Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

EFFECTIVE IRRIGATION FOR SUSTAINABLE AGRICULTURAL PRODUCTION

Borkosha Small Scale Irrigation Project

Kembata Tembaro Zone

SNNPR

Ethiopiain Kachabira Woreda

Methodology for replication of irrigation system

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

1. Methodology purpose

Methodology describes the extent of the implemented irrigation system, its costs, sustainability, impacts, recommendations for possible replication and SWOT analysis.

2. Kachabira irrigation system

2.1. Irrigation system description

- Irrigation by diverting Borkosha River at the head work
- Irrigation of 44,2 ha
- Irrigation canals 1,9 km long

For efficient water management practice and economical use of resources, the required amount of water at the right place and time should be delivered to each plot. To facilitate this, various network of irrigation canal and drains were provided in this project.

The main canal receive water from the intake and convey the water to field canals through the various division boxes provided at the junctions. The irrigation of each farm will be done through field channel and finally the farmers get water from field canal by furrow.

Beside to the various canal net work, different canal appurtenant and related structure such as division box, drop structure, pipe culvert are provided in the system to facilitate easy conveyance of irrigation water to the various plot from beginning to tips of the command.

2.2. Location and Accessibility

Borkosha Small Scale Irrigation and Drainage Project (BSSIP) is located in Kembata Tembaro Zone of the Southern Nations, Nationalities and Peoples Regional State (SNNPRs), in the Woreda of Kachabira (See Location Map, Figure 3). It is located at a distance of 150km from the regional capital Hawassa and 25km from the zonal town Durame and 4km from the woreda town Shinshicho. The last 2km off taking road from Shinshicho-Adero road to the project site is a dry weather road. The diversion site is located about 30m downstream of bridge on Borkosha River of Shinshichi-Miro road.

The diversion site is situated at Borkosha peasant association whereas the project command area (PCA) lies in Misrak Lesho peasant association of Miro kebel (Right side of the river).

