
- 8) Interview survey of traders and vendors at public markets focusing on rural road conditions
- 9) Questionnaire surveys of institutions concerned with primary health care and education
- 10) Interview survey of major NGOs

The Study carried out direct interviews to the district officers and other stakeholders including PA chairpersons, development agents (DAs), NGOs, community leaders, middlemen, street vendors, and retailers at the public markets at Meki and Alem Tena. The farmers' attitude and intention for agricultural and rural development were studied at representative communities through the RRA and the intensive field inspections. These activities verified social and cultural characteristics of the Meki area including roles of traditional groups, way of decision making in a rural community and gender imbalance. The field study has also focused on local experiences and indigenous knowledge to cope with unfavorable natural conditions.

A series of workshops were held with collaboration of OIDA by inviting cadres, officers and researchers from other organizations. In response to the presentation by each expert of the JICA Study Team, development constraints, needs and possible countermeasures were discussed more specifically from the professional point of view. The subjects included improved farming techniques, modernized animal husbandry with dairy cattle, irrigation development, agricultural support systems, environmental conservation, etc. The development constraints and needs through the Study are mentioned below.

## 4.2 Constraints and Needs in Irrigation Development

### (1) Lack of development strategy in the Meki area

The irrigation development in the Meki area is encouraged by the government agencies, NGOs and private investors. It is urgently required to establish an optimum development plan with a long-term strategy. However, several constraints are identified against the irrigation development in the Meki area as follows.

#### 1) Fragile environmental conditions of the Rift Valley

The Meki-Ziway basin forms a closed hydrological system on the bottomland of the Rift Valley. Surface water in the Meki river basin finally drains into the Ziway lake and finally into the Abijata lake. Therefore, the water levels of both lakes are subject to water abstraction from the Meki river. In view of such fragile environmental conditions of the Rift Valley, hydrological observation and impact assessment are required before further irrigation development is undertaken in the Meki river basin.

Some 180 small pumps are currently installed by investors for profit-oriented horticultural farming. These on-going irrigation activities give local farmers strong incentive to embark on further irrigation development. However, irresponsible expansion of irrigation area will accelerate water use of the Meki river basin. In order to avoid environmental impact and optimize irrigation water use in the Meki river basin, a well-balanced development plan has to be formulated with a long-term strategy. In parallel, it is also required to continue a monitoring survey of irrigation water use in the Meki river basin so as to minimize environment adverse impact at the earliest stages.

#### 2) Topographic constraints against introduction of a gravity irrigation system

The regional state government has faced the financial difficulties of the Meki-Ziway scheme during last decade. In order to reduce the financial burden for O&M of its pumping facilities, OIDA envisages converting the existing pump system to the cost-saving gravity system. With this background, the Study aimed firstly at justifying technical and financial viability of a gravity irrigation development including a dam construction on the upstream of the Meki river.

The Meki river incises a v-shaped valley of 40-50 m deep in the upstream reaches and forms steep narrow gorges of 10-20 m deep on flat alluvial deposits extending over the downstream. Due to such morphological conditions of the Meki river, a scale of either dam or diversion structure tends to be large with few alternatives. The required dam is not lower than 30m, while the proposed diversion structure is to be designed not lower than 10 m. The geological foundation of the riverbanks and riverbeds of the Meki river is generally friable with high permeability and needs additional subsurface and protection works. In order to recover an initial investment for such large-scale civil works, an irrigation area has to be enlarged to the maximum level, e.g. 8,000 ha, so as to ensure reasonable economic scale.



### 3) Management capability of large-scale scheme

More attention should be paid to institutional and organizational arrangements necessary for a large-scale irrigation scheme. As mentioned in Chapter 2, the irrigated area under the control of OIDA is limited to less than 100 ha per scheme. This means that both OIDA and water users need more established management system far beyond their past experience in the existing schemes.

In-depth study is required to confirm a viability of the proposed scheme not only from environmental, technical and economic viewpoints but also from institutional and organizational viewpoints. In this regard, the capability building of OIDA and water users is crucial.

## (2) Inadequate operation and management (O&M)

### 1) Vague demarcation of responsibility between OIDA and WUAs

At completion of the construction of irrigation schemes, most of responsibilities for O&M are officially taken over from OIDA to WUAs. However, the handing-over agreements do not mention clear demarcation of responsibilities between OIDA and WUAs at the O&M stage. As a result, confusions are raised from day-to-day operation especially when the project faces unforeseeable troubles, for which countermeasures are beyond technical and financial capacity of WUAs.

### 2) Farmers' ignorance to financial management for O&M

NGOs have provided local farmers free pumps together with farm inputs for the first crop season. With such supports, the farmers obtain successful harvest from the first crop season. In most cases, however, farmers faced financial difficulties in and after second crop season when NGOs faded out due to lack of fund for procurement of fuel. Moreover, most of WUAs have failed to replace the pumps after their depreciation.

It is believed that irrigation farmers in the Meki area do not have sufficient capacity to pay the water charge and can not sustain the scheme operation without financial supports. To improve the profitability of the irrigation farming at farmer level, further detailed financial analyses will be required. In addition, awareness creation will be required for sustainable financial management for O&M. The Study preliminarily identified farmers' ignorance to necessity of financial sustainability for O&M. In fact, water charge is not collected in most community-based irrigation schemes even though farmers are capable to pay water charge after good harvest.

### 3) Lack of technical knowledge for O&M

Water Management and Extension Department of OIDA is responsible for extension of the O&M techniques to WUAs at official hand-over of a scheme. After the hand-over of the project, farmers are to take most responsibilities for O&M with little assistance of OIDA staffs. However, some project facilities are not functioning due

to lack of annual or seasonal maintenance as a result of insufficient knowledge among the WUA members. Weed control and desilting of canals are rarely operated due to negligence of WUAs. Uneven water distribution and illicit water tapping due to ignorance among the WUA members are also reported in many existing schemes. In this regard, the DAs assigned by OIDA are expected to be catalyst to train the WUA members. The Study recognized urgent needs for provision of training programs for both the DAs of OIDA and the WUA members especially on efficient use of limited water resources.

(3) Insufficient support by OIDA

1) Insufficient capacity for planning and design

The OIDA engineers need more technical training especially for planning and design of irrigation development. The Study identified urgent needs of intensive training especially for hydrological analysis essential for design of diversion weirs. The analytical methods are required to assess the water development potentials in the basin, in particular, where discharge records are very limited. It is noted that low irrigation performance of the existing schemes, i.e. 58%, could not be improved without proper hydrological analysis and countermeasures.

Some structures do not function as designed due to technical negligence to soil and geological conditions. In this regard, lack of planning and design criteria is one of constraints.

2) Lack of criteria for implementation of new projects and rehabilitation works

The OIDA branch offices receive and assess farmers' proposals for new irrigation projects, while the OIDA head office makes final decision for project selection and provides approval for its 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. Due to lack of guidelines and criteria for project selection and prioritization, these services are not systematically operated.

3) Insufficient administration capacity to manage external resources

Some facilities are not properly constructed in accordance with design and technical specification. Soil compaction is not satisfactorily carried out resulting in water leakage from embankments of canal and night ponds. A total review is required to optimize quality control by OIDA especially for site inspection and measurement.

In recent years, some of planning and design works were performed with aid of foreign consultants. In future, the project construction will be carried out by more participation of private contractors instead of on OIDA's force account. This will reduce the workloads of the OIDA engineers. Instead of direct management, however, OIDA's responsibility for progress and quality control of construction

works including preparation of terms of reference (TOR) for the engineering services, construction management, contract administration, preparation and interpretation of general and technical specifications and monitoring of physical and financial progress.

4) Insufficient project monitoring and evaluation

The project monitoring and evaluation system is not fully functioned in OIDA. To ensure the development activities in each scheme, a regular reporting system between the head office and the branch offices are required.

5) Insufficient experiences for participatory development approach

The community mobilization is one of the most important steps of the project implementation. OIDA dispatches the community mobilization teams to the candidate communities for WUAs and encourages awareness creation followed by participatory plan formulation. At this initial stage of the project, the communities need a wide range of information concerning the irrigation farming to make proper judgement. However, due to lack of information necessary for plan formulation, the communities can not realize the actual difficulties of the community-based irrigation management. One of the reasons is the staff structure of a community mobilization team of OIDA, which is organized only by social workers. The OIDA social workers do not have sufficient engineering knowledge and working experiences. It is crucial for community members to be aware not of management difficulties of the irrigation project but also of the engineering problems during the PRA. The WUA members need to be motivated by appropriate facilitation by both socialists and engineers.

(4) Low crop productivity due to poor farming techniques

1) Lack of research for irrigation farming

The agricultural research in Ethiopia is currently carried out in line with the research-extension linkage program under the responsibility of EARO. In view of large impact to majority of farmers, EARO has attached the priority to improvement of rainfed farming and animal husbandry, which contributes to substantial portions of the national economy and livelihood. In contrast, the irrigation research is carried out to the limited scale by EARO. Modern irrigation techniques are not sufficiently studied under local climatic and soil conditions of Ethiopia.

2) Weak extension activities

OADB is responsible for the agricultural extension services by deploying DAs. Most DAs have educational background of high school with agricultural diploma for 2 years. In general, their practical experiences are not sufficient to meet the requirement among local farmers. Moreover, DAs are not capable to provide extension advises to farmers since DAs are not provided skill training for irrigation farming, which are under the responsibility of OIDA. It is important to train the DAs not only in rainfed crop production but also in the technical field of irrigation farming.

Although OIDA dispatches DAs to the selected woredas where irrigation schemes are operated, their technical knowledge and experiences are not sufficient.

### **4.3 Constraints and Needs in Rain-fed Agriculture**

#### **(1) Improper farming practices**

##### **1) Lack of research for rainfed farming techniques suited to ASAL**

With regard to the linkage between research centers and extension offices, there is no direct communications between research centers and district office. As mentioned above, the research-extension linkage program is the main stream of the agricultural research activities in Ethiopia. Some 300 recommendable agricultural techniques are already selected and in process for extension. However, most of them are selected under relatively favorable agro-climatic conditions and, therefore, not appropriate to introduce directly to the ASAL zones including the Meki area. The agricultural research in situ is required to modify the selected techniques to more suitable for the local conditions of Meki.

##### **2) Weak extension**

As mentioned above, the technical knowledge of DAs is not sufficient to provide a wide range of appropriate advises to local farmers. The DAs need more training programs to elaborate their technical skills and knowledge. Lack of extension tools (materials) is also one of constraints facing DAs. Besides, lack of transportation means hinders regular visits to contact farmers according to the schedule of T&V system. Heavy workloads of EPP are another constraint against the regular visits of DAs. On an average a DA visits a farmer one to four times per month according to the farmers interview by the JICA Study Team. The most of interviewees need more frequent visits by DAs to meet their demands.

#### **(2) Delayed inputs supply**

##### **1) Poor agro-inputs supply system**

Grain yield can be increased when improved seeds and chemical fertilizers are applied together. One of the agronomic constraints in Ethiopia is lack of improved seeds. Especially improved seeds of teff and haricot beans are in short supply. Only fertilizers are often available in EPP. Instead of improved varieties, farmers are forced to use local varieties, which are available through local middlemen. The productivity of local varieties is basically low even though chemical fertilizers are sufficiently applied. Grain yield can be increased only by 20-30% at maximum when local varieties are used. This yield increase can not meet to repayment of EPP credit. Recovery rate of EPP credit in the entire Oromia Region is as high as 97%, while 78% in the Meki area where EPP improved seeds are in short. This gap may be caused by incomplete EPP without improved seeds. Incomplete EPP without improved seeds is not recommendable to farmers unless farmers have their own good

seeds to use.

2) Weak financial status of farmers

Most of the farmers in the Meki area are at subsistence level. Their farming system cannot be profit-oriented due to lack of capital. Opportunities for access to credit schemes such as EPP and NGO are limited.

(3) Low post-harvest efficiency

1) Post-harvest loss

Post-harvest losses of grains are substantial especially during traditional threshing by oxen. Legs of oxen penetrate threshing plot and easily mix grains with soils and sands. As a result, grain quality is significantly degraded. Furthermore waste and urine directly thrown on grain decrease their quality.

2) Insufficient flour milling places

As mentioned in Chapter 3, there are only nine (9) flourmills registered in addition to a few more non-registered mills in the 54 PAs. Some villagers have to spend a long time to go to Meki town for milling.

(4) Low bargaining power against middlemen

About 70 % of grains produced in the Meki area are traded through middlemen, who make tacit agreement in price setting. Farmers have no financial margin to build up bargaining power and are forced to sell their farm products at asking prices.

(5) Frequent Drought Disaster

1) Limited and erratic rainfalls

Drought hazard is the most uncontrollable cause of crop damages, especially when recurrent dry spells occur during the reproductive stage of grain crops. Especially the western to northern lakeshore of Ziway is a chronically drought prone area. In this zone, crop failures have continuously occurred during the last 5 - 6 years.

2) Poor soils with low water holding capacity

Soils in the study area are originated from lacustrine deposits with medium to coarse texture, which are basically poor in plant nutrients and of low water holding capacity. Crop residues are rarely incorporated into soils and are often utilized as animal feed.

#### **4.4 Constraints and Needs in Animal Husbandry**

(1) Prevailing local breeds of low productivity

Cattle in the study area are not controlled and are mostly unimproved indigenous. Recognized breeds include Boran, which is renowned as a beef breed well beyond the boundaries of Ethiopia. In Oromia, the most common breed is Arsi, which is small and unproductive for milk. European breeds, especially Friesian and Jersey, have

been imported for many years and crossed with indigenous cattle in attempts to improve the productivity of the latter. However, the improved breeds are limited in number in the Region.

Almost all sheep and goat are indigenous types although several breeds have been identified. They have generally evolved under harsh conditions of health, nutrition and climate and their output is low. The national poultry flock comprises some about 99% indigenous birds that are mostly managed under a scavenging system with the remaining 1% being imported exotic breeds that are usually managed intensively.

(2) Shortage of forage crops

1) Low carrying capacity of natural grasslands

The problem of nutrition is exacerbated in the Meki area particularly due to overstocking although this may be mitigated to some extent by the access to grazing by the lakes and rivers in the dry season. Mortality of adult animals is low, despite poor herd health management, but mortality among young stock is high, calving rate in cows is poor, and growth in cattle is poor. At a stocking rate of an average of 0.25 TLU per ha against the carrying capacity of 0.13 TLU/ha, severe environmental degradation through, erosion, bush encroachment and loss of topsoil is inevitable, particularly in a fragile environment.

2) Shortage of managed pasture for intensified animal husbandry

Livestock raising can be intensified partially by zero-grazing system of production. This is only possible through a year-round supply of farm-grown forages, fed as green chop in the rains and as conserved forage through the year. The supply of high quality forage is possible only in this area through irrigation. However, the use of this system, together with the use of livestock which have been crossbred with exotic breeds, provides an opportunity for profit-oriented production. This can be achieved through dairy production. When profits are high enough, farmers would be less concerned with keeping unproductive livestock as insurance and would sell them to buy crossbred heifers. This reduces the number of cattle per herd even further.

Planting of improved pasture species in contours and suitable species in wetlands would involve community participation in preventing uncontrolled grazing on these areas until the grass is well established. Irrigation provides the potential for ruminant livestock development. Through irrigation, high yielding, good quality forages can be produced for year-round feeding. However, one should be careful in selecting the system of production that would likely to be successful in terms of profit, adoption by farmers, and sustainability.

(3) Frequent outbreak of animal diseases

The most prevalent disease outbreaks in Dugda Bora appear to be Anthrax, Black

Leg (Quarter Evil), Pasteurellosis and Lumpy Skin Disease in cattle; sheep and goat pox in sheep and goats and African Horse Sickness in horses. Tick borne disease only occurs infrequently probably due to the enzootic stability achieved in the indigenous population of livestock. Internal parasites are a major cause of mortality in this area because of the large population of animals that congregate around bodies of water during the dry season. Dosing is an essential activity, especially at the beginning and end of the dry season and especially in sheep and cattle. In poultry, Newcastle disease occurs sporadically but the most important cause of mortality in poultry is coccidiosis in young pullets or cockerels.

There is one veterinary clinic at wareda level and one health post, with ten veterinary crushes distributed around the wareda. This is grossly inadequate and according to the veterinary office, at least ten more health posts should be established around the wareda.

In particular, vaccination and dosing levels are totally inadequate. According to the veterinary office, prophylactic drugs and chemicals have become unreliable and costly. Recently, a cost recovery exercise commenced to allow better consistency in supplies. Spraying or applying acaricide with a soft cloth is carried out when tick burdens are heaviest, in the late rains, mainly to prevent damage to hides or severe loss in body condition.

(4) Lack of animal husbandry techniques suited to the Meki area

The research station of Adami Tulu undertake the livestock experiment focusing on feeds and nutrition, breeding for selection of suitable cross-bred, i.e. Boran and Jersey, and animal health under the local climatic conditions. In view of income generation by women, the study for the dairy farming techniques suited to women are commenced. In addition, selection of forage species is envisaged. Promising forage crops selected are *Lablab purpureus* and *Chloris Guyana*. Due to lack of extension staff and budgetary arrangement, these techniques are not fully transferred to local farmers.

(5) Farmer's low capacity

1) Farmer knowledge and interest

It is important to promote adoption and commitment of a production system which farmers are familiar with. In the Meki area, cattle feedlot with young steers is not a mode of production familiar to them, nor is goat milk, nor is lamb or mutton production. Modes of production that are in use are milk and egg production from cattle and hens, allowing a foundation of development on which to build.

2) Adopting new technologies

Farmers can be encouraged when it can be shown that a production system is very profitable and will not only bring significantly increased income to the farmer but at low risk and high sustainability. The main lessons to be learnt from previous projects,

i.e. SDDP, are that heavy imposed structures do not serve the best needs of the nation and are unable to continue after project financing is terminated, and incremental recurrent costs should be kept to a minimum. Although farmers can quickly adopt technologies that provide rapid and clearly perceived increased in production and profitability, the demonstration activities are very limited.

### 3) Irregular income

A production system can be more easily adopted when returns are by short term. Income from milk and eggs is regular and returns are regular and frequent (usually weekly). This is important when financial reserves are low and the farmer depends on a regular cash flow. Beef on the other hand is long term. It would take two years from birth of a calf before income can be realized from commercial production and if animal dies, there has been no return on the animal before that event.

### 4) Unstable marketing

There must be a ready and accessible market. In the Wareda, eggs, butter, cheese and milk are sold easily and the markets, namely Meki, Ziway, Ela, Ombole, and Alem Tena, are reachable within a morning by most farmers on market day. There is no market for goats' milk as this is not popular in this area, nor is there any market for young beef or lamb (lack of formal beef marketing in this area).

## 4.5 Environmental Degradation

### (1) Increase of sediment loads in river water

The soils in the Meki area are extensive in the eroded, hilly and sloping areas. In the uppermost catchment area, over 90% of which lies in the Southern Region, erosion is observed to be serious as characterized by deep and wide gullies. The effect of erosion and the resultant sedimentation can reduce the efficiency of irrigation structures, increasing maintenance and operating efficiency and costs. Since erosion rates in the catchment area are unavailable, it is difficult to quantitatively assess sedimentation in the backwater flow at the proposed intake.

### (2) Low water retention capacity of catchment

Oromia has about 3 million ha of forestry and it is estimated that about 50,000 ha to 100,000 ha of natural forests are lost annually due to shifting and commercial agriculture, fuelwood collection, forest fires etc. Virtually no extensive areas of undisturbed forest and wildlife habitat remain in the Meki area except for remnants of the original forests, i.e. "Podocarpus mixed forests". Only 11.3% of the Meki area are covered by bushlands. The annual incremental yields are only 1.2 m<sup>3</sup>/ha for woodlands and 0.2 m<sup>3</sup>/ha for bushlands. Due to the open access system, their harvest has exceeded their annual growth.

Few experiences exist in watershed management in the Meki area except in the 4 PAs,



where WFP has initiated soil and water conservation and gully stabilization project by organizing a watershed management team in each PA. It is estimated that the Meki area with a population of about 162,750 need to plant at least 9,765 ha to meet the current total demand of 146,475 – 195,300 m<sup>3</sup>/year. The current afforestation activities are still far below its requirement.

(3) Deterioration of farm land

1) Difficulties in environmental conservation

Re-forestation of lands that have been severely denuded of browse trees by goats and sheep. Goats in particular are browsers and if trees were planted to prevent erosion in degraded areas and de-forested areas, goats would decrease grazing activity in preference for browse. This would reduce grazing pressure.

2) Decrease of arable and grazing lands caused by land degradation

Slope lands especially edges of terraces are severely eroded and incised by large gullies as a result of deforestation, over-grazing and irresponsible cultivation without awareness of soil conservation.

3) Soil salinity

Soil salinity is partially observed in the farmlands adjacent to the Ziway lake and causes physiological desiccation of plant growth and further detailed survey is required. Incorporation of organic manure is recommendable not only for improvement of soil fertility and but also for mitigation of salinity problems. However, crop residues are vital for feeding. Recycled residues are apt to reduce demand, which increases due to increase of livestock population under fragile environment in the central Rift Valley.

(4) Prevalence of water-borne diseases

Due to lack of sanitary facilities and poor public concerns related to hygiene and nutritional availability, health conditions of the local people are under serious threat causing relatively high morbidity rates of diarrhea infections. As for vector borne parasitic diseases, malaria is the most prevailing disease in and around the Meki area. Bilharzia is also known to be present in the Meki area.

#### **4.6 Low Development Incentives and Capabilities among Rural Communities**

(1) Lack of awareness creation by the local government agencies

Awareness creation aims at advocacy for quality of life among community members. The government is responsible to tackle poverty alleviation by uniting the efforts in evaluating the past efforts among the communities and in planning new initiatives to solve common social problems. In order to promote solidarity, community would make attempt to identify their rules and traditional customs to accommodate each other. In the process, they would be aware of democracy in both form and content. There are no systematic approaches in the Meki area to finally envisage strengthening

solidarity and equity in their community. Insufficient participatory experts among the local government staff would be one of the most crucial constraints.

(2) Farmer's difficulty to access to public services

The system of decision making at community level is democratic. Each peasant is in a position to discuss the social and physical problems in and around their community. PA chairmen take responsibility to submit official request upward. Since the community meeting is not regularly held and attendants are limited, opinions of poverty groups including women and youth are hardly reflected to the meeting resulting in lower accessibility to public services for them.

(3) Discouraged farmers

In the Meki area, some of communities have been involved in the development projects, which were initiated by either donors or NGOs. The Meki-Ziway irrigation project is the most typical case. After the donor's assistance faded out, the responsibilities of project operation were transferred to the communities without sufficient skill training. As a result, the project performance currently remains far below the expectation of the donor. The Study identified that some of communities were discouraged by these negative experiences.

(4) Conventional society of rural community

Traditional societies in the Meki area are sometimes too conservative to embark on new development activities.

(5) Low participation caused by financial constraints

Due to low financial capability, peasants are often not able to participate in the community-based development, which forces each member to share group finance.

#### **4.7 Insufficient Fulfillment of Basic Human Needs (BHN)**

(1) Shortage of safe drinking water

In the district, main source for drinking water is underground water, level of which is almost the same around EL.1,620 m through the district. Thus in the mountain area, it is very difficult to fetch the water, while that is easier in lakeside. The number of water supply schemes managed by communities is 66, consisting of 45 boreholes, 16 shallow wells and 2 hand dug wells. Planned beneficiaries for the schemes amount to some 117,000. However, out of 66 schemes, 26 schemes are not functioning and 19 schemes need maintenance works. Over half of the windmill schemes are not functional, most of which were constructed under assistance of NGOs. The beneficiaries in the schemes pointed out that it was caused by lack of spare parts, and the bureau has taken no action for the repair.

It was also observed that some of schemes were abandoned due to water quality problems, such as a high concentration of fluoride and salinity. Such high fluoride

contents could cause dental and skeletal fluorosis. To eliminate the constraint, which is widely discussed in Rift Valley, it is suggested that surface water as alternative water source for domestic water could be sought in the study area.

(2) Stagnation of inter and inner transportation

There are six (6) major roads in the Wareda, which are categorized into 3 classes in accordance with its pavement, such as asphalt-paved road, gravel-paved road and unpaved road. In the Wareda, the total length of the paved roads is 97km. Some 40% of inhabitants living in the rural area seldom access to Meki and Alam Tena, which can be reached within 3 hours on foot. Their main transportation means include donkey, donkey cart and on foot. Footpaths are deteriorated in the rainy seasons resulting in not only time loss during transport but also serious damage of agro-products and other commodities.

(3) Insufficient health care service

Although the region has been putting emphasis on ensuring the primary health care, there are a limited number of health care facilities and health personnel. A large portion of the population neither has access to safe water nor sanitation facilities, which is afflicted by water-borne diseases. The major causes of morbidity are respiratory infection, malaria, skin infections, diarrhea diseases and intestinal parasitic infections.

The responsible of front line service for health care is under health department of wareda. There are i) health center (1), ii) district clinic (5), iii) private clinic (7), iv) health post (2) and v) drug store (10). A doctor and nurses are assigned to the health center, while health assistants mainly run clinics. A health post is managed by a community health worker with basic training in health and mid-wives. But the facility faces to budgetary and manpower problems in terms of number of staff and lack of training. In addition to the government service, in Alam Tena, the Catholic Church established a clinic in 1995. The number of patients visited the facilities in 1999 was reported to be 29,900 for first visit, and 31,900 for the repeated. The present condition of the health care service in the wareda suggest that of importance is to strengthen the health post, where is a front-line health care institution and awareness of the communities for preventive health care.

(4) Insufficient schools

Education plays a crucial role in the process of social and economic development. There are 27 primary schools and 3 junior high schools in the district for 17,232 pupils administrated by the wareda education department. There is only one senior secondary school that belongs to the Catholic Church.

In the wareda, other than government activities, UNICEF and NGOs are acting an important role in the education sector. UNICEF is conducting a capacity building programs to communities as well as school including awareness program to community, gender issue and children's right. NGOs manage a kinder garden,

construct a primary school and employ teachers, which are finally to be transferred to the government. With these efforts, drop out ratio of 27% in 1998/99 was drastically reduced to 18% in 1999/2000. On the other hand, enrollment of the primary and junior high schools are drastically increased, thus, requiring a commensurate increase in schools and school facilities. To make up the school facilities, 2 primary schools are under construction while one junior high school is being upgraded. Shortage of school facilities is still crucial.

#### **4.8 Institutional Constraints**

OIDA has directed every effort towards improvement and reinforcement of its institutional and organizational set-up since the official recognition in July 1999. OIDA is now entrusted with full responsibility for development of the irrigation sector in the Region. In view of project sustainability and appropriate resource use, the Study focuses on the institutional development of OIDA to meet the supporting requirements arising from the project implementation. The initial study identified the following constraints, which will be crucial for future adequate institutional and organizational operation of OIDA as well as the irrigation sector of the Region.

(1) Financial loads to be expanded by staff recruitment

The staff structure of OIDA is not yet fully developed but has expanded to meet urgent requirements at the zonal and district levels. Currently, OIDA has 720 staff including 211 at 69 districts level. There is a proposal to increase the district staff to 621 in accordance with the five-year irrigation development plan. Staff salary is the largest expenditure of the recurrent cost of OIDA and will be expanded further in the years to come. In-depth study and intensive monitoring will be required for optimum use of human resources to adjust staff salary and related cost implication within an acceptable range.

(2) Weak quality control in the direct force account project

Currently, OIDA carries out construction work of irrigation projects by applying two (2) modes, namely OIDA's direct force account and sublet work. IFAD provides the heavy equipment and vehicles together with the training program for OIDA to implement construction works. Construction Management Team is fully responsible for OIDA's direct construction works executed under the supervision of a Construction Supervision Team. The tasks of both teams are summarized below.

- |  |  |
|--|--|
| 1) Construction Management Team<br>(Construction Department) | : To supervise construction work in general and occasionally take responsibilities for direct force account work |
|--|--|

- 2) Construction Supervision Team (Study and Design Department) : To supervise progress, quality, cost, etc. and to issue approval for the completion of project works

This internal arrangement sometimes tends to make the responsibility on quality control of the construction vague at the field level. In addition, direct construction needs frequent supervision by construction teams of both the head and branch offices. This results in increasing the heavy burden on supervisory staff. In terms of strict quality and financial control, extended use of sublet method may be considered. Urgent review of this aspect will be required for OIDA, which is in a position to supervise the construction works as a client and owner of the projects. To rationalize the OIDA's scope of responsibilities, the study of the international rules, e.g. FIDIC, will be useful.

(3) Unnecessary gap between community development and agricultural extension

Two (2) departments of OIDA are responsible for soft components of irrigation development on frontline. They are as follows.

- 1) Community Participation Department : Coordinate community mobilization and organize WUAs
- 2) Irrigation Extension and Water Management Department : Implement extension works on irrigation farming including water management

The cadre and staff of Community Participation Department are mainly sociologists, while those of Irrigation Extension and Water Management Department are graduates from agricultural fields. There is an unnecessary gap between two activities of OIDA, namely community mobilization by Community Participation Department and extension of irrigation farming techniques by Irrigation Extension and Water Management Department. Although the immediate roles and specialties of two parties are different, their ultimate target is to contribute to "rural community". Coordination between two parties is urgently required for smooth flow of the project cycle.

(4) Needs for capacity building for watershed management works

Watershed Management Team under the Irrigation Extension and Water Management Department was organized at the OIDA HQs, while no staff is posted to branch offices and no activities are carried out. Participatory afforestation and other conservation measures are required for protecting watersheds from soil erosion.

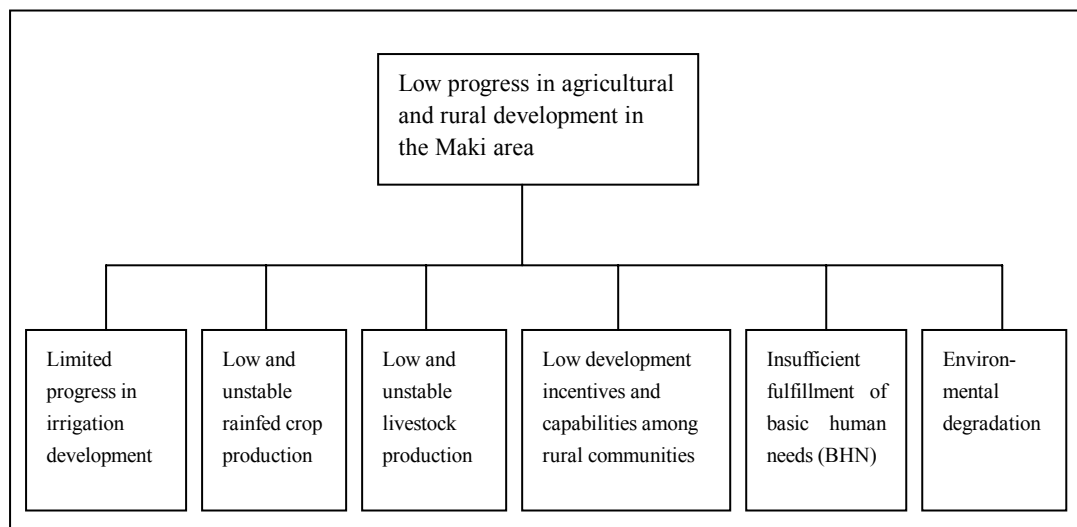
(5) Needs for communication facilities between head office and local offices

The communication between the head office and local offices is limited. Further consideration is required for closing this communication gap. The Study identified

urgent needs for regular visits and reporting system between the head office and local offices to exchange and share their information with each other. Shortage of communication facilities including vehicles is chronic constraints experienced by both head office and local offices.

#### 4.9 Problem Tree

The Study Team prepared the problem tree taking all the information and lessons learnt through the above-mentioned studies into consideration. The problem tree is illustrated in Figure 4.9.1. All the constraints in the agricultural and rural development in the Meki area are categorized into six (6) direct causes as illustrated below.



The direct causes comprise (i) limited progress in irrigation development, (ii) low and unstable rainfed crop production, (iii) low and unstable livestock production, (iv) low development incentives and capabilities among rural communities, (v) insufficient fulfillment of basic human needs (BHN) and (vi) accelerated environmental degradation. Although the magnitude of the impact on the core problem can not be quantified, the problem tree shows nearly all the problems.

As seen, some of problems are derived from underlying sociological causes including non-organized community activities and institutional weakness rather than physical factors. Therefore, particular attention has been paid to both physical causes and the background to those causes so as to identify proper solutions.

## CHAPTER 5 WATER RESOURCES POTENTIAL AND CONSTRAINTS

### 5.1 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. 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 learnt from existing medium- and large-scale pump schemes it has been proved, that 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 scheme sustainability.

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, for 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.

### 5.2 Candidate for New Water Sources

As discussed in the previous chapter, the Meki river is considered a candidate for new water sources. Hydrological analysis was made for the river as shown in section 3.1.4. The Meki river has an annual runoff as much as 290 million m<sup>3</sup> 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 m<sup>3</sup>/s, with a minimum monthly discharge of 0.90 m<sup>3</sup>/s in December, whereas it is 30 m<sup>3</sup>/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 for 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 5.2.1.

### **5.2.1 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 “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 slopes. 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 irrigation of high-elevated lands in the study area.

The another site 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 deposits, special attention would be paid for its foundation treatment and upstream river training to ensure stability of the river course. This plan will make sure to irrigate land mainly below Meki town.

### **5.2.2 Proposed Dam Site**

The proposed dam site is located 48 km upstream of the Ziway Lake. The Meki river flows down on the plateau, forming a 30-40 m deep v-shaped valley with a width of about 1,000 m. The average gradient of the river is 1/600, and the riverbed elevation is El. 1,760.0 m. The abutments at the site is characterized 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.

The proposed dam site is covered by quaternary 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.



Results of the standard penetration test data 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 indicated that the permeability coefficients are found at the range of  $10^{-4}$ . Series of an impermeable rock were not observed on the abutments up to the depth of 20m. A clue based on the obtained tests results the need for large-scale foundation treatment, which could result in a rise in the construction cost of the dam.

### **5.3 Water Balance Study**

The study area in rift valley is prone to drought because of erratic nature of rainfall. The supplemental irrigation is one the means to minimize drought risk and sustain small holders agricultural production. The construction of the dam and the diversion weir on the Meki river are alternatives for irrigation of the study area. The diversion weir or dam will regulate the river water and supply water to the project area. The Meki-Ziway-Abijata sub-basin is important in the rift valley in terms of potentials for water resources exploitation. However, the lakes and rivers have an interconnected system and the constraints for water resources are complex. Therefore, the diversion of water from the Meki river will affect the water recharge of Ziway lake, which can lead to change in outflow to Bulbula river and will ultimately affect water level of the Abijata lake. Therefore, the water resources development of the basin requires a judicious planning for protection of the fragile eco-system.

The objectives of the preliminary water balance study are to determine the optimum development scale for the irrigation area under the project and to maximize 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. The water balance model is formulated from the conceptual diagram (Figure 5.3.1) of the water resources system that includes the Meki river, Ziway, Abijata lake and a dam to supply the water to the new area, the procedure of the study and results are described in the following sections.

### 5.3.1 Irrigation Requirement

#### (1) Cropping Pattern

Two alternative cropping patterns are considered for water balance study. Cropping pattern 1 with 105% cropping intensity is taken for diversion weir scheme, while 195% is taken for dam irrigation scheme due to introduction of 5% perennial fruit crop. The commencement date for main rainy season crops is taken as 11 June for maize and haricot bean and 1 July for wheat and fruit. The staggered period of planting is taken as 30 days for rainy and dry seasons. In addition, non-irrigation periods before harvesting were set up to be 20 days. The cropping area is presented in the following table.

**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

#### (2) Diversion Water Requirements

The Diversion water requirements are calculated for 10-day intervals using the methodology described in FAO Irrigation Drainage Paper 24, 25 and 46. The overall irrigation efficiency is taken as 44.2%. 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 peak diversion requirement for 195% cropping intensity is 1.32 l/s/ha during the month of February.

### 5.3.2 Elevation-Storage Capacity

The elevation-storage and elevation-area curves of lakes are based on the curves used in previous reconnaissance study carried out by Halcrow & Partners Ltd. The bathymetric survey data is available only on the Ziway lake. The elevation-storage-area curves of the Ziway lake and Abijata lakes are presented in Figure 5.3.2. The elevation-storage and elevation-area curve of the proposed dam is determined, based on the available topographical map and shown in Figure 5.3.2.

### 5.3.3 Water Balance Model

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. The operation of the combined Meki, Ziway and Abijata system is simulated using a water balance model whereby the change in reservoir storage is equal to inflow minus outflow equals change in storage.

### 5.3.4 Data Used

The monthly data of rivers' discharge and lakes' water levels related to this study are available from 1979 to 1999. Therefore, this period of 21 years from 1979 to 1999 is selected for the simulation study. The monthly data of river discharge, monthly lake water level, monthly rainfall, monthly diversion requirements, storage characteristics of lake and dam are used in the water balance study.

### 5.3.5 Case Study

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	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

## 5.4 Results of the Study

### (1) Cropping Intensity

The river discharge as well as rainfall is significantly low during December and January, therefore with diversion scheme reliable water flow is not available for the irrigation area during the period. Therefore, only 5% of the area for second cropping period could be irrigated from January, which is the start period of the Belg season (short rain season). The cropping intensity of 105% or 2,300 ha could be irrigated with the diversion scheme. However, the 195% cropping intensity is also possible with the dam scheme due to regulation of the river flow.

### (2) Potential Service Area of the Meki Irrigation Project

The viability of the results of the water balance study is measured by the reliability, and effect on the downstream lakes and rivers. The definition of reliability is the number of times the dam/weir is able to supply the reservoir demand over the total period of operation. In the case of an irrigation system, a failure to supply for a one month period will mean loss of crop or reduction in yield. Reliability of 80% is adopted for determination of the potential irrigation area. 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 results of alternatives study show that 2,300 ha of area can be irrigated with 105% cropping intensity with a diversion scheme. Dam scheme can irrigate larger area with 195% cropping intensity, from 4,700 ha for 30 m dam height to 9,400 ha for 40 m dam height. However, dam scheme will cause substantial reduction in Meki river flow to the Ziway lake, from 29.7% for 4,700 ha to 57.1% for 9,400 ha. The reduction in inflow to Ziway lake will result in reduction in water level of the lake and that will lead to a reduction in Bulbula river outflow and the Abijata lake's water level. The effect on downstream water resources system is discussed in the following sections.

### (3) Effect on Ziway Lake Storage

The effects of the Meki river water diversion on the downstream water resources system under different alternatives are presented in the following table.

**Effect of Meki River Water Intake on Downstream Lakes and Bulbula River**

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

The results show that Ziway lake storage will reduce by 1.6% with diversion scheme. However, it will reduce by 10.3% with a dam of 30 m height and by 24.2% with a dam of 40 m height. The increase in dam height causes more reduction in storage of the lake due to increase in water for irrigation and also increase in storage capacity of dam. A large reduction in storage of the lake with the dam scheme can cause increase in salinity of the lake and will have some impact on existing pumping schemes on the Ziway lake. Moreover, reduction in the Ziway lake storage also has a significant impact on the outflow to the Bulbula river.

(4) Effect on Outflow to Bulbula River

The reduction in the Bulbula river flow under different alternatives is shown in the previous table. The results show that diversion weir will cause 11.3% reduction in the Bulbula flow, however, the dam scheme will cause much reduction in flow; from 42% to 76% under various dam heights. It can be seen from results that the effect of dam schemes on the Bulbula outflow is significant compared to that of Ziway lake storage reduction. The seasonal reduction in the Bulbula outflow is shown in Fig 5.4.1. It shows the Bulbula river flow with dam scheme will decrease to nearly zero during the period from April to July. There are several irrigation schemes on the Bulbula river, they may also face some problems with decreased discharge. Moreover, the Bulbula river is also used for domestic water supplies along its length from the Adami Tulu to Abijata lake, they may face water problems during dry period. The Bulbula river recharges the Abijata lake and it provides more than half of total inflow into the Abijata lake. Therefore, the decrease in the Bulbula river discharge will also affect the fresh water flow to Abijata lake. Therefore, the effect on the outflow to the Bulbula river is critical in the determination of the potential irrigation area as it has direct effect on the decrease of the water level of the Abijata lake.

(5) Abijata Lake

The reduction in the Abijata lake storage and area is shown in the previous table. The results show a reduction of 5.1% in storage with diversion scheme and from 26% to 41% with dam schemes. The results also show that dam scheme can have

significantly impacts on the water level of the Abijata lake. The reduction in water level can cause increase in the alkalinity of the lake, which may affect the birds such as Pelican and Flamingo. These are rough estimate to show the possible environmental impacts on the Abijata lake as the storage characteristics of the Abijata lake is assumed based on the previous study. However, for more precise estimate a bathymetric survey of the lake is essential to determine the water level, area and storage's relationship of the lake.

Moreover, larger 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 that bird life is also influenced by the reduction in water storage

## **5.5 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 the downstream reach of the river.
2. Irrigation development with diversion weir scheme mainly for wet season on the Meki river will have less adverse environmental impacts.
3. There is a possibility of development of 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 its 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 5.5.1 and 5.5.2.

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 is recommended to decide where to locate the diversion weir. 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 economic viewpoints.

## CHAPTER 6 THE MASTER PLAN

### 6.1 Basic Concepts

#### 6.1.1 General

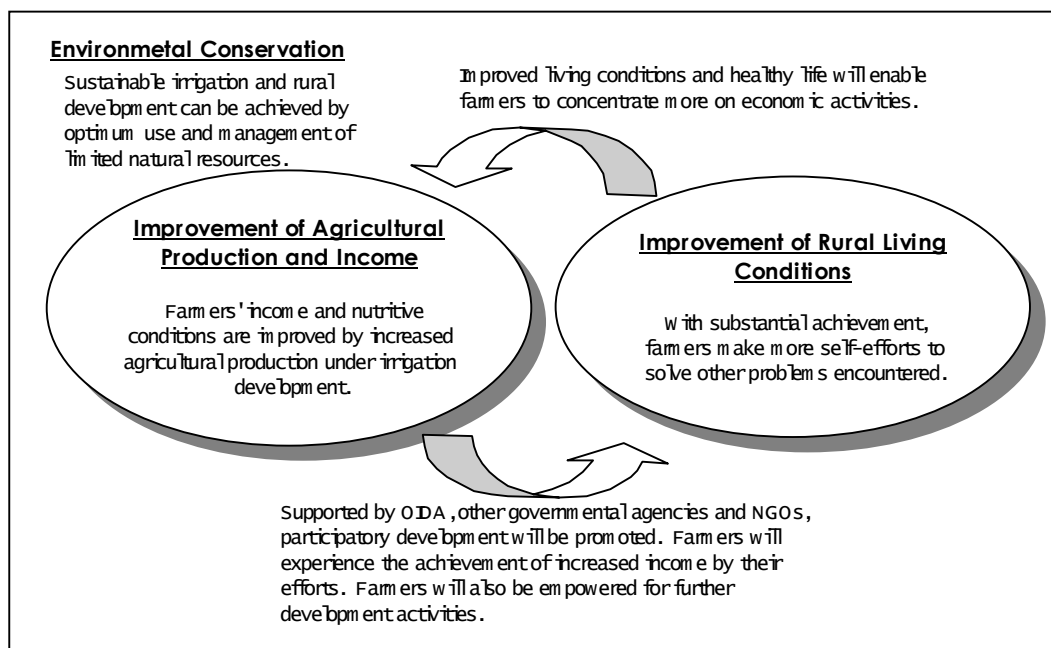
The Study aims at formulation of a master plan for the Meki Irrigation and Rural Development Project. The plan formulation has been directed around the following three basic concepts.

- 1) Integrated development
- 2) Sustainable development
- 3) Model development

The background of each of three concepts is spelled out below.

#### 6.1.2 Integrated Development

Poverty problems widely range with the complex structure of cause-effect relationships. In other words, several approaches will be required for solving even a single problem. For instance, overload of domestic work such as fetching water and pounding maize grains, tends to reduce working hours for farm works. This causes insufficient crop maintenance and results in low crop yield and consequently low farm income. This implies needs of “holistic approach”, in which a crop yield improvement project and a rural water supply project should be simultaneously implemented under one programme. The concept of an integrated development is thus derived.



Integrated Development Concept



Due to limited financial resources, however, it is crucial for both the government and a community to select the most effective project, which can quickly contribute to poverty alleviation. In the Study, the priority is attached more to profit-oriented agricultural development and income generating projects. Farmers can be more empowered by increased income through the development. Empowerment of farmers thus initiated will direct them to further initiatives for more development. Increased income will enable farmers to make more efforts for improvement of “quality of life” and the cycle illustrated above.

In addition, the environmental conservation is a prerequisite for sustainable development especially within the fragile environmental conditions of the Rift Valley system. The Meki area falls in the semi-arid zone of which ecology is susceptible to environmental changes and would be often irreversible by drastic changes. For instance, intensive irrigation farming with saline water will accelerate accumulation of soluble salts in soils resulting in crop damages. It is crucial to avoid such degradation processes by knowing soil conditions and water quality.

The Study firstly concentrated on in-depth analyses of the natural conditions of the Meki area. Secondly, constraints and potentials were carefully assessed from the viewpoint of optimum use of land and water resources. Finally, all the information and analytical results were incorporated into the master plan for sustainable development in the Meki area.

The watershed management is another important aspect of sustainable development. Over-grazing and deforestation in the upstream areas of the Meki riverbasin are major causes of high content of sediment loads in the river water, which is adversely affecting the ecology of the Ziway lake. Irresponsible land use including deforestation has to be controlled so as to reduce river sedimentation in the downstream areas and prolong a project lifetime when irrigation projects will be implemented. The watershed conservation program is also prepared within the framework of the Study.

### **6.1.3 Sustainable Development**

Project performance is often minimized after donors and NGOs are phased out at the completion of project implementation. The project sustainability is one of the important aspects to be discussed when a project is formulated.

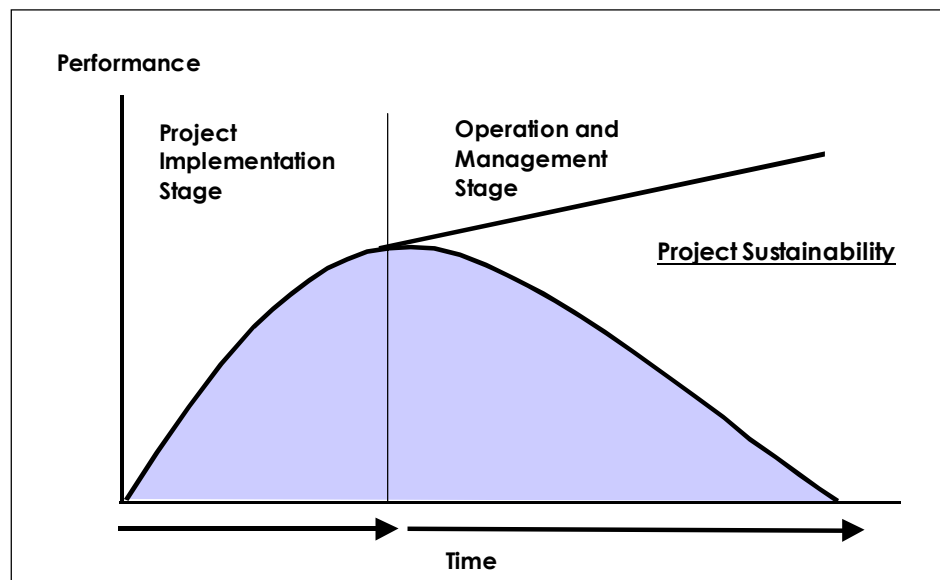
For instance, inadequate technical plan and design of irrigation facilities will finally result in rapid deterioration of facilities and technical difficulties in O&M. This directly increases the O&M cost and occasionally the necessity for rehabilitation within a few years. This means that the farmers are loaded with the heavy burden of O&M when the project scheme is handed over to them by from the government.

Apart from technical and financial issues, the project sustainability is often highly

dependent upon sociological aspects including maturity of consensus among the community. Farmers have different interests and problems depending on their natural and social conditions. Even within a community, farmers have different problems and conflicting interests. It is highly important to verify the interests of farmers so as to formulate a more beneficial and sustainable project for them. This is why “bottom up approach” is undertaken for community based development.

In principle, the Project is planned and to be implemented by initiatives and self-efforts of farmers. The government is to support such farmers’ efforts by infrastructure development, which is too costly to realize only by farmers’ financial sources. The project sustainability is dependent not only upon farmers’ empowerment (capability to solve the problems facing them) but also upon the logistic supports. Capacity building for both the government and community is another essential input to enhance project sustainability. To enhance project sustainability, two approaches should be emphasized; (i) capacity building of the government staff directly and indirectly involved in the project management and (ii) community awareness and empowerment with training. The well-balanced combination of these inputs will help in achieving the project objectives.

Necessary actions for all these aspects should be considered during the project implementation stage. The concept of sustainable development is illustrated below.

