

APPENDIX 1

EXPLANATION MATERIALS OF COBSI APPROACH FOR THE FIELD SURVEY

TABLE OF CONTENTS

APPENDIX 1 EXPLANATION MATERIALS OF COBSI APPROACH FOR THE FIELD SURVEY

1.1	What's "COBSI"?	I-1
1.2	Mozambique.....	I-2
1.3	Sierra Leone	I-3
1.4	Cote d'Ivoire	I-4
1.5	Tanzania	I-5
1.6	Madagascar	I-6

1.1 What's “COBSI”?



What's "COBSI"?



(Community-Based Smallholder Irrigation)

Information Collection Survey for the Expansion of the
Community-Based Smallholder Irrigation in Africa Region

Yoshihiro SAGAWA, Sanyu Consultants Inc.

June ,2022



(1) Secure Water

Uniqueness of Community-Based Smallholder Irrigation (COBSI)

If we have 1 to 2 meters width stream...

- With Easily Adaptable Simple Techniques
- By Using LOCALLY AVAILABLE MATERIALS (e.g., grass, twigs, wooden poles and soil)
- Farmers construct and maintain the simple weir, canal and furrows
- Shift to "Irrigated Agriculture" with 2-3 USD (material wise)
- No Harm to Environment nor include activities to increase the emissions.

Expensive Dam, Reservoir, Pump, Concrete Furrows

Agenda

1. COBSI Approach
(Simple weir, Earthen canal, Irrigation and Upgrading to Permanent weir)
2. Appropriate technology
(Training Materials of COBSI)

(2) Simple Weir



- Use of LOCALLY AVAILABLE Materials.
- Farmers CONSTRUCT, OPERATE, and MAINTAIN.
- SIMPLE yet FUNCTIONAL
- Easy to RE-CONSTRUCT when washed away

(3) 4 types of Simple Weir



Type 1: Inclined
Stream Width Narrow & Deep



Type 2: Single Line
Stream Width Large & Shallow



Type 3: Double Line
Stream With Large, Shallow, & Water Leakage with Type 2



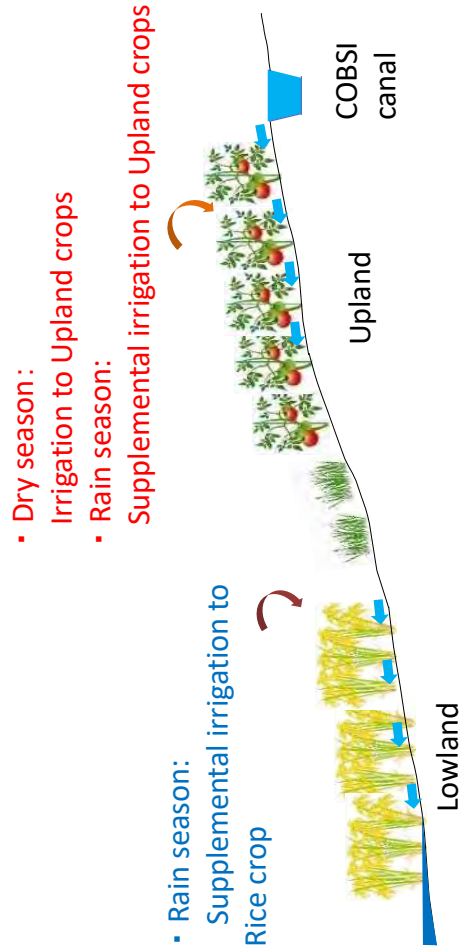
Type 4: Trigonal
Stream Width Large, Shallow, & Rocky Riverbed

(4) Furrows and Gravity irrigation



- Gravity Irrigation
- Furrows made with equipments which farmers already uses for farming

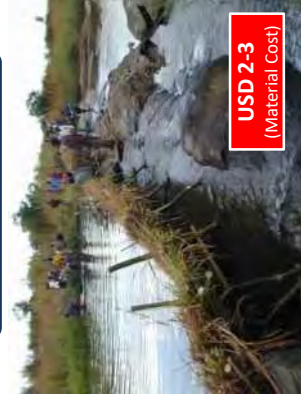
(5) Sketch of irrigation to Crops



(6) Permanent Weir (Upgrading)

Upgrading SIMPLE weir to PERMANENT weir

Simple Weir



USD 2-3
(Material Cost)

Permanent Weir



Approx. USD 1,800
(Material Cost)

- Entry point to Irrigated Agriculture
- Start with Low Cost

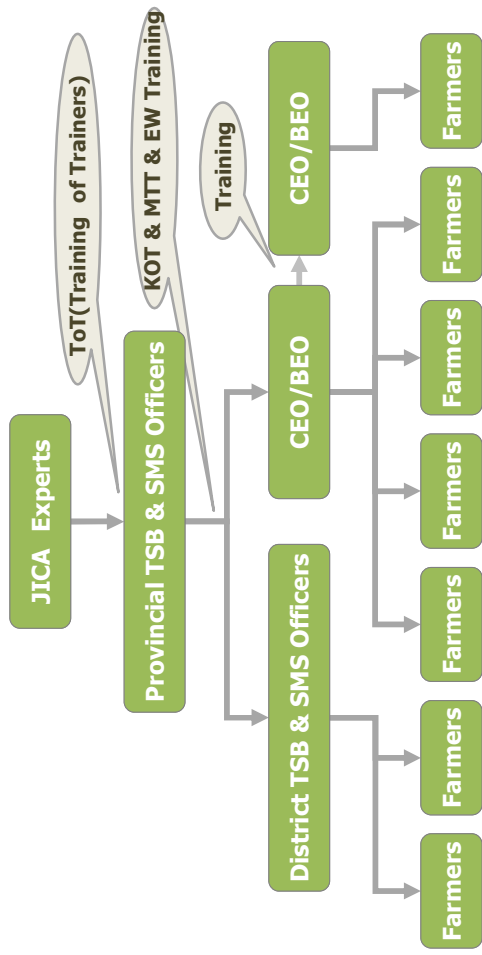
- By upgrading to Permanent Weir,
- Stable intake of water
- Increase in Volume of Water
- Increase in Irrigated Area

(6) Permanent Weir



- Construct with Cement, Sand and Rocks
- Farmers can construct and maintain by themselves
- Government Officials supervise the construction

*Extension System in Zambia



Cascade-like dissemination of irrigation technologies

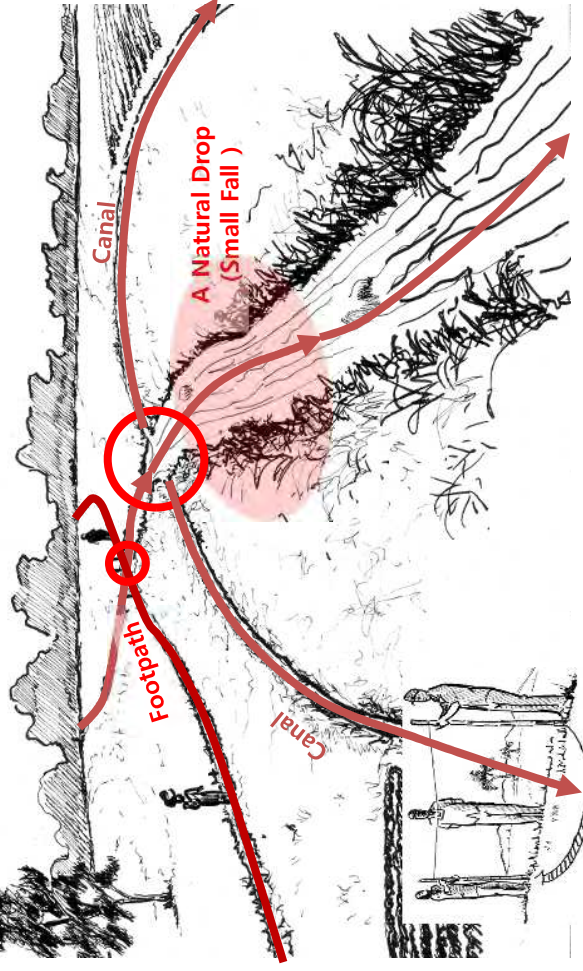
2. Appropriate technology (Training Materials of COBSI)

Contents:

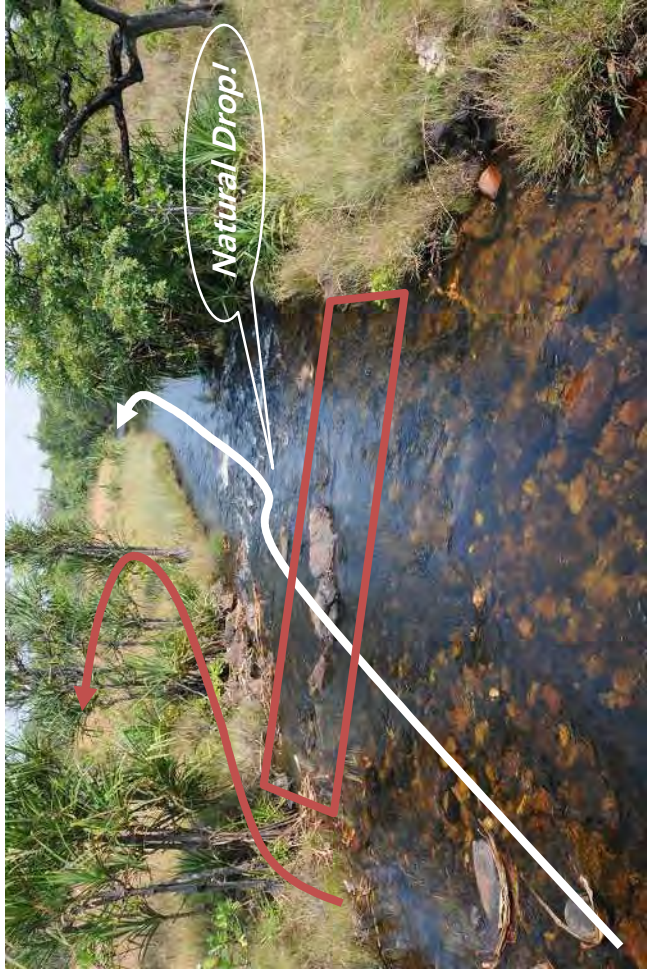
- (1) Potential diversion point
- (2) Canal alignment with Spirit level
- (3) Ancillaries

(1) Potential Diversion Place

Explore right upstream of a natural drop or near footpath



A Potential Diversion Place



(2) Canal Alignment with Spirit Level

CANAL RUNNING NICELY

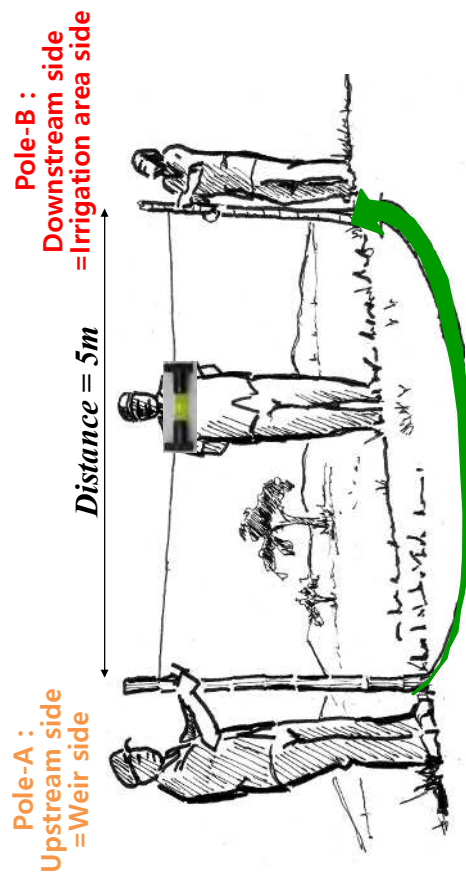


MAKING THE LINE LEVEL



COPING MEASURES

Distance	Off-set	Gradient	Land scape
5m	1.0 cm	1/500	Common land (Hilly area)
5m	0.5 cm	1/1,000	Gentle land (Flat area, Dambo area)