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

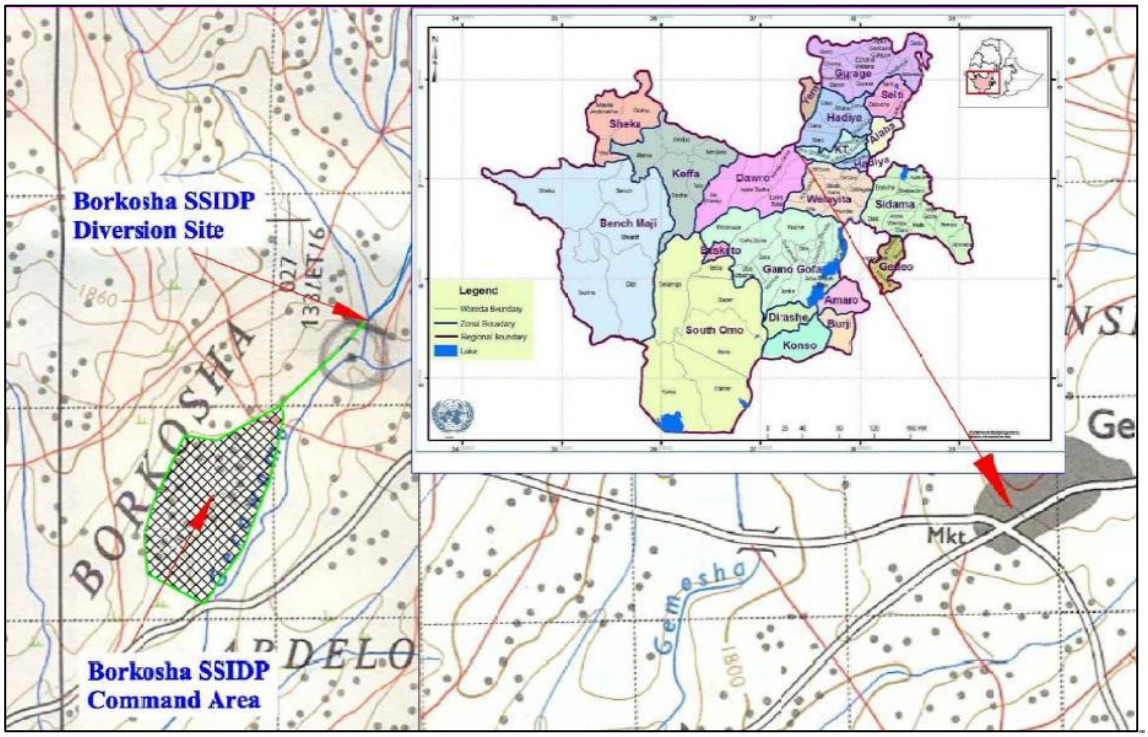


Figure 3 - Location Map of Borkosha SSIDP

2.3. Supply and Demand of Irrigation water

The size of command area to be irrigated entirely depends on the amount of flow available from the source and time of irrigation period (hours). As stated in the feasibility study report of Borkosha SSIDP, the minimum flow of the Borkosha River is estimated as 120lit /s. However, it is difficult to abstract all the flow available during this period due to downstream requirement. Hence only 60% of the minimum flow, i.e.71lit/s is abstract during driest month and the rest of flow is allowed to the river downstream and abstraction of flow at upstream (by any means). The maximum amount of water required during this driest period is estimated to be 71lit/s as calculated from the water requirement of crop in different month as in the agronomy report.

Irrigation water is proposed to be supplied on 12hour (usually from 6:00am to 6:00pm). The supply regime of 12hours has been preferred mainly on in basis for surface irrigation and grounds of social customs. The daily opening and closing of canals will need time to stabilize the full supply level. The time involved may vary from 1/2 to 1 hour because firstly water from the river shall be delivered to the main canal through the intake and then to the last off-taking field canal depending on the irrigation schedule. All the canals will run in day hours only. Therefore, they will carry double the discharge required for 24hour irrigation.

2.4. Irrigation Schedule

The irrigation interval is an important factor in determining the operation of the system. It affects especially the on-farm operation by determining the rotation of the field ditches along the tertiary canal and therefore it affects the discharge of the tertiary canals. Tentative water distribution plan (rotational

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

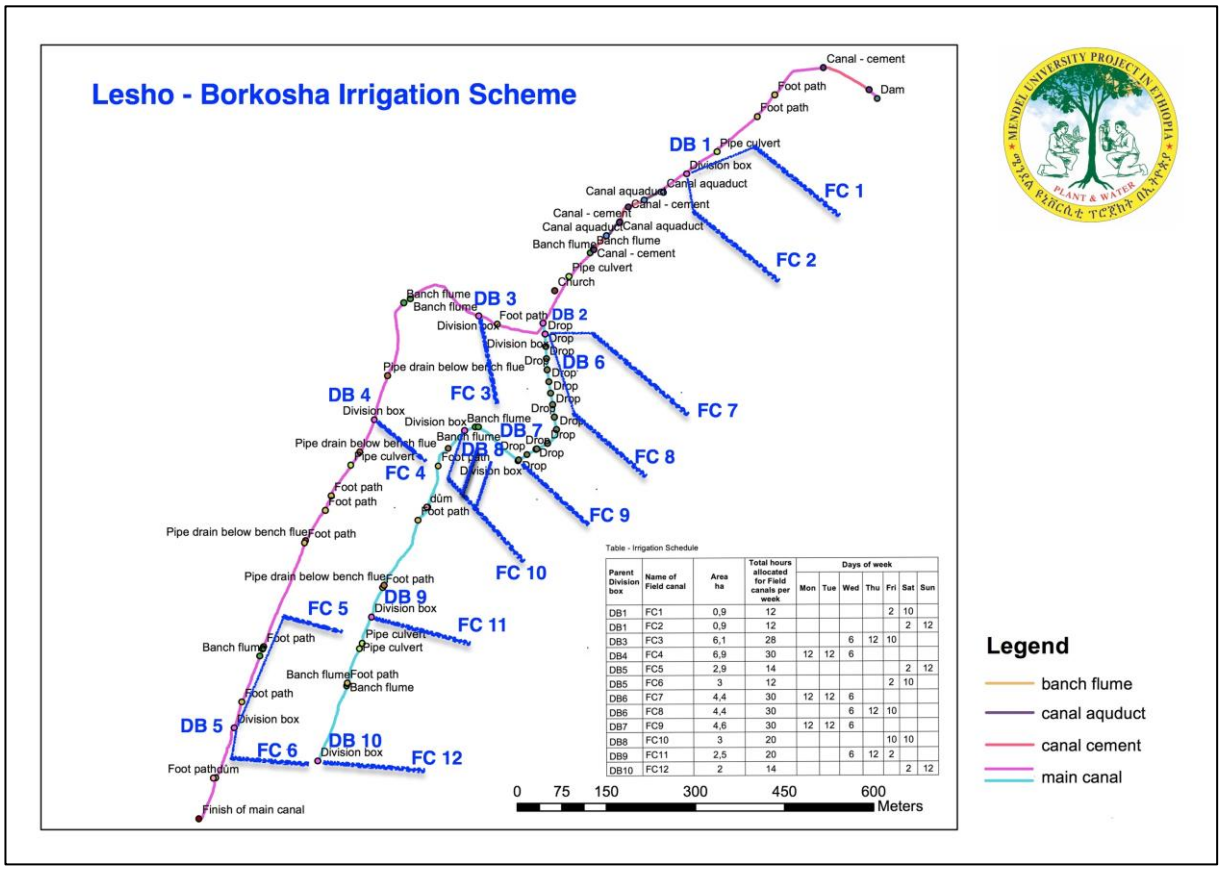
water supply system) is shown on table to make easy for the water association to arrange the program.