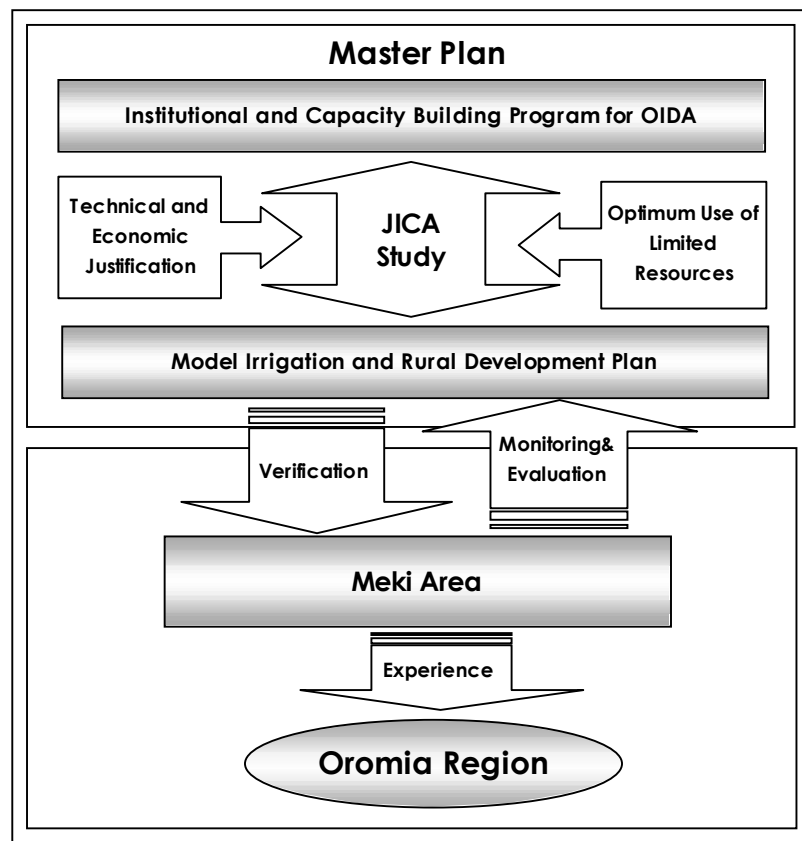


Sustainable Development Concept

To learn from local experiences and identify needs among communities more precisely, all the possible tools have been fully applied throughout the Study.

#### 6.1.4 Model Development

Since the Meki area is located at 130 km south of Addis Ababa with easy access, the Project is envisaged as a model scheme to demonstrate the performance of the development activities. Experiences in the Meki area are expected to be applied to other zones and waredas in the Oromia Region as illustrated below.



Model Development Concept

In order to achieve such an important objective, all the steps of the Study have been carefully executed by selecting standardized study procedures and methodologies. In this regard, the verification study in the Phase 2 of the Study is an extremely important step to confirm viability of the master plan and to verify unforeseeable conditions. At the final stage, all the results of the verification study will be incorporated into the master plan for its modification and elaboration.

#### 6.2 Development Approaches

The attempts have been made for identification of development approaches on the problem tree in Figure 4.9.1. The followings are selected development approaches.

- a. Irrigation Farming Promotion Approach**
  - a.1 Irrigation planning and monitoring capacity building sub-approach
  - a.2 Operation and maintenance reinforcement sub-approach
  - a.3 Participatory small-scale irrigation development sub-approach
  - a.4 Irrigation farming techniques improvement sub-approach
- b. Rain-fed Agriculture Improvement Approach**
  - b.1 Farming techniques optimization sub-approach
  - b.2 Optimized farming techniques extension sub-approach
  - b.3 Farm inputs supply sub-approach
  - b.4 Post-harvest techniques optimization sub-approach
  - b.5 Price-setting improvement sub-approach
  - b.6 Supplemental irrigation water supply sub-approach
- c. Animal Husbandry Modernization Approach**
  - c.1 Improved breed introduction sub-approach
  - c.2 Forage production promotion sub-approach
  - c.3 Veterinary services supporting sub-approach
  - c.4 Animal husbandry techniques optimization sub-approach
  - c.5 Optimized animal husbandry techniques extension sub-approach
- d. Environmental Conservation Approach**
  - d.1 Watershed management sub-approach
  - d.2 Farmland conservation sub-approach
  - d.3 Environmental education promotion sub-approach
- e. Capacity Building Approach**
  - e.1 Local government staff training sub-approach
  - e.2 Community leaders training sub-approach
  - e.3 Community awareness creation sub-approach
  - e.4 Off-farm income generation for women and landless farmers sub-approach
- f. Rural Infrastructure Development Approach**
  - f.1 Rural drinking water supply sub-approach
  - f.2 Rural roads development sub-approach
  - f.3 Rural primary health care promotion sub-approach
  - f.4 School construction sub-approach

The primary target group of the Project is “small farmers in the Meki area”, who are below the poverty line. All approaches mentioned above are expected to provide solutions to the problems stipulated on the problem tree and contribute towards poverty alleviation directly or indirectly.

## **6.3 The Master Plan**

### **6.3.1 Plan Period**

The master plan aims at directing all the development efforts to the ultimate objectives, i.e. food security and poverty alleviation, along the long-term strategy. With realistic sense, the Study defined a plan period to be the next decade of 2001-2010.

The master plan will be implemented within the macro-framework of the Five Years Development Programmes of the Oromia State Government. The development investment and recurrent budgetary arrangement are to be optimized within the Programmes. In order to facilitate the project implementation and its budgetary arrangement, the master plan period is tentatively split into two (2) phases, which are coincident with two (2) five-year programmes, i.e. Phase-I for 2001-2005 and Phase-II for 2006-2010. The project selection was made for the entire period of 2001-2010, while the action plan is to be prepared only for the Phase-I period of 2001-2005.

It is noted that the Meki area is rather in better conditions in terms of existing rural infrastructure. It is envisaged to optimize the government investment and avoid expansion of socio-economic gaps between the Meki area and other rural areas of the Region by intensive investment in the Meki area. It seems that infrastructure development in Meki area cannot be prioritized at least for the coming 10 years of the master plan in comparison with that of other areas of the Region.

### **6.3.2 Project Selection**

The 21 projects were preliminarily formulated as presented in Table 6.3.1 to meet the requirement verified through the analysis of the development approaches. As aforementioned, the rural infrastructure development is excluded from the master plan. The selected 21 projects selected are listed below and their outlines are summarized in Table 6.3.2. The details of the projects are stipulated in Attachment 2.

#### **1. Irrigation Development Programme**

1-1 WUA Support Programme

1-2 Meki Irrigation and Rural Water Supply Project

#### **2. Rain-fed Agriculture Improvement Programme**

2-1 Semi-Arid Farming Improvement Project

2-2 Community Seed Bank Project

2-3 Post-Harvesting Techniques Improvement Project

2-4 Community Pond Project

#### **3. Animal Husbandry Modernization Programme**

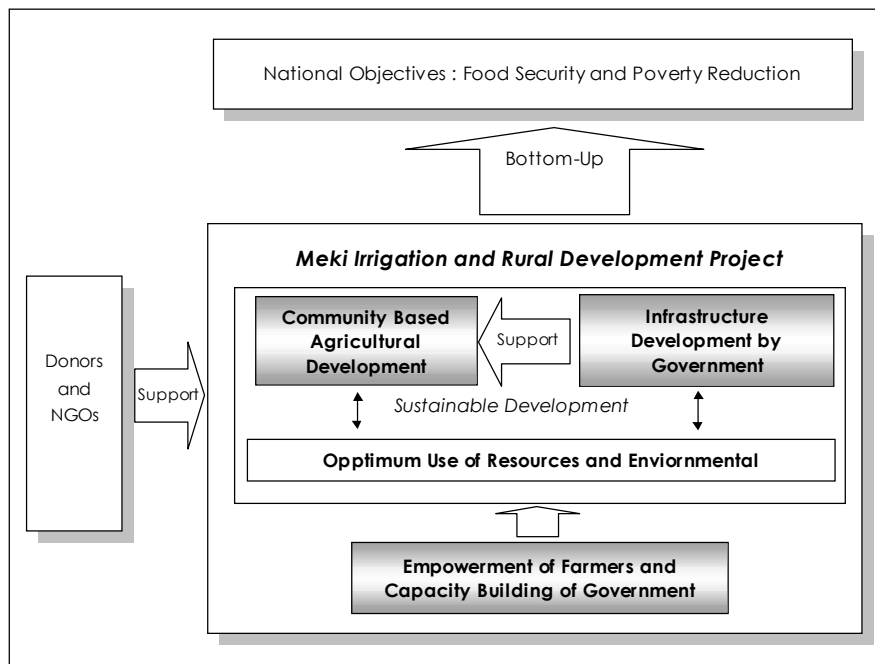
3-1 Demonstration Unit Project

3-2 Forage Production Project

3-3 Improved Breed Promotion Project

4. **Environmental Conservation Programme**
  - 4-1 Environmental Monitoring Programme
  - 4-2 Seedling Center Project
  - 4-3 Watershed Management Programme
5. **Capacity Building Programme for OIDA and Wareda Staff**
  - 5-1 OIDA Engineers Training Programme
  - 5-2 OIDA Community Development Experts Training Programme
  - 5-3 Wareda Staff Training Programme
  - 5-4 Community Resource Mapping Project
6. **Community Development and Cooperative Promotion Programme**
  - 6-1 Community Leader Training Programme
  - 6-2 Visioning Workshop Programme
  - 6-3 Drinking Water and Nutritional Improvement Programme
  - 6-4 Community Center Project
  - 6-5 Grain Bank Promotion Programme

The master plan will be carried out by either single project or combination of the projects among the 21 projects. The basic structure of the project implementation is illustrated below.



Basic Structure of Implementation of Master Plan

The 21 projects can be categorized into three (3) components. The community-based agricultural development is the main component supported by infrastructure development by the government. Both activities are sustainable by human factors,

namely empowerment of farmers and capacity building of the government staff. Donors and NGOs are supporters for implementation of the master plan.

#### **6.4 Preliminary Assessment of Project Priority**

The project priority is assessed on a preliminary basis in order to set up the tentative implementation schedule. The selected 21 projects were qualitatively evaluated in terms of the following factors.

- 1) Contribution to project objectives, namely food security and poverty alleviation.
- 2) Urgency among rural communities
- 3) Technical adaptability of OIDA
- 4) Technical adaptability of Bureau of Agriculture
- 5) Technical adaptability of farmers
- 6) Fund requirement
- 7) Time requirement
- 8) Duplication with on-going projects
- 9) Social risk
- 10) Environmental impact

The results of the analysis are presented in Table 6.4.1. According to the preliminary analysis, the priority was given to such projects as the semi-arid farming technical improvement project, the WUA support programme, the environmental monitoring programme, the seedling center project, the community leader training programme, the visioning workshop programme for farmers empowerment, and the drinking water and nutritional improvement programme.

The quantitative project evaluation will be made from technical, economic, financial, environmental and sociological points of view. The results will be presented in the Draft Final Report.

#### **6.5 Implementation Schedule**

Taking into consideration the preliminary analysis on the project priority, the implementation schedule of the master plan is tentatively prepared as presented in Figure 6.5.1.

#### **6.6 Preliminary Consideration of Financial Arrangement**

##### **6.6.1 Ethiopian Social Rehabilitation and Development Fund (ESRDF)**

The master plan consists of 21 projects mentioned above. Suitable fund sources for the implementation of the master plan should be a flexible multi-sector development

fund. In this regard, the existing nationwide development fund, namely ESRDF, is the ideal source.

In parallel to the SDPs, the ESRDF was established in February 1996 under the initiatives of IDA. This fund aims at financing multi-sector poverty reduction projects and programs. As of December 2000, the ESRDF has disbursed US\$ 88 million, out of US\$ 153 million earmarked from donors, for 1,740 projects consisting of 891 water supply and sanitation, 386 education, 340 health, 25 small-scale irrigation and capacity building and training since its establishment. So far about 5 million poor people were covered by the ESRDF projects. Other activities including agriculture, environment protection and income generation are also to be covered by support of the fund in future.

The major beneficiaries of the fund are rural communities, which are expected to participate not only in labour and material contribution but also in decision making, cost sharing and overall ownership of the projects. With a concept of decentralization, the fund management is entrusted to the national board and the regional steering committees.

#### **6.6.2 Oromia Rural Development Fund (ORDF) for Community-Based Agricultural and Rural Development Projects**

##### **(1) Objectives**

The ESRDF has contributed largely to the development of such components as drinking water supply, education, primary health care and roads. In contrast, the irrigation sector is less promoted with financial assistance from ESRDF due to its funding conditions.

Successful irrigation projects are highly dependent upon: (i) rigid ownership of a project by community (WUA); (ii) financial arrangement for O&M at initial stage; and (iii) skillfulness of irrigation farming by water users. The community mobilization is utmost important for the above-mentioned. In addition, the irrigation projects in Ethiopia should be integrated with environmental conservation activities. Capacity building of OIDA and Bureau of Agriculture is urgently required at national, zonal and woreda levels, respectively. Integrated approach will be required under one scheme consisting of technical and financial assistance.

The Oromia Rural Development Fund is proposed to implement the following five (5) projects selected under the M/P.

1. Irrigation Development Program
  - 1-1 WUA Support Program
2. Rain-fed Agriculture Improvement Program
  - 2-3 Post-Harvesting Techniques Improvement Project
  - 2-4 Community Pond Project
3. Animal Husbandry Modernization Program



- 3-1 Demonstration Unit Project
- 4. Environmental Conservation Program
- 4-3 Watershed Management Program

(2) Basic Concepts

In order to promote community-based development, especially for irrigation development [1-1], the funding conditions should be carefully studied. A development fund more suited to agricultural and rural development should have the following conditions.

- 1) Fund should be more accessible for poverty groups including womens' groups
- 2) Revolving fund formation in a saving bank account during the construction period – the initial O&M cost will be allocated from the fund.
- 3) Participation in environmental conservation activities is a preconditions.
- 4) Training and capacity building should be linked with facility development.
- 5) Frequent monitoring by the Fund should be carried out to identify any problems arising from a project.

Fund will also be suitable for community (cooperative) activities including pond construction, mini-flourmills procurement and dairy farming.

## CHAPTER 7 ENVIRONMENTAL ASSESSMENT

### 7.1 Environmental Screening

#### 7.1.1 Objectives

The environment screening aims at preliminary assessment for 21 proposed project under the Master Plan in order to identify any projects, which would be subject to negative environmental impact and need Initial Environment Examination (IEE). The study results are presented below.

#### 7.1.2 Irrigation Development Program

(1) WUA Support Program

*Environment Screening:* Neutral to Positive. No IEE or EIA is required if planning considers the environmental and social aspects.

The objective of the program is to support small-scale farmers' irrigation activities through technical and institutional capacity building for WUAs as well as local staff of OIDA. The program will also assist in the establishment of new WUAs in the project area. The community mobilization and technical guidance will lead to improved and efficient management of water. The program will also help in improvement of farm income and living conditions of WUA members. This should result in neutral or positive environmental effects due to better management of the projects and program.

(2) Meki Irrigation and Rural Water Supply Project

*Environment Screening:* Variable. The aim of the project is to increase food security and income in the Meki Project area. The water from the Meki river will be used for the irrigation and rural water supply by constructing water supply system. It will use water from the Meki river. In such case an IEE or IEA may be required after screening of the project is undertaken.

The objective of the project is to introduce a gravity irrigation system, which is more sustainable in comparison to pump irrigation system. Headworks and irrigation system will be constructed on the Meki river to irrigate 2,300 ha of agricultural land. The project is expected to contribute to promotion of stable food production and poverty alleviation in the area. The proposed irrigation system will divert water from the Meki river, which is a source of water for the rift valley lakes (Ziway and Abijata). Therefore, assessment of environment impacts on the lake system is necessary and IEE/EIA should be undertaken when necessary.

### 7.1.3 Rain-fed Agriculture Improvement Program

#### (1) Semi-Arid Farming Improvement Project

*Environment Screening:* Positive. The program will establish semi-arid farming system suitable for the project area. The developed practices will aim on soil conservation, improvement of soil fertility and controlling soil erosion and salinity. These are positive to the environment, therefore No IEE or EIA is required.

The program aims to establish the optimum farming system suited to local conditions of the Meki area under semi-arid climate through the actual three years research in situ. The techniques to be optimized will be transferred to local farmers through existing extension channel. This program, if successful, should result in increase production, and controlling soil erosion and salinity with positive environmental results.

#### (2) Community Seed Bank Project

*Environment Screening:* Neutral. The project aims at the preservation of second generation seeds harvested from quality seed planted crops, which are otherwise consumed. Moreover, project will promote community-based approach for the timely distribution of quality seeds. It will contribute to food security with neutral environmental impact. Therefore, no IEE or EIA is required.

The project aims at preservation of second-generation seeds to be harvested from plots sown with quality seeds instead of consumption. Limited use of certified seeds is one of the constraints against reasonable crop yields in the Meki area. Although quality seeds are introduced to the Meki area through the extension program, its coverage is still limited. The project will be promoted by community-based approach with minimum government supports. Quality seeds will be procured by communities and released to peasants timely. The production will increase with improvement of seed quality and its timely distribution to the farmers.

#### (3) Post Harvesting Techniques Improvement Project

*Environment Screening:* Neutral. The project will promote improved post harvest techniques for the minimization of post harvest loss at threshing, milling and storing. Therefore, no IEE or EIA is required.

Post-harvest loss is significant in Ethiopia. According to the FAO staff in Addis Ababa, the total loss in the nation is estimated as much as 25% of the total production at on-farm level. The project aims at minimization of post-harvest loss at several processes, namely threshing, transport, milling and storing. It is expected to

reduce the post harvest loss and promotion of micro-enterprises for post harvest sector.

(4) Community Pond Project

*Environment Screening:* Neutral. The community ponds will be constructed in the remote areas for water supply. The storage capacity of pond will be less than 500 m<sup>3</sup> with micro-catchment area less than 5 km<sup>2</sup>, therefore will not have any significant negative environmental impacts. Moreover, these ponds will help in reducing workload of fetching water for domestic water supply. No IEE or EIA is required if planning considers the environmental and social aspects.

The project aims at development of community ponds in remote areas far from stable water resources such as the Meki river and the Ziway lake. Rather than natural development potentials, social factors may be more important for successful community pond development. The pond water will be used for drinking, animal and supplementary irrigation purposes and it help in reducing the workload for fetching water for domestic supply.

#### **7.1.4 Animal Husbandry Modernization Program**

(1) Demonstration Unit

*Environment Screening:* Neutral to Positive. The demonstration unit for livestock modernization will be established under this project, which will promote the crossbred cattle and modern animal husbandry techniques. The project will also educate farmers about modernized animal husbandry under zero grazing with crossbred and improved forage. It is expected to get neutral to positive environment results from the project in the environmental conservation. Therefore, no IEE or EIA is required.

The objective of this program is to create community based initiative for livestock modernization. The basic concept of the livestock modernization program is to increase livestock productivity by introduction of crossbred integrated, forage production and improvement of husbandry techniques. The environmental conservation, the regional livestock sector needs to be optimized under the zero-grazing system. The program is expected to convince farmers about high profitability of modernized animal husbandry under the zero-grazing system with crossbreeds and improved forages.

(2) Forage Production Project

*Environment Screening:* Neutral to positive. This project will promote the introduction of forage crops and efficient use of crop residues and by-products of agro-industries such as molasses and cotton seed cake. The planting of grasses and legumes should contribute to environmental conservation. Therefore, no IEE or EIA is required.

The project aims at introduction of forage crops in the Meki area and promotion of efficient use of crop residues and by-products of agro-industries. The program will help in meeting the rapidly increasing forage demand in the livestock sector, thereby increasing their productivity. The efficient use of by-products of agro industries such as molasses will help in improving environmental conditions.

(3) Improved Breed Promotion Project

*Environment Screening:* Neutral to Positive. This project will promote the crossbred cows and veterinary service in the project area. This should lead to healthier animals with neutral to positive environmental results. Therefore, no IEE or EIA is required.

The project envisages multiplying the Boran and Holstein crossbred and introduce them. For successful introduction of the crossbred, the animal health services will be reinforced. The project promotes introduction of more veterinary services and installation of crushes for preventing and controlling the prevailing diseases. The zero grazing of crossbred cow will lead to enhancement of environmental conservation.

### **7.1.5 Environmental Conservation Program**

(1) Environmental Monitoring Program

*Environment Screening:* Positive. The project aims at environmental monitoring of the water resources of whole river basin. The monitoring will promote awareness creation and optimum water resources development. This will lead in better management of water resources, thereby positive environmental results. Therefore, no IEE or EIA is required.

The project aims at execution of the environmental monitoring which will cover all these water resources under the same program. The results will fully be utilized for optimum use of the water resources in the Meki area with minimum influence to the natural environment. Within the framework of Environmental Monitoring Program, progress of the WFP watershed management program and other environmental factors including drinking water quality, disasters such as drought, floods and flash

water, frequency and area of epidemic diseases. The project will focus not only on establishment of environmental monitoring system and capacity building for the government staff and communities.

(2) Seedling Center Program

*Environment Screening:* Positive. The project is expected to contribute expansion of agro forestry and alley cropping system. This will help in preventing soil erosion and enhancing soil conservation with positive environmental effects. Therefore, no IEE or EIA is required.

The project aims at reinforcing capability of the existing tree nursery in order to encourage environmental conservation activities. In addition to tree species for afforestation purposes, it is envisaged to produce seedlings for tree crops such as papaya and coffee in the nursery. This will contribute to expansion of agro forestry and alley cropping system and to improve farm family income through cash crop production.

(3) Watershed Management Program

*Environment Screening:* Positive. The project envisages establishing a model scheme in which agronomic and engineering measures of soil conservation are effectively integrated in order to supplement each other and enhance their benefits. The model will demonstrate the positive environment effects of expanding soil protection area and agro forestry with above measures for watershed conservation. Therefore, no IEE or EIA is required.

The objective of the project is to introduce agronomic as well as engineering measures of soil conservation. The soil conservation measures are expected to expand the agro forestry and protect the watershed from soil erosion with positive environmental effects. The model program will create awareness and need of watershed conservation and introduce watershed conservation methods. It is anticipated to expand the area of agro forestry and soil protection, which will lead to watershed conservation with positive environment effects.

### **7.1.6 Capacity Building Program for OIDA and Wareda Staff**

(1) OIDA Engineers Training Program

*Environment Screening:* Neutral to Positive. No IEE or EIA is required.

The OIDA Engineers Training Program aims at providing training to the OIDA engineers on water and irrigation policy, hydrological analysis methods, civil design, preparation of tender documents, environment and watershed conservation, water

management, preparation of reports and participatory development approach. The training program includes environment and watershed conservation and water management, which can provide neutral to positive environmental effects.

(2) OIDA Community Development Expert Training Program

*Environment Screening:* Neutral to Positive. No IEE or EIA is required if planning considers the environmental and social aspects.

The program envisages to train 20 community development experts including, at least, 5 female staff. The particular attention will be paid to NGOs' activities in the program. The program will establish a database of NGOs accessible for the people of Oromia Region. The gender issue will be highlighted in the program. Therefore, program is expected to give neutral to positive environmental effects.

(3) Wareda Staff Training Program

*Environment Screening:* Neutral. No IEE or EIA is required.

The training will be provided to the Wareda staff on participatory development, improved techniques of rain-fed agriculture, irrigation technology, and animal husbandry. The program will help in improving working capacity of the Wareda staff of OIDA and BOA.

(4) Community Resource Mapping Project

*Environment Screening:* Neutral to Positive. No IEE or EIA is required.

The objective of program is to prepare a resource map of each community to verify their geographical position, population of community members, natural resources, social conditions and other essential information. The map will assist in smooth operation of administrative services including extension. The map can also be used for planning of community based rural development. Therefore, the project will have neutral to positive environmental effects.

### **7.1.7 Community Development and Cooperative Promotion Program**

(1) Community Leader Training Program

*Environment Screening:* Neutral. This program will promote the participatory development and democratic operation of community activities. No IEE or EIA is required.

The program aims at systematic capacity building of community leaders in order to promote democratic operation of community activities and participatory development. This program will enhance community leaders' knowledge for better community management. This program will not have any environmental impacts.

(2) Visioning Workshop Program

*Environment Screening:* Neutral to positive. The program is expected to promote participatory development and empowerment of rural community with neutral to positive environment impacts. Therefore, No IEE or EIA is required.

Visioning Workshop Program will create awareness for advocacy for quality of life among community and empowerment especially of poverty groups of community. This program will have neutral to positive environmental impacts.

(3) Drinking Water and Nutritional Improvement Program

*Environment Screening:* Positive. The project aims at creating awareness of improving drinking water quality and nutritional status among rural farmers especial women. It will assist in controlling water borne diseases and reducing the infant mortality rate. Therefore, no IEE or EIA is required.

The objectives of the program is to transfer the knowledge of the prevention of water borne diseases, drinking water quality controlling methods, importance and improvement of nutrition especially for infants and pregnant women and promotion of nutritionally rich horticultural crops. The awareness creation among small farmers especially women will lead to healthier life with positive environmental results.

(4) Community Center Project

*Environment Screening:* Neutral. No IEE or EIA is required if planning considers the environmental and social aspects.

The Community Center Project aims at provision of conventional shed-type building to rural communities so as to encourage the community activities. The facilities will be utilized for the meetings, training program, administrative service, cooperative activities, recreation, temporary space for seedlings and seeds and other purposes of community. It will promote participatory development and empowerment of local farmers without any environmental effects.

(5) Grain Bank Promotion Program

*Environment Screening:* Neutral to Positive. No IEE or EIA is required.

This program aims at securing food grains during the lean season through lending and borrowing products among the surplus and deficit farmer producers at PA level. The products in the peak harvesting season will be stored by the farmers at a grain bank warehouse. During the lean season, the deficit farmers who need to purchase food grains shall borrow the food grains from the grain bank and return the grains in the next harvesting season with a certain additional quantity as an interest. The program will establish food grain security system at village level and promote grain marketing.



It will contribute in increasing farmers' income and village welfare with neutral to positive environmental effects.

### **7.1.8 Conclusion**

The initial screening process indicated 20 projects will give positive or neutral environmental benefits. However, only project "Meki Irrigation and Rural Water Supply Project" shows variable environmental impacts and requires IEE for further assessment of environmental impacts. The following chapter describes about the IEE of this project.

## **7.2 Initial Environmental Examination (IEE)**

### **7.2.1 The Scope and Objectives of the Study**

The IEE, which is a requirement of the Environmental Policy of the FDRE, has two components: screening and scoping. Screening is a preliminary environmental review to assess whether EIA is necessary or not for a proposed development project. And if needed, to decide the nature and magnitude of the proposed project's potential environmental and social impacts and assigns the project to one of the three categories (Schedules) according to the EIA Guidelines of the FDRE. Once a project is categorised, a scoping process defines the project's likely environmental impacts and the area of influence more precisely and develops terms of reference (TOR) for the EIA. As part of this process, information about the project is disseminated to local communities and NGOs, followed by consultations to help to focus the EIA on issues of concern at the local level. The IEE was conducted using existing data and experience in similar projects. To attain these objectives, the Study reviewed all relevant data and documents related to potential environmental impacts of the Project, especially, the Environmental Assessment Guidelines Document of: the FDRE (2000).

### **7.2.2 Ecological Regions**

The proposed irrigation development project includes a diversion weir, canals and drains and related on-farm structures. The environmental items for IEE are principally the common items related to dam and irrigation development projects based on the existing guidelines for the EIA. Consequently, the 20 environmental items for IEE have taken into account the general features of the project. On this basis, the study area can be broadly divided into the following seven (7) ecological regions as shown in a diagram in Figure 7.2.1.

- Region I : Catchment area of the diversion weir
- Region II : Head work area
- Region III : Meki river channel (from the diversion weir to Lake Ziway)
- Region IV : proposed irrigation area, i.e. 3,200 ha covered by agricultural

land owned by some 1,000 to 2,000 HHs

- Region V : Lake Ziway system
- Region VI : Bulbula river channel (from the Ziway lake to the Abijata lake)
- Region VII : Abijata- Shalla lake system

### **7.2.3 Results of Initial Environmental Examination (IEE)**

Based on the data and information related to existing environmental conditions and potential impacts of the Project, the significance and magnitude of the impacts have been preliminarily examined using the environmental attributes – important environmental components for each of ecological regions. The results of the IEE are presented in Table 7.2.1 and summarized below.

#### **(1) Conflicts with water Supply Rights**

The diversion of water from Meki River for irrigation in Region IV will reduce water for downstream users especially, in regions III and VII. This can lead to competition and conflicts among various water users (WUAs, the Soda-ash enterprise near Lake Abijata, fishery, and local communities including pastoralists) within the influence of the project.

#### **(2) Social Impacts**

Approximately 2,300 ha in Region IV will be irrigated under the Project. Although the command area of the Project is not yet selected, some 1,000 to 2,000 Households live within this farmland. Although no communities in Region IV will be resettled in other areas, parts of their farmland will be reallocated to other communities under the project. This may cause some significant social impacts to these communities, in that, they will lose part of their land and will have to cope with influx of new people and the associated social discomfort.

#### **(3) Change of River Flow Regime**

The Project will cause a change of current flow regime in Meki and Bulbula rivers due to diversion of Meki River for irrigation in Region IV. The magnitude and significance of expected impacts should be established based on ecological studies, hydrological data and plan of operation of the Project. Currently, there is no policy on minimum flow requirements in rivers, and minimum water levels in lakes, and this guideline is urgently needed to ensure equitable apportionment of water resources.

#### **(4) Water Quality Change**

Water quality deterioration is expected through changes of existing river flow regime and additional pollution loads from the irrigation area, especially, through a return flow from Region IV into Lake Ziway. This would contain chemical fertilizers,

insecticides and herbicides with deleterious effect on human and animal health. The possibility and magnitude of these impacts should be clarified based on the data related to river flow discharge and water quality analysis.

(5) Depreciation of Fisheries

Diversion of Meki River will cause reduced flow downstream, affecting the ecology of fish especially in the lower reaches of Meki River, Lake Ziway and Lake Abijata. The two lakes are economically important sources of fish. Moreover, reduction of fish in Lake Abijata due to reduced water inflow into the lake may reduce the current earnings from tourism and diminish the international status of Lake Abijata as a would-be RAMSAR site. More detailed hydrological and ecological studies are needed to establish requirements for minimum water flow in Bulbula River and minimum water levels in Lake Abijata that will not disrupt ecological balance in these water bodies.

(6) Impacts on Precious Ecology

Like in (4) above, precious ecology that is host to phytoplanktons, zooplanktons, fish and water fowls in the water bodies in the ecological Regions III and V-VII will be disturbed significantly due to change in water flow regime. The same remedial measures as in (1-4) above are needed.

(7) Positive Impacts

Despite the above potential negative impacts of the proposed Project, the overall effect of the Project on the people of Dogda Bora is expected to be positive. The environmental conservation component of the Project will ensure environmentally sustainable development. The planned afforestation and water conservation will ensure sustainability of the irrigation development and animal husbandry modernisation components in the currently badly degraded Project area by reducing soil erosion and sedimentation in the planned irrigation system as well as by improving riverflow regime and water supply. Also, the environmental monitoring and management plan to be developed in the EIA is expected to effectively mitigate the negative environmental and social impacts of the proposed irrigation development. Overall, the Project is expected to improve the livelihood of the target group through increased food production and availability of water for crop production, human and livestock use, thus achieving the objective of the Project of ensuring food security and poverty reduction. The Project will further contribute to food security and poverty reduction through the other three components of the Project: (i) rain-fed agriculture improvement; (ii) capacity building for OIDA and Wereda Staff; and (iii) community development and co-operative promotion. And on a short-term basis, the Project will create employment for over 200 people during the construction phase.

#### **7.2.4 Conclusion**

Overall, the Project is expected to improve the livelihood of the target group through improved food security and reduced poverty through environmentally sustainable practices. According to the IEE results, the proposed project falls under Category (Schedule) I, which requires a full EIA, as its adverse impacts may be sensitive, irreversible, and diverse. The most crucial negative impact of the proposed project relates to diversion of water Meki River through an intake for irrigation. The diversion of water will result into competition and conflicts from water users downstream due to change of river flow regime. The conflicts relate mainly to reduced flow for on-going irrigation activities, pastoral and domestic water uses, depreciation of fish and fisheries, and reduction of waterfowl population (especially, Pelicans and Flamingo) in Lake Abijata-Shalla National Park, which is a proposed RAMSAR site. The adverse social impact of the Project relates to loss of land by the communities in the proposed irrigation area due to the planned influx of new farmers and the associated social discomfort. Although these impacts range from moderate to highly significant effects, they were identified during the limited period of the IEE, which is characterized by inadequate supporting data. Therefore, the IEE results are not considered decisive to approve or discredit the project viability at this stage.

#### **7.3 Environmental Impact Assessment (EIA)**

The TOR for EIA is presented in Attachment 8-1 of Appendix VIII. The Project falls under Category (Schedule) I, which requires a full EIA, as its adverse impacts may be sensitive, irreversible, and diverse. The EIA will be directed to assess the most crucial issue of change in water flow and the expected impacts focusing on the following issues.

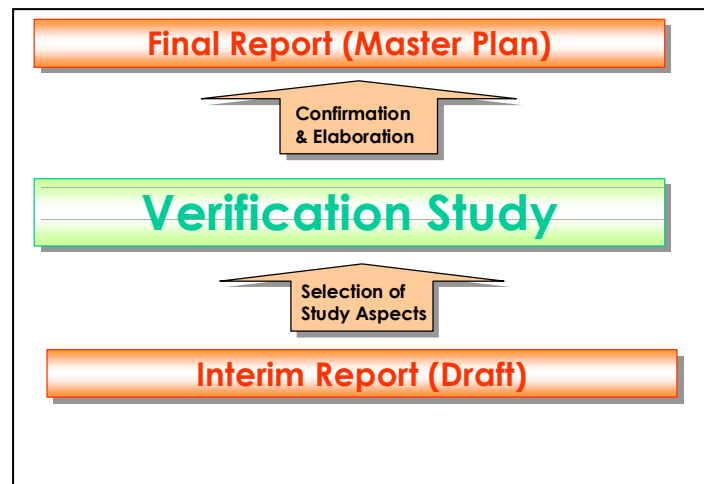
- 1) Careful assessment will be made particularly on the significance of the expected change in river flow on downstream development activities and the Abijata lake ecosystem.
- 2) Quantitative information is needed on the relationship between water level and salinity in the Abijata lake and the aquatic life.
- 3) The FDRE does not have guidelines on minimum river maintenance flow and minimum water level for optimum ecological balance. Further study will be required on this aspect.
- 4) The EIA is expected to provide a conclusive opinion on the project viability and may develop countermeasures, and a comprehensive environmental monitoring and management plan to ensure its environmental sustainability.

## CHAPTER 8 VERIFICATION STUDY

### 8.1 Objectives

Under six (6) components, 21 projects were preliminarily formulated as stipulated in the Interim Report submitted in March 2001. The anticipated implementation agencies of the proposed 21 projects are to be not only OIDA but also OADB. Especially for improvement of rain-fed agriculture and livestock sectors, OADB will play a key role. Besides, community development and environmental conservation are to be promoted by both OIDA and OADB.

The S/W directed the Study to examine technical and financial viability of the draft Master Plan and to select pilot activities (study aspects) for the V/S as mentioned in Clause V of the S/W. All the results of the V/S will be incorporated into the final Master Plan in Draft Final Report to be submitted in March 2002. The objectives of the V/S can be summarized as illustrated below.



**Objectives of Verification Study**

The V/S is expected to provide a lot of valuable information for confirmation and elaboration of the Mater Plan. In addition, the V/S envisaged to contribute to the capacity building for the government staff, who will play key roles in the implementation of the Mater Plan in future and the direct benefits to target groups through the implementation of the V/S.

### 8.2 Selection of Programs

#### 8.2.1 Selection Criteria of Verification Study Programs

The V/S programs were selected under the following conditions.

- (1) Pilot projects to confirm viability of the priority projects among 21 projects and identify unforeseeable constraints for their elaboration

- (2) Pilot projects to contribute effectively to the capacity building of OIDA and OADB for future smooth implementation of the Master Plan
- (3) Pilot projects to be completed within definitive time period, i.e. six (6) months from May to November 2001, for earlier commencement of the actual Master Plan

### 8.2.2 Selected Programs

The following six (6) programs were selected for the V/S.

#### Selected Verification Study Programs

No.	Verification Study Program	Agency
1.	Training of analytical methodology for water resources development	OIDA
2.	Establishment of management information system of the OIDA irrigation schemes	OIDA
3.	Environmental monitoring – irrigation water use in the Meki area	OIDA
4.	Preparation of guideline for formation and operation of water users associations (WUA)	OIDA
5.	Community resource mapping	OADB
6.	Preparation of extension tools and research program for the Meki area	OADB

The details of the above-mentioned programs are stipulated in Attachment 2.

## 8.3 Performance and Results

### 8.3.1 General

The V/S was carried out in the Third Fieldwork in Ethiopia of the Phase-II for six months from May to November 2001. The intensive monitoring was continued for each of the V/S programs. The evaluation was made through the analyses of the monitoring records and actual performance of the activities at the workshop and discussed by all the attendants. At the completion of the verification study, the Progress Report (2) was prepared and submitted to OIDA. Taking the study results and all the comments on the Progress Report (2) into consideration, the JICA Study Team prepared the Draft Final Report at the end of the Second Home Office Work in Japan and submitted to OIDA for final scrutiny.

The details of performance and results of the V/S are mentioned in Appendix X and summarized from page 8-6 with special attentions to (i) information fed back to the M/S, (ii) contribution to capacity building for the government staff and (iii) direct benefits as pilot project.

### **8.3.2 Performance and Results of Program 1**

Program 1 aimed (i) to determine the present capacity and knowledge of the existing OIDA engineers on analytical hydrology for irrigation development, (ii) to optimize realistic target to meet the tasks of OIDA, and (iii) to select effective training programs necessary to fulfil the gap between (i) and (ii). The training program including 2-day general workshop for all participants and 2-weeks intensive training program on methodology of hydrological analysis for selected persons was carried out. The Program concluded that OIDA engineers need further training under the M/P as follows.

- 1) Basic training of computer use for data analysis
- 2) Estimation of missing data, crop water requirement, probability analysis, flood analysis, low flow analysis, and other hydraulic analysis needed for planning and design for irrigation development project.
- 3) Preparation of Design Report
- 4) Preparation of terms of reference for hydrological analysis

### **8.3.3 Performance and Results of Program 2**

Program 2 aimed to establish the management information system for 96 existing irrigation schemes, of which overall irrigation performance is as low as 58%, so as to provide OIDA staff with data and information necessary for identification of prevailing constraints facing each of scheme including necessity of urgent rehabilitation works. The data and information collected through the field survey covered 27 items consisting of finance source, natural condition, water source, present condition of facilities, progress of project implementation, farming, activities of water users' association, assignment of OIDA DA. The database thus established will be utilized for more efficient scheme management and future rehabilitation program.

### **8.3.4 Performance and Results of Program 3**

The objective of Program 3 is to initiate the long-term environmental monitoring program specified in the draft master plan. Although OIDA is the most appropriate agency to monitor irrigation water use in the Region, the budgetary arrangement and human resources are limited. The V/S envisaged formulating a realistic monitoring program under the given conditions. Three monitoring programs could be commenced during the V/S period as follows. (8.3)

- 1) The discharge measurement for the Meki and Bulbura rivers by the automatic water level recorders installed by the JICA Study Team.
- 2) Irrigation water use by operation records of the Meki-Ziway irrigation scheme.
- 3) Inventory survey of small pumps in the Meki river basin by the OIDA Wareda staff.

### **8.3.5 Performance and Results of Program 4**

Program 4 aims to prepare a guideline for establish WUAs for small-scale irrigation development, focusing on standardization of community mobilization for establishment of the WUAs. The Community Mobilization Department of OIDA is responsible for establishment of the WUAs, assigning 31 social workers in the head office and the branch offices. Through the PRA, appropriate approaches and procedures from planning to construction have been discussed in three (3) rural communities of Shubi Gamo PA, which preferred to embark on a small-scale irrigation development. For each scheme, 20 householders with 5 ha of total farmlands were organized. A small pump and cost for civil works were provided by JICA, while OIDA arranged construction equipment. The number of beneficiary under the Program is 63 comprising of 315 family members, i.e. Shubi scheme (15H.H with 3.5ha), Sombo Genet scheme (28H.H. with 7.0ha) and Sombo Aleltu (20H.H. with 5.0ha).

### **8.3.6 Performance and Results of Program 5**

The objective of Program 5 was to collect and arrange the information of rural communities by means of Community Resources Map (CRM) and to seek potentiality to apply the map to rural. The V/S prepared the entire CRM covering 54 PAs of Dugda Bora Wareda by inputs of 27 DAs of OADB. Firstly, the applicability of CRMs was analyzed for the field of agricultural extension. The V/S demonstrated the applicability of CRMs for (i) data accumulation and application to sustainable extension activities, (ii) application to EPP, (iii) collection and provision of data in uniform manner, (iv) identification of bottom-up needs and (v) preparation of strategic extension program with development targets.

### **8.3.7 Performance and Results of Program 6**

The objectives of Program 6 were (1) to review the extension and research programs to improve farming practices in the semi-arid area, (2) to compile extension materials suitable for the Meki area, and (3) to verify the materials in the area. Because of low literacy rate in the area, it was foreseen that the extension materials to be applied in the area should be prepared visually by use of illustrate and photograph. The Study identified that the conversation language in the Meki area is Oromo but the written languages are Amharic for adults and Oromo for youth, who are given the primary education in Oromo language. The extension information seeked by farmers are different by communities. Referring to the existing 55 extension materials, Extension Handbook for DAs and 14 subject leaflets were prepared and handed over to OADB.

### **8.3.8 Participants in Verification Study**

The number of participants in the program is 268 (3,450 man-days). Detail of



information per each program is shown below.

### Number of Participants in the Program

Program	Detail of Participants			
<u>Program 1</u> Training of analytical methodology for water resources development Number of participants: 10 persons, 118 man-days	<u>Description</u> 1)Program Coordinator 2)Participants in workshop 3)Participants in intensive course Total	<u>Persons</u> 1 10 4 Total	<u>Days</u> 50 2 12 Total	<u>Man-day</u> 50 20 48 Total
<u>Program 2</u> Establishment of management information system of the OIDA irrigation schemes Number of participants: 42 persons, 359 man-days	<u>Description</u> 1)Program Coordinator 2)4 branch office managers 3)Irrigation engineer in the branch offices 4)Interim appraisal workshop Total	<u>Persons</u> 1 4 4 34 Total	<u>Days</u> 125 20 30 1 Total	<u>Man-day</u> 125 80 120 34 Total
<u>Program 3</u> Environmental monitoring – irrigation water use in the Meki area Number of participants: 37 persons, 374 man-days	<u>Description</u> 1)Program Coordinator 2)OIDA Wareda office 3)OIDA Meki-Ziway Operator 4)Interim appraisal workshop Total	<u>Persons</u> 1 2 1 34 Total	<u>Days</u> 150 30 130 1 Total	<u>Man-day</u> 150 60 130 34 Total
<u>Program 4</u> Preparation of guideline for formation and operation of water users associations (WUA) Number of participants: 120 persons, 816 man-days	<u>Description</u> 1)Program Coordinator 2)OIDA head / branch office 3)Participants of workshop 4)OIDA Wareda office 5)Illustrate meeting 6)Interim appraisal workshop Total	<u>Persons</u> 1 3 9 3 74 34 Total	<u>Days</u> 150 120 2 60 1 1 Total	<u>Man-day</u> 150 360 18 180 74 34 Total
<u>Program 5</u> Community resource mapping Number of participants: 32 persons, 1,435 man-days	<u>Description</u> 1)Program Coordinator 2)OADB Wareda Office 3)DA in Dugda Bora 4)DA workshop 5)CRM Committee 6)Interim appraisal workshop Total	<u>Persons</u> 1 4 27 74 20 Total	<u>Days</u> 90 60 30 1 1 Total	<u>Man-day</u> 90 240 810 80 195 20 Total
<u>Program 6</u> Preparation of extension tools and research program for the Meki area Number of participants: 27 persons, 356 man-days	<u>Description</u> 1)Program Coordinator 2)OADB Wareda Office 3)DA in Dugda Bora 4)DA workshop 5)Interim appraisal workshop Total	<u>Persons</u> 1 4 3 20 Total	<u>Days</u> 120 30 30 1 Total	<u>Man-day</u> 120 120 90 6 20 Total

## Evaluation of Verification Study

Program	Feed back to the Master Plan
<p><b>□ Training of analytical methodology for water resources development</b></p>	<p><b><u>Objectives and Background</u></b></p> <p>The objectives of Program 1 are (1) to determine the present capacity and knowledge of the existing OIDA engineers on analytical hydrology for irrigation development, (2) to optimize realistic target to meet the tasks of OIDA, and (3) to select effective training programs necessary to fulfil the gap between (1) and (2). The above-mentioned process will be verified through the actual hydrological training for 12 participants, which includes 4 persons in the head office and 8 persons in four branch offices. Lessons obtained from the training program are expected to be taken into consideration in finalization of □5-1□ OIDA Engineers Training Program proposed under the Draft Master Plan.</p> <p><b><u>Activities and Input</u></b></p> <p>In June and July 2001, the training program including 2-day general workshop for all participants and 2-weeks intensive training program on methodology of hydrological analysis for selected persons was carried out. The number of the participants was 10. Dr. Mehta, Hydrologist of the JICA Study Team, provided them the training with aid of 4 computers supplied by JICA.</p> <p><b><u>Output and Feedback</u></b></p> <p>(1)Present capacities of hydrologist</p> <p style="padding-left: 20px;">Major finding through the program are as follows.</p> <p style="padding-left: 20px;">1) Participants□</p> <p style="padding-left: 40px;">Out of 720 OIDA staff, 38 persons need knowledge of analytical hydrology. They consist of 24 irrigation engineers and the rests are hydrologists. Out of 38 staff, 15 staffs are based in the OIDA head office, while 23 staffs in the 4 branch offices. 12 participants were selected among them, of which 8 staffs are irrigation engineers and 4 staffs are hydrologists.</p> <p style="padding-left: 20px;">2) Educational background□</p> <p style="padding-left: 40px;">Among 10 participants in the training course, four of them are MSc. Degree holders, while others had BSc. degree in engineering courses.</p> <p style="padding-left: 20px;">3) Work experience for hydrological analysis and related engineering fields□</p> <p style="padding-left: 40px;">The average technical experience of the trainees was 7.2 years. As for the analytical hydrology, the number of trainees with some experience was nine in analysis of crop water requirement, eight in flow analysis•and six in frequency / probability analysis. On the other hand, the participants had not much experienced in rainfall analysis (two persons)•flood analysis(2 of 10)•regression and correlation analysis (none).</p> <p style="padding-left: 20px;">4) Computer knowledge / experience□</p> <p style="padding-left: 40px;">Among 10 participants, four of them had some knowledge and experience of computer, while the others were beginners. It was pointed out that, in Ethiopia, computers have been used mainly for writing letters or documents as a typewriter, engineers had not sufficient computer knowledge and seldom access to computer system. So the training program under the V/S firstly envisaged providing an introduction of basic computer use. They could master basic operation of Microsoft Excel during 2-week intensive training course with high trainability.</p> <p>(2)Realistic targets</p> <p style="padding-left: 20px;">The targets to be achieved by for the hydrologists and design engineers by 2015, the target year of the master plan, are set as follows.</p> <p style="padding-left: 20px;">1) To conduct hydrological analysis for irrigation development by OIDA engineers.</p> <p style="padding-left: 20px;">2) To execute planning and design for irrigation facilities in medium and small-scale irrigation schemes, with an area of less than 100 ha.</p> <p style="padding-left: 20px;">3) To understand the technical report prepared by consultants in terms of planning and design of irrigation infrastructures in large-scale schemes.</p> <p>(3)Required training program</p> <p style="padding-left: 20px;">1) Basic training of computer use for data analysis</p> <p style="padding-left: 20px;">2) Estimation of missing data, crop water requirement, probability analysis, flood analysis, low flow analysis, and other hydraulic analysis needed for planning and design for irrigation development project.</p> <p style="padding-left: 20px;">3) Preparation of Design Report</p> <p style="padding-left: 20px;">4) Preparation of terms of reference for hydrological analysis</p>

## Evaluation of Verification Study

Contribution to capacity building for the Government staff	Direct benefit as a pilot project																				
<p><b><u>Program Coordinator:</u></b> Mr. Abera Shiferaw MSc., Hydrologist of the head office, acted as the coordinator of Program 1.</p> <p><b><u>Participants in the program:</u></b> The program, consisting of workshop (10 persons) and intensive training (4 persons), was carried out for the following manners.</p> <ol style="list-style-type: none"> <li>1) Presentation of the water balance study in Meki-Ziway basin, which was conducted in the Phase I of the Study, focusing on the alternative study of water resource for the irrigation development. This aims to promote their understanding of the Study, showing them the sample of hydrological study.</li> <li>2) Basic knowledge for computer operation necessary for the hydrological study, such as the Microsoft Excel.</li> <li>3) Training and practice required for hydrological analysis to design structures, such as regression, correlation, probability analysis, crop water requirement, and so on.</li> </ol> <p><b><u>Number of participants in the Program:</u></b> The number of Participants in the Program was 10 and amounted to 118 man-day in total as shown below.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Description</u></th> <th style="text-align: center;"><u>Persons</u></th> <th style="text-align: center;"><u>Days</u></th> <th style="text-align: center;"><u>Man-day</u></th> </tr> </thead> <tbody> <tr> <td>1)Program Coordinator</td> <td style="text-align: center;">1</td> <td style="text-align: center;">50</td> <td style="text-align: center;">50</td> </tr> <tr> <td>2)Participants in workshop</td> <td style="text-align: center;">10</td> <td style="text-align: center;">2</td> <td style="text-align: center;">20</td> </tr> <tr> <td>3)Participants in intensive course</td> <td style="text-align: center;">4</td> <td style="text-align: center;">12</td> <td style="text-align: center;">48</td> </tr> <tr> <td style="text-align: left;">Total</td> <td></td> <td></td> <td style="text-align: center;"><u>118</u></td> </tr> </tbody> </table>	<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>	1)Program Coordinator	1	50	50	2)Participants in workshop	10	2	20	3)Participants in intensive course	4	12	48	Total			<u>118</u>	<p><b><u>Capacity building to hydrological analysis and awareness creation for OIDA staff</u></b></p> <p>Direct benefits in the program are as follows.</p> <ol style="list-style-type: none"> <li>1) Need for capacity building for hydrological analysis was recognized by OIDA.</li> <li>2) Capacity of hydrological analysis for 10 persons, who participated in the intensive training course, has been improved.</li> <li>3) Standardization of hydrological analysis methods led to improve accuracy, compatibility, and efficiency of the work performance in the head office and four branch offices</li> <li>4) The participants of the program are expected to be core persons to transfer the technology to the other technical staff, although there are insufficient training facilities in the branch offices.</li> <li>5) Four (4) sets of the computers, software for hydrological analysis, and manual edited by the JICA Study Team can be utilized for future study of irrigation development.</li> <li>6) Technical exchange, between the head office and the branch offices, and among staff in the branch offices were realized.</li> <li>7) It was good opportunity for all the to know concept, process, and result of the Study.</li> </ol>
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## Evaluation of Verification Study