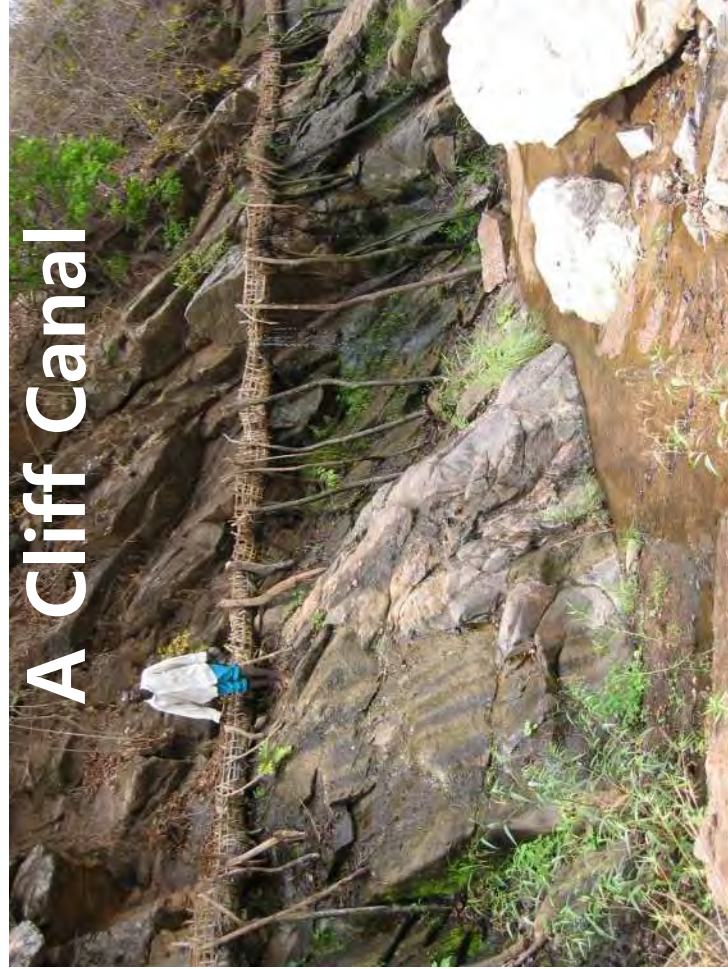


(3) Ancillaries



A CANAL BRIDGE

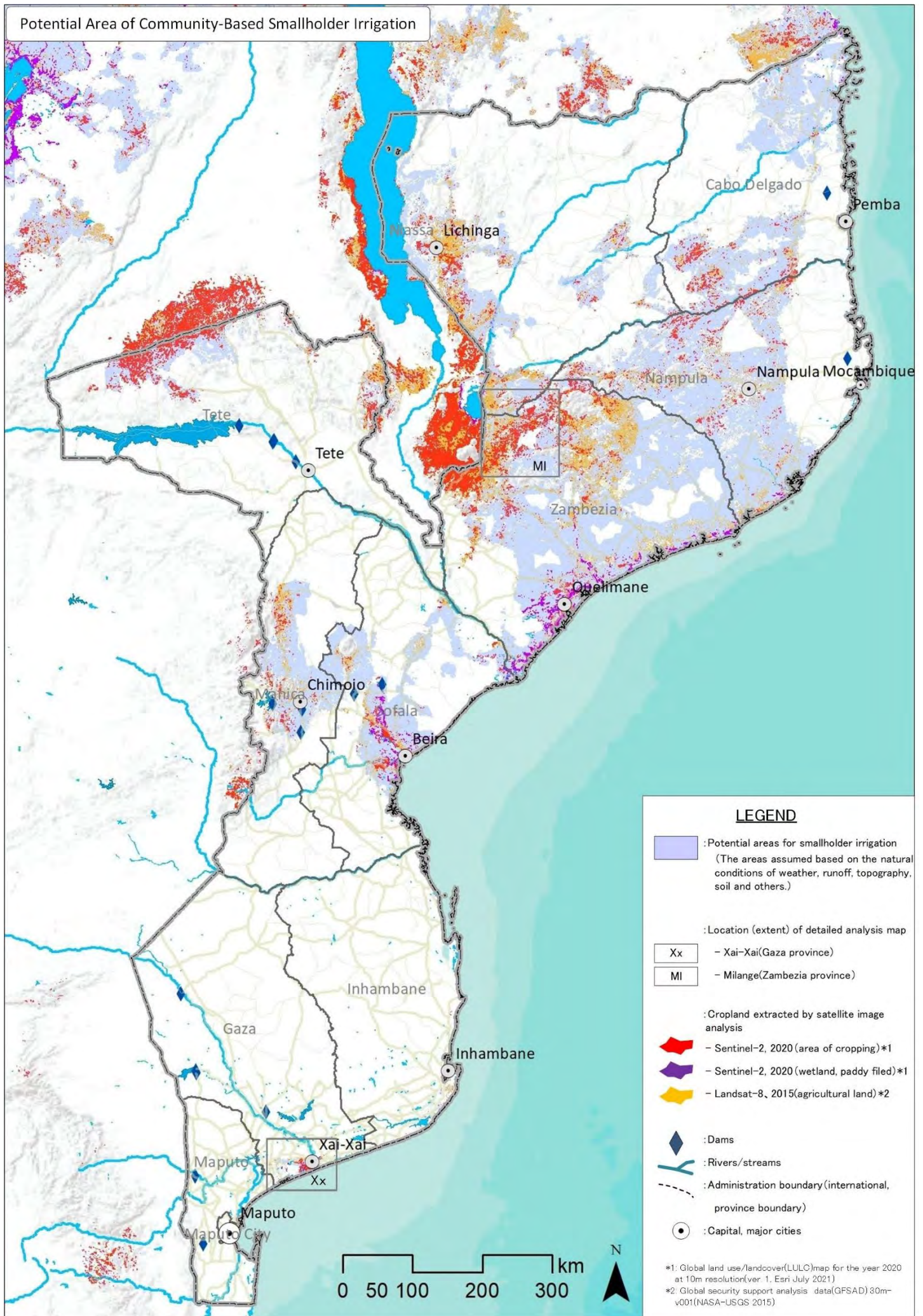
Canal Lining in Locality



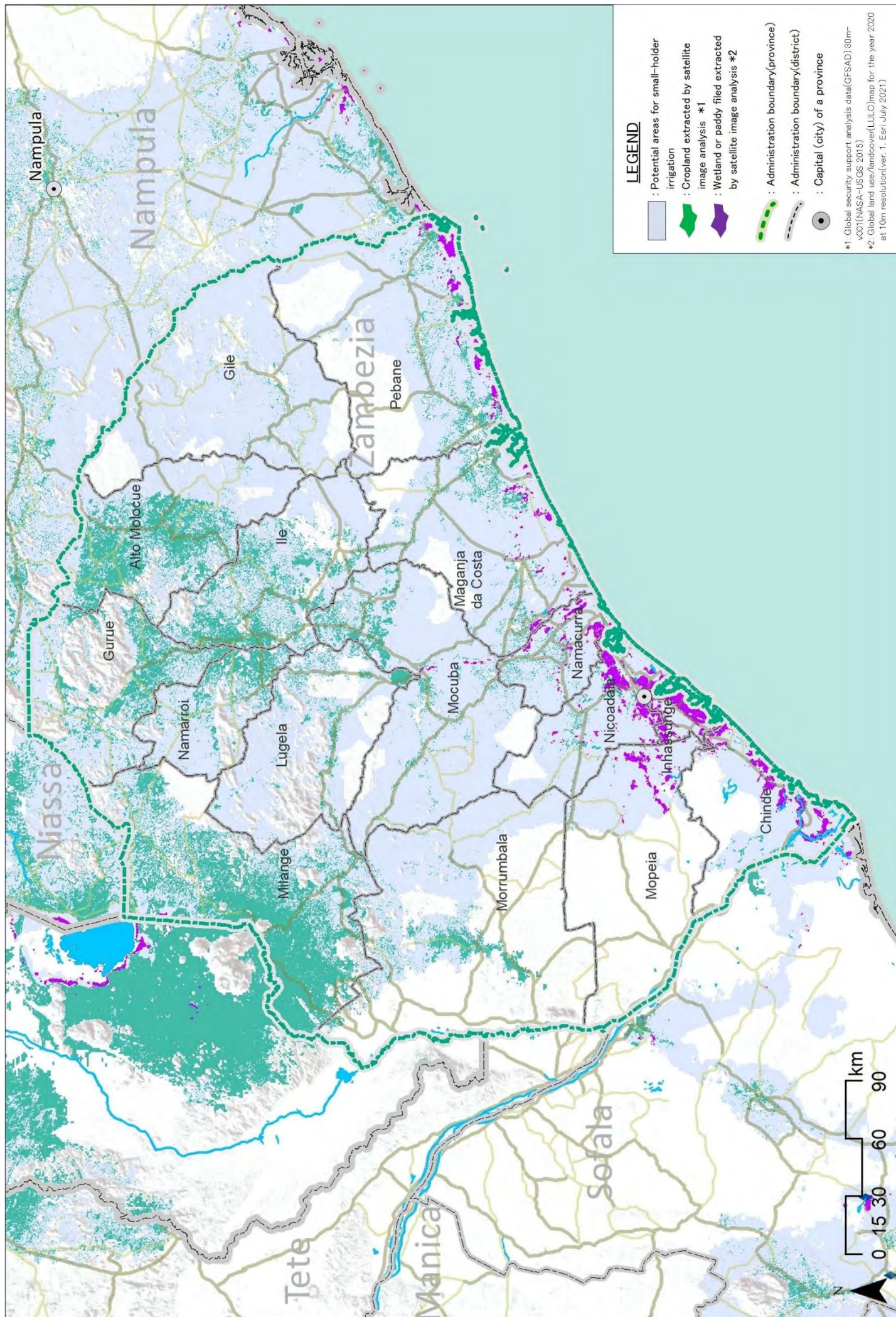
A Cliff Canal

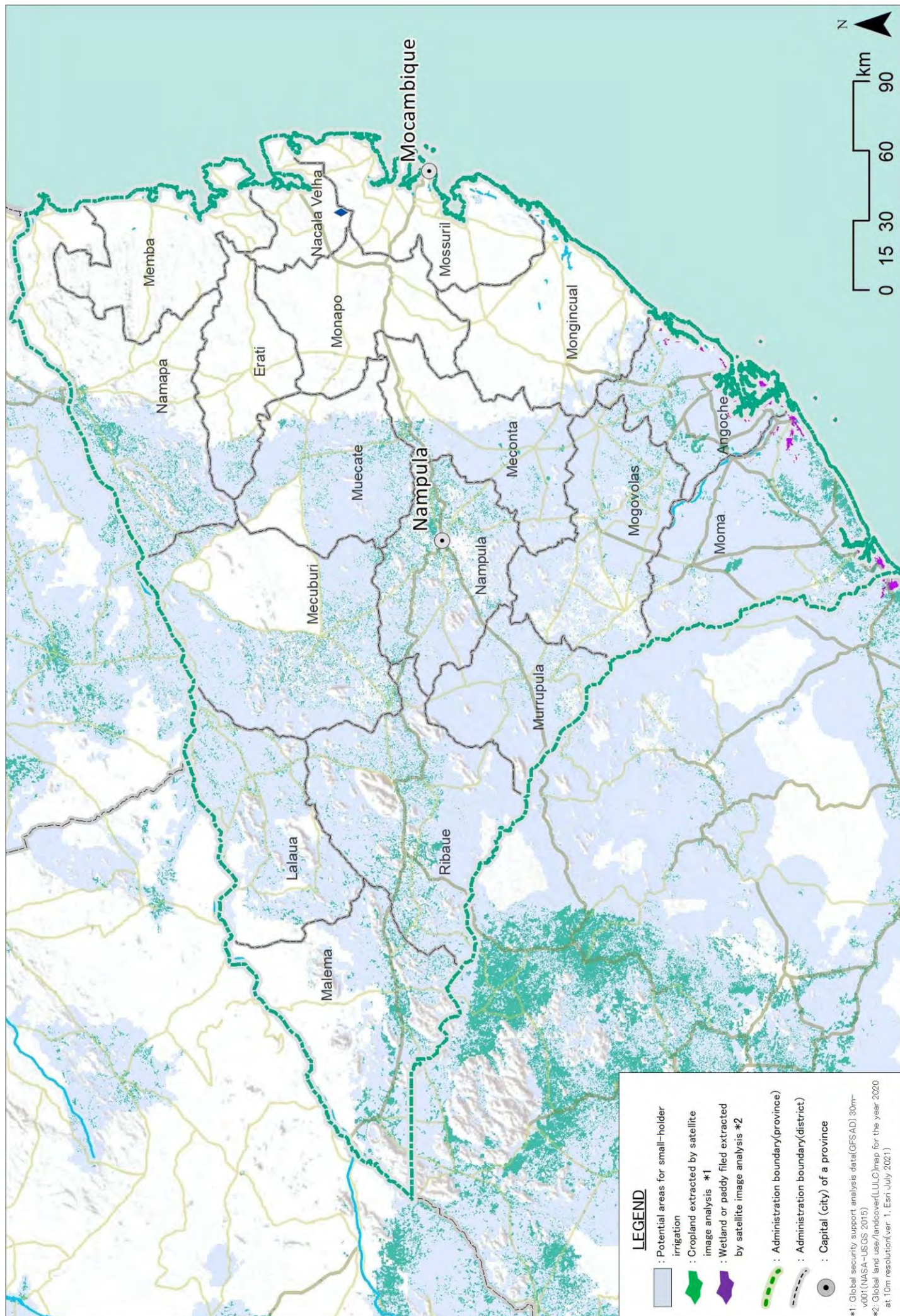


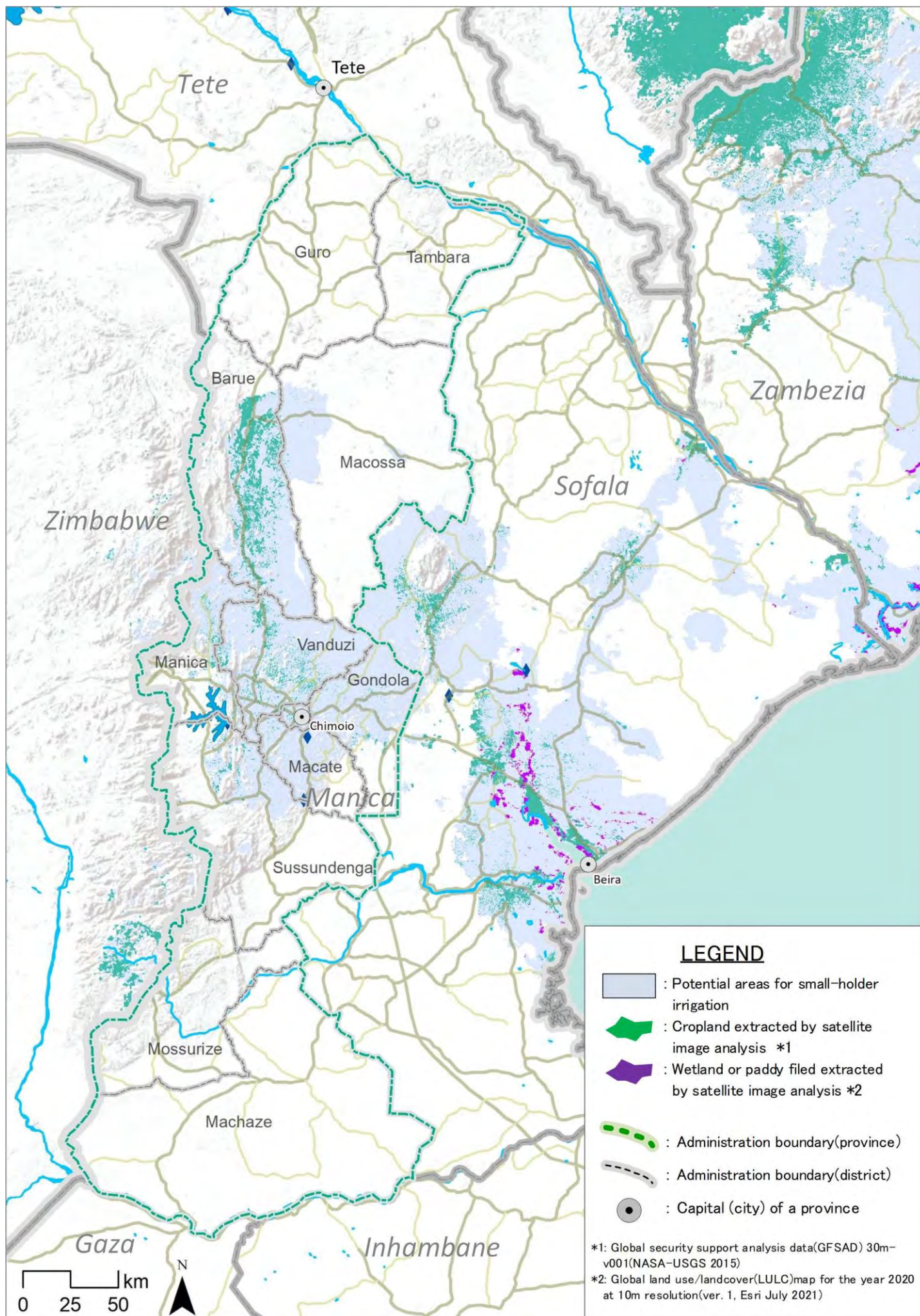
1.2 Mozanbique

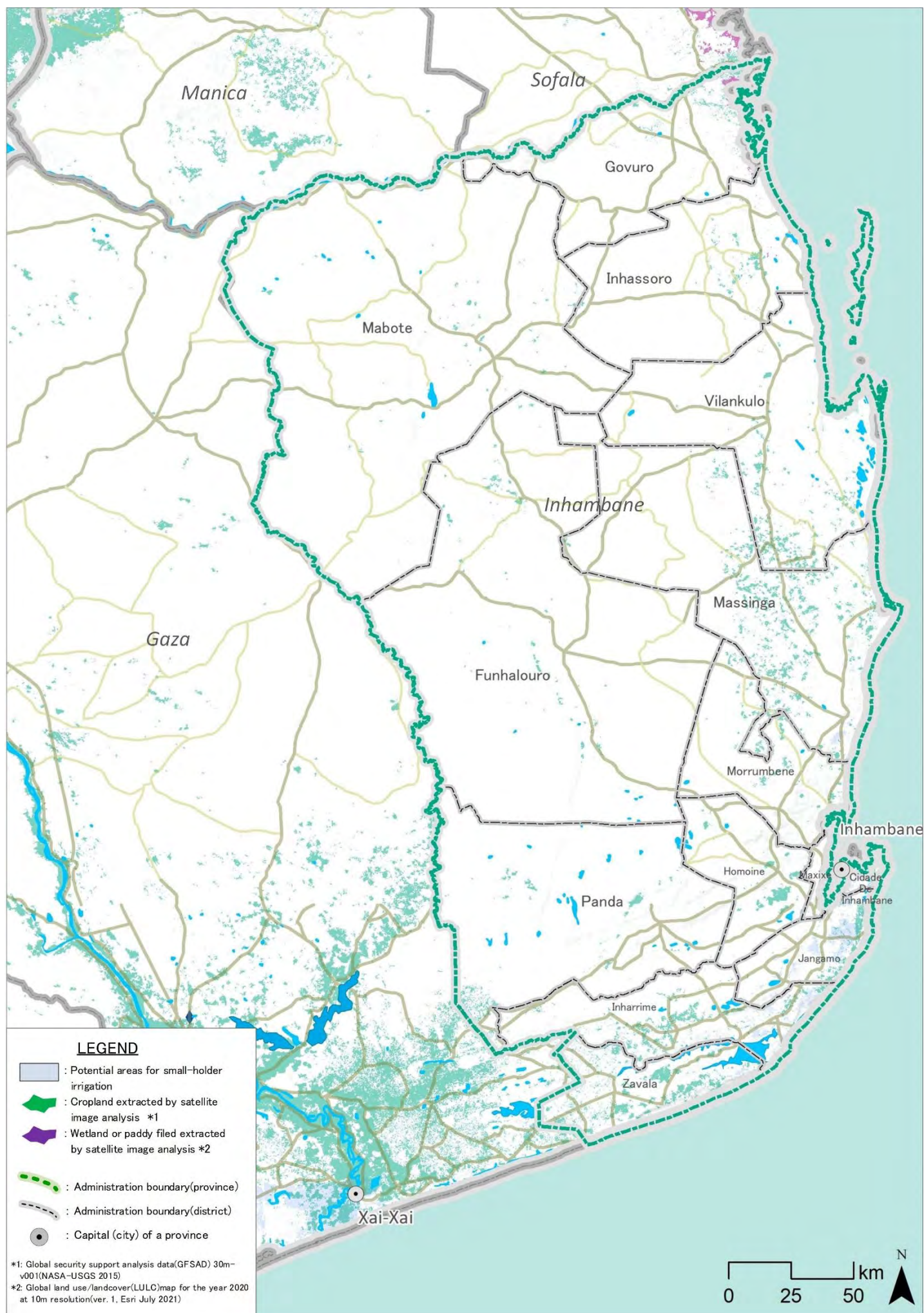


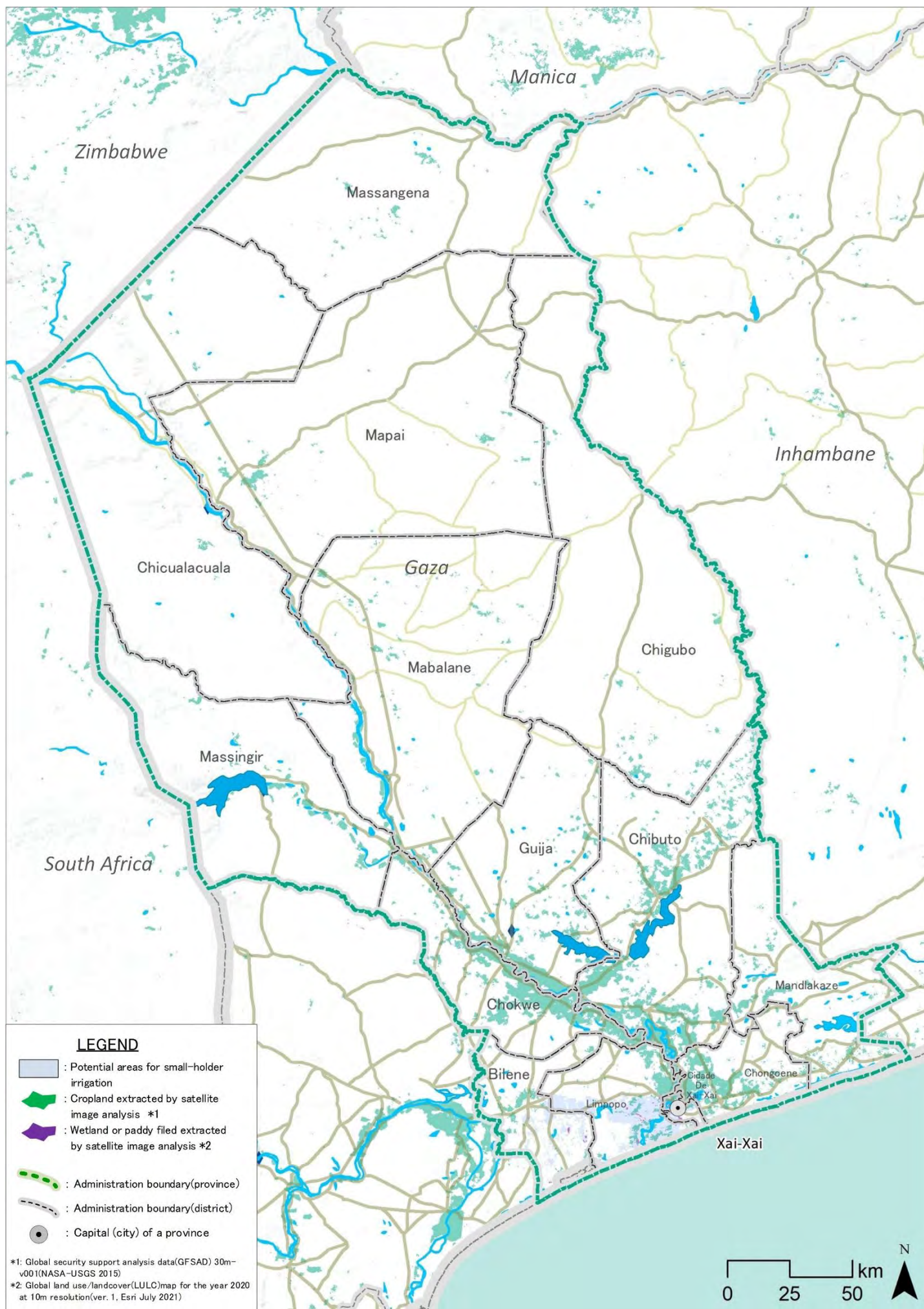


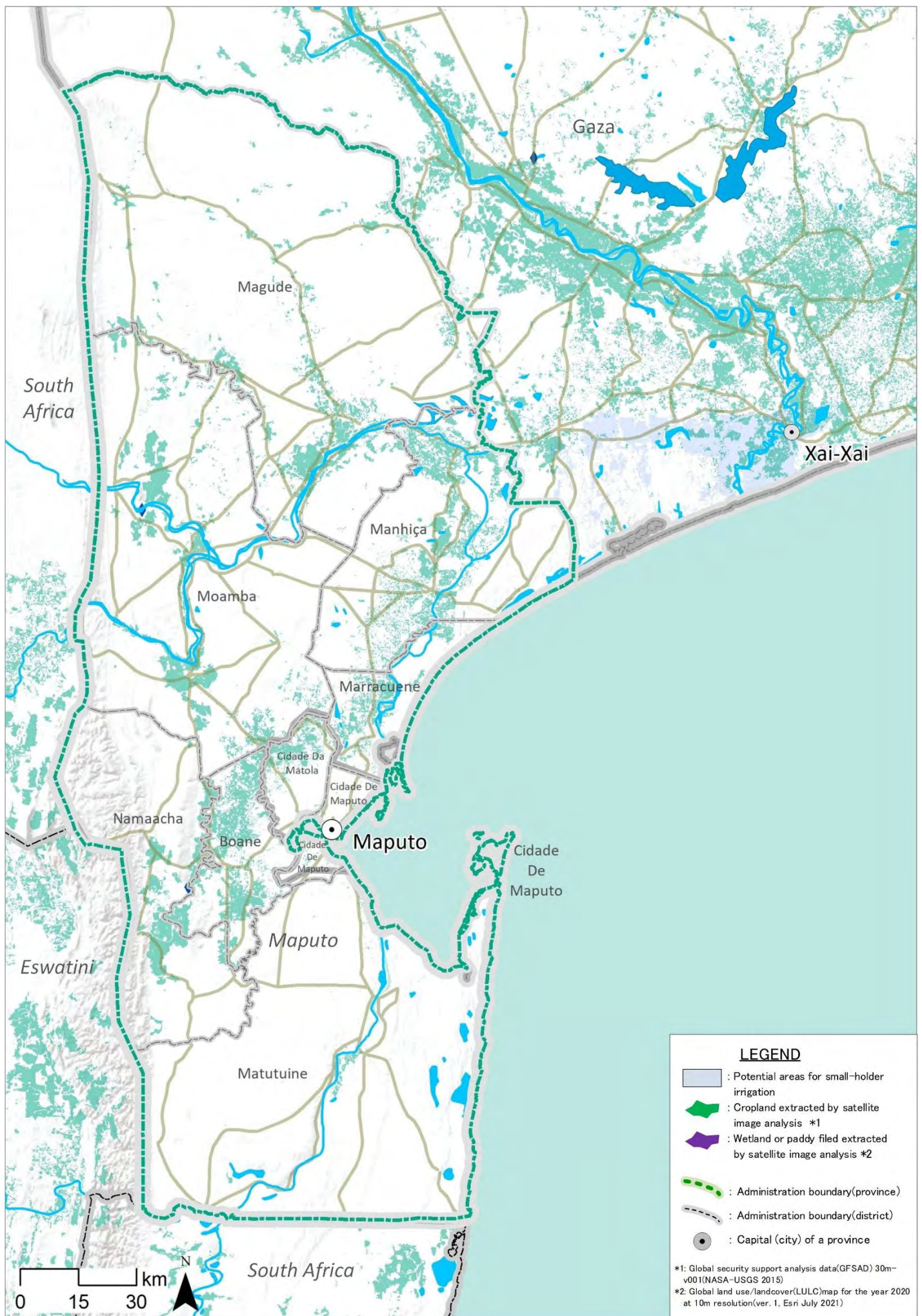




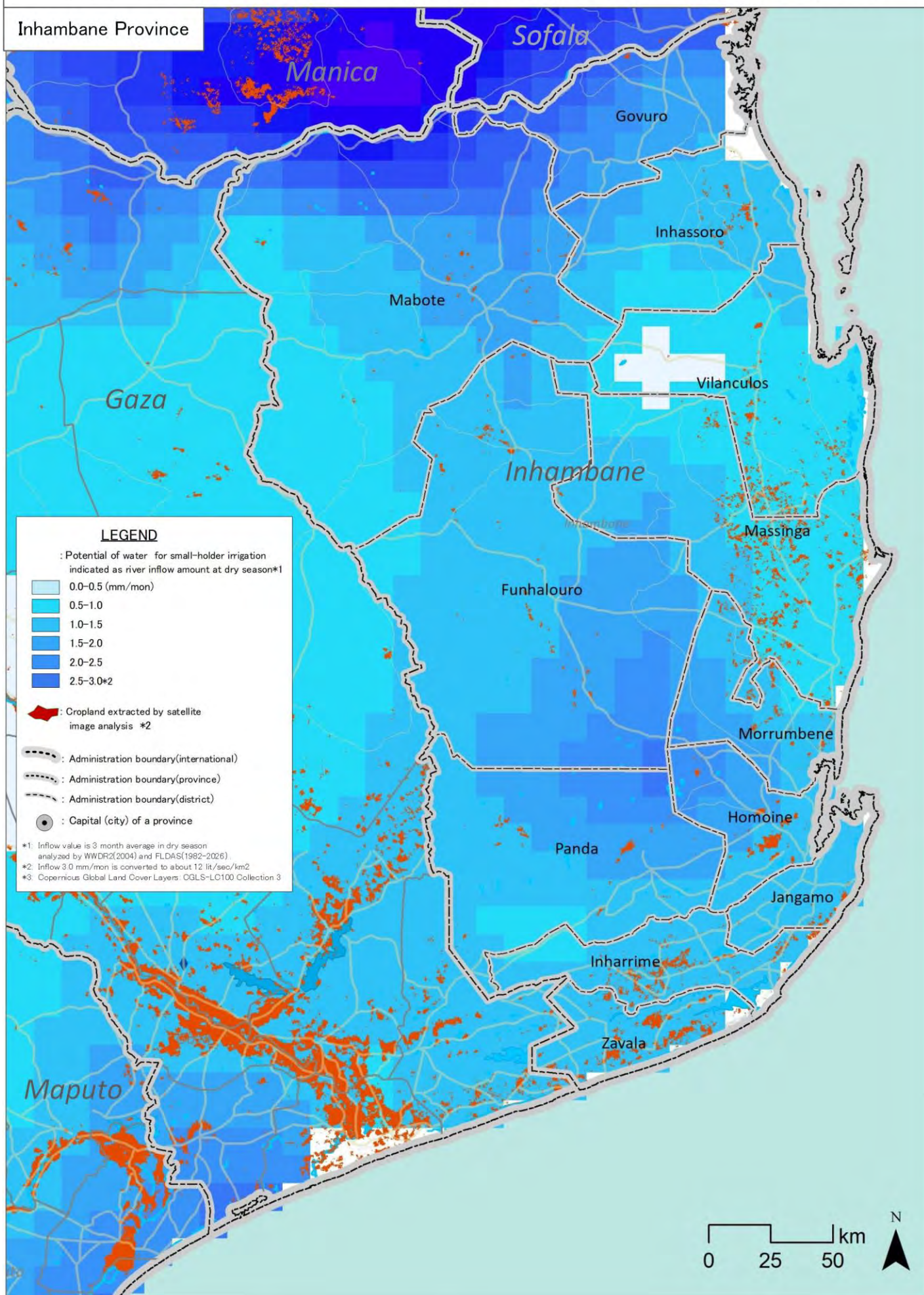




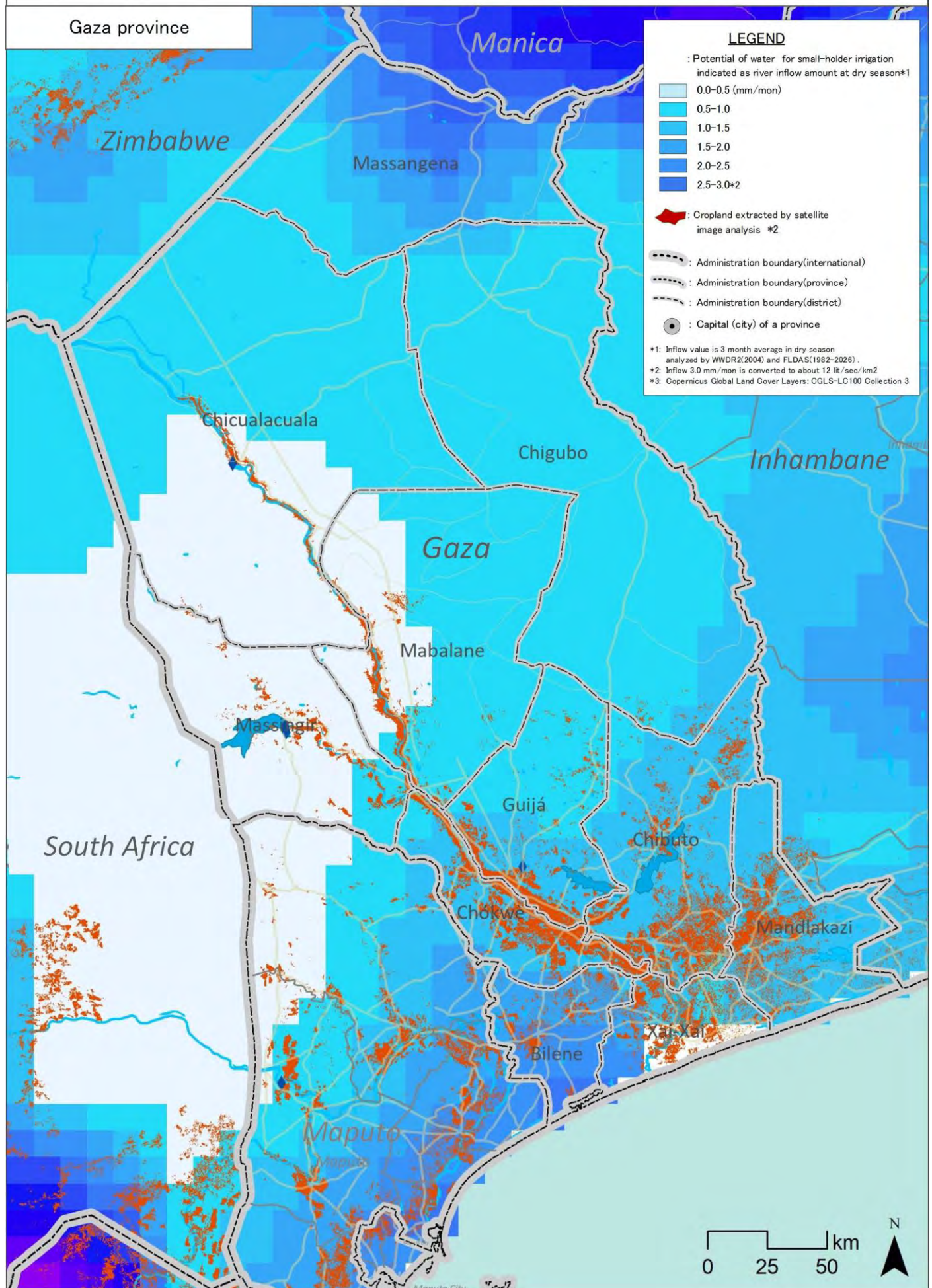




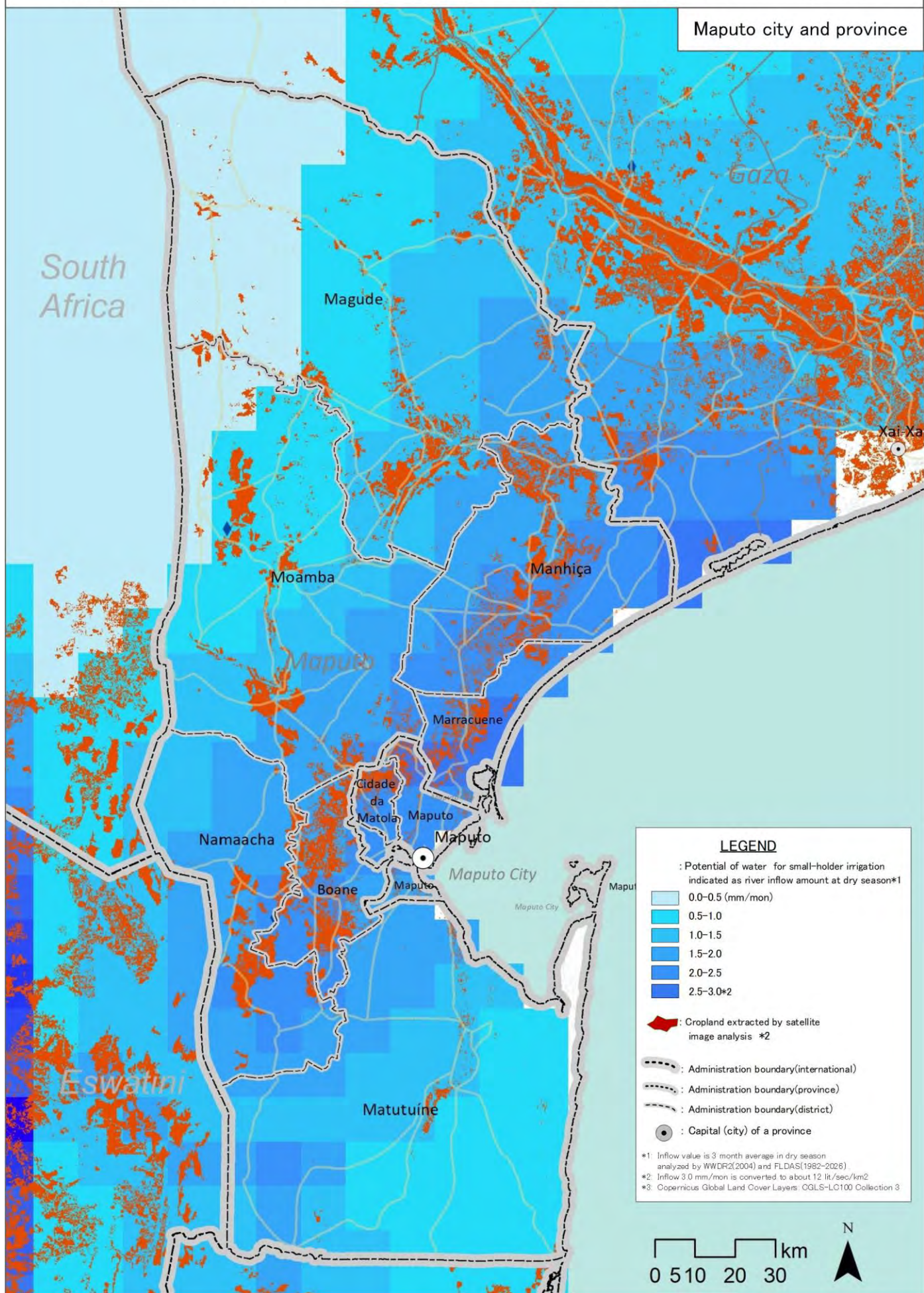
Potential of water source for small-holder irrigation indicated as river inflow amount at dry season



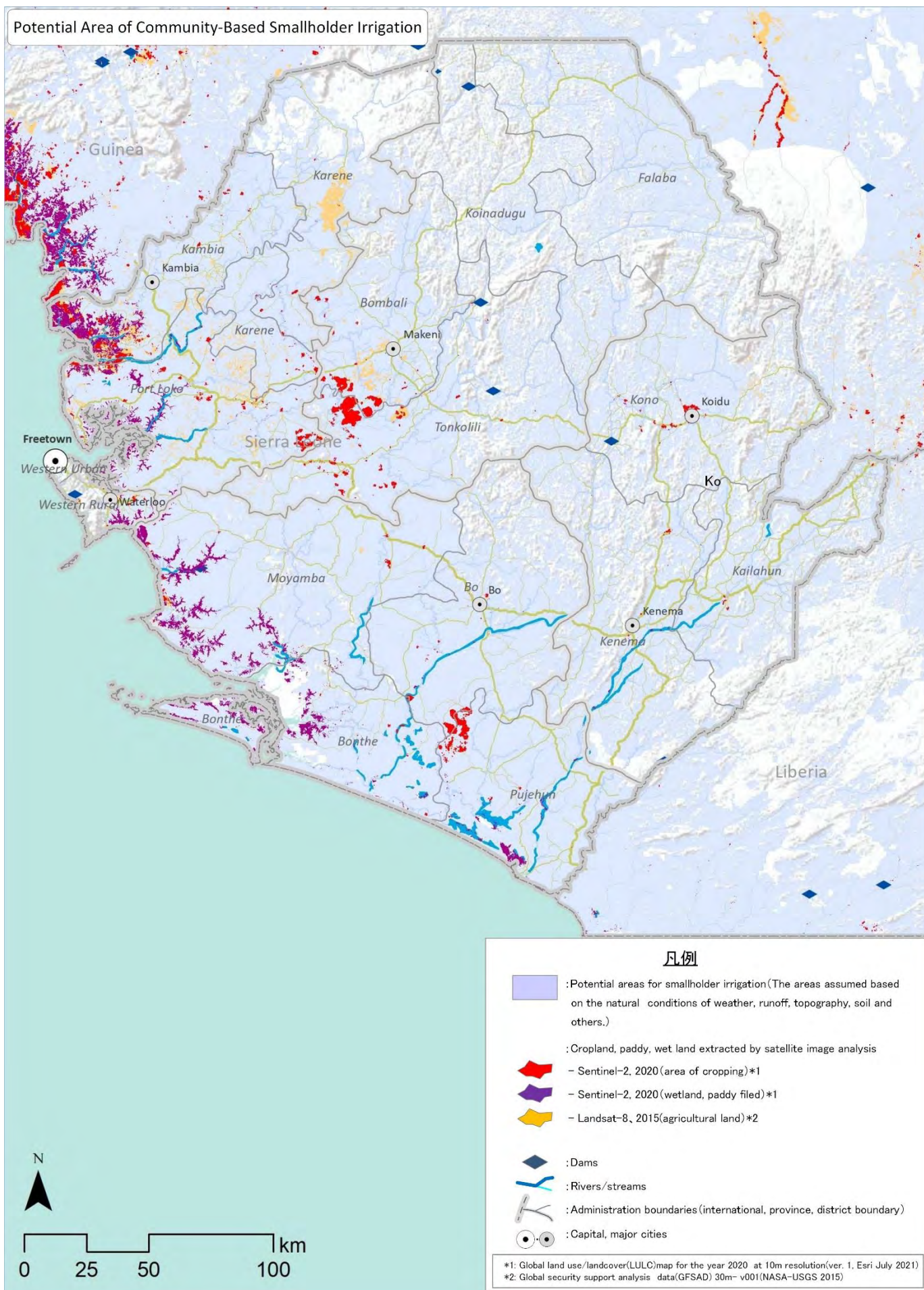
Potential of water source for small-holder irrigation indicated as river inflow amount at dry season



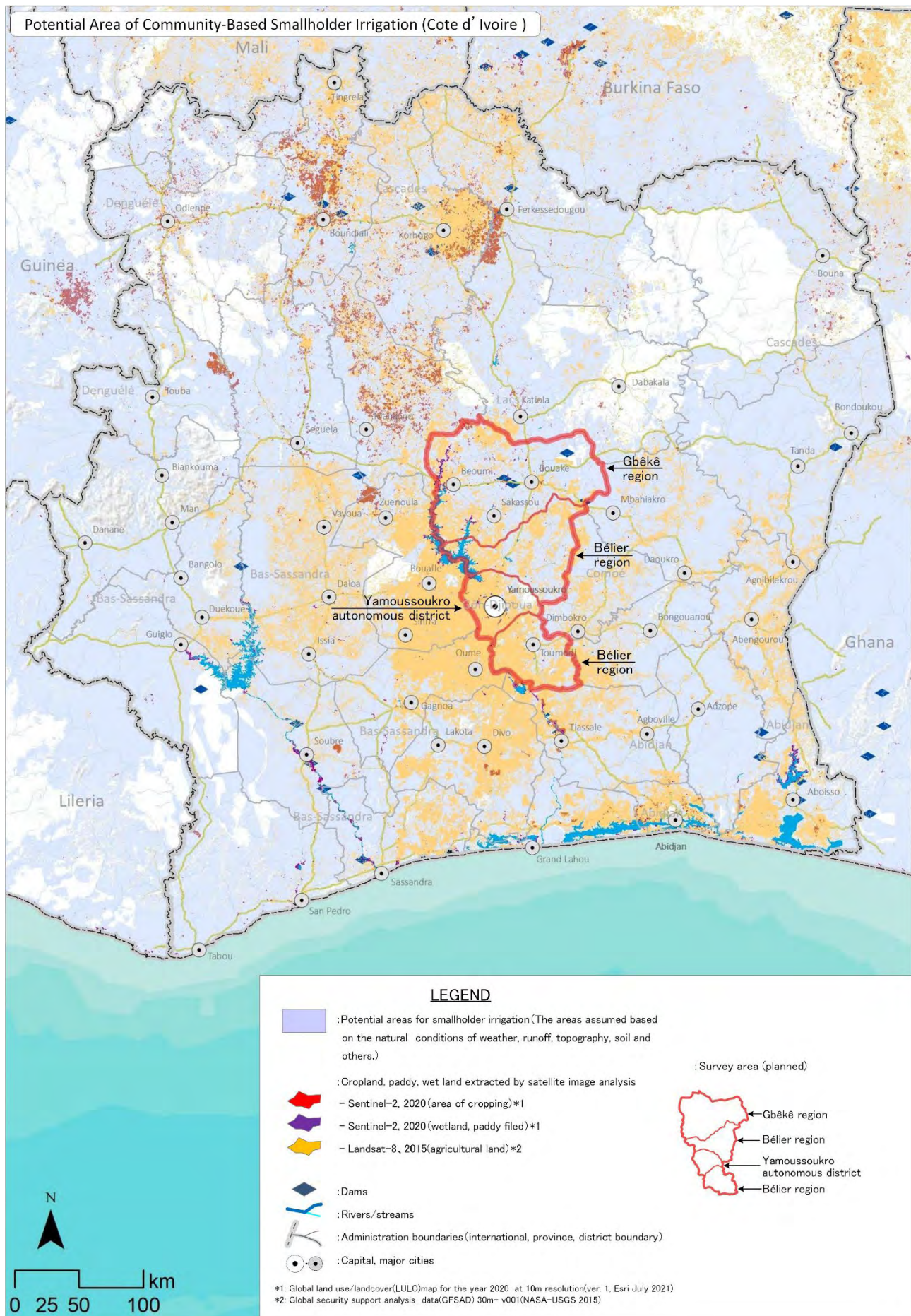
Potential of water source for small-holder irrigation indicated as river inflow amount at dry season