- Total No of working days per week = 7 days
- Duration of canal operation =12 hours/day (from 6:00 – 18:00)
- Total hours available for distribution in a week =12*7=84hours

Table - Irrigation Schedule

Parent Division box	Name of Field canal	Area ha	Total hours allocated for Field canals per week	Days of week						
				Mon	Tue	Wed	Thu	Fri	Sat	Sun
DB1	FC1	0,9	12					2	10	
DB1	FC2	0,9	12						2	12
DB3	FC3	6,1	28			6	12	10		
DB4	FC4	6,9	30	12	12	6				
DB5	FC5	2,9	14						2	12
DB5	FC6	3	12					2	10	
DB6	FC7	4,4	30	12	12	6				
DB6	FC8	4,4	30			6	12	10		
DB7	FC9	4,6	30	12	12	6				
DB8	FC10	3	20					10	10	
DB9	FC11	2,5	20			6	12	2		
DB10	FC12	2	14						2	12

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia



Picture 1 - Irrigation system scheme

The irrigation depth and interval vary from crop to crop as well as from one stage to other stage in the same crop as stated in agronomy part of feasibility study of this project. Hence it is difficult for the scheme managed by the farmers to adopt this complex schedule. Therefore irrigation intervals of seven days have been adopted and the irrigation depth has adjusted accordingly in order to manage the system easily by the farmers. Based on the above concept the irrigation systems do have the following general schedule of operation

Main canal:-This canal receives the water from the intake. Hence this canal works continuously for about 12hour per day.

2.5. Constructions on the irrigation system

In irrigation system there are different structures which help us proper utilization of water therefore through those structures we can manage direction and velocity of water.

Structures of this small scale irrigation system are listed below:-

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

Head work (diversion weir)

Main canal

Field canals

Drop structures

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

Crossing structures – pipe culvert

Aquaducts

Bench flume

Division box

3. Expenses

The costs of the irrigation system includes the cost of:

- Construction of diversion headwork and other associated works.
- Construction of Main Canal, Secondary Canal and Tertiary Canals
- Construction of Main Canal Structures like Aqueduct, Road Crossings, Division Boxes and Drops
- Construction of Drain Canals and access roads

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

The final cost breakdown and quantities are tabulated below, the estimated total project cost that is required for the implementation of the proposed Irrigation system is Birr 4,174,933.33.

Summary of Project Cost

S/N	Description	Amount
1.0	Head work and its Associated Structures	618,558.36
2.0	Main canal and Associated Structures	1,193,930.95
3.0	Secondary Canals and Associated Structures	762,556.49
4.0	Tertiary Canals and Associated Structures	53,818.42
5.0	Field Drain and Associated Structures	28,637.50
6.0	Miscellaneous Works	
6.1	Temporary Diversion channel and protection works	40,000.00
6.2	Access Road	560,000.00
6.3	Mobilization and camping	200,000.00
Total carried to summary		**3,457,501.72**
Contingency (5%)		172,875.09
Overall Total		3,630,376.81
VAT (15%)		544,556.52
GRAND TOTAL		**4,174,933.33**

4. Sustainability

4.1. General irrigation system maintenance

Utilization and maintenance are not separated each other. If there is utilization there should be maintenance. Therefore, proper management and maintenance of irrigation system will increase durability and sustainability of the system further more ease for use and maintenance. However, improper management of irrigation system will reduce sustainability of the system and the maintenance become complicated.

Knowing following points helps for proper management of irrigation system:

- Proper amount of water requirement
- Stepwise water flow
- On time irrigation

Checking different canals of irrigation system and we can do this according to the following points:-

- The operation system of irrigation should be maintained according to the manual

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

- Keep the irrigation system in order to avoid complicated maintenance.

Avoid problems which affect proper utilization of irrigation system such as:-

- over irrigation which cause water lodging problem and soil salinity through time. Therefore, identifying cause for such problem and take action is important for sustainability of irrigation system.