Program	Feed back to the Master Plan
<p>□ <b>Establishment of management information system of the OIDA irrigation schemes</b></p>	<p><b><u>Purpose and background of the program</u></b></p> <p>In Ethiopia, due to frequent structural changes of the government organization, the basic data and information necessary for irrigation development have not been kept in proper condition, most of which got scattered and lost. It causes difficulty to conduct monitoring and evaluation of the schemes, and consequent systematic support to the schemes based on lessons obtained from last experiences. OIDA, since its establishment in July 1999, has faced scarcity of data and information regarding planning, design, present condition of existing irrigation schemes in terms of irrigation facilities and water users' associations. Under this circumstance, in May 2000, OIDA carried out an inventory survey to gather basic information of 96 existing irrigation schemes in Oromia Region.</p> <p>Program 2 aims to establish the management information system for 96 existing irrigation schemes so as to provide OIDA staff with data and information necessary for identification of prevailing constraints facing each of scheme including necessity of urgent rehabilitation works. The management information system will be applied to •5-1• OIDA Engineers Training Program and •5-2• OIDA Community Development Experts Training Program.</p> <p>The results of the inventory survey in May 2000 became clear that overall performance of the irrigation schemes, that is ratio of actual irrigated areas to planned irrigation area, fell into only 58%. There is no prospect to commence the data collection and the necessary rehabilitation works due to financial constraints since the available fund arranged by IFAD and ESRDF are allocated mainly to new construction irrigation schemes.</p> <p><b><u>Activities and input</u></b></p> <p>In cooperation with the four branch offices in data collection covering design reports, design drawings, questionnaire, photograph was carried out. Consequently problems in relation to low performance of OIDA irrigation scheme was preliminarily analyzed.</p> <p><b><u>Output and Feedback</u></b></p> <p>1) Available data and information □  Data and information collected in the field cover 27 items, containing finance source, natural condition, water source, present condition of facilities, progress of project implementation, farming, activities of water users' association, assignment of OIDA DA.</p> <p>2) Document management □  It was found that many design reports and drawings are lost. Data management is not conducted systematically although some data are kept personally not organized systematically. The central branch office rates high in data quantity, while consciousness on data management vary in branch office, putting relative high rating on the western branch office.</p> <p>3) Technical level of OIDA staff □  The OIDA engineers could identify and clarify present constraints and problems of the existing irrigation schemes without special training and guidance.</p> <p>4) Format of the database system □  In the interim appraisal workshop held in August 2001, there was a series of discussion how to select hardware and software suitable for the management information system. The OIDA engineer pointed out that data base management system developed by OIDA should be compatible with that being formulated by the Oromia Water, Mineral, Energy Bureau. The bureau establish the system by PDF file. Through the data collection, it was observed that the data and information obtained through the field survey were too inadequate both in quality and quantity to establish computerized management information system. Thus, for the moment, the hard copy of the collected data and information with photograph are compiled into files while the data are encoded for further analysis by use of the Microsoft Excel.</p> <p>5) Application of the management information system □  Present problems and constraints prevailing in the schemes were classified according to both engineering and institutional aspects, such as deterioration of irrigation facilities, degree of WUA's activities, and so on.</p> <p>6) Cost for field investigation and system maintenance □  The most important issue on the management information system is how the cost for the system maintenance should be arranged. The data and information stored in the system shall be reviewed and updated every year. Thus, since the cost needed for the one –day field investigation is Birr 300 per scheme, OIDA shall proceed budgetary arrangement amounting to some Birr. 30,000 for the annual data maintenance. The arrangement of vehicle for the field study is required. The awareness campaign regarding necessity and importance of the management information system should also be promoted.</p>

## Evaluation of Verification Study

Contribution to capacity building for the Government staff	Direct benefit as a pilot project																														
<p><b><u>Program Coordinator:</u></b></p> <p>Mr. Teshomme Lemma., design engineer of the OIDA head office, is responsible for implementing the program, including program design, preparation of the questionnaire, data collection.</p> <p>However, he could not attend the data analysis conducted in latter half of the period since he was dispatched to the study abroad in the Netherlands.</p> <p><b><u>Branch Office Manager</u></b></p> <p>The JICA Study Team visited all four (4) branch offices to discuss present condition and constraints of project management and to exchange opinions to solve the problems. During course of the discussion, the managers understood needs to establish the management information system as well as responsibilities of the branch offices to implement the system. It was of significance that awareness creation for the managers could be promoted.</p> <p><b><u>Irrigation engineers in the branch offices</u></b></p> <p>Data collection, field survey, and filling the questionnaire for the program were carried out by irrigation engineers in the branch offices.</p> <p>Data encoding was carried out by computer operators arranged by the Study Team. The data were transferred to OIDA in January 2002.</p> <p><b><u>Participants in interim appraisal workshop</u></b></p> <p>Based on eight schemes managed by the central branch office, preliminary analysis was conducted so as to clarify cause on low irrigation performance in the OIDA scheme was conducted. Presentation of the study results in the interim workshop reached smooth implementation of the program, getting better understanding and cooperation of OIDA senior staff for the program.</p> <p><b><u>Number of participants in the Program</u></b></p> <p>The number of Participants in the Program was 42 and 359 man-day as shown below.</p> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Description</u></th> <th style="text-align: center;"><u>Persons</u></th> <th style="text-align: center;"><u>Days</u></th> <th style="text-align: center;"><u>Man-day</u></th> </tr> </thead> <tbody> <tr> <td>1)Program Coordinator</td> <td style="text-align: center;">1</td> <td style="text-align: center;">125</td> <td style="text-align: center;">125</td> </tr> <tr> <td>2)4 branch office managers</td> <td style="text-align: center;">4</td> <td style="text-align: center;">20</td> <td style="text-align: center;">80</td> </tr> <tr> <td>3)Irrigation engineer in the branch offices</td> <td style="text-align: center;">4</td> <td style="text-align: center;">30</td> <td style="text-align: center;">120</td> </tr> <tr> <td>4)Interim appraisal workshop</td> <td style="text-align: center;">34</td> <td style="text-align: center;">1</td> <td style="text-align: center;">34</td> </tr> <tr> <td style="text-align: right;">Total</td> <td></td> <td></td> <td style="text-align: center;"><u>359</u></td> </tr> </tbody> </table>	<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>	1)Program Coordinator	1	125	125	2)4 branch office managers	4	20	80	3)Irrigation engineer in the branch offices	4	30	120	4)Interim appraisal workshop	34	1	34	Total			<u>359</u>	<p><b><u>Basic data and information for Irrigation sub-sector in Oromia Region</u></b></p> <p>Database files compiling basic data and information were prepared and left for OIDA.</p> <p>The numbers of beneficiaries through making practical use of the database system is expected as shown below.</p> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tbody> <tr> <td style="width: 15%;">Present</td> <td style="width: 15%; text-align: right;">5,560ha</td> <td style="width: 70%; text-align: right;">15,763 H.H</td> </tr> <tr> <td>Future with rehabilitation project</td> <td style="text-align: right;">9,644ha</td> <td style="text-align: right;">26,984 H.H.</td> </tr> </tbody> </table>	Present	5,560ha	15,763 H.H	Future with rehabilitation project	9,644ha	26,984 H.H.
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## Evaluation of Verification Study

Program	Feed back to the Master Plan
<p><b>□ Environmental monitoring – irrigation water use in the Meki area</b></p>	<p><b><u>Objective and background</u></b></p> <p>The Meki-Ziway Irrigation Development Project is located in the Meki area. This project is known as one of the largest irrigation schemes in the country. The design discharge of the pump station is 5 m<sup>3</sup>/sec. The station consists of 9 sets of the pump with a capacity of 0.72 m<sup>3</sup>/sec, among which 2 sets are reserved as stand-by. Actual developed area is 1,500 ha total planned area of 3,000 ha. Actual cultivated areas in recent years were 380 ha in 1999, 160 ha in 2000, and 216 ha in 2001. A private enterprise cultivated maize in 2000 while in 2001 377 households organized by the Oromia Cooperative Promotion Bureau planted seed of maize. The operation of the project is recognized to have the most influence of water level of the lake Ziway. On the other hand, estimated annual water consumption by small-scale pump irrigation scheme along the Meki river and the Lake Ziway is less than 10 MCM, which is nearly equal to 3% of annual runoff of the Meki river (291 MCM). This fact shows, at the moment, that the environmental affects on water abstraction by the schemes are negligible. However, under such background that legislative framework in terms of water right is not satisfactory, the disordered water usage in the area may lead to serious adverse environmental affect if no action is taken to restrict and monitor it carefully. Moreover it should be commented irrigation farming by large-scale landholders and private investors residing in urban area causes gap of income level in the area.</p> <p>The objective of the program is to commence □4-1□Environmental Monitoring Program specified in the draft master plan. OIDA is most appropriate agency than other governmental organizations, like bureaus of water, mineral, and energy, health, and agricultural development, and so on. It is not realistic for OIDA to formulate excessive monitoring program beyond their budgetary arrangement and human resources. It is necessary to start the monitoring program with minimal level so that OIDA can proceed the program continuously with utilizing their resources.</p> <p><b><u>Activities and Inputs</u></b></p> <p>At first, the following activities were attempted to be motored by the JICA Study team and OIDA Meki Wareda Office:</p> <ul style="list-style-type: none"> <li>• Water level in Meki and Bulbula rivers</li> <li>• Water quality in Meki and Bulbula rivers</li> <li>• Present condition of water use and agricultural farm input in the Meki-Ziway Irrigation Project</li> <li>• Present water use in small-scale pump irrigation schemes</li> <li>• Present crop production in small-scale pump irrigation schemes</li> <li>• Progress of reforestation project</li> <li>• Present activities of donor and NGO related to water resources</li> </ul> <p><b><u>Output and Feedback</u></b></p> <p>1) Applicable activities □The number of Activities which could commence during the verification study period was only three, namely •, •(water use only), and •, as shown below</p> <ul style="list-style-type: none"> <li>• The automatic water level recorders installed by the JICA Study Team were utilized in the activity.</li> <li>• Only water usage of the irrigation project was studied by operation records of the pump.</li> <li>• The number of the pumps with their power were clarified through the inventory survey conducted by the OIDA Wareda staff.</li> </ul> <p>2) Present irrigation water use□Water usage of the Meki-Ziway Irrigation Project from April to August in 2001 amounts to only 0.06% of total storage of the lake. Although The number of the small pumps was 180, with an increase of 20 sets over last year, it was impossible to estimate total water usage due to lack of their operation records.</p> <p>3) Activities which failed to proceed□ Among seven activities, five items, namely •,•,•,•, and •. Although the OIDA establishment proclamation specifies that environmental conservation and watershed management, there is no department, taking in charge of those activities. Further, items Water, Mine &amp; Energy Resources Development Bureau is in charge of •, and •. Oromia Agricultural Development Bureau deals with •,and • while Oromia Cooperative Promotion Bureau is responsible for item •. In such circumstance, it is very difficult that to implement comprehensive environmental monitoring program under sole governmental agency.</p> <p>4) Constraints of nursery program in Meki and reforestation program in the catchment□ It was observed that implementation of reforestation program in such river basin, that its catchment is located in several Regions, is very difficult due to lack of inter-region cooperation. In addition to that, several constraints were observed such as low incentive of rural community, mitigation of damage by animals and so on.</p> <p>Based on lessons 1) to 3), □4-1□Environmental Monitoring Program would be reviewed. Further, lesson from 4) indicates that the implementation program of the master plan should be revised so that two programs of □4-2□Seedling Center Program, and□4-3□Watershed Management Program are to be implemented simultaneously.</p>
Contribution to capacity building for the Government staff	Direct benefit as a pilot project

## Evaluation of Verification Study

### **Program Coordinator**

The programme coordinator of Program 3 is Mr. Sileshi Getahun MSc., Head of Extension and Water Management Department. Mr. Sileshi. However, he had difficulty to participate in the program fully due to time constraints. Consequently, Mr. Bifa Bedhadra, Deputy head of the department, acted as the coordinator for the remaining 2.5 months, being engaged in implementation and completion of the Program.

### **Water Level Measurement**

Mr. Abera Shiferaw MSc., Hydrologist of OIDA, and coordinator of Program 1, was in charge of the measurement of water level.

### **Staff in Wareda Office**

The number of staff assigned in OIDA Meki Office is seven, among whom 5 persons are technical staff. An inventory survey of existing small-scale pump scheme and data collection of pump operation records in the Maki-Ziway Irrigation Project have been conducted by them from April to August 2001.

### **Number of participants in the Program:**

The number of Participants in the Program was 37 and 374 man-day as shown below.

<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>
1) Program Coordinator	1	150	150
2) OIDA Wareda office	2	30	60
3) OIDA Meki-Ziway Operator	1	130	130
4) Interim appraisal workshop	34	1	34
Total			<u>374</u>

Note:

As for the monitoring for water usage of the area, highly advanced technology is not required except for training of operation for measurement equipment. Rather than that, it was revealed that an awareness creation campaign to senior staff of OIDA should be enhanced so as to let them recognize significance and necessity of long-term environmental monitoring program.

### **Commencement of Environmental Monitoring:**

In the Meki area, the community-based pump irrigation development project will be promoted in line with the concept of Program 4. It is essential for OIDA to carry out the long-term environmental monitoring to optimize the water usage of the area, mitigating adverse environmental impact.

It is meaningful for OIDA to commence the data collection necessary for IEE, and EIA, which execution should be obliged by EPA in terms of accountability for the project implementation.

### **Supply of Equipment for Environmental Monitoring:**

Equipment used for the Program is as follows.

- 1) Hydrological equipment (2 sets of Automatic water level recorder with consumables, and 1 set of current meter.
- 2) Three Bicycle for transportation
- 3) Test kits for water quality measurement, pH meter, and EC meter.

Program	Feed back to the Master Plan
<b><u>Preparation of</u></b>	<b><u>Objectives and Background</u></b>

## Evaluation of Verification Study

<p><b>guideline for formation and operation of water users associations (WUA)</b></p>	<p>The Master Plan proposes •1-2• Meki Irrigation and Rural Water Supply Project to introduce a gravity irrigation system to drought prone zone of the Meki area by means of proposed headwork and the irrigation system on the Meki River, covering 2,300 ha and 9,200 households. Toward a realization of the project, •1-1• Water Users Associations (WUAs) Support Program will be implemented so the beneficiary farmers will organize water users' associations (WUA), and their capacity of the project management shall be strengthened.</p> <p>Program 4 aims to prepare a guideline for establish WUAs for small-scale irrigation development, focusing on standardization of community mobilization for establishment of the WUAs. The Community Mobilization Department of OIDA is responsible for establishment of the WUAs, assigning 31 social workers in the head office and the branch offices. The community mobilization will be carried based on guidelines prepared by IFAD and ESRDF. However, preparation of practical manuals and guidelines for the community mobilization has been expected.</p> <p>Pump Irrigation schemes are broadly applied in the Meki area due to topographic constraint. Through the field investigation, taking into account sustainability of irrigated farming, it was considered that an irrigation scheme with an area of less than 10 ha, having 20 members would be appropriate. The guideline describes process and methodology for such development stages, as planning, design, construction, and scheme management, covering engineering aspects as well as social matters. The guideline will be applied •5-1• OIDA Engineers Training Program, and •5-2• OIDA Community Development Experts Training Program.</p> <p><b><u>Activities and Inputs</u></b></p> <p>A series of process from planning to construction has been verified in three (3) rural communities of Shubi Gamo PA, which preferred to embark on a small-scale irrigation development. For each scheme, 20 householders with 5 ha of total farmlands were organized. A small pump and cost for civil works were provided by JICA, while OIDA arranged construction equipment.</p> <p><b><u>Results and Feedback</u></b></p> <ol style="list-style-type: none"> <li>1) Present status of social workers □ The verification study identified such constraints, as community mobilization depending on personal experience of the social workers, inadequate discussion on land holding issue during planning stage and cost-benefit analysis, insufficient knowledge and experience of social worker regarding scheme management, lack of fund for O&amp;M.</li> <li>2) Present condition and constraint of Existing WUA: Major constraints on the existing WUA are low profit, imbalance of water distribution, insufficient support by OIDA, insufficient technical consideration during planning and design stage, no replacement budget for pumps.</li> <li>3) Mixed approach of top-down and bottom-up: Since OIDA should be responsible for optimum resource management, the conditions to donate the pump and implement the scheme were presented to farmers by OIDA/JICA. It is essential to let them understand the background of the condition, like difficulty of irrigated farming without forcing them the condition. Further intention of the farmers are incorporated in the development plan.</li> <li>4) Consensus on land allocation and fund formation: During planning stage a considerable discussion with farmers will be required on land issue and fund formation for scheme management.</li> <li>5) Flexibility in WUA membership: Membership can be entitled to family members in addition to their family head.</li> <li>6) Conflict management among community members: Settlement of conflict and disputes should left in hands of the farmers themselves with minimal intervention by OIDA because they have mechanism to settle them among their community.</li> <li>7) Conditions for sustainable farming: The important point for sustainable scheme management is equal land allocation to each member, support for fund formation, saving for pump replacement, land consolidation and exchange for efficient water management, selection of mobile pump considering maintenance and flood, and establishment of monitoring and evaluation by OIDA.</li> <li>8) Design revision □ Flexible design revision during construction period is expected so as to settle claim by the farmers arose during the construction period.</li> </ol>
Contribution to capacity building for the Government staff	Direct benefit as a pilot project



## Evaluation of Verification Study

<p><b><u>Program Coordinator:</u></b> Mr. Birhanu Hirpo MSc., team leader of the Community Mobilization Department of the head office, acted as the coordinator of Program 4. During his absence for overseas training, Mr. Admasu and Mr. Mohamed, staff of the central branch office, coordinated the program.</p> <p><b><u>OIDA Social Workers:</u></b> Two-days workshop for social workers in OIDA was held in July 2001 to discuss job description of them, constraints for project implementation, and present guideline for community mobilization. Further through a questionnaire survey, present condition and constraints for WUA establishment was also clarified. Nine staff including one woman participated in the workshop from community mobilization department in the head office and branch offices. Major findings are as follows.</p> <ul style="list-style-type: none"> <li>• Social workers has less educational background and work experience than engineers. It is hard for the social workers to participate in decision making.</li> <li>• Since social workers also hold post of accounting and procurement, they have difficulty to concentrate in community mobilization work.</li> <li>• Social workers often acts to inform farmers just conditionality of Donor/NGO for project implementation without sufficient discussion with them.</li> <li>• Some of social workers have insufficient knowledge and experience to inform farmers difficulties of irrigation infrastructure management and irrigated farming practice through PRA session.</li> <li>• Most frequent conflict among farmers is resulting from land holding issue. And generally WUA has no fund for scheme management.</li> </ul> <p><b><u>Staff in OIDA Meki Wareda Office:</u></b> Sufficient transfer to knowledge was carried out to three staff of OIDA Meki Wareda Office from PRA to construction management.</p> <p><b><u>OIDA Engineers:</u></b> Planning and design works were carried out by engineers in the head office, consisting of design engineers (2), chief surveyor (1), who conducted design of irrigation canals with related structures and pump house. As for construction management, a construction engineer assigned from the central branch office for 2.5 months.</p> <p><b><u>Approximate Participants in the Program:</u></b> The number of Participants in the Program was 120 and 816 man-day as shown below.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Description</th> <th style="text-align: center;">Persons</th> <th style="text-align: center;">Days</th> <th style="text-align: center;">Man-day</th> </tr> </thead> <tbody> <tr> <td>1) Program Coordinator</td> <td style="text-align: center;">1</td> <td style="text-align: center;">150</td> <td style="text-align: center;">150</td> </tr> <tr> <td>2) OIDA head / branch office</td> <td style="text-align: center;">3</td> <td style="text-align: center;">120</td> <td style="text-align: center;">360</td> </tr> <tr> <td>3) Participants of workshop</td> <td style="text-align: center;">9</td> <td style="text-align: center;">2</td> <td style="text-align: center;">18</td> </tr> <tr> <td>4) OIDA Wareda office</td> <td style="text-align: center;">3</td> <td style="text-align: center;">60</td> <td style="text-align: center;">180</td> </tr> <tr> <td>5) Illustrate meeting</td> <td style="text-align: center;">74</td> <td style="text-align: center;">1</td> <td style="text-align: center;">74</td> </tr> <tr> <td>6) Interim appraisal workshop</td> <td style="text-align: center;">34</td> <td style="text-align: center;">1</td> <td style="text-align: center;">34</td> </tr> <tr> <td style="text-align: right;">Total</td> <td></td> <td></td> <td style="text-align: center;"><u>816</u></td> </tr> </tbody> </table>	Description	Persons	Days	Man-day	1) Program Coordinator	1	150	150	2) OIDA head / branch office	3	120	360	3) Participants of workshop	9	2	18	4) OIDA Wareda office	3	60	180	5) Illustrate meeting	74	1	74	6) Interim appraisal workshop	34	1	34	Total			<u>816</u>	<p><b><u>Members of WUAs:</u></b> The number of beneficiary under the Program is 63 as shown below. (315 family members)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tbody> <tr> <td>Shubi</td> <td style="text-align: center;">15H.H</td> <td style="text-align: center;">3.5ha</td> </tr> <tr> <td>Sombo Genet</td> <td style="text-align: center;">28H.H.</td> <td style="text-align: center;">7.0ha</td> </tr> <tr> <td>Sombo Aleltu</td> <td style="text-align: center;">20H.H.</td> <td style="text-align: center;">5.0ha</td> </tr> <tr> <td>Total</td> <td style="text-align: center;">63H.H</td> <td style="text-align: center;">15.5ha</td> </tr> </tbody> </table> <p><b><u>Increase of income (63households):</u></b> An expected incremental benefit obtained from irrigated tomato cultivation is some Birr. 450 per member (0.25 ha) in minimum as shown below.</p> <p style="margin-left: 20px;"><u>Gross Income</u></p> <ol style="list-style-type: none"> <li>1. Anticipated Yield : 8.0 ton/ha</li> <li>2. Target Production : 2.0 ton/0.25ha</li> <li>3. Farm Gate Price : Birr 0.5/kg (Birr 0.5 • 1.0)</li> <li>4. Gross Income (1) : Birr 1,000/0.25ha</li> </ol> <p style="margin-left: 20px;"><u>Production Cost</u></p> <ol style="list-style-type: none"> <li>1. Farm inputs : Birr 250</li> <li>2. Diesel : Birr 200</li> <li>3. Spare parts (10%): Birr 200</li> <li>4. Total Cost (2) : Birr 650</li> </ol> <p style="margin-left: 20px;">Net Revenue (1)-(2) : Birr 350 (Birr 700/year)</p> <p style="margin-left: 20px;"><u>Saving for Pump Replacement</u></p> <ol style="list-style-type: none"> <li>1. Birr 5000/20HH/year = Birr 250/year</li> </ol> <p><b><u>Awareness creation for farmers:</u></b> A community meeting, by use of illustration was held to study appropriate tools and technology for participatory planning in rural area of Oromia Region. The number of participants was 74 in total. The meeting was good opportunity for OIDA staff to obtain basic approach for empowerment of local community.</p>	Shubi	15H.H	3.5ha	Sombo Genet	28H.H.	7.0ha	Sombo Aleltu	20H.H.	5.0ha	Total	63H.H	15.5ha
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## Evaluation of Verification Study

<p><b>Community Resource Mapping</b></p>	<p><b><u>Objectives and Background</u></b></p> <p>In 2000, the estimated population in rural area in Dugda Bora Wareda is some 125,000 with 26,400 households, amounting to 77% of total population. The Wareda consists of 54 Peasant Associations (PAs). Each PA comprises 416 households (some 1,970 persons) on an average. 27 Development Agents (DA) are assigned for front-line agricultural extension. Through frequent communication with community members, the DAs seem to hold much information in connection with rural community, especially development needs by the community members. The objective of the program is to arrange the information by use of a community resources map (CRM) and to seek potentiality to apply the map to rural. Major application of CRM is supposed to be as follows.</p> <p>(1) Application as reinforcement of government administration:</p> <ol style="list-style-type: none"> <li>1) Impact on extension works <ul style="list-style-type: none"> <li>• Data accumulation and application to sustainable extension activities</li> <li>• Application to EPP</li> <li>• Collection and provision of data in uniform manner</li> <li>• Identification of Bottom-up needs</li> <li>• Preparation of strategic extension program with development targets</li> </ul> </li> <li>2) Impact on cooperative activities <ul style="list-style-type: none"> <li>• Promotion of strengthening of existing cooperatives</li> <li>• Promotion of new cooperative formation</li> </ul> </li> <li>3) Data collection by Wareda administration office</li> </ol> <p>(2) Application as empowerment of rural communities:</p> <ol style="list-style-type: none"> <li>1) Promotion of participatory development and NGO assisted development <ul style="list-style-type: none"> <li>• Planning initiated by communities</li> <li>• Creation of exchange with other communities, motivation and awareness</li> </ul> </li> <li>2) Application to measures for disaster and disease prevention <ul style="list-style-type: none"> <li>• Application by community to disaster relief</li> <li>• Community participation in local disease prevention</li> </ul> </li> </ol> <p><b><u>Activities and Inputs:</u></b></p> <p>In line with concept in 5-4 Community Resources Map Program proposed in the draft master plan, activities, consisting of preparation of CRM and verification of the map application, were carried out by staff in the OADB Wareda office and 27 DAs. Bicycles were provided to each DA for smooth implementation of the program.</p> <p><b><u>Results and Feedback</u></b></p> <p>Results and major finding in the program are shown below.</p> <ol style="list-style-type: none"> <li>1) Community as core of rural development Referring to previous literatures, Edirs were to be regarded as a core body for rural development. In the program field investigation was carried out to access the groups and identify their leaders. However, during the survey conducted in first half of the verification study period, it was concluded that Edir was a conventional mutual aid society for funeral and not suitable as core body for agricultural and other economical activities. And It was also pointed out that community leaders are not always recognized as right persons who transfer extension messengers due to their insufficient educational background and agricultural knowledge.</li> <li>2) Communication channels in rural area: The results of Rapid rural Appraisal (RRA) revealed that each community conceits of 30 to 40 households and PA Chairman and community leader acts to transfer messages to villagers. There are 550 communities within Dugda Bora Wareda.</li> <li>3) CRM prepared by DA Due to DA's specialty of DA, interests of DAs on the maps were to clarify the communication channel and access to rural communities, the prepared CRMs were characterized by access map to the rural area rather than resource map in rural area. •Information on the map is rural road network and major rural infrastructures including school, dispensary, wells, market, church, and natural environment and resources including forest, river, gullies. Detailed information such as variation of resource like annual variation of ground water level and water quality and socio-economic information could be obtained insufficiently through the survey.</li> <li>4) CRM for extension services It was verified that the CRM could be applied to agricultural extension, distribution of improved seeds in EPP, and preparation of extension program to meet local requirement.</li> <li>5) Application of CRM to other fields Potentialities of CRMs can be exploited by other experts for further useful, like health workers and cooperative it was not verified during the study period.</li> </ol>
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## Evaluation of Verification Study

Contribution to capacity building for the Government staff	Direct benefit as a pilot project																																										
<p><b><u>Program Coordinator:</u></b></p> <p>The Program was carried out by Oromia Agricultural Development Bureau (OADB). The coordinator of the Program is Mr. Benti Shomina, Chief Researcher for Soil Laboratory of the Region, under supervision of Mr. Kebede Woldegiyorgis, Chief Counterpart of OADB. However, Mr. Kebede Woldegiyorgis left the job due to re-organization of the OADB, Mr. Benti Shomina acted as the chief counterpart.</p> <p><b><u>Staff in OADB Dugda Bora Wareda Office:</u></b></p> <p>Staff in OADB Dugda Bora Wareda Office, consisting of head and three experts, participated in the program, coordinating 27 DAs.</p> <p><b><u>Approximate Participants in the Program:</u></b></p> <p>The number of Participants in the Program was 32 and 1,435 man-day as shown below.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Description</u></th> <th style="text-align: center;"><u>Persons</u></th> <th style="text-align: center;"><u>Days</u></th> <th style="text-align: center;"><u>Man-day</u></th> </tr> </thead> <tbody> <tr> <td>1) Program Coordinator</td> <td style="text-align: center;">1</td> <td style="text-align: center;">90</td> <td style="text-align: center;">90</td> </tr> <tr> <td>2) OADB Wareda Office</td> <td style="text-align: center;">4</td> <td style="text-align: center;">60</td> <td style="text-align: center;">240</td> </tr> <tr> <td>3) DA in Dugda Bora</td> <td style="text-align: center;">27</td> <td style="text-align: center;">30</td> <td style="text-align: center;">810</td> </tr> <tr> <td>4) DA workshop</td> <td></td> <td></td> <td style="text-align: center;">80</td> </tr> <tr> <td>5) CRM Committee</td> <td style="text-align: center;">74</td> <td style="text-align: center;">1</td> <td style="text-align: center;">195</td> </tr> <tr> <td>6) Interim appraisal workshop</td> <td style="text-align: center;">20</td> <td style="text-align: center;">1</td> <td style="text-align: center;">20</td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td style="text-align: center;"><u>1,435</u></td> </tr> </tbody> </table> <p>In addition to the above, four kinds of field investigation were carried out for rural community. The number of farm households participating in the survey was 761 as shown below</p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>Questionnaire survey for community leader</td> <td style="text-align: right;">550 H.H.</td> </tr> <tr> <td>Workshop in community</td> <td style="text-align: right;">74 H.H.</td> </tr> <tr> <td>Survey for information channel in rural community</td> <td style="text-align: right;">118 H.H.</td> </tr> <tr> <td>Measurement of farmland</td> <td style="text-align: right;">19 H.H.</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: right;"><u>761 H.H.</u></td> </tr> </tbody> </table>	<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>	1) Program Coordinator	1	90	90	2) OADB Wareda Office	4	60	240	3) DA in Dugda Bora	27	30	810	4) DA workshop			80	5) CRM Committee	74	1	195	6) Interim appraisal workshop	20	1	20	Total			<u>1,435</u>	Questionnaire survey for community leader	550 H.H.	Workshop in community	74 H.H.	Survey for information channel in rural community	118 H.H.	Measurement of farmland	19 H.H.	Total	<u>761 H.H.</u>	<p><b><u>Contribution to provision of basic information for rural development:</u></b></p> <p>Estimated number of direct and indirect beneficiaries for the Program would be 26,400 households or 125,000 persons, who would receive the more systematic extension service by OADB.</p> <p><b><u>Motivation for the other sectors:</u></b></p> <p>The community resource map prepared by the agricultural extension staff can be applied to other sectors such as health, disaster prevention, rural infrastructure, and so on.</p> <p>It is noted that understanding and cooperation by the Higher Ministry of Agriculture and Rural Development is expected in order to extend the study results to the other agency and NGOs.</p>
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## Evaluation of Verification Study

Program	Feed back to the Master Plan
<p>□ <b>Preparation of extension tools and research program for the Meki area</b></p>	<p><b><u>Objectives and Background</u></b></p> <p>In 1998, under financial assistance of IFAD, the Ethiopian Agricultural Research Organization (EARO) launched the research-extension linkage program in order to increase crop productivity. Although some 310 farming techniques have been established under the program, their efforts have not sufficiently penetrated in rural areas due to shortage of budget and staff required.</p> <p>The objectives of the program are (1) to review the extension and research programs to improve farming practices in the semi-arid area, (2) to compile extension materials suitable for the Meki area, and (3) to verify the materials in the area. Because of low literacy rate in the area, it was foreseen that the extension materials to be applied in the area should be prepared visually by use of illustrate and photograph.</p> <p>Special care should be taken to introduce the recommended techniques directly into the Meki area because most of them have been established near Addis Ababa, where the agricultural potential is relatively high. It is expected thus that research program should be carried out in order to seek appropriate techniques in the semi-arid zone in Ethiopia.</p> <p>The program also aims to recommend necessary research program preparing the plan of operation. The result of the program will be applied to □2-1□ Semi-arid Farming Improvement Project.</p> <p><b><u>Activities and Inputs</u></b></p> <p>Activities in the program are shown below.</p> <ol style="list-style-type: none"> <li>1) Collection, review and classification of existing extension material</li> <li>2) Collection and review of documents on agricultural Research and Extension Advisory Council</li> <li>3) Interview to EARO, Zonal office, NGO, Ministry of agriculture</li> <li>4) Study on job description of government organizations regarding preparation and distribution of extension materials</li> <li>5) Study on needs of framers to the extension materials</li> <li>6) Study on problems and constraints of rain-fed agriculture in the Meki area</li> <li>7) Preparation extension material to SMS, DA, and farmers in semi-arid area of Oromia Region</li> <li>8) Recommendation of research program to be conducted in the Meki area</li> </ol> <p><b><u>Result and Feedback</u></b></p> <ol style="list-style-type: none"> <li>1) Existing extension materials□ The JICA Study Team collected 55 extension materials, of which 42 materials are written in Amharic, 12 materials are described in English. Main subjects of the materials are crop guidance and pest and disease.</li> <li>2) Extension material suitable in the Meki area: In the Meki area people generally speak oromo language. An adult generation above 20 years received primary education in Amharic while education in young generation is given in oromo language. Literacy rate appears low in remote area. Taking those finding into account, it is concluded that the extension materials should be prepared in Oromo and Amharic languages as a transition period.</li> <li>3) Understanding of poster□ In the Meki area, the farmers' preference is for descriptive posters rather than illustrated one.</li> <li>4) Subjects needed by DA: pest control, damage by birds and animals•weeding, drought, soil erosion• improved seed, ploughing, soil control.</li> <li>5) Subjects needed by farmers: soil conservation, tree planting, bee keeping, poultry farming, dairy farming, pest control, weeding, credit, improved seed, forage production, and cooperative.</li> <li>6) Extension materials: The number of extension materials is 14, of which 7 materials are written in Amharic and the rest are prepared in oromo language. They consist of sorghum, haricot bean, maize, maize cropping calendar, teff, wheat, chili, sweet potato, potato, intercropping between maize and desmodium, elephant grass, heavy clay soil management technology, treatment in moisture stressed area, and water and soil conservation.</li> <li>7) Preparation of extension materials: Since there is no copy writes in Ethiopian extension materials, reprinting of them depends on budgetary arrangement.</li> </ol>

## Evaluation of Verification Study

Contribution to capacity building for the Government staff	Direct benefit as a pilot project																												
<p><b><u>Program Coordinator:</u></b></p> <p>Program 6 was carried out by Oromia Agricultural Development Bureau (OADB). The coordinator of the Program is Mr.Mohamed Yaquin, Extension Department of OADB, under supervision of Mr.Kebede Woldegiyorgis, Chief Counterpart of OADB. However, Mr.Kebede Woldegiyorg left the job due to re-organization of the OADB, Mr.Mohamed Yaquin acted as the chief counterpart.</p> <p><b><u>Staff in OADB Dugda Bora Wareda Office:</u></b></p> <p>Staff in OADB Dugda Bora Wareda Office, consisting of head and three experts, participated in the program, coordinating 27 DAs.</p> <p><b><u>Approximate Participants in the Program:</u></b></p> <p>The number of Participants in the Program was 27 and 356 man-day as shown below.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Description</u></th> <th style="text-align: center;"><u>Persons</u></th> <th style="text-align: center;"><u>Days</u></th> <th style="text-align: center;"><u>Man-day</u></th> </tr> </thead> <tbody> <tr> <td>1)Program Coordinator</td> <td style="text-align: center;">1</td> <td style="text-align: center;">120</td> <td style="text-align: center;">120</td> </tr> <tr> <td>2)OADB Wareda Office</td> <td style="text-align: center;">4</td> <td style="text-align: center;">30</td> <td style="text-align: center;">120</td> </tr> <tr> <td>3)DA in Dugda Bora</td> <td style="text-align: center;">3</td> <td style="text-align: center;">30</td> <td style="text-align: center;">90</td> </tr> <tr> <td>4)DA workshop</td> <td></td> <td></td> <td style="text-align: center;">6</td> </tr> <tr> <td>5)Interim appraisal workshop</td> <td style="text-align: center;">20</td> <td style="text-align: center;">1</td> <td style="text-align: center;">20</td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td style="text-align: center;"><u>356</u></td> </tr> </tbody> </table>	<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>	1)Program Coordinator	1	120	120	2)OADB Wareda Office	4	30	120	3)DA in Dugda Bora	3	30	90	4)DA workshop			6	5)Interim appraisal workshop	20	1	20	Total			<u>356</u>	<p><b><u>Extension Material:</u></b></p> <p>Extension materials were prepared to sorghum, haricot bean, maize, maize cropping calendar, teff, wheat, chili, sweet potato, potato, intercropping between maize and desmodium, elephant grass, heavy clay soil management technology, treatment in moisture stressed area, and water and soil conservation.</p> <p>60 copies of DA handbooks and 500 copies of the pamphlets have been prepared and distributed.</p> <p>On November 20 2001 the extension materials produced were officially handed over from the JICA Ethiopia Office to OADB.</p>
<u>Description</u>	<u>Persons</u>	<u>Days</u>	<u>Man-day</u>																										
1)Program Coordinator	1	120	120																										
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Total			<u>356</u>																										

## *Tables*

**Table 1.1.1 Member List of JICA Study Team and Counterpart Team**

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Name	Position
<b>JICA STUDY TEAM</b>	
1. Mr. M. Koyama	Team Leader / Organization & Institution
2. Mr. Y. Fukasaka	Rural Development
3. Mr. T. Igawa	Deputy TL / Irrigation and Rural Infrastructure
4. Mr. Z. Kurita	Agriculture and Soils
5. Dr. B.K. Mehta	Hydrology and Water Use
6. Mr. M. Shibata	Agricultural Support System
7. Dr. M. Titterton	Animal Husbandry
8. Dr. A.A. Latigo	Environment and Watershed Management
9. Mr. Y. Niikawa	Design and Cost Estimate
10. Ms. J. Kakinuma Jin	Project Evaluation
11. Mr. Y. Ando	Coordination
<b>COUNTERPART TEAM</b>	
1. Mr. Teshome Atnafie	Team Leader (OIDA)
2. Mr. Abera Shiferaw	Hydrology and Water Use (OIDA)
3. Mr. Abera Chala	Irrigation and Rural Infrastructure (OIDA)
4. Mr. Melesa Kare	Organization & Institution (OIDA)
5. Mr. Teshome Lemma	Design and Cost Estimate (OIDA)
6. Mr. Hasen Ahmed	Agriculture and Soils (OIDA)
7. Mr. Nigatu Bekele	Agricultural Support Services (OIDA)
8. Mr. Habtamu Teka	Animal Husbandry (Bureau of Agriculture)
9. Ms. Shitaye Lemma	Sociology (OIDA)
10. Mr. Sileshi Getahun	Environment and Watershed Management (OIDA)

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**Table 2.4.1 Staff Structure of OIDA****(1) Staff Number by Office**

Offices	Staff Number as of November 2000				
	Total		Technical	Support	Staff with College
	No.	%			
Head Office	102	14.2	45	57	56
Branch Offices	407	56.5	187	220	143
Central	136	18.9	72	64	42
Eastern	82	11.4	32	50	29
Western	121	16.8	51	70	44
Southern	68	9.4	32	36	28
District Extension Offices	211	29.3	198	13	175
Total	720	100.0	430	290	374

**(2) Staff Number by Speciality**

Technical Fields	No. of Staff, as of November 2000					
	Total		Head Office	Branch Offices	Staff with	
	No.	%			BSc	MSc
I. Engineering	195	84.1	29	166	54	14
Agricultural Engineer	70	30.2	8	62	34	5
Irrigation Engineer	24	10.3	6	18	9	4
Hydrologist/Hydraulic Engineer	14	6.0	9	5	5	5
Geologist	3	1.3	1	2	3	0
Water Management Engineer	1	0.4	0	1	0	0
Building Engineer	5	2.2	0	5	0	0
Electrician	5	2.2	0	5	0	0
Mechanical, others	73	31.5	5	68	0	0
II. Other Specialist	37	15.9	16	21	27	5
Management	7	3.0	5	2	5	0
Agricultural Economist	15	6.5	6	9	13	2
Irrigation Agronomist	12	5.2	3	9	6	3
Sociologist	2	0.8	2	0	2	0
Pedologist	1	0.4	0	1	1	0
	232	100.0	45	187	78	19



Table 2.4.2 List of Existing Irrigation Schemes in Oromai 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'l			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 Birbisa			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 Balo	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 Hima			Tulo	70.00	40.00	57.1	80	63	78.8	1994	C	River	Headworks

Table 2.4.2 List of Existing Irrigation Schemes in Oromai 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	%				
45 Homicho			Bedesa	375.00	212.00	56.5	600	200	33.3	1991	D	River	Headworks
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 Bakekisa			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 & Waliso	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

Table 2.4.2 List of Existing Irrigation Schemes in Oromai 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	%				
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
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 Laftu			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
<b>Total</b>				9,644.00	5,559.84	57.7	26,984	15,765	58.4				
<b>Average</b>				100.46	57.92	-	281	164	-				
<b>Maximum</b>				1,500.00	517.50	-	3,375	1,087	-				
<b>Minimum</b>				20.00	0.00	-	40	0	-				

**Table 3.2.1 Population and Household in Dugda Bora District**

No.	Name of PA	1994 Statistics			2000 Estimate/ 2		Population Density (Person/km <sup>2</sup> )		
		Population	No. of Total Households	Family Size	Population	No. of Total Households	Area (ha)	1994	2000 Estimate
1	Kersa Gambala	2,170	428	5.1	2,550	500	2,690	81	95
2	Abuno Kumoro	2,387	455	5.2	2,810	540	2,390	100	118
3	Adele Mirt	2,076	442	4.7	2,440	519	1,580	131	154
4	Biliti Balewoid	1,498	316	4.7	1,760	374	1,950	77	90
5	Koto Biliti	1,462	288	5.1	1,720	337	3,590	41	48
6	Argo Gadilala	1,696	353	4.8	1,990	415	2,660	64	75
7	Tuchi Denbel	1,662	333	5.0	1,950	390	2,170	77	90
8	Weyu Gebrael	1,874	401	4.7	2,200	468	2,520	74	87
9	Abono Gebrael	1,165	226	5.2	1,370	263	2,020	58	68
10	Dodoti Dembel	1,565	333	4.7	1,840	391	3,670	43	50
11	Mukeye 1	3,219	658	4.9	3,780	771	4,950	65	76
12	Birbisa Guda Sabolae	2,728	602	4.5	3,210	713	3,690	74	87
13	Birbisa Galae	1,895	374	5.1	2,230	437	2,460	77	91
14	Aella Gebre Dalacha	1,580	312	5.1	1,860	365	1,450	109	128
15	Menjegso Weji	1,881	338	5.6	2,210	395	3,030	62	73
16	Jero Raka	1,553	296	5.2	1,830	352	1,300	119	141
17	Korkie Adama	1,959	391	5.0	2,300	460	2,300	85	100
18	Goro Korkie	2,281	446	5.1	2,680	525	5,260	43	51
19	Kiltu Ambolae	2,611	552	4.7	3,070	653	3,370	77	91
20	Doyu Laman	1,823	388	4.7	2,140	455	3,240	56	66
21	Tutae Kormetu	2,129	468	4.5	2,500	556	3,150	68	79
22	Koyo Jejeba	1,495	346	4.3	1,760	409	3,370	44	52
23	Huafa Kemelaena	1,502	317	4.7	1,770	377	2,260	66	78
24	Weldia Hafa	1,906	422	4.5	2,240	498	2,240	85	100
25	Beymogusa	1,492	320	4.7	1,750	372	2,780	54	63
26	Dengoroita	1,166	254	4.6	1,370	298	2,140	54	64
27	Mukeye 2	1,585	319	5.0	1,860	372	2,750	58	68
28	Hate Leman	1,470	320	4.6	1,730	376	2,640	56	66
29	Taepa Cherokae	2,319	508	4.6	2,730	593	2,500	93	109
30	Geraba Korki Adi	3,177	635	5.0	3,730	746	2,480	128	150
31	Bekelae Gerisa	2,974	615	4.8	3,500	729	2,590	115	135
32	Weldiyo Mekdela	1,120	214	5.2	1,320	254	1,020	110	129
33	Woldia Kelina	4,690	1,065	4.4	5,510	1,252	3,190	147	173
34	Shubi Gamo	3,948	831	4.8	4,640	967	2,330	169	199
35	Tuchi Sumayan	1,841	392	4.7	2,160	460	2,250	82	96
36	Jewae Bofo	1,356	272	5.0	1,590	318	2,360	57	67
37	Oda Bokota	1,253	259	4.8	1,470	306	2,720	46	54
38	Saera Wakelae	1,417	312	4.5	1,670	371	2,640	54	63
39	Darara Dallecha	2,984	634	4.7	3,510	747	2,150	139	163
40	Burke Delecha	2,204	453	4.9	2,590	529	2,080	106	125
41	Jirma Bora	1,950	399	4.9	2,290	467	4,150	47	55
42	Berta Sami	1,814	402	4.5	2,130	473	3,620	50	59
43	Sori Dalesa	1,763	345	5.1	2,070	406	3,740	47	55
44	Tuka Langano	1,423	302	4.7	1,670	355	1,980	72	84
45	Gose Korke	2,093	443	4.7	2,460	523	3,390	62	73
46	Tuchi Deko	1,444	367	3.9	1,700	436	2,690	54	63
47	Elen	1,522	364	4.2	1,790	426	2,530	60	71
48	Keshi Huluko	1,453	338	4.3	1,710	398	1,730	84	99
49	Lanfesa Germeji	1,481	347	4.3	1,740	405	1,980	75	88
50	Gora Leman/ 1	(735)	(245)	3.0	(860)	(287)	2,070	36	42
51	Dodo Wedera	3,675	804	4.6	4,320	939	2,760	133	157
52	Malima Terae Beri	3,015	681	4.4	3,540	805	2,750	110	129
53	Tubae Suti	1,991	442	4.5	2,340	520	2,730	73	86
54	Dalota Mati	1,687	354	4.8	1,980	413	3,160	53	63
	Sub-total	106,424	22,476	4.7	125,080	26,419	145,210	73	86
	Meki Town	20,460	4,536	4.5	27,500	6,111	1,380	1,483	1,993
	Alem Tena Town	7,570	1,676	4.5	10,170	2,260	210	3,605	4,843
	Total	134,454	28,688	4.7	162,750	34,790	146,800	92	111

Note : /\_1 ; Not listed in the Census, the population included in PA No. of 49, 51 and 52 (surrounding PAs)  
The figures in ( ) are information from the District Office.  
/\_2 ; Applied the population growth rate of 2.73%/year for PA and 5.05%/year for two towns  
(Average growth rates of Oromia Region)

Source : The 1994 Population and Housing Census of Ethiopia for Oromia Region  
Volume I, Part VI (Table 2.1, 2.4, 7.3 )  
Dugra Bora District Administration Office

**Table 3.2.2 Distribution of Rural Households by Domestic Expenditure Classification**

Class of Domestic Expenditure (Birr/year)	Ethiopia		Oromia		Addis Ababa	
	Distribution (%)	Cumulative (%)	Distribution (%)	Cumulative (%)	Distribution (%)	Cumulative (%)
Below 600	0.3	0.3	0.1	0.1	0	0.0
600 - 999	1.1	1.3	0.7	0.8	0.8	0.8
1,000 - 1,399	2.2	3.5	1.0	1.8	0.8	1.6
1,400 - 1,999	6.5	10.0	3.0	4.8	3.4	5.0
2,000 - 2,599	9.3	19.2	6.0	10.8	0.8	5.8
2,600 - 3,399	13.4	32.6	9.5	20.3	11.8	17.6
3,400 - 4,199	14.7	47.3	13.4	33.7	4.0	21.6
4,200 - 5,399	18.3	<b>65.6</b>	18.5	<b>52.2</b>	11.7	33.3
5,400 - 6,599	13.1	78.8	16.3	68.5	13.1	46.3
6,600 - 8,999	13.5	92.2	19.4	88.0	20.3	<b>66.6</b>
9,000 - 12,599	6.1	98.4	9.3	97.3	20.2	86.8
12,600 - 16,199	1.1	99.4	1.6	98.9	6.0	92.8
16,200 - 19,999	0.4	99.8	0.7	99.6	1.8	94.6
20,000 and Over	0.2	100.0	0.4	100.0	5.4	100.0
Total	100.0		100.0		100.0	

Source : Revised Report on the 1995/96 Household Income, Consumption and Expenditure Survey  
Central Statistical Authority (Table 1r)

**Table 3.2.3 Distribution of Rural Households by Income Classification**

Class of Income (Birr/year)	Ethiopia		Oromia		Addis Ababa	
	Distribution (%)	Cumulative (%)	Distribution (%)	Cumulative (%)	Distribution (%)	Cumulative (%)
Below 600	0.7	0.7	0.2	0.2	0	0.0
600 - 999	2.2	2.9	1.4	1.6	0.8	0.8
1,000 - 1,399	3.8	6.7	2.2	3.9	2.5	3.3
1,400 - 1,999	8.5	15.1	5.9	9.8	1.7	5.0
2,000 - 2,599	10.1	25.2	7.8	17.6	9.9	14.8
2,600 - 3,399	14.7	39.9	11.8	29.4	7.7	22.5
3,400 - 4,199	13.3	<b>53.3</b>	13.4	42.8	5.8	28.3
4,200 - 5,399	16.1	69.4	17.3	<b>60.1</b>	11.8	40.1
5,400 - 6,599	9.9	79.2	10.7	70.8	6.6	46.8
6,600 - 8,999	11.4	90.6	15.0	85.9	19.2	<b>65.9</b>
9,000 - 12,599	6.1	96.7	9.0	94.9	15.5	81.4
12,600 - 16,199	2.0	98.8	2.9	97.8	6.6	88.0
16,200 - 19,999	0.7	99.4	1.1	98.8	5.9	94.0
20,000 and Over	0.6	100.0	1.2	100.0	6.0	100.0
Total	100.0		100.0		100.0	