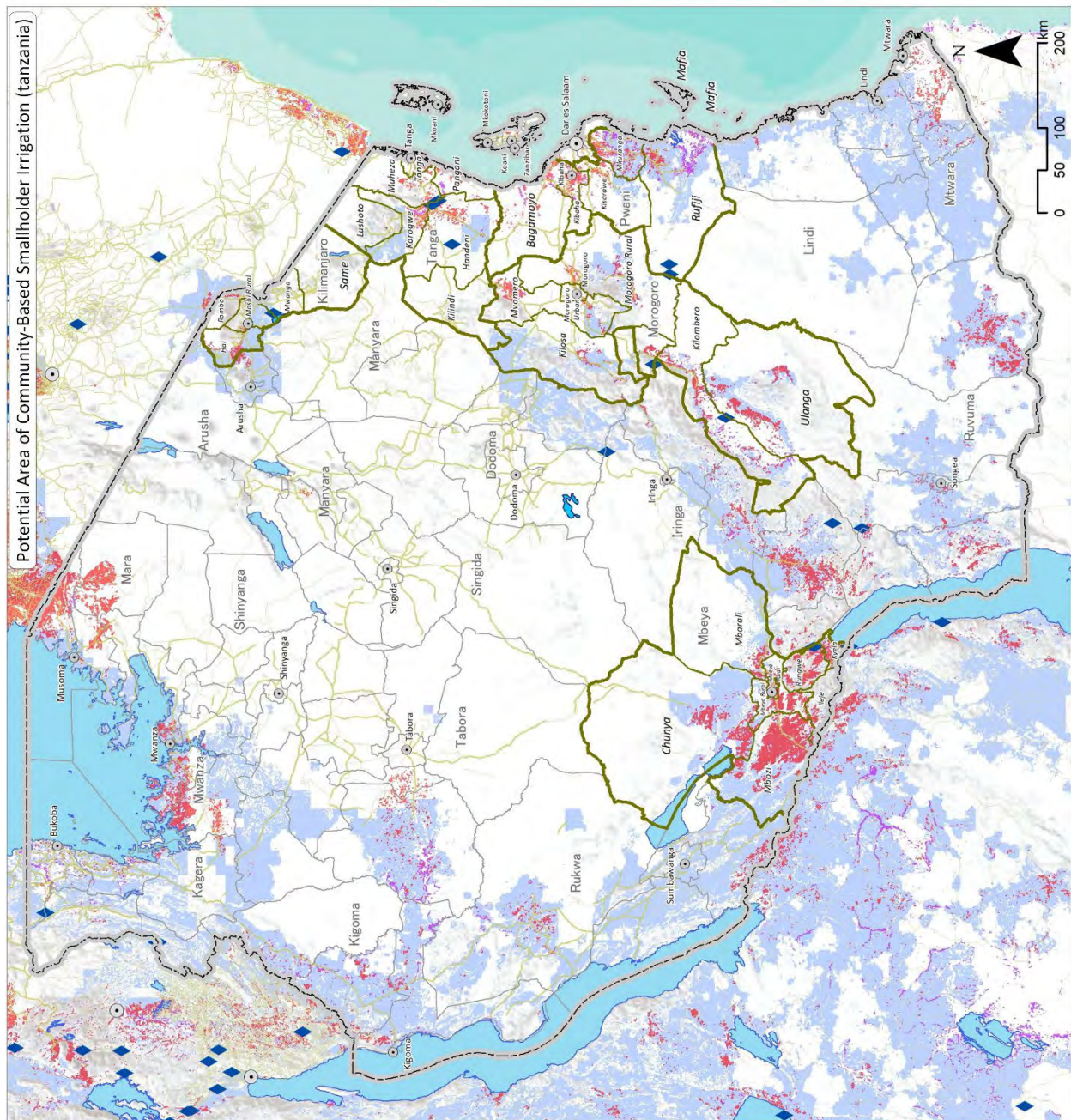
1.3 Sierra Leone



1.4 Cote d'Ivoire

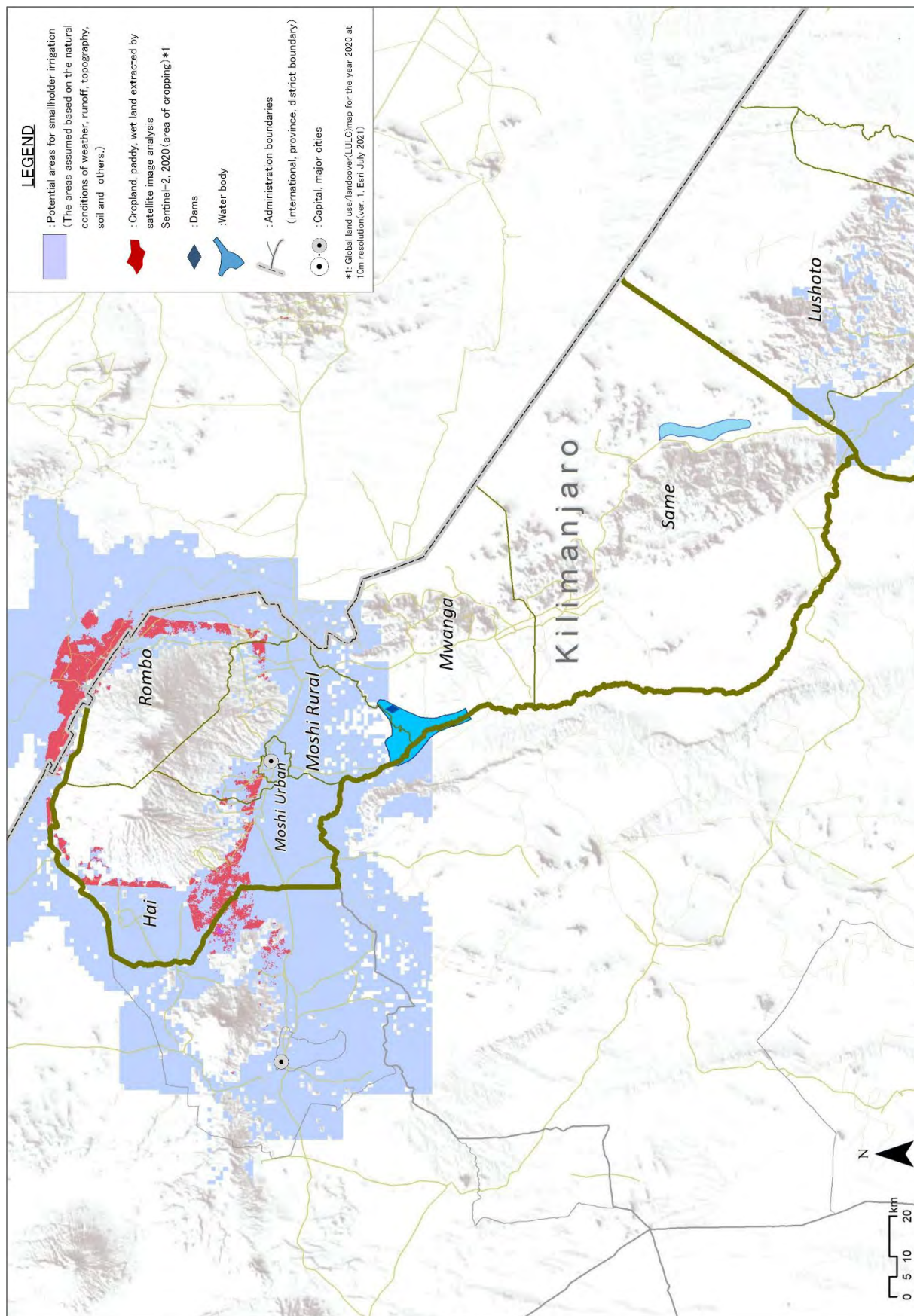


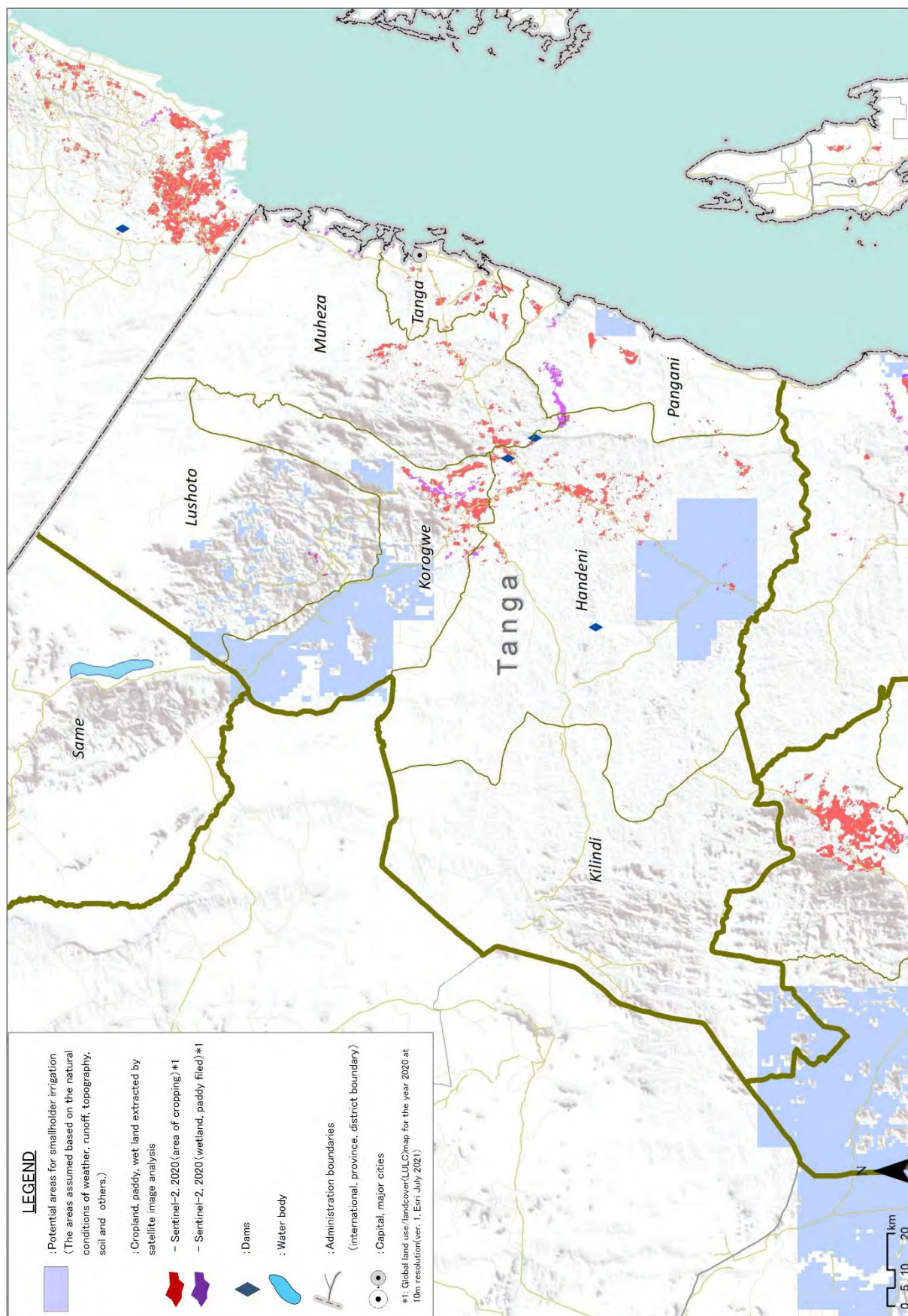
1.5 Tanzania

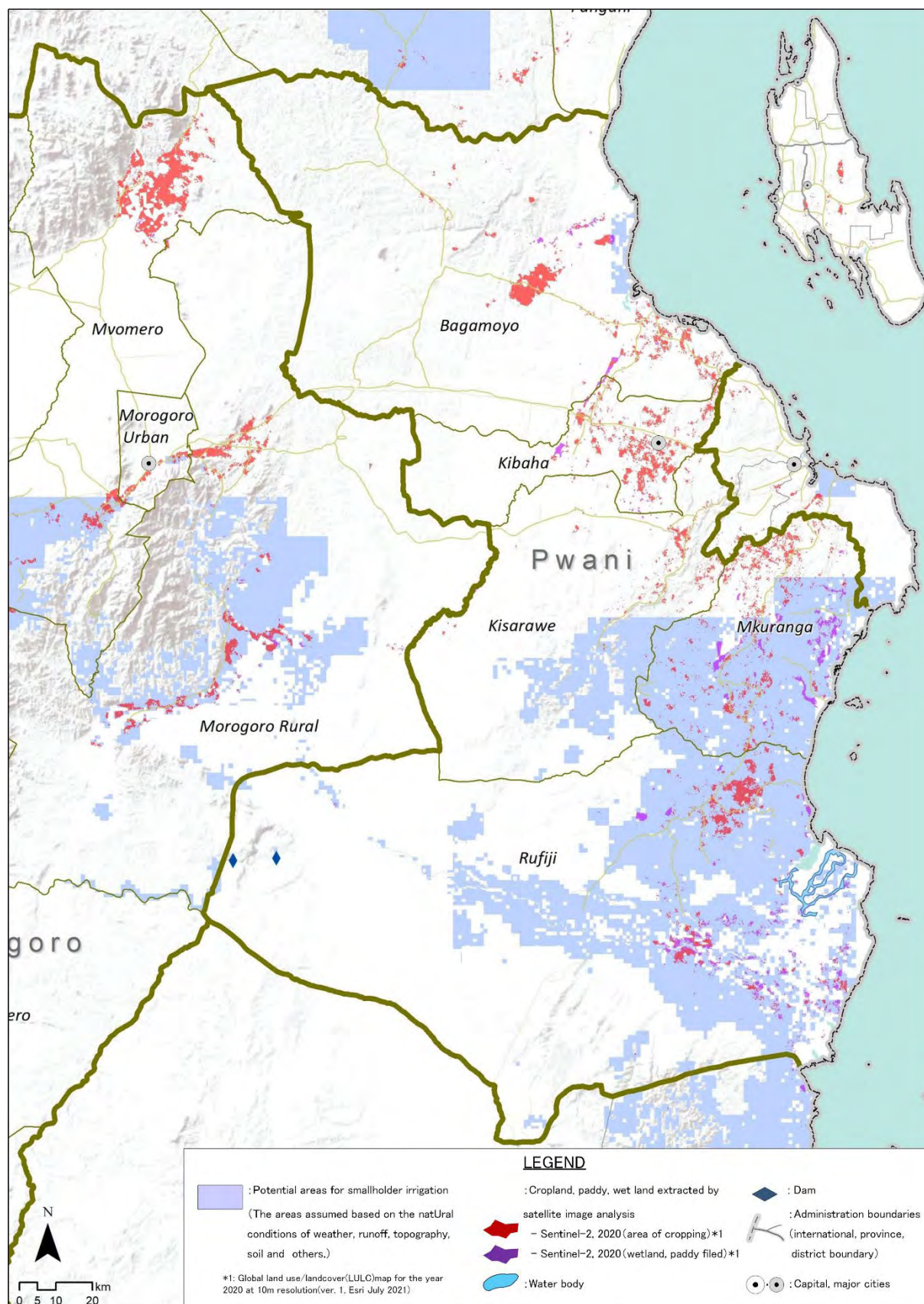


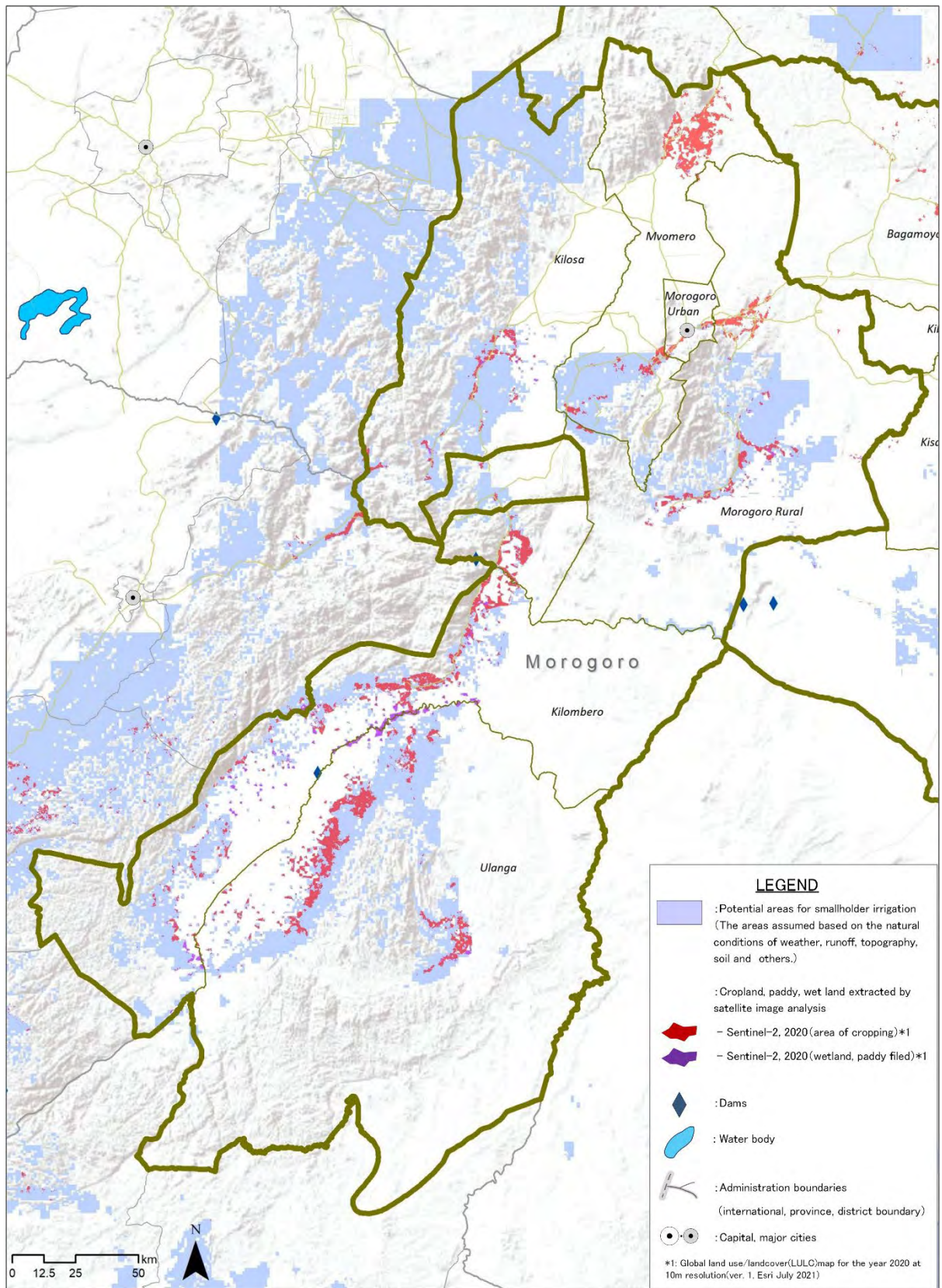
LEGEND

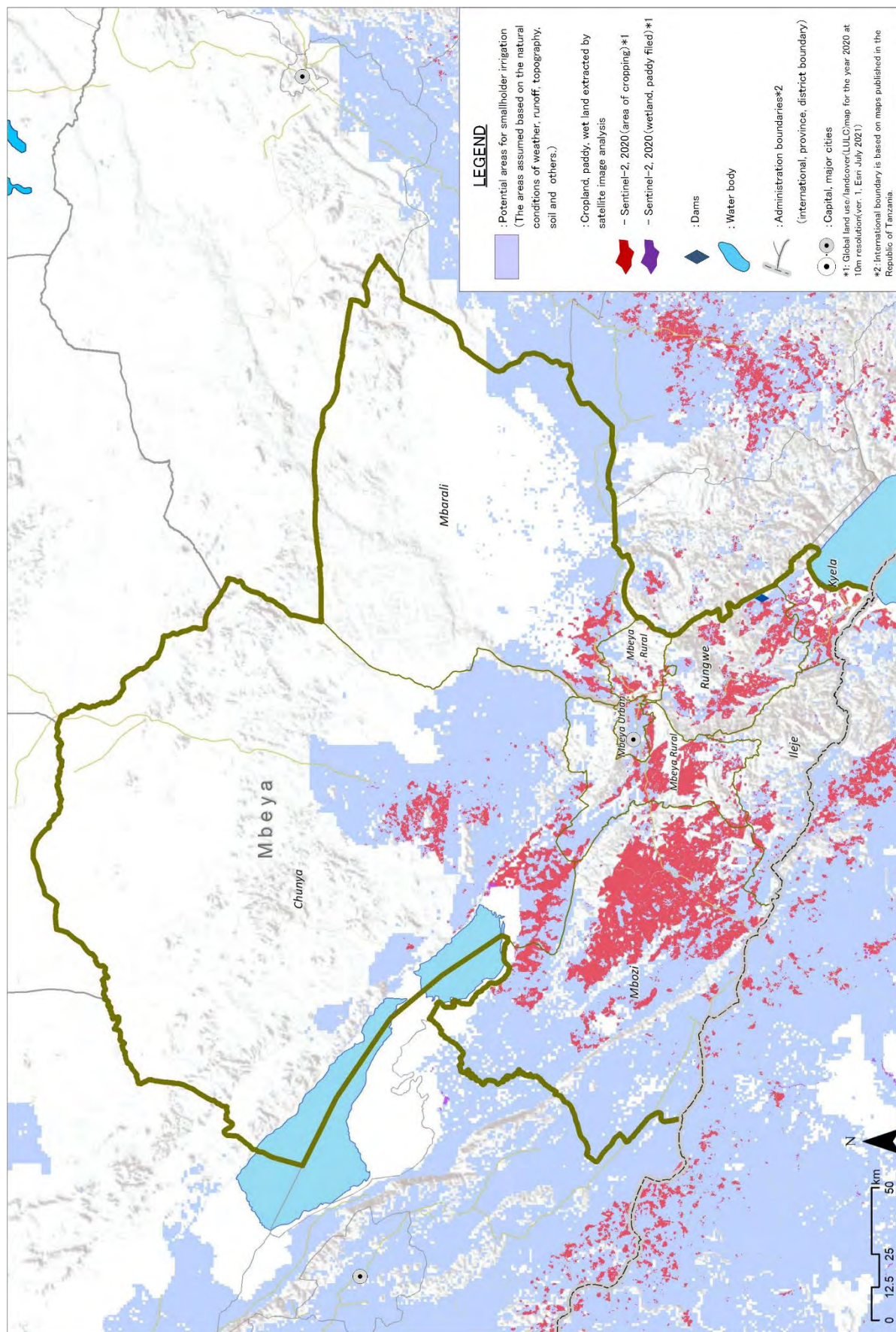
- : Potential areas for smallholder irrigation
(The areas assumed based on the natural conditions of weather, runoff, topography, soil and others.)
 - : Cropland, paddy, wet land extracted by satellite image analysis
- Sentinel-2, 2020 (area of cropping) *1
- Sentinel-2, 2020 (wetland, paddy field) *1
 - : Dams
 - : Administration boundaries #2
(international, province, district boundary)
 - : Capital, major cities
- *1: Global land use/landcover (LULC) map for the year 2020 at 10m resolution (ver. 1, Eri July 2021)
*2: International boundary is based on maps published in the Republic of Tanzania.





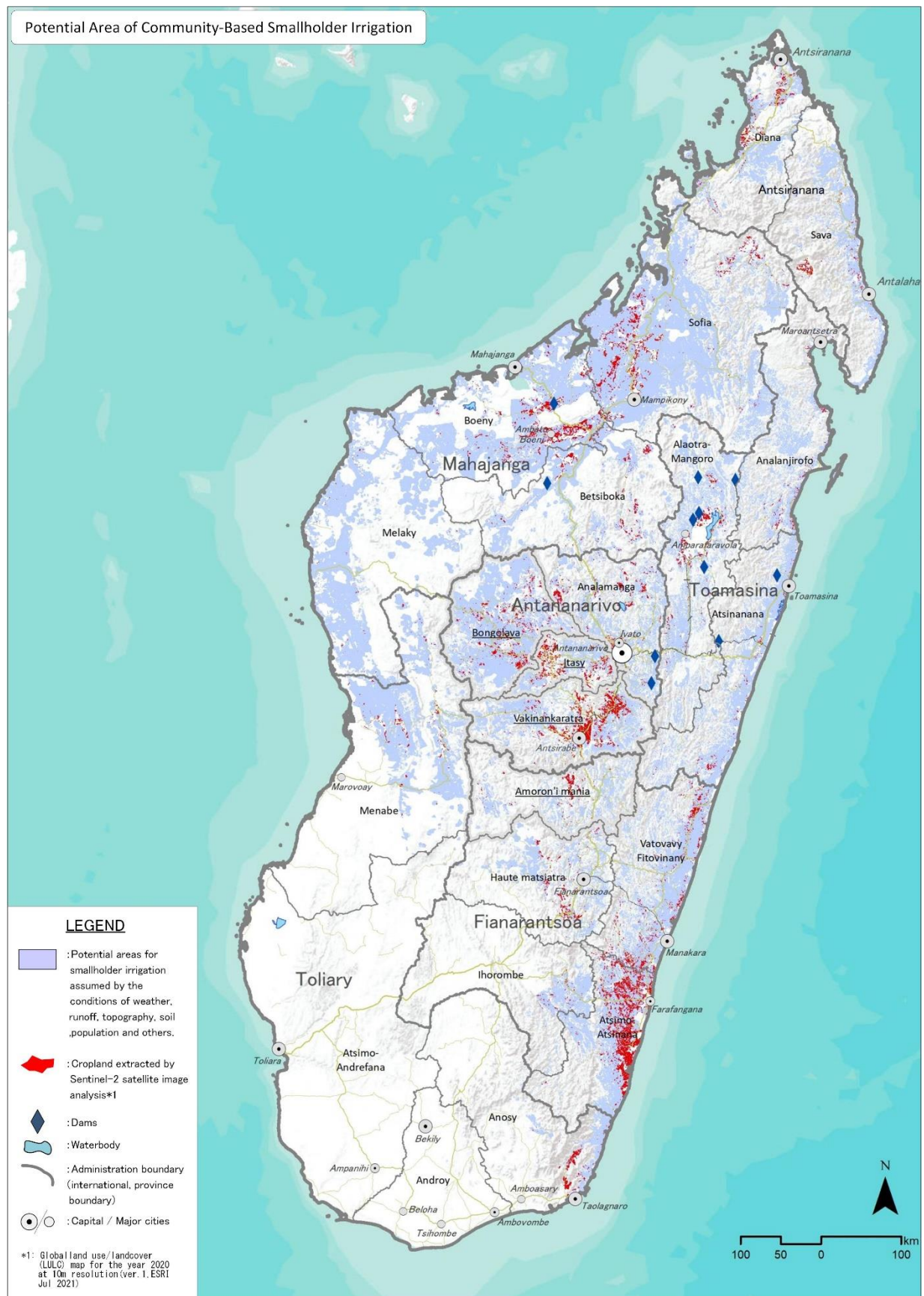


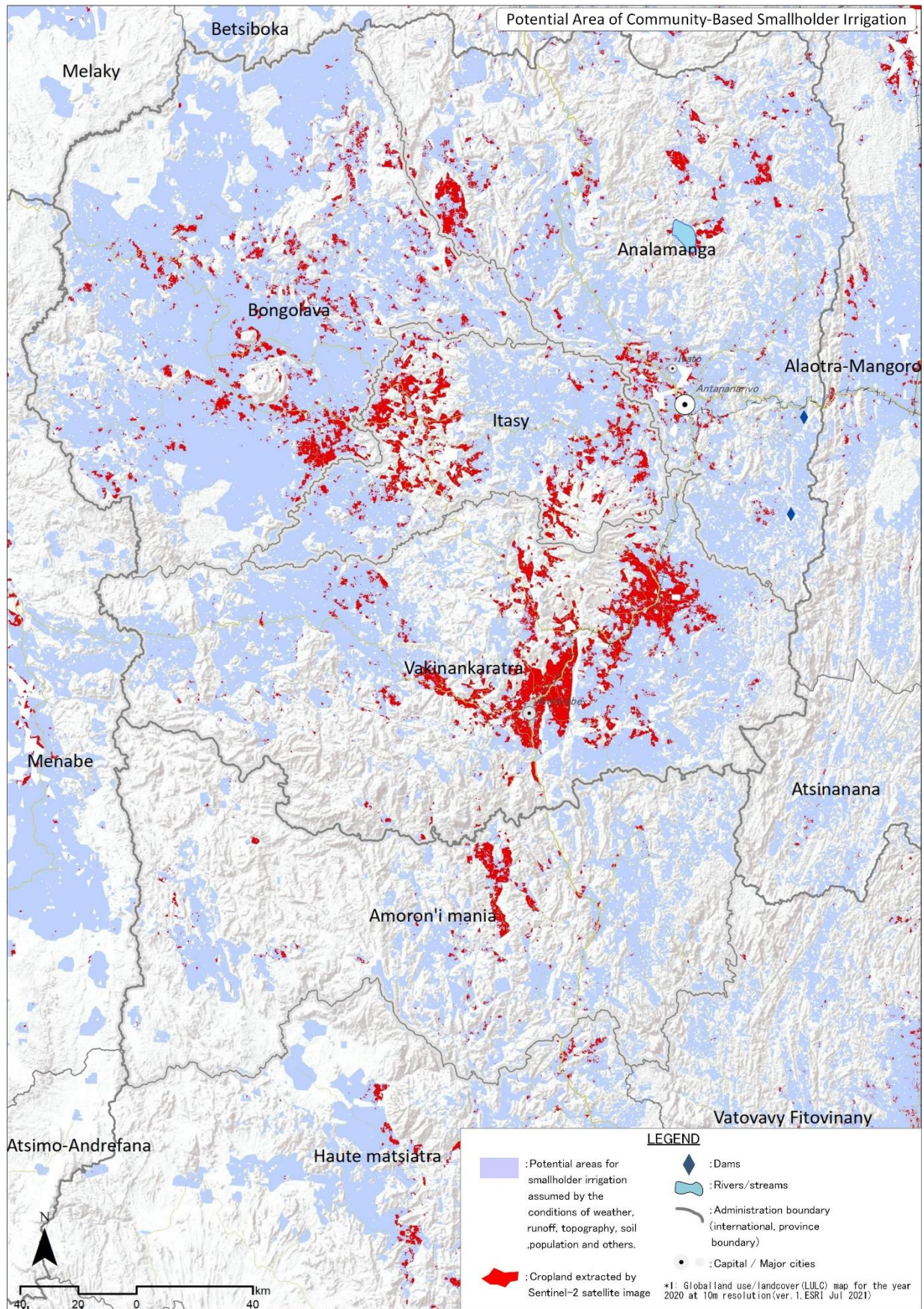




1.6 Madagascar

Potential Area of Community-Based Smallholder Irrigation





APPENDIX 2

FIELD SURVEY REPORTS

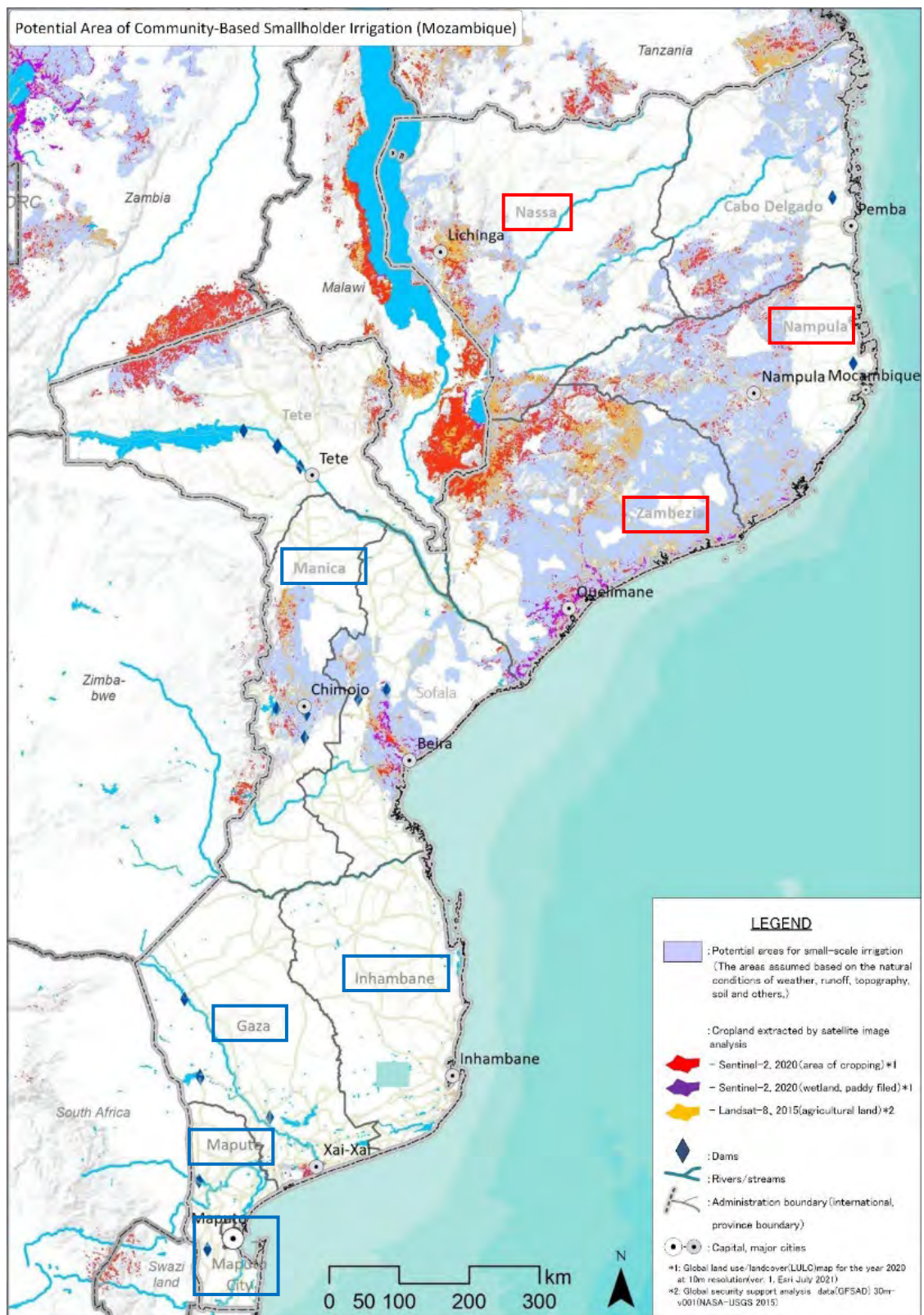
TABLE OF CONTENTS

APPENDIX 2 FIELD SURVEY REPORTS

2.1	Mozambique.....	II-1
2.2	Sierra Leone	II-2
2.3	Cote d'Ivoire	II-3
2.4	Tanzania	II-4
2.5	Madagascar	II-5

2.1 MOZAMBIQUE

Survey Areas in Mozambique



: First Survey Area

: Second Survey Area

Photo Album



[Meeting with INIR Officers]

On 11th October 2021, JICA Mozambique staff and the JICA Survey Team visited the INIR office to collect information related to irrigation in Mozambique.



[Meeting with Provincial/ District Officers in Niassa]

On 14th October 2021, the JICA Survey Team had a discussion with Niassa Province and Lichinga District officials.



[Interview with farmers]

The JICA Survey Team conducted interviews with farmers in two communities in order to get information about existing agricultural practices in Niassa Province.



[Dining scene in the community]

Family members in the community had only boiled cassava for lunch. According to them, they take meals two times a day.



[Namakula Market]

Namakula Market is the biggest market in Lichinga District. Some farmers bring their products to here over a distance of more than 20km away from their farmlands.



[Tomato damaged by pests]

This tomato could not be sold to middlemen due to pest damage. According to farmers, such damage is frequently observed as a result of their inability to apply agricultural chemicals and/or fertilizers because of their high costs.

Niassa Province



[Irrigation Practice, Majune District]

This is a site where farmers practice COBSI-like irrigated farming, constructing their own facilities for gravity irrigation. They have a plan to expand irrigable farming areas by extending the irrigation canal.



[Meeting with Farmers, Majune District]

Farmers are pointing out the challenges of cultivation and marketing like irrigation water, pests and diseases, fertilizers, transportation to markets, etc. The COBSI approach can provide solutions to such difficulties.



[Simple Weir, Muembe District]

A simple weir damaged by the stream current. There should be room to improve such facilities by adapting the COBSI technical package which shows how to construct simple weirs and canals.



[Simple Weir, Muembe District]

Once, local farmers constructed these simple weir and canal. Not much water is running in the canal due to little rainfall in the last season. Nevertheless, this traditional irrigation structure is still in good working condition.



[Reservoir, Mandimba District]

This reservoir was constructed at Lissiete from 2019 to 2020 and implemented by ARA-Norte under the "Programa Agua Para Vida". The originally planned irrigation area was 50ha, when the actual irrigated area is less than 5ha because of intake pipe water leakage.



[Potential Site for COBSI, Ngauma district]

This is a site where farmers used to irrigate by way of a small canal. Currently, only one person is farming here, though there is an association of 10 farmers in the same area. Those farmers are willing to introduce the COBSI approach in this site.

Zambezia Province



[Pump damaged by flood, Nicosadala District]

Because of flooding from Licuar River in 2015, this pump was damaged and has not functioned again ever since. Farmers, who formed an association, have called for support, but it is vain. Before that, the group had collected water users member fee of 10 MZN for maintenance.



[Pump irrigation users' group, Nicosadala District]

That other pump being broken, water users are coping by using a small pump instead. They grow horticulture crops such as onion, cabbage, lettuce, tomato, etc. under irrigation on 2ha (originally 21ha). In the rainy season, rice and maize are cultivated for home consumption.



[A pump irrigation system, Namacurra District]

A pump irrigation system constructed in 2012 to draw water from Nabanya River. At the moment, 53 association members use this system to grow rice for sale. The group collects 100 MZN annually from members to purchase fuel, small spare parts, etc. for the pump.



[Rice fields to be irrigated, Namacurra District]

The pump system currently discharges water into 50ha of rice fields, parts of which cannot be irrigated well enough, pushing the water to drain away through this canal. Some areas are seemingly not leveled, but knowing the exact causes will help take the appropriate countermeasures.



[A potential site for COBSI, Lugela District]

This is a suitable site for introducing the COBSI approach. Although a local farmer grows certified seeds of rice mainly in the rainy season, there are no farming activities during the dry season. COBSI can introduce dry-season cash crop cultivation through effective use of existing stream water.



[Facilities construction put on hold, Lugela District]

Irrigation facilities construction put on hold for many years. Since the infrastructure is built on a relatively steep slope, it is desirable to resume construction as soon as possible following a certain level of engineering, in anticipation of potential flood damage.

Nampula Province



[A Potential Site for COSBI, Mucuburi District]

There is a simple weir irrigation site along the Caparuane River where vegetables are cultivated in the dry season. The river is running with enough discharge for COBSI irrigation farming. The areas along the said river seem to be a potential zone for COBSI activities.



[Traditional Can Irrigation, Mucuburi District]

Farmers who do not have irrigation facilities practice a traditional way of dry-season irrigation involving taking water out of a shallow well using a can—exhausting labor which limits irrigation coverage. The COBSI approach can ease farmers off such a burden with simple facilities.



[A Pump Irrigation Site, Mucumbi District]

Pump irrigation is practiced in areas where the river size is beyond the capacity of COBSI facilities. Considering the pump's operation costs, crops to be cultivated need to be selected based on market demand information. COBSI incorporates market-oriented irrigation farming.



[SUSTENTA Work in The Fields, Mucuburi District]

A "PACE" farmer of the SUSTENTA program. He leads 200 small-scale farmers with the aim of turning them into commercial-size producers through provision of agricultural inputs and equipment. He himself expands his agribusiness according to a concept of the Program.



[A Potential Site for COBSI, Ribaue District]

Here is a simple weir made of sandbags around which vegetables are cultivated using a pump. Although there are many farmers along the Muconona River, irrigation farming is not as active and water resources are not as efficiently used in the area.



[A Pump Irrigation Site, Ribaue District]

This site has a reservoir built in 1972 and four mobile pumps used to irrigate 10ha of vegetable cultivation by 11 farmers organized in an association. They operate and maintain the pump irrigation facilities very well and can enjoy furrow irrigation after pumping the water up.

Pilot Project: Simple weir and canal construction (Ntiwile site, Lichinga District)



[Simple weir construction]

COBSI has prepared 4 types of simple weir structure adaptable to the characteristics of streams where the weir is planned to be constructed. For the pilot project site, farmers selected the "Double-line type" whose construction was completed in 4 hours by 30 participants.



[Earthen canal construction]

After aligning with a simple device, participants from both sides of farmers and officers started digging the earthen canal while blocking the stream water. Despite the fact that digging the clayey soil was heavy, the participants worked hard and eventually reached the irrigation field.



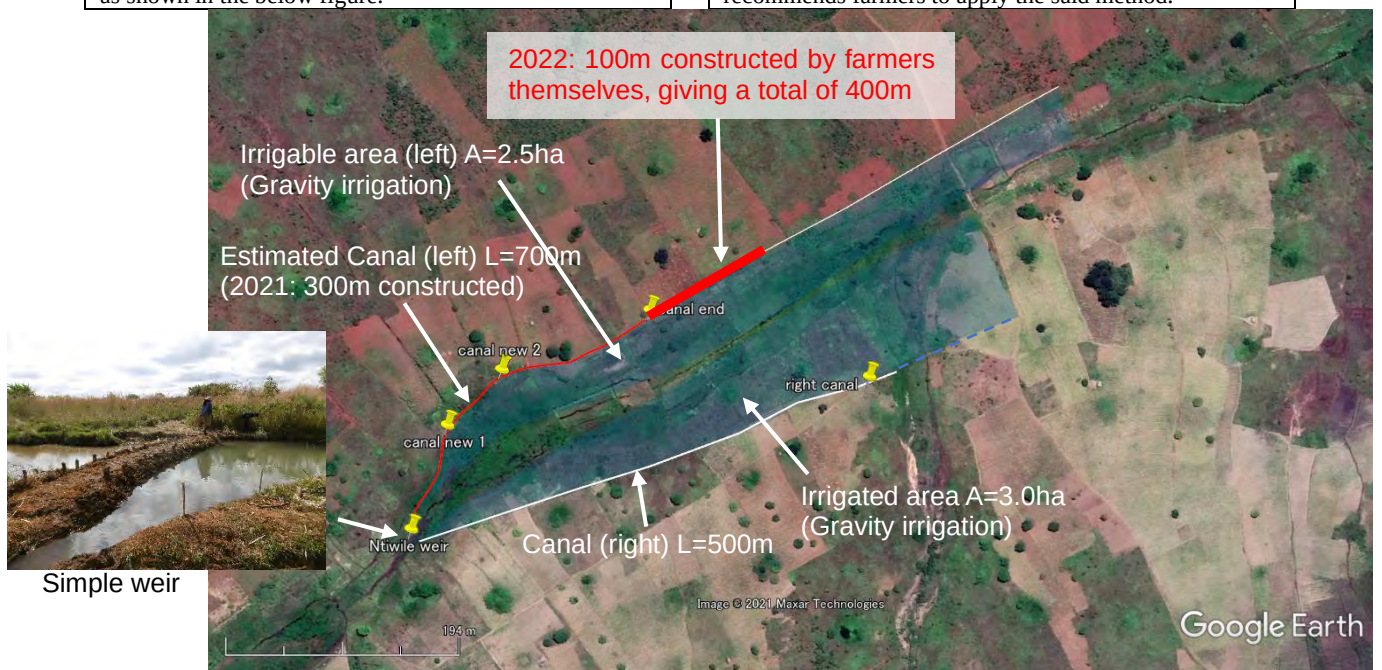
[Stream water just entering the irrigation canal]

Stream water blocked by a simple weir started running in the canal. Although the end of the dry season was approaching, there was enough water to irrigate farming on a couple of hectares. 2.5 ha is expected to be irrigated as shown in the below figure.



[Demonstration of gravity irrigation]

The pilot project demonstrating gravity irrigation methods to farmers still practicing "can irrigation". Gravity irrigation can expand irrigation coverage and reduce manual irrigation labor force. COBSI basically recommends farmers to apply the said method.



Pilot Project: Simple weir and canal construction (Calange site, Lichinga District)



[Simple weir construction]

COBSI is a unique program for community-based irrigation development targeting small-scale farmers and using only locally available materials such as grass, twigs, soil, etc. which they can collect in their localities to construct simple entry point weirs.



[Simple weir construction -Soil passing relay-]

During construction of a simple weir, soil is put on a grass wall to block the stream water more effectively. This is an important process of the works, as a lot of soil is needed. This photo shows participants in the pilot project passing clods of earth in relays over to the weir construction site.



[Canal alignment]

COBSI introduces a simple device, a spirit level, for proper canal alignment. Here, an officer is instructing her fellows the right alignment for the canal while reading that small tool. After a few hours, the participants saw a much nicer alignment from the intake to the irrigated fields.



[Construction of an earthen canal]

Actual digging work started. The work can be done with tools like hoes and pangas which are commonly used in farming. COBSI applies "simple, low-cost, and turnkey farming irrigation techniques", which means that farmers do not have to wait for outside support.

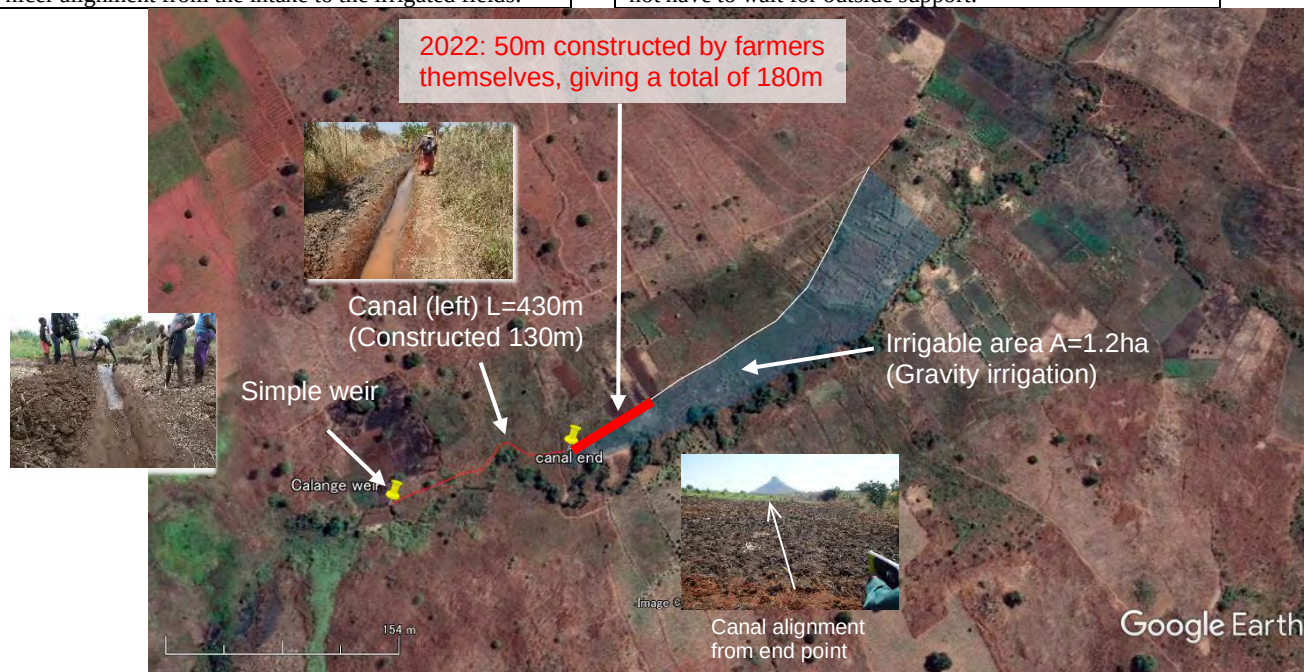


Photo Album [2nd Survey]



Irrigation Farming in Peri-Urban Areas, Maputo City (18/Oct/2022)

Farmers in peri-urban areas irrigate with river water using small pumps. However, the fuel consumption of such pumps tends to be high due to frequent irrigation. There is still room to increase income by knowing appropriate irrigation methods which help reduce pump operation costs.