4.2. Improper management and utilization of irrigation water and its impact

The effect of over irrigation

1. Soil erosion
2. Soil salinity problem
3. Soil aeration problem
4. Reduction of soil nutrient content

The effect of under irrigation

1. Low production
2. During fertilizer application it cause burning of plant

Therefore, the production land should be balanced with the amount of water supplied by irrigation system.

Improper management of irrigation system can cause damage on crop as well as on surrounding natural resource.

For example due to unexpected increment of water at the source over filling of the canals may occur this may result over irrigation or flooding of farm land. During this time drainage of excess water from the field is very important.

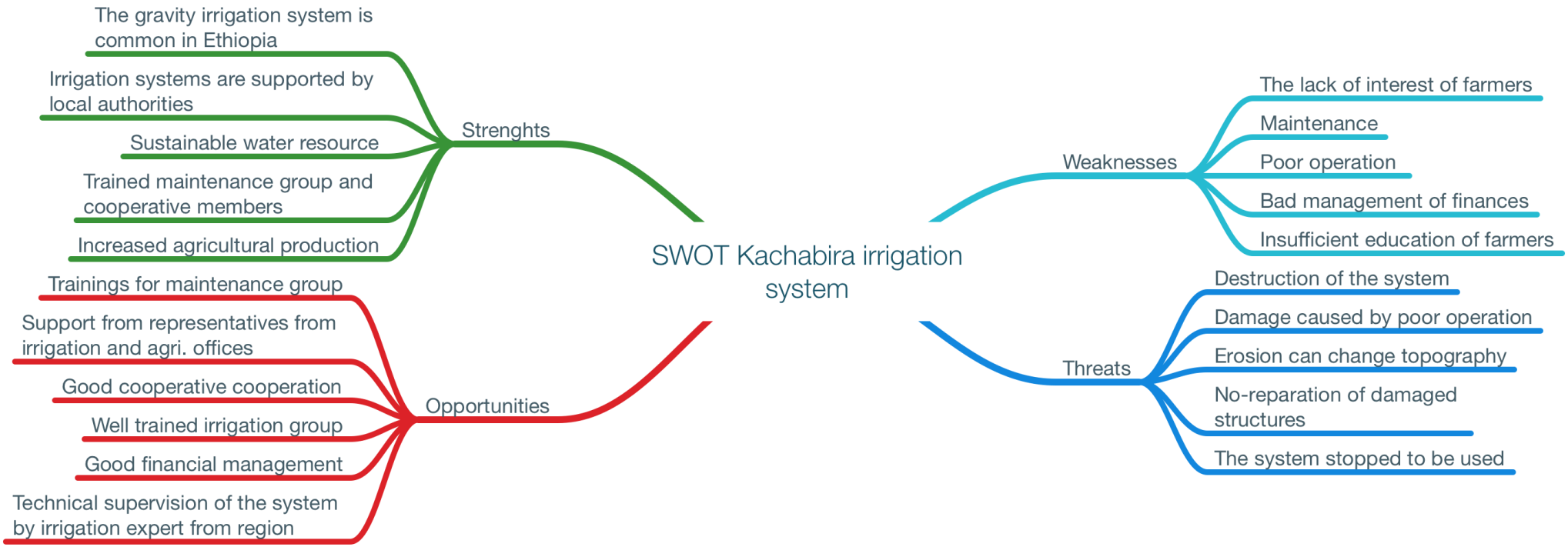
5. Impact of irrigation system

The introduction of the irrigation system has resulted in the following positive changes in the farmer's management in the project site:

- Irrigations cover an area of over 44 hectares of land, which has significantly increased agricultural production.
- Due to the availability of irrigation in the dry season, the production of new crop species requiring more water (sugar cane, etc.) was started.
- The co-operative for the irrigation system is better motivated and co-ordinated.
- Improved cooperation with the local authorities. Communication has also improved among farmers.
- Irrigation has contributed to improving the living standards of the local population.

Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

6. SWOT analysis



Mendel University
P.O. Box 734, Awassa, Ethiopia
tel.: 0926448799
e-mail: shife19@yahoo.com www.mendelu.cz
In its capacity of contractor within the official framework of the Czech Republic Development Cooperation with Ethiopia

7. Conclusion and recommendations for replication

The irrigation system is common technology in Ethiopia that positively affects the management of large agricultural land, helping farmers to use their natural resources more efficiently. This type of irrigation systems is supported by the Ethiopian government. In case there is no misalignment of the water from the natural source of water (rivers, etc.), it is advisable to replicate this method of irrigation in other localities.