Source : Revised Report on the 1995/96 Household Income, Consumption and Expenditure Survey  
Central Statistical Authority (Table 2r)

**Table 3.3.1 Crop Production in Dugda Bora Wareda (1994/95 - 1999/2000)**

(1) Cultivated Area

Crop	(Unit : ha)						
	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000/1	Average/2
Teff	16,000	16,700	15,000	15,200	16,000	15,000	15,700 (28.1)
Wheat	9,000	10,800	9,400	20,000	10,500	15,400	12,500 (22.4)
Maize	22,000	13,600	16,000	4,200	15,100	2,200	12,200 (21.8)
Haricot Bean	7,000	7,000	6,100	11,700	5,800	14,700	8,700 (15.6)
Barley	2,800	2,900	2,200	2,100	1,800	2,400	2,400 (4.3)
Sorghum	3,200	3,200	3,000	2,300	2,200	900	2,500 (4.5)
Field Peas	1,000	1,000	1,000	-	700	800	900 (1.6)
Lentil	100	200	200	200	200	200	200 (0.4)
Chick Peas	-	-	-	100	2,200	200	800 (1.4)
Total	61,100	55,400	52,900	55,800	54,500	51,800	55,900 (100.0)

(2) Unit Yield

Crop	(Unit : ton/ha)						
	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000/1	Average
Teff	0.85	0.58	1.00	0.36	0.90	0.70	0.73
Wheat	1.29	1.00	1.80	0.97	1.60	2.20	1.48
Maize	0.86	1.00	3.20	0.13	2.40	1.60	1.53
Haricot Bean	0.80	0.40	0.60	0.32	1.20	1.00	0.72
Barley	1.20	1.00	2.00	1.20	1.36	1.80	1.43
Sorghum	0.61	0.80	1.60	0.29	1.40	1.20	0.98
Field Peas	0.37	0.32	0.60	-	0.80	0.60	0.54
Lentil	0.20	0.26	0.30	0.10	0.10	0.30	0.21
Chick Peas	-	-	-	0.50	0.12	0.60	0.41
Total Average	0.77	0.67	1.39	0.48	1.10	1.11	0.89

(3) Crop Production

Crop	(Unit : ton)						
	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000/1	Average/2
Teff	13,600	9,700	15,000	5,500	14,400	10,500	11,500 (18.2)
Wheat	11,600	10,800	16,900	19,400	16,800	33,900	18,200 (28.8)
Maize	18,900	13,600	51,200	500	36,200	3,500	20,700 (32.8)
Haricot Bean	5,600	2,800	3,700	3,700	7,000	14,700	6,300 (10.0)
Barley	3,400	2,900	4,400	2,500	2,400	4,300	3,300 (5.2)
Sorghum	2,000	2,600	4,800	700	3,100	1,100	2,400 (3.8)
Field Peas	400	300	600	-	600	500	500 (0.8)
Lentil	0	100	100	0	0	100	100 (0.2)
Chick Peas	-	-	-	100	300	100	200 (0.3)
Total	55,500	42,800	96,700	32,400	80,800	68,700	63,200 (100.0)

Source : Zonal Agricultural Department, Nazareth 1999

Remarks /1: Hearing at OIDA Dugda Bora Wareda Office

/2: ( ) indicating percentage in total area / production

**Table 3.3.2 Horticulture Crop Production per each Peasant Association in the 1999 - 2000 Cropping Season**

No	P/A name	Total Land (ha)	Farm land(A) (ha)	No of FHs/Hort., crop	Planted area per crop 1999 - 2000 Year (ha)																	Net Area (B)	(B)/(A) (%)			
					Vegetables												Fruit									
					Tomato	Onion	Hot pepper	S/pepper	Cabbage	Local cabbage	Garlic	Irish potato	Carrot	Beet root	Water melon	Egg plant	Cucumber	Mango	Avocado	Papaya	Sugar-cane			Orange		
1	Makue 1	3854	1942																			0	0.0			
2	Gora Korkea	3680	1652																			0	0.0			
3	Jirne Bora	3542	1501																			0	0.0			
4	Birbira Glsabule	3532	2081																			0	0.0			
5	Sore Doleasa	3472	1396																			0	0.0			
6	Koye Jejeba	3430	1284																			0	0.0			
7	Tute Koremta	3427	1561																			0	0.0			
8	Berta Sami	3310	1536																			0	0.0			
9	Gose Korke	3269	1610																			0	0.0			
10	Welda Kalina	3033	1442		50	40	40		80		1				1	3	1			14		230	16.0			
11	Graba Korke Adi	2994	1764		18	12	8	2	2		1											45	2.6			
12	Menjisko Weje	2969	951										1	1								0	0.0			
13	Beyimo Gasa	2872	1200																			0	0.0			
14	Kiltu ombole	2856	1745																			0	0.0			
15	Deyo Leman	2745	1303																			0	0.0			
16	Dedo Wedera	2730	1586		45	5	19							20	1	1	1	1	5	1	99	6.2				
17	Ealen	2684	1027		30	20	8		6	4	2							28	8	40	3	171	16.7			
18	Tuchi Deko	2657	1217																			0	0.0			
19	Tube Suti	2659	1223																			0	0.0			
20	Dalata Mati	2658	792																			0	0.0			
21	Koto Biliti	2575	1446																			0	0.0			
22	Argo gadilala	2553	626																			0	0.0			
23	Korke Adama	2404	1237																			0	0.0			
24	Hate Leman	2400	1312																			0	0.0			
25	Welda Hafa	2380	1160																			0	0.0			
26	Karsa G/Gengelechii	2335	1307																			0	0.0			
27	Abumo Kumro	2330	1155																			0	0.0			
28	Oda Boketa	2327	1071		7	3	2		1	1												14	1.3			
29	Seara Wekele	2218	1114																			0	0.0			
30	Bekele Grisa	2172	1125		80	80	40		3	10					3	3	0.5	0.5	60	8	290	25.8				
31	Derara Dalicha	2154	1501		10	5	50															65	4.3			
32	Dedota Dembel	2151	804		18	12	8		2	2												45	5.6			
33	Bribira Gale	2115	1057																			0	0.0			
34	Dengoreta	2114	1002																			0	0.0			
35	Mukuye 2	2105	1135																			0	0.0			
36	Tuchi Sumeya	2060	1533																			0	0.0			
37	Hafa Kemele	2058	1066																			0	0.0			
38	Lafesa Germeji	2049	913		30		15															45	4.9			
39	Koshi Huluka	2044	1080																			0	0.0			
40	Jororaka	2040	952																			0	0.0			
41	Tuka Langanu	2039	808																			0	0.0			
42	Burka Debrebea	2036	1478		15	8	40		2	5												70	4.7			
43	Biliti baleweld	2031	1012																			0	0.0			
44	Adele Mirt Meteja	2030	1308																			0	0.0			
45	Tepho Cherokee	2026	1610		16	14	9		2	2												46	2.9			
46	Jawe	2007	1082																			0	0.0			
47	Shuki Gemu	1990	1437		70	70	60		2	10		4										293	20.4			
48	Tuchi Dembel	1944	1077		10	6	6			3												29	2.7			
49	Abuno Gebriel	1904	841		18	12	8		2	2												45	5.4			
50	Weyo Gebriel	1842	1179		20	8	8		2	4												45	3.8			
51	Malima Terberi	1796	972		35	4	20		2	6		2										77	7.9			
52	Gora Laman	1739	534		49		20															69	12.9			
53	Welda Mekdela	1735	1493		60		60			3												126	8.4			
54	Ela Geredaleha	1725	864																			0	0.0			
																						0	0.0			
		133801	67104		581	299	421		21	136		11	12		1	10	8	21	11	7	31	11	171	30	22	1804
					32.2	16.6	23.3		1.2	7.5		0.6	0.7		0.1	0.6	0.4	1.2	0.6	0.4	1.7	0.6	9.5	1.7	1.2	100

Source: Dugda bora District Agriculture Office, Nov., 2000

Note: The production amount includes the private farmers (non-PA's member) production.

**Table 3.3.3 Producers' Prices of Farm Products**

(1) Selling Prices of Major Crops to Middlemen in Meki Area

No	Crop	Selling Price	Unit• Birr/100 kg	
			Selling Price to Middlemen	Other
1	Peas(Atar)	180	200	
2	Haricot Bean (White & Red)	140	150	
3	Teff / White Grain	220	230	
	Teff / Brown Grain	170	180	
4	Chickpea (nuts)	140	150	
5	Horse bean (beans)	120	130	
6	Maize	70	80	
7	Wheat	130	140	
8	Barley	120	130	

Source • JICA Study Team, November 2000

(2) Price of Farm Produce at the Thursday Market Price

No	Crop	Selling Price	Unit• Birr / 100 kg	
			Selling Price to Other Middlemen	
2	Haricot Bean (White & Red)	165	175	
6	Maize	70	80	
7	Wheat	140	150	
9	Dry Hot Chili	8 -10 /kg		
10	Ethiopian Cabbage	0.5 /bunch		
11	Green Chili Pepper	0.25/heap		
12	Sugarcane	0.50/stem		
13	Orange	2.0/kg		
14	Pumpkin	2.0/pc (big)		
		0.75 /(med.)		
15	Tomato	1.5 /kg		
16	Beet Root	1.0/kg		
17	Ginger	10 /heap (4 – 5 kg)		
18	Potato	1.0 /kg		
19	Carrot	2.0 / kg		
20	Red onion	2.5/kg		
21	Garlic	2.0 /kg		

Source • JICA Study Team, October 2000



**Table 3.5.1 Grazing Management of Cattle in the Rainy Season**

PA Code	Grazing Conditions	Feeding in Rainy Season		Grazing Pattern in Rainy Season (%)				
		Grazing Only	Grazing+Supple.	1	2	3	4	5
Near Lake								
8	Poor	25	50	65	25	10	35	90
40	Poor	50	40	20	70	10	80	90
9	Medium	45	40	60	25	10	35	85
30	Medium	45	55	0	15	85	100	15
7	Good	60	25	50	5	45	50	55
29	Good	100	0	25	25	50	75	50
31	Good	30	70	5	95	0	95	100
Far from Lake								
23	Poor	95	0	60	30	5	35	90
36	Poor	0	100	5	5	0	0	90
22	Medium	100	0	15	20	40	25	35
24	Medium	100	0	25	50	25	75	75
25	Good	35	65	0	0	100	100	0
42	Good	10	90	100	0	0	0	100
26	Good	50	50	0	0	100	100	0

Note:

- 1 Near PA
- 2 By the Lake
- 3 By the River
- 4 By the Lake + by the River
- 5 PA + by the Lake

**Table 3.5.2 Grazing Management of Cattle in the Dry Season**

PA Code	Grazing Conditions	Feeding in Rainy Season		Grazing Pattern in Rainy Season (%)				
		Grazing Only	Grazing+Supple.	1	2	3	4	5
Near Lake								
8	Poor	40	60	80	0	0	35	0
40	Poor	35	10	95	0	0	80	0
9	Medium	50	50	95	0	0	35	0
30	Medium	5	50	0	0	100	100	0
7	Good	85	10	95	0	0	50	0
29	Good	70	30	50	0	50	75	0
31	Good	15	55	95	0	0	95	0
Far from Lake								
23	Poor	5	75	100	0	0	35	0
36	Poor	10	45	0	0	100	0	0
22	Medium	15	60	20	0	30	25	50
24	Medium	10	50	25	0	75	75	0
25	Good	10	90	0	0	100	100	0
42	Good	5	45	0	0	0	0	0
26	Good	30	70	0	0	100	100	0

Note:

- 1 Near PA
- 2 By the Lake
- 3 By the River
- 4 By the Lake + by the River
- 5 PA + by the Lake

**Table3.6.1 Increase in Numbers of EPP and DA in 1995-2000 (East Shewa)**

Year(Crop yr.)	National	East Shewa	Dugda Bora	Nos. of DA
1995/96	40,000	n.d.	412	72
1996/97	350,000	11,109	578	99
1997/98	650,000	17,272	821	188
1998/99	2,500,000	60,117	4,721	225
1999/00	4,000,000	111,315	9,371	339
2000/01	5,000,000	130,523	10,238	359

Source: NFIA report; East Shoa AD(Nazareth); Dugda Bora AO(Meki)

**Table 3.6.2 Marketing / Exchanging of Produced Seeds and Seed Transfer**

Seed utilization	Quantity	Total %	Network type	Seed growers	%
Marketed	16 ton	63 %	Neighborhood	64 farmers	62 %
Reserved	2.8	11%	Friendship	27	26%
<u>Exchanged</u>	<u>6.5</u>	<u>26%*</u>	<u>Members of relative</u>	<u>12</u>	<u>12%</u>
Total	25.3 ton	100 %	Total	103 farmers	100 %

Source: "Local seed supply in Central rift valley" by A. Deressa, 1996

**Table 3.6.3 Farmers' Seed Exchange Methods by Social Networks**

(No. of seed growers who transferred seeds to others in methods)

Type of Social network	Lend	Sell	Exchange	Gift	%
Neighborhood	33	21	8	2	62%
Friendship	17	7	3	-	26%
<u>Members of relative</u>	<u>9</u>	<u>2</u>	<u>-</u>	<u>1</u>	<u>12%</u>
Total %	57%*	29%	11%	3%	100 %

\*Farmers' mutual lending(credit) of seed counts 14.8%( 0.26 times 0.57).

Source: "Local seed supply in Central rift valley" by A. Deressa, 1996

**Table 3.6.4 FBSPMS Achievements in 1977-1999**

	<i>Participants (farmers)</i>			<i>Acreage (ha)</i>			<i>Seed Production (qts:100kg)</i>		
	Oromia	Others*	Total	Oromia	Others	Total	Oromia	Others	Total
1997/98	276	1,176	1,452	244	497	741	4,209	6,656	10,865
1998/99	1,336	8,148	9,754	626	3,975	4,601	12,689	45,430	58,119
1999/00	2,300	13,941	16,241	1,087	6,113	7,200	25,650	135,790	161,440
Total	3,899	23,548	27,447	1,895	10,647	12,542	42,548	187,876	230,424

\*6 regions• Amhara, SNNPR, Tigray, Gambella, Benshangul, and Harari.

Source: NSIA Report• Aug. 2000

**Table3.6.5 Seed Distribution by Respective Producers in 1995-2000**

(••: 1,000 ton)

	ESE	FBSPMS	Private Sector*	Total
1995/96	12,260(94%)	-	730( 6%)	12,990(100%)
1996/97	10,490(94%)	-	630( 6%)	11,120(100%)
1997/98	15,600(91%)	1,090( 6%)	470( 3%)	17,160(100%)
1998/99	10,930(60%)	5,810(32%)	1,450( 8%)	18,190(100%)
1999/2000	<u>22,430( 56%)</u>	<u>16,140(41%)</u>	<u>1,250( 3%)</u>	<u>39,820(100%)</u>
Total	71,710(72%)	23,040(23%)	4,530(5%)	99,280(100%)

\*Ethiopian Hybrid Seed Incorporated(only Hybrid Maize)

Source: EARO; Seed Research & Multiplication Strategy; July, 2000

**Table3.6.6 Yield Difference by Local Seed and Improved Seed**

(Unit: t / ha)

	Traditional practice <i>No fertilizer By local seed</i>	Traditional practice <i>With fertilizer By local seed</i>	Improved practice <i>With fertilizer &amp; By improved seed</i>					
			<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>Av</i>
Maize	1.7	2.1	4.9	4.4	3.4	4.6	4.4	4.3
Wheat	1.2	1.6	2.7	2.4	2.2	3.1	2.5	2.6
Teff	0.7	1.1	1.1	1.4	0.9	1.4	1.3	1.2
Barley	1.0	1.5	-	2.9	1.8	2.1	2.0	2.2
Sorghum	1.2	1.5	3.1	2.7	1.8	2.5	2.4	2.5

Source: Fertilizer in Oromia • By NFIA, Nov. 2000 • See Annex 8 (2) 10 •

**Table 3.6.7 Oromia Fertilizer Consumption in Every Zone in 1995-2000**

(Unit: 1,000t)

<i>No.</i>	<i>Zone</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
1.	Arsi*	26.5	24.0	24.5	27.2	23.0	22.7
2.	Bale	3.5	3.9	3.2	6.5	8.5	5.0
3.	Borena	0.1	0.3	0.2	0.4	0.7	1.3
4.	E. Hararge	5.7	5.4	2.8	4.5	7.6	4.5
5.	W. Hararge	0.5	1.8	1.0	2.6	4.2	3.6
6.	Ilubabor	1.8	2.5	1.7	3.0	3.5	3.8
7.	Jimma	10.7	9.5	6.3	6.2	8.8	8.9
8.	E. Shoa*	37.8	32.6	23.2	21.1	19.6	22.3
9.	N. Shoa	5.8	5.3	6.2	8.3	9.5	8.3
10.	W. Shoa*	29.8	32.3	19.2	24.7	29.4	30.9
11.	E. Welega	9.5	9.6	7.1	9.3	10.0	14.3
12.	W. Welega	2.6	4.2	3.5	5.7	7.1	14.1
	Oromia Total	134.4	131.4	98.8	119.7	131.7	139.6
	Three Major zones*	94.1	88.9	66.8	73.1	71.9	75.9
	(%)	70%	68%	67%	61%	55%	54%

\*Three major zones mean Arsi, East Shoa and West Shoa

Source: Report; Fertilizer Marketing in Oromia(Oct. 2000, NFIA)

**Table 3.6.8 Import Price and Sale Price in Fertilizer in 1997-2000**

<i>Year</i>	<i>Import Price(CIF: US\$/ t)</i>		<i>Sale Price(Birr/ t)</i>			
	<i>Variety</i>		<i>Oromia Region Average</i>		<i>East Shoa (Nazareth)</i>	
	DAP	Urea	DAP	Urea	DAP	Urea
1997	275	244	2,488	2,341	2,371	2,224
1998	248	148	2,433	1,851	2,110	1,515
1999	236	98	2,536	1,620	2,240	1,330
2000	208	110	2,827	1,920	2,563	1,800

Source: The Report of The 5<sup>th</sup> Annual Fertilizer Workshop; Oct. 2000

**Table 6.3.1 Development Approaches and Project Selection**

Development Approaches	Candidates Projects (31)	Master Plan 21 Projects
<b>a. Irrigation Farming Promotion Approach</b>	<b>1. Irrigation Development Programme</b>	<b>1. Irrigation Development Programme</b>
a.1 Irrigation planning and monitoring capacity building a.2 Operation and maintenance reinforcement a.3 Participatory small-scale irrigation development a.4 Irrigation farming technique improvement	1.1 WUA Support Programme 1.2 Meki Irrigation and Rural Water Supply Project	1-1 WUA Support Programme 1-2 Meki Irrigation and Rural Water Supply Project
<b>b. Rain-fed Agriculture Improvement Approach</b>	<b>2. Rain-fed Agriculture Improvement Programme</b>	<b>2. Rain-fed Agriculture Improvement Programme</b>
b.1 Farming techniques optimization b.2 Optimized farming techniques extension b.3 Farm inputs supply sub-approach b.4 Post-harvest techniques optimization b.5 Price-setting improvement b.6 Supplemental irrigation water supply	2.1 Semi-Arid Zone Cereal Production Improvement Programme 2.2 Post-Harvesting Techniques Improvement Programme 2.3 Farm Pond Promotion Project	2-1 Semi-Arid Farming Improvement Project 2-2 Community Seed Bank Project 2-3 Post-Harvesting Techniques Improvement Project 2-4 Community Pond Project
<b>c. Animal Husbandry Modernization Approach</b>	<b>3. Animal Husbandry Modernized Programme</b>	<b>3. Animal Husbandry Modernization Programme</b>
c.1 Improved breed introduction c.2 Forage production promotion c.3 Veterinary services supporting c.4 Animal husbandry techniques optimization c.5 Optimized animal husbandry extension	3.1 Demonstration Unit Project 3.2 Forage Production Project 3.3 Improved Breed Promotion Project 3.4 Biogas Plant Promotion Project	3-1 Demonstration Unit Project 3-2 Forage Production Project 3-3 Improved Breed Promotion Project
<b>d. Environmental Conservation Approach</b>	<b>4. Environmental Conservation Programme</b>	<b>4. Environmental Conservation Programme</b>
d.1 Watershed management d.2 Farmland conservation d.3 Environmental education promotion	4.1 Environmental Monitoring Programme 4.2 Seedling Center Project 4.3 Watershed Management Programme	4-1 Environmental Monitoring Programme 4-2 Seedling Center Project 4-3 Watershed Management Programme
<b>e. Capacity Building Approach</b>	<b>7. Capacity Building Programme</b>	<b>5. Capacity Building Programme for OIDA and Wareda Staff</b>
e.1 Local government staff training e.2 Community leaders training e.3 Community awareness creation e.4 Off-farm income generation	7.1 OIDA Engineers Training Programme 7.2 OIDA Community Development Expert Training Programme 7.3 Wareda Staff Training Programme 7.4 WUA Supporting Project 7.5 Group Leader Training Programme 7.6 Community Awareness Creation P. 7.7 Drinking Water Training Programme 7.8 Nutritional Improvement Training P. 7.9 Gender/Environment/Poverty Reduction Training Programme 7.10 Meki Vocational Center Establishment P. 7.11 Homestead Horticulture Crop Production Programme	5-1 OIDA Engineers Training Programme 5-2 OIDA Community Development Experts Training Programme 5-3 Wareda Staff Training Programme 5-4 Community Resource Mapping Project
	<b>6. Cooperative Promotion Programme</b>	<b>6. Community Development and Cooperative Promotion Programme</b>
	6.1 Farm Inputs Storage & Distribution Improvement Project 6.2 Village Mills Promotion Programme 6.3 Grain Bank Promotion Programme 6.4 Women Group Poultry Farming Project	6-1 Community Leader Training Programme 6-2 Visioning Workshop Programme 6-3 Drinking Water and Nutritional Improvement Education Programme 6-4 Community Center Project 6-5 Grain Bank Promotion Programme
<b>f. Rural Infrastructure Development Approach</b>	<b>5. Rural Infrastructure Improvement Programme</b>	
f.1 Rural drinking water supply f.2 Rural roads development f.3 Rural primary health care promotion f.4 School construction	5.1 Rural Water Supply Project 5.1 Farm Road Improvement Project 5.3 Multipurpose PA Center Project 5.4 School & Dispensary Establishment P.	

**Table 6.3.2 Project Summary Sheets (1 / 21)**

<b>Program</b>	<b>1. Irrigation Development Program</b>	
<b>Sub-Program</b>	<b>1-1 Water Users Associations (WUAs) Support Program</b>	
<b>Target Group</b>	Both existing and candidate water users associations (WUAs) for future small-scale pumping irrigation development	
<b>Background &amp; Objectives :</b>		
<p>[1-1] Water Users Association Support Program aims at supporting small farmers' irrigation activities through technical and institutional capacities building for WUAs as well as local staff of OIDA. Some 160 small pumps are currently operated for irrigation purposes in the Dugda Bora Wareda. Out of 160 units, 75 are installed along both the Meki river and the Ziway lake. These pumps supply irrigation water mainly to horticultural crops throughout the year. Most of these pumps are owned by rich farmers, who generally hire small farmers as farm labor force. On the other hand, the community-based irrigation activities are limited in terms of both number of farmers and extent of irrigation area. This situation implies that the on-going irrigation farming contribute more to poverty alleviation along the national policy but profit generation for pump owners. There are only 15 WUAs in the Dugda Bora Wareda. They are organized by 400 farmers in total and manage 500 ha for cereal and horticultural crops mainly for local consumption. This sub-program will place emphases more on reinforcement of the existing 15 WUAs and further establishment of new WUAs in line with a long-term strategy. All those WUAs are expected to integrate under the proposed large-scale gravity irrigation system, i.e. [1-2] Meki Irrigation and Rural Water Supply Project. This sub-program will also support the capacity building of OIDA, who will play a leading role in community mobilization. Encouraged by performance in the existing irrigation areas, some 20 farmers' groups already expressed urgent needs of government supports to them. The sub-program consists of two (2) phases. In Phase I from September 2002 to December 2003, the capacity building program will be provided by OIDA to the existing 15 WUAs. In Phase II from January 2004 to December 2005, the new schemes will be developed. The sub-program will embark on community mobilization, financial arrangement, technical guidance and pump installation and on-farm construction.</p>		
<b>Activities :</b>		
<ul style="list-style-type: none"> <li>• To make inventory of existing small-scale pumping irrigation schemes in the Meki area and prepare their data-base for monitoring</li> <li>• To strengthen supporting system of OIDA at the wareda level</li> <li>• To provide technical and financial support to the existing 15 water users association (WUA) in the Meki area, which comprise 400 householders with 500 ha.</li> <li>• To investigate defects of the existing pumps of the Meki-Ziway irrigation scheme and rectified them.</li> <li>• To make assistance to communities for establishment of new WUAs and their by-laws and operation rules including cost sharing</li> <li>• To assist new WUAs to access fund sources of donors and NGOs for project implementation</li> <li>• To support installation of new pumps and devilmont of on-farm irrigation facilities</li> <li>• To make a technical guidance for irrigation farming and water management</li> <li>• To strengthen all the WUAs in order to facilitate their integration for future development of a large-scale gravity irrigation scheme, i.e. [1-2] Meki Irrigation and Rural Water Supply Project</li> </ul>		
<b>Input : Donor</b>		<b>Input : Ethiopian side</b>
<ul style="list-style-type: none"> <li>• Participatory Development Expert (24 men-months)</li> <li>• Irrigation Expert (24 men-months)</li> <li>• Small pumps and related equipment (20 units)</li> <li>• O&amp;M cost for initial stages</li> <li>• Vehicles</li> </ul>		<ul style="list-style-type: none"> <li>• Counterpart personnel from OIDA</li> <li>• Wareda staff of OIDA and Bureau of Agriculture</li> <li>• Translators</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Institutional reinforcement of the existing 15 WUAs (500 members) and establishment of new 20 WUAs (600 members)</li> <li>• Improvement of farm income and living conditions of WUA members</li> <li>• Expansion of drinking water availability</li> <li>• Capacity building of OIDA staff</li> </ul>		

**Table 6.3.2 Project Summary Sheets (2 / 21)**

<b>Program</b>	<b>1. Irrigation Development Program</b>	
<b>Sub-Program</b>	<b>1-2 Meki Irrigation and Rural Water Supply Project</b>	
<b>Target Group</b>	Small farmers in the Meki area	
<b>Background &amp; Objectives :</b>		
<p>The main objective of the project is to introduce a gravity irrigation system, which is more sustainable in comparison with pump irrigation system, particularly to drought prone zone of the Meki area by means of proposed headwork and the irrigation system (tentatively 3,200 ha) on the Meki River. The project is expected to contribute to promotion of stable food production and poverty alleviation in the area. Currently, the water uses in the Meki area concentrates geographically only along the Meki river and on the lakeshore of Ziway due to the capacity of small pumps. Potentials for future expansion are highly limited as far as only small pumping irrigation will be sustained. This means that majority of local farmers will be able to access to stable water resources and continue unstable rain-fed agriculture and cattle grazing under the semi-arid conditions with an annual rainfall of 760 mm. Domestic water as well as irrigation water is very limited in the Meki area. Most of local communities obtain drinking water from existing wells along the lakeshore and running water in the Meki river basin. Due mainly to low density of wells and low yield of groundwater, farmers are forced to devote several hours a day for fetching water. Furthermore, water-borne diseases are prevailing as a result of use of stagnant water without awareness of water quality.</p> <p>In order to tackle the chronicle problems, i.e. low and unstable agricultural production and lack of domestic water, OIDA envisages constructing a dam of 40 m high on the Meki river to supply water to 8,000 ha throughout the year. However, the water balance study carried out through the JICA study verified serious negative impact to the downstream ultimately the water resource system of the Abijata lake, which is located within the Abijata-Shella National Park. The study tentatively selected the intake weir at some 3 km upstream of the Meki town and divert river water to the lakeshore area. The water users will be organized into a union of the WUAs to be set up under [4-1] Environmental Monitoring Program.</p> <p>The study also clarified the necessity of the long-term environmental monitoring system for the entire water resource system from both Meki and Katar rivers to the Abijata lake through the Ziway lake and the Bulbula river. The project will be formulated and periodically reviewed taking into consideration the monitoring results to be obtained through [1-1] Water Users Associations (WUAs) Support Program.</p> <p>Community mobilization will be the key factor of successful implementation of the project. Prior to the project, therefore, the capacity building for the OIDA staff will be encouraged under [5-1] OIDA Engineers Training Program and [5-2] OIDA Community Development Experts Training Program.</p>		
<b>Activities :</b>		
<p>The project will be carried out according to the following procedures.</p> <ul style="list-style-type: none"> <li>• To monitor and analyze both hydrological data and water use within the Meki-Ziway-Abijata system</li> <li>• To assess environmental impact of the proposed large-scale irrigation project.</li> <li>• To carry out a feasibility study including Environmental Impact Assessment (EIA)</li> <li>• To prepare the detailed design and tender document</li> <li>• To promote community mobilization and awareness creation</li> <li>• To establish a WUA, in which all the WUAs trained under “1-1 WUA Support Program”</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Cost and professional inputs for F/S</li> <li>• Cost and professional inputs for design</li> <li>• Capacity building programs</li> <li>• Project costs</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OIDA counterpart personnel</li> <li>• OIDA’s supervision units</li> <li>• OIDA’s sociologist social workers</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Stable and increased crop production and domestic water supply</li> <li>• Reinforcement of WUAs’ management capacity and empowerment to the WUA members</li> <li>• OIDA’s capacity building</li> </ul>		

**Table 6.3.2 Project Summary Sheets (3 / 21)**

<b>Program</b>	<b>2. Rain-fed Agriculture Improvement Program</b>	
<b>Sub-Program</b>	<b>2-1 Semi-Arid Farming Improvement Project</b>	
<b>Target Group</b>	Development Agents (DAs) and small farmers in Dugda Bora Wareda	
<p><b>Background &amp; Objectives :</b></p> <p>The project aims to establish the optimum farming system suited to local conditions of the Meki area under the semi-arid climate through the actual three-year research in situ. The research will fully take into consideration the traditional farming techniques prevailing among local farmers and research results worked out by the Ethiopian Agricultural Research Organization (EARO). The research network will be established with the Melkasa Research Center as well as NGOs in order to exchange the knowledge on research experiences and other related information. The research aspects to be undertaken will include the followings;</p> <ul style="list-style-type: none"> <li>• Crop selection, cropping patterns, mixed cropping, crop seasons, etc.</li> <li>• Preservation and pureline selection of traditional varieties, multiplication of improved varieties, etc.</li> <li>• Improvement of farming practices and implements</li> <li>• Mulching and soil conservation practices</li> <li>• Optimization of fertilization suitable for the local conditions of the Meki area</li> <li>• Precaution of pests and disease out-break</li> <li>• Optimum post-harvesting techniques for maximum use of crop residues as animal feed</li> <li>• Improvement of soil fertility by applying organic matters and effective micro-organisms (EM)</li> <li>• Improvement of soil fertility by introduction of more legumes in crop rotation</li> <li>• Soil diagnosis and assessment to prevent from salinity hazard and soil erosion</li> <li>• Establishment of supplemental irrigation and drainage method by optimizing water supply amount and interval</li> </ul> <p>The above-mentioned experiments will be carried out in the temporary research station set up in the Meki area. The techniques to be optimized will be transferred to local farmers through the existing extension channel of Development Agents (DA). In addition, group leaders will be trained at the research station for introduction of community-based extension channels.</p> <p>The research will be carried out in the three-year period from 2003 to 2005. The results will be incorporated into extension materials.</p> <p>At the completion of the research, the project will set up further research program including organizational and administrative arrangement to be undertaken by the Ethiopian side.</p>		
<p><b>Activities :</b></p> <p>The research will be carried out for three years paying particular attention to the following aspects;</p> <ul style="list-style-type: none"> <li>• To design the research activities</li> <li>• To establish the temporary research station within the Meki area</li> <li>• To carry out the research under supervision of expatriates researchers</li> <li>• To establish optimum farming techniques</li> <li>• To demonstrate the research activities to DAs and key farmers</li> <li>• To prepare extension materials for DAs and key farmers</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>• Agriculturist (18 men-months)</li> <li>• NGO or local consultants (6 men-months)</li> <li>• Vehicles</li> <li>• Research equipment</li> <li>• Soil survey equipment</li> </ul>	<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>• Counterpart personnel from Bureau of Agriculture</li> <li>• Wareda staff</li> <li>• Translator</li> <li>• Research plot (approximately 2 ha)</li> </ul>	
<p><b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA) and Bureau of Agriculture (OBA)</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Establishment of semi-arid farming system suited to local conditions of the Meki area</li> <li>• Extension materials suited to local farmers in the Meki area</li> <li>• Promotion of the extension activities</li> </ul>		

**Table 6.3.2 Project Summary Sheets (4 / 21)**

<b>Program</b>	<b>2. Rain-fed Agriculture Improvement Program</b>	
<b>Sub-Program</b>	<b>2-2 Community Seed Bank Project</b>	
<b>Target Group</b>	Communities and small farmers	
<b>Background &amp; Objectives :</b>		
<p>Crop productivity and quality are basically declined by continuous use of homemade seeds without renewal. Especially deterioration of seeds is significant after three generations (crop seasons). Limited use of certified seeds is one of the constraints against reasonable crop yields in the Meki area. Although quality seeds are introduced to the Meki area through the extension program, its coverage is still limited. Some reasons are identified. Firstly, the financial situation of farmers does not allow full use of quality seeds. Secondly, availability of quality seeds is sometimes too low to meet local requirement due to limited seed stocks in Ethiopia Seed Enterprise (ESE), especially for teff and haricot beans. Thirdly, poor accessibility to seed distribution points in the Meki area hinders timely procurement of farm inputs. Although local farmers traditionally reserve some amounts of produces as seeds for next crop seasons, they often sell all produces immediately after harvesting. Therefore, seed stock in the area is chronically in short.</p> <p>The project aims at preservation of second generation seeds to be harvested from plots sown with quality seeds instead of consumption. Currently, the following certified seeds are widely introduced to the Meki area.</p> <ul style="list-style-type: none"> <li>• Maize (early maturing variety)      AW511</li> <li>• Maize (late maturing variety)      BH660</li> <li>• Wheat(early maturing variety)      Paran</li> <li>• Teff      CR37</li> <li>• Haricot beans      Awash</li> </ul> <p>The project will be promoted by community-based approach with minimum government supports. Quality seeds will be procured by communities and released to peasants timely. Orthodox churches, i.e. two in Meki town and 30 in the Wareda, will also be able to coordinate seed marketing between communities.</p>		
<b>Activities :</b>		
<p>The project will select farmers who would obtain certified seeds under Extension Package Program (EPP) and select well-maintained plots in which EPP seeds by DAs and community leaders. Community will make a contract on seed procurement with farmers, purchase seeds and store them. Prior to crop seasons, communities supply farmers who can not access official seed sources. It is essential to take the following necessary actions for smooth operation.</p> <ul style="list-style-type: none"> <li>Price setting      •Purchase and selling prices</li> <li>Seed storage      • Use of existing storage and installation of new storage</li> <li>Guarantee      • Seeds should be virus free without mixture of weeds and ensure at least 70% of germination.</li> </ul>		
<b>Input : Donor</b>		<b>Input : Ethiopian side</b>
<ul style="list-style-type: none"> <li>• Agriculturist (12 men-months)</li> <li>• NGO or local consultants (12 men-months)</li> <li>• Vehicles</li> <li>• Storage and weighing machines</li> </ul>		
<b>Executing Agencies :</b> Communities and Orthodox church		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Increased crop production by improvement of seed quality</li> <li>• Timely distribution of quality seeds</li> <li>• Contribution to food security</li> </ul>		



**Table 6.3.2 Project Summary Sheets (5 / 21)**

<b>Program</b>	<b>2. Rain-fed Agriculture Improvement Program</b>	
<b>Sub-Program</b>	<b>2-3 Post-Harvesting Techniques Improvement Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>Post-harvest loss is significant in Ethiopia. According to the FAO staff in Addis Ababa, the total loss in the nation is estimated as much as 25% of the total production at on-farm level. The project aims at minimization of post-harvest loss at several processes, namely threshing, transport, milling and storing. The basic strategy is mentioned below.</p> <ul style="list-style-type: none"> <li>•Storage: On-farm grain storage is widely used in the rural area of Oromia Region. They are basket-type storage made by locally available materials and contribute to food security at farmers' level. DAs provide farmers technical guidance for installation of their improved model. The project aims at assisting procurement of construction materials. The project will be integrated with [6-5] Grain Bank Promotion Program in future.</li> <li>□Transport: Grains are threshed, bagged and transported from farm to market by hand. Loss through the processes is significant. Bagging materials and carts will be promoted under the project.</li> <li>•Flour mills: Maize is generally pounded at home and mechanical milling is limited. There are nine (9) flourmills within the wareda. They are old and deteriorated. The project will assist the financial arrangement for millers to renew milling machines.</li> <li>•Threshing: Grain crops are threshed by tramping of cattle and winnowed. During this process, substantial amounts of grains are lost. Melkasa Research Center focuses on minimizing losses by introduction of multi-grain threshers. The research has been carried out for development of machines by the JICA expert for two years and transferred to SG2000 afterward. At present, some 60 units of threshers are introduced in the domestic markets. The project envisages more introductions in future.</li> </ul>		
<b>Activities :</b>		
<p>The project included the following activities;</p> <ul style="list-style-type: none"> <li>• To promote modified on-farm storage by supplying construction materials to local farmers</li> <li>• To promote bagging materials and ox-carts</li> <li>• To promote small flourmills by supporting cooperatives and micro- entrepreneurs</li> <li>• To promote multi-grains threshers</li> </ul> <p>To assist the above-mentioned components, multi-financial schemes including grant-aid and short-and long-terms credits will be required.</p>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Rural infrastructure expert (12 men-months)</li> <li>• Vehicles</li> <li>• Construction materials for on-farm grain storage</li> <li>• Provision of ox-carts</li> <li>• Credit schemes for procurement of threshers and milling machines</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• Counterpart personnel</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Bureau of Agriculture (OBA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Mitigation of post-harvest losses</li> <li>• Improvement of farm family income</li> <li>• Promotion of micro-enterprises for post-harvest sector</li> <li>•</li> </ul>		

**Table 6.3.2 Project Summary Sheets (6 / 21)**

<b>Program</b>	<b>2. Rain-fed Agriculture Improvement Program</b>	
<b>Sub-Program</b>	<b>2-4 Community Pond Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>World Food Program (WFP) promoted development of community ponds as one of the components of the nationwide soil and moisture conservation programs since 1980s. The development has targeted the rural communities in and around Nazareth and completed. Most of ponds are currently under full responsibility of the relevant communities and supply domestic water to villagers and animals. The daily management of ponds is generally entrusted from communities to caretakers of ponds with regular payment of about Br. 150 per month. Desilting sediment accumulated in settling basins is also organized by communities.</p> <p>In Nazareth, ponds are generally constructed with embankment and storage of less than 500 m<sup>3</sup> dug within old river courses and ox-bow lakes with micro-catchment of less than 5 km<sup>2</sup>. Development potential of ponds in Meki may as same as that in Nazareth since climatic and physiographical conditions of both Meki (annual rainfalls : 760 mm) and Nazareth (870 mm) are similar. Rather than natural development potentials, social factors may be more important for successful community pond development. Mutual agreement among the community is prerequisite for land acquisition for pond area and land use of catchment (natural vegetation and cereal farms have to be maintained). Negative impact, e.g. water-borne diseases, should be assessed.</p> <p>The project aims at development of community ponds in remote areas far from stable water resources such as the Meki river and the Ziway lake. The potential sites will be selected in the areas with the following conditions.</p> <ul style="list-style-type: none"> <li>• Footslopes along the uplands; ponds combined with check-dam construction</li> <li>• Swamps and marsh</li> <li>• Drains along rural roads</li> </ul>		
<b>Activities :</b>		
<p>The project will be carried out according to the following procedures.</p> <ul style="list-style-type: none"> <li>• To make inventory of existing community ponds</li> <li>• To investigate water bodies and possible sites for future pond development</li> <li>• To set up planning and design criteria</li> <li>• To assist community by technical guidance and provision of materials</li> <li>• To assist water quality monitoring</li> </ul>		
<b>Input : Donor</b>		<b>Input : Ethiopian side</b>
<ul style="list-style-type: none"> <li>• Rural infrastructure expert (12 men-months)</li> <li>• Community development expert (6 men-months)</li> <li>• Vehicles</li> </ul>		<ul style="list-style-type: none"> <li>• OIDA counterpart personnel</li> <li>• Topographic surveyors</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA) and Bureau of Agriculture (OBA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Domestic water source for drinking, animal and supplementary irrigation purposes</li> <li>• Mitigation of workload for fetching water</li> </ul>		

**Table 6.3.2 Project Summary Sheets (7 / 21)**

<b>Program</b>	<b>3. Animal Husbandry Modernized Program</b>	
<b>Sub-Program</b>	<b>3-1 Demonstration Unit Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>The animal population in the Dugda Bora Wareda amounts to 206,000 heads of cattle and 89,000heads of sheep and goats. The biggest constraint encountered the livestock sector is chronicle shortage of animal feed sources. The carrying capacity of the wareda is estimated to be as low as 0.13TLU/ha (TLU- tropical livestock unit: 270kg). In contrast, actual stocking rate in the same wareda is as high as 0.25TLU/ha on an average. In one of PAs, the grazing sources are intensively consumed at the rate of 0.58TLU/ha or nearly 5 folds of the carrying capacity. Overgrazing is the direct cause of low animal productivity and environmental deterioration. In view of environmental conservation, there is an urgent need to optimize the animal husbandry in the wareda.</p> <p>Zebu and Sanga represent the prevailing cattle breed in the Meki are highly tolerant to drought and diseases. They environmental conservation, the regional livestock sector needs to be optimized under the zero-grazing system. They provide animal power for farming practices and income source. Although farmers are interested in introduction of improved breeds, modernization of animal husbandry is hindered due to lack of both forage and animal health services in the Meki area. It is important to convince farmers high profitability of modernized animal husbandry under the zero-grazing system with crossbreeds and improved forages.</p> <p>The basic concept of the livestock modernization program is the increased livestock productivity by (1) introduction of cross-bred integrated with (2) forage production and improvement of husbandry techniques. Adamitulu Research Station has performed the livestock research focusing on adaptability of two types of crossbred, i.e. Boran x Jersey and Boran x Holstein-Friesian.</p> <p>Since farmers' husbandry technique are still insufficient to ensure modern animal husbandry, the project envisages to introduce the crossbreeds through the demonstration units. In parallel, forage production by utilizing crop residues (one-bag silage) and environmental education will be promoted.</p>		
<b>Activities :</b>		
<p>The project will establish the Demonstration Units under the government management in three-year period from 2003 to 2005. The Demonstration Units consist of the following components;</p> <ul style="list-style-type: none"> <li>• Cow-sheds for two heads of cow and storage for one-bag silage*</li> <li>• Irrigated plots of 0.5 ha for forage production</li> <li>• Paddock of 0.5 ha</li> </ul> <p>*One-bag silage are prepared by mixing chopped crop residues and morasses in small parasitic bags</p> <p>In parallel to the demonstration units, crossbreeds will be introduced to 30 farmers with financial supports similar to Smallholder Dairy Development Program (SDDP).</p>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Livestock expert (18 men-months)</li> <li>• Vehicles</li> <li>• Facilities and equipment for Demonstration Units</li> <li>• Small pump for irrigation and straw chopper, etc.</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OBA counterpart personnel</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Bureau of Agriculture (OBA) and Adamitulu Research Station		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Creation of community-based initiative for livestock modernization</li> <li>• Improvement of farm family income</li> <li>• Environmental conservation</li> </ul>		

**Table 6.3.2 Project Summary Sheets (8 / 21)**

<b>Program</b>	<b>3. Animal Husbandry Modernized Program</b>	
<b>Sub-Program</b>	<b>3-2 Forage Production Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>Ethiopian farmers generally attach a priority to crop production than animal husbandry. Since animal husbandry in Ethiopia has been dependant largely upon natural grazing resources, it is highly difficult for farmer to accept to allocate their farm land and other resources for animal husbandry.</p> <p>Agricultural support system such as research, marketing, credit and extension also directs more efforts to improvement of crop production. The support system for the animal husbandry has been less established. The gap between crop production and animal husbandry is also recognized in allocation of farmland at farmers' level.</p> <p>Animal population has sharply increased in recent years. It is crucial for the livestock sector to meet rapidly increasing forage demand not only in Ethiopia but also in the Meki area. Firstly improvement of forage productivity is urgent issue in Ethiopia.</p> <p>Secondly, more efficient use of crop residues is important to make up the gap shortage of forage. Crop residues contribute to 11% of the total animal feed consumption in Ethiopia. It is estimated that the average farmer produces 2.6 ton of crop residues including straws and shells with 1.5 ha of farmland in the Meki area. In addition, by-products of agro-industries are also valuable animal feed. The existing sugar factories at three locations including Wenji near Nazareth produce morasses and the edible oil factory at Mojo produces cake of cottonseeds after oil extraction. These by-products are not fully utilized for animal feeds.</p> <p>The project aims at •introduction of forage crops to the Meki area and •promotion of efficient use of crop residues and by-products by agro-industries. The project envisages to extend the experience obtained through [3-1] Demonstration Unit Project.</p>		
<b>Activities :</b>		
<p>The project will include the following activities.</p> <ul style="list-style-type: none"> <li>• To educate farmers on necessity and technique of forage production</li> <li>• To distribute grass seeds (napiar grass and elephant grass) and legumes seedlings (dismodem, lovelove and cowpea) to farmers</li> <li>• To promote more use of by-products of agro-industries, e.g. morasses and cotton seed cake.</li> <li>• Introduction of straw choppers for promotion of on-bag silage</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Livestock expert (12 men-months)</li> <li>• Vehicles</li> <li>• Receiving units of morasses and seed cakes</li> <li>• Straw chopper</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OAB counterpart personnel</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Bureau of Agriculture (OBA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Motivation for animal husbandry modernization</li> <li>• Contribution to environmental conservation</li> <li>• Improvement of animal production</li> </ul>		

**Table 6.3.2 Project Summary Sheets (9 / 21)**

<b>Program</b>	<b>3. Animal Husbandry Modernized Program</b>	
<b>Sub-Program</b>	<b>3-3 Improved Breed Promotion Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>Adamitulu Research Station, which is located in the south of the Ziway lake, has played a leading role for livestock development in East Showa Zone of Oromia Region. The Station was established in 1968 by Ethiopia Agricultural Research Organization (EARO) and has carried out practical animal researches to improve the husbandry techniques and productivity. The Station was transferred to Oromia Region in 1993. Some 15 researchers currently make their efforts mainly for improved breeds and their introduction. The Station embarked on the research for breed improvement with traditional breeds such as Barka and Boran and imported breeds such as Jersey, Holstein-Friesian, Simental, etc. So far, the Boran cross-bred (F1, 50•62.5%) with Jersey and Holstein Friesian is recognized to be the most suitable for local conditions of the Meki area.</p> <p>The crossbred of Boran and Jersey is highly tolerant to drought and high temperature. They are advantageous from the viewpoint of animal health control but less suitable for draft animal. Therefore, the relevant education is essential for local farmers when the Boran and Jersey crossbred is introduced. In contrast, the Boran and Holstein cross-bred is high milk yielding and advantageous as animal power sources but less resistant to unfavorable climatic conditions and diseases.</p> <p>Under the project, the priority is tentatively given to the Boran and Holstein crossbred. In association with researchers from Adamitulu Research Station, the project will promote the Boran and Holstein crossbred in the Meki area.</p> <p>The project envisages multiplying the Boran and Holstein crossbred and introduce them. For successful introduction of the crossbred, the animal health services will be reinforced. Prevailing animal diseases include Anthrax, Black Leg (Quarter Evil), Pasteurellosis and Lumpy Skin Disease. There is one veterinary clinic in Meki town and one health post with 10 veterinary crushes distributed around the wareda. The project promotes introduction of more veterinary services and installation of crushes.</p>		
<b>Activities :</b>		
<p>The project consists of the following activities.</p> <ul style="list-style-type: none"> <li>• To assist Adamtulu Research Station for multiplication of cross-bred (Boran x Friesian and Boran x Jersey)</li> <li>• To distribute cross-bred cows to farmers at reasonable conditions</li> <li>• To promote veterinary services with more installation of crushes</li> <li>• To supply vaccine and veterinary equipment including technical training</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Livestock expert (12 men-months)</li> <li>• Vehicles</li> <li>• Receiving units of morasses and seed cakes</li> <li>• Equipment and medicines for animal clinic</li> <li>• Installation of 10 units of crushes</li> <li>• Receiving units of morasses and seed cakes</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OAB counterpart personnel</li> <li>• Veterinary doctor</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Bureau of Agriculture (OBA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Increased dairy products</li> <li>• Increased farm family</li> </ul>		