Site with a similar concept to COBSI, Vanduzi District, Manica Province (19/Oct/2022)

Visited sites already use a concept similar to COBSI, as they are equipped with simple weirs and canals. On such sites, the COBSI approach can be used to introduce to farmers techniques for upgrading simple weirs to permanent ones, while—at the same time—training them on irrigation facilities maintenance and proper water management.



Introduction of COBSI, Manica Province DPAP (20/Oct/2022)

The survey team explaining the COBSI approach, particularly its advantages, to officers during a courtesy visit to DPAP in Manica. The officers stated that there were potential sites for COBSI activities in the province. The team could, afterwards, confirm through field surveys such high possibilities for COBSI.



Traditional Irrigation Scheme, Macate District, Manica Province (20/Oct/2022)

Farmers constructed this simple stone weir and related canals to irrigate a farmland of 1 ha, and they function well even today. Those irrigation facilities have been maintained by 29 farmers as a part of group work. This can be a good example for expanding the COBSI approach to other potential sites.



Bucket Irrigation in the Locality, Massinga District, Inhambane Province (20/Oct/2022)

Watering can/Bucket irrigation is one of the most challenging irrigation methods. Such manual irrigation is labor-intensive and covers only a limited area. Gravity irrigation, which COBSI introduces, can relieve farmers of such a burden and shorten time spent irrigating.



Potential Stream for COBSI, Morrumbene District, Inhambane Province (20/Oct/2022)

Chikwani is a perennial stream and a potential water source for the COBSI approach in the district. The stream water is used by farmers to irrigate vegetables grown along the banks in the dry season. Production and productivity in the area can be boosted through COBSI.



Presentation made by an INIR Officer, DPAP Xai-Xai, Gaza Province (26/Oct/2022)

Mr. Euclides Tiago Mazive, INIR Agronomist (center in the photo), making a presentation to inspire Gaza DPAP officers with COBSI. The officers showed interest in the approach and joined in the survey team to seek potential places for introducing COBSI in the province.



A Potential Site, Homoine District, Inhambane Province (21/Oct/2022)

The stream—utilizable for vegetable cultivation using COBSI technologies—was still flowing even during the driest period of the year. COBSI supports small-scale farmers' livelihood improvement through the creation of opportunities to consume and sell produce grown in the dry season.



COBSI and Environment Conservation, Morrumbene District, Inhambane Province (20/Oct/2022)

This slope has been eroded away due to shrubs and grass overharvesting, silting up the irrigation canal running at its bottom. COBSI also provides farmers with environmentally friendlier techniques through the use of locally available materials to construct simple irrigation facilities.



An Ideal Site for COBSI, Chongoene District, Gaza Province (26/Oct/2022)

Farmers at this site, which has a stream that never dries up, can enjoy all-year-round irrigated and rainfed cultivation. The places visited are perfect for COBSI, particularly their topographical features where the water-to-field elevation is fairly low, as the photo shows.



A Constraint on Irrigation Farming, Maputo and Matola City border (31/Oct/2022)

The Mulahuze river can be considered as a potential water source for COBSI. However, the social impacts of the introduction of related irrigation facilities should be assessed prior to its implementation, as numerous small-scale farmers have been using the said river water for many years.



Reporting and Discussion with INIR HQ Officers, Maputo, (3/11/2022)

Dr. Sagawa (center in the photo) reporting field activity findings to INIR HQ officers who questioned some points such as evaluation criteria for provinces or the situation of sites the team visited. The participants in the meeting, then, agreed to the cooperation plans Dr. Sagawa proposed.

Survey Areas in Mozambique
Photo Album

Contents

2.1.1	Outline of the Field Survey.....	II-1-1
2.1.2	Development Plans and Legal Frameworks Related to the COBSI Approach.....	II-1-2
2.1.3	Survey Results (Current Situation/Identified Issues).....	II-1-5
2.1.4	Pilot Projects in COBSI Candidate Sites.....	II-1-11
2.1.5	Proposal for the Further Cooperation and Support.....	II-1-13

List of Tables

Table 1	Visited Organizations for Information Collection (Mozambique).....	II-1-1
Table 2	Laws and Regulations Related to Environmental and Social Considerations in Mozambique	II-1-3
Table 3	An Example of Cropping Pattern	II-1-9

List of Figures

Figure 1	Small-Scale Irrigation Potential Distribution in Mozambique.....	II-1-2
Figure 2	Categorization Procedure of Planned Projects.....	II-1-5
Figure 3	A Simple Weir Irrigation Site (Manica Province).....	II-1-6
Figure 4	Sourcing Irrigation Water from Pump Discharge Tank (Maputo City).....	II-1-6
Figure 5	Organization Chart of Niassa Province.....	II-1-7
Figure 6	Agricultural Extension System in Lichinga District	II-1-7
Figure 7	Relationship among District, Locality and Povoado.....	II-1-8
Figure 8	Production Area (ha) by Crop in Mozambique.....	II-1-9
Figure 9	Discussions Between Officials, Visitors, and Zambian Farmers	II-1-11
Figure 10	Photo and Location Map of a Simple Weir and Earthen Canals Constructed Through the Pilot Project (Ntiwile Site)	II-1-12
Figure 11	Photo and Location Map of a Simple Weir and Earthen Canals Constructed Through the Pilot Project (Calange Site)	II-1-12
Figure 12	Concept for COBSI Approach in Mozambique (Draft)	II-1-14

List of Figures

List of Abbreviation

CEO	Camp Extension Officer
CN	Concept Note
COBSI	Community-based Smallholder Irrigation Development
CSA	Agricultural Service Center
DAE	Direct Access Entity
DBZ	Development Bank of Zambia
CEO	Camp Extension Officer
DACO	District Agriculture Coordinator
DNAAF	National Directorate for Farming Family Assistant
DNDAF	National Directorate for Development of Family Agriculture
DPA	Provincial Department of Agriculture
DPAP	Provincial Directorate of Agriculture and Fisheries
DPEA	Provincial Department of Agricultural Extension
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPDA	Pre-viability and Definition of Scope Study
ESIA	Environmental and Social Impact Assessment
IIAM	Mozambique Institute of Agricultural Research
INIR	National Irrigation Institute
MADER	Ministry of Agriculture and Rural Development
MENU	Multisectoral Enhancement for Nutrition Upgrading
MOLE	Ministry of Land and Environment
MOPHRH	Ministry of Public Works, Housing, and Water Resources
NDWRM	National Directorate of Water Resources Management, ARA-Norte
PACO	Provincial Agriculture Coordinator
PAO	Provincial Agriculture Officer
PEDSAII	Strategic Plan for the Agricultural Sector Phase 2
PNI	Programa Nacional de Irrigação
ProAPA	Project for Improvement of Rice Production in Zambezia Province
RPSAN	Provincial Division of Food and Nutritional Security
SAO	Senior Agriculture Officer
SER	Simplified Environmental Report
SETSAN	Technical Secretariat for Food Security and Nutrition
SDAE	District Services for Economic Activities
SIE	Senior Irrigation Engineer
SPAE	Provincial Services for Economic Activities
SUSTENTA	Additional Financing to the Agriculture and Natural Resources Landscapes Management Project
TAC	The Technical Assessment Committee
TSB	Technical Service Branch

2.1.1 Outline of the Field Survey

(1) Survey Outline

Two (2) field surveys were conducted in Mozambique, the first from October 10 to November 7, 2021 in three (3) provinces—Niassa, Zambezia, and Nampula—in the North and the second from October 15 to November 5, 2022 in four (4) other provinces—Manica, Inhambane, Gaza, and Maputo—and in two (2) cities, Maputo and Matola, in the central and southern areas. Field surveys were, thus, carried out in a total of seven (7) provinces and 2 cities. They included surveys of natural conditions such as hydrology and topography, conditions of existing irrigation sites (including facilities), of farmlands and farming, and of markets alongside interviews with farmers. During the first field survey, a simple weir and an earthen canal were constructed at 2 COBSI potential sites as a pilot project.

Visited organizations for information collection in Mozambique are listed in Table 1 below.

Table 1 Visited Organizations for Information Collection (Mozambique)

Categories	Visited Organizations
Mozambican Government	✓ National Irrigation Institute (INIR) ✓ Ministry of Agriculture and Rural Development (MADER) - National Directorate for Development of Family Agriculture (DNDAF) - National Directorate for Farming Family Assistant (DNAAF) - Technical Secretariat for Food Security and Nutrition (SETSAN) ✓ Mozambique Institute of Agricultural Research (IIAM) ✓ Ministry of Public Works, Housing, and Water Resources (MOPHRH) - National Directorate of Water Resources Management (NDWRM) ✓ Ministry of Land and Environment (MOLE) ✓ Provincial Directorate of Agriculture and Fisheries (DPAP) - Provincial Department of Agriculture (DPA) - Provincial Department of Agricultural Extension (DPEA) - Provincial Division of Food and Nutritional Security (RPSAN) ✓ Provincial Services for Economic Activities (SPAЕ) ✓ District Services for Economic Activities (SDAE)
Other	✓ Project for Improvement of Rice Production in Zambezia Province (ProAPA) ✓ Multisectoral Enhancement for Nutrition Upgrading (MENU) Local consultants

Source: JICA Survey Team

(2) Potential Areas for Small-Scale Irrigation

Based on the results of detailed satellite image analysis, the distribution of small-scale irrigation potential in Mozambique is shown in Figure 1 (indicated in purple). In the northern and central areas, annual precipitation is more than 1,000 mm and the topography is mountainous and hilly except in some coastal zones. Those areas were identified as having high potential for small-scale irrigation development based on surface runoff, soil types, and surrounding populations and land use. The southern

area, on the other hand, is indicated as having low potential because its annual rainfall is below 1,000 mm.

In this Figure, red boxes highlight the 3 provinces where the first field survey was conducted and the blue ones the 4 other ones and 2 cities which were subsequently surveyed.

2.1.2 Development Plans and Legal Frameworks Related to the COBSI Approach

(1) Strategic Plan for the Development of the Agrarian Sector II (PEDSA 2021-2030)

Published by the Ministry of Agriculture and Rural Development in August 2021, the draft “*Plano Estratégico Para o Desenvolvimento do Sector Agrário – PEDSA II*” (Portuguese for “Strategic Plan for the Development of the Agrarian Sector II”) aims to achieve the following:

- Shift from subsistence to commercial agriculture through modernization of agricultural production and markets;
- Inclusion of producers in the primary production – processing – retail value chain;
- Creation of more job opportunities in the agricultural sector;
- Addressing changing demand for higher quality food.

Current main challenges in Mozambique are poverty reduction, achieving food and nutrition security, strengthening agricultural competitiveness, and sustainable natural resources management. Most Mozambicans make a living from agriculture, though still conducting subsistence and traditional farming with low productivity besides low investment in modern technology that has resulted in low competitiveness. In that regard, the Government of Mozambique has started introducing modern agricultural infrastructures, including irrigation systems and farm machinery, while subsidizing inputs such as seeds, fertilizers, and pesticides. Still, the agricultural sector has yet to be sufficiently developed.

PEDSA II is essential in achieving food and nutrition security, increasing job opportunities and disaster resilience, and reducing poverty, and is based on strategies related to the following eight directions:

- 1) Agricultural productivity and competitiveness;
- 2) Agricultural markets;
- 3) Agricultural infrastructures;
- 4) Food and nutrition security;
- 5) Natural resources;
- 6) Agricultural institutions;
- 7) Gender equality and youth participation, and

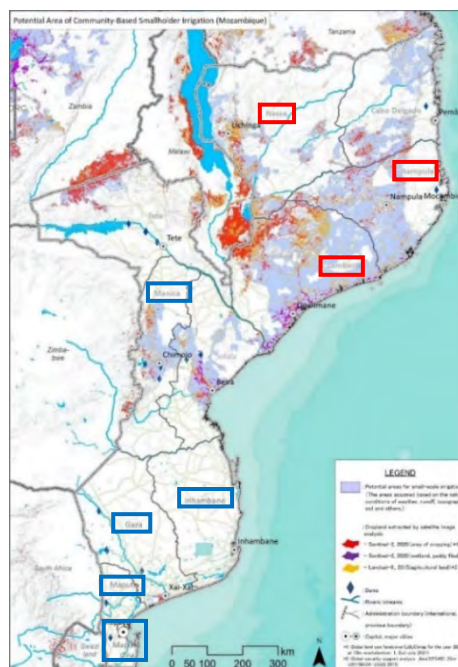


Figure 1 Small-Scale Irrigation Potential Distribution in Mozambique

Source: JICA Survey Team

8) Climate change and natural disasters.

Activities based on the above-mentioned directions will contribute to the growth of the agricultural sector through participation of the private sector. It is expected that PEDSA II will increase job opportunities for farmers, especially for the youth (target: 30%) and reduce chronic malnutrition (target: 40-35%) and poverty (target: 40%). It is estimated that the Gross Domestic Product (GDP) per capita in the agricultural sector will rise by more than 6% thanks to income increase in the sector.

(2) National Irrigation Plan ("Programa Nacional de Irrigação – PNI") (2016)

Mozambique's National Irrigation Plan was approved by Resolution No. 43 (2016). It aims to establish irrigation development guidelines, legal and technical standards, and respective plans and financing mechanisms—specifically to establish the means for irrigation development and a framework for irrigation development and investment for river basins and agricultural development, and to ensure sustainable expansion of irrigated agriculture and socio-economic development in Mozambique. Those goals are expected to be achieved—concretely—through a) prioritization of areas with high potential for irrigation development; b) mapping and identification of existing irrigation infrastructures; c) identification of water availability in river basins and water demand assessment; d) irrigation planning based on sustainable use, and e) identification of needs to improve the organizational capacity of the National Irrigation Institute.

(3) Legal Frameworks on Environmental and Social Considerations

Laws and regulations related to environmental and social considerations in Mozambique are described in the following table. Out of them, the ones related to Environmental and Social Impact Assessment (EIA), resettlement, and land acquisition are specifically described hereinafter:

Table 2 Laws and Regulations Related to Environmental and Social Considerations in Mozambique

Document Level	Name of Legal Document	Validity
Policy	National Environmental Policy (No. 5, 1995)	Valid
Law	Environment Law (Law No. 20, 1997)	Valid
	Land Law (Law No. 19, 1997)	Valid (Under Revision)
	Forestry and Wildlife Act (Law No. 10, 1999)	Valid (Under Revision)
	The Conservation Law (Law No. 16, 2014)	Valid
	Law on the Protection of Cultural Heritage (Law No.10, 1988)	Valid
Regulations and Guidelines	Environmental Impact Assessment Regulation (Decree No.54, 2015)	Valid
	Regulations on the Process for the Environmental Audit (Decree No. 25, 2011)	Valid (Under Revision)
	Guidelines on the Environmental Impact Assessment (Ministerial Order No. 129, 2006)	Valid
	Guidelines for Public Participation in the EIA Process (Ministerial Order No. 130, 2006)	Valid
	Regulation on the Environmental Inspection (Decree No. 11, 2006)	Valid
	Regulation on Environmental Quality and Effluents' Emissions (Decree No.18, 2004 amended by Decree No. 67, 2010)	Valid (Under Revision)
	Regulation on Hazardous Waste Management (Decree No. 83, 2014)	Valid
	Regulation on the Forestry and Wildlife (Decree No. 12, 2002)	Valid
	Regulations for the Resettlement Process Resulting from Economic Activities (Decree No. 31, 2012)	Valid

Note: The JICA Survey Team listed up related documents of legal frameworks about the EIA Procedure by referring to "Report on Preparatory Survey Report on the Project for Construction of Bridges on N380 in Cabo Delgado Province (Phase-2)" (JICA, 2019)

1) Law No. 20 (1997): Environment Law

The Environment Law is applied to all development activities, including public and private projects, and aims for sustainable use and management of natural resources. A project, which could cause negative impacts on the environment, should prepare an EIA report and gain approval by the Ministry of Land and Environment. In this Law, Article 8 stipulates the necessity of participation of all concerned stakeholders for proper natural resources management, while Article 9 describes prohibited activities which can cause pollution to air, water, and soil. Furthermore, overall environmental and natural resources management in Mozambique are regulated by this Law, including pollutants storage and sustainable resources use.

2) Guidelines on the Environmental Impact Assessment (Ministerial Order No. 129, 2006)

These Guidelines on the EIA process covers the following basic environmental management principles:

- Necessity of environmental management to improve people's quality of life and conserve biodiversity;
- Assessment and recognition of the traditional knowledges of local communities;
- Potential environmental pollutions prevention systems;
- Importance of resident participation;
- Polluter-Pays Principle, and
- Importance of international cooperation on environmental management.

3) Land Law (Law No.19, 1997)

Article 3 of this Law states the principle that lands belong to the State but that people can occupy or use them based on the land-use rights and benefits enumerated therein. Such rights and benefits can, however, be terminated due to land acquisition for public interest after payment of appropriate compensation to current land users, as stipulated by Article 18.

Article 7, on the other hand, defines nature reserves—including national parks—as “Total Protection Zones” or fully protected areas. Proponents are required to apply for special permissions/licenses to the Cadastre Services for construction projects within such areas.

4) Regulations for the Resettlement Process Resulting from Economic Activities (Decree No. 31, 2012)

The Regulations describe the principles of resettlement procedures for public and private projects, noting that resettlement due to any project should not degrade income levels of the affected persons, and should ensure social equity—through promotion of public participation—to achieve accountability. They also mention that compensation and restoration of livelihoods are necessary if resettlement is not avoidable. However, there is no detailed and specific description of the related application procedures.

5) Environmental Impact Assessment Regulation (Decree No.54, 2015)

Current EIA Regulation, amending a previous one (Decree No. 45, 2004), stipulates the EIA approval process. It consists of five chapters, thirty articles, and eight supplementary provisions, applicable to all public and private projects. The EIA process under this Regulation is summarized as follows:

a) Project Registration: A project proponent applies for screening to the Provincial Land and

Environment Department.

b) **Screening:** The Ministry of Land and Environment (MOLE) inspects the proposed project site and classifies the project into categories A, B, and C based on the magnitude of expected impacts. Category A necessitates preparation of a scoping report (Pre-viability and Definition of Scope Study: EPDA), TORs, and an EIA report; category B TORs and a Simplified Environmental Report (SER), while category C—for projects having little, no, or a positive impact on the environment—does not require any specific documents.

c) **Review:** The EPDA, EIA TORs, SER TORs, EIA Reports, SERs, and other documents are reviewed by the Technical Assessment Committee (TAC) within MOLE. If approved by TAC, the project can proceed to the next step.

d) **Environmental License:** Category A Licenses are issued by MOLE at national level and by MOLE provincial offices for Category B.

e) **Monitoring:** The project proponent shall follow the proposed environmental monitoring plan.

f) **Public Participation:** For Category A and Category B projects, appropriate public participation is required at the scoping and the draft EIA report preparation stages.

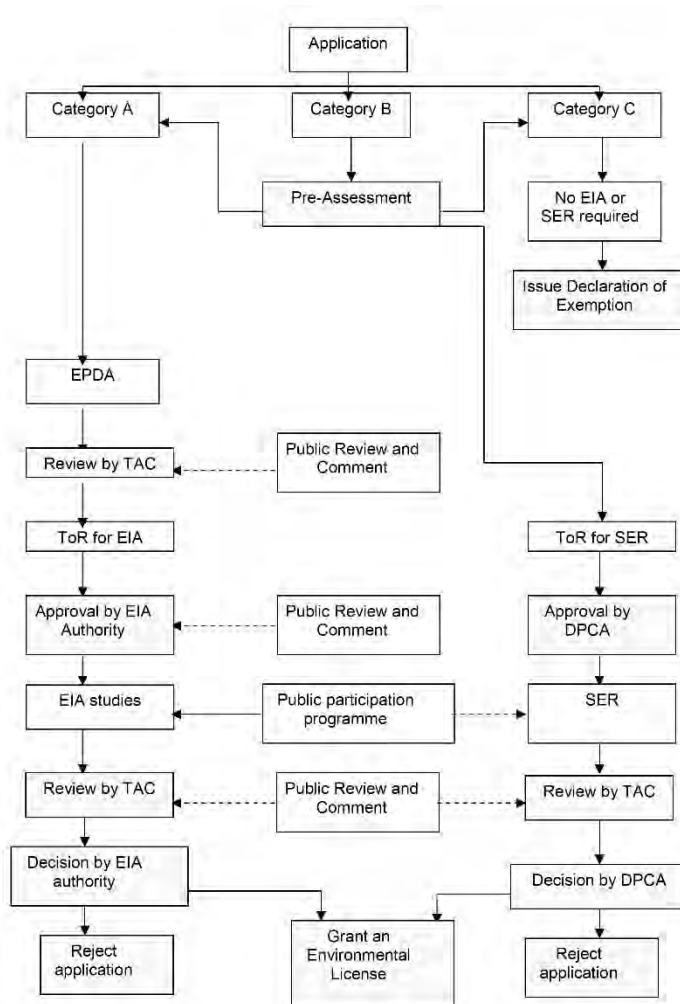


Figure 2 Categorization Procedure of Planned Projects

Source: JICA, Final Report of the Project for Construction of Bridges on N380 in Cabo Delgado Province in Mozambique, 2019

2.1.3 Survey Results (Current Situation/Identified Issues)

(1) Irrigation, Water Management and Maintenance

The National Irrigation Institute (“*Instituto Nacional de Irrigação – INIR*”) is mainly responsible for irrigation administration in Mozambique. The country’s irrigable potential areas are estimated at about 3.1 million hectares (ha) out of which about 120,000 ha (roughly 4% of the total) have been developed so far, leaving high enough future potential for irrigation development.

Although the northern and central parts are considered to be more suitable for irrigation, there is also high demand in the south, though adequate terrain and land for irrigation development are limited. The situation in each province is as follows:

1) Manica and Niassa Provinces

These areas receive more than 1,000 mm of annual precipitation and have relatively high river flows. There are already many simple weir irrigation sites (traditional weirs and earthen canals) similar to COBSI in use in the area, especially in Manica where mountainous and hilly terrain is dominant and perennial streams are numerous. It is, therefore, possible to start COBSI activities right from permanent weir upgrade (cf. Figure 3).

2) Nampula, Zambezia and Inhambane Provinces

There are vast low-lying coastal areas where irrigated agriculture is practiced using small- to medium-scale pumping facilities. Inhambane Province has inland hills and perennial streams but also many sites where irrigated farming can be started by constructing simple weirs upstream low marshy areas and placing earthen canals along their outside edges.

3) Gaza Province

This province has annual precipitation of about 500 mm to 800 mm and relatively flat terrain not suitable for COBSI development. In spite of that, it has several streams flowing from springs and some sites where COBSI could be applied. In the river floodplain, the drainage system is facing problems, and many farmlands are abandoned because drainage facilities constructed in the 1970s are no longer functional; canals are submerged and are unusable during the rainy season even in areas where watercourses have been built.

4) Maputo Province, Maputo and Matola Cities

The field survey sites were flat like the ones visited in Gaza Province, though adaptable streams are more limited. It is, therefore, difficult to introduce gravity irrigation, which is COBSI's goal, because of such topographical conditions. As a result, peri-urban irrigated horticulture using pumping facilities on small- and medium-sized rivers is widely practiced in Maputo Province, Maputo City and Matola City.

In terms of infrastructure, INIR has constructed permanent irrigation facilities such as concrete weirs and reservoirs. Since these facilities are constructed by local contractors, construction costs are high and maintenance is technically sophisticated and economically expensive. As a result, there are irrigation sites where facilities have deteriorated due to a lack of technical support and funding. Set against that, COBSI permanent weirs boast the advantage of being built by farmers using mortar and stone which are less costly and easier to maintain—a method considered acceptable to INIR and local farmers' groups.

(2) Extension Activities and Farmers' Groups

In Mozambique, each Province has an Agricultural Department and an Agricultural Extension



**Figure 3 A Simple Weir Irrigation Site
(Manica Province)**

Source: JICA Survey Team
(October 2022)



**Figure 4 Sourcing Irrigation Water from
Pump Discharge Tank (Maputo City)**

Source: JICA Survey Team
(October 2022)

Department, the latter being responsible for extension activities, as seen—for example—in the Niassa Province organizational chart below.

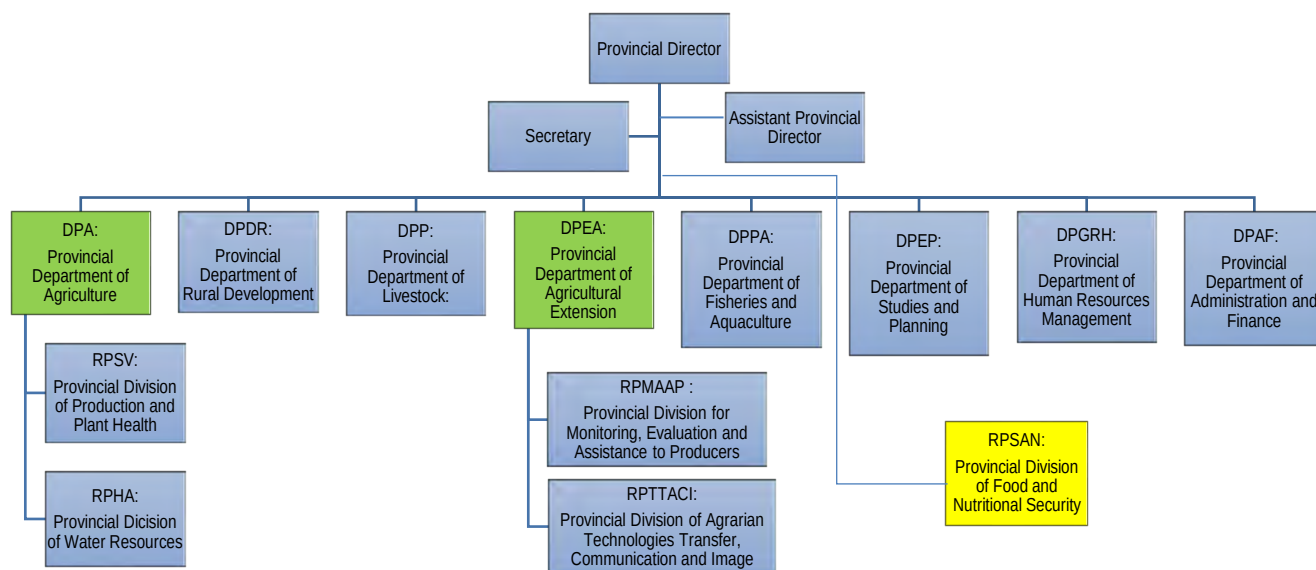


Figure 5 Organization Chart of Niassa Province

Source: JICA Survey Team

A Province is composed of several Districts where agricultural extension personnel are also assigned. In total, 29 staff are assigned to the Agriculture Department of Lichinga District in Niassa Province, consisting of 1 Director, 1 Supervisor, 1 Agricultural Specialist, 3 Coordinators, and 24 agricultural extension workers (Extensionists) as illustrated in following figure:

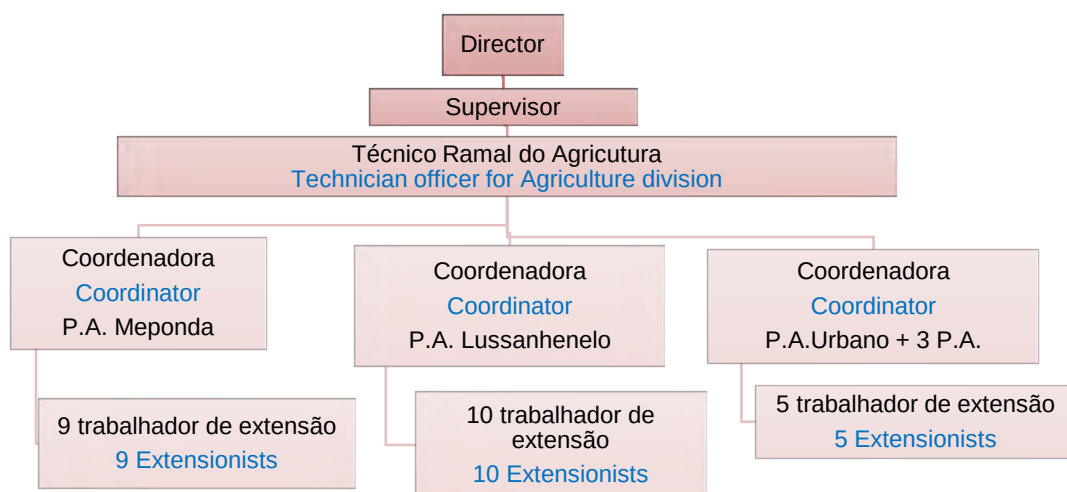


Figure 6 Agricultural Extension System in Lichinga District

Note: P.A. stands for “*Posto Administrativo*” (Portuguese for Administrative Post)

Source: Prepared by the JICA Survey Team based on information provided by Niassa Provincial Office

Under the District, the smallest administrative unit—called Locality—is where the Administrative Post is located. In case of Lichinga District, there are six Administrative Posts for six Localities. Moreover, each Locality consists of several villages called as “Povoado”. Generally, extension workers go to their Povoados to conduct extension activities, and one extension worker is in charge of one or two Povoados. The structures of local administration are shown below:

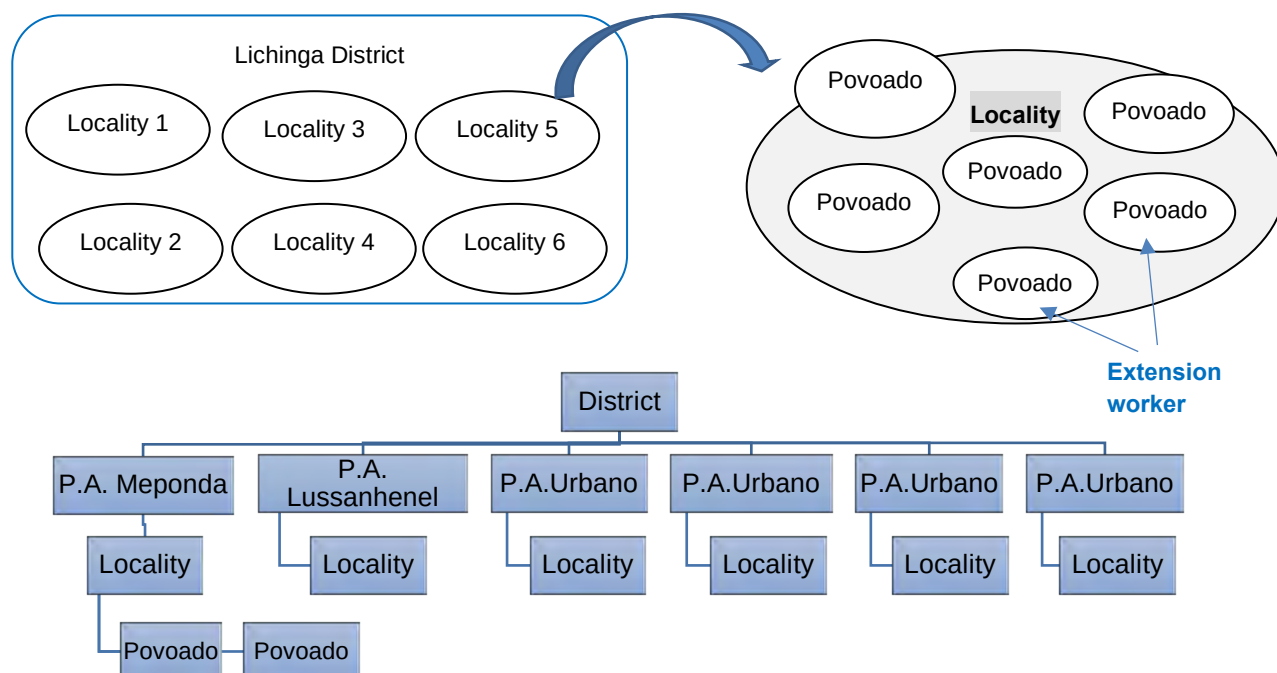


Figure 7 Relationship among District, Locality and Povoado

Source: Prepared by the JICA Team based on hearing to Niassa Provincial Office

The duties of agricultural extensionists are as follows:

- Extension of agricultural techniques to improve agricultural productivity;
- Collection of information on production and harvest;
- Reporting of the progress of adapted agricultural production techniques;
- Training of farmers on how to store harvested products, and
- Giving guidance to farmers about seed multiplication methods.

(3) Farming and Marketing

Agriculture in Mozambique is mainly covered by small-scale farmers, who account for 99% of all farm households and cultivate 96% of the total farmland, namely 5.6 million ha. The majority of farmers practice subsistence agriculture through rainfed farming on small plots of 1.35 ha per household on average (International Institute for Environment and Development, 2016).

The most consumed staple foods in Mozambique are—in order of importance—maize, cassava, and rice. Maize is widely consumed throughout the country, while cassava consumption is limited to the

provinces of Nampula, Zambezia, Cabo Delgado, and Inhambane, and rice concentrated in the southern part of the country, mainly in Maputo, which means that crop cultivation has strong regional characteristics.

Cotton, sugarcane, banana, and cashew nuts have, on the other hand, been grown traditionally as cash crops, added by pigeon peas, soybeans, and sesame intensively and increasingly produced these days in the northern and central regions in response to market demand. Furthermore, vegetables are becoming more and more important in the south, with maize being the most widely grown crop followed by beans and cassava, as of 2020. The following figure shows main crops cultivated in Mozambique:

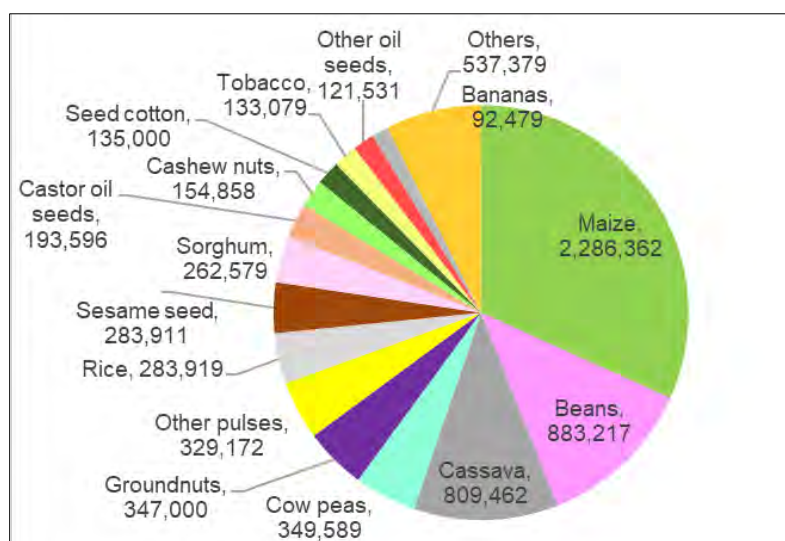


Figure 8 Production Area (ha) by Crop in Mozambique

Source: FAO STAT (Crop plantation area as of 2020)

The JICA Survey Team conducted a pilot project applying the COBSI approach in Lichinga District, Niassa Region. Prior to the project implementation, some farmers were interviewed by the Team in several Localities in the District. The findings based on the interviews are summarized as follows:

During the rainy season, many farmers grow mainly maize, beans, and potatoes. Maize is cultivated not only for sale but also for family consumption. Other crops grown—cassava, sweet potato, rapeseed (leafy greens), lettuce, cabbage, pepper, cucumber, peanut, garlic, and tomato—vary from household to household. Garlic and tomatoes are grown in both the rainy seasons and the dry season when bucket irrigation is practiced. Farmland area per household ranges generally from 2 ha to 10 ha (2 ha to 3 ha in most cases). An example of the cropping system is shown in the following table:

Table 3 An Example of Cropping Pattern

Month	1	2	3	4	5	6	7	8	9	10	11	12
Rainy Season												
Maize					Harvesting						Seeding	
Beans			Seeding			Harvesting						
Irish Potato (1)			Harvesting							Seeding		
Sweet Potato		Seeding				Harvesting						
Other Beans	Seeding					Harvesting						Seeding

Month	1	2	3	4	5	6	7	8	9	10	11	12
Rainy Season												
Irish Potato (2)						Seeding		Harvesting			Seeding	
Rape						Seeding	Harvesting					
Lettuce						Seeding	Harvesting					
Tomato						Seeding	Harvesting					

Remark: The rainy season in Mozambique is generally from November to May and the dry season from June to October.

