

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 km² 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 km² 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 7th July 1995 to 6th July 2000, which is followed by the second five years program from 7th July 2000 to 6th 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 km². According to discharge data recorded near Meki town (1965-1999), average annual discharge of the river is 291 MCM or 9.18 m³/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 ³ /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 ²)	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 ²)	Storage Volume (MCM)	Mean Depth (m)	Altitude (m)	Catchment Area (km ²)	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 ²)	Population Density (person/km ²)
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	Wedia Kelina	Wedia 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
	Total	-	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 ²
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 woreda 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 Woreda 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 Woreda

Facilities / Medical Personnel	Number of Facilities / Personnel	Ratio of Facilities, Medical Personnel to population		
		Dugda Bora Woreda	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 : Woreda 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)

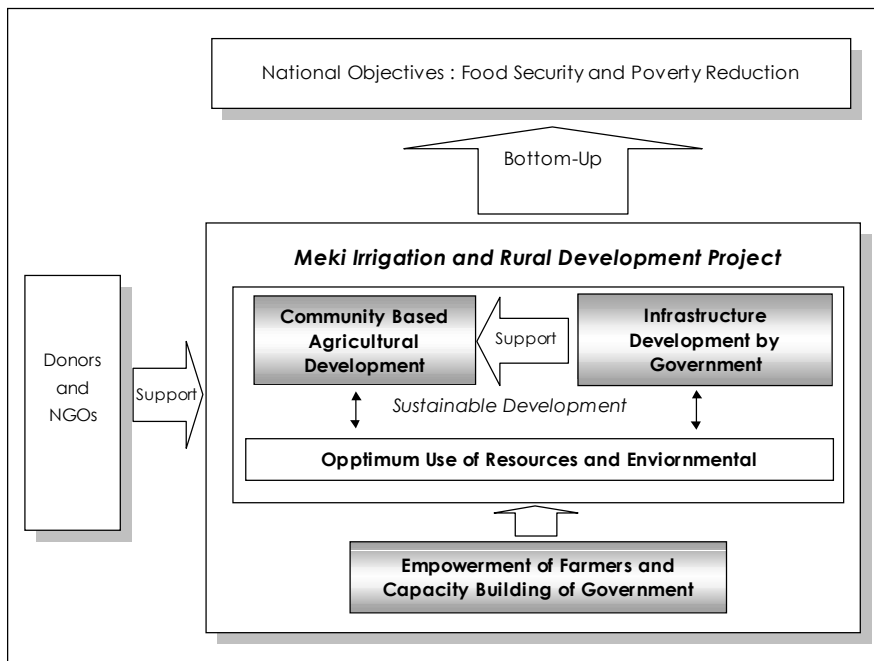
55. It is noted that the Meki area is rather in better conditions in terms of existing rural infrastructure. It is envisaged to optimize the government investment and avoid expansion of socio-economic gaps between the Meki area and other rural areas of the Region by intensive investment in the Meki area. 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 ₀	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 ²	square kilometer
m ³	cubic meter
MCM	million cubic meter
mm/mon	millimeter per month
mm/d	millimeter per day
m/s	meter per second
m ³ /s	cubic meter per second
•C	degrees centigrade
%	percent
US\$	United States of America Dollar