**Table 6.3.2 Project Summary Sheets (10 / 21)**

<b>Program</b>	<b>4. Environmental Conservation Program</b>	
<b>Sub-Program</b>	<b>4-1 Environmental Monitoring Program</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<p><b>Background &amp; Objectives :</b></p> <p>The hydrological analyses verified that the water resources development of the Meki river for the proposed irrigation development with a dam would result in serious adverse impact to the Abijata lake. The water resources of the Abijata lake is influenced by several water resources including the Meki and Katar rivers, the Ziway lake, the Bulbula river and the Langano lake. Therefore, the overall environmental monitoring system is required for conservation of the Abijata lake.</p> <p>The project aims at execution of the environmental monitoring which will cover all these water resources under the same program. The results will fully be utilized for optimum use of the water resources in the Meki area with minimum influence to the natural environment. Within the framework of Environmental Monitoring Program, progress of the WFP watershed management program and other environmental factors including drinking water quality, disasters such as drought, floods and flash water, frequency and area of epidemic diseases. The project will focus not only on establishment of environmental monitoring system and capacity building for the government staff and communities.</p>		
<p><b>Activities :</b></p> <p>The environmental monitoring will be carried out for the following aspects.</p> <ul style="list-style-type: none"> <li>• Guidance of environmental policies and guidelines to OIDA and Wareda staff</li> <li>• Preparation and distribution of environmental monitoring manuals</li> <li>• Educational leaflets and posters for environmental conservation</li> <li>• Follow-up observation of water level recorders on the Meki and Bulbula rivers in collaboration with Ministry of Water Resources</li> <li>• Periodical water quality analyses</li> <li>• Periodical monitoring of water use (drinking, irrigation and others), community ponds, rehabilitation and expansion of water facilities, which will affect water use in quantity and quality</li> <li>• Progress monitoring of afforestation and other land conservation programs</li> <li>• Monitoring of natural disasters including droughts, floods, flash water</li> <li>• Monitoring of water-borne diseases and out-patients</li> <li>• Establishment of data-base storing the above-mentioned data and information</li> <li>• Report preparation</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>• Environmentalist (6 men-months)</li> <li>• Vehicles</li> <li>• Computer for data-base</li> </ul>		<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>• Environmentalist counterpart personnel</li> <li>• Recurrent cost for hydrological observation</li> </ul>
<p><b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Establishment of the environmental monitoring system and data-base</li> <li>• Awareness creation and education about watershed management and disaster controls</li> <li>• Optimum water resources development in the Meki area</li> </ul>		

**Table 6.3.2 Project Summary Sheets (11 / 21)**

<b>Program</b>	<b>4. Environmental Conservation Program</b>	
<b>Sub-Program</b>	<b>4-2 Seedling Center Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>The Dugda Bora wareda office of Oromia Agricultural Bureau (OAB) established the tree nursery (0.75ha) in Meki town by obtaining technical and financial assistance of United Nation World Food Program (UNWFP) in 1989. The main objective of the tree nursery is to supply tree seedlings to communities in the wareda. Currently, the nursery is under the control of Subject Matter Specialist (SMS) for soil conservation for the wareda. Although fluctuation is observed, the nursery annually produces and distributes some 200,000 nos. of tree seedlings of 24 species including Eucalyptus and Leucaena.</p> <p>Tree seedlings are transplanted for several purposes such as fencing, fire woods, construction materials, parceling, windbreakers and others. They are basically sold to local farmers and generated profits are allocated for operation costs of the tree nursery. However, due mainly to lack of the operation budget, its past performance in seedling supply is still low compared to their actual requirement.</p> <p>The project aims at reinforcing capability of the existing tree nursery in order to encourage environmental conservation activities. In addition to tree species for afforestation purposes, it is envisaged to produce seedlings for tree crops such as papaya and coffee in the nursery. They are expected to contribute to expansion of agroforestry and alley cropping system and to improve farm family income through cash crop production.</p>		
<b>Activities :</b>		
<p>The project aims at supply of necessary facilities, equipment and tools for the existing tree nursery linked with the capacity building and transfer of technology for appropriate tree seedling production. The main activities include;</p> <p><u>Physical components</u></p> <ul style="list-style-type: none"> <li>• Office space and fences</li> <li>• Shading house</li> <li>• Irrigation pumps</li> <li>• Pick-up track for seedling transportation</li> </ul> <p><u>Capacity buildings</u></p> <ul style="list-style-type: none"> <li>• Selection of tree crops suited to the Meki area</li> <li>• Procurement of virus-free seedlings from EARO and international organization, i.e. ICRAF</li> <li>• Transfer of technology for tree seedling raising and afforestation</li> <li>• Seedling production</li> <li>• Production of extension materials including leaflets and posters</li> <li>• Establishment of demonstration plots for afforestation</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Agricultralist (12 men-months)</li> <li>• Vehicles</li> <li>• Facilities and equipment</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OAB counterpart personnel</li> <li>• Land acquisition</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Capacity improvement of the existing tree nursery</li> <li>• Expansion of afforestation area</li> <li>• Increased farm income through tree crop production</li> </ul>		

**Table 6.3.2 Project Summary Sheets (12 / 21)**

<b>Program</b>	<b>4. Environmental Conservation Program</b>			
<b>Sub-Program</b>	<b>4-3 Watershed Management Program</b>			
<b>Target Group</b>	Small farmers in Dugda Bora Wareda			
<b>Background &amp; Objectives :</b>				
<p>The nationwide soil conservation program phase-IV is in progress in Ethiopia by World Food Program (WFP). Under the program, local farmers are involved in afforestation by providing labor force. Farmers are provided wheat flour and edible oil as wages. In the past, Nazareth (Adama) and Lume Wareda of East Showa Zone were covered by the program. As a continuation of the program, WFP embarked on soil conservation practices in Dugda Bora Wareda in 2000. Out of nine (9) candidate micro-catchments, the following four (4) were selected and the afforestation program will be started for the target year of 2005.</p>				
	Micro-catchments	Peasant Association (PA)	Beneficiaries	Area(ha)
	•Mati	Dalota Mati (54)	955	787
	•Wede Weji	Menjegso Weji (15)	451	1,493
	•Lube	Menjegso Weji (15)	450	1,100
	•Jero Raka	Jero Raka(16)	360	1,157
<p>The project will introduce two (2) categories of soil conservation measures. The agronomic conservation measures include water harvesting, contour farming, grassed waterways, mulcting, etc. The engineering conservation measures include terrace channel with stepped chute, erosion and torrent control, sedimentation tank, waterway-road, bench terrace, gully protection dam, disaster preventing dam, hillside works, etc. WFP (Food for Work) applies mainly agronomic conservation measures by farmers, while few engineering conservation measures are applied. The project envisages establishing the model scheme in which both measures are effectively integrated in order to supplement each others and enhance their benefits. In line with a long-term strategy, the participatory approach such as PRA will be fully utilized to involve more farmers in the program.</p>				
<b>Activities :</b>				
<p>The project includes the following activities;</p> <ul style="list-style-type: none"> <li>• To select typical micro-watersheds within the Meki River basin as model areas</li> <li>• To prepare planning and design criteria</li> <li>• To install suitable measures and works including terrace channel with stepped chute, erosion and torrent control, sedimentation tank, waterway-road, bench terrace, gully protection dam, disaster preventing dam, hillside works, etc.</li> <li>• Procurement of vehicles and heavy equipment</li> <li>• To promote and expand the protection measures with farmers participation in line with experiences in the model watershed</li> </ul>				
<b>Input : Donor</b>		<b>Input : Ethiopian side</b>		
<ul style="list-style-type: none"> <li>• Rural Infrastructural Expert (12 men-months)</li> <li>• Participatory Development Expert (12 men-months)</li> <li>• Vehicles</li> <li>• Heavy equipment</li> </ul>		<ul style="list-style-type: none"> <li>• OAB counterpart personnel</li> <li>• Translator</li> </ul>		
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)				
<b>Project Benefits :</b>				
<ul style="list-style-type: none"> <li>• Expansion of soil protection area and agroforestry</li> <li>• Watershed conservation</li> </ul>				



**Table 6.3.2 Project Summary Sheets (13 / 21)**

<b>Program</b>	<b>5. Capacity Building Program for OIDA and Wareda Staff</b>	
<b>Sub-Program</b>	<b>5-1 OIDA Engineers Training Program</b>	
<b>Target Group</b>	OIDA engineers	
<b>Background &amp; Objectives :</b>		
<p>The OIDA cadres and engineers in both the headquarters and branch offices are generally highly qualified with higher educational background. It is important, however, to accumulate work experiences through actual irrigation and drainage development. The OIDA Engineers Training Program aims at providing the training program to the OIDA engineers. The small-scale irrigation development for poverty alleviation is main stream of the irrigation sector of Ethiopia. Therefore, the OIDA engineers are required to basic knowledge for participatory development approach. The program targets to train up some 50 engineers of senior and middle classes. The training aspects include;</p> <ul style="list-style-type: none"> <li>• Lectures on national and regional agricultural policies, irrigation development strategies, etc.</li> <li>• Review seminars and educational tours to existing irrigation projects in Oromia and other regions</li> <li>• Joint workshop with other government agencies concerning water resources, meteorology, mapping, etc.</li> <li>• Practices on methodology for hydrological and meteorological analyses</li> <li>• Practices on irrigation planning, designing and construction supervision</li> <li>• Lectures on transaction of tendering for irrigation project implementation</li> <li>• Practices on research design for improved irrigated farming techniques</li> <li>• Capacity building for construction supervision according to FIDIC</li> <li>• Lectures on environmental and watershed management including engineering protection measures</li> <li>• Practices on O&amp;M of small pumps prevailing in the Meki area</li> <li>• Establishment of database for irrigation schemes for project benefit monitoring and evaluation (PBME)</li> <li>• Lectures and practices for participatory development and gender issues</li> <li>• Review of organizational set up of OIDA for decision-making and smooth day-to-day operation</li> <li>• Study on budgetary arrangement and financial management</li> <li>• Capacity building for report preparation</li> <li>• Practices on the basic technology to access international data sources through internet facilities</li> </ul>		
<b>Activities :</b>		
<ul style="list-style-type: none"> <li>• To have a series of technical seminars on several aspects including policy and plans of water/irrigation sector, hydrological analysis methods, civil engineering, preparation of tender documents, environmental and watershed conservation, water management</li> <li>• To provide basic knowledge and experiences on participatory development, community mobilization, institutional management, budgetary arrangement</li> <li>• To make guidance for irrigation farming techniques</li> <li>• To train for report preparation</li> <li>• To prepare training materials for wareda staff</li> <li>• To organize educational tours</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Irrigation Engineer (12 men-months)</li> <li>• Participatory Development Expert (3 men-months)</li> <li>• Vehicles</li> <li>• Audio-visual facilities</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OIDA engineers</li> <li>• Training rooms</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Capacity building of OIDA engineers</li> <li>• Training program for OIDA wareda staff by applying training materials</li> <li>• Systematic and efficient implementation of OIDA projects</li> </ul>		

**Table 6.3.2 Project Summary Sheets (14 / 21)**

<b>Program</b>	<b>5. Capacity Building Program for OIDA and Wareda Staff</b>	
<b>Sub-Program</b>	<b>5-2 OIDA Community Development Experts Training Program</b>	
<b>Target Group</b>	OIDA community development experts and social workers	
<b>Background &amp; Objectives :</b>		
<p>The concept of the program is Training-of-Trainers (TOT). Firstly, the community development experts of the OIDA headquarters and branch offices will be provided qualified training program. Secondly, the experts trained up through the program will train social workers at the wareda level. The program envisages to train 20 community development experts including, at least, 5 female staff. The program consists of (1) lectures, seminars and workshop and (2) on-the-job training of Participatory Rural Appraisal (PRA) and Project Cycle Management (PCM) covering the following aspects.</p> <ul style="list-style-type: none"> <li>• National and regional policies on agriculture and rural development, etc.</li> <li>• Concepts and procedures of participatory development</li> <li>• Gender issues and poverty reduction strategy</li> <li>• Environmental and watershed conservation</li> <li>• Fundamental knowledge of irrigation farming, O&amp;M of irrigation facilities, etc.</li> <li>• Post-harvest techniques and marketing of agricultural products</li> <li>• Agricultural supports particularly for micro-credit</li> <li>• NGO's activities in Oromia Region</li> <li>• Capacity building for report preparation and statistical analysis</li> <li>• Practices on the basic technology to access international data sources through internet facilities</li> </ul> <p>The particular attention will be paid to NGOs' activities in the program. With current financial constraints, it is important for OIDA and other governmental agencies in Ethiopia to coordinate with NGOs in the grass roots development activities for poverty reduction. The program will establish a database of NGOs accessible for the people of Oromia Region. The database will consist of names, address and contact persons, past and on-going activities, future plan and program, application form for assistance, etc. OIDA will utilize the database for assisting rural communities when they seek development aids from NGOs.</p> <p>The gender issue will be highlighted in the program. The program will provide the trainees a series of lectures and organize the workshop in which the trainees will learn</p> <ul style="list-style-type: none"> <li>• current position of gender issues in Ethiopia and Oromia Region and</li> <li>• awareness of gender imbalance among the OIDA staff. They will also participate in</li> <li>• preparation of guideline for gender in irrigation development,</li> <li>• joint seminar with Omomia Women's Affairs Sector and NGOs,</li> <li>• on-the-job training for gender analyses and</li> <li>• practices in line with operation guideline for gender in development.</li> </ul>		
<b>Activities :</b>		
<ul style="list-style-type: none"> <li>• To have a series of seminars and workshop on several social aspects organized by donors and NGOs</li> <li>• To have PRA and PCM workshops with several stakeholders</li> <li>• To prepare training materials for wareda staff, which include leaflets, posters and video-episodes</li> <li>• To prepare Plan of Operation of [5-3] Wareda Staff Training Program</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Community Development Expert (12 men-months)</li> <li>• Local social workers (12 men-months)</li> <li>• Vehicles</li> <li>• Audio-visual facilities</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• OIDA staff</li> <li>• Training rooms</li> <li>• Translators</li> </ul>
<b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Trained 20 community development experts</li> <li>• Accumulated knowledge and work experience of systematic training for community development</li> <li>• Democratic operation and management of WUA and other rural communities</li> <li>• Improved performance in the OIDA irrigation projects</li> </ul>		

**Table 6.3.2 Project Summary Sheets (15 / 21)**

<b>Program</b>	<b>5. Capacity Building Program for OIDA and Wareda Staff</b>	
<b>Sub-Program</b>	<b>5-3 Wareda Staff Training Program</b>	
<b>Target Group</b>	Wareda staff under OIDA and Bureau of Agriculture	
<p><b>Background &amp; Objectives :</b></p> <p>Capacity building program will be provided to the wareda staff by utilizing the training materials to be prepared by the OIDA staff through [5-1] OIDA Engineers Training Program and [5-2] OIDA Community Development Experts Training Program. Around the concept of Training of Trainers, senior staff will firstly be trained and provide the training program to the wareda staff. The program will target the staff of Dugda Bora Wareda at initial stage of the program and envisage covering other waredas of East Showa Zone and furthering Oromia Region. The major training aspects include the followings.</p> <p>(1) Engineering aspects</p> <ul style="list-style-type: none"> <li>• Improvement of crop productivity under irrigation farming system</li> <li>• Capacity building for construction supervision</li> <li>• Guideline and criteria for environmental and watershed management</li> <li>• O&amp;M of small pumps and generators</li> <li>• Project monitoring and evaluation</li> </ul> <p>(2) Sociological aspects</p> <ul style="list-style-type: none"> <li>• Basic concepts and procedures of participatory development</li> <li>• Gender imbalance, poverty reduction, rural development, etc.</li> <li>• Post-harvest techniques and marketing of agricultural products</li> <li>• Agricultural supports particularly for micro-credit</li> <li>• Access to NGOs in Oromia Region particularly Dugda Bora Wareda</li> </ul> <p>The master plan to be prepared through the JICA study will be explained. Roles and responsibilities of the wareda office for the action program will also be explained.</p>		
<p><b>Activities :</b></p> <ul style="list-style-type: none"> <li>• To explain the implementation procedures of the master plan</li> <li>• To make necessary guidance on wareda's responsibilities in implementation of the master plan</li> <li>• To make specific training on participatory development improved techniques of rain-fed agriculture and animal husbandry, irrigation technology especially for O&amp;M and water management, environmental conservation, etc.</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>• Community Development Expert (12 men-months)</li> <li>• Local social workers (12 men-months)</li> <li>• Vehicles</li> <li>• Audio-visual facilities</li> </ul>		<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>• OIDA staff</li> <li>• Translators</li> </ul>
<p><b>Executing Agencies :</b> Oromia Irrigation Development Authority (OIDA)</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Improvement of work capacity of the wareda staff of OIDA and OBA</li> <li>• Promotion of participatory development</li> </ul>		

**Table 6.3.2 Project Summary Sheets (16 / 21)**

<b>Program</b>	<b>5. Capacity Building Program for OIDA and Wareda Staff</b>																																									
<b>Sub-Program</b>	<b>5-4 Community Resource Mapping Project</b>																																									
<b>Target Group</b>	Small farmers in Dugda Bora Wareda																																									
<b>Background &amp; Objectives :</b>																																										
<p>Peasant Associations (PAs) are the lowest administrative societies to exert community development in association with the government services. Dugda Bora Wareda consists of 54 PAs. Each PA comprises some 500 households on an average (804 at maximum and 154 at minimum). The PA representatives are appointed by the Wareda (District) Administrator with prior consent of relevant rural communities in PAs. In addition to PAs, there are several communities in rural areas of Ethiopia. These traditional communities play important roles in communication among inhabitants and decision making in rural activities. They also settle several arbitration among inhabitants and between communities.</p>																																										
<table border="1"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2">Area (km<sup>2</sup>)</th> <th colspan="3">Population</th> <th rowspan="2">Density (person/km<sup>2</sup>)</th> <th rowspan="2">Household (no.)</th> <th rowspan="2">Family (person/ HH)</th> </tr> <tr> <th>Male</th> <th>Female</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Wareda Total</td> <td>1,468.0</td> <td>64,523</td> <td>62,051</td> <td>126,574</td> <td>44.0</td> <td>27,013</td> <td>4.7</td> </tr> <tr> <td>PA(max)</td> <td>38.5</td> <td>1,879</td> <td>1,796</td> <td>3,675</td> <td>167.9</td> <td>804</td> <td>5.6</td> </tr> <tr> <td>PA(min)</td> <td>17.3</td> <td>387</td> <td>338</td> <td>725</td> <td>27.8</td> <td>154</td> <td>3.8</td> </tr> </tbody> </table>									Area (km <sup>2</sup> )	Population			Density (person/km <sup>2</sup> )	Household (no.)	Family (person/ HH)	Male	Female	Total	Wareda Total	1,468.0	64,523	62,051	126,574	44.0	27,013	4.7	PA(max)	38.5	1,879	1,796	3,675	167.9	804	5.6	PA(min)	17.3	387	338	725	27.8	154	3.8
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<p>The JICA Study carried out the preliminary studies on traditional communities in cooperation with Development Agents. Family-based groups are called ‘Ukobo’ or ‘Edir’ in rural areas of Oromia Region. Some 500 edirs are identified within 54 PAs of Dugda Bora Wareda. Each edir consists of 20 to 100 households (40 HH on average).</p>																																										
<p>The JICA Study focuses on these existing communities as nucleus bodies for future rural development. In order to verify their geographical positions, community members, natural resources, social conditions, etc., this program aims at preparation of Community Resource Maps.</p>																																										
<b>Activities :</b>																																										
<ul style="list-style-type: none"> <li>• To survey PAs and list existing communities within PAs for data-base</li> <li>• To prepare community resource map indicating existing conditions of land use/vegetation, rural facilities, road networks, erosion process, etc.</li> <li>• To utilize the maps for various community activities</li> </ul>																																										
<b>Input : Donor</b>				<b>Input : Ethiopian side</b>																																						
<ul style="list-style-type: none"> <li>• Participatory Development Expert (6 men-months)</li> <li>• Vehicles</li> <li>• Motor-cycles and bicycles for DA</li> </ul>				<ul style="list-style-type: none"> <li>• Bureau of Agriculture (Staff training section)</li> <li>• 27 DAs</li> <li>• Translator</li> </ul>																																						
<b>Executing Agencies :</b> Bureau of Agriculture																																										
<b>Project Benefits :</b>																																										
<ul style="list-style-type: none"> <li>• Community Resource Maps to cover the entire Dugda Bora Wareda</li> <li>• Promotion of participatory development</li> <li>• Smooth operation of administrative services including extension services</li> </ul>																																										

**Table 6.3.2 Project Summary Sheets (17 / 21)**

<b>Program</b>	<b>6. Community Development and Cooperative Promotion Program</b>	
<b>Sub-Program</b>	<b>6-1 Community Leader Training Program</b>	
<b>Target Group</b>	Community leaders	
<b>Background &amp; Objectives :</b>		
<p>The program aims at systematic capacity building of community leaders in order to promote democratic operation of community activities and participatory development. Community leaders will organize the Community Leaders' Committee and exchange their opinions about constraints encountered and their own experiences how to solve the problems each other in the Committee. Through these practices, each leader will enhance their knowledge on appropriate community management. Wareda Officers and DAs will occasionally attend the meeting and provide advises when required.</p>		
<b>Activities :</b>		
<p>Community leaders will be selected by applying the community resource maps to be prepared through [5-4] Community Resource Map Project. The main aspects concerned are;</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Establishment of Community Leaders' Committee and registration to District Offices</li> <li><input type="checkbox"/> Concepts and procedures of participatory community development</li> <li><input type="checkbox"/> Exchange of opinions on problems and needs in group activities</li> <li><input type="checkbox"/> Gender imbalance encountered</li> <li><input type="checkbox"/> Group operation with democracy and high transparency</li> <li><input type="checkbox"/> Coordination of the Input Credit scheme</li> <li><input type="checkbox"/> Price information of agricultural products and marketing channels</li> <li><input type="checkbox"/> Operation and maintenance (O&amp;M) of community's assets, e.g. multi-purpose sheds, sprayers, etc.</li> <li><input type="checkbox"/> Group farm operation and marketing especially for fruits farmers of Type C</li> <li><input type="checkbox"/> Daily record keeping and accounting reports</li> <li><input type="checkbox"/> Presentation of group activities in the Committee</li> <li><input type="checkbox"/> Village functions such as agricultural show, movie show, football games, etc.</li> </ul> <p>Through these activities mentioned above, the community members will communicate more frequently and discuss their problems. In addition, the Committee will discuss and attain mutual agreement how to implement the community-based projects.</p>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Participatory Development Expert (6 men-months)</li> <li>• Vehicles</li> <li>• Audio-visual equipment</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• 27 DAs</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Wareda staff from OIDA and OBA		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Capacity building of community leaders</li> <li>• Promotion of participatory development</li> </ul>		

**Table 6.3.2 Project Summary Sheets (18 / 21)**

<b>Program</b>	<b>6. Community Development and Cooperative Promotion Program</b>	
<b>Sub-Program</b>	<b>6-2 Visioning Workshop Program</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<p><b>Background &amp; Objectives :</b></p> <p>In the rural societies of Oromia Region, problems and needs were regularly discussed at the PA level under the previous government. Currently, however, bottom-up needs are not officially discussed at the PA level but collected by DAs and other government agencies. This implies that opinions of poverty groups including women and youth are hardly reflected in the communities and taken up by the government due to low accessibility to the public services for them.</p> <p>[6-2] Visioning Workshop Program aims at awareness creation for advocacy for quality of life among community and empowerment especially of poverty groups of community. The objectives of the program include:</p> <ul style="list-style-type: none"> <li>• Provision of opportunity for awareness creation</li> <li>• Exchange of opinions among generations of communities</li> <li>• Problem analyses and development approaches</li> <li>• Discussion concerning irrigation and rural development</li> <li>• Application of proposed projects to be selected among the community</li> <li>• Awareness creation for environmental conservation</li> <li>• Clarification of responsibilities and cooperation</li> <li>• Establishment of operation rules for community facilities</li> </ul>		
<p><b>Activities :</b></p> <ul style="list-style-type: none"> <li>• To explain the necessity of visioning workshop to every group including women and youth</li> <li>• To organize the workshop and show the video-episodes on successful community activities in the other regions</li> <li>• To discuss how to implement community-based development</li> <li>• To implement the infrastructure development</li> <li>• To prepare an action program for participatory development</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>• Participatory Development Expert (6 men-months)</li> <li>• Vehicles</li> <li>• Audio-visual equipment</li> </ul>		<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>• 27 DAs</li> <li>• Translator</li> </ul>
<p><b>Executing Agencies :</b> Wareda staff from OIDA and OBA</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Empowerment of rural communities</li> <li>• Promotion of participatory development</li> <li>• Improvement of farm income and living standard</li> </ul>		

**Table 6.3.2 Project Summary Sheets (19 / 21)**

<b>Program</b>	<b>6. Community Development and Cooperative Promotion Program</b>	
<b>Sub-Program</b>	<b>6-3 Drinking Water and Nutritional Improvement Program</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<p><b>Background &amp; Objectives :</b></p> <p>Drinking water supply in the Meki area is highly relying on groundwater. There are four (4) deep wells in Meki town, while there are 45 deep wells, 16 shallow wells and 2 hand pumps in the rural area. The availability of potable water to rural people is 70%, which is much higher than that of the national average, i.e. 16% to 20%. However, considerable number of the existing wells are deteriorated and local farmers obtain water from the Meki river and other water bodies. The average groundwater table in Meki town (El. 1,620) is some 30 m in depth. Water quality of groundwater is characterized by high Floride content.</p> <p>Local farmers in the Meki area are at subsistence level. They broadly produce main staple grains including maize, teff, wheat, etc. and haricot beans, while horticultural crops are planted to the limited extent. For small farmers, availability of animal protein as well as horticultural crops is far below for their requirement resulting in malnutrition among rural peoples according to the JICA Study.</p> <p>[6-3] Drinking Water and Nutritional Improvement Program aims at the following:</p> <ul style="list-style-type: none"> <li>• Transfer of knowledge about prevention against water-borne diseases and drinking water quality control</li> <li>• Improvement of nutritional status especially for pregnant and infants (below 24 months old)</li> <li>• Distribution of seedlings and seeds for horticultural crops</li> </ul>		
<p><b>Activities :</b></p> <p>The program will promote the following activities:</p> <p>(1)Public health and hygiene</p> <ul style="list-style-type: none"> <li>• To visit communities and organize mini-workshop with small farmers including women, youth and landless farmers</li> <li>• Consultation to staff of Bureau of Health</li> <li>• Introduction and distribution of water filters</li> <li>• Follow-up and project monitoring</li> </ul> <p>(2)Improvement of nutritional status</p> <ul style="list-style-type: none"> <li>• Meal survey and cropping calendars</li> <li>• Discussion with social workers and extension workers</li> <li>• Workshop on food processing and cooking</li> <li>• Distribution of free seedling and seeds of horticultural crops to women</li> <li>• Set-up of nursery schools</li> <li>• Introduction and distribution of flour mills</li> <li>• Educational tours</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>• Participatory Development Expert (6 men-months)</li> <li>• Primary Health and Nutrition Expert (6 men-months)</li> <li>• Vehicles</li> <li>• Water filters, Flour mills</li> <li>• Audio-visual facilities</li> </ul>		<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>• Counterpart personnel under wareda office (Bureau of Health, OIDA and OBA)</li> <li>• Translator</li> </ul>
<p><b>Executing Agencies :</b> Wareda office (Bureau of Health, OIDA and OBA)</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Awareness on water quality and nutritional improvement</li> <li>• Improvement of water quality</li> <li>• Improvement of nutritional status</li> <li>• Reduced infant motility ratios</li> </ul>		

**Table 6.3.2 Project Summary Sheets (20 / 21)**

<b>Program</b>	<b>6. Community Development and Cooperative Promotion Program</b>	
<b>Sub-Program</b>	<b>6-4 Community Center Project</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<b>Background &amp; Objectives :</b>		
<p>The rural communities in the Meki area are geographically scattered and have no facilities for assemble. [6-4] Community Center Project aims at provision of conventional shed-type building to rural communities so as to encourage the community activities. The facilities will be utilized for the following purposes:</p> <ul style="list-style-type: none"> <li>• Meeting by communities</li> <li>• PA assembly and record keeping</li> <li>• Capacity building and training program</li> <li>• Administrative services including visiting medical doctors' services</li> <li>• Cooperative activities</li> <li>• Supplemental use for schooling</li> <li>• Exchange of information (notice board)</li> <li>• Recreation (football games, movie show, etc.)</li> <li>• Demonstration farm for vegetable productions</li> <li>• Weighing machines</li> <li>• Wells</li> <li>• Temporary post office</li> <li>• Temporary storage of seedlings and seeds</li> </ul> <p>The operation rules of facilities will be discussed and agreed among communities. In principle, building materials will be supplied by the project, while the communities will provide labor power.</p>		
<b>Activities :</b>		
<p>••••••• Activities •••••••</p> <ul style="list-style-type: none"> <li>• To have community' meeting and functions including capacity building, training, etc.</li> <li>• To use for temporary schooling, health post, marketing activities, etc.</li> <li>• To use as emergency purposes including temporary storage, etc.</li> <li>• To provide demonstration of horticultural farm</li> <li>• To store communities' assets</li> </ul>		
<b>Input : Donor</b>	<ul style="list-style-type: none"> <li>• Participatory Development Expert (6 men-months)</li> <li>• NGO or Local Expert (12 men-months)</li> <li>• Vehicles</li> <li>• Building materials</li> </ul>	<b>Input : Ethiopian side</b>
		<ul style="list-style-type: none"> <li>• Wareda staff</li> <li>• Translator</li> </ul>
<b>Executing Agencies :</b> Wareda Office		
<b>Project Benefits :</b>		
<ul style="list-style-type: none"> <li>• Empowerment of local farmers</li> <li>• Democratic operation of PAs and communities</li> <li>• Promotion of participatory development</li> </ul>		



**Table 6.3.2 Project Summary Sheets (21 / 21)**

<b>Program</b>	<b>6. Community Development and Cooperative Promotion Program</b>	
<b>Sub-Program</b>	<b>6-5 Grain Bank Promotion Program</b>	
<b>Target Group</b>	Small farmers in Dugda Bora Wareda	
<p><b>Background &amp; Objectives :</b></p> <p>This sub-program aims basically at securing food grains during the lean season through lending and borrowing products among the surplus and deficit farmer producers at PA level. The products in the peak harvesting season shall be kept by the farmers at a grain bank warehouse. During the lean season, the deficit farmers who need to purchase food grains shall borrow the food grains from the grain bank and return the grains in the next harvesting season with a certain additional quantity as an interest. These grain lending and borrowing practices shall accrue the following benefits:</p> <ul style="list-style-type: none"> <li>□ Surplus farmers are able to minimize post harvest losses at an improved storage facility. The stored grains remained shall be sold out in the lean harvesting season at a higher price that could be expected from seasonal price fluctuation and bulk trading.</li> <li>□ Deficit farmers are able to purchase and /or borrow required food grains from the grain bank. In case of purchase, grain price shall be set lower than prevailing retail price because of a less cost of transportation and trading margins. Borrower farmers shall return the grains in kind with an interest quantity from their products in the next harvest season. The deficit farmers could minimize their livelihood expenditure burden compared with relying on the retail markets.</li> <li>□ The farmers can secure staple food grains within the vicinity of village areas.</li> <li>□ The grain bank could generate village fund that accrue from storage charges collecting from the surplus farmers and trading benefit.</li> <li>• The village fund generating from the grain bank operation could be used for maintenance of storage facilities, incentives for grain bank management staff, welfare investment at PA level, etc.</li> </ul>		
<p><b>Activities :</b></p> <p>The grain bank shall be installed at selected pilot PAs (3 sites according to different types of farming) that will have a certain surplus products in a year, acceptance of majority farmers, existence of leadership and preliminary operating knowledge. The sub-program shall be implemented as follows :</p> <ul style="list-style-type: none"> <li>□ Identification of pilot PAs : a) presentation and explanation of the system, b) receiving an interest from the PAs, c) selection of pilot Pas through PA's resource verification by PBME benchmark survey, d) confirmation of participating farmers at selected Pas.</li> <li>□ Participatory planning for installation of grain bank at the selected pilot Pas : explanation and receiving farmers' concerns to reflect a design and operational plan, joint preparation of facility and implementation plan including required organization, confirmation of the final plan by farmers, and selection of management farmers.</li> <li>□ Joint construction of facilities, training for operation, monitoring and evaluation of activities to reflect expansion of the sub-program</li> </ul>		
<p><b>Input : Donor</b></p> <ul style="list-style-type: none"> <li>□ Market and post harvest specialist      3 M/M</li> <li>□ Agronomist                                      2 M/M</li> <li>□ Institutional expert                            2 M/M</li> <li>□ Local Expert/Post harvest                10 M/M</li> <li>□ Computer, printer, copy machine        1 sets</li> <li>□ Post harvest facilities (warehouse, thresher, Cleaning and drying space, etc.) 3 sets</li> </ul>	<p><b>Input : Ethiopian side</b></p> <ul style="list-style-type: none"> <li>□ Superintendent staff of both central and district levels, e.g. OIDA (1) and DA (1 district, 3 PA DAs) in charge, etc.</li> </ul>	
<p><b>Executing Agencies :</b> Wareda Office</p>		
<p><b>Project Benefits :</b></p> <ul style="list-style-type: none"> <li>• Installation of food grain security system at village level and grain marketing by the farmer groups</li> <li>□ Contribution to increase farmers' income and village welfare</li> </ul>		

**Table 6.4.1 Preliminary Assessment of Projects Selected under Master Plan**

Master Plan	Factors for Assessment										
	Contribution to project objectives	Urgency among rural communities	Technical adaptability of OIDA	Technical adaptability of Bureau of Agriculture	Technical adaptability of farmers	Fund requirement	Time requirement	Duplication with on-going projects	Social risk	Environmental impact	Total
Weighting Factor	2	3	2	2	2	3	1	1	2	3	
1. Irrigation Development Programme											
1-1 WUA Support Programme	3	4	5	3	4	5	5	4	4	4	86
1-2 Meki Irrigation and Rural Water Supply Project	5	4	3	3	2	2	2	5	2	2	61
2. Rain-fed Agriculture Improvement Programme											
2-1 Semi-Arid Farming Improvement Project	5	3	3	5	4	5	5	3	5	5	91
2-2 Community Seed Bank Project	4	4	2	3	3	5	5	2	2	5	77
2-3 Post-Harvesting Techniques Improvement Project	2	2	2	3	3	3	5	2	5	5	67
2-4 Community Pond Project	4	4	4	3	2	4	4	3	3	5	78
3. Animal Husbandry Modernization Programme											
3-1 Demonstration Unit Project	4	2	2	4	3	5	5	3	3	5	76
3-2 Forage Production Project	4	2	2	3	3	3	3	3	3	5	66
3-3 Improved Breed Promotion Project	2	2	2	3	2	3	4	3	3	5	61
4. Environmental Conservation Programme											
4-1 Environmental Monitoring Programme	5	2	3	3	2	5	5	5	5	5	82
4-2 Seedling Center Project	5	3	2	4	4	3	5	4	5	5	82
4-3 Watershed Management Programme	5	4	3	3	3	3	2	3	5	5	79
5. Capacity Building Programme for OIDA and Wareda Staff											
5-1 OIDA Engineers Training Programme											
5-2 OIDA Community Development Experts Training Programme											
5-3 Wareda Staff Training Programme											
5-4 Community Resource Mapping Project											
6. Community Development and Cooperative Promotion Programme											
6-1 Community Leader Training Programme	5	4	3	3	4	5	5	3	5	5	90
6-2 Visioning Workshop Programme	4	3	3	3	4	5	5	3	5	5	85
6-3 Drinking Water and Nutritional Improvement Programme	3	4	3	3	4	5	5	3	5	5	86
6-4 Community Center Project	3	3	3	2	3	3	3	4	5	5	72
6-5 Grain Bank Promotion Programme	2	2	2	3	2	3	3	4	3	5	61

Note : Qualitative rates are tentatively given at five (5) grades, i.e. 5 for positive (favourable) to 1 for negative (unfavourable)  
The quantitative project evaluation will be made at the final stage of the Study from technical, economic, financial, environmental and sociological points of view. The results will be presented in Draft Final Report

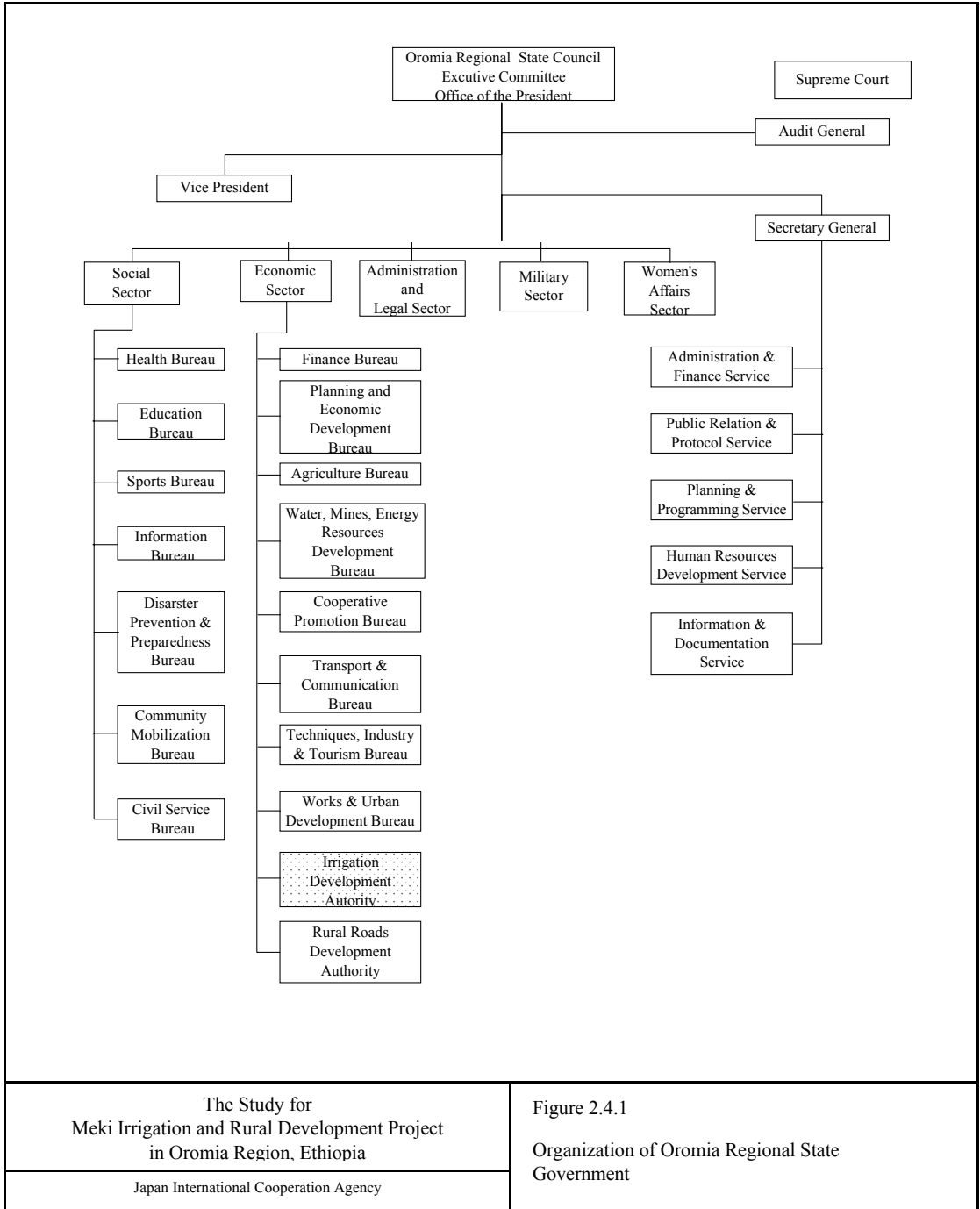
**Table 7.2.1 Result of IEE of Meki Irrigation and Rural Development Project**

Environmental Items	Catchment Area Region-I	Head Work Area Region-II	Meki River Channel Region-III	Irrigation Area Region -IV	L. Ziway system Region-V	R. Bulbula Channel Region-VI	Abijata-Shalla System Region-VII
<b>A. PROBLEMS DUE TO PROJECT LOCATION</b>							
1. Impacts on minority ethnic group	X	X	X	X	X	X	X
2. Resettlement	X	X	X	X	X	X	X
3. Impacts on land use	++/B	X	--/C	++/A	--/C	--/C	--/C
4. Impairment of transport system & existing infrastructure	X	++/C	-	++/C	X	X	X
5. Inundation of minerals	*	X	*	X	*	*	*
6. Inundation of historical assets	*	X	*	X	*	*	*
7. Encroachment on precious ecosystem	X	--/C	++/C	++/C	++/C	X	X
8. Watershed erosion & sedimentation	X	X	*	x	*	*	*
9. Conflicts with water supply rights	--/C	X	--/C	x	--/C	--/B	--/B
<b>B. PROBLEMS RELATED TO CONSTRUCTION</b>							
1. Air pollution, noise & vibration	*	--/C	X	--/C	*	*	*
2. Soil erosion & silt run off	X	--/C	--/C	--/C	--/C	X	*
3. Sanitation in workers' camp & wastes	X	--/C	X	X	X	X	*
4. Aesthetics & landscape	*	X	X	X	*	*	*
<b>C. PROBLEMS DUE TO PROJECT OPERATIONS</b>							
1. Change of river flow regime	*	--/B	--/A	*	--/B	--/A	--/A
2. Deterioration of down stream water quality	*	*	--/B	*	--/B	x	--/B
3. Depreciation of fisheries	*	X	--/C	*	--/B	x	--/B
4. Impacts on precious ecology	X	X	X	X	X	x	--/B
5. Eutrophication of back water flow	*	--/C	*	*	*	*	*
6. Vector borne parasitic diseases	X	--/C	X	--/C	*	*	*
7. Change of micro climate	X	X	X	X	X	X	X

**Notes:**

- ++/A : Upper parts stands for the direction of impacts and the lower part shows the magnitude of impacts
- A : Relatively high magnitude of impact expected
- B : Relatively moderate magnitude of impact expected
- C : Relatively low (minor) magnitude of impact expected
- X : No effect is expected
- \* : No relationship
- ++ : Positive effect is expected
- : Negative effect is expected

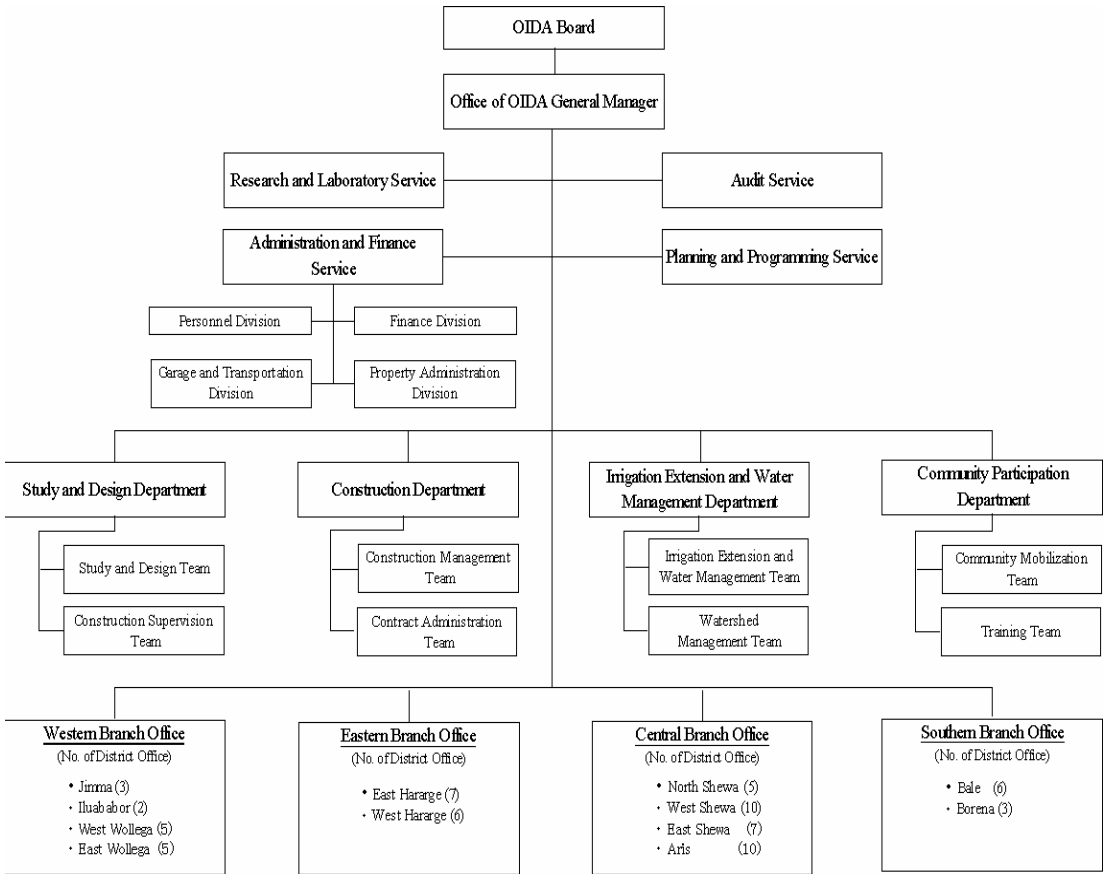
## *Figures*



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

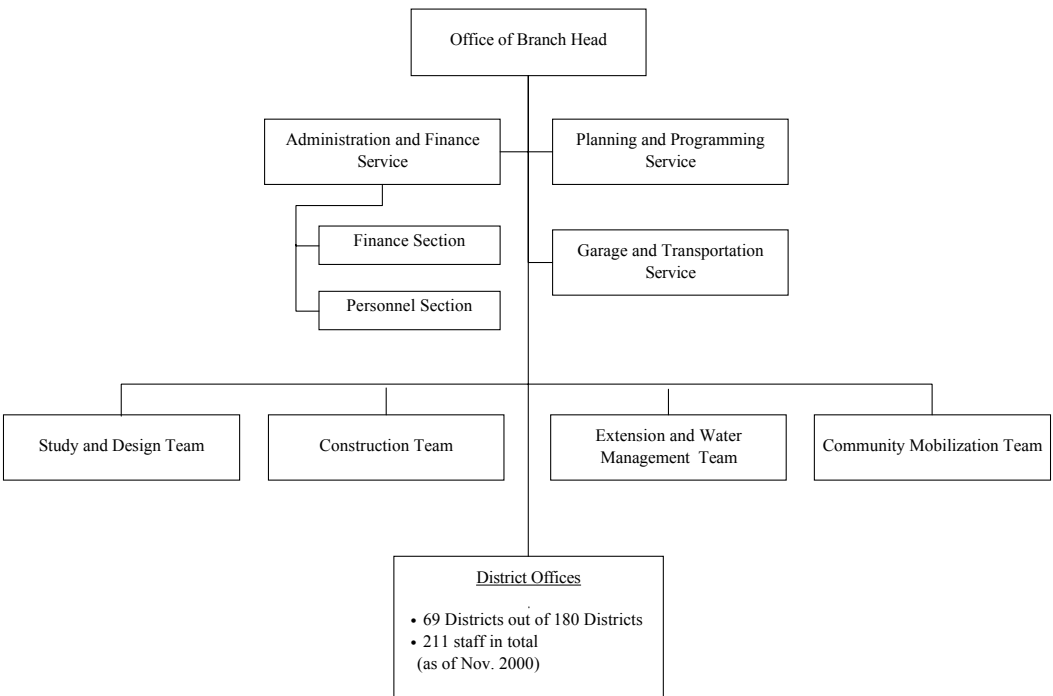
Japan International Cooperation Agency

Figure 2.4.1  
Organization of Oromia Regional State  
Government



The Study for  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
Japan International Cooperation Agency

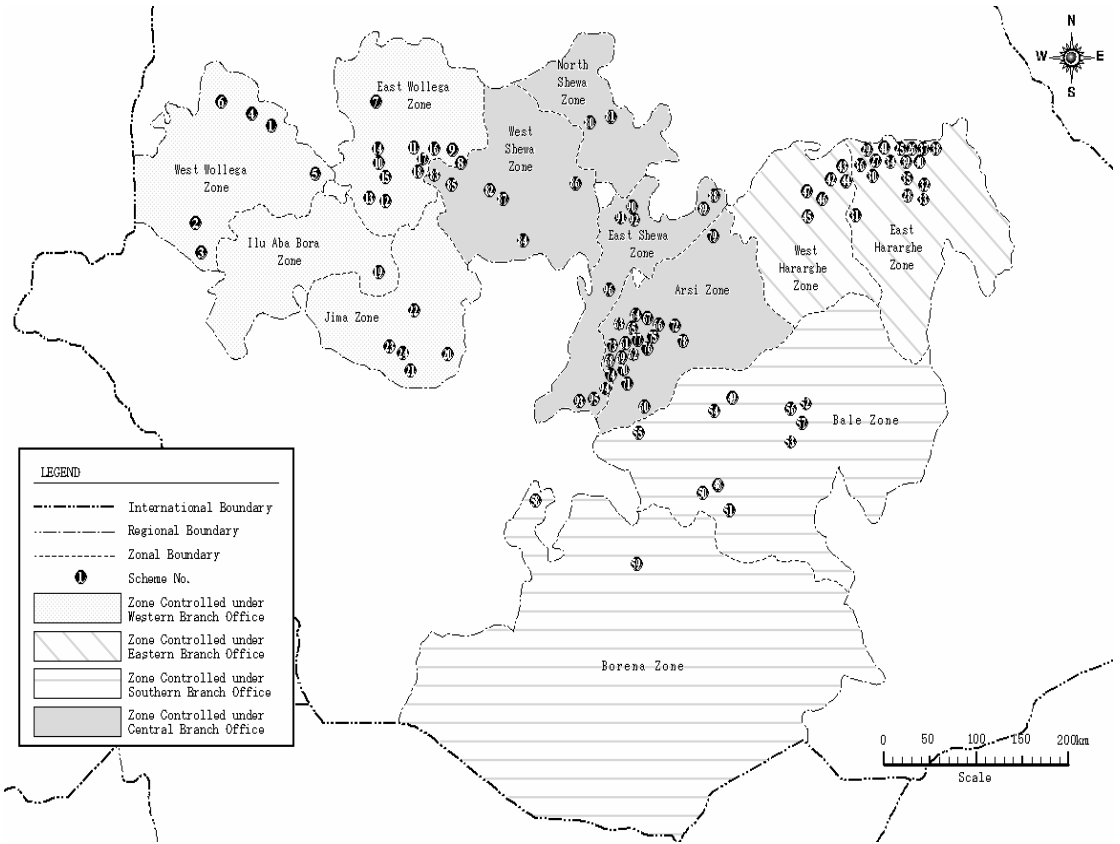
Figure 2.4.2  
Organization of OIDA Head Office Units and  
Branch