Source: Farmers interviews, JICA Survey Team

In general, middlemen come to the villages to buy harvested crops, but sometimes farmers go to the Namakula market located about 20 km away. The cultivated crops vary depending on the year and market price conditions. Farmers understand the importance of getting market information to gain more profits, and determine crops to be cultivated in relation to middlemen prices.

Current challenges faced by farmers are diverse, for example low agricultural income, limited transportation means (they either walk or ride bicycles) and long distances/poor road condition to marketplaces, lack of agricultural machinery and equipment such as tractors and irrigation pumps, shortage of agricultural inputs such as fertilizers, insecticides, and fungicides due to their unaffordability or unavailability which is a much bigger issue, and inexistence of farmers' organizations. Nevertheless, access to agricultural technology extension does not seem to be a major problem, as agricultural extension workers often stay in the same villages with farmers.

No farmers' organizations have been established so far, entailing that there is no farmer groups or water users' associations. However, all interviewees expressed interest in and hope for the creation of such groups, as many could see the benefit of exchanging experiences and knowledge to help increase production and joining forces among same-crop growers to have strong bargaining power. They also expect that agricultural extension workers come to their villages more frequently if such organizations are established.

(4) Environmental and Social Considerations

The JICA Survey Team discussed with MOLE officials the category an irrigation project applying the COBSI approach is sorted into. According to them, it is difficult to specify such a category at this moment, since project classification is carried out after visiting the site where the project would be implemented. They, thus, recommended having another meeting with MOLE when any COBSI approach projects are to be actually implemented.

Expected impacts of COBSI approach implementation was also discussed with other governmental organizations such as the “*Direcção Nacional de Desenvolvimento da Agricultura Familiar – DNDAF*” (Portuguese for National Directorate for Development of Family Agriculture) whose personnel cautiously ruled out environmental and/or social impacts such as water conflicts. Moreover, according to the National Directorate of Water Resources Management (NDWRM), there have been no significant water conflicts in Mozambique so far, because there is, in general, enough water in the rainy season; the southern part might, however, experience minor problems with regard to that, especially in the dry

season. It is, thus, difficult to say, at this moment, whether any environmental and social impacts will be caused, so detailed, site-specific surveys are to be conducted before implementing the COBSI approach.

(5) Zambia COBSI Site Visit

The Zambia COBSI site visit by irrigation officials from Mozambique was held on November 24-25, 2022 with the participation of INIR and JICA's Mozambique Office. The visitors consisted of six (6) members: Two (2) from INIR including the Director General, three (3) from JICA's Mozambique Office, and one (1) from JICA's Zambia Office. At each site, they visited—in order—simple then permanent weirs, irrigation canals, and irrigated fields. Farmer representatives from irrigation groups gave brief overviews of the sites, farmers' group activities and farming conditions, then the visitors shared impressions, exchanged opinions, and had discussions with the farmers, extension officers, and the Ministry of Agriculture side (Figure 9). The participants understood



Figure 9 Discussions Between Officials, Visitors, and Zambian Farmers

Source: JICA Survey Team
(November 2022)

that water management and maintenance activities are also important for the sustainability of irrigated farming, and enhancing the capacity of farmers' organizations is key to sustainable expansion of COBSI.

Moreover, the E-COBSI project being implemented in Zambia has recognized the synergistic effects of irrigated agriculture and SHEP, and the project is working on comprehensive capacity building and strengthening, not only in terms of hardware, but also software. The visitors also went to see a fishpond construction site in connection with nutrition improvement. The Zambian side seemed to have gained an understanding of its pioneering position in the COBSI approach.

2.1.4 Pilot Projects in COBSI Candidate Sites

During a first field survey, COBSI pilot projects were implemented at the Ntiwile and Calange sites in Lichinga District, Niassa Province. First, the Survey Team explained the COBSI activities to farmers' groups and identified their willingness to participate in the pilot projects, then simple weirs (double-line type) and earthen canals were constructed at each site. During the construction, concerned officials and agricultural extension officers from Lichinga District and Niassa Province also participated together with farmers' groups, learning on the job how to construct a simple weir and choose an irrigation canal alignment.

At the Ntiwile site, a canal alignment of $L=700$ m was selected on the left bank, besides an earthen canal constructed over 300 m, and involved the use of a spirit level (cf. Figure 10). After that, a demonstration of gravity irrigation was performed to encourage shift from bucket irrigation. As a result, the group of farmers requested to expand the irrigated area, so the Survey Team chose an additional irrigation canal alignment of $L=500$ m on the right bank.

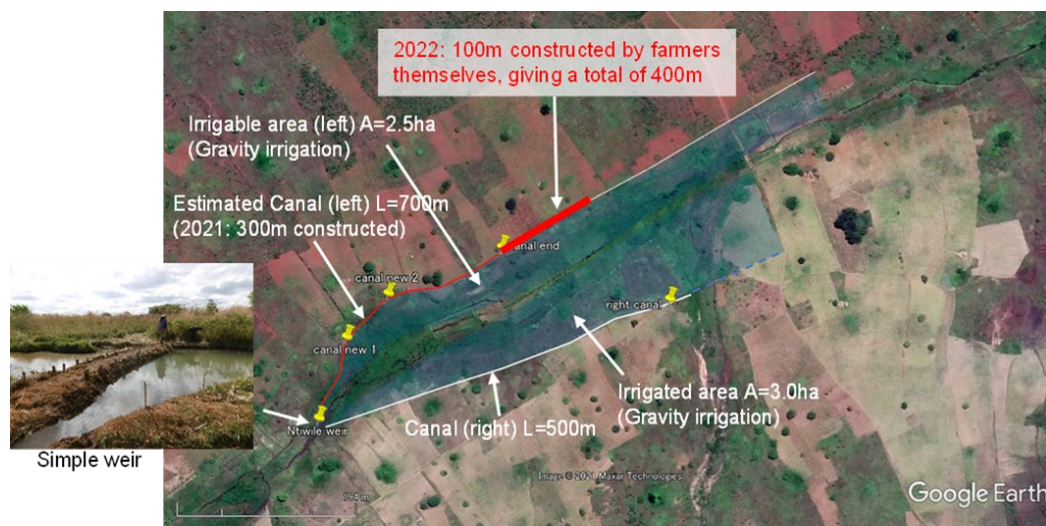


Figure 10 Photo and Location Map of a Simple Weir and Earthen Canals Constructed Through the Pilot Project (Ntiwile Site)

Source: JICA Survey Team

At the Calange site, a canal alignment of $L=430$ m was selected on the left bank, besides an earthen canal stretching over 130 m, also involving the use of a spirit level (cf. Figure 11).

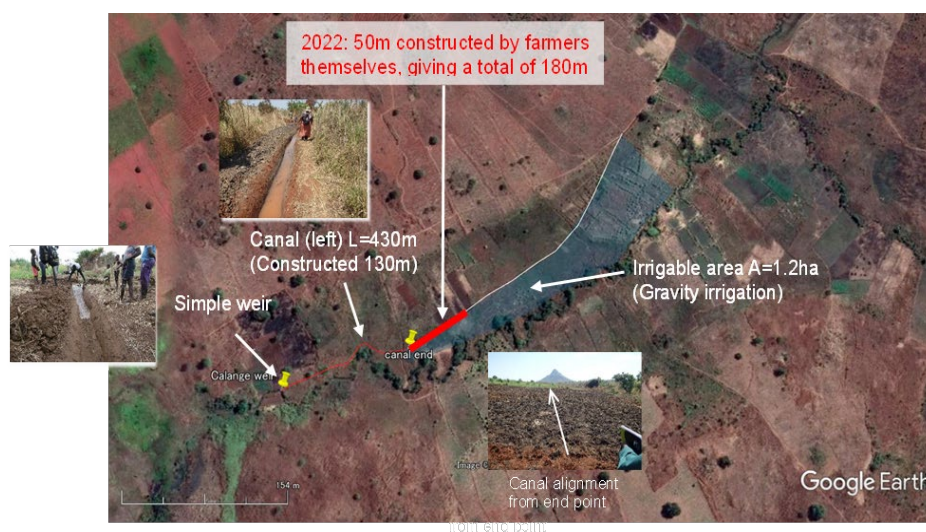


Figure 11 Photo and Location Map of a Simple Weir and Earthen Canals Constructed Through the Pilot Project (Calange Site)

Source: JICA Survey Team

Site conditions were subsequently identified during a second field survey. At both sites, canals have been extended upon the initiative of farmers themselves—by 100 m to a total of 400 m at the Ntiwile site (cf. Figure 10) and by 50 m to a total of 180 m at the Calange site (cf. Figure 11). This is one of COBSI's strongest points and is considered to be a touchstone for future small-scale irrigation development in the country.

2.1.5 Proposal for the Further Cooperation and Support

(1) Target Areas

Small-scale irrigation potential for COBSI development—based mainly on topographical as well as natural conditions such as COBSI-suitable river sizes and late-dry-season river flow—was evaluated as high in Niassa and Manica Provinces, medium in Nampula, Zambezia and Inhambane Provinces, low in Gaza Province, and very low in Maputo Province (including Maputo City and Matola City).

In Niassa and Manica Provinces, river flow is usually relatively high even in the latter half of the dry season (October-November), and it is expected that cultivation and harvesting will be possible until the end of the dry season after the introduction of COBSI. Another advantage is that there are many COBSI-like simple weir irrigation sites in this area, making it easier for farmers' groups to adopt the approach in the future.

Nampula, Zambezia and Inhambane Provinces are considered to have medium COBSI potential because of their mountainous terrain averagely suitable for simple weir construction on the inland side and streams flowing even in the dry season. Although a field survey was not conducted in Sofala Province, its western mountainous area is located in neighboring Manica Province, so has similar natural conditions, placing it in the moderate category.

Gaza Province is mainly flat, and the potential for small-scale irrigation is low. However, the northern parts of the Gaza Governorate have relatively mountainous terrain, offering potential for COBSI introduction.

Maputo Province, Maputo City, and Matola City topography is flat, and land suitable for COBSI is limited. In addition, local farmer groups have, for a long time, been sourcing water to irrigate farming from the same river under the rules of several farmers' associations. Since interviewed farmers' groups responded that they would not be accustomed to the construction of a simple weir, the Survey Team judged that conducting COBSI activities in this area would be difficult, considering the historical and social background of the project.

(2) Proposed Plans and Concept

INIR categorizes development areas into the following three levels—from largest to smallest—over 500 ha (large), 500 ha-50 ha (medium), and under 50 ha (small). Although INIR also handles the small-scale level, it has yet to implement sufficient irrigation development and services. Therefore, future cooperation direction should concern introduction of COBSI irrigation development in the small-scale category, aiming to contribute to the national goals of developing the agricultural sector, enhancing food security, and improving nutrition by increasing agricultural production as well as irrigated areas (cf. Figure 12).

Furthermore, COBSI expansion in Mozambique is planned to be implemented in two stages:

1) Pilot Project Stage

As an entry to COBSI, pilot projects will be implemented in various locations, focusing on establishing model sites and training “COBSI Master Trainers” who will, in turn, share their challenges and solutions through monitoring and follow-up towards further expansion into a wider area.

Draft-Concept-for-the-COBSI-Approach-in-Mozambique:- MOZ-COBSI

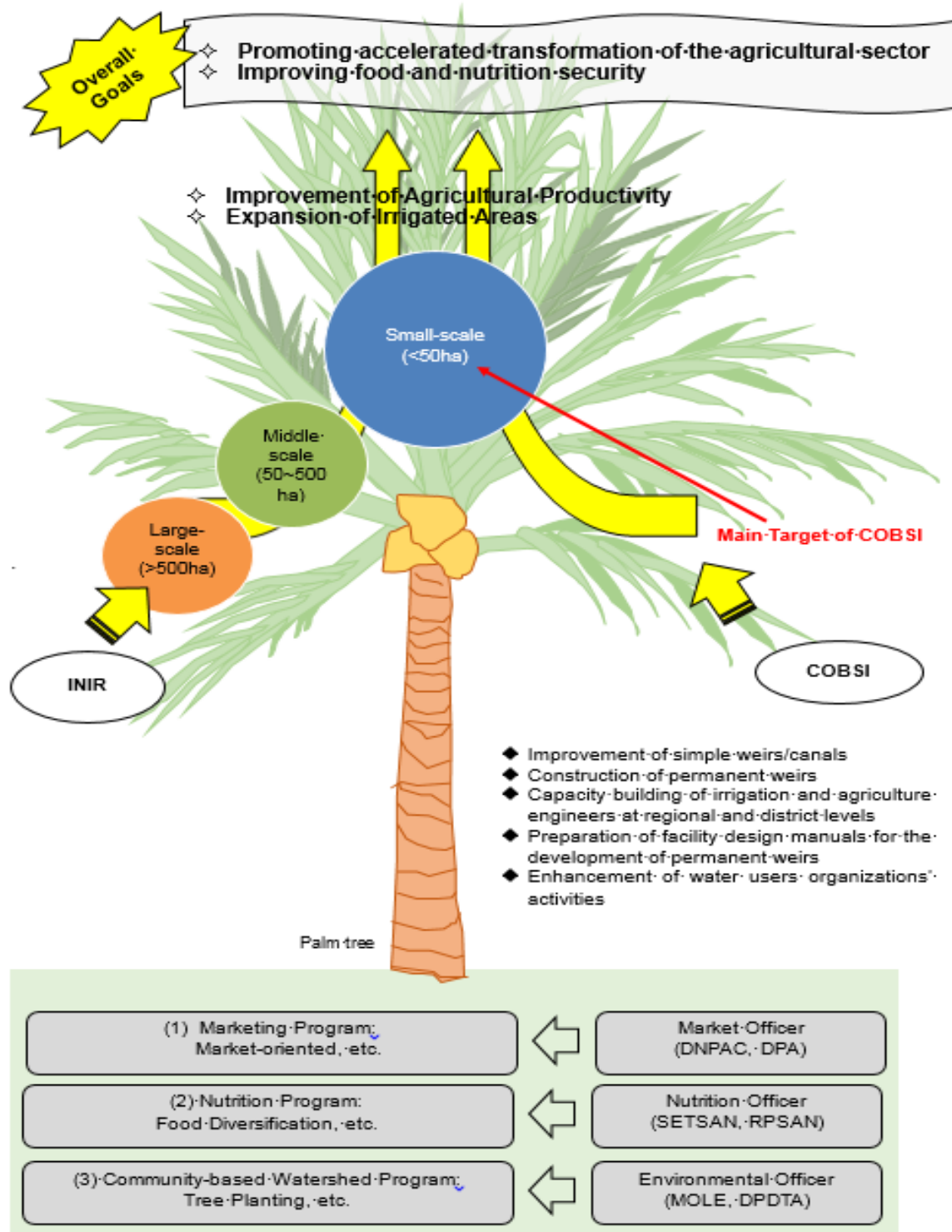


Figure 12 Concept for COBSI Approach in Mozambique (Draft)

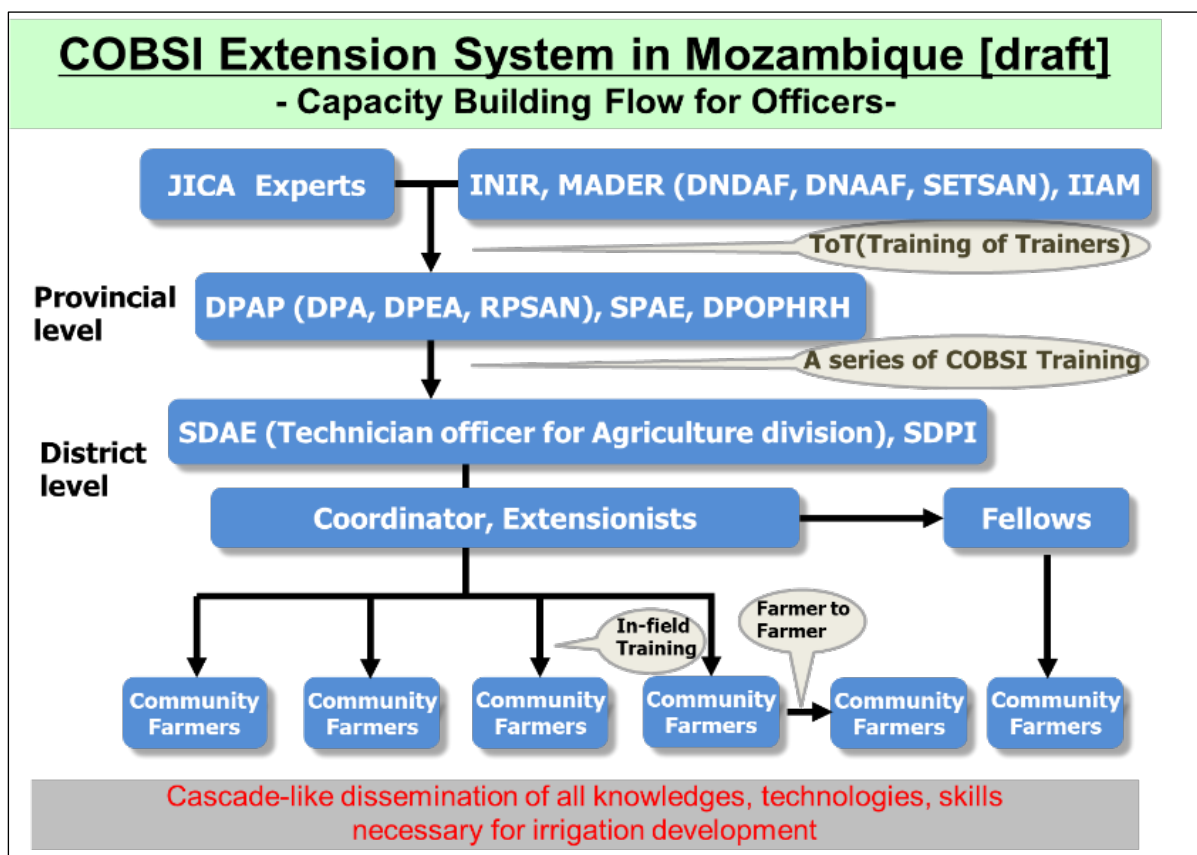
Source: JICA Study Team

Potential target areas for such activities are those where the natural conditions are suitable for COBSI, where local farmers already have some irrigation experience, and where marketing strategies can be trialed as close as possible to the capital city of Maputo. In this sense, the proposed target areas for the first stage are Manica, Inhambane and Sofala (western region) Provinces.

(3) Implementation Structure (Draft)

The proposed implementation and extension structure for the COBSI approach is shown in Figure 14 below. The main implementation agency will be INIR which is in charge of irrigation development. Cooperation agencies will be MADER—responsible for all aspects of agriculture, extension, smallholder support and nutrition activities—and IIAM which is responsible for crop cultivation research. At the provincial level, DPAP, which is under the umbrella of MADER, will be the main actor in this activity. Also, SPAE—the upper body of SDAE where extension agents are assigned—should also be involved. The extension system of the COBSI approach would be divided into four (4) levels: Central, Provincial, District and Local (extensionist to farmers).

JICA experts and Central-level government officials such as INIR and MADER will work together to conduct Training of Trainers (TOT) for Provincial-level officials to produce training instructors. Provincial-level officials will, then, be providing direct training to SDAE technical and extension staff at District level, followed by expansion of the training to farmers' groups. This series of training will include Kick-off Training (KOT), Mid-Term Training (MTT), and an Annual Evaluation Workshop (AEW) which will be held three (3) times a year.



2.2 SIERRA LEONE

Survey Areas in Sierra Leone

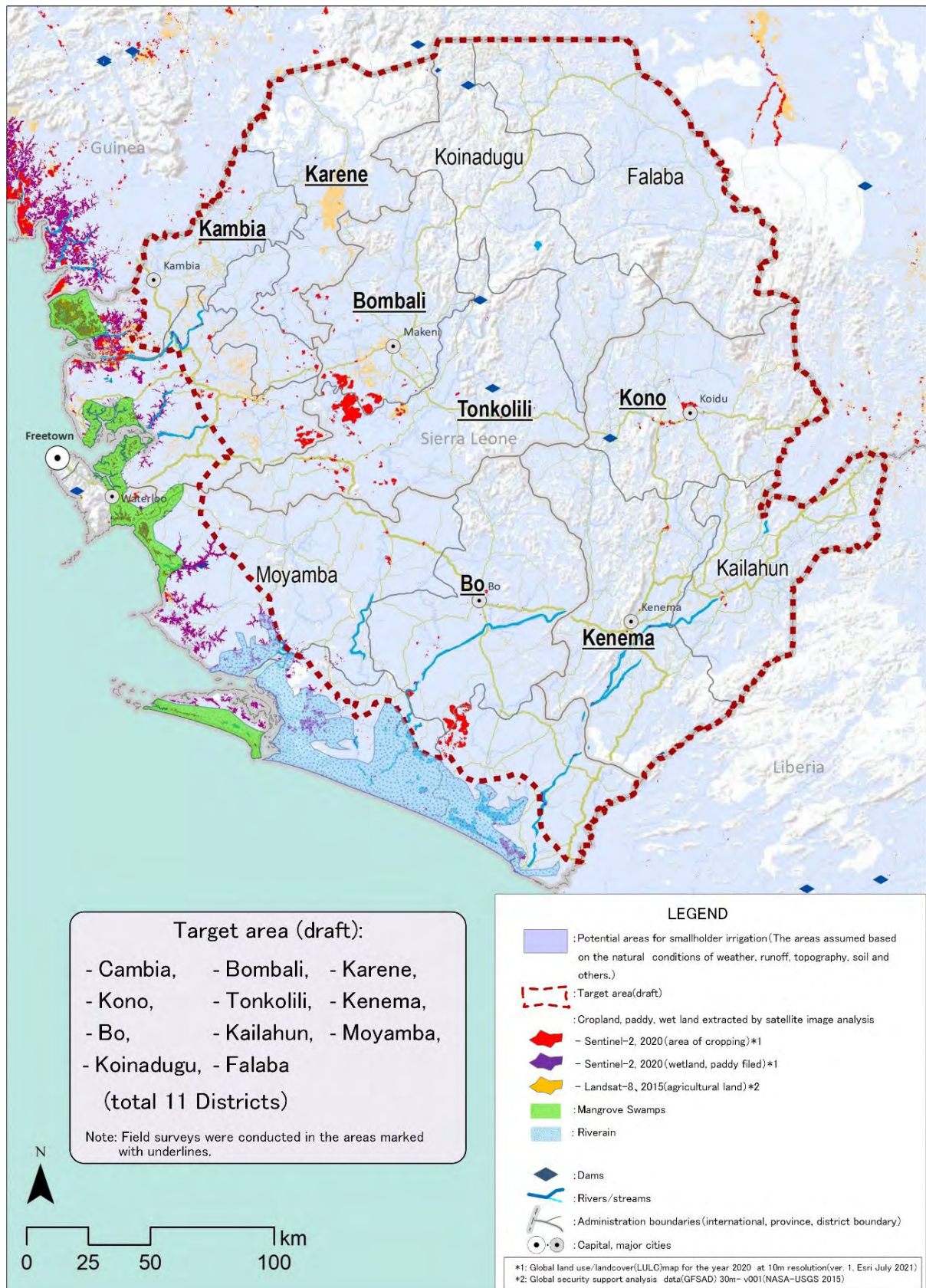


Photo Album



Rokupr Agriculture Research Center, Kambia District

The Center—equipped with a research building, an experimental field, and training facilities established in 1934—deals with cereals such as rice, maize, sorghum, and so forth. “At present, rice production needs to meet the demand of the market”, the Center’s researchers have analyzed. (3/Feb/2022)



Discussion on COBSI with Officers, Kambia Dist.

The Survey Team visiting the impressive office of Kambia District. Mr. Ambrose Bindi Kamara, DAO Kambia (center in the photo) chaired the discussion. The officers expressed their interests in the COBSI approach and stated that there was potential for COBSI activities in the district. (3/Feb/2022)



Mabonkani IVS, Bombali District

This IVS is a part of SRPP project where farmers have carried out not only advanced rice cultivation, but also rehabilitation of irrigation facilities through the introduction of COBSI simplified technologies. (4/Feb/2022)



Kathirie IVS, Karene District

An already developed IVS where farmers cultivate horticulture crops like onions or potatoes along peripheral canals. They have shown interests in vegetable cultivation which brings cash into their pockets. (5/Feb/2022)



TAWOPANNEH ABC, Kamaranka, Bombali District

This Agricultural Business Center (“ABC”), one of 92 in the country, was established in 2010. Its main activities are 1) buying and selling quality seeds, 2) renting farm machinery, and 3) training farmer members of Farmers-Based Organizations. Mr. Samuel Dolosco Kamara, a member of the Survey Team (left in the photo), was interviewing the ABC members. (5/Feb/2022)



Moindae Stream, Kono District

This is a perennial stream flowing into the Sewa River. Surrounding farmers irrigate the grassland along the stream by using watering cans in the dry season. This is a potential area for COBSI promotion. The width and depth of the stream, across which a single- or double-line simple weir can be built, are 7m and 2m respectively. (7/Feb/2022)



Dakrifie Lake National Protected Area, Tonkolili District

Human activities are prohibited in this kind of area, and the Ministry of Agriculture and Forestry (“MAF”) is one of the ministries responsible for the protection of such natural resources. Conservation of watersheds belonging to communities could, however, be prioritized through sensitization as part of COBSI activities promotion. (8/Feb/2022)



Njala Horticultural Crop Research Center, Njala University, Moyamba District

Researchers of the Center emphasized that secure irrigation water in the dry season was essential for horticulture. The Center conducts a series of farmer trainings on conservation of watersheds belonging to communities, a policy also followed by COBSI. (9/Feb/2022)



Sierra Tropical, Sumbuya, Bo District

Dole farms pineapple in Sumbuya—over 600ha as of now, but targeting 3,400ha—with the aim of exporting this produce mainly in the West. The company is also involved in a wide range of other activities such as construction of roads and community clinics, supporting farmers by giving farming inputs, etc. (10/Feb/2022)



Lambayama IVS in Nongowa Chiefdom, Kenema Dist.

This IVS covers an area of 52ha containing fishponds that are managed by some ABC. The farming is relatively well operated, though there is still room for improvement in terms of maintenance activities, e.g. trimming the grass, or desilting the canals for smoother water flow. (11/Feb/2022)



Nongowa Agribusiness Center, Kenema District

The tin in the center is used in the field as a standardized container for trading rice across the country. The unit of the tin is called a bushel, and 2 bushels of rice is equivalent to 50kg. In most cases, however, farmers are likely to be at a loss, as they do not weigh the amount of rice in the tin when they sell. In that regard, MAF strongly recommends that farmers use scales to improve this situation. (11/Feb/2022)



Maandu Community IVS, Bo District

Here, farmers cultivate rice 2-3 times per year depending on water availability. Despite challenges such as shortage of community labor force, especially the youth, or financial difficulty, MAF is pushing actions to cover maintenance of non-developed IVSs through its district engineering division and Block Extension Supervisors (“BES”), whose roles are designing and supervising, in order to contribute to food security by increasing rice production as a political commodity. (12/Feb/2022)

Survey Areas in Sierra Leone
Photo Album

Contents

2.2.1	Field Survey Outline.....	II -2-1
2.2.2	National Development Plans and Legal Frameworks Related to the COBSI Approach	II -2-2
2.2.3	Survey Results (Current Situation/Identified Issues)	II -2-6
2.2.4	Proposal for Further Cooperation and Support.....	II -2-9

List of Tables

Table 1	Visited Organizations for Information Collection (Sierra Leone).....	II -2-1
Table 2	Key Legal Frameworks on Environmental and Social Considerations in Sierra Leone ...	II-2-2
Table 3	Projects Requiring an ESIA License in Sierra Leone.....	II-2-3
Table 4	Factors Determining whether a Project Requires an ESIA in Sierra Leone.....	II-2-3
Table 5	Project Concept: Introduction of COBSI Packaged Irrigation Technologies through the COBSI Approach in Sierra Leone	II-2-11

List of Figures

Figure 1	Small-Scale Irrigation Potential Distribution (Sierra Leone)	II-2-1
Figure 2	Environmental and Social Impact Assessment Flow in Sierra Leone	II-2-5
Figure 3	A Developed IVS (Bombali District)	II-2-6
Figure 4	Non-Developed IVS (Tonkolili District).....	II-2-6
Figure 5	Vegetable Cultivation in a Developed IVS (Karene District)	II-2-7
Figure 6	IVS being developed in Sierra Leone.....	II-2-8
Figure 7	Climate Projections for Sierra Leone	II-2-9
Figure 8	Sierra Leone Small-Scale Irrigation Potential Area Map.....	II-2-10
Figure 9	Sketch of Integrated Irrigation Farming (IVS and Upland).....	II-2-10
Figure 10	Pictures of Integrated Irrigation Farming (IVS and Upland).....	II-2-11
Figure 11	Implementation Structure for the COBSI Approach in Sierra Leone (Draft).....	II-2-14
Figure 12	Concept of the COBSI Approach in Sierra Leone	II-2-15

List of Abbreviation

CEO	Camp Extension Officer
ABC	Agricultural Business Center
AEW	Annual Evaluation Workshop
AfDB	African Development Bank
BES	Block Extension Officer
CARD	Coalition for African Rice Development
COBSI	Community-Based Smallholder Irrigation
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
FBO	Farmer Based Organization
FEW	Front line Extension Worker
HCRC	Horticultural Crops Research Centre
IVS	Inland Valley Swamp
KOT	Kick off Training
MAF	Ministry of Agriculture and Forestry
MTT	Mid-Term Training
MWR	Ministry of Water Resources
NRDS	National Rice Development Strategy
NSADP	Comprehensive Africa Agriculture Development Programme
PEMSD	Planning, Evaluation, Monitoring and Statistics Division
RARC	Rokupr Agricultural Research Centre
SMS	Subject Matter Specialist
SRPP	Sustainable Rice Production Project
TOT	Training of Trainers
UN	United Nations
WB	World Bank

2.2.1 Field Survey Outline

(1) Survey Outline

Field surveys for Sierra Leone were conducted from January 28 to February 19, 2022 in a total of seven (7) Districts—namely Cambia, Bombali, Kalene, Tonkolili, Kono, Bo, and Kenema. They included surveys of natural conditions such as hydrology and topography, conditions of existing irrigation sites (including facilities), of farmlands and farming, and of markets alongside interviews with farmers.

Visited organizations for information collection in Sierra Leone are listed in Table 6.2.1 below.

Table 1 Visited Organizations for Information Collection (Sierra Leone)

Categories	Visited Organization
Sierra Leonean Government	✓ Ministry of Agriculture and Forestry (MAF) Engineering Division, Extension Division, Planning, Evaluation, Monitoring and Statistics Division (PEMSD) ✓ Sierra Leone Agricultural Research Institute (SLARI) Rokupr Agricultural Research Centre (RARC), Horticultural Crops Research Centre (HCRC) ✓ Environmental Protection Agency (EPA) ✓ Ministry of Water Resources (MWR)
Other	✓ Sustainable Rice Production Project (SRPP) ✓ Sierra Tropical

Source: JICA Survey Team

(2) Potential Areas for Small-Scale Irrigation

Based on the results of detailed satellite image analysis, small-scale irrigation potential distribution in Sierra Leone (indicated in purple) is shown in Figure 1. Sierra Leone is located at the northern limit of the tropical rainforest zone, with average annual precipitation exceeding 4,000 mm in coastal areas and about 2,000 mm in the northern areas where less rainfall is available. Those areas were also identified as having high potential for small-scale irrigation development based on surface runoff, soil types, and surrounding populations and land use.

Red boxes in the Figure indicate the locations of the 7 districts where field surveys were conducted.

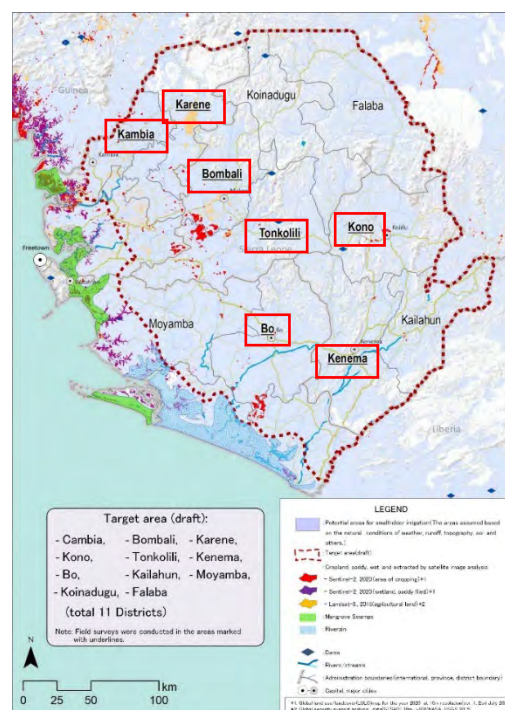


Figure 1 Small-Scale Irrigation Potential Distribution (Sierra Leone)

Source: JICA Survey Team

2.2.2 National Development Plans and Legal Frameworks Related to the COBSI Approach

(1) Sierra Leone's Medium-Term National Development Plan (2019-2023)

The Medium-Term National Development Plan (MTNDP) was developed in 2019, showing a roadmap to achieving the goal of becoming one of the middle-income countries by 2039 through “sustainable growth that leaves no one behind”. The MTNDP consists of eight cluster policies, the second cluster being related to the agricultural sector, focusing on crop production increase and farming commercialization, fishery production increase and sustainable resources management, improvement of the rural economy, promotion of manufacturing and service sectors, and management of mineral resources for economic diversification and further growth.

At first glance, labor force is certainly a key factor to increasing agricultural productivity, knowing that 55% of Sierra Leone's working population is engaged in the agricultural sector.

(2) National Sustainable Agricultural Development Plan (2010-2030)

The National Sustainable Agricultural Development Plan (NSADP), which was published in 2009, focuses on small-scale farming commercialization, highway rehabilitation, wetland development for irrigation, canal establishment, storage and processing facilities rehabilitation and modernization, and research centers upgrade. Moreover, considering rice as a priority crop for commercial farming, NSADP also declares that value addition of rice based on market needs is important to increase production for achieving self-sufficiency and attaining resulting food security and poverty reduction.

(3) National Rice Development Strategy (2009-2018)

The National Rice Development Strategy (NRDS) is a strategy which was developed within the framework of CARD. Sierra Leone's annual rice consumption is the highest in the Sahara region, showing 104 kg/person—rice being an important staple food. The country has focused on the achievement of rice self-sufficiency since its independence in 1961, which has resulted in a self-sufficiency rate of 71% as of 2007. NRDS emphasizes the importance of establishing a framework for food security improvement as well as economic development through rice production increase. Specifically, it aims to increase rice production and productivity, improve post-harvest processing technology, promote marketing, enhance infrastructure, and develop the capacity of all actors in the rice sector.

(4) Legal Frameworks on Environmental and Social Considerations

Key legal frameworks on environmental and social considerations in Sierra Leone are as shown in Table 1.

Table 2 Key Legal Frameworks on Environmental and Social Considerations in Sierra Leone

No.	Name of Legal Framework
1	The Constitution of Sierra Leone, 1991
2	Wildlife Conservation Act, 1972
3	Forestry Act, 1988
4	Environment Protection Act, 2000
5	National Land Policy and Land Commission Act, 2004
6	Environment Protection Agency Act 2008 (amended in 2010)
7	National Environment Policy, 1994
8	Integrated National Waste Management Policy, 2012
9	Final National Land Policy of Sierra Leone, Version 6, 2015
10	Infection Control and National HealthCare Waste Management Plan, 2015

Source: JICA Survey Team (2022)

In accordance with the Environment Protection Agency Act enacted in 2008 and amended in 2010, the Environment Protection Agency (EPA) is in charge of appraisal and monitoring related to ESIA activities. Moreover, the said act stipulates the type of projects that require an ESIA license as well as factors determining whether a project requires an ESIA, as shown in Table 2 and Table 3.

Table 3 Projects Requiring an ESIA License in Sierra Leone

No.	Type of projects requiring an ESIA license
a	Substantial changes in renewable resource use (e.g. conversion of land for agricultural production, forestry or pasture, rural development, timber production)
b	Substantial changes in farming and fisheries practices (e.g. introduction of new crops, large scale mechanization or use of chemicals in agriculture)
c	Exploitation of hydraulic resources (e.g. dams, drainage and irrigation projects, water basin development, water supply)
d	Infrastructure (e.g. roads, bridges, airports, harbors, transmission lines, pipelines, railways)
e	Industrial activities (e.g. metallurgical, wood processing, chemical, power, cement, refinery, and petro-chemical plants; agro-industries)
f	Extractive industries (e.g. mining, quarrying, sand, gravel, salt, peat, oil, and gas extraction)
g	Waste management and disposal (e.g. sewerage systems and treatment plants, landfills, household and hazardous waste treatment plants)
h	Housing construction and development schemes
i	Establishment of places of entertainment, motor repair garages and welding Shops
j	Importation of second-hand vehicles

Source: Annex 1, Environment Protection Agency Act (2008)

Table 4 Factors Determining whether a Project Requires an ESIA in Sierra Leone

No.	Factor
a	Environmental impact on the community
b	Project location
c	Whether the project transforms the locality
d	Whether the project has or is likely to have a substantial impact on the ecosystem of the locality
e	Whether the project results in the diminution of the aesthetic, recreational, scientific, historical, cultural or other environmental qualities of the locality
f	Whether the project will endanger any species of flora or fauna or the habitat of the flora or fauna
g	Project scale
h	Degradation extent of the quality of the environment
i	Whether the project will result in an increase in demand for natural resources in the locality
j	Cumulative impact of the project (together with other activities or projects) on the environment

Source: Annex 2, Environment Protection Agency Act (2008)

Figure 1 shows the flow of the Environmental and Social Impact Assessment. All projects need to commence from the preparation and submission of the project proposal as the first step. The second step is screening by the EPA: If projects are judged to necessitate an ESIA, then the process continues to the third step and beyond; if—on the other hand—they do not require any, the third and fourth steps are skipped to the fifth step and beyond. In this latter case, projects are required to prepare an Environmental Management Plan (EMP) and submit it to the EPA. In some cases, however, neither an ESIA report nor an EMP is required, depending on the types of projects.

During the discussion with the EPA, the JICA Survey Team explained the contents and purposes of the COBSI approach and noted the EPA's observation that ESIA implementation is seemingly not necessary, but

that the preparation of an EMP would be required. As mentioned in Table 3, however, this judgement can be affected by factors such as the project location; the project, thus, needs to obtain the formal evaluation of the EPA in conformity with the procedures described in Figure 1.

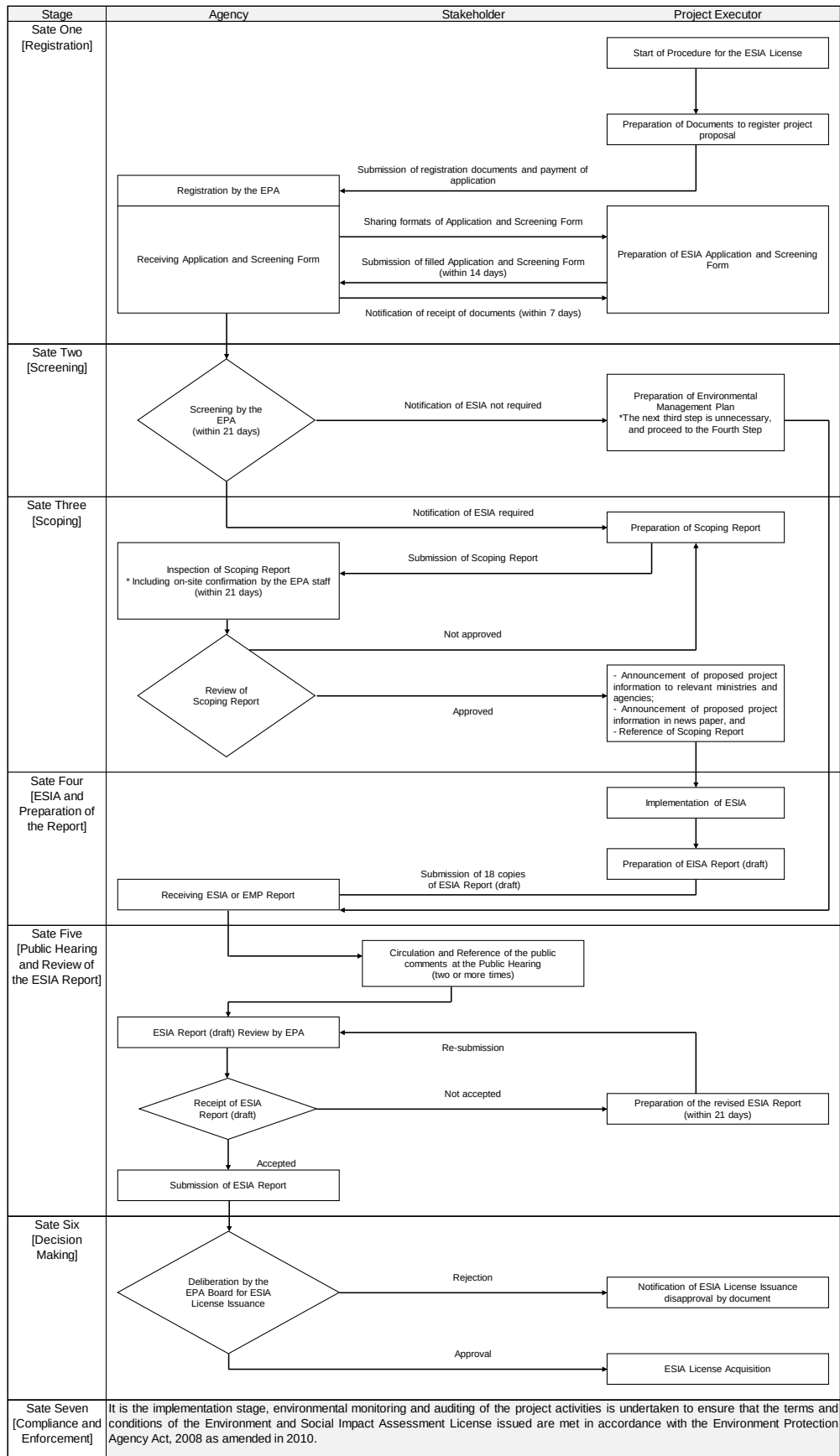


Figure 2 Environmental and Social Impact Assessment Flow in Sierra Leone

Source: "Preparatory Survey Report on the Project for Strengthening Children's Hospital in Freetown" (JICA, 2020)

2.2.3 Survey Results (Current Situation/Identified Issues)

(1) Irrigation, Water Management and Maintenance

Irrigation administration in Sierra Leone is mainly handled by the Engineering Division of the Ministry of Agriculture and Forestry (MAF). Potential irrigable areas total about 810,000 ha, about 30,000 ha (4%) of which have been developed so far, so the potential for future expansion of irrigated areas is fairly high. An irrigation master plan is being prepared for the first time with the assistance of FAO and international consultants.

In Sierra Leone, the natural environment is divided into five (5) categories: Upland, Mangrove swamp, Riverine, IVS (Inland Valley Swamp, which is relatively small), and Boliland. Since the scale of Riverine and Boliland is large, the government is proceeding with IVS development which is, in this respect, consistent with the COBSI target. There is, therefore, no irrigated area categorization into large-, medium-, or small-scale.

IVSs are numerous throughout the country, ranging from a few to several dozens of hectares per site. In IVSs that have been developed, intake weirs (earthen embankments) called “head bunds” are constructed on springs or small streams, and irrigation canals are placed on both banks to irrigate paddy fields and fields that have been developed into plots (cf. Figure 3). Drainage canals are constructed in the central lowlands but with insufficient capacity. As a result, when irrigation facilities collapse due to flooding during the rainy season, they are left untended, as farmers do not have enough capacity to maintain them. As a solution to this issue, the Sustainable Rice Production Project (SRPP) applied COBSI technology to repair drainage canals at the Mabonkani site in Bombali Province. According to interviews with local farmers, this technique is easy to use, because it allows for simple repairs by using local materials.



Figure 3 A Developed IVS (Bombali District)

Source: JICA Survey Team (February 2022)

On the other hand, there are a very large number of non-developed IVSs, and the delay in their development is significant. Flood damage due to undeveloped drainage canals has occurred frequently, thereby reducing rice and vegetable harvests and causing cultivated soil erosion as well as the spread and increase of pests and diseases (cf. Figure 4). In addition, IVS development is being carried out first in areas with good accessibility; rural areas with poor access conditions experience a decrease in labor force required for IVS development and construction (outflow of youth and labor to urban areas) and a resulting rise in labor and maintenance costs.



Figure 4 Non-Developed IVS (Tonkolili District)

Source: JICA Survey Team (February 2022)

In Upland environments, some groups of farmers use watering cans to irrigate near streams where COBSI

is applicable. It is worth noting that the COBSI approach can be practiced not only in IVSs, but also Upland. In non-developed zones without irrigation facilities, the irrigated area is limited due to inefficient irrigation methods involving watering cans, buckets and shallow wells.

(2) Extension Activities and Farmers' Organizations

Extension activities are carried out by extension officers (BES: Block Extension Officer and FEW: Front-line Extension Worker) assigned to each District Office. Each District is divided into about five (5) to (8) agricultural Administrative Blocks, and each Block is further divided into about seven (7) to eight (8) Circles. BESs are assigned to Blocks and FEWs to Circles to conduct agricultural extension activities. However, the number of BESs and FEWs is not sufficient due to a lack of government budget. According to interviews with District officers, the average number of extension officers (BESs and FEWs altogether) for forty-three (43) Circles in eleven (11) Districts totals only 9.1.

In addition, District Offices experience shortages of irrigation technicians and technical skills, lack of training opportunities in new technologies relating particularly to cultivation, and lack of transportation means (vehicles and motorcycles) and survey/office equipment. Not enough extension activities are, thus, being conducted, yet the task of those extension officers is to transfer cultivation techniques to farmers by establishing demonstration plots and supporting farmers' activities.

District agricultural office directors are dispatched by the Ministry of Agriculture, and District extension officials (SMSs), who are responsible for coordinating BESs activities, are also appointed by the same ministry. This means that the Ministry of Agriculture controls the chain of command of the District's extension organization.

Regarding farmers' organizations, various agricultural activities are implemented by farmers' groups called Farmer-Based Organizations (FBOs). The establishment of FBOs is one of the tasks of extension officers and the Government also encourages such an initiative, as those organizations are the recipients of external support. In addition, the Government also recommends that five (5) neighboring FBOs get together to establish an Agricultural Business Center (ABC) whose main activities are 1) rice seed purchase and sales (with government seed certification), 2) farm equipment and machinery rental, and 3) farmer training (with government extension officer participation). As of today, ninety-two (92) ABCs have been established nationwide.

(3) Farming, Marketing and Agricultural Research Center

Sierra Leone is one of the largest rice-consuming countries in Africa, so rice cultivation is a top priority within the national policy, given that the country has not achieved domestic self-supply yet. As a result, farmers grow rice in three cropping cycles when sufficient water is available during the dry season to allow cultivation. If sufficient dry-season water supply is not available, farmers grow one or two cycles of rice, then switch to vegetables during the off-season.

In addition, vegetables such as onions, potatoes, peppers, tomatoes, cabbage, okra, and lettuce are grown in developed IVS fields at higher elevations



Figure 5 Vegetable Cultivation in a Developed IVS (Karene District)

Source: JICA Survey Team (February 2022)

and along canals (cf. Figure 5). Farmers are generally highly interested in growing vegetables during the dry season, some getting more profit from cultivating them over rice. As of now, however, low production combined with high demand for vegetables during the dry season have resulted in high market prices. High need for irrigation in that season can be addressed through the COBSI approach which has the potential to secure irrigation water and increase horticultural crop production.

Lack of quality seeds for rice and vegetables and low yields due to low inputs of fertilizers are challenges. The reasons for this are shortage of funds (ready cash) in farmers' possession, lack of understanding of the proper use of seeds and fertilizers, and inexistence of nearby agricultural inputs suppliers. In the market, the priority is on quantity rather than quality as was observed in generalized rush into securing production volume.

The Rokupr Agricultural Research Center (RARC) is a research institute that focuses mainly on rice, maize and sorghum, and also handles long-stalk varieties of rice. Its staff comprises about thirty-six (36) people, including rice specialists. The Center has a storage, a cold room and bio-research facilities which are, however, not adequately maintained and seem to lack electrical equipment and agricultural machinery. The Center's building was rehabilitated in 2007 and has accommodations for trainees, though there are now concerns about its deterioration. It conducts experimental researches on vegetable cultivation by growing NERICA-L19 on a trial basis and irrigating it from a shallow well (2 to 3 meters) during the dry season, with test plots maintained in the same manner as developed IVSs. There are seven (7) of such agricultural research facilities in Sierra Leone to cover a variety of research topics.

(4) Environmental and Social Considerations

1) IVS development and reforestation activities

In Sierra Leone, development of IVSs has been carried out in accordance with national policies (Figure 2). Issues such as soil flowage caused by deforestation have, however, been observed. Under such a circumstance, the Ministry of Agriculture and Forestry has promoted reforestation with the "Cut One, Plant Three" slogan for balanced agricultural activities and forest protection toward basin conservation. Additionally, locals were observed patrolling community forests where field surveys were conducted to help curb illegal deforestation activities.



Figure 6 IVS being developed in Sierra Leone

Source: JICA Survey Team (January 2022)

2) Impacts caused by climate change

Sierra Leone national lands can be roughly classified into two kinds: Plains of an elevation around 100 m on the western side and highlands as well as mountainous areas of an elevation of 100 m to 2,000m on the eastern side. It has been pointed out that lowland areas along the Pacific Ocean are especially susceptible to climate change impacts such as floods, coastal erosion, decrease in freshwater quality, and decline of

agricultural potential (Figure 3)¹.

According to the results of interviews conducted during field surveys, some farmers responded that crops were affected by the flooded fields and seeds flushed away during the rainy season, that all crops were lost due to heavy seasonal rain in 2021, or that crop failure was caused by high temperature damage during the dry season—confirming that situations that can be considered as effects of climate change have already occurred.

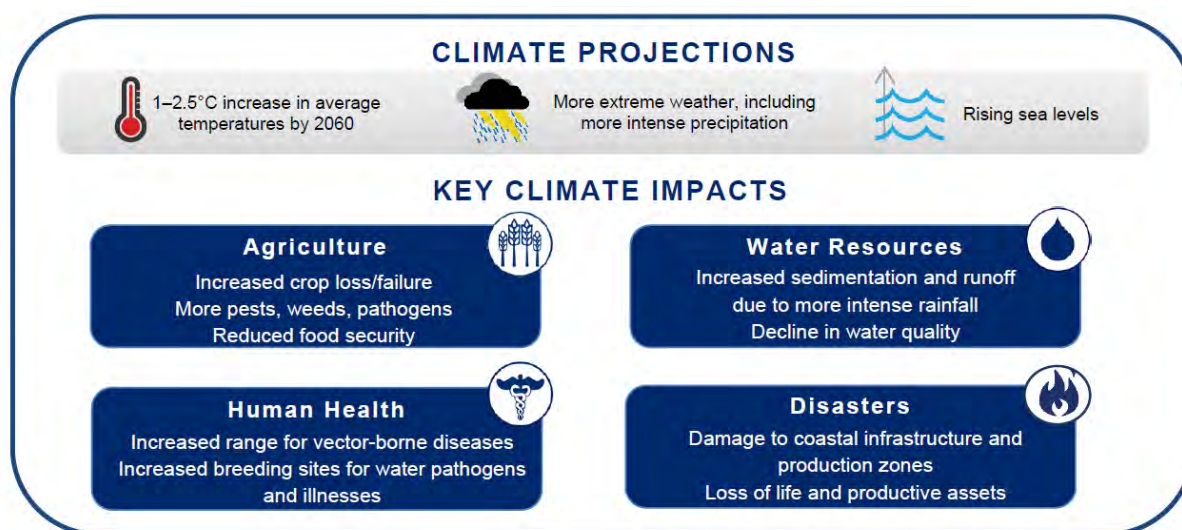


Figure 7 Climate Projections for Sierra Leone

Source: Climate Change Risk Profile, Sierra Leone (2018, USAID)

2.2.4 Proposal for Further Cooperation and Support

(1) Target Areas

The Survey Team identified COBSI potential in IVS and Upland environments in all seven (7) Districts (Kambia, Bombali, Karene, Tonkolili, Kono, Bo, and Kenema) where field surveys were conducted. Conditions in Districts where field surveys were *not* conducted were, however, determined based on the results of interviews with government officials. Since the natural conditions in Kailahun, Moyamba, Koinadugu, and Falaba Districts are similar to those in the 7 aforementioned surveyed Districts, those four (4) were added to a total of eleven (11) Districts to be considered as potential areas (cf. 8). Coastal areas, being constituted by large areas of Mangrove swamp and Riverine, shall be excluded from the targets.

¹ Climate Change Knowledge Portal (World Bank Group):

<https://climateknowledgeportal.worldbank.org/country/sierra-leone/vulnerability>

and Climate Change Risk Profile, Sierra Leone (2018, USAID):

<https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Sierra%20Leone.pdf>

(2) Proposed Plans and Concept

Since increasing rice production is a top priority in Sierra Leone, the Survey Team will adapt COBSI IVS technology based on collaboration with CARD. Upland, sites have been identified where COBSI can be introduced, and the Survey Team will propose COBSI expansion in that environment as well. In addition, since cultivated soil and sediment runoff from flooding are challenges, the Team will propound to add watershed conservation, market orientation through SHEP as well as nutrition improvement to the concept.

In developed IVSs, COBSI technology will be applied to rehabilitate head bunds, drainage and irrigation canals, and contribute to rice production through improved maintenance techniques. In undeveloped IVSs, however, basic irrigation facilities are to be constructed to ensure stable agricultural production, since there are many cases of flood damage due to inadequate drainage. Soil runoff control techniques (fencing and sediment ponding) will be introduced at IVS sites from the outer hillsides, and existing rice paddies will be utilized as fishponds for nutrition improvement.

Upland, a new COBSI approach project, involving construction of simple and permanent weirs alongside related canals, is expected to improve farmers' livelihoods and nutrition through irrigated horticulture and crop diversification. Water can be taken from streams upstream IVSs to irrigate uplands in the dry season and supplement IVS paddy field irrigation in the rainy season. This will promote cultivation of horticultural crops in uplands and rice production in IVSs. Sketches and plan views of integrated IVS and upland environments are shown below (cf. Figures 9 and 10).

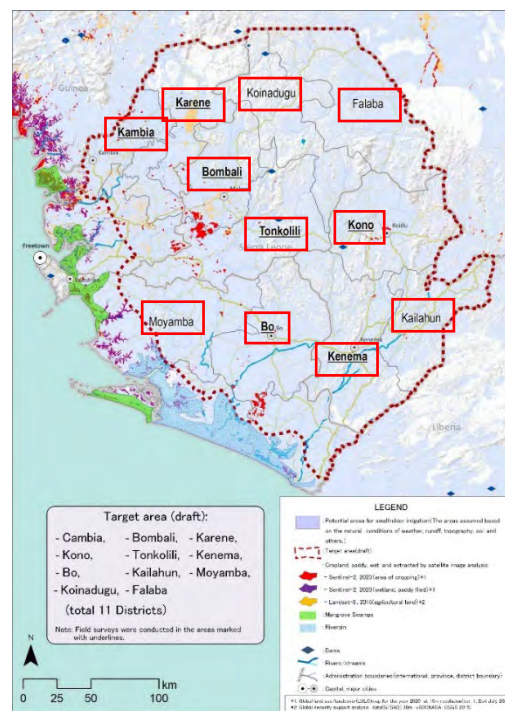


Figure 8 Sierra Leone Small-Scale Irrigation Potential Area Map

Source: JICA Survey Team

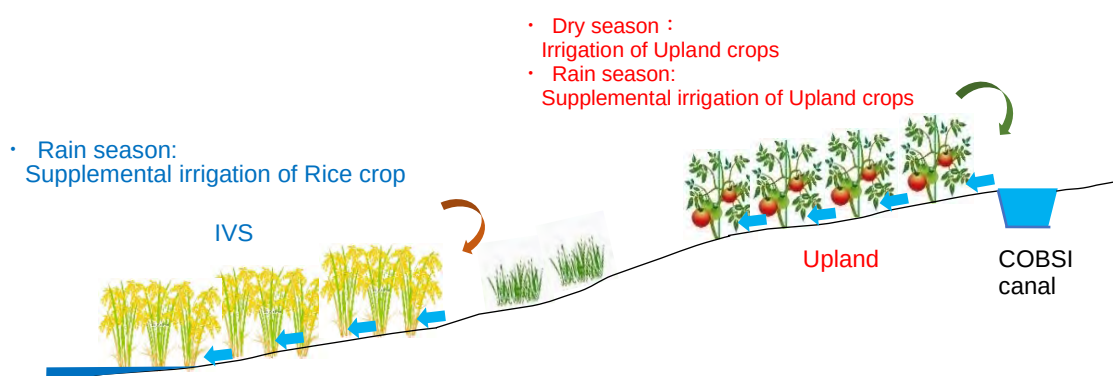


Figure 9 Sketch of Integrated Irrigation Farming (IVS and Upland)

Source: JICA Survey Team

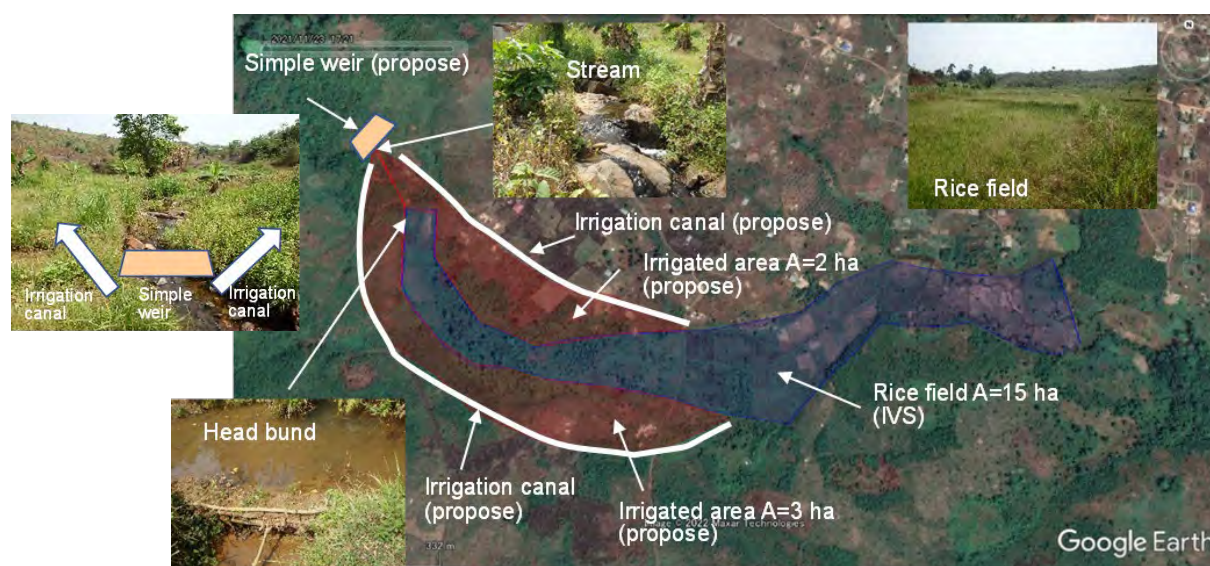


Figure 10 Pictures of Integrated Irrigation Farming (IVS and Upland)

Source: JICA Survey Team

In terms of software, the project will include capacity building of District staff to irrigation technicians and extension officers, development of water management/facilities maintenance manuals (IVS and Upland versions) and provision of related training, watershed conservation and nutrition improvement training, and SHEP implementation.

Moreover, inquiries were made to District Offices in the 11 Districts proposed as targets for new projects to identify the number of sites and areas of developed and non-developed IVSs. The number of developed IVSs is four hundred twenty-five (425) with an area of 3,663 ha and non-developed IVSs two thousand five hundred eighty-three (2,583) with an area of 19,428 ha, meaning that non-developed IVSs are five (5) times larger than developed ones. The average IVS area per site is 8.6 ha and 7.5 ha respectively. Upland, the area and number of sites were estimated at 1,000 ha for 500 sites and 12,000 ha for 1,700 sites in integrated Upland/IVS environments. Based on this information, proposed new projects are summarized in Table 5 below. It is worth noting that it is possible and crucial to collaborate with SRPP (under implementation as of 2022) concerning IVS development, since most areas are under rice cultivation.

Table 5 Project Concept: Introduction of COBSI Packaged Irrigation Technologies through the COBSI

Approach in Sierra Leone				
Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Concept Name	IVS+	IVS++	COBSI Up	Integrated Irrigation Farming
Target	Developed IVS	Non-developed IVS	Upland	Developed/ Non-developed IVS and Upland
Findings related to Small-scale Irrigation	Insufficient capacity of farmers in terms of operation & maintenance of irrigation facilities (head bunds, drainage and irrigation canals)	- Vast areas of non-developed or slow-developed (developing from areas where access is easy) IVS - Flood damages caused by undeveloped drainage canals	Inefficient irrigation (using watering cans, buckets, and shallow wells) and limited irrigated areas	Inefficient irrigation (using watering cans, buckets, and shallow wells) and limited irrigated areas

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Concept Name	IVS+	IVS++	COBSI Up	Integrated Irrigation Farming
Target	Developed IVS	Non-developed IVS	Upland	Developed/ Non-developed IVS and Upland
	- Collapsed irrigation facilities caused by flooding (structure failure and size unsuitability) - Runoff of rice cultivation soil and hilly land, and untreated sedimentary soil in peripheral canals (reducing rice yields; causing cultivation soil runoff; increasing and spreading pests & diseases) - Youth migration (labor power) to urban areas resulting in high costs of development and manpower - Lack of transportation means such as vehicles and motorbikes, investigation equipment, and office equipment at district offices - Shortage and insufficient technical capabilities of irrigation engineers at district level - Short-staffing of extension workers at district level (The average number of BES and FEW in 11 districts is only 9.1 members for 43 circles), and lack of training opportunities on new cultivation techniques - Low usage of improved rice and vegetable seeds due to farmers' lack of finances and understanding, and low productivity resulting from low inputs due to farmers' limited finances and access to supply sources - Markets focusing on quantity rather than quality of products - Floods in the rainy season and water shortage in the dry season accompanied by deforestation of the surrounding areas - Impacts caused by climate change such as changes of pattern and intensity of rainfall - Unbalanced diets			
Concept Summary	Increase in rice production and productivity through rehabilitation and operation & maintenance capacity building in developed IVS	Increase in rice production and productivity through consolidation of fundamental facilities in non-developed IVS	Improvement of farmers' income through irrigation of upland horticulture crops, as well as nutrition through food diversification	Increase in rice production and productivity in developed/ non-developed IVS, and enhancement of upland horticulture crop production
Package of Components	- Rehabilitation of head bunds, drainage and irrigation canals through the COBSI approach (construction of simple/permanent weirs) - Introduction of preventive techniques against soil erosion on hilly sites (fencing and ditch) - Promotion of aquaculture (construction of fishponds)	- Construction of irrigation canals as well as drainage canals to prevent flood damages - Construction of irrigation facilities of appropriate scale and structure - Introduction of preventive techniques against soil erosion on hilly sites (fencing and ditch) - Promotion of aquaculture (construction of fishponds)	- Construction of simple weirs and irrigation canals - Construction of permanent weirs	Combination of IVS+ and COBSI Up, or IVS++ and COBSI Up
Package of Soft Components	- Capacity building of irrigation engineers and extension workers at district level - Formulating facilities design manuals for IVS rehabilitation/development	- Capacity building of irrigation engineers and extension workers at district level - Formulating facilities design manuals for IVS rehabilitation/development - Provision of training on	- Capacity building of irrigation engineers and extension workers at district level - Formulating facilities design manuals for upland development	Activities mentioned in the left columns are to be conducted based on site-specific conditions.

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Concept Name	IVS+	IVS++	COBSI Up	Integrated Irrigation Farming
Target	Developed IVS	Non-developed IVS	Upland	Developed/ Non-developed IVS and Upland
	ment ver. - Provision of training on water management/ facilities operation & maintenance - Promotion of E-extension and dissemination by farmers themselves (FFS, FFD, and demo) - Introduction of community-based watershed conservation - Provision of training on nutrition improvement - Introduction of Market-oriented Irrigation Farming	water management/ facilities operation & maintenance - Promotion of E-extension and dissemination by farmers themselves (FFS, FFD, demo) - Introduction of community-based watershed conservation - Provision of training on nutrition improvement - Introduction of Market-oriented Irrigation Farming	- Introduction of gravity irrigation - Provision of training on water management/ facilities operation & maintenance - Promotion of E-extension and dissemination by farmers themselves (FFS, FFD, demo) - Provision of training on horticulture crops cultivation methods - Introduction of Market-oriented Irrigation Farming - Introduction of community-based watershed conservation - Provision of training on nutrition improvement	
Pilot District	11 districts (Except for swamps in coastal areas)	11 districts (Except for swamps in coastal areas)	11 districts (Except for swamps in coastal areas)	11 districts (Except for swamps in coastal areas)
Number of Potential Sites	425 sites	2,583 sites	500 sites	1,700 sites
Potential Sites (ha)	3,663 ha	19,428 ha	1,000 ha	12,000 ha
Projects being able to collaborate	SRPP	SRPP	-	SRPP

Source: JICA Survey Team

JICA and other international aid organizations have also provided support for IVS development by hiring farmers as laborers and paying them wages in almost all cases, or by providing them with food through the World Food Program (WFP). Therefore, many farmers have some experience in participating in temporary "cash- or food-for-work" activities. In that regard, it is crucial to determine whether voluntary participation in COBSI projects—based on the principle of not offering direct compensation—is acceptable to farmers.

(3) Implementation Structure (Draft)

The proposed implementation structure for the COBSI approach is shown in Figure 11. below. The dissemination system of this approach will be divided into Central, District and Local (farmer dissemination) levels. The main implementing agency will be MAF's Engineering Department. JICA experts and Central-level government officials from that Department will work together to produce trainers by conducting TOT related to irrigation, extension, cultivation, planning, environment, nutrition, and staff training in District offices. Then, District government officials are next in line to provide direct training to agricultural extension officers (BESs and FEWs), followed by expansion to farmers' groups. This series of training will include KOT, MTT, and an AEW which will be held three times a year.

Many Circles are left unattended because of the limited number of agricultural extension officers in Sierra Leone. In this case, representatives of farmers' groups like FBOs and ABCs could, instead of extensionists, attend and receive COBSI training directly from District offices.