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

Japan International Cooperation Agency

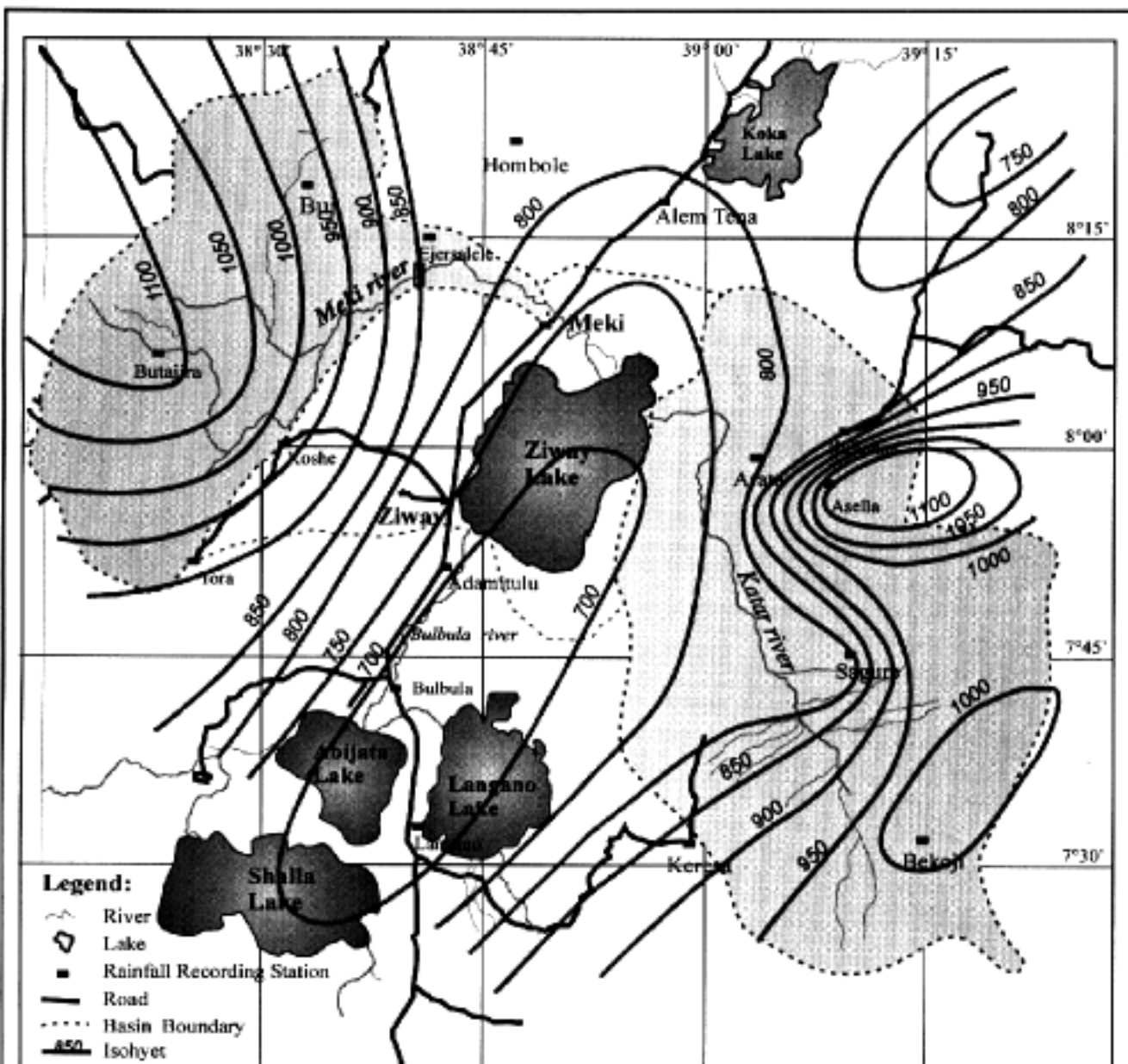
Figure 2.4.3  
Organization of OIDA Branch Office Units



The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia  
 Japan International Cooperation Agency

Figure 2.4.4  
 Location of the Existing Irrigation Schemes in  
 Oromia Region





**List of Rainfall Recording Stations**

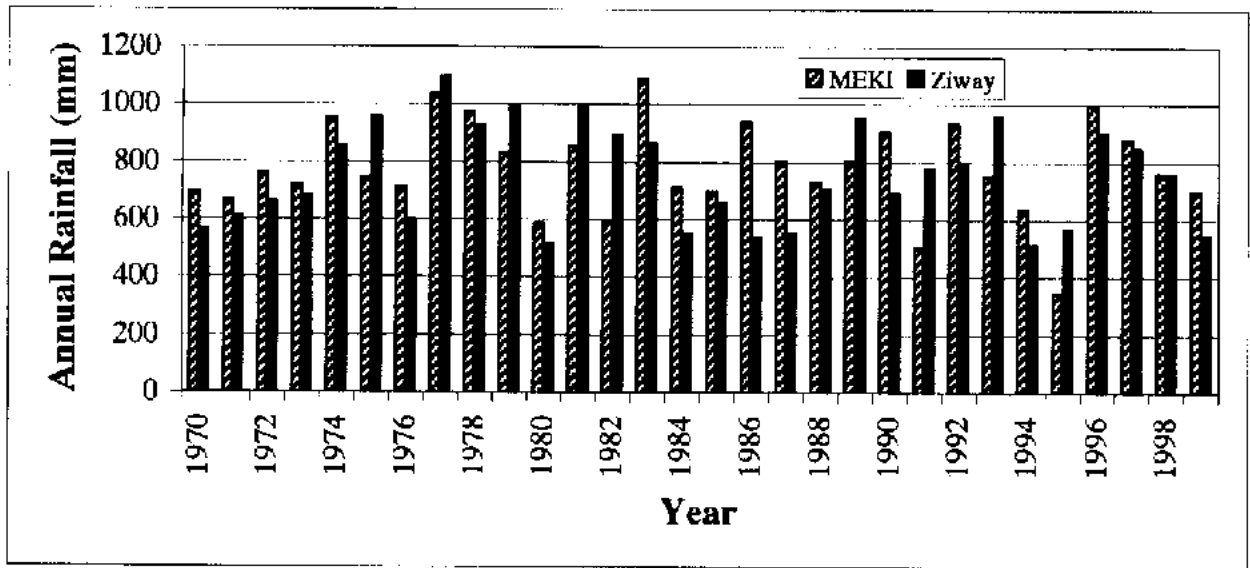
S.N.	Station Name	Coordinates		S.N.	Station Name	Coordinates	
		Latitude	Longitude			Latitude	Longitude
1.	Alem Tena	8° 18' N	38° 56' E	10.	Hombole	8° 22' N	38° 46' E
2.	Adamtulu	7° 51' N	38° 42' E	11.	Kereba	7° 33' N	38° 58' E
3.	Arata	7° 59' N	39° 04' E	12.	Koshe	8° 01' N	38° 32' E
4.	Asella	7° 57' N	39° 08' E	13.	Kulumsa	8° 04' N	39° 08' E
5.	Bekoji	7° 32' N	39° 15' E	14.	Langano	7° 31' N	38° 48' E
6.	Bui	8° 21' N	38° 33' E	15.	Meki	8° 09' N	38° 49' E
7.	Bulbula	7° 43' N	38° 40' E	16.	Sigure	7° 46' N	39° 09' E
8.	Butajira	8° 09' N	38° 22' E	17.	Tora	7° 52' N	38° 25' E
9.	Ejersalele	8° 15' N	38° 41' E	18.	Ziway	7° 56' N	38° 43' E

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

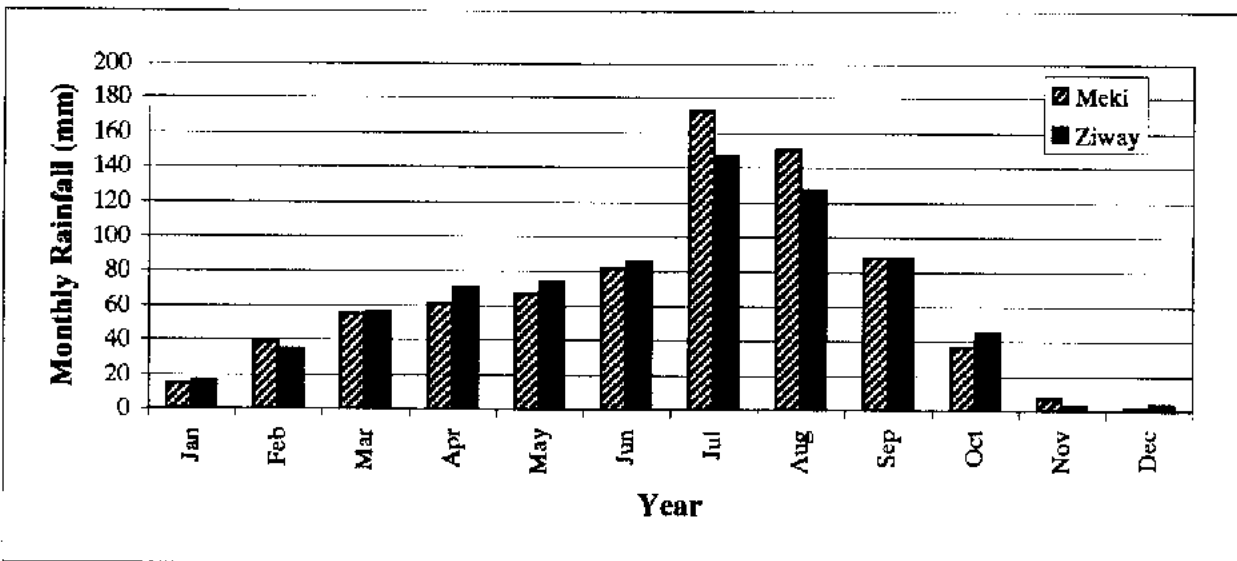
Japan International Cooperation Agency

Figure 3.1.1

Annual Isohyetal Map



(1) Annual Variation



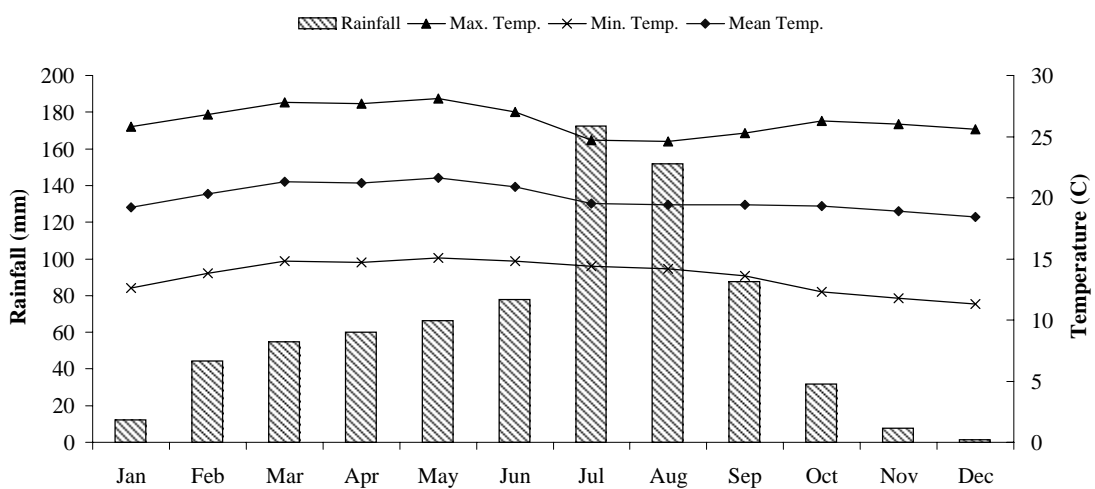
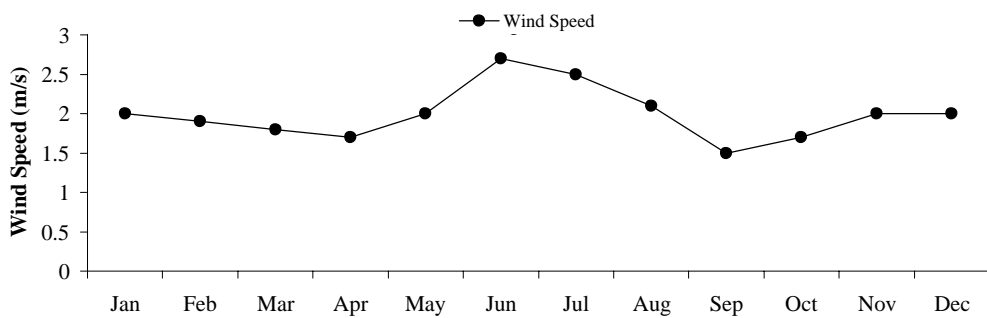
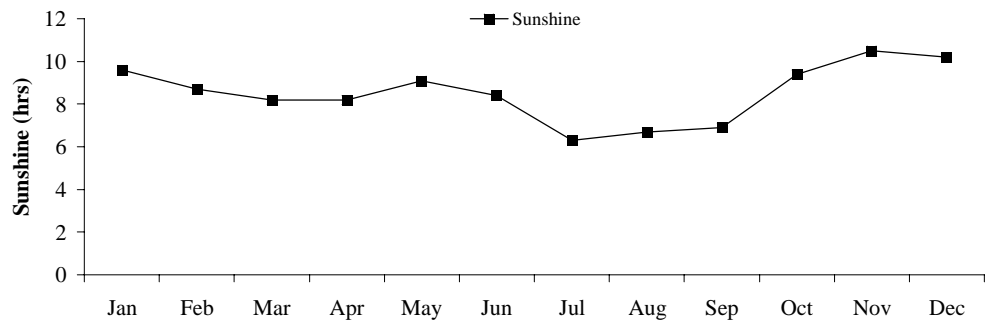
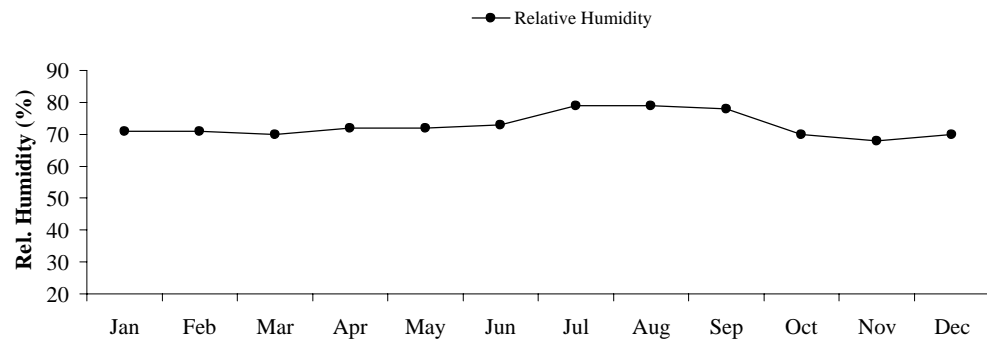
(2) Seasonal Variation

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

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Figure 3.1.2

Annual and Seasonal Rainfall Variation at  
the Meki and Ziway Stations

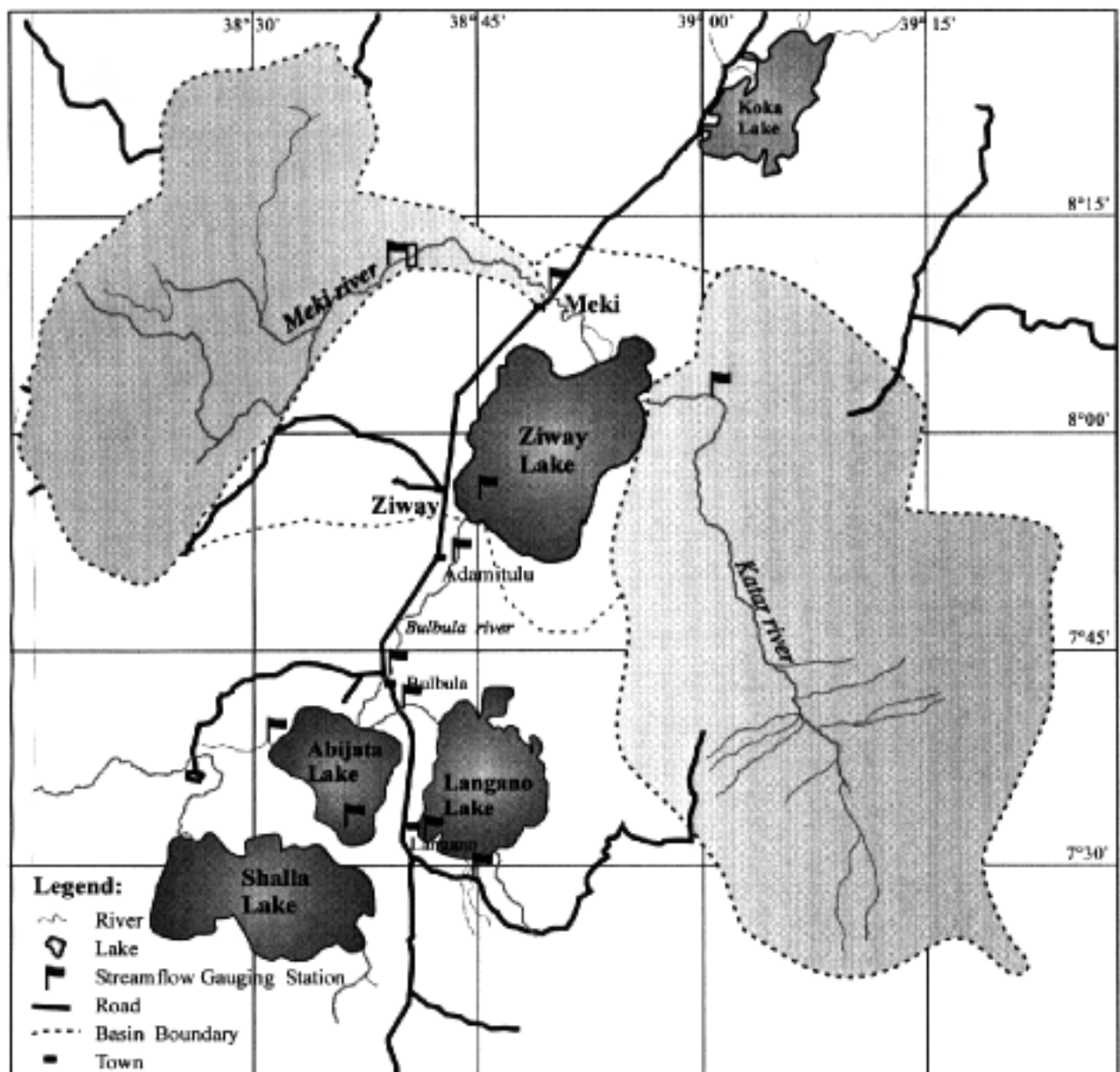


The Study for  
Meki Irrigation and Rural Development Project  
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Figure 3.1.3

Average Climate Parameters in the Study Area



**List of Streamflow Gauging Stations**

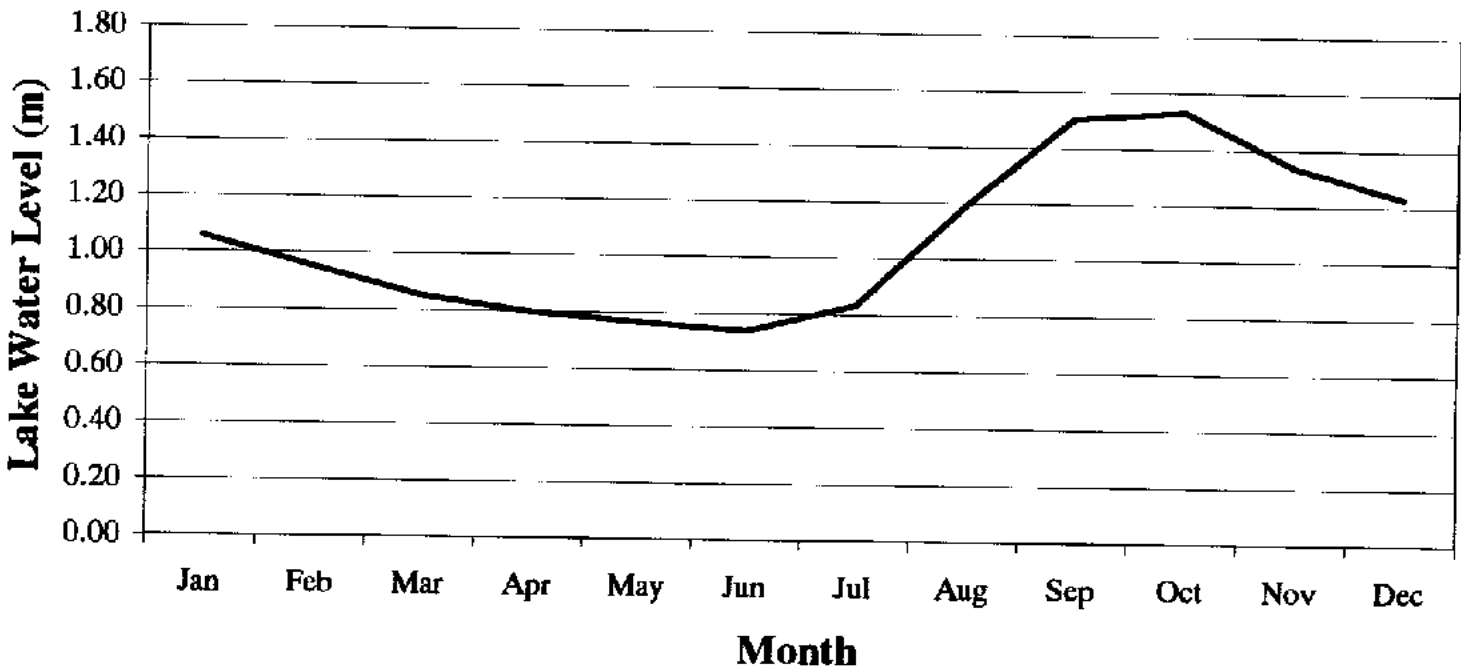
S.N	River/Lake	Station	Coordinates		Drainage	Remarks
			Latitude	Longitude		
1.	Meki	Dugda	8°12'N	38°42'E	2,040	Abandon
2.	Meki	Meki Village	8°09'N	38°50'E	2,433	
3.	Katar	Abura	8°04'N	39°03'E	3,350	
4.	Lake Ziway	Bochessa	7°54'N	38°45'E	7,380	
5.	Kekersitu	Adamitulu	7°51'N	38°43'E	7,488	
6.	Bulbula	Bulbula	7°43'N	38°38'E	8,155	Abandon
7.	Lake Langano	Near Hotel	7°32'N	38°41'E	2,006	
8.	Gedemso	Near Langano	7°28'N	38°44'E	213	Abandon
9.	Horakelo	Near Bulbula	7°41'N	38°40'E	2,050	
10.	Lake Abijata	Aroessa	7°33'N	38°36'E	10,744	
11.	Gogessa	Near Judu	7°38'N	38°32'E		

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

Japan International Cooperation Agency

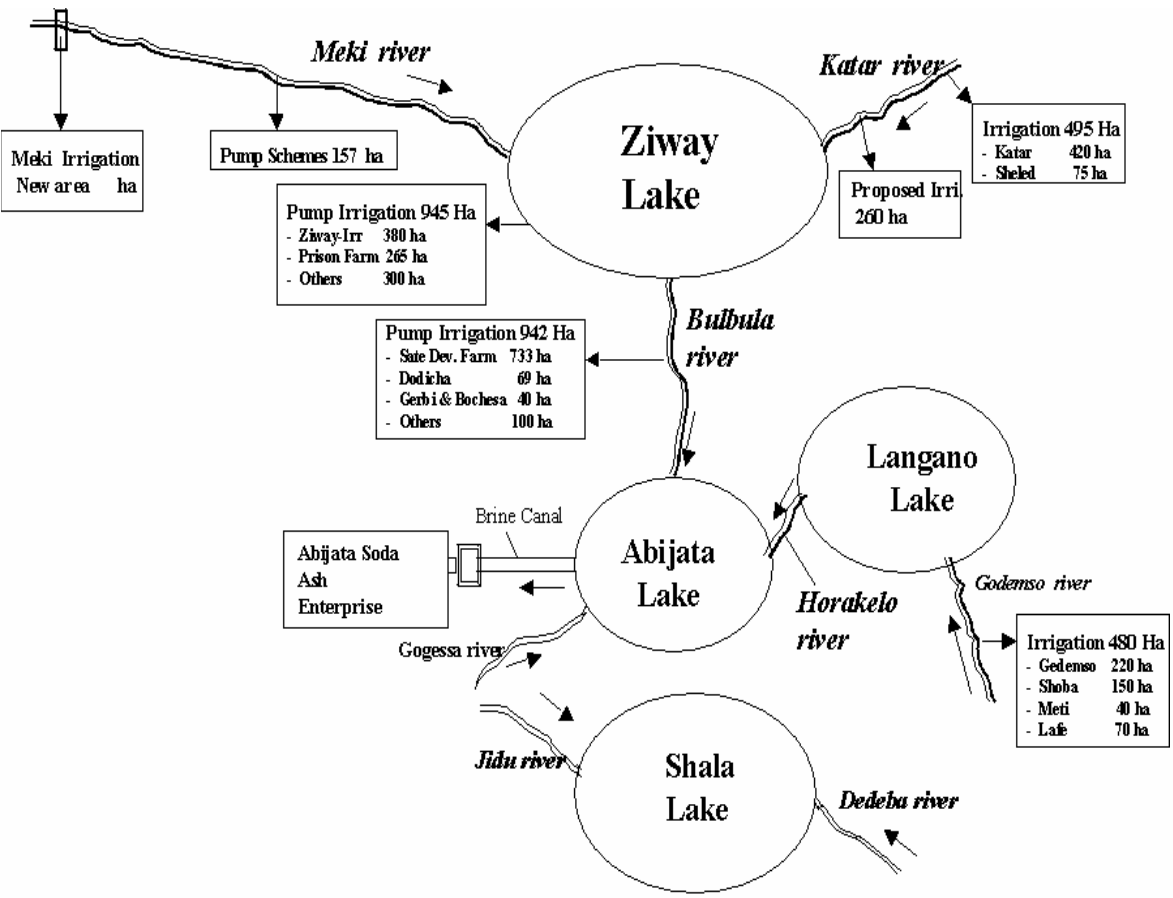
Figure 3.1.4

Location of Streamflow Gauging Stations



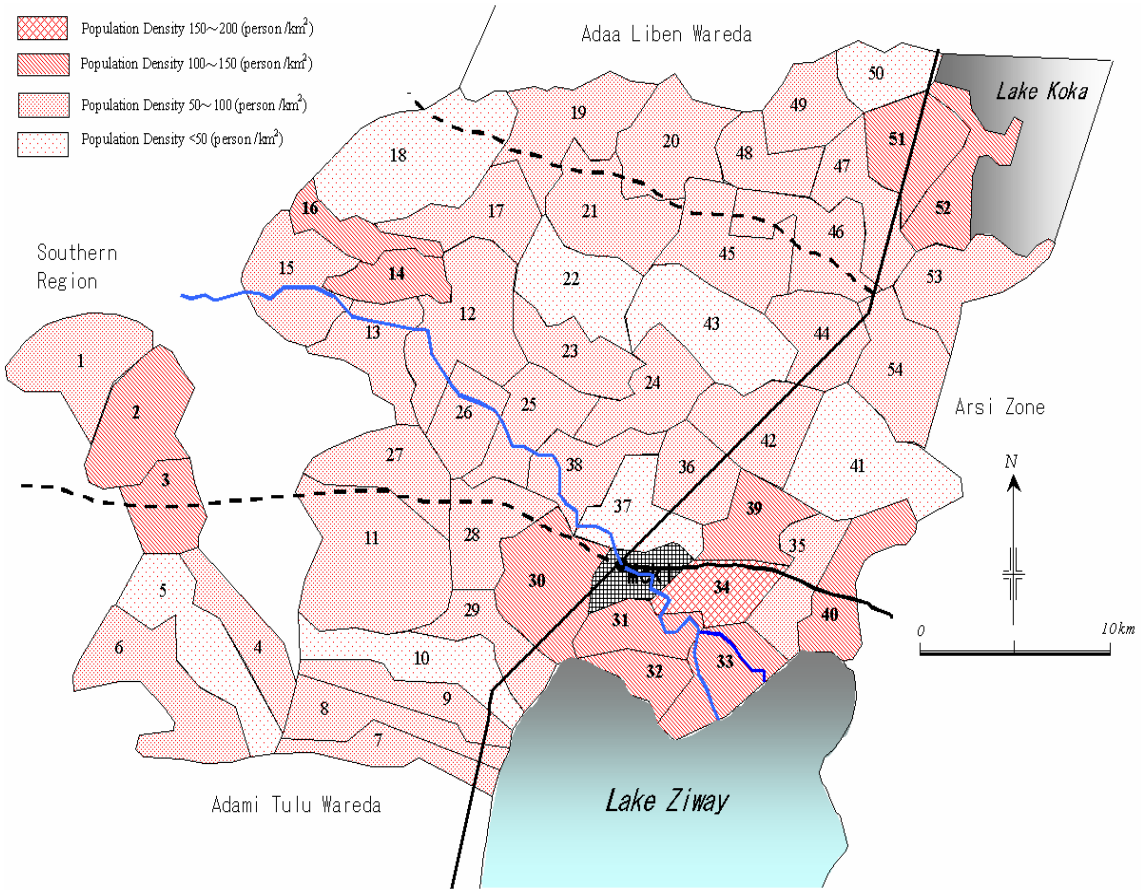
The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia  
 Japan International Cooperation Agency

Figure 3.1.5  
 Seasonal Variation of Water Level of  
 the Ziway Lake



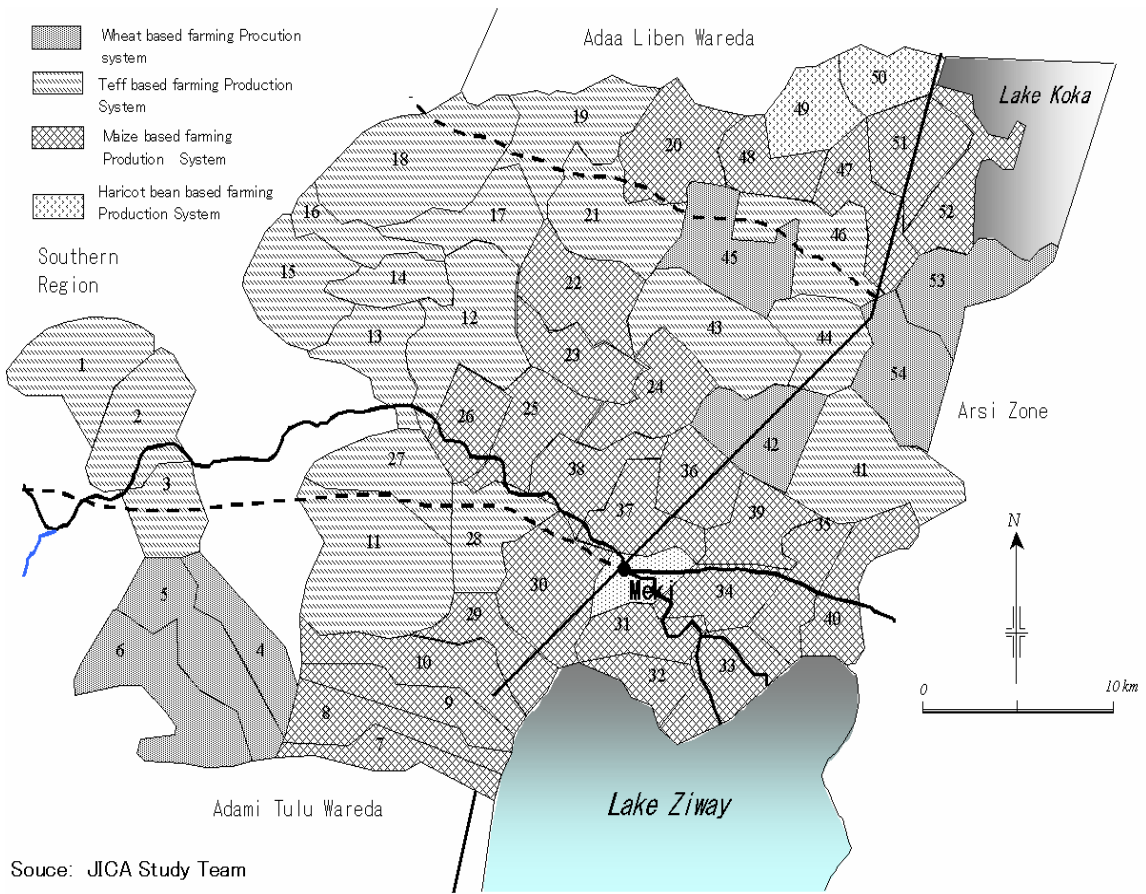
The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia  
 Japan International Cooperation Agency

Figure 3.1.6  
 Water Use in the Meki-Ziway-Abijata System



The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia  
 Japan International Cooperation Agency

Figure 3.2.1  
 Population Density by Peasant Association in  
 Dugda Bora Warada, Year 1994



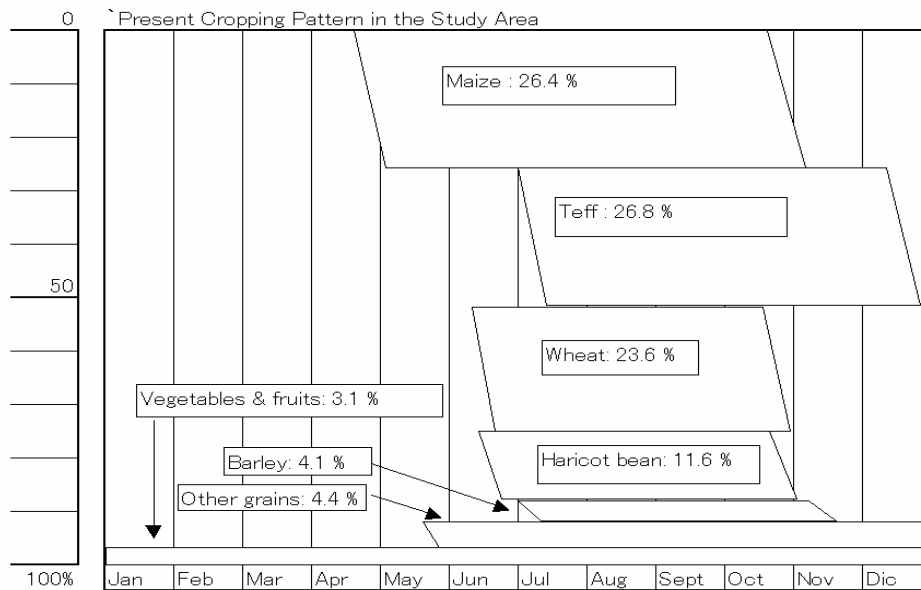
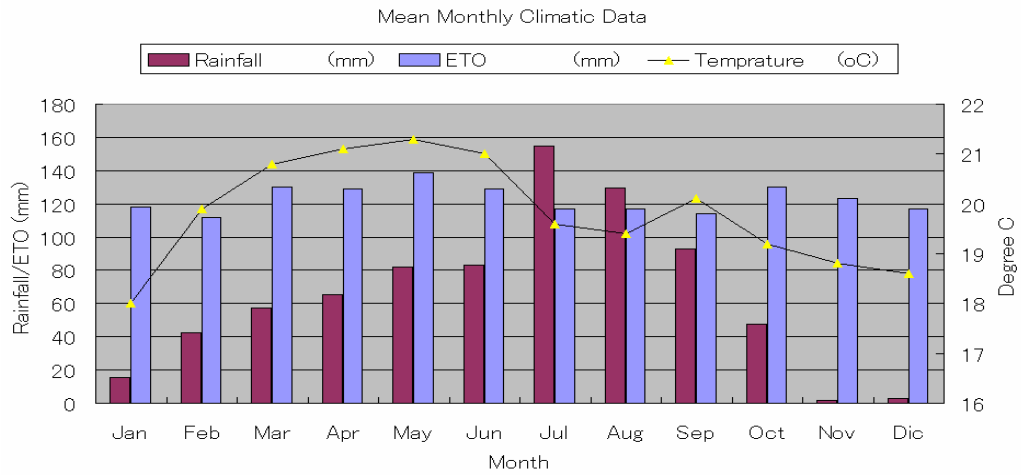
Source: JICA Study Team

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

Japan International Cooperation Agency

Figure 3.3.1  
Crop Production Zone in the Study Area





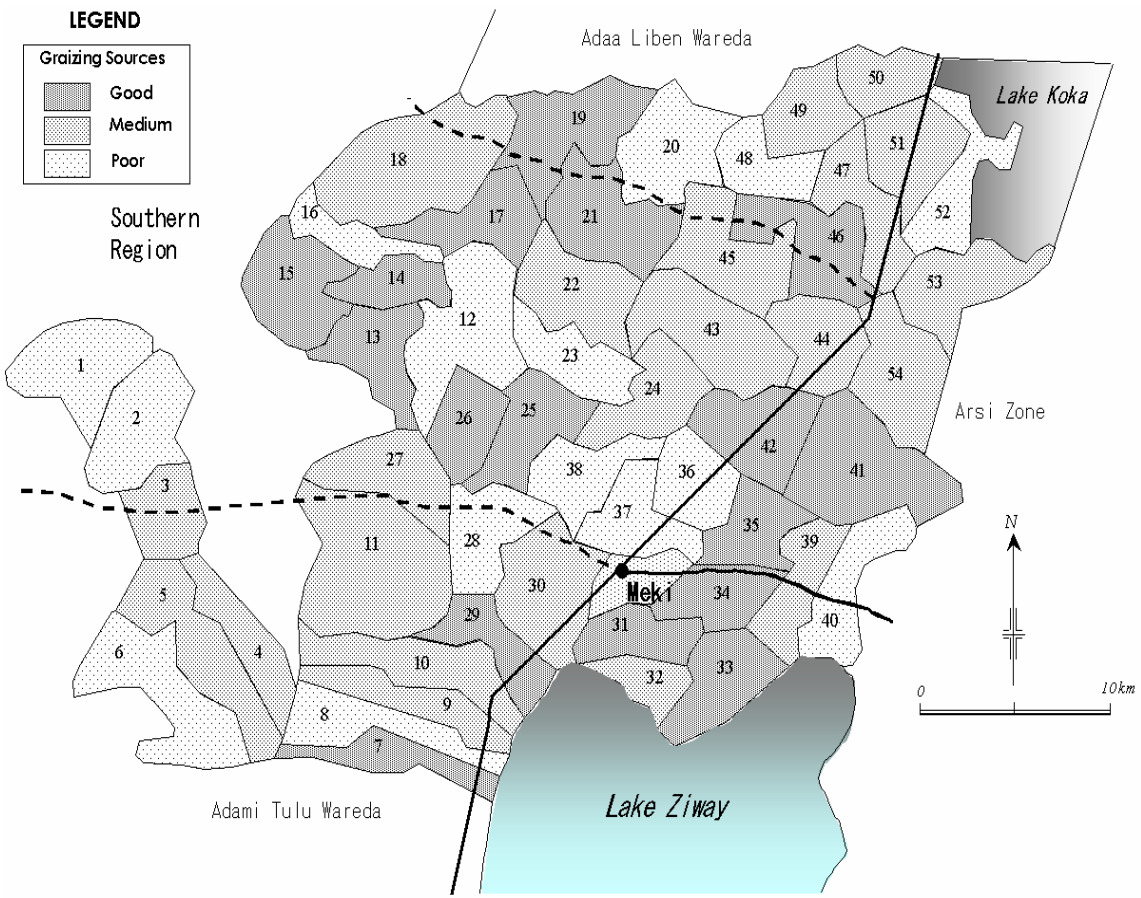
Source: JICA Study Team

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

Japan International Cooperation Agency

Figure 3.3.2

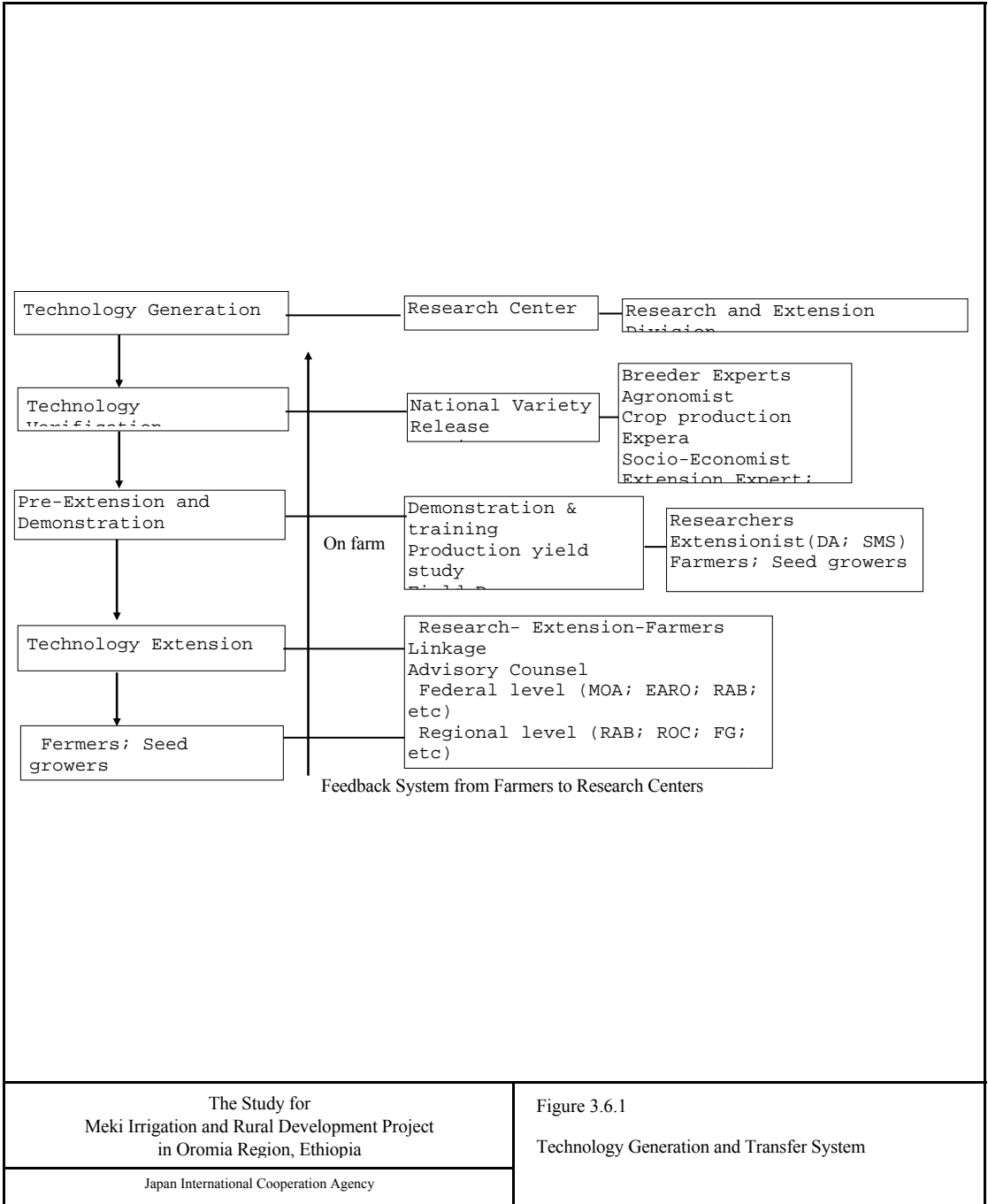
Present Cropping Pattern in the Study Area



The Study for  
Mek1 Irrigation and Rural Development Project  
in Oromia Region, Ethiopia

Japan International Cooperation Agency

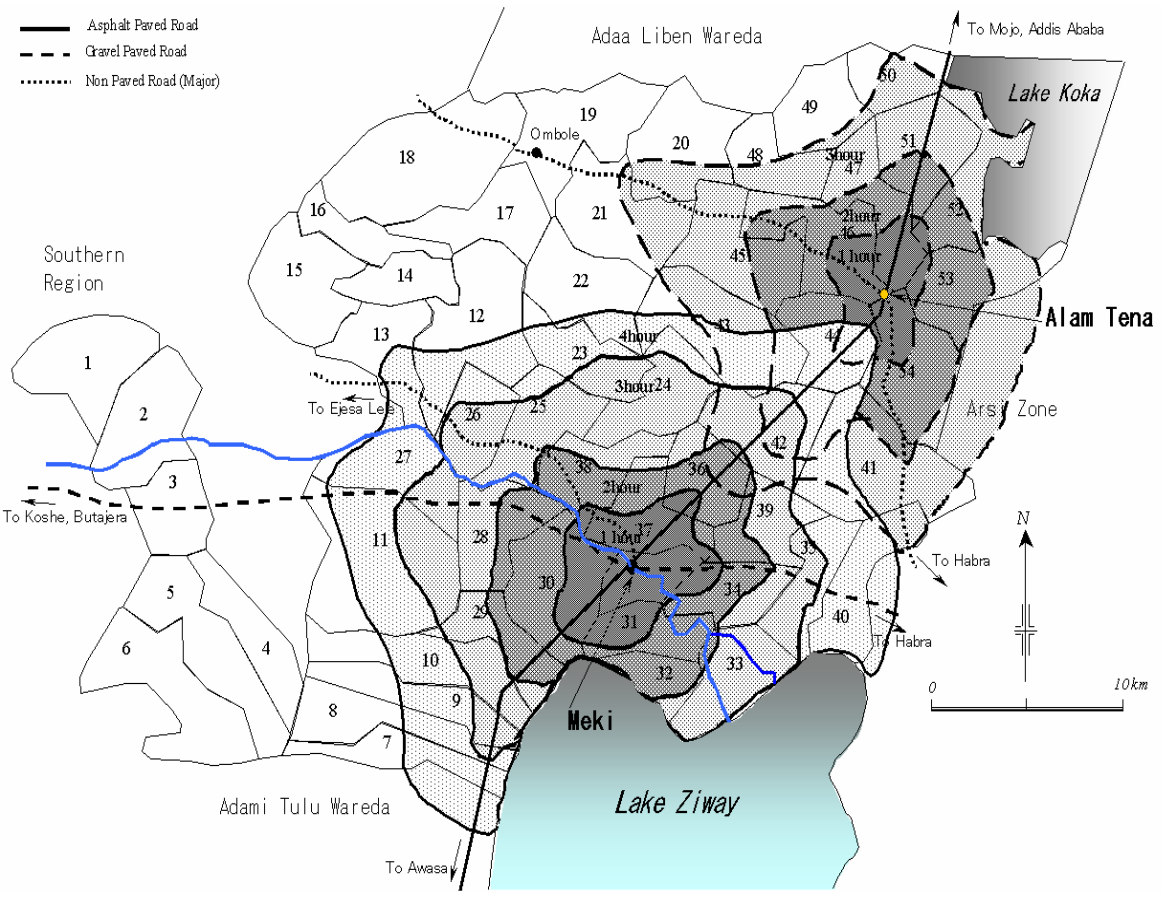
Figure 3.5.1  
Grazing Sources in Duguda Bora Wareda



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

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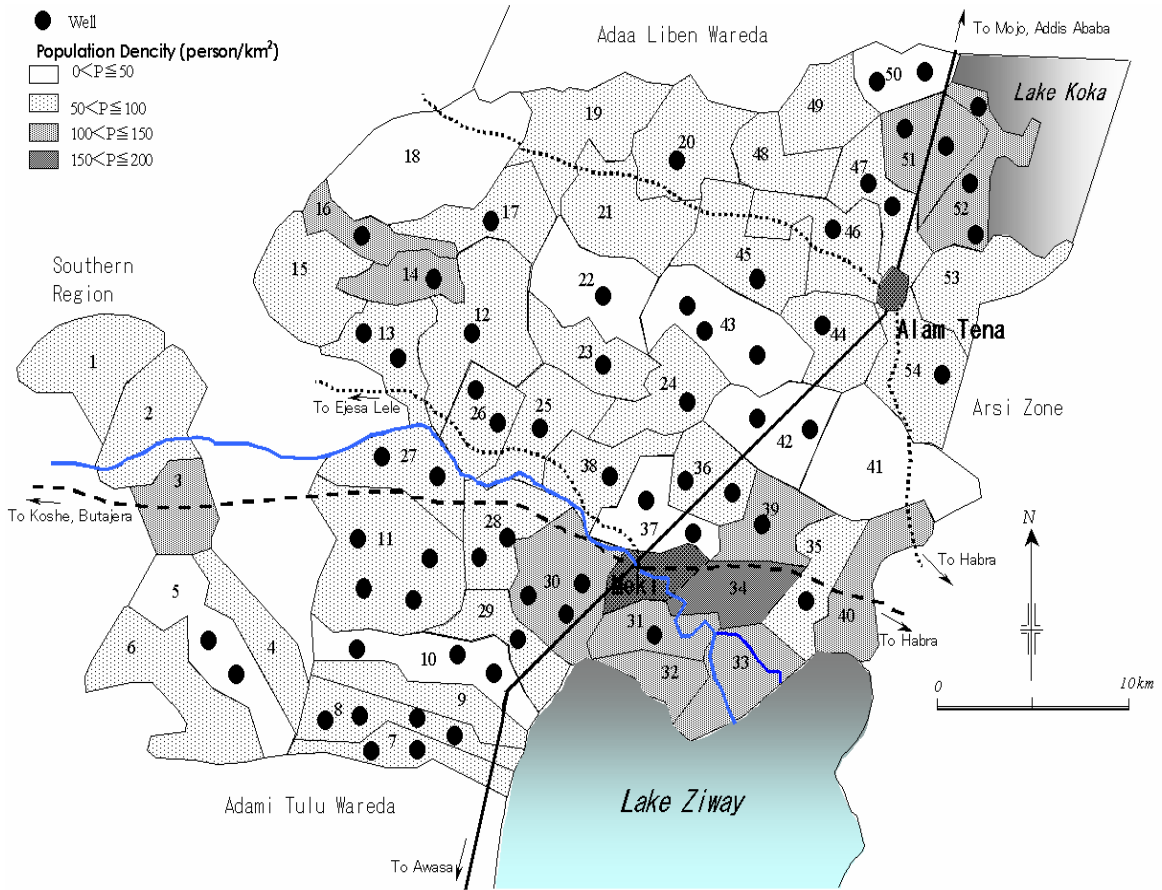
Figure 3.6.1  
Technology Generation and Transfer System