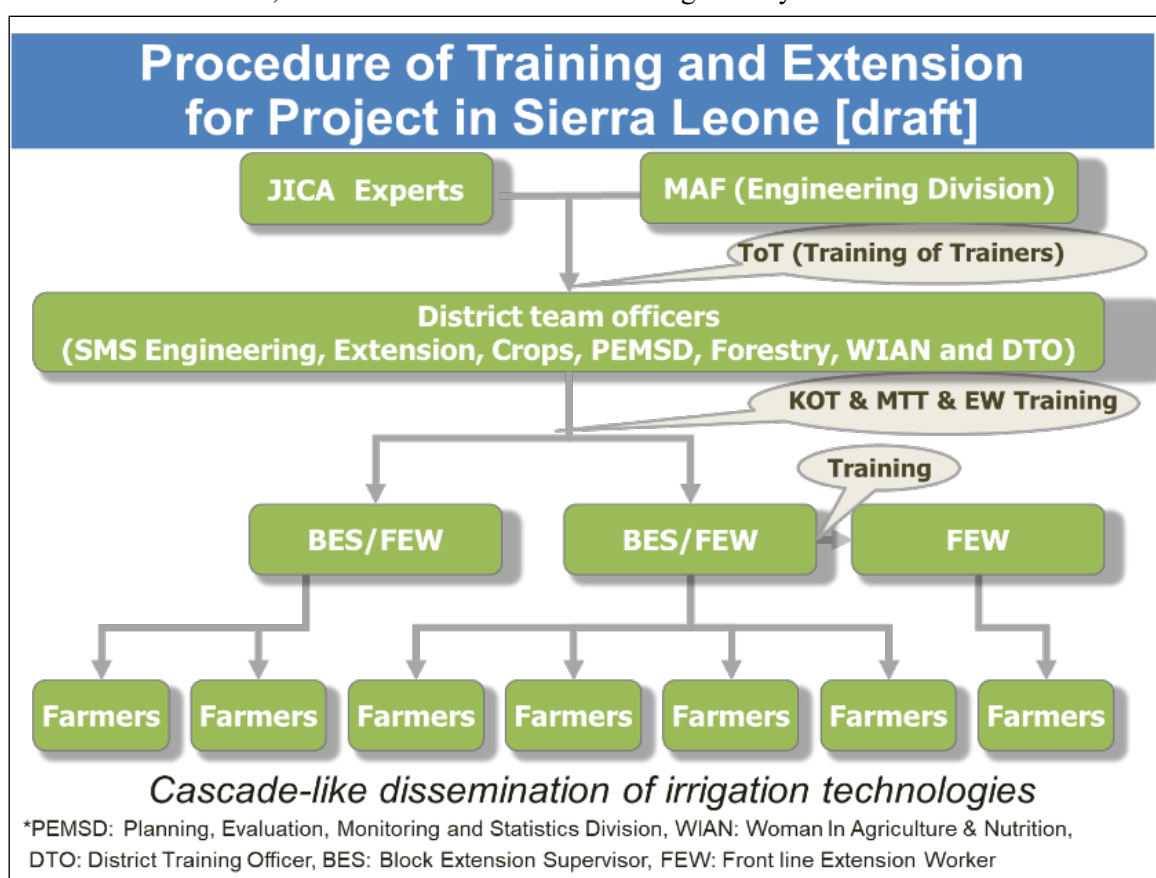


Figure 11 Implementation Structure for the COBSI Approach in Sierra Leone (Draft)

Source: JICA Survey Team

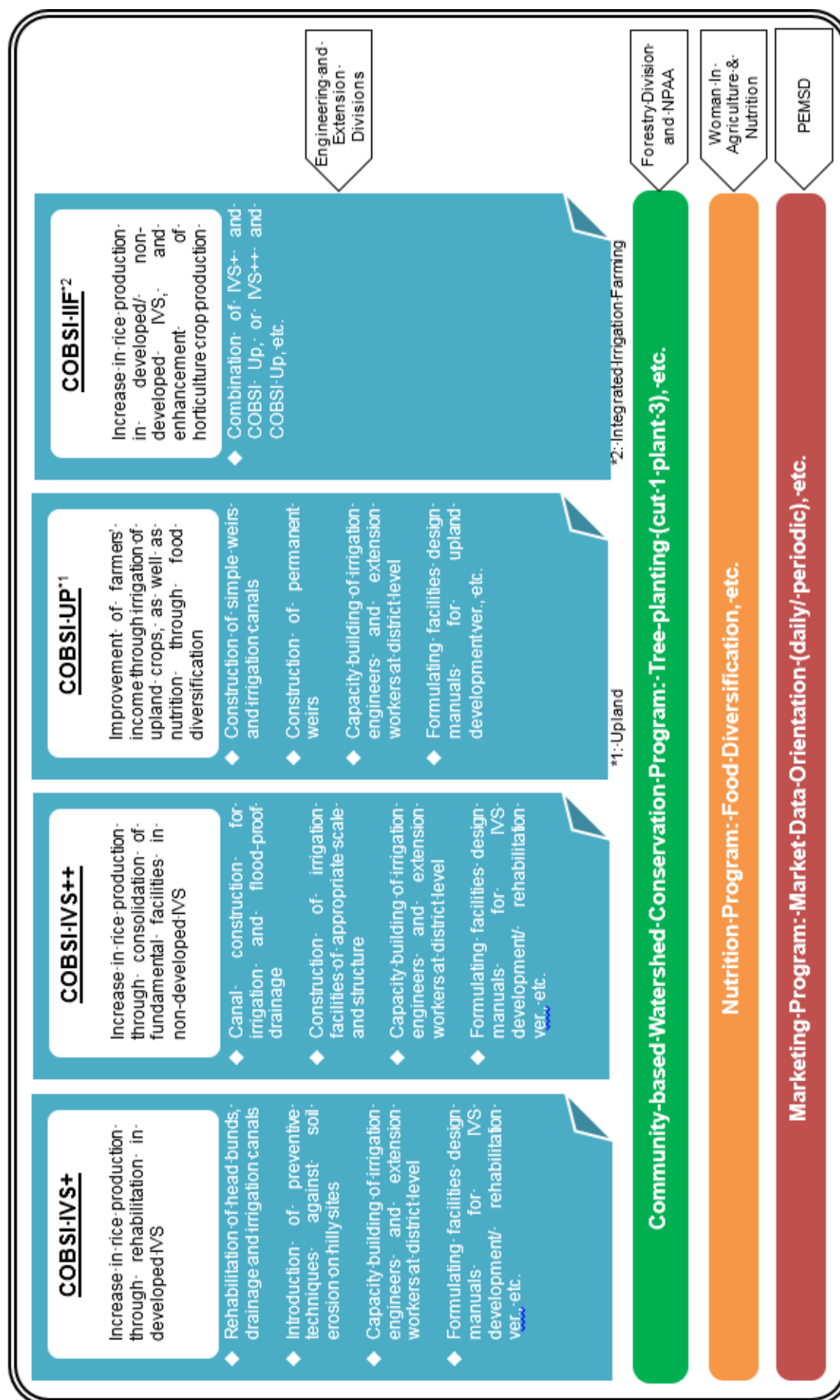


Figure 12 Concept of the COBSI Approach in Sierra Leone

Source: JICA Survey Team

2.3 COTE D'IVOIRE

Survey Areas in Cote d'Ivoire

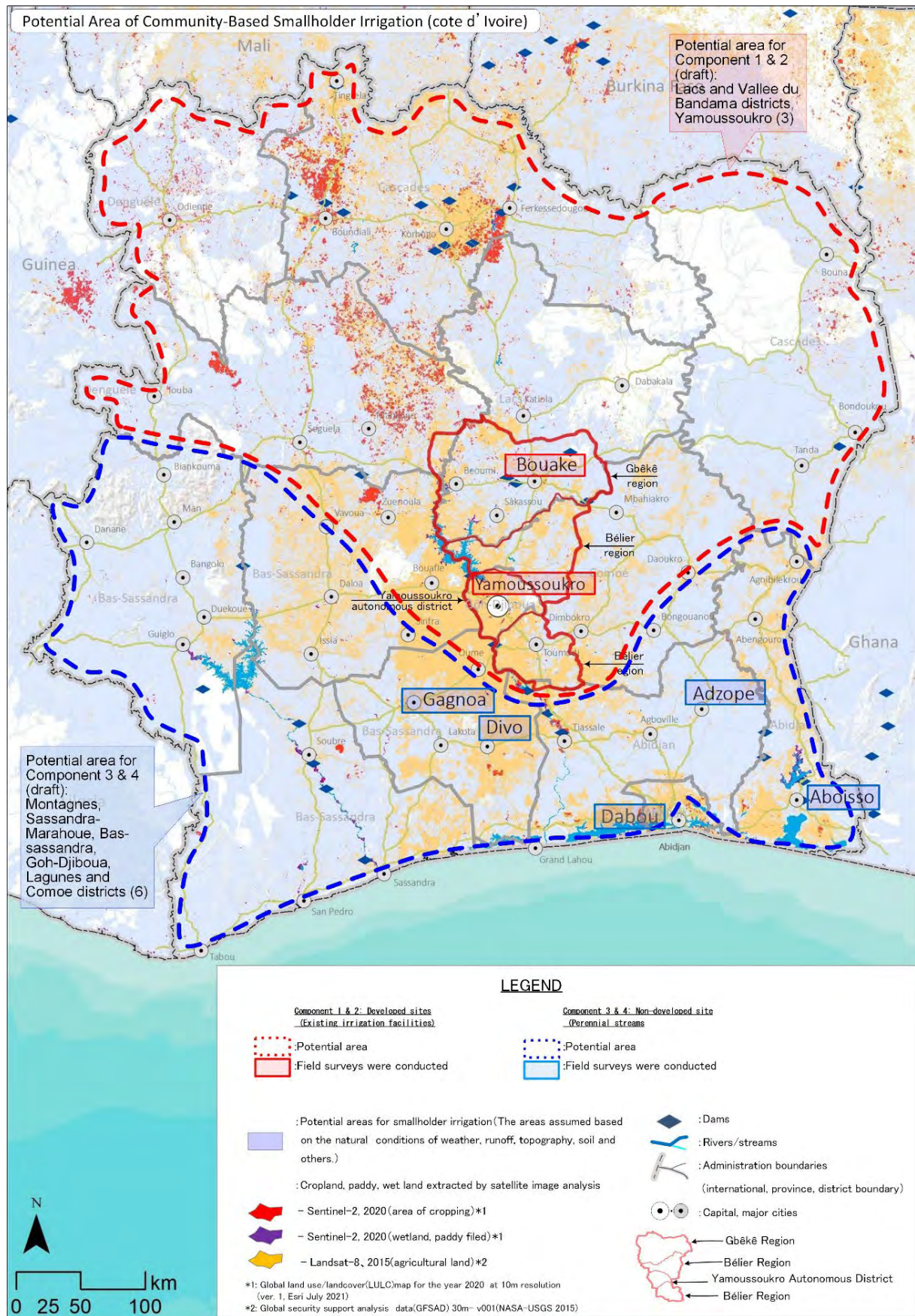


Photo Album



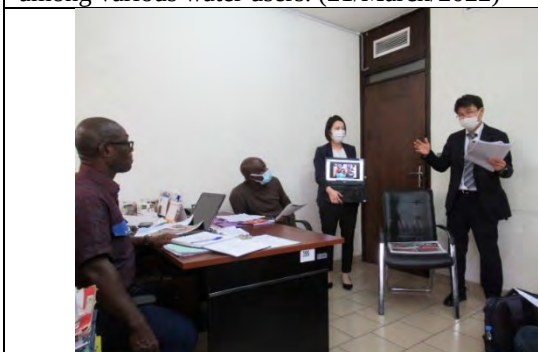
Ministry of Water and Forestry, Abidjan

The JICA Survey Team visited this ministry at the very beginning of the Survey. Dr. Sagawa, Team Leader, explained the purpose and concept of the COBSI approach. In response, the Ministry commented to consider measures of avoiding further water conflicts among various water users. (21/March/2022)



Ministry of Agriculture and Rural Development, Abidjan

This ministry, which deals with irrigation development, could be the main counterpart organization. Both parties discussed potentials area in the country for the introduction of the COBSI approach. (21/Mar/2022)



ANADER Head Office, Abidjan

The ANADER is the agency responsible for agricultural extension services in the country. The COBSI approach can, in other words, be considered as an extension program, so the affinity between ANADER and COBSI is quite high. (22/Mar/2022)



Yamoussoukro ANADER, Yamoussoukro

The JICA Survey Team visited the Yamoussoukro Zone of the ANADER. Participants on the ANADER side were TSCA, TSCP, and TSE technicians who showed interest in the COBSI approach. Both parties exchanged ideas and opinions. (23/Mar/2022)



Ministry of Agriculture and Rural Development, Yamoussoukro

The JICA Survey Team met Dr. Martin KOFFI Kouakou who is, himself, an Agro-economist. He suggested the possibility of promoting market demand-driven vegetable production through the COBSI approach, particularly in irrigation farming during the dry season. (22/Mar/2022)



OCPV, Abidjan

OCPV is an agency under the umbrella of the Ministry of Commerce. The JICA Survey Team paid them a visit to collect information related to the current market status of vegetable crops. OCPV officers suggested that vegetable production is still under self-sufficiency level, and the COBSI approach could, at the same time, contribute to increasing farmers' income. (01/Apr/2022)



FONTAMANA BALAKRO Site, Yamoussoukro

This farmer cultivates rice in the rainy season and vegetables such as tomato and okra in the dry season. His land is located downstream-most of the irrigation site. Although the site has a reservoir, not enough irrigation water reaches his land. It is, thus, recommended to develop water rules among related farmer beneficiaries. (24/March/2022)



COPRORIZ ZATTA Site, Yamoussoukro

The flood damaged the irrigation facilities and paddy fields in 2016, 2018, and 2021. A farmer explained how the flood came from behind the irrigation site and obstructed the drainage system with washed-away debris. He appealed for the necessity of improving the drainage system. (25/Mar/2022)



ABOUKU Area, Yamoussoukro

A number of farmers enjoy irrigation water for free by using pumps along the stream. It seems to be an indication of unregulated water rights or licenses to source water from the river/stream. This situation may eventually raise issues related to water use, so the concept of water rights is expected to be introduced across the whole country. (26/Mar/2022)



M'BEL-1 Site, Bouaké

The irrigation of farming on this site is operated by way of a reservoir. Due to poor water management, however, irrigation water overflows canals as seen during field observations. As a solution, farmers should be given training opportunities for proper water sharing. (27/Mar/2022)



SOUNGLOU stream, Bouaké

This is a candidate perennial stream for installing the COBSI approach. There are around 20 farmers along the stream which is used to irrigate farming in the dry season by way of watering cans/ buckets or pumps. (28/Mar/2022)



BOUBO River, Divo

Boubo River is not suitable for installing the COBSI approach. However, Divo seems to have smaller water resource points. It is expected that such streams could be found out through continued surveys. (29/Mar/2022)



BOGNOA Village, Gagnoa

Spring water is the main water source for irrigation farming in this village where farmers cultivate both rice and vegetables throughout the year. This site could be a candidate for the COBSI approach, though the water volume should be investigated carefully prior to its implementation. (30/Mar/2022)



CAMPEMENT DYBI Village, Dabou Zone

Plantation crops such as oil palm, cacao and rubber trees— seen from the southwest to the south of the country—are mainly cultivated by men, whereas vegetables are grown chiefly by women. Knowing women want to expand vegetable cultivation in the dry season, this area offers a potential to promote COBSI with its two perennial streams. (29/Mar/2022)



ADZOPE, Adzopé Zone

Steel gate-type permanent weirs and irrigation canals were constructed in the 1970s. Around 10 years after, the steel gates were damaged and irrigation water could no longer be distributed to fields. Currently, farmers cultivate rice only in the rainy season and vegetable crops by using buckets/watering cans along this perennial stream in the dry season. (30/Mar/2022)



MASSANDGI Village, Adzopé Zone

This stream flows perennially, with a width and a depth of 3m to 4m and less than 1m respectively. Farmer users have established a cooperative and have already started collecting a fee of 1,000 CFA/year/member. They showed determination to start irrigation farming in the dry season. This area also offers a good potential for promoting COBSI. (30/Mar/2022)



CARREFOUR Village, Aboisso Zone

A farmer grows okra over 0.8 ha, using pumps and watering cans along a perennial stream whose width and depth are 2m to 3m and less than 1m respectively. According to Aboisso Zone Chief of ANADER, there are more than 20 perennial streams in his zone. Aboisso Zone is also a potential area for implementing the COBSI approach. (31/Mar/2022)



BODANOVO Village

The JICA Survey Team conducted a farmer interview to know the current situation in terms of agricultural patterns, livelihood, etc. by using a questionnaire prepared by the Team itself. The results of the interview will be analyzed to extract important information to the Study. (24/March/2022)

Survey Areas in Côte d'Ivoire
Photo Album

Contents

2.3.1	Field Survey Outline	II-3-1
2.3.2	Development Plans and Legal Frameworks related to the COBSI Approach.....	II-3-2
2.3.3	Survey Results related to the COBSI Approach (Present Situation and Issues)	II-3-4
2.3.4	Proposal for the Further Cooperation and Support.....	II-3-7

List of Tables

Table 1	Visited Organizations for Information Collection (Côte d'Ivoire)	II-3-1
Table 2	Key Legal Frameworks on Environmental and Social Considerations in Côte d'Ivoire ..	II-3-2
Table 3	Draft Cooperative Contents of the COBSI Approach for Côte D'Ivoire	II-3-9

List of Figures

Figure 1	Small-Scale Irrigation Potential Distribution (Côte d'Ivoire).....	II3-1
Figure 2	Irrigation Canal and Paddy Plots in Developed Irrigation Sites (Bouaké)	II3-4
Figure 3	Vegetable Cultivation in Downstream Areas of a Developed Irrigation Site (Yamoussoukro)	II3-4
Figure 4	Potential Stream for COBSI (Adzopé).....	II3-5
Figure 5	Palm Plantation in Southern Côte d'Ivoire	II3-6
Figure 6	Agricultural Chemicals Used in Farmlands in Côte d'Ivoire.....	II3-7
Figure 7	Côte d'Ivoire Small-Scale Irrigation Potential Map	II3-8
Figure 8	Implementation Structure for the COBSI Approach in Côte d'Ivoire (Draft).....	II3-13

List of Abbreviation

	(English)	(French)
ADR	Agent Rural Development	Agent de Développement Rural
AfDB	African Development Bank	Banque Africaine de Développement
ANADER	National Agency for Support to Rural Development	Agence Nationale d'Appui au Développement Rural
ANDE	National Agency for the Environment	Agence Nationale de l' Environnement
DGE	Directorate General of the Environment	Direction Générale de l'Environnement
DGRE	Director General of Water Resources	Direction Générale des Ressources en Eau
EMP	Environmental Management Plan	Plan Cadre de Gestion Environnementale et Sociale (PCGES)
ESIA	Environmental and Social Impact Assessment	l'évaluation d'impact environnemental et social (ÉIES)
MEF	Ministry of Waters and Forests	Ministère des Eaux et Forêts
MINEMINADER	Ministry of Agriculture and Rural Development	Ministère de l'Agriculture et du Développement Rural
MINSEDD	Ministry of the Environment, Hygiene, and Sustainable Development	Ministère de la Salubrité, de l'Environnement et du Développement Durable
OCPV	Commodities Marketing Support Board	Office d'aide à la Commercialisation des Produits Vivriers
PNIA	National Agricultural Investment Program	Programme National D'Investissement Agricole
PRORIL	Local Rice Promotion Project	Projet de Promotion du Riz Local
TSCA	Technical Specialist of Annual Crops	Technicien Spécialisé en Cultures Annuelles
TSOPA	Technical Specialist of Professional Agriculture Organization	Technicien Spécialisé en Organisations Professionnelles Agricoles
UN	United Nations	Nations Unies(NU)
UNEP	United Nations Environment Programme	Programme des Nations Unies pour l'environnement (PNUE)
WB	World Bank	Banque mondiale(BM)

2.3.1 Field Survey Outline

(1) Survey outline

Field surveys were conducted from March 19 to April 6, 2022, and the organizations listed in Table 1 below were approached to collect relevant information. The areas targeted for field surveys were determined on the basis of high small-scale irrigation potential identified from detailed satellite image analysis conducted in advance and in consideration of a travel restriction by the JICA Côte d'Ivoire office (within 7 hours' drive one-way from Abidjan). The Survey Team visited Yamoussoukro and six (6) Regions (regional seats in parentheses): Gbêkê (Bouaké), Gôh (Gagnoa), Lôh-Djiboua (Divo), Grands Ponts (Dabou), La Mé (Adzopé), and Sud-Comoé region (Aboisso). The field surveys' scope included natural conditions such as hydrology and topography, conditions of existing irrigation sites (including facilities), of farmlands and farming, and of markets alongside interviews with farmers.

Table 1 Visited Organizations for Information Collection (Côte d'Ivoire)

Category	Visited Organization
Ivoirian Government	✓ State Ministry of Agriculture and Rural Development (MINEMINADER) Directorate of Irrigation and Infrastructure Enhancement - Directorate of Vegetable Crops and Food Security ✓ National Agency for Support to Rural Development (ANADER) ✓ Ministry of the Environment and Sustainable Development (MEDD) Directorate of the Environment ✓ Commodities Marketing Support Board (OCPV) ✓ Ministry of Water and Forestry (MEF)
Others	✓ Local Rice Promotion Project Phase 2 (PRORIL 2)

Source: JICA Survey Team

(2) Small-Scale Irrigation Potential Areas

Figure 1 shows small-scale irrigation potential distribution in Côte d'Ivoire (indicated in purple) based on detailed satellite image analysis results. Except for some areas in the northeast, annual precipitation exceeds 1,000 mm across the country, and most areas were identified as having potential based, additionally, on surface runoff, topographic gradient, soil types, surrounding populations and land use.

Red boxes in the Figure indicate the locations of Yamoussoukro and the six (6) provinces where field surveys were conducted.

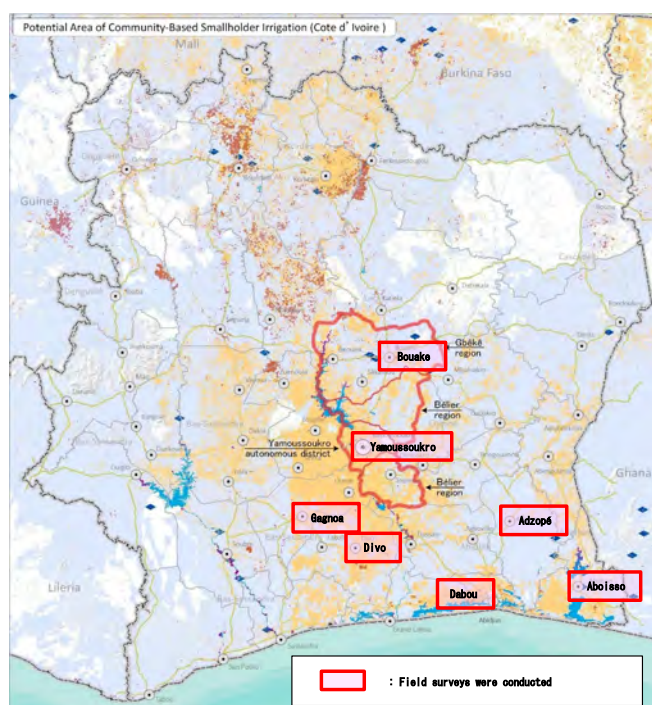


Figure 1 Small-Scale Irrigation Potential Distribution (Côte d'Ivoire)

Source: JICA Survey Team

2.3.2 National Development Plans and Legal Frameworks Related to the COBSI Approach

(1) National Development Plan (2021-2025)

The “*Plan National de Développement (PND)*” consists of five (5) pillars for economic and social innovation, including agriculture and nutrition. This Plan also includes strategies, one of which is related to agriculture and rural development and focuses on the increase of agricultural productivity, achievement of high-quality rice self-sufficiency, and rice-farming mechanization. It also sets some goals, for instance achievement of 100% rice self-sufficiency and reduction of stunting percentage in children under 5 years old to 17% by 2025.

(2) National Agricultural Investment Program II (2017-2025)

The first “*Programme National D’Investissement Agricole*” (PNIA I, 2012-2017) identified challenges in the agricultural sector in Côte d’Ivoire, namely 1) low productivity, 2) food and nutrition insecurity, 3) low income per farmer, 4) negative environmental impacts of the agricultural sector such as climate change, and 5) improvement of agricultural land management systems.

PNIA II, developed in 2017, in contrast, is a framework to promote public and private investment in the agricultural sector over the next eight (8) years, aiming for poverty reduction by half and zero hunger by 2025 through the development of sub-sectors, including agriculture, livestock, fisheries, aquaculture, and environmental management. PNIA II also proposes a vision of sustainable and competitive agriculture and puts an emphasis on even benefit sharing. It specifically focuses on value-added agricultural, livestock, and fishery products, promotion of sustainable agriculture inclusive of livestock and fishery, comprehensive growth, and rural development.

(3) National Rice Development Strategy Version 2 (2020-2030)

The “*Stratégie Nationale de Développement de la Riziculture (SNDR) 2*” (2020-2030) was prepared in March 2020 as a second version of the revised National Rice Development Strategy (2012-2020). This development strategy aims for rice self-sufficiency by 2025 whereby Côte d’Ivoire will become one of the leading rice exporters in African countries by 2030 through 1) rehabilitation of about 55,000 ha of State-owned farmlands and sixty-four (64) dams, 2) implementation of rice projects, 3) outsourcing of rice hulling and processing to the private sector, 4) production of high-yield seeds, and 5) mechanization of irrigated areas, among others.

(4) Legal Frameworks on Environmental and Social Considerations

Key legal frameworks on environmental and social considerations in Côte d’Ivoire are shown in Table 2.

Table 2 Key Legal Frameworks on Environmental and Social Considerations in Côte d’Ivoire

No.	Name of Legal Framework	Summary of Provisions
1	Law No. 96-766 of October 3rd, 1996	Establishment of principles on ESIA implementation
2	Decree No. 96-894 of November 8th, 1996	Concrete procedure for an ESIA
3	Order No. 00972 of November 14th, 2007	Improvement of the quality of ESIA reports and strengthening of ANDE activities
4	Decree No. 2005-03 of January 6th, 2005	Environmental and social management plan
5	Law No. 88-651 of July 7th, 1988	Management of hazardous and toxic industrial waste
6	Law No. 2002-102 of February 11th, 2002	Establishment of national parks and protected areas
7	Law No. 98-755 of December 23rd, 1998	Water management
8	Law No. 2014-424 of July 14th, 2014	Forestry protection

No.	Name of Legal Framework	Summary of Provisions
9	Law No. 66-122 of March 31st, 1966	Determination of conserved trees and plants
10	Law No. 65-255 of August 4th, 1965	Determination of conserved and protected fauna and hunting management
11	Order No. 01164/MINEEF/CIAPOL/SDIIC of November 4th, 2008	Emission regulations regarding exhaust gas, wastewater, noise and vibration

Source: JICA Survey Team (2022)

Annex 1 of Decree No. 96-894 provides examples of projects for which an ESIA is mandatory, and the National Agency for the Environment (“*Agence Nationale de l’Environnement – ANDE*”)—under the Ministry of the Environment, Hygiene, and Sustainable Development (“*Ministère de la Salubrité, de l’Environnement et du Développement Durable – MINSEDD*”)—has the final decision on it. The specific procedures are as follows:

Procedure 1: The project proponent officially reports information regarding the project by letter or email to the ANDE.

Procedure 2: The project proponent prepares the ESIA survey’s Terms of Reference (TOR).

- (a) The TOR can be prepared by the project proponent and submitted to the ANDE for appraisal, or
- (b) The project proponent can directly request the ANDE to prepare the TOR.
- (c) The ANDE determines the necessity of an ESIA survey for the project as the very last step of this procedure.

Procedure 3: If an ESIA survey is required, the project proponent shall select consultants certified by the ANDE to conduct the survey.

- (a) The project proponent can select from a list of 20 certified consultants and contract with them directly, or
- (b) The project proponent can call for tender.

Procedure 4: Certified consultants conduct the ESIA as follows:

- (a) Organizing public hearings;
- (b) Assessing environmental and social impacts for the ESIA report, including EMP for submission to the ANDE;
- (c) Organizing public hearings in conformity with county and internal provincial committees legislation to inform community members about the project and collect opinions.

Procedure 5: Concurrent review and approval of the ESIA and the public hearing reports by an internal committee in the Ministry

According to said Annex, ESIA implementation is mandatory for agricultural development projects if the beneficiary area is more than 999 ha; it is, therefore, not applicable to the COBSI Approach. As a first step, however, project information shall be provided to the ANDE in accordance with the above Procedure 1 and the necessity of ESIA implementation and compliance with procedures stipulated by the law need to be confirmed.

2.3.3 Survey Results (Current Situation/Identified Issues)

(1) Irrigation, Water Management and Maintenance

The Directorate of Irrigation and Infrastructure Enhancement under MINEMINADER¹ is in charge of Irrigation development in Côte d'Ivoire where only about 73,000 ha out of the 475,000 ha (about 15%) of irrigable areas has been developed so far, leaving high enough potential for future irrigation development.

The central areas (Yamoussoukro and Bouaké) where field surveys were conducted receive about 1,000 mm of precipitation annually. Given that rivers are limited throughout the year, reservoirs have been preferentially constructed, as a national policy, in the country's central and northern areas where rainfall is relatively low and many irrigation sites have already been developed. Most of these reservoirs—built with watercourses, drainage canals, intake gates, and plots—were constructed in the 1960s and 1970s. Irrigation sites with such reservoirs can produce two or three cycles of rice a year and have allowed many farmers to also grow vegetables (cf. Figure 2).



Figure 2 Irrigation Canal and Paddy Plots in Developed Irrigation Sites (Bouaké)

Source: JICA Survey Team (March 2022)

Irrigation water has been observed to be insufficient downstream developed irrigation sites, which is indicative of farmers' limited ability to manage water and maintain the facilities. As a result, farmers tend to cultivate rice in upstream areas and vegetables more downstream (cf. Figure 3).

Regarding existing facilities, no major damage was observed on concrete irrigation canals which seemed to lack maintenance, as weeds and soil deposits were not removed. In addition, drainage is done through earthen canals which frequently sustain damage from outside flood inflows, the main reasons being insufficient drainage canal cross-section sizes and untreated sediment soil in channels outside of the site. Maintenance and management activities performed by farmers themselves are inadequate, so they are relying on government support though not receiving sufficient assistance.

In Yamoussoukro, there is a reservoir site equipped with a spillway but without water intake gates and irrigation/drainage canals yet. Irrigated agriculture is also practiced during the dry season, with rice cultivated in the lower part of the site and vegetables in higher places. Small engine pumps are used along downstream banks to freely irrigate nearby fields.



Figure 3 Vegetable Cultivation in Downstream Areas of a Developed Irrigation Site (Yamoussoukro)

Source: JICA Survey Team (March 2022)

¹ "Ministère d'État, Ministère de l'agriculture et du développement durable"

In the southern areas (Gagnoa, Divo, Dabou, Adzopé, and Aboisso), annual precipitation exceeds 1,200 mm and there are many perennial streams, though there are also many non-developed irrigated sites. Many of those streams offer high potential to apply the COBSI approach. In addition, because of the high annual rainfall, rainfed plantation farming of crops such as oil palm (palm oil), cacao and rubber trees are widely practiced in the area. Along streams, vegetables are irrigated using watering cans and buckets which are judged inefficient, because water resources are not effectively utilized, resulting in limited irrigated areas.



**Figure 4 Potential Stream for COBSI
(Adzopé)**

Source: JICA Survey Team (March 2022)

In Adzopé, a steel-gate type intake weir, irrigation canals, and irrigation fields were constructed and developed on a site in the 1970s, but the gate is now severely damaged and the intake weir is no longer functional. It was generally observed that fewer irrigation sites were developed in the southern areas.

(2) Extension Activities and Farmers' Organizations

In Côte d'Ivoire, the National Agency for Support of Rural Development under MINEMINADER, locally called ANADER (*"Agence Nationale d'Appui au Développement Rural"*), is responsible for rural extension activities across the whole country zoned into seven (7) Blocks and fifty-seven (57) Zones. The Survey Team first visited ANADER's zone offices to collect information before going on site to conduct field surveys. Each zone is divided into Extension Centers to which one (1) or two (2) extension officers get assigned. The Yamoussoukro zone office in the Bouaké Block has, for example, twenty-seven (27) Extension Centers, with one (1) extension officer assigned to each. There are approximately two thousand (2,000) extension officers nationwide, all of whom are equipped with motorcycles. However, the area covered by each extension officer is large, and visits to villages are consequently reduced, except during project implementation.

Regarding farmers' organizations, weaknesses in systems and activities in developed irrigation sites have been identified. For example, by-laws are not documented even when associations are set up, and maintenance activities for irrigation facilities are not performed regularly by association members.

It is worth noting that since ANADER is at the dissemination front line, it collaborates with other ministries and agencies outside of the agricultural sector, so is, for instance, sometimes called to distribute mosquito nets.

(3) Farming and Marketing

Approximately 50% of Côte d'Ivoire's rice, domestically considered as a "political commodity", is imported, as domestic production is insufficient. Possible reasons for such insufficiency is farmers in some areas continue to use the same seeds repeatedly when they lack funds, when the amount of quality seeds in distribution is not sufficient, or when there are no agricultural supply dealers in nearby villages. In spite of that, there are some case where quality rice seeds are distributed freely to farmers by ANADER and other organizations and others where farmers either use seeds obtained from ANADER and pay for them after harvest, or purchase them at agricultural supply dealers.

Vegetables such as tomatoes are also imported due to insufficient domestic production. In general, the

supply of rice and vegetables decrease during the dry season due to lack of water, which leads to an inevitable increase in sales prices compared to the rainy season. Sometimes, however, there is no change between the dry and the rainy seasons, because middlemen impose prices.

Interviewed farmers consider vegetable cultivation to be profitable, especially during the dry season when demand for vegetables is high. Regarding rice consumption, consumer preferences have, in recent years, gradually shifted to aromatic rice despite inadequacy of rice production, implying that quality is becoming a criterion of choice.

(4) Environmental and Social Considerations

1) Forest Coverage Decline Caused by Plantation Expansion

In Côte d'Ivoire, there are many large-scale plantations of coffee, natural rubber, oil palm, and other crops besides cocoa beans the country is a world dominant producer of (cf. Figure 5). Slash-and-burn farming is still conducted in plantation development, which has led to the reduction of natural forests and the degradation of the soil's water retention capacity. In this regard, the United Nations Environment Programme (UNEP) points out plantation as a major factor in the country's forest coverage decline².



**Figure 5 Palm Plantation in Southern
Côte d'Ivoire**

Source: JICA Survey Team (March 2022)

In southern areas such as Adzopé, Aboisso, Dabou, Divo, and Gagnoa where field surveys were conducted, the division of tasks among men and women seemed fairly clear with the former mainly doing heavy plantation work and the latter performing relatively labor-intensive vegetable cultivation.

2) Impacts Caused by Climate Change

According to an AfDB report³, climate change has also caused temperatures to raise between 1979 and 2015 in Côte d'Ivoire, and it is predicted that agricultural production will continue to be affected by such change in areas climatically suitable for agricultural production, by an increased risk of crop exposure to water stress (a condition in which water supply and demand are tight), etc. “*Direction Générale des Ressources en Eau (DGRE)*” Deputy Director expressed his expectation—during a field survey enabling the JICA Survey Team to explain the COBSI Approach—that the introduction of COBSI promoting efficient water use could help farmers who are already facing challenges in their farming activities due to the impacts of climate change.

² Post-Conflict Environmental Assessment (2015, UNEP):

https://postconflict.unep.ch/publications/Cote%20d'Ivoire/UNEP_CDI_PCEA_EN.pdf

³ National Climate Change Profile (2018, AfDB):

<https://www.afdb.org/en/documents/cote-divoire-national-climate-change-profile>

⁴ Directorate General of Water Resources

3) Inappropriate Use of Agricultural Chemicals

According to the Directorate General of the Environment (“*Direction Générale de l’Environnement – DGE*”) under MINSEDD, while significant environmental impacts caused by irrigation projects are not seen in Côte d’Ivoire, inappropriate use of agricultural chemicals such as excessive application is a source of concern. Empty bottles of agricultural chemicals such as herbicide were, for instance, found disposed of near farmlands during our field survey (Figure 6).



**Figure 6 Agricultural Chemicals Used
in Farmlands in Côte d’Ivoire**

Source: JICA Survey Team (March 2022)

The majority of interviewed farmers replied that they used such chemicals, some having been trained by extension workers on their proper use, while others had received no training at all.

4) Water Conflicts

According to the DGRE of the Ministry of Water and Forestry (“*Ministère des Eaux et Forêts – MEF*”), farmers are surface water users next to fishermen, animal breeders, illegal gold diggers, etc.; there are risks of water conflicts between farmers and those others users if water rules are not instituted. The DGRE pointed out, further, that cooperation between the Ministry of Agriculture and Rural Development (“*Ministère de l’Agriculture et du Développement Rural – MINADER*”) and MEF is essential to prevent such conflicts and expects to include the MEF into the project implementation for the technical management.

(5) Nutrition

The National Agency for Support to Rural Development (“*Agence Nationale d’Appui au Développement Rural – ANADER*”), which the MINADER has entrusted extension activities to, assigns extension workers in charge of nutrition issues. An ANADER officer indicated the country’s nutritional situation can be comparatively better in the rainy season when water is more accessible and crop cultivation flourishes, farmers having crops in hand for their own consumption. In the dry season, however, nutritional conditions tend to deteriorate, as cultivation itself is impacted by lack of irrigation water.

Côte d’Ivoire is also characterized by undiversified regional agriculture, leading to farmers having to pay high transportation costs if nutrients are recommended to be obtained from a particular crop. From a nutritional standpoint, it is possible to get the necessary nutrients from alternative crops, but whether farmers actually grow them with such knowledge is uncertain. Further, a nutritionally unbalanced diet composed of yams and bananas without any side dishes at mealtimes seems to have become usual among people. Under such circumstances, the ANADER is working with extension workers (“*Agents de Développement Rural - ADR*”) to provide guidance and other activities to improve nutrition.

2.3.4 Proposed Plans for Future COBSI Approach Cooperation

(1) Target areas

In Yamoussoukro and the six regions where field surveys were conducted, irrigation facilities and natural environment conditions differed from area to area, but the potential for introducing the COBSI approach was identified in all areas. In addition, interviews were conducted with ANADER and other government

officials regarding situations in regions the Survey Team could not visit this time. Based on comprehensive consideration of the results of those surveys, division of candidate areas for the introduction of the COBSI package in Côte d'Ivoire in two (2) was decided: Northern/central and southern/western areas (cf. Figure 7).

In the northern/central area, although the number of perennial streams is limited, facilities and water management and maintenance capacities are expected to be enhanced by applying COBSI techniques in already developed irrigation sites (red line in Fig. 7).

The western/southern area has, on the other hand, many perennial streams and non-developed sites, so the existing COBSI approach can be adapted (blue line in Figure 7).

(2) Proposed Plans and Concept

New projects introducing COBSI package technology in Côte d'Ivoire were examined by dividing the targets into four categories based on irrigation facilities and stream conditions. New project proposals with respective concepts, activities (hard and soft), and potential areas are summarized in Table 3.

The common concept for all categories is to increase rice and vegetable production through enhanced water management and maintenance capacities to which facilities maintenance will be added in sites where facilities are not developed.

Regarding activities for developed sites, Plan 1 applies COBSI technology to maintain drainage canals, whereas Plan 2 helps construct intake gates and irrigation canals using COBSI technology. Designed for *unimproved* sites, Plan 3 implements the traditional COBSI approach from scratch where simple weirs and earthen canals are constructed and used to irrigate farming before a future upgrade to permanent weirs. Plan 4 is almost the same as Plan 3, except that it, instead, rehabilitates some facilities which are still in place but not functioning. A common activity for all those plans is either construction of new fishponds, or use of existing rice paddies as fishponds for nutrition improvement.

Software activities include strengthening the capacity of irrigation engineers and extension officers, developing water management and facilities maintenance manuals, conducting water management/facilities maintenance training, and introducing market orientation through SHEP. The introduction of community-based watershed conservation (fencing, sediment ponding) is particularly important in developed sites.