The Study for  
**Meki Irrigation and Rural Development Project**  
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Japan International Cooperation Agency

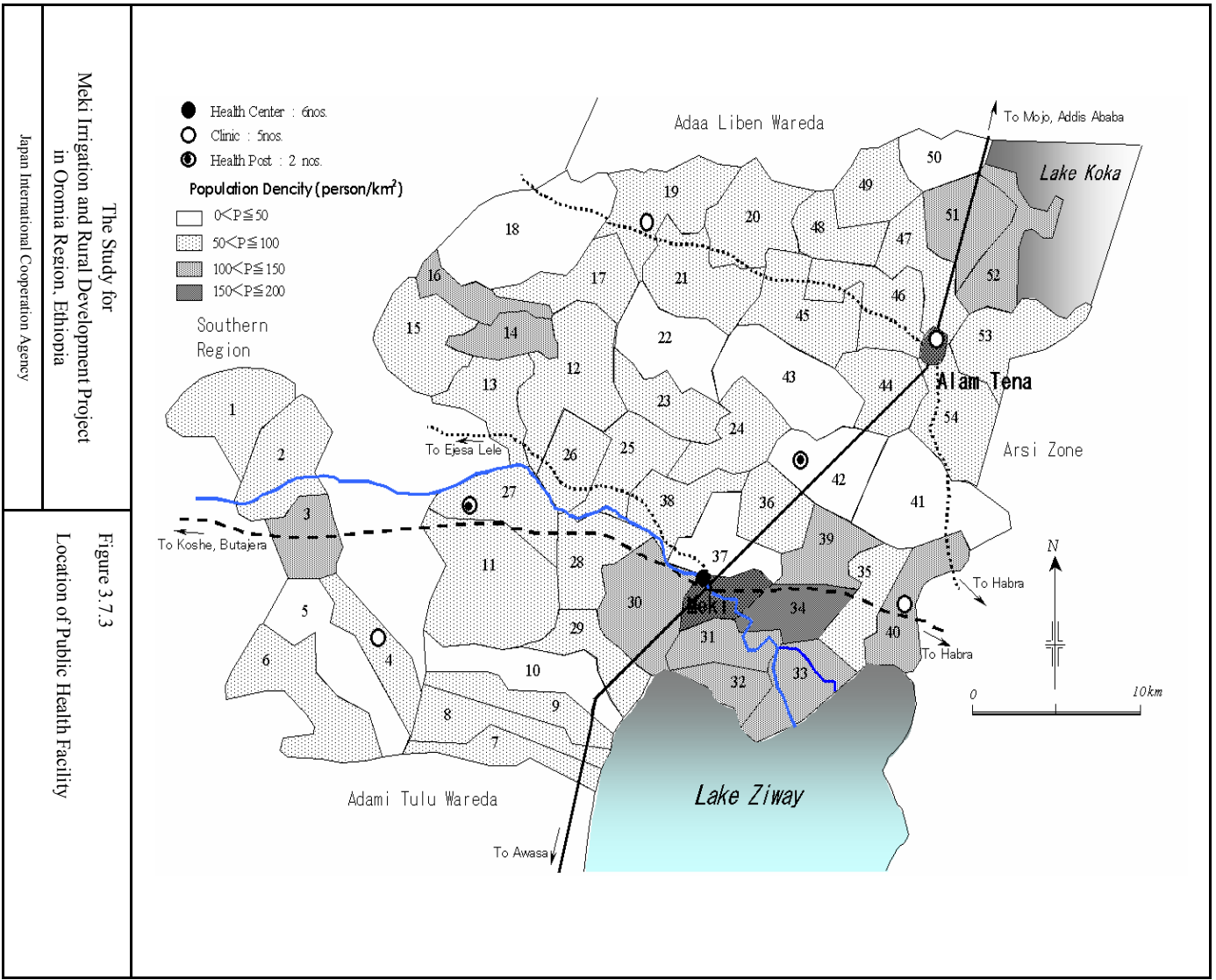
**Figure 3.7.1**  
 Accessibility to Meki and Alam Tena

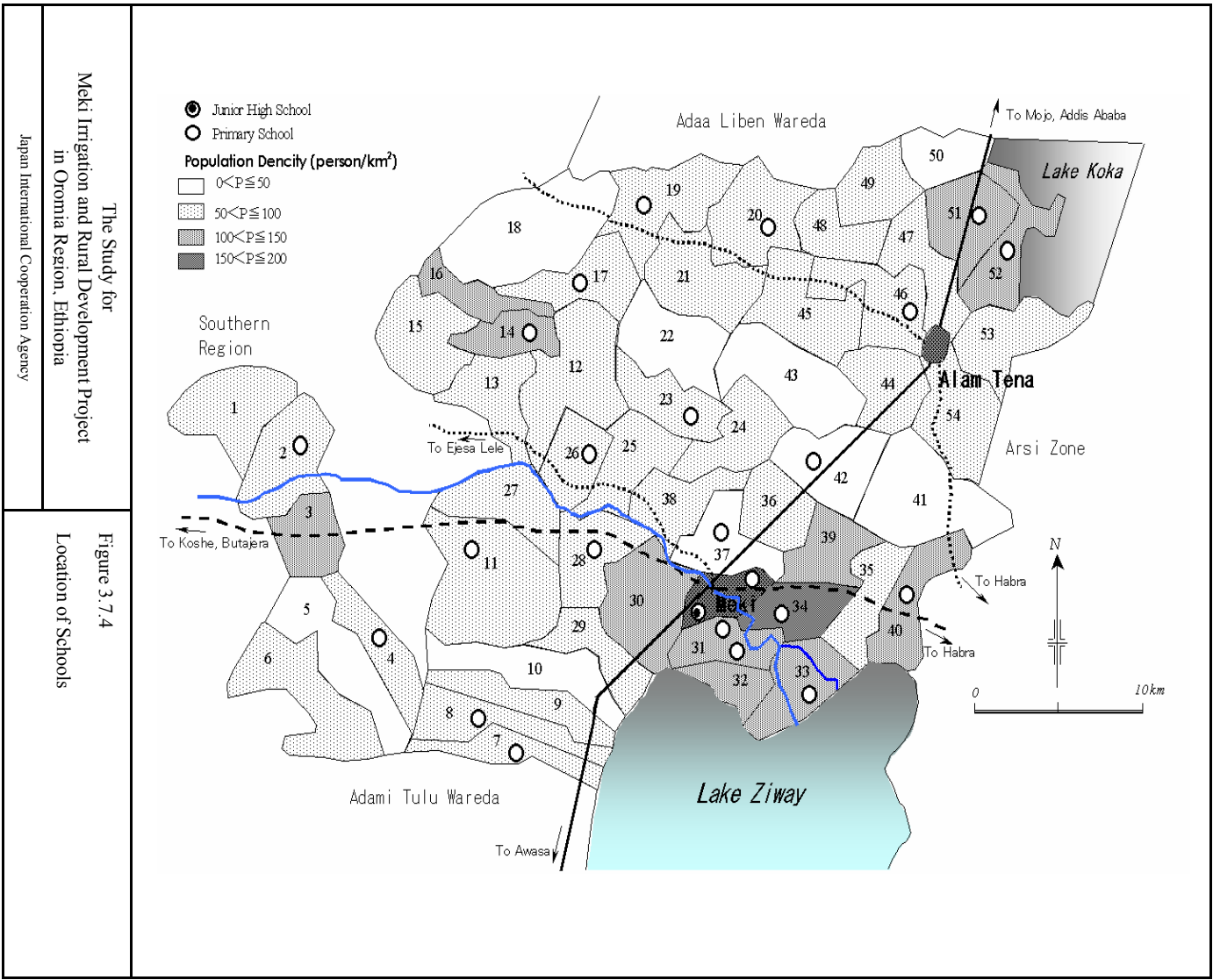


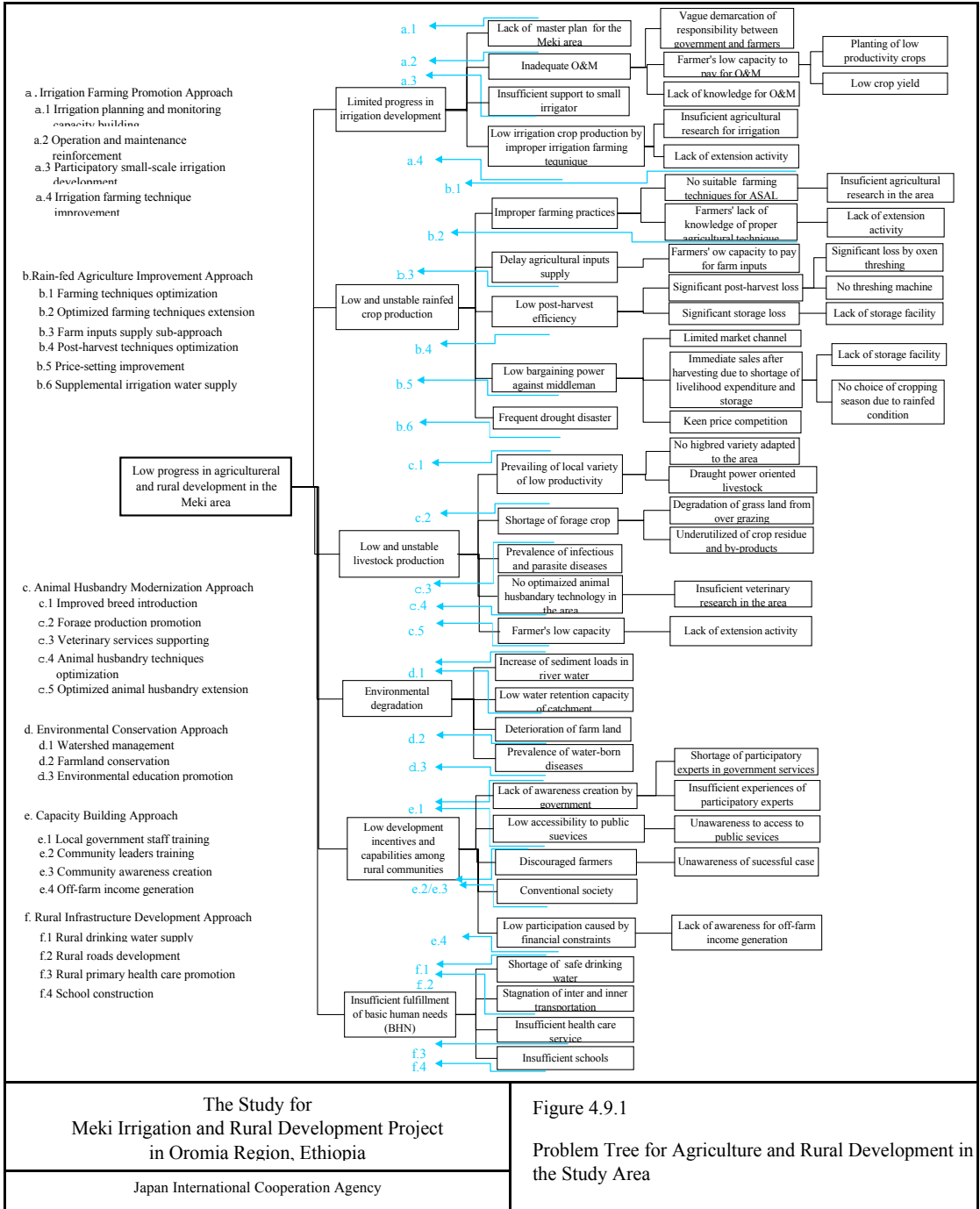
The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia

Japan International Cooperation Agency

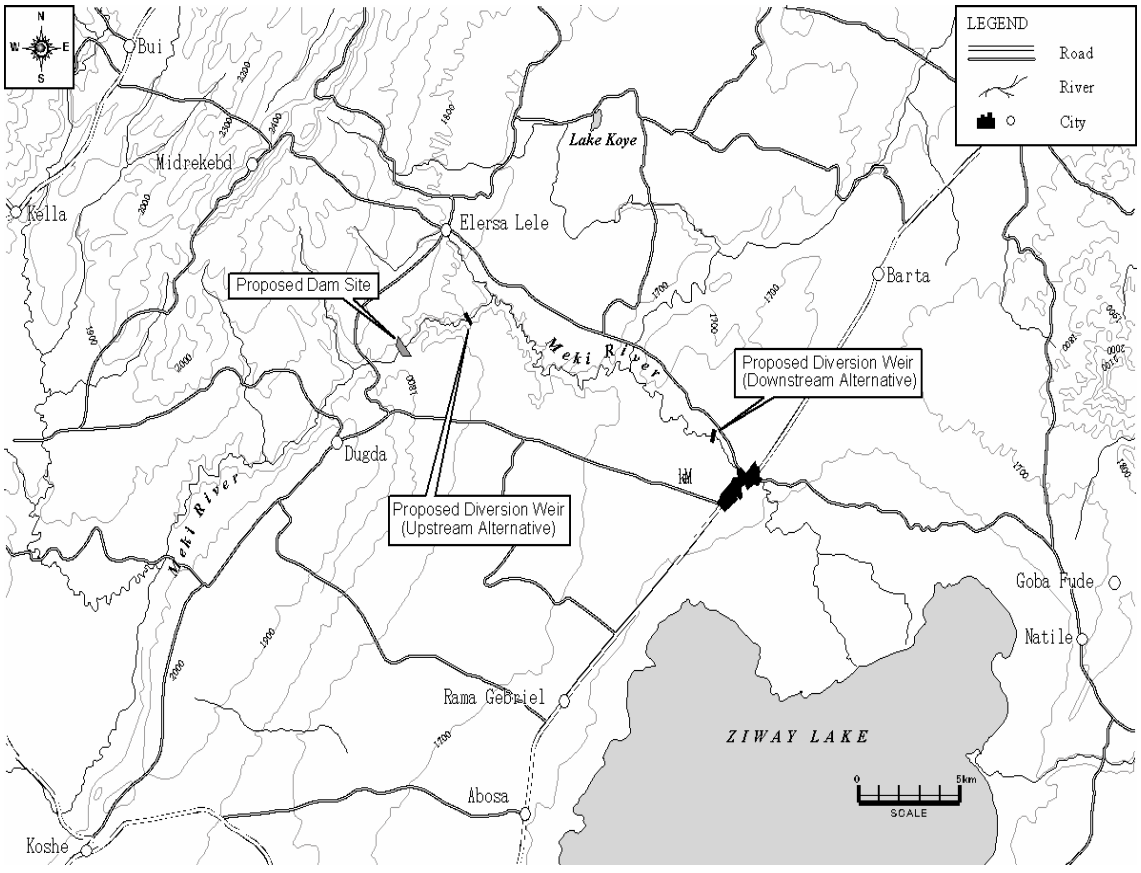
Figure 3.7.2  
 Location of Rural Water Supply Facility







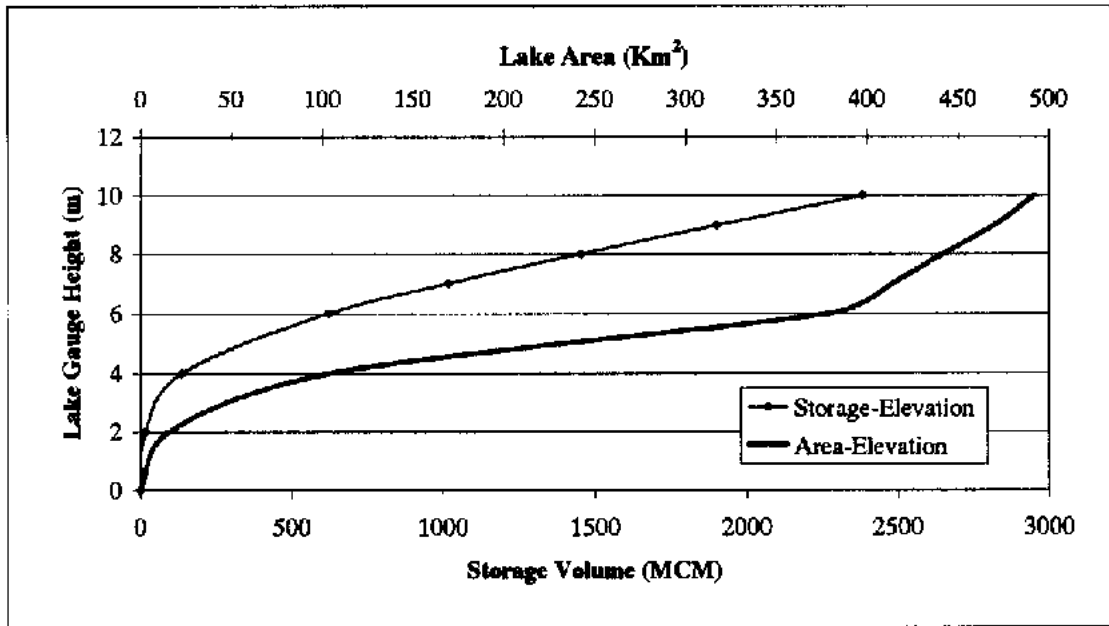




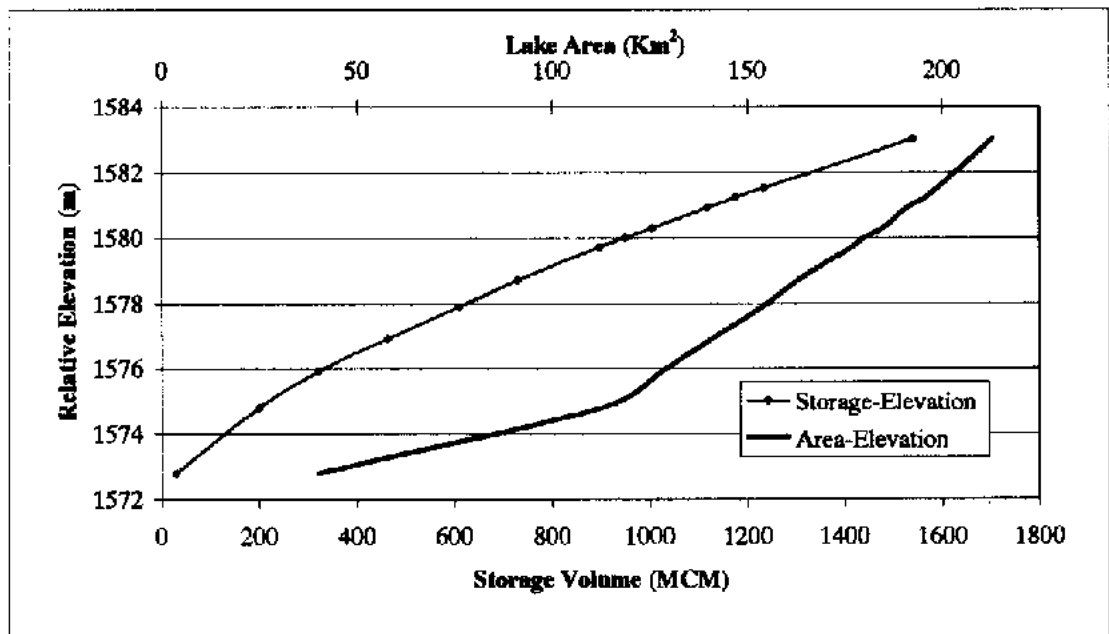
The Study for  
 Meqi Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia

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Figure 5.2.1  
 Location of Candidate Water Resources Facility



(1) Ziway Lake



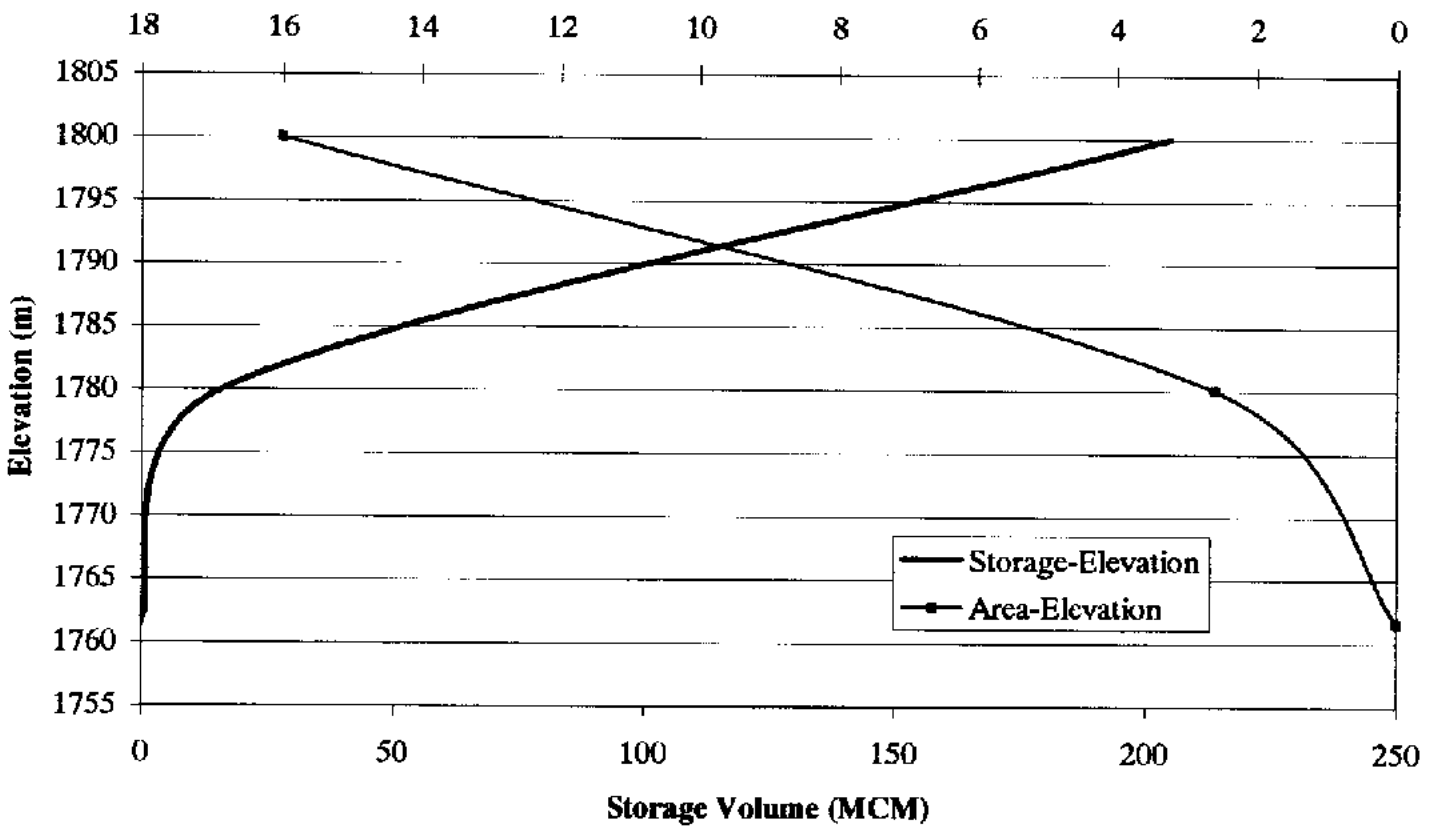
(2) Abijata Lake

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

Japan International Cooperation Agency

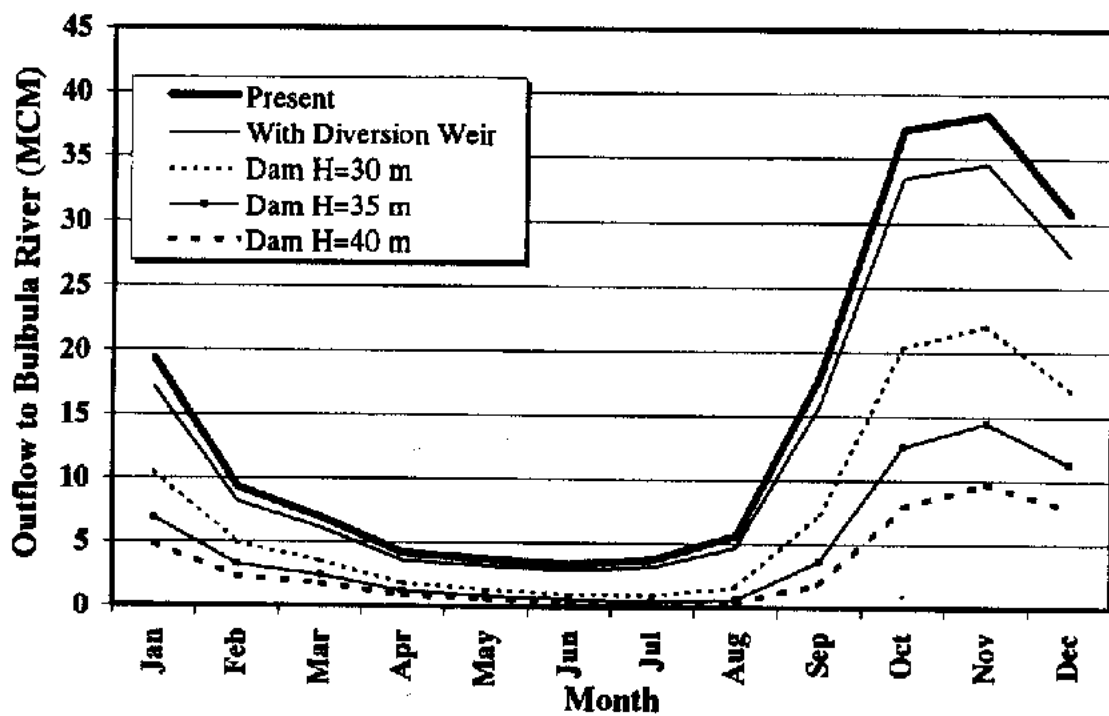
Figure 5.3.1

Storage Characteristics Curve of the  
Ziway and Abijata Lake



The Study for  
**Meki Irrigation and Rural Development Project**  
 in Oromia Region, Ethiopia  
 Japan International Cooperation Agency

Figure 5.3.2  
**Storage Characteristics Curve of the Proposed Dam**

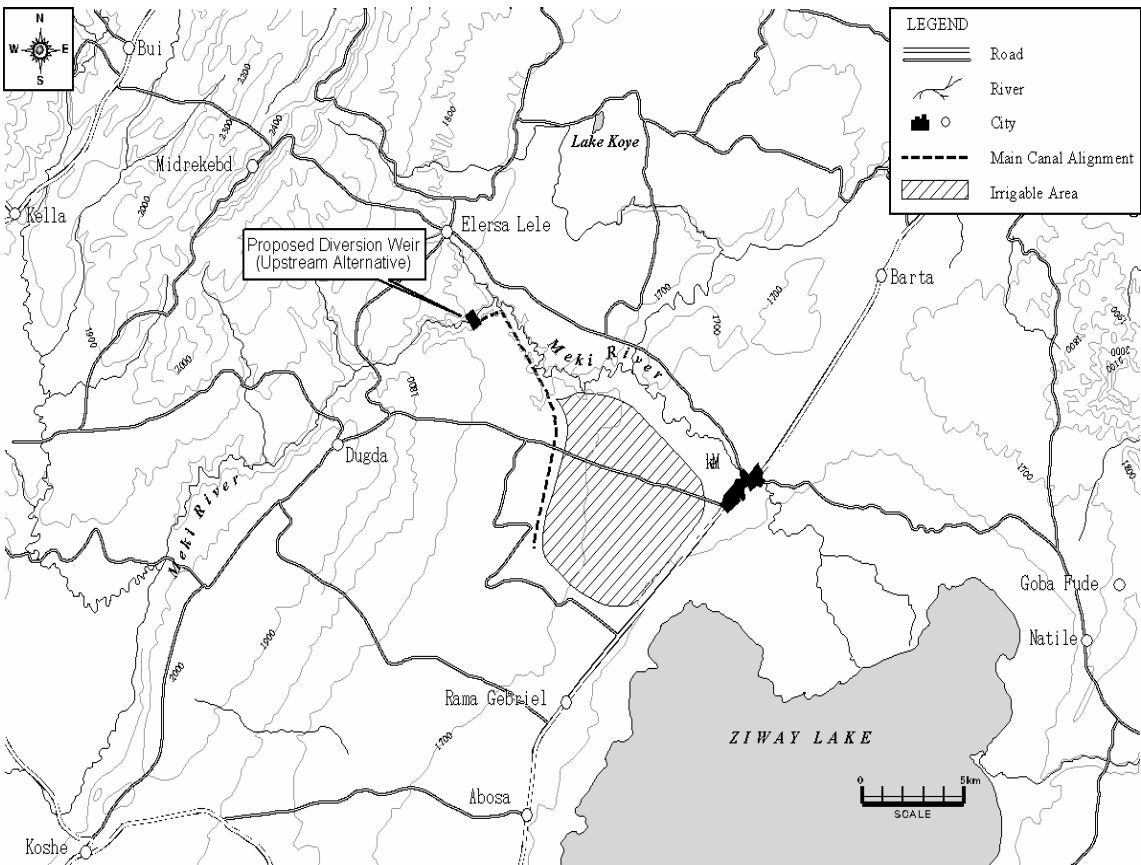


The Study for  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia

Japan International Cooperation Agency

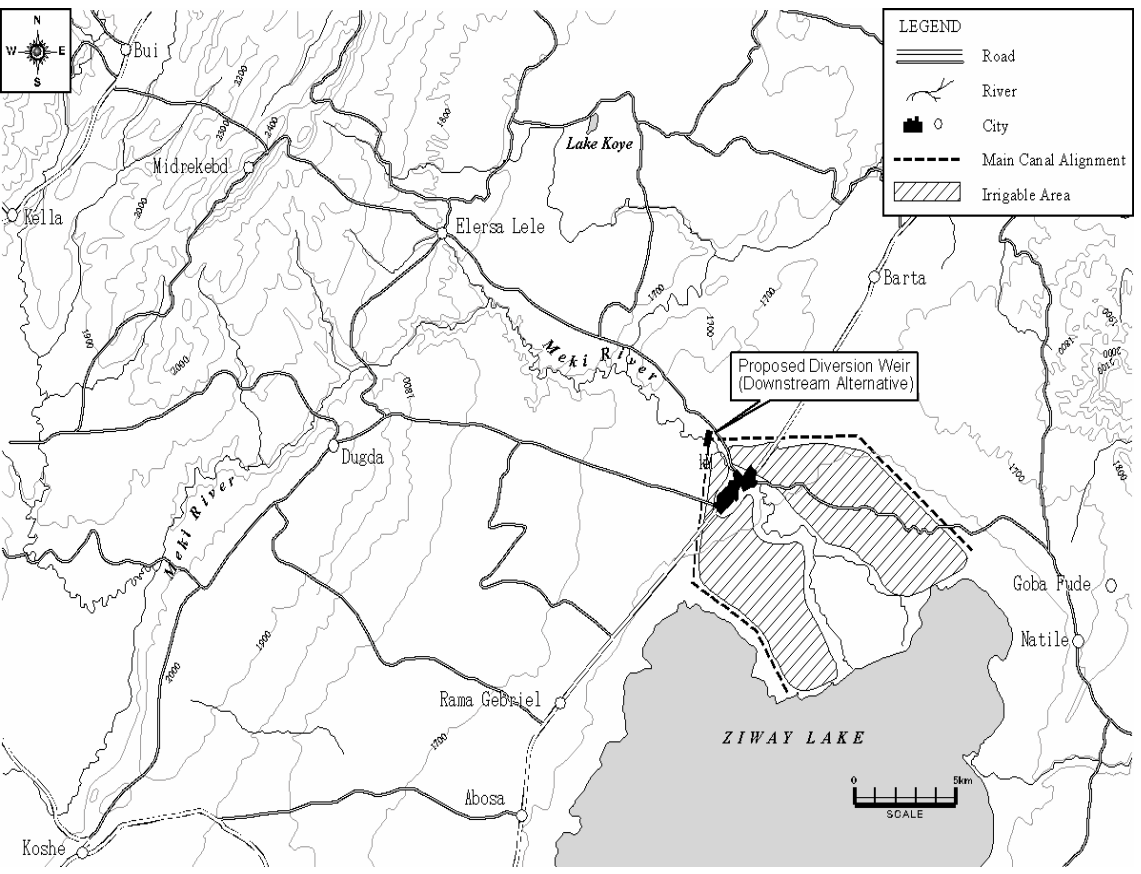
Figure 5.4.1

Seasonal Reduction of the Bulbula River  
Discharge under Different Cases



The Study for  
 Meki Irrigation and Rural Development Project  
 in Oromia Region, Ethiopia  
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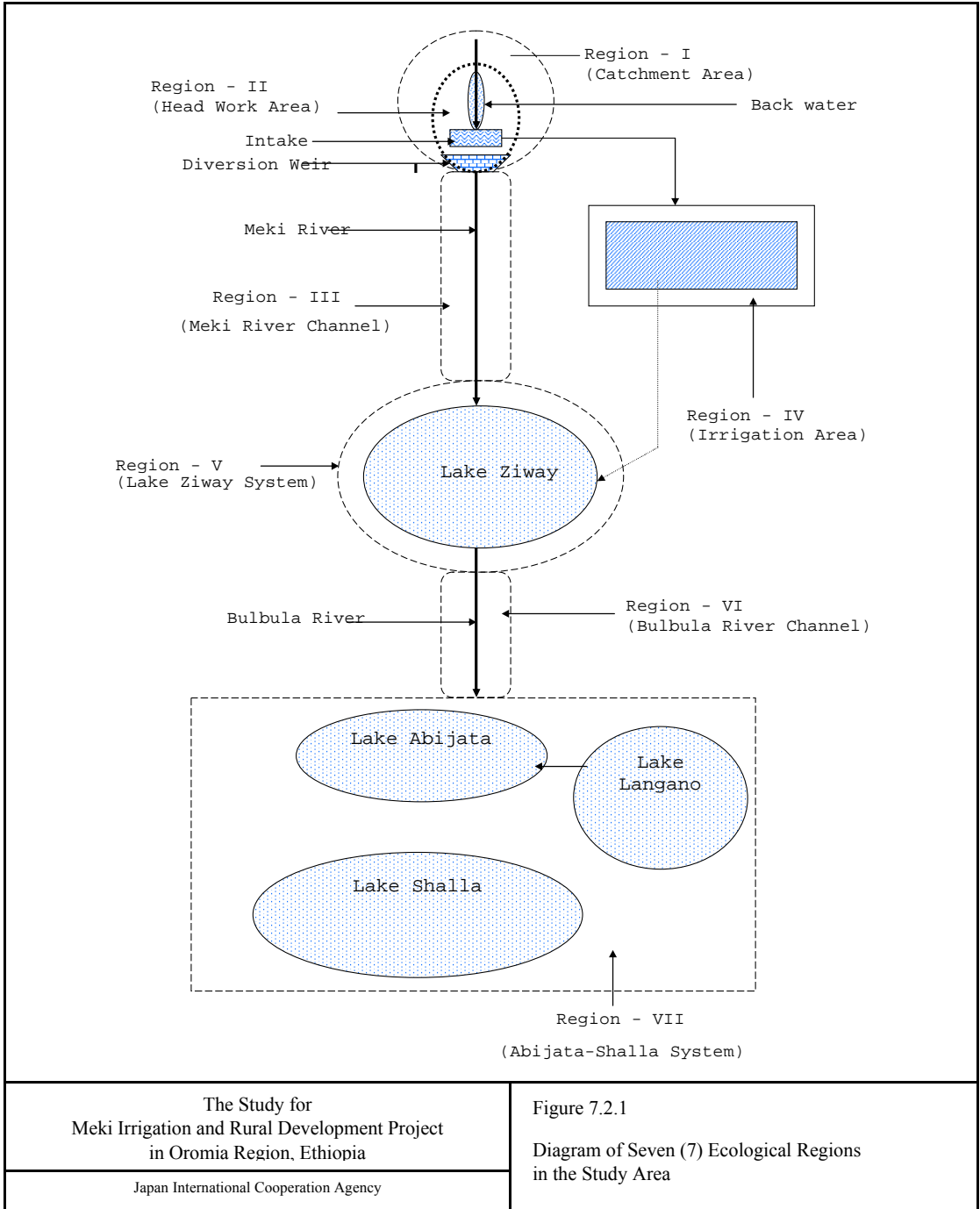
Figure 5.5.1  
 Location of Irrigation Area by Diversion Weir  
 (Upstream Alternative)



The Study for  
 Meki Irrigation and Rural Development Project  
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Figure 5.5.2  
 Location of Irrigation Area by Diversion Weir  
 (Downstream Alternative)







*Attachments*

## *Attachments-1*


### *Master Plan for Meki Irrigation and Rural Development Project*


#### *Minutes of Meetings*

- 1-1 Scope of Work (S/W)  
(28 March 2000)
- 1-2 Minutes of Meeting (M/M) on Scope of Work (S/W)  
(28 March 2000)
- 1-3 Minutes of Meeting (M/M) on Inception Report  
(7 September 2000)
- 1-4 Minutes of Meeting (M/M) on Progress Report (1)  
(20 December 2000)
- 1-5 Minutes of Meeting (M/M) on Interim Report  
(9 March 2001)
- 1-6 Note of Understanding on Preparatory Work for  
Phase – II Study  
(13 March 2001)
- 1-7 Minutes of Meeting (M/M) on Progress Report (2)  
(20 November 2001)
- 1-8 Minutes of Meeting (M/M) on Draft Final Report  
(31 January 2002)


Scope of Work  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

Addis Ababa, 28 March, 2000

  
Ryuzo NISHIMAKI  
Leader  
The Preparatory Study Team  
Japan International Cooperation Agency  
(JICA)

  
Amdisa Kelkela Angessa  
General Manager  
Amdisa Kelkela  
General Manager  
Oromia Irrigation Development Authority  
(OIDA)  
the Government of the Oromia Regional  
State

Witnessed by

  
Hailenichael Kinfu  
Head  
Bilateral Cooperation Department  
Ministry of Economic Development  
and Cooperation

## I. INTRODUCTION

In response to the request of the Government of The Federal Republic of Ethiopia (hereinafter referred to as "GOE"), the Government of Japan decided to conduct the Study on Meki Irrigation and Rural Development Project in Oromia Region, (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as JICA), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of Ethiopia.

The present document sets forth the scope of work with regard to the Study.

## II. OBJECTIVES OF THE STUDY

The objectives of the study are as follows;

- (1) to formulate a Master plan for a rural development in Meki area through considering its irrigation potential, of which over-all goal is to be a model for other area in Oromia region,
- (2) to conduct a technology transfer to Ethiopian counterpart personnel, aiming to contribute to the institutional building of OIDA, in the course of the Study.

## III. STUDY AREA

The Study area shall be indicated in the location map attached as Annex 1.

## IV. SCOPE OF THE STUDY

In order to achieve the objectives above, the Study shall consist of the following items.

### [ Phase 1 ]

#### 1. Data collection

1.1 Collect and review the existing information relevant to the Study

1.2 Carry out field surveys and interviews together with the supplementary data collection on following aspects;

- (1) Natural condition (Topography, Meteorology, Hydrology, Geology, Soil, etc.)
- (2) Social and economic condition (Social & economic indices, Land tenure, Health & water supply, Farmers' economy, etc.)
- (3) Present activity and potential of agricultural & livestock production
- (4) Present condition of post-harvest and marketing
- (5) Rural economy and rural credit
- (6) Extension service / system
- (7) Others relevant to the Study

#### 2. Identification of constraints and potentials

2.1 Analyze the collected information, and identify major constraints, problems and potentials.

2.2 Conduct the Initial Environment Evaluation (IEE)

2.3 Prepare a draft master plan, taking into account following components.

- (1) Water resource development
- (2) Improvement of agricultural production
- (3) Improvement of people's livelihood
- (4) Public intervention (Extension service, Rural credit, etc.)
- (5) Institutional Building

(6) Others

2.4 Select pilot activity / activities for a verification study

[ Phase 2 ]

3. Formulation of Master plan

3.1 Conduct the verification study through implementing selected activity / activities, proposed in the draft Master plan.

3.2 Verify rationality and effectiveness of the draft Master plan.

3.3 Finalize the Master plan.

4. Prepare Conclusion and Recommendation

## V. STUDY SCHEDULE

The Study shall be carried out in accordance with the Tentative Work Schedule attached as Annex 2.

## VI. REPORTS

JICA shall prepare and submit the following reports, written in English, to the GOE;

Inception Report	: Twenty (20) copies at the commencement of the Study
Progress (1) Report	: Twenty (20) copies at the end of Phase I
Interim Report	: Twenty (20) copies at the commencement of Phase II
Progress (2) Report	: Twenty (20) copies in Work in Ethiopia of Phase II
Progress (3) Report	: Twenty (20) copies at the end of Work in Ethiopia of Phase II
Draft Final Report	: Twenty (20) copies at the end of Phase II Ethiopian side shall submit written comments on the Draft Final Report to JICA in one (1) month after the receipt of the report.
Final Report	: Forty (40) copies in two (2) months after the receipt of comments on the Draft Final Report from Ethiopian side

## VII. UNDERTAKING OF THE GOE

1. To facilitate the smooth conduct of the Study, GOE shall take necessary measures, as listed below;

- (1) Secure the safety of the Study Team,
- (2) Permit the members of the Study Team to enter, leave and sojourn in Ethiopia for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
- (3) Exempt the members of the Study Team from taxes, duties and other charges on equipment, machinery and other materials brought into Ethiopia for the conduct of the Study,
- (4) Exempt the members of the Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study,
- (5) Provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced into Ethiopia from Japan in connection with the implementation of the Study,
- (6) Secure permission for the Study Team(s) to enter wherever necessary for the implementation of the Study,
- (7) Secure permission for the Study Team to take all data and documents, including photographs and maps, relevant to the Study out of Ethiopia to Japan, and
- (8) Provide medical services as needed. Its expenses will be chargeable to members of the Study Team.

2. GOE shall bear claims, if any arises, against members of the Study Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team.

3. Oromia Irrigation and Development Authority (hereinafter referred to as "OIDA") shall act as the counterpart agency to the Study Team and also as the coordinating body in relations with other governmental and non-governmental organizations for the smooth implementation of the Study.

4. OIDA shall, at its own expense and in cooperation with other organizations concerned, provide the Study Team with the following;

- (1) Available data and information related to the Study,
- (2) Counterpart personnel,
- (3) Suitable office space and necessary equipment in Addis Ababa and the Study area,
- (4) Credentials or identification cards, and,
- (5) Adequate number of drivers.

#### VIII. UNDERTAKING OF JICA

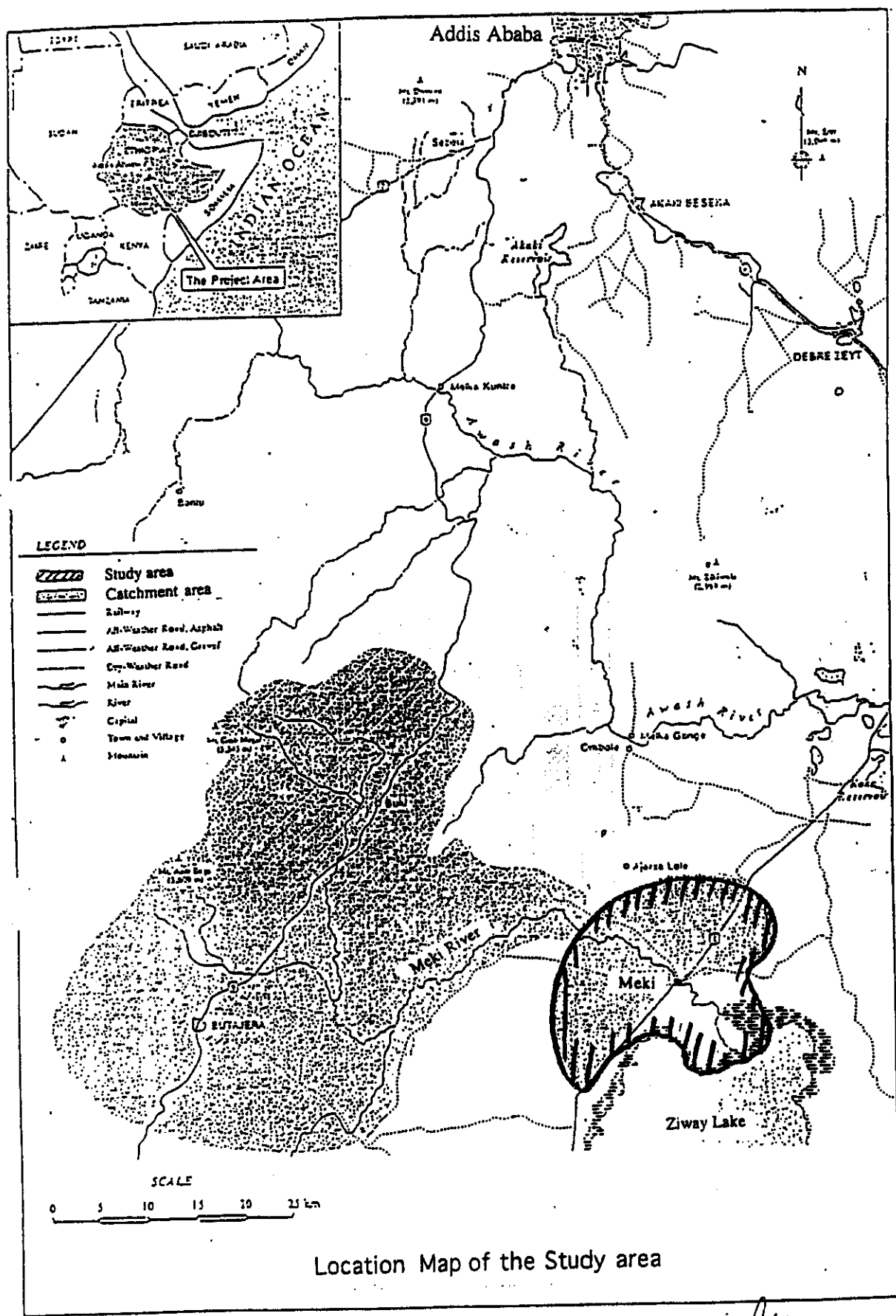
For the implementation of the study, JICA shall take the following measures;

- (1) Dispatch, at its own expense, study teams to Ethiopia, and,
- (2) Pursue technology transfer to the Ethiopian counterpart personnel in the course of the study.

#### IX. CONSULTATION

JICA and OIDA shall maintain constant communication and consult with each other in respect of any matters that may arise from or in connection with the Study.





Location Map of the Study area

*Handwritten signatures and initials:*  
 HP  
 gm  
 \*

## TENTATIVE WORK SCHEDULE

\ MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26				
Work in Ethiopia																														
Work in Japan																														
Stages	← Phase 1 →							← Phase 2 →																						
Reports	△ IC/R				△ P/R(1)					△ P/R(2)		△ I/R								△ P/R(3)			△ DF/R		◎	△ F/R				

(Remarks)

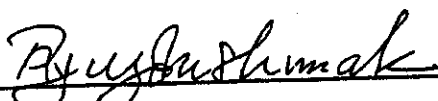
- Ic / R : Inception Report
- P / R(1) : Progress Report(1)
- It / R(1) : Interim Report(1)
- P / R(2) : Progress Report(2)
- It / R(2) : Interim Report(2)
- P / R(3) : Progress Report(3)
- Df / R : Draft Final Report
- F / R : Final Report
- ◎ : Comments on Df / R by Ethiopian side

A1-6



**Minutes of Meetings  
of  
Scope of Work  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency**

Addis Ababa, 28 March, 2000



Ryuzo NISHIMAKI

Leader

The Preparatory Study Team

Japan International Cooperation Agency  
(JICA)



Amdisa Kelkela Angessa  
General Manager

Amdisa Kelkela

General Manager

Oromia Irrigation Development Authority  
(OIDA)

The Government of the Oromia Regional  
State

The preparatory study team (hereinafter "the Team"), organized by Japan International Cooperation Agency (hereinafter "JICA") and headed by Mr. Ryuzo NISHIMAKI, visited the Federal Republic of Ethiopia from May 18 to May 29, 2000. The Team discussed and exchanged views with regard to the Scope of Work for "the Study on Meki Irrigation and Rural Development Project in Oromia Region"(hereinafter "the Study") with the officials from Oromia Irrigation Development Authority (hereinafter "OIDA") as well as others concerned.

As a result of the discussions, the Ethiopian side and the Team mutually agreed on the Scope of Work for the Study.

The followings are the important issues discussed and agreed.

The list of participants in the series of discussions is attached as ANNEX.

1. Data collection

OIDA will collaborate and facilitate the data collection for the study team. JICA would pay for items; topographic maps for instance, when needed.

2. Verification study and activity to be studied

The verification study would be conducted in phase 2 of the Study, aiming for capacity building of OIDA as well as verifying the technological soundness of the Master plan.

Whereas, the institutional building would be studied and planned with regard to OIDA's activities; (1) Planning & designing, (2) Construction, (3) Extension & water shed management in crop production and (4) Community mobilization.

The details of this study would be discussed in phase 1 and confirmed at beginning of phase 2.

3. Technology transfer

The on-the-job training, seminar(s) and workshop(s); on agricultural practices in Japan for instance, would be carried out in the course of the Study.

OIDA requested counterpart training in Japan in order to supplement the activities above. The team promised to convey its request to the government of Japan.

4. Steering committee

For smooth and efficient implementation of the Study, the Steering Committee would be established. OIDA would chair and be responsible to convene the committee prior to the commencement of the Study.

The following institutions are currently assumed.

Ethiopian side: Oromia Irrigation Development Authority (OIDA)

Bureau of agriculture

Water, Mining, Energy Resource Development bureau



Cooperative promotion bureau  
relevant institution of Woman Affairs Sector  
Ministry of Economic Development and Cooperation (MEDaC)

Japanese side: Study team  
Advisory study team  
JICA Ethiopia office  
Embassy of Japan

5. Specialist to be engaged

Basically, specialists in following fields are assumed to participate in the Study.

(1) Irrigation infrastructure and management, (2) Rural development, (3) Hydrology / Water management, (4) Topography / Geology, (5) Agronomy / Soil, (6) Agro-economy, (7) Extension / Community mobilization, (8) Design and estimate, (9) Project evaluation

6. Final report

The final report would be accessible to whoever interested.

7. Office space

OIDA promised to provide office space in Addis Ababa, furnished with desks, chairs, power outlet and an exclusive use of one international telephone line. OIDA also promised to arrange the office in the study area, equipped in the same manner with the one in Addis Ababa. However, OIDA requested that personal computer(s), a photocopier, a facsimile, a telephone bill and a rent (if necessary) would be provided and paid by JICA. The team promised to convey its request to the government of Japan.

8. Vehicle

OIDA requested the vehicle(s) including fuel for the study team would be prepared by JICA, while OIDA promised to arrange necessary number of drivers with basic salaries. The team promised to convey the request to the government of Japan.

OIDA explained it was favorable if the vehicle(s) would be donated to OIDA after completion of the Study, and also explained OIDA would take care of the tax and others relevant to the acquisition of the vehicle(s).

9. Allowance for field trip

Regarding field trips from Addis Ababa, OIDA will pay per diem in accordance with the laws, regulations or rules of Ethiopia to counterpart personnel(s) and driver(s). OIDA strongly requested that JICA would pay the excess over what OIDA would cover, when necessary. The team promised to convey its request to the government of Japan.



ANNEX

List of Participants

**Ethiopian side:**

**Oromia Irrigation Development Authority (OIDA)**

Mr. Amdisa Kelkela	General Manager
Mr. Teshome Atnafie Guyo	Head, Study and Design Department
Mr. Teshome Lemma	Leader, Study and Design team
Mr. Belay Melkamu	Leader, Construction Supervision team

**Japanese side:**

**Preparatory study team**

Mr. Ryuzo NISHIMAKI	Leader
Mr. Takuro ISHII	Agriculture
Mr. Yasukuni KIMURA	Agricultural and Rural Infrastrucutre
Mr. Makoto ASAI	Coordinator
Mr. Takahiro MIYOSHI	Rural / Society Development

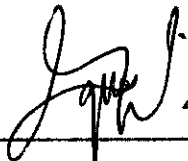
**JICA Ethiopia office**

Mr. Hiroshi SUMIYOSHI	Staff
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Minutes of Meeting  
on  
Inception Report  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

Addis Ababa, 7<sup>th</sup> September 2000



Mr. Amdisa Kelkela  
General Manager  
Oromia Irrigation Development  
Authority (OIDA)  
The Government of the Oromia  
Regional State




Mr. Masayuki Koyama  
Leader  
The Study Team  
Japan International Cooperation Agency  
(JICA)

Witnessed by



Mr. Tassew Bekele  
For Bilateral Cooperation Department  
Ministry of Economic Development &  
Cooperation (MEDaC)



Dr. Satoru Takahashi  
Leader  
Advisory Study Team  
Japan International Cooperation Agency  
(JICA)

In accordance with the Scope of Work (hereinafter referred as “S/W”) for the Study on Meki Irrigation and Rural Development Project in Oromia Region (hereinafter referred as “the Study”), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Mr. Masayuki Koyama for the implementation of the Study, to the Federal Democratic Republic of Ethiopia. At the commencement of the Study, the Study Team officially submitted twenty (20) copies of the Inception Report and explained the basic concepts, methodology and schedule of the Study to the Oromia Irrigation Development Authority (hereinafter referred as OIDA) on 5<sup>th</sup> September 2000. The participants of the meeting are listed as per ANNEX. The followings are important issues discussed and agreed upon in the meeting.

(1) The Ethiopian side confirmed that contents of the Inception Report were prepared in compliance with the conditions set forth in the S/W and agreed to proceed to the next stage of the Study in accordance with the methodology and schedule stipulated in the Inception Report.

(2) The Ethiopian side stated that Health Bureau and Planning and Economic Development Bureau of the Oromia Regional State would additionally take part in the steering committee. It was confirmed that the steering committee would consist of the following agencies in order to provide necessary advice from time to time and official approvals on the reports to be submitted by the Study Team.

Oromia Irrigation Development Authority (OIDA)  
Bureau of Agriculture  
Water, Mining, Energy Resource Development Bureau  
Cooperative Promotion Bureau  
Health Bureau  
Planning and Economic Development Bureau  
Relevant institution of Women Affair Sector  
Ministry of Economic Development and Cooperation (MEDaC)

(3) In response to the request by the Japanese side, the Ethiopian side confirmed to nominate local counterparts for each member of the Study Team. It was agreed that the weekly meeting would be held between the Study Team and the counterpart team every Monday in order to keep the mutual understanding on the work progress and solve problems arising from the day to day operation of the Study. The counterparts would participate in the daily activities of the Study according to the work schedule agreed in the weekly meetings.



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**List of Participants****Ethiopian side:****Oromia Irrigation Development Authority (OIDA)**

Mr. Amadisa Kelkela	General Manager
Mr. Teshome Atnafie Guyo	Head, Study and Design Department
Mr. Neme Sori	Head, Planning & Programming Service
Mr. Jemal Kedir	Head, Extension & Irrigation Water Management Dept
Mr. Ermias Biru	Head, Research & Laboratory Service

**Water, Mineral and Energy Resources Development Bureau**

Mr. Dereje Walco	Team Leader
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**Co-operative Promotion Bureau**

Mr. Lelissa Chalchisa	Head, Planning and Programming Services
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**Japanese side:****Advisory Study Team**

Dr. Satoru Takahashi	Leader
Mr. Kyosuke Kawazumi	Coordinator

**The Study Team**

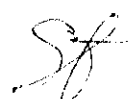
Mr. Masayuki Koyama	Leader
Mr. Takuya Igawa	Irrigation and Rural Infrastructure Engineer
Mr. Yoshikazu Ando	Coordinator

**JICA Ethiopia Office**

Mr. Hiroshi Sumiyoshi	Assistant Resident Representative
Mr. Yeshitila Amare	Staff



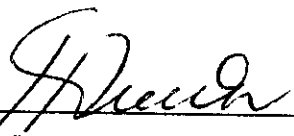
A1 - 13

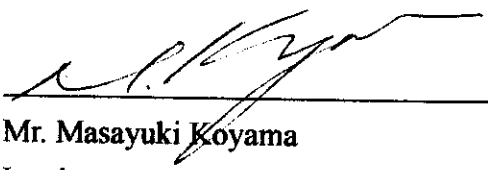




Minutes of Meeting  
on  
Progress Report (1)  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

Addis Ababa, 20<sup>th</sup> December 2000

  
\_\_\_\_\_  
Mr. Itafa Imama  
General Manager  
Oromia Irrigation Development  
Authority (OIDA)  
The Government of the Oromia  
Regional State

  
\_\_\_\_\_  
Mr. Masayuki Koyama  
Leader  
The Study Team  
Japan International Cooperation Agency  
(JICA)



In accordance with the Scope of Work for the Study on Meki Irrigation and Rural Development Project in Oromia Region (hereinafter referred as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team for the implementation of the Study, to the Federal Democratic Republic of Ethiopia, the Study Team officially submitted twenty (20) copies of the Progress Report (1) to the Oromia Irrigation Development Authority (hereinafter referred as "OIDA") at the completion of the First Field Work of the Study. All the Steering Committee members accepted the Progress Report (1).

The Study Team explained the contents of the Progress Report (1) to the Steering Committee meeting on 20<sup>th</sup> December, 2000. The participants of the meeting are listed in the ANNEX. The Study Team made clarification for the comments raised by the Ethiopian side as follows.

The Ethiopian side commented that there is a need to include all the relevant institutions in the capacity building under the Master Plan. The Study Team replied that appropriate institutional set-up is not yet proposed. The capacity building programme will be carried out for OIDA and the woreda staff for smooth implementation of the Master Plan. Other institutions will be involved in the capacity building programme if its necessity is identified.

The Ethiopian side commented that there is a need to describe necessity of the environmental conservation as a concept of the Project in Chapter 6. The Study Team explained that its necessity is already mentioned in Section 6.1.2 on Integrated Development as one of three concepts of the plan formulation.

The Ethiopian side commented that data sources shall be provided for references in the report. The Study Team accepted it.

The Ethiopian side commented that it is necessary to attach more priority to the community development programme and reflect in the implementation schedule of the Mater Plan. The Study Team explained that the community development programme will be promoted under the initiative of the government. According to the principle of Training-of-Trainers (TOT), the capacity building programme will firstly be executed to the government staff, namely sociologists and social workers, who will be responsible for the community awareness creation and development in the following stage. Therefore, the capacity building programme for the government staff will be started earlier than those for community.

The Study Team requested the Ethiopian side to make more scrutiny on the Progress Report (1) to elaborate the initial study results. It was agreed that the Ethiopian side will officially forward their comments on the Progress Report (1) by 15<sup>th</sup> January 2001 to the Study Team.



**List of Participants****Ethiopian side:****Oromia Irrigation Development Authority (OIDA)**

Mr. Teshome Atnafie Guyo      Chief Engineer  
 Mr. Hassen Nur                      Head, Irrigation Construction Department

**Bureau of Agriculture**

Mr. Kernesha Eficha              Team Leader, Extension Division

**Water, Mining, Energy Resource Development Bureau**

Mr. Dereje Wako                  Team Leader, Water Resources Management Team

**Co-operative Promotion Bureau**

Mr. Lelissa Chaklissa              Head, Planning & Research Service

**Bureau of Planning and Economic Development**

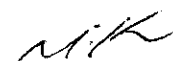
Mr. Dinku Gurmessa              Team Leader, Water, Mines and Energy Development  
 Planning Team

**Japanese side:****The Study Team**

Mr. Masayuki Koyama              Leader  
 Mr. Takuya Igawa                  Deputy Leader, Irrigation and Rural  
 Infrastructure  
 Mr. Yuichi Fukasaka              Rural Development  
 Mr. Zetsugaku Kurita              Agriculture and Soils  
 Dr. Brijesh Kumar Mehta          Hydrology and Water Use  
 Mr. Masayoshi Shibata              Agricultural Support System  
 Dr. Alfred A. Latigo                  Environment and Watershed Management  
 Mr. Yutaka Niikawa                  Design and Cost Estimate

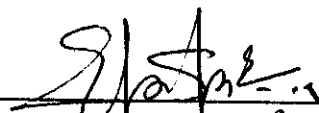
**JICA Ethiopia Office**

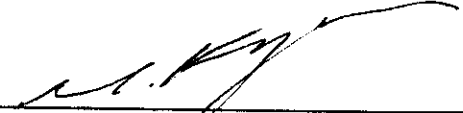
Mr. Hiroshi Sumiyoshi              Assistant Resident Representative  
 Mr. Yeshitila Amare                  Staff

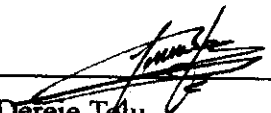
Minutes of Meeting  
on  
Interim Report  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

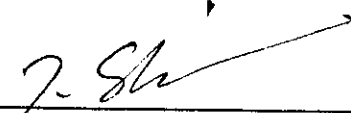
Addis Ababa, 9<sup>th</sup> March 2001

  
Mr. Etafa Emama  
General Manager  
Oromia Irrigation Development  
Authority (OIDA)  
The Government of the Oromia  
Regional State

  
Mr. Masayuki Koyama  
Leader  
The Study Team  
Japan International Cooperation Agency  
(JICA)

Witnessed by

  
Mr. Dereje Tolu  
Bureau Head  
Oromia Agricultural  
Development Bureau (OADB)  
The Government of the Oromia  
Regional State

  
Mr. Takao Shibusawa  
Advisor  
JICA Advisory Team  
Japan International Cooperation Agency  
(JICA)

In accordance with the Scope of Work for the Study on Meki Irrigation and Rural Development Project in Oromia Region (hereinafter referred as “the Study”), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team to the Federal Democratic Republic of Ethiopia at the completion of the First Home Office Work of the Study. The Study Team officially submitted twenty (20) copies of the Interim Report to the Oromia Irrigation Development Authority (hereinafter referred as “OIDA”), that presents all the results worked out through the Phase I Study.

Mr. Etafa Emama, General Manager of OIDA, officially opened the meeting. In response to his welcome address, Mr. Takao Shibusawa, Deputy Director – Agricultural Development Study Division of JICA, presented the opening remark to the meeting. In addition, Mr. Teshoma Lamma briefly reported the performance of his counterpart training in Japan held in February 2001.

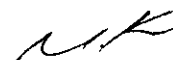
The Study Team explained the contents of the Interim Report to the Steering Committee meeting on 8<sup>th</sup> March 2001. The participants of the meeting are listed in the ANNEX. The Study Team made clarification for the comments raised by the Ethiopian side. The followings are major aspects discussed and confirmed by all the participants in the meeting.

The Ethiopian side agreed to execute the proposed six (6) programs of the Verification Study, which are stipulated in Chapter 8 of the Interim Report, for six (6) months in the Phase II Study. The Ethiopian side also agreed that both OIDA and Oromia Agricultural Development Bureau (OADB) would carry out the Verification Study according to the following demarcation of responsibilities.

Verification Study Program	Responsible Agency
Program 1 : Training of analytical methodology for water resources development	OIDA
Program 2 : Establishment of management information system and monitoring evaluation system of the OIDA irrigation schemes	OIDA
Program 3 : Environmental monitoring – irrigation water use in the Meki area	OIDA
Program 4 : Preparation of guideline for formation and operation of water users associations (WUA)	OIDA
Program 5 : Community resource mapping	OADB
Program 6 : Preparation of extension tools and research program for the Meki area	OADB

Mr. Etafa Emama stated that, for the period of the Verification Study, OADB would be in more advantageous position than OIDA in execution of Programs 5 and 6 by deploying the






existing human resources of OADB.

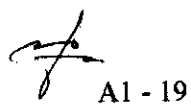
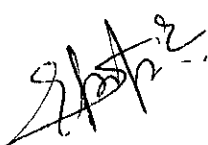
Oromia Co-operative Promotion Bureau (OCPB) requested their involvement in the Verification Study. OIDA replied that the responsibilities of community development are overlapped among three agencies, namely OIDA, OADB and OCPB. It was agreed that the Verification Study for Program 4 will be carried out by OIDA and if necessary OCPB would be involved. OIDA agreed to keep the close relationship with OCPB throughout the study period.

All the participants confirmed that the above-mentioned demarcation is only for the purposes of the Verification Study. The organizational set-up for implementation of the Master Plan will be discussed and optimized on the basis of the Verification Study results before finalization of the Study.

The participants sustained the basic concepts of the Oromia Rural Development Fund (ORDF) for encouraging small-scale irrigation development and others selected among the Master Plan by referring the past performance of ESRDF, which put more emphases on social sectors especially for education, health care and drinking water supply.

On the basis of the above-mentioned discussion, the Ethiopian side acknowledged the Interim Report.

In response to the requests by the Study Team, OIDA and OADB agreed to embark on in-depth study for the plan of operation of the Verification Study with the Study Team in the period from 12<sup>th</sup> to 16<sup>th</sup> March 2001.



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**List of Participants****Ethiopian side:****Oromia Irrigation Development Authority (OIDA)**

Mr. Etafa Emama	General Manager
Mr. Teshome Atnafie Guyo	Chief Engineer, Counterpart Team Leader
Mr. Hassen Nur	Head, Irrigation Construction Department
Mr. Sileshi Getahun	Head, Irrigation Extension Department
Mr. Olani Wirtu	Head, Planning & Programming Service
Mr. Tadewos Adaba	Head, Community Participation Department
Mr. Teshome Lamma	Irrigation Engineer
Mr. Abera Chala	Construction Supervision Engineer
Mr. Abera Jhiferaw	Hydrologist
Miss Shitaye Lemma	Soil Expert

**Oromia Agriculture Development Bureau**

Mr. Emiru Mijana	Senior Agronomist
------------------	-------------------

**Oromia Water, Mining, Energy Resource Development Bureau**

Mr. Dereje Wako	Team Leader, Water Resources Management Team
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**Oromia Co-operative Promotion Bureau**

Mr. Lelissa Chalchissa	Head, Planning & Research Service
------------------------	-----------------------------------

**Ministry of Economic Development and Cooperation (MEDaC)**

Mr. Tamirat Kediro	Head, Asian, Australia & Middle East Countries
--------------------	--

**Japanese side:****JICA Study Team**

Mr. Masayuki Koyama	Leader
Mr. Takuya Igawa	Deputy Leader, Irrigation and Rural Infrastructure
Mr. Yuichi Fukasaka	Rural Development

**JICA Head Office**

Mr. Takao Shibusawa	Deputy Director, Agricultural Development Study Division
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Note of Understanding  
on  
Preparatory Work  
for  
Verification Study in Phase-II Study  
for  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia

Addis Ababa, 13<sup>th</sup> March 2001


Confirmation

The joint meeting was held among Oromia Irrigation Development Authority (OIDA), Oromia Agricultural Development Bureau (OADB) and JICA Study Team on 13<sup>th</sup> March 2001. It was agreed to complete the preparatory work by May 2001 for smooth commencement of the Verification Study according to the document attached hereto. The Ethiopian side strongly requested the Study Team to consider the financial assistance for transportation cost and travel allowance for the counterpart personnel and drivers within the budget of the Study. The Study Team promised to convey their request to the JICA headquarters.



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Mr. Teshome Atnafie  
Leader for Counterpart Team  
Oromia Irrigation Development Authority (OIDA)



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Mr. Beteccha Tuki  
Leader for Counterpart Team  
Oromia Agricultural Development Bureau (OADB)

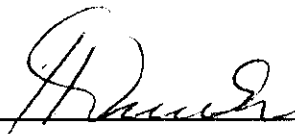


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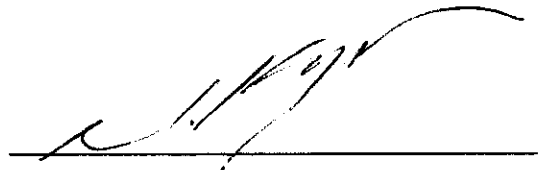
Mr. M. Koyama  
Leader for the JICA Study Team

Minutes of Meeting  
on  
Progress Report (2)  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

Addis Ababa, 20<sup>th</sup> November 2001



Mr. Teshome Atnafie Guyo  
General Manager  
Oromia Irrigation Development  
Authority (OIDA)  
The Government of the Oromia  
Regional State



Mr. Masayuki Koyama  
Leader  
The Study Team  
Japan International Cooperation Agency  
(JICA)



In accordance with the Scope of Work for the Study on Meki Irrigation and Rural Development Project in Oromia Region (hereinafter called the Study), the JICA Study Team officially submitted twenty (20) copies of the Progress Report (2) to OIDA at the completion of the Third Fieldwork of the Study. To discuss the Progress Report (2), the Steering Committee meeting was held at the OIDA headquarters on 20<sup>th</sup> November 2001. The participants of the meeting are listed in the ANNEX.

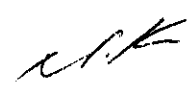
The JICA Study Team summarized the study results obtained through the Third Fieldwork, of which main objective is to execute the following six (6) programs of the Verification Study.

Verification Study Program	Responsible Agency
Program 1 : Training of analytical methodology for water resources development	OIDA
Program 2 : Establishment of management information system of the OIDA irrigation schemes	OIDA
Program 3 : Environmental monitoring – irrigation water use in the Meki area	OIDA
Program 4 : Preparation of guideline for formation and operation of water users associations (WUA)	OIDA
Program 5 : Community resource mapping	OADB
Program 6 : Preparation of extension tools and research program for the Meki area	OADB

In response to the presentation by the JICA Study Team, the following issues were discussed by all the participants of the meeting.

Environmental impact of irrigation development in the Meki river basin

OIDA requested the JICA Study Team to make more explanation on the results of environmental assessment on irrigation water use by prevailing small pumps in the Meki area. Referring to the hydrological analyses in the Phase-I study, the Study Team explained that current water consumption by the existing small pumps is presumed to be negligibly small although its exact volume is not known. The Study Team stated that it is crucial for OIDA as a government agency responsible for the irrigation sector of Oromia to continue the frequent monitoring of irrigation water use in the Meki and Ziway watersheds. The monitoring will enable OIDA to identify any environmental impacts of the proposed irrigation development at the earliest stage. Program 3 of the Verification Study, therefore, initiated the environmental monitoring focusing on irrigation water use in parallel to the promotion of the community-based irrigation development under Program 4.

### River diversion

The Ethiopian side commented that the diversion of river water from the neighboring basins to the Meki area, where the irrigation water demands is higher. The JICA Study Team explained that a technical viability of the river diversion was not assessed under the Study. In this conjunction, the JICA Study Team recommended OIDA that it is also important for the OIDA engineers to study an introduction of water-saving irrigation methods, e.g. sprinkler and drip systems, to the Meki area, where water resources are limited although water demand is rapidly increasing.

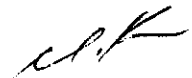
### Involvement of Oromia Cooperative Promotion Bureau (OCPB)

OCPB requested OIDA to consider more involvement of OCPB at the initial stage of the WUA establishment by referring to advantages and benefits for registered cooperative members. According to the basic agreement between both agencies, OIDA replied that OIDA would not reject the involvement of OCPB and requested OCPB to undertake awareness creation among the WUA members in due course.

### Extension materials concerning irrigation farming

OIDA requested the JICA Study Team to consider preparation of extension materials concerning irrigation farming techniques. The Study Team replied that aspects of extension materials were carefully selected through in-depth assessment with DAs and farmers in the Meki area. Since the extension materials for rain-fed farming are highly demanded in the Meki area, the priority was given to them under Program 6. In this regard, the Study Team suggested that the irrigation research in the Meki area is also important to optimize the irrigation techniques suitable for the local conditions of the Meki area prior to preparation of the extension materials concerned.

The Ethiopian side agreed that they would make more scrutiny on the Progress Report (2) and forward their comments through OIDA to the Study Team by 5<sup>th</sup> December 2001.



**List of Participants****Ethiopian side:****Oromia Irrigation Development Authority (OIDA)**

Mr. Teshome Atnafie Guyo	General Manager
Mr. Gosa Wolde	Acting Chief Engineer
Mr. Hassen Nur	Head, Irrigation Construction Department
Mr. Tadewos Adiba	Head, Community Development Department
Mr. Olani Wirtu	Head, Planning & Programming Service
Mr. Biffa Bedade	Acting Head, Extension & Water Management Department
Mr. Birhanu Hirpo	Team Leader, Community Development Department
Mr. Amdisa Kelkela	Team Leader, Construction Administration Team
Mr. Ketema Legese	Public Relation Officer
Mr. Zarihun Hayile	Legal Advisor
Mr. Dagnachew Alemu	Irrigation Expert
Mr. Tesfaye Derisa	Irrigation Engineer
Mr. Negatu Bekele	Agronomist
Mr. Abebe Ayana	Environmentalist
Mr. Name Sori	Economist

**Oromia Agricultural Development Bureau**

Dr. Mohamed Hassan	Bureau Head
Mr. Mohammed Yekin	Acting Head, Extension Department (Program 6)
Mr. Benti Shimina	Community Development Expert (Program 5)

**Co-operative Promotion Bureau**

Mr. Ahmed Tuba	Head Office
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**Bureau of Planning and Economic Development**

Mr. Dinku Gurmessa	Team Leader, Water, Mines and Energy Development Planning Team
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**Ministry of Finance and Economic Development**

Mr. Gebremedihin Birega	Japan Desk Officer
-------------------------	--------------------

**Japanese side:****The Study Team**

Mr. Masayuki Koyama	Team Leader
Mr. Takuya Igawa	Deputy Leader, Irrigation Engineer
Mr. Zetsugaku Kurita	Agronomist

**JICA Ethiopia Office**

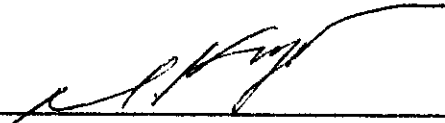
Mr. Yoshinori Ebata	Chief Representative
Mr. Hiroshi Sumiyoshi	Assistant Resident Representative

Minutes of Meeting  
on  
Draft Final Report  
for  
the Study on  
Meki Irrigation and Rural Development Project  
in Oromia Region, Ethiopia  
agreed upon between  
Oromia Irrigation Development Authority,  
the Government of the Oromia Regional State  
and  
Japan International Cooperation Agency

Addis Ababa, 31<sup>st</sup> January 2002



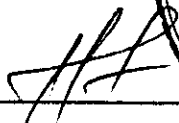
Mr. Teshome Atnafie Guyo  
General Manager  
Oromia Irrigation Development  
Authority (OIDA)  
The Government of the Oromia  
Regional State



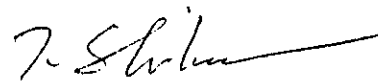
Mr. Masayuki Koyama  
Leader  
The Study Team  
Japan International Cooperation Agency  
(JICA)



Witnessed by



Mr. Hailemichael Kintu  
Head of Bilateral Cooperation Department  
Ministry of Finance and Economic  
Development (MOFED)



Mr. Takao Shibusawa  
Deputy Director  
Agricultural Development Study Division  
Japan International Cooperation Agency  
(JICA)

In accordance with the Scope of Work for the Study on Meki Irrigation and Rural Development Project in Oromia Region (hereinafter called the Study), the JICA Study Team officially submitted twenty (20) copies of the Draft Final Report to OIDA at the commencement of Fourth Fieldwork of the Study. The steering committee meeting was held to discuss the Draft Final Report in Addis Ababa on 31<sup>st</sup> January 2002. The participants of the meeting are listed in the ANNEX.

The JICA Study Team made overall explanation on the Draft Final Report in the meeting. In response to the presentation by the JICA Study Team, all the participants discussed and agreed the following issues.

#### Project implementation

OIDA has officially submitted the aid proposal for the extension of the Study to the Government of Japan (GOJ). The proposal aims at extension of the capacity building program for the OIDA staff through the community-based irrigation development in the Meki area and the rehabilitation work of the model scheme to be selected among the existing schemes under the Central Branch Office of OIDA. The proposal is currently under the scrutiny by the GOJ.

#### Organizational arrangement

The appropriate organizational set-up would be a key issue for successful implementation of the Master Plan. OIDA will take a full responsibility for technical guidance and training to water users associations (WUA) at the initial stage of the community-based irrigation development project. In the following years, Oromia Cooperation Promotion Bureau (OCPB) will assist WUAs to access more government supports, e.g. credit and marketing. Further arrangement is required among the Oromia Government to set up appropriate coordination among the government organizations concerned.

#### Model project of participatory rural development

The Study enabled the Ethiopian counterpart personnel to accumulate valuable experiences of model plan formulation of the participatory rural development. Although the Study has region-specific natures, the development concepts and approaches taken by the Study are highly applicable not only to the entire Oromia but also to the other Regions of Ethiopia.

In this regard, the Ethiopian side requested the JICA Study Team to make a briefing of the Draft Final Report to the federal ministries including MOFED and Ministry of Agriculture (MOA) during his stay in Ethiopia. The JICA Study Team willingly accepted the request and suggested MOFED to contact the Japanese side when the relevant meeting will be arranged.

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### Project monitoring

Three WUAs established through the verification study have already embarked on the irrigation farming. It is highly important to undertake a project monitoring under the responsibility of OIDA. The long-term monitoring will provide OIDA more information essential for sustainable development.

### Capacity building

The wide range of the capacity building is required for successful implementation of the Master Plan. The capacity building program will cover not only individuals by technical in-service training and overseas training but also institutions as a whole linked with input of facilities and equipment. The JICA Study Team took note.

### Comments on Draft Final Report

All the participants agreed that they would make more scrutiny on the Draft Final Report and forward their comments through OIDA to the JICA Study Team by 14<sup>th</sup> February 2002. Comments will be taken into consideration in preparation of Final Report to be submitted in March 2002.



**List of Participants****Ethiopian side:****Oromia Irrigation Development Authority (OIDA)**

Mr. Teshome Atnafie Guyo	General Manager
Mr. Birhanu Bekele	Chief Engineer
Mr. Tadewos Adiba	Head, Community Development Department
Mr. Olani Wirtu	Head, Planning & Programming Service
Mr. Biffa Bedade	Head, Extension & Water Management Department
Mr. Birhanu Hirpo	Team Leader, Community Development Department
Mr. Amdisa Kelkela	Team Leader, Construction Department
Mr. Ermias Birru	Team Leader, Research
Mr. Abera Shiferaw	Hydrological Expert
Mr. Ketema Legese	Public Relation Officer
Mr. Negatu Bekele	Agronomist
Ms. Shittaye Lemma	Soil Expert

**Oromia Agricultural Development Bureau**

Mr. Mohammed Yekin	Acting Head, Extension Department
Mr. Benti Shimina	Community Development Expert

**Oromia Bureau of Planning and Economic Development**

Mr. Dinku Gurmessa	Senior Economist
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**Oromia Water, Mining, Energy Resource Development Bureau**

Mr. Fekadu Lebecha	Water, Mines and Energy Development Planning Expert
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**Ministry of Finance and Economic Development**

Mr. Gebremedihin Birega	Japan Desk Officer
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**Japanese side:****The Study Team**

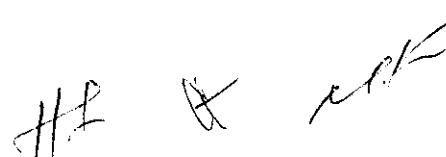
Mr. Masayuki Koyama	Team Leader
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**JICA Ethiopia Office**

Mr. Yoshinori Ebata	Resident Representative
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**JICA Tokyo Headquarters**

Mr. Takao Shibusawa	Deputy Director, Agricultural Development Study Division
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## *Attachments-2*

### *Master Plan for Meki Irrigation and Rural Development Project*

#### *Verification Study Program*

1. Training of analytical methodology for water resources development
2. Establishment of Management Information System and Monitoring and Evaluation System on OIDA Irrigation Schemes
3. Environmental monitoring – irrigation water use in the Meki area
4. Preparation of guideline for formation and operation of WUA
5. Community Resource Mapping
6. Preparation of extension tools and research program for the Meki area



<b>Program 1</b>	<b>Training of analytical methodology for water resources development</b>	
<b>Target Group</b>	<b>OIDA Engineers in Head Office and Branch Offices (20 members)</b>	
<b>Background &amp; Objectives:</b>		
<p>OIDA irrigation engineers are requested to accumulate an experience of irrigation development project, such as planning, design, construction management, and operation and maintenance, so as to implement the project efficiently and smoothly. To achieve this target, it is necessary to carry out an intensive technology transfer program for OIDA engineers aiming at the capacity build-up of them. This verification program focuses on transfer of technology for data collection and analytical methodology for water resources development in line with the concept of [5-1] OIDA engineers training program among the selected projects in the master plan.</p>		
<b>Activities:</b>		
<p>The program includes a workshop followed by an intensive training course for hydrological analysis. The workshop will be carried out for some 20 engineers in both the head office and the branch offices in order to have a basic knowledge of data collection and compilation, and analysis of water resources development. The training course will provide the practical method of data collection and compilation to the selected 10 engineers.</p> <ul style="list-style-type: none"> <li>• Data Collection</li> <li>• Data Compilation</li> <li>• Data Verification</li> <li>• Hydrological Analysis</li> <li>• Irrigation Water Demand</li> <li>• Hydrological Model</li> <li>• Management of Model</li> <li>• Water Quality Analysis</li> <li>• Operation and maintenance of hydrological equipment, method of data collection</li> <li>• Data compilation by use of personal computers, Primary data analysis (mean and variation)</li> <li>• Theory and methodology of river discharge measurement, preparation of rating curve</li> <li>• Hydrological analysis, estimation of dependable flow and flood discharge</li> <li>• Irrigation water requirement by FAO method (evapo-transpiration, percolation, effective rainfall, irrigation efficiency)</li> <li>• Hydrological basin model, and water balance simulation</li> <li>• Method of verification and management of hydrological basin model</li> <li>• Water quality standard, method of sampling, analysis and evaluation</li> </ul>		
<pre> graph TD     A[• Data Collection] --&gt; B[• Data Compilation]     B --&gt; C[• Data Verification]     B --&gt; D[• Hydrological Analysis]     B --&gt; E[• Irrigation Water Requirement]     B --&gt; F[• Water Quality Analysis]     C --&gt; D     D --&gt; G[• Hydrological Basin Model]     E --&gt; G     G --&gt; H[• Verification and Management of the Model]     </pre>		
<b>Input: JICA</b>	<ul style="list-style-type: none"> <li>1) JICA Study Team (Irrigation, hydrology/water use)</li> <li>2) Computers and printers</li> </ul>	<b>Input: Ethiopian side</b>
<ul style="list-style-type: none"> <li>1) Training room</li> <li>2) Translator</li> </ul>		
<b>Expected results and Information to be obtained</b>		
<ul style="list-style-type: none"> <li>1) Awareness creation for improvement of OIDA engineers' capacity</li> <li>2) Capacity build-up for data collection and analysis of meteorology and hydrology</li> <li>3) Review of [5-1] OIDA engineers training program and preparation of training texts</li> </ul>		

<b>Program 2</b>	<b>Establishment of Management Information System and Monitoring and Evaluation System on OIDA Irrigation Schemes</b>	
<b>Target Group</b>	<b>OIDA Engineers in Head Office and Branch Offices (20 members)</b>	
<b>Background &amp; Objectives:</b>		
<p>The objective of this program is to establish the information management system and method of data update, and monitoring and evaluation for 96 existing irrigation schemes managed by OIDA so as to manage the schemes intensively and comprehensively. The data and information to be collected are location (administration), funding source, natural condition, water resources, layout of the facilities, feature of the facilities, organization, progress of physical works, agriculture, problems and constraints, and so on.</p> <p>OIDA established in July 1999 have some institutional constraints for collection, compilation, and evaluation of information, especially for monitoring of progress of physical works, performance of scheme, technical issues, institutional status. In order to improve the OIDA engineers' capacity for the above fields, this verification program aims to formulate a management information system on the irrigation schemes, consisting of work flow of information management (Wareda•Branch Office• OIDA head office), preparation of data collection format, encoding of data, monitoring and evaluation, preparation of reports. The program will also carry out an institutional arrangement including responsibilities of staff and organization for smooth implementation of the management system.</p>		
<b>Activities:</b>		
<p>A workshop will be held to discuss objective of the management system with monitoring and evaluation, system need analysis, and implementation method for the system. The workshop for some 20 engineers will be followed by the transfer of technology for the management system, consisting of establishment of data base system, method of monitoring and evaluation, preparation of reports. The program consists of the following aspects:</p> <ol style="list-style-type: none"> <li>1)Data collection • Collection of data and information for existing 96 irrigation schemes, such as feasibility study reports, design reports, and other relevant reports and information required.</li> <li>2)Data compilation • Compilation of salient features of schemes, drawings and maps, and data relevant to project management and institutional aspects.</li> <li>3)Conceptualization • Study on purpose of system, target user, method of data transaction, and contents of reports.</li> <li>4)Database design • Study on reporting system, such as management reports, post evaluation, regular reports, selection of application software, and preparation of data encoding format</li> <li>5)Data encoding • Encoding by OIDA staff or external</li> <li>6)PBME method • Establishment of a project monitoring and evaluation method by use of the system</li> <li>7)Reporting • Study on report format by use of the system, and standardization of report preparation</li> </ol> <p>Through the above procedures, capacity of OIDA engineers on management of database system and monitoring and evaluation will be strengthened. A operation and maintenance manual on the system will also be prepared.</p>		
<b>Input: JICA</b>	<ol style="list-style-type: none"> <li>1) JICA Study Team (Irrigation, hydrology/water use)</li> <li>2) Computers and printers</li> <li>3) Scanner and digital camera</li> </ol>	<b>Input: Ethiopian side</b>
<b>Expected results and Information to be obtained</b> <ol style="list-style-type: none"> <li>1) Establishment of data base system and it's management in OIDA irrigation schemes</li> <li>2) Establishment of periodical monitoring and evaluation</li> <li>3) Standardization of procedure for planning, design, and construction supervision for irrigation development projects</li> <li>4) Review of [5-1] OIDA engineers training program and preparation of training texts</li> </ol>		

<b>Program 3</b>	<b>Environmental monitoring – irrigation water use in the Meki area</b>													
<b>Target Group</b>	<b>OIDA engineers of the Headquarters and Branch Offices (20 persons)</b>													
<b>Background &amp; Objectives :</b>														
<p>The monitoring of water use in the Meki area should be started as early as possible in order to optimize the water resources development in the Meki area. The water balance study verified that the water resources development of the Meki river would result in adverse environmental impact to Abijata lake although there is an alternative scheme to develop the gravity irrigation system with a diversion weir with less impact to the environment. However, due to lack of actual data and information on current and future water use conditions, the engineering study on the plan formulation can not completed. Moreover, the water analysis in the Abijata lake basin, which is the closed hydrological system, is more complex because the Abijata lake are fed by two major water sources, namely the Meki river and the Karar river. Therefore, comprehensive water use monitoring is prerequisite for future water resources development within the Abijata system. On the other hand, the World Food Program (WFP) embarked on the land and water conservation project for four (4) small watersheds within the Meki area. The project envisages preventing land and water degradation by applying afforestation within gullies and minor soil protection works. The progress and benefits of the WFP project should be monitored within the same framework of the environmental monitoring. All these ideas are formulated into one program of the M/P, namely [4-1] Environmental Monitoring Program.</p> <p>Program 3 aims at optimizing the environmental monitoring program. As a first step of Program 3, current water use by small-pump irrigation will be clarified and recorded at detail. Some 160 pumps have been introduced to the Meki area. Out of 160 units, 75 units are installed on the river bank of Meki and the lakeshore of Ziway in order to irrigate 75 ha and 300 ha, respectively. OIDA is in a position to control these activities. Program 3 will firstly prepare the database of these pump irrigation schemes apart from the database for the OIDA irrigation schemes.</p>														
<b>Activities :</b>														
<p>The database for the small pump irrigation development and water use will be prepared according to the following procedures.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">1) Data collection</td> <td>• Questionnaire survey for 160 pump owners</td> </tr> <tr> <td>2) Data compilation</td> <td>• Users, specification of pumps &amp; related facilities, O&amp;M, etc.</td> </tr> <tr> <td>3) Data input</td> <td>• Data input by the OIDA staff with technical assistance of the JICA Study Team</td> </tr> <tr> <td>4) Application</td> <td>• Data categorization by water resource, management system, marketing activities, problems and needs.</td> </tr> <tr> <td>5) RRA for farmers group</td> <td>• More detailed information of community-based pump irrigation schemes in terms of problems and needs</td> </tr> <tr> <td>6) Report preparation</td> <td>• Procedure of annual report preparation</td> </tr> </table>			1) Data collection	• Questionnaire survey for 160 pump owners	2) Data compilation	• Users, specification of pumps & related facilities, O&M, etc.	3) Data input	• Data input by the OIDA staff with technical assistance of the JICA Study Team	4) Application	• Data categorization by water resource, management system, marketing activities, problems and needs.	5) RRA for farmers group	• More detailed information of community-based pump irrigation schemes in terms of problems and needs	6) Report preparation	• Procedure of annual report preparation
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6) Report preparation	• Procedure of annual report preparation													
<b>Input : JICA</b>	<b>Input : Ethiopian side</b>													
1) JICA Study Team 2) Computers and printers 3) Bicycles for DAs	1) Training rooms at OIDA and Wareda office 2) Translator													
<b>Expected Results and Information to be Obtained:</b>														
1) Current water use by small-pump irrigation 2) Capacity building of OIDA and Wareda staff in data collection and analysis 3) Awareness creation in OIDA for environmental conservation 4) Review of [4-1] Environmental Monitoring Program 5) Review of [1-2] Meki Irrigation and Water Supply Project														

<b>Program 4</b>	<b>Preparation of guideline for formation and operation of WUA</b>	
<b>Target Group</b>	<b>Community development experts and social workers of the Headquarters and Branch Offices (20 persons)</b>	
<p><b>Background &amp; Objectives :</b></p> <p>The community-based irrigation development in Dugda Bora Wareda extends to 400ha under the management of 15 WUAs organized by 500 household. These irrigation schemes contribute to the regional economy through production of both food crops and vegetables as well as creation of employment opportunities to local farmers. Successful performance also empowers local farmers, who are not involved in the irrigation projects, as a whole. This verification study program focus on standardization of community mobilization for establishment of WUAs for small-scale irrigation development (5 ha) in line with the concept of [1-1] Water Users Association Support Program. The Program will provide the training to the OIDA community development experts and social workers under Community Participation Department.</p> <p>According to the OIDA Wareda Office at Meki, some 20 groups have already requested OIDA to provide both technical and financial supports for the small-scale irrigation development. Among already recognized groups, three (3) groups will be selected and actually participate in the small-scale irrigation development. The OIDA staff will organize PRA, in which direct interview, questionnaire survey, focus group discussion and community resources mapping, etc. The PRA will lead the groups to formulate group fund under the registered bank accounts. A pumping facility will be supplied to a group after consensus and mutual agreement will be attained within a group.</p>		
<p><b>Activities :</b></p> <p><b>(1) Seminars and Workshops with Community development experts and social workers</b></p> <ol style="list-style-type: none"> <li>1) Government policies for agricultural and rural development as well as poverty alleviation at national and regional levels</li> <li>2) Concepts and procedures of participatory development</li> <li>3) Gender issues</li> <li>4) Environmental conservation and watershed management</li> <li>5) Basic knowledge on irrigation farming and O&amp;M of irrigation facilities</li> <li>6) Agricultural support systems including micro-credits</li> <li>7) NGO files</li> </ol> <p><b>(2) PRA and PBME</b></p> <ol style="list-style-type: none"> <li>1) PRA with candidate groups for WUAs at 3 locations</li> <li>2) Community mobilization for group fund formation</li> <li>3) Irrigation development with 3 groups</li> <li>4) Project monitoring</li> </ol>		
<p><b>Input : JICA</b></p> <ol style="list-style-type: none"> <li>1) JICA Study Team</li> <li>2) Small pumps with essential attachments and spare parts</li> <li>3) Installation cost for small pumps</li> </ol>	<p><b>Input : Ethiopian side</b></p> <ol style="list-style-type: none"> <li>1) Translator</li> </ol>	
<p><b>Expected Results and Information to be Obtained:</b></p> <ol style="list-style-type: none"> <li>1) Accumulated experiences and information for process of WUAs establishment</li> <li>2) Trained facilitators</li> <li>3) NGO files</li> <li>4) Awareness creation for poverty alleviation and environmental conservation within OIDA staff</li> <li>5) Review of [1-1] Water Users Association Support Program</li> <li>6) Review of [1-2] Meki Irrigation and Rural Water Supply Project</li> <li>7) Review of Oromia Rural Development Fund</li> </ol>		

<b>Program 5</b>	<b>Community Resource Mapping</b>	
<b>Target Group</b>	<b>Wareda staff and Development Agents (DA)</b>	
<b>Background &amp; Objectives :</b>		
<p>Peasant Associations (PAs) are the lowest administrative societies to exert community development in association with the government services. Dugda Bora Wareda consists of 54 PAs. Each PA comprises some 500 households on an average (804 at maximum and 154 at minimum). The PA representatives are appointed by the Wareda (District) Administrator with prior consent of relevant rural communities in PAs. In addition to PAs, there are several communities in rural areas of Ethiopia. These traditional communities play important roles in communication among inhabitants and decision making in rural activities. The JICA Study carried out the preliminary studies on traditional communities in cooperation with Development Agents. Family-based groups are called ‘Edir’ in rural areas of Oromia Region. Some 500 edirs are identified within 54 PAs of Dugda Bora Wareda. Each edir consists of 20 to 100 households (40 HH on average). The Study focuses on these existing communities as nucleus bodies for future rural development. In order to verify their geographical positions, community members, natural resources, social conditions, etc., this program aims at preparation of Community Resource Maps. In addition, their applicability will also be examined through actual community development, especially for formation of WUAs under the Verification Program 4.</p>		
<b>Activities :</b>		
<p>Program 5 will be carried out according to the following steps.</p> <ol style="list-style-type: none"> <li>1) Field survey with DAs for PAs, which are located along the Meki river and the Ziway lake. The WUA formation for community-based irrigation will be promoted in these PAs</li> <li>2) Map preparation by incorporating various community data to be obtained through the field survey</li> <li>3) Preparation of list of communities at the edir level and community leaders</li> <li>4) Communication channels between communities</li> <li>5) Preparation of thematic maps for road networks, drinking water facilities, schools, land use and vegetation cover, etc.</li> <li>6) Indicating market information on the maps</li> <li>7) Trial application of the maps for community awareness creation and mobilization for the WUA formation under Program 4</li> <li>8) Trial application of the maps for extension services with DAs</li> <li>9) Workshop for Community Resource Maps</li> </ol>		
<b>Input : JICA</b>		<b>Input : Ethiopian side</b>
<ol style="list-style-type: none"> <li>1) JICA Study Team</li> <li>2) Vehicles</li> <li>3) Computers and printers</li> <li>4) Scanner</li> <li>5) Bicycles for DAs</li> </ol>		<ol style="list-style-type: none"> <li>3) Staff Training Section, Bureau of Agriculture</li> <li>4) Training rooms at OIDA and Wareda office</li> <li>5) Translator</li> </ol>
<b>Expected Results and Information to be Obtained:</b>		
<ol style="list-style-type: none"> <li>1) Community resources maps of Dugda Bora Wareda with detailed maps for selected PAs</li> <li>2) Applicability of community resource maps for the WUA formation</li> <li>3) Analytical results of applicability and further possibilities for community resource maps</li> <li>4) Empowerment of Wareda staff and DAs</li> <li>5) Review of [5-4] Community Resource Mapping Project</li> </ol>		

<b>Program 6</b>	<b>Preparation of extension tools and research program for the Meki area</b>	
<b>Target Group</b>	<b>Wareda staff, Development Agents (DA) and Farmers</b>	
<b>Background &amp; Objectives :</b>		
<p>Improvement of rain-fed agriculture techniques is utmost important in the semi-arid Meki area. Program 6 aims at preparation of region-oriented extension tools and research program focusing on the specific natural conditions of the Meki area.</p> <p>The program will be executed in collaboration with the agricultural research institutes such as the Melkasa station and the zonal office of Bureau of Agriculture. There are several extension tools and materials in Ethiopia. They were prepared by MOA being assisted by donors and NGOs. However, they are not accessible for all the DAs and farmers. Taking into consideration high illiteracy rate in the rural area of Oromia Region, the existing extension materials should be reviewed for enhancement of their adaptability. Firstly all the existing extension materials will be collected and studied in order to develop more applicable ones suited to the Meki area. Secondly, the necessity of further agricultural research to select promising crop production techniques, which will be reflected for improvement of extension materials. To obtain actual data and information, further research program will be designed. The major aspects for this Program 6 will include:</p> <ol style="list-style-type: none"> <li>1) Crop selection, cropping patterns, mixed cropping, crop seasons, etc.</li> <li>2) Preservation and puerile selection of traditional varieties, multiplication of improved varieties, etc.</li> <li>3) Improvement of farming practices and implements</li> <li>4) Mulching and soil conservation practices</li> <li>5) Optimization of fertilization suitable for the local conditions of the Meki area</li> <li>6) Precaution of pests and disease out-break</li> <li>7) Optimum post-harvesting techniques for maximum use of crop residues as animal feed</li> <li>8) Improvement of soil fertility by applying organic matters and effective micro-organisms (EM)</li> <li>9) Improvement of soil fertility by introduction of more legumes in crop rotation</li> <li>10) Soil diagnosis and assessment to prevent from salinity hazard and soil erosion</li> <li>11) Establishment of supplemental irrigation and drainage method by optimizing water supply amount and interval</li> </ol>		
<b>Activities :</b>		
<p>Program 6 will be carried out according to the following steps.</p> <ol style="list-style-type: none"> <li>1) Technical discussion with agricultural researchers, extension officers and NGOs</li> <li>2) Collection of existing research data and extension materials</li> <li>3) Preparation of extension materials more suitable for the local conditions of Oromia Region</li> <li>4) Preparation of Plan of Operation of agricultural research program</li> <li>5) Workshop with OIDA and Bureau of Agriculture</li> </ol>		
<b>Input : JICA</b>	<ol style="list-style-type: none"> <li>1) JICA Study Team</li> <li>2) Computers and printers</li> <li>3) Scanner</li> <li>4) Illustrator</li> <li>5) Text books for DAs, leaflets and posters for farmers</li> </ol>	<b>Input : Ethiopian side</b>
		<ol style="list-style-type: none"> <li>1) Training rooms at OIDA and Wareda office</li> <li>2) Translator</li> </ol>
<b>Expected Results and Information to be Obtained:</b>		
<ol style="list-style-type: none"> <li>1) Extension materials including text books for DAs, leaflets and posters for farmers</li> <li>2) Accumulated experience of extension activities by applying materials to be prepared</li> <li>3) Plan of Operation of agricultural research program</li> <li>4) Review of [2-1] <b>Semi-Arid Farming Improvement Project</b></li> </ol>		