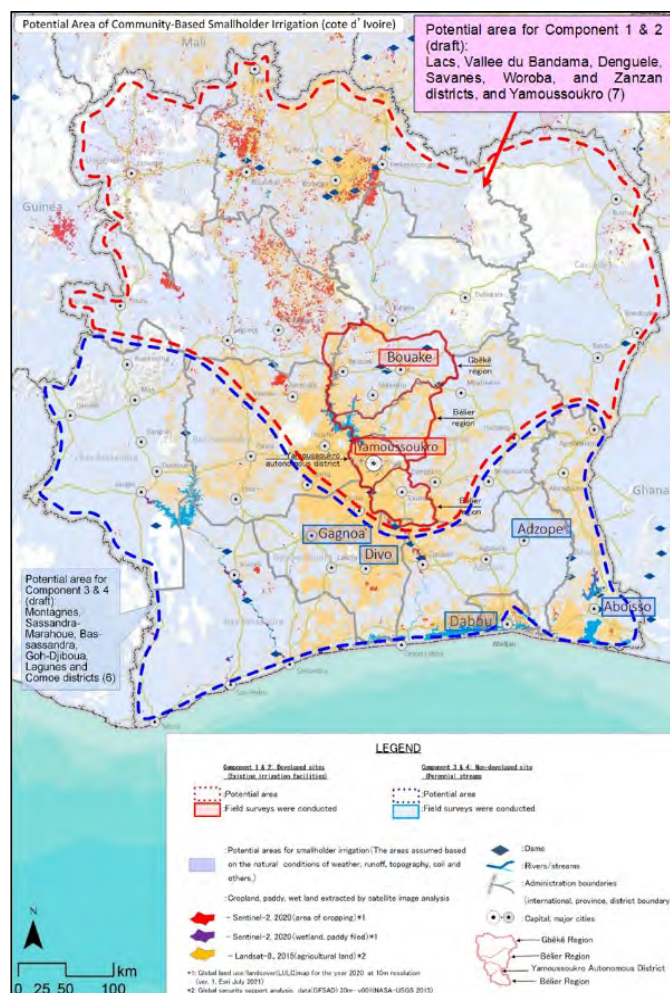


Figure 7 Côte d'Ivoire Small-Scale Irrigation Potential Map

Source: JICA Survey Team

Regarding potential partner projects, PRORIL 2 is supporting the expansion of financial services to rice millers and dealers for seed production quality and post-harvest handling improvement in developed sites, mainly in central areas. Supporting water management and maintenance capacity enhancement through the COBSI approach will allow for more stable irrigation water availability which is expected to increase production not only of rice, but also of vegetables.

Table 3 Draft Cooperative Contents of the COBSI Approach for Côte D'Ivoire

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Survey Target / Area	Developed sites (1) (Existing irrigation facilities) Central area: Yamoussoukro, and Bouaké	Developed sites (2) (Existing irrigation facilities) Central area: Yamoussoukro	Non-developed sites (1) (Perennial streams) Southwestern, southern, and coastal areas: Adzopé, Aboisso, Dabou, Divo, and Gagnoa	Non-developed sites (2) (Perennial streams) Southern and coastal areas: Adzopé, and Aboisso
Findings related to Small-scale Irrigation	• There are existing reservoirs, irrigation/ drainage canals, intake gates, and fields, and irrigated agriculture in the dry season has been conducted richly. Most reservoirs were constructed in the 1960s or 1970s. • Farmers' level of knowledge of water management and capabilities of operation and maintenance are not sufficient. Downstream of irrigated areas, especially, tend to lack irrigation water due to insufficient water management. In addition, operation and maintenance are left solely in the hands of the government. • Due to the inflow of floodwater from outside of the irrigated areas, crops and facilities are frequently damaged by	• While there are existing reservoirs and spillways, no intake gates or irrigation/ drainage canals have been developed. • Irrigated agriculture in both the rainy and dry seasons has been richly conducted. • While rice production is conducted in areas where the elevation is lower, vegetable cultivation is performed on higher altitudes. • There are farmers who use pumps with small engines to irrigate uplands along rivers downstream of spillways, enjoying irrigation water freely.	• There are many perennial streams in western and southern areas where the annual rainfall volume exceeds 1,200mm. However, no irrigation system has been installed yet in most areas. • Since inefficient irrigation using watering cans and buckets is conducted, irrigated areas are narrow and water resources have not been used efficiently. • Plantation farming of oil palm (palm oil), cacao, and rubber trees is mainly performed by male farmers. • Vegetable cultivation, which is relatively labor-intensive, is mainly conducted by female farmers.	• While there are areas with iron gate weirs, irrigation canals, and fields which were developed in the 1970s, the weirs are no longer functional due to significant damages on the gates. • Since inefficient irrigation using watering cans and bucket is conducted, irrigated areas are narrow and water resources have not been used efficiently. • Rice is cultivated in the rainy season, while vegetables are grown during the dry season.

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Survey Target / Area	Developed sites (1) (Existing irrigation facilities) Central area: Yamoussoukro, and Bouaké	Developed sites (2) (Existing irrigation facilities) Central area: Yamoussoukro	Non-developed sites (1) (Perennial streams) Southwestern, southern, and coastal areas: Adzopé, Aboisso, Dabou, Divo, and Gagnoa	Non-developed sites (2) (Perennial streams) Southern and coastal areas: Adzopé, and Aboisso
	floods. The considered reasons for such inflow are inappropriate drainage canal sections/ capacity of irrigated areas, lack of maintenance work such as desilting drainage canals. - In areas with reservoirs, double or triple rice cultivation in a year is possible. In addition, there are many farmers who cultivate vegetables besides rice. [Extension Activities] - The ANADER is in charge of extension services. (There are 57 zones under 7 blocks in the country. Several extension centers are established in each zone, and 1 to 2 extension workers are assigned to each center. Then, all over the country, there are around 2,000 extension workers. Although extension workers have been equipped with motorbikes, the number of field visits to target villages has decreased, except for when there is a specific project or program, due to the vastness of the areas they have to cover.) [Cooperative Activities] - While there are organized cooperatives in the country, it is seen in some cases that their systems and activities are vulnerable. (For example, the regulation of the cooperatives has not been documented yet, and/or operation or operation & maintenance activities such as regular maintenance of irrigation facilities have not been properly conducted by members.) [Cultivation] - Regarding access to certified seeds of rice, there are various cases where ADERIZ, ANADER, etc. provide seeds to farmers free of charge, where farmers pay for seeds they received only after harvests, or where farmers purchase them from agricultural pharmacies themselves. Due to financial problems or physical inaccessibility, however, some farmers repeatedly use their own seeds for the following seasons, which inevitably reduces their productivity, and/or some locations are simply not able to meet the demand for seeds. [Market] - While rice is identified as an important staple food, half the amount of the supply volume has to be imported due to the shortage of domestic production. There is also a growing emphasis on the quality of rice, as consumers have recently shown preference for aroma rice. - Due to the shortage of domestic production of vegetables such as tomatoes, their supply volume is also dependent on import.			

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Survey Target / Area	Developed sites (1) (Existing irrigation facilities)	Developed sites (2) (Existing irrigation facilities)	Non-developed sites (1) (Perennial streams)	Non-developed sites (2) (Perennial streams)
	Central area: Yamoussoukro, and Bouaké	Central area: Yamoussoukro	Southwestern, southern, and coastal areas: Adzopé, Aboisso, Dabou, Divo, and Gagnoa	Southern and coastal areas: Adzopé, and Aboisso
	- While the selling prices of rice and vegetables in the dry season are higher than ones in the rainy season due to water shortage, cases where middlemen set almost the same prices for both seasons have been observed. - Since farmers tend to think that vegetable cultivation is more profitable, related needs are high especially in the dry season. [Environment] - In general, the excessive use of agricultural chemicals is recognized as one of the issues caused by agricultural activities. Further, the acreage of natural forest has decreased due to slash-and-burn or plantation agriculture. - Changes in rainfall patterns caused by climate change have been observed. [Nutrition] - Especially in rural areas, problems related to unbalanced diets are seen, and malnutrition is particularly prominent.			
Concept Summary	Increase in production of rice and vegetables through enhancement of water, operation and maintenance management	Increase in production of rice and vegetables through improvement of intake gates and canals, as well as enhancement of water, operation and maintenance management	improvement of female farmers' income through upland farming in the dry season as well as of nutrition through food diversification	Increase in production of rice and vegetables through improvement of intake facilities and enhancement of water, operation and maintenance management
Package of Components	- Introduction of operation and maintenance technology for drainage canals based on the advanced COBSI approach - Enhancement of aquaculture: use of existing paddy fields as fishponds	- Improvement of intake gates, and irrigation canals through application of the COBSI approach - Enhancement of aquaculture: use of existing paddy fields as fishponds	- Construction of simple weirs and irrigation canals - Construction of permanent weirs - Enhancement of aquaculture: use of existing paddy fields as fishponds	- Construction of simple or permanent weirs, and rehabilitation of irrigation canals - Enhancement of aquaculture: use of existing paddy fields as fishponds
Package of Soft Components	- Capacity building of irrigation technicians and extension workers (✓) - Development of manuals on water, operation and maintenance management (✓) - Provision of training on water, operation and maintenance management (✓) - Promotion of E-	- Capacity building of irrigation technicians and extension workers (✓) - Development of manuals on water, operation and maintenance management (✓) - Provision of training on water, operation and maintenance management (✓) - Promotion of E-	- Capacity building of irrigation technicians and extension workers (✓) - Development of manuals on water, operation and maintenance management (✓) - Provision of training on water, operation and maintenance management (✓) - Promotion of E-	- Capacity building of irrigation technicians and extension workers (✓) - Development of manuals on water, operation and maintenance management (✓) - Provision of training on water, operation and maintenance management (✓) - Promotion of E-

Item	COMPONENT-1	COMPONENT -2	COMPONENT -3	COMPONENT -4
Survey Target / Area	Developed sites (1) (Existing irrigation facilities) Central area: Yamoussoukro, and Bouaké	Developed sites (2) (Existing irrigation facilities) Central area: Yamoussoukro	Non-developed sites (1) (Perennial streams) Southwestern, southern, and coastal areas: Adzopé, Aboisso, Dabou, Divo, and Gagnoa	Non-developed sites (2) (Perennial streams) Southern and coastal areas: Adzopé, and Aboisso
	extension and dissemination by farmers themselves (FFS and FFD) • Promotion of training on horticulture crop production, including a topic on the appropriate use of agricultural chemicals • Introduction of Market-oriented, SHEP approach (✓) • Introduction of community-based watershed conservation (fencing and ditch) (✓) • Promotion of training for nutrition improvement • Introduction of the concept of water rights	extension and dissemination by farmers themselves (FFS and FFD) • Promotion of training on horticulture crop production, including a topic on the appropriate use of agricultural chemicals • Introduction of Market-oriented, SHEP approach (✓) • Introduction of community-based watershed conservation (fencing and ditch) (✓) • Promotion of training for nutrition improvement • Introduction of the concept of water rights (✓)	extension and dissemination by farmers themselves (FFS and FFD) • Promotion of training on horticulture crop production, including a topic on the appropriate use of agricultural chemicals • Introduction of Market-oriented, SHEP approach (✓) • Introduction of community-based watershed conservation (fencing and ditch) (✓) • Promotion of training for nutrition improvement (✓) • Introduction of the concept of water rights	extension and dissemination by farmers themselves (FFS and FFD) • Promotion of training on horticulture crop production, including a topic on the appropriate use of agricultural chemicals • Introduction of Market-oriented, SHEP approach (✓) • Introduction of community-based watershed conservation (fencing and ditch) (✓) • Promotion of training for nutrition improvement (✓) • Introduction of the concept of water rights
Potential Sites (ha)	Central area*	Central area*	Western and southern areas**	Western and southern areas**
Projects being able to collaborate	PRORIL-2			

Note 1: * Potential sites in the central area are Lacs and Vallée du Bandama Districts and Yamoussoukro.

** Potential sites in the western and southern areas are Montagnes, Sassandra-Marahoue, Bas-sassandra, Goh-Djiboua, Lagunes, and Comoe Districts.

Note 2: “(✓)” in the table shows prioritized components.

Source: JICA Survey Team

Concerning cooperation schemes for new projects, the Survey Team proposes to dispatch short-term experts to start with a pilot project which would be limited to two (2) or three (3) regions such as the central area (Bouaké) and the southern areas (Adzopé and Dabou) and focus on establishment of model sites and development of human resources. Then, the project could be expanded nationwide through Technical Cooperation.

Moreover, by promoting Côte d'Ivoire as a hub for COBSI expansion in West Africa, it is expected to lead to wider outreach through regional integration involving, especially, neighboring French-speaking countries such as Togo and Benin.

(3) Implementation Structure (Draft)

Figure 8 below shows the proposed implementation structure for the COBSI approach. COBSI's dissemination system will be divided into Central, Zone, and Local (dissemination to farmers) levels. The main implementation agency will be the Directorate of Irrigation and Infrastructure Enhancement under MINEMINADER, with ANADER as the cooperating agency. This Directorate has about thirteen (13) Central-level irrigation technicians traveling to but not stationed in the regions; ANADER also has irrigation engineers though assigned only to the headquarters.

JICA experts, the Directorate of Irrigation and Infrastructure Enhancement, and central-level ANADER officials will collaborate to train technical experts at ANADER's Zone Offices by conducting TOT. Then, government officials from the Zone Office are next in line to provide training directly to ANADER's extension officers (ADRs), followed by expansion to farmers' groups. This training, which includes KOT, MTT, and an AEW, will be conducted three times a year.

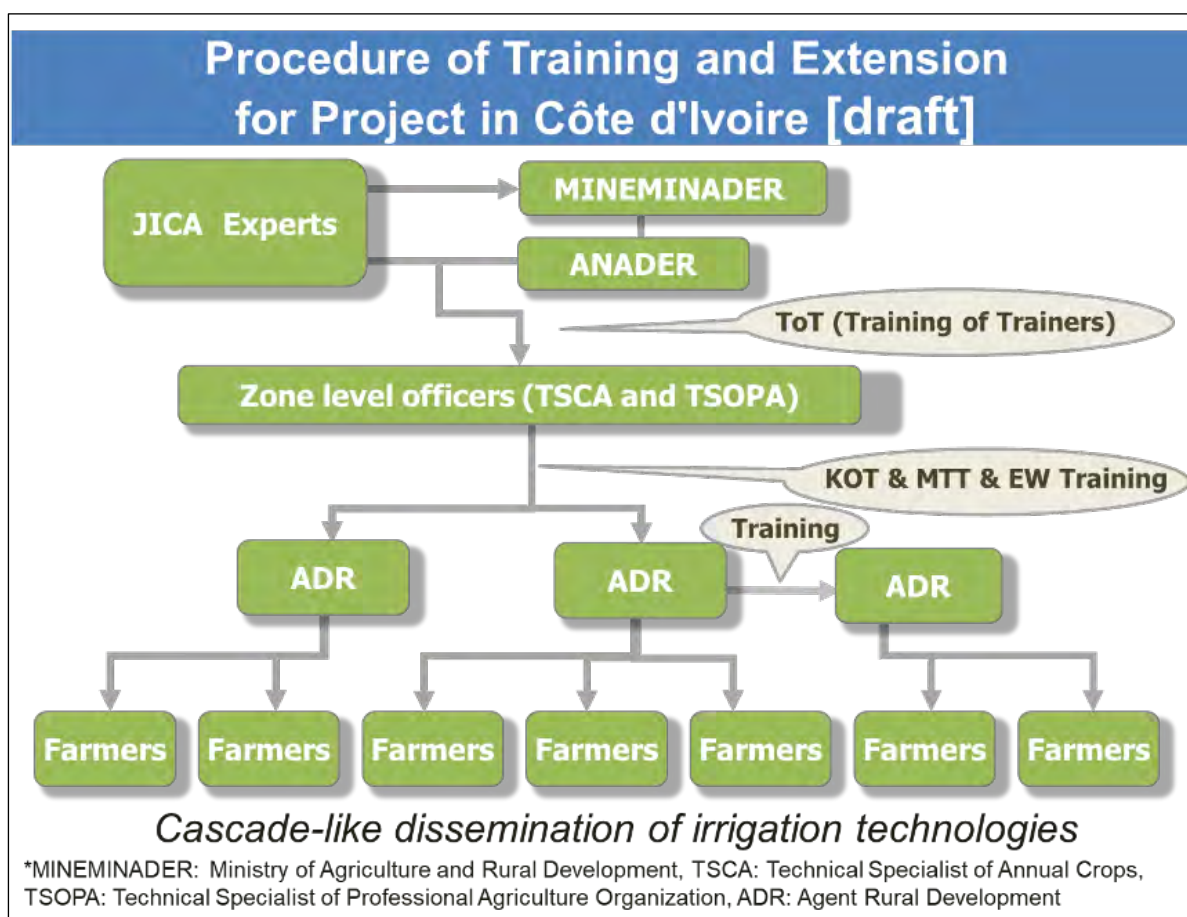


Figure 8 Implementation Structure for the COBSI Approach in Côte d'Ivoire (Draft)

Source: JICA Survey Team

2.4 TANZANIA

Survey Areas in Tanzania

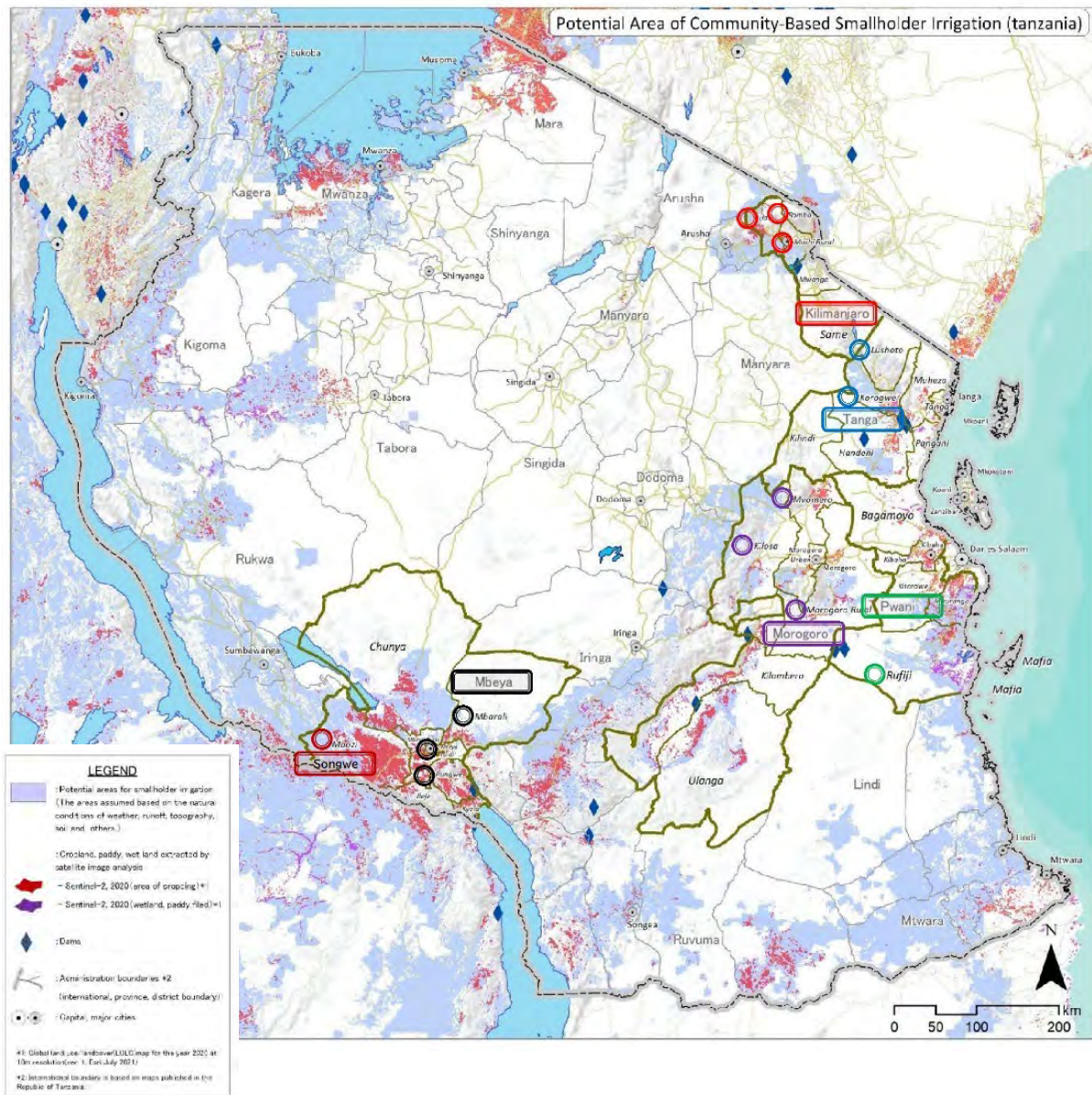


Photo Album

	
Ministry of Water, Dodoma Dr. Sagawa (right), Leader of the JICA Survey Team, presenting the COBSI approach at the beginning of the Survey, followed by an exchange of opinions about efficient water usage and irrigation practices, sedimentation management, etc. (9/June/2022)	National Irrigation Commission (NIRC), Dodoma The NIRC could be the main counterpart organization for COBSI implementation. Mr. Daudi Kaali—Director of Planning, Monitoring & Evaluation—stated that the NIRC plans to strengthen its administrative structure from 2023 on by increasing offices at district level. (9/June/2022)
	
Ministry of Agriculture (MOA) – DMI & EMU, Dodoma The Team had discussions with the DMI and EMU. Eng. Mwangamilo (center), DMI Director, shared interesting perspectives on COBSI, especially as regards support to small-scale farmers. (10/June/2022)	MOA – DTER & DCD, Dodoma Dr. Mashaka Mdanji, DTER Asst. Director (center) emphasized the possibility to introduce the COBSI approach in the country. The discussion focused on the current situation of farming extension services and new cultivation methods as well as their dissemination. (10/June/2022)
	
PoRALG, Dodoma In order to disseminate this approach, collaboration between NIRC and PoRALG is essential, given that COBSI is an extension program. In that regard, Eng. Enock Nyanda—ADEP Asst. Director (second from left)—stated the real possibility of LGAs to take the initiative in promoting COBSI. (10/June/2022)	NIRC Morogoro Regional Office, Morogoro Dr. Sagawa reported observation of irrigation schemes similar to the COBSI approach to Regional Irrigation Eng. Boniface Mkita who mentioned that there were plenty of suitable places for COBSI in the area. Dr. Sagawa said, in response, that COBSI can contribute to increasing existing irrigation areas. (22/June/2022)

	
Rombo District, Kilimanjaro Region [Improved scheme] Irrigation of the area was started in the 1950s using local materials, then the Government upgraded the facilities composed of weirs and canals into concrete. Surrounding farmers rotate irrigation once per week. (14/June/2022)	Hai District, Kilimanjaro Region [Traditional scheme] A kind of simple weir made of wood and banana trunks was observed. Depending on this facility are farmlands of 200 acres where crops such as banana, vegetables, maize, and coffee are cultivated by using the irrigation water. (14/June/2022)
	
Korogwe District, Tanga Region While this area has an annual rainfall of 750mm/year, the main water sources are mountain springs. Only 15ha out of a potential irrigation area of 100ha is currently irrigated. A hundred farmers are farming there, and registration of the area as a Traditional Scheme has just started. (16/June/2022)	Lushoto District, Tanga Region The District, where vegetable cultivation is popular, has mountainous geological characteristics. According to the NIRC District Officer, about 85% of irrigable areas are small-scale schemes below 500ha out of which 50% are estimated to be less than 50ha and can be potential sites for the COBSI approach. (17/June/2022)
	
Kilosa District, Morogoro Region [Traditional Scheme] Farmers paid 5,000Tsh/acre for the construction of simple weirs made of wood and sacks. This area has 1,136ha where 376 farmers cultivate mainly rice. According to a DAICO Officer, there are more than 30 sites where there is no irrigation at all. (20/June/2022)	Mvomero District, Morogoro Region The irrigation scheme along the Dizwingwi River, involving 425 farmers, has an area of 2,000ha. Out of the said acreage, only 300ha is equipped with irrigation facilities. According to a DAICO Irrigation Officer, the District has more than 20 perennial rivers and farmers use buckets to irrigate. (21/June/2022)



A Traditional Irrigation Scheme

This irrigation scheme was started in the 2010s out of farmers' own initiative. According to an extension officer, however, those farmers are facing some challenges caused by lack of understanding of the importance of facilities maintenance. The COBSI approach can support efforts to address such issues. (Mbeya District, Mbeya Region, 13/June/2022)



Horticulture Cultivation on an Irrigation Scheme

Farmers here cultivate lettuce and tomato—among other crops, grown for both selling and self-consumption—on a small-scale irrigation scheme. The COBSI approach can help enhance such cultivation through farmer trainings on market-oriented agriculture, nutrition improvement, as well as proper irrigation methods. (Mbeya District, Mbeya Region, 13/June/2022)



A Potential Stream

This is a perennial stream and a potential water source for the COBSI approach, especially for dry-season horticulture production. Trigonal-type simple weirs can be introduced here because of the rocky foundation. (Busokelo District, Mbeya Region, 14/June/2022)



Explanation by an NIRC Officer

Ms. Fatuma (center), the NIRC Officer who accompanied the Team during this data collection survey, explaining the COBSI approach and related potential streams with her mobile phone to an extension officer (left) and farmers. (Rufiji District, Pwani Region, 17/June/2022)



Irrigation using Pump Equipment

In parts of Pwani Region, farmers have to spend money on fuel to irrigate farming using pumps due to topographic barriers between water sources and fields. In this regard, COBSI can contribute to reducing their expenses through installation of entry point gravity irrigation. (Rufiji District, Pwani Region, 17/June/2022)



Bucket Irrigation in Locality

Bucket irrigation burdens farmers with hard labor yet covers only limited areas. As a solution, gravity irrigation—which the COBSI approach introduces—can ease them off such challenges. The duration of irrigation can even be shortened, saving farmers precious time which they can use for other activities (Morogoro District, Morogoro Region, 20/June/2022)

Survey Areas in Tanzania
Photo Album

Contents

2.4.1	Outline of the Field Survey	II -4-1
2.4.2	National Development Plans and Legal Frameworks Related to the COBSI Approach	II-4-2
2.4.3	Survey Results (Current Situation/Identified Issues).....	II-4-5
2.4.4	Proposed Plans for Future COBSI Approach Cooperation.....	II-4-9

List of Tables

Table 1	Visited Organizations for Information Collection (Tanzania)	II -4-1
Table 2	Key Legal Frameworks on Environmental and Social Considerations in Tanzania	II-4-3
Table 3	List of Projects for which an ESIA is Mandatory in Tanzania	II-4-4
Table 4	NIRC's Registration Approach to Traditional Irrigation Schemes	II-4-6
Table 5	Project Concept: Introduction of COBSI Packaged Irrigation Technologies through the COBSI Approach in Tanzania.....	II-4-12

List of Figures

Figure 1	Small-Scale Irrigation Potential Distribution (Tanzania).....	II -4-1
Figure 2	Environmental and Social Impact Assessment Flow in Tanzania.....	II-4-4
Figure 3	An Intake Weir Made of Stones at Traditional Irrigation Schemes (Mbeya Region).....	II-4-5
Figure 4	Intake Weir Made of Sacks at Traditional Irrigation Schemes (Morogoro Region).....	II-4-5
Figure 5	Farming at Irrigation Schemes (Tanga Region)	II-4-7
Figure 6	Cultivated Hilly Areas in Tanzania.....	II-4-8
Figure 7	COBSI-Applicable tream (Mbeya Region).....	II-4-9
Figure 8	Concept of the COBSI Approach for Tanzania (Draft).....	II-4-11
Figure 9	Implementation Structure for the COBSI Approach in Tanzania (Draft)	II-4-14

List of Abbreviation

AEW	Annual Evaluation Workshop
DCD	Crop Development Division
DMI	Agricultural Mechanisation and Irrigation Division
DTERR	Agricultural Training, Extension services and Research Division
EMU	Environment Management Unit
FFS	Farmers Field School
KOT	Kick off Training
LGA	Local Government Authority
MoA	Ministry of Agriculture
MTT	Mid-Term Training
NEMC	National Environmental Management Council
NIMP	National Irrigation Master Plan
NIRC	National Irrigation Commission
PoRAG	President's office, Regional Administration and Local Government
TANSHEP	Project for Strengthening DADP Planning and Implementation capacity through Use of SHEP Approach
TOT	Training of Trainers

2.4.1 Outline of the Field Survey

(1) Field Survey Outline

Field surveys for Tanzania were conducted from June 7 to 26, 2022, and various organizations listed in Table 6.3.1 below—with offices in the capital city of Dodoma—were approached to collect relevant information. The areas targeted for field surveys were determined on the basis of relatively high small-scale irrigation potential identified from detailed satellite image analysis conducted in advance and in consideration of a travel restriction by the JICA Tanzania office (within 8 hours' drive each way from Dar es-Salaam and specific areas where domestic flights were available). Field surveys were conducted in a total of thirteen (13) Districts and six (6) Regions: Kilimanjaro Region (Moshi, Hai, and Rombo Districts), Tanga Region (Lushoto and Korogwe Districts), Pwani Region (Rufiji District), Mbeya Region (Mbeya, Mbarali, and Busokelo Districts), Songwe Region (Mboshi District), and Morogoro Region (Morogoro, Kilosa, and Mvomero Districts). The field surveys' scope included natural conditions such as hydrology and topography, conditions of existing irrigation sites (including facilities), of farmlands and farming, and of markets alongside interviews with farmers.

Table 1 Visited Organizations for Information Collection (Tanzania)

Categories	Visited Organizations
Tanzanian Government	✓ National Irrigation Commission (NIRC) ✓ Ministry of Agriculture (MOA) - Agricultural Mechanisation and Irrigation Division (DMI), - Agricultural Training, Extension services and Research Division (DTER), - Crop Development Division (DCD), Environment Management Unit (EMU) ✓ Ministry of Water President's office, Regional Administration and Local Government (PoRALG)
Other	Project for Strengthening DADP Planning and Implementation capacity through the Use of the SHEP Approach (TANSHEP)

Source: JICA Survey Team

(2) Potential Areas for Small-Scale Irrigation

Figure1 shows small-scale irrigation potential distribution in Tanzania (indicated in purple) based on detailed satellite image analysis results. Eastern to southern as well as western and Mt. Kilimanjaro areas receive more than 1,000 mm of annual precipitation. The country's small-scale irrigation development potential was identified as high based on surface runoff, soil types, and surrounding populations and land use. Northern to central areas were, on the other hand, analyzed as having low potential due to vast areas with annual rainfall below 1,000 mm.

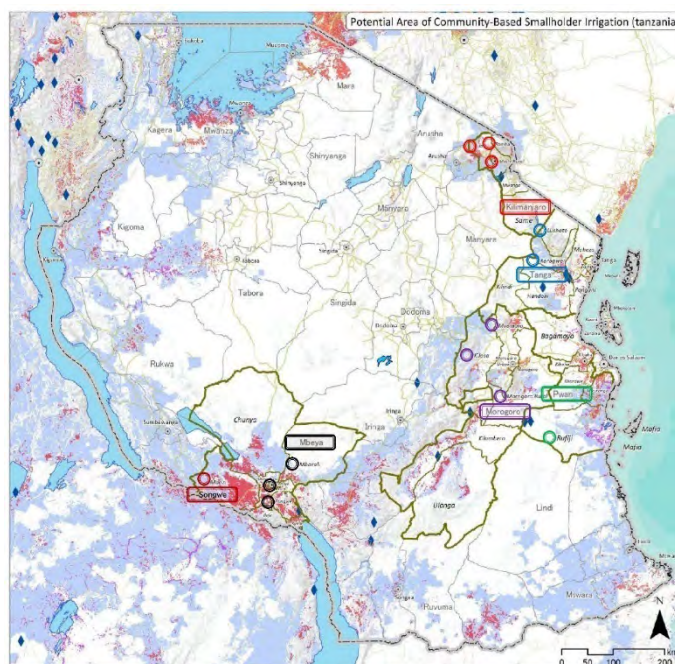


Figure 1 Small-Scale Irrigation Potential Distribution (Tanzania)

Source: JICA Survey Team

Southern and western regions near COBSI-implementing Zambia and Malawi are considered to have particularly high potential.

The locations of the 6 Regions and 13 Districts where field surveys were conducted are respectively indicated in squares and circles in the same Figure.

2.4.2 National Development Plans and Legal Frameworks Related to the COBSI Approach

(1) National Agriculture Policy (2013)

Irrigation development is regarded as an effective approach in terms of food security and poverty reduction in Tanzania, since it can lead to crop productivity increase and continuous agricultural development. Additionally, climate change—particularly rainfall decrease and change in patterns—is having more severe consequences these days to the point that irrigation development is recognized as essential in addressing impacts on crop production.

(2) Agriculture Sector Development Programme II (2017)

Agriculture Sector Development Programme II is a 10-year program consisting of two phases with a 5-year implementation period each. The first phase covers five years from 2017/2018 to 2022/2023. The Programme aims for productivity increase in the agricultural sector, commercial farming, and small-scale farmers' income increase, thereby improving livelihoods, reinforcing food and nutrition security, and increasing GDP. It especially focuses on increasing production of targeted commodities in a sustainable manner, while enhancing competitiveness and value chain development.

(3) National Irrigation Master Plan (NIMP 2018)

After the National Irrigation Master Plan of 2002 (NIMP 2002) was developed, the National Irrigation Agency, which is in charge of irrigation development and management in Tanzania, was established as an independent administrative agency under the Ministry of Water and Irrigation in 2015. The Tanzanian Government reported that irrigation development areas increased from around 200,000 ha in 2004 to around 460,000 ha in 2015 as a result of a series of irrigation projects under NIMP 2002.

Considering that more than fifteen (15) years have passed since the drafting of NIMP 2002; and situations concerning irrigation development have significantly changed, NIMP II was formulated in 2018 with the support of JICA, with the aim of “contribut[ing] to the improvement of the national economy and food security through the increase of agricultural productivity and incomes by irrigation development, which leads to poverty reduction and taking measures against climate change.”¹, The Master Plan targets one (1) million ha of irrigated areas, three hundred fifty-eight (358) thousand farm household beneficiaries, yield increases for rice, tomato and onion (5 t/ha, 40 t/ha, and 10 t/ha respectively), and net farm income increase of TZS3-4 million/ha/year by 2035. The project will be implemented in two (2) phases, 2018-2025 for Phase 1 and 2026-2035 for Phase 2.

¹ The Project on the Revision of National Irrigation Master Plan in the United Republic of Tanzania: Final Report (JICA, 2018)

(4) Legal Frameworks on Environmental and Social Considerations

Key legal frameworks on environmental and social considerations in Tanzania are shown in Table 2.

Table 2 Key Legal Frameworks on Environmental and Social Considerations in Tanzania

No.	Name of Legal Framework
1	The Constitution of Tanzania, 1977 (*Official revised English version, 2005)
2	Environmental Management Act, 2004
3	Environmental Impact Assessment and Audit Regulations, 2005
4	Water Resource Management Act, 2009
5	Forest Act, 2002
6	National Environment Policy, 2021
7	National Human Settlements Development Policy (2000)
8	National Water Policy, 2002
9	National Irrigation policy, 2010
10	Land Act, 1999
11	Land (Amendment) Act, 2004
12	Village Land Act, 1999
13	Land Acquisition Act (No. 47, 1967)
14	Land Use Planning Act, 2007
15	Land Disputes and Courts Act, 2002
16	National Land Policy, 1995

Source: JICA Survey Team (2022)

In Tanzania, the Environmental Management Act (2004) regulates the ESIA procedure whose flow is shown in Figure 2. First, the project proponent shall submit the project brief to the National Environmental Management Council (NEMC) under the Vice Presidents' Office - Division of Environment (VPO-DE) where projects get categorized through screening into either Type A for which a full-scale ESIA is mandatory, or Type B for which a preliminary-level ESIA is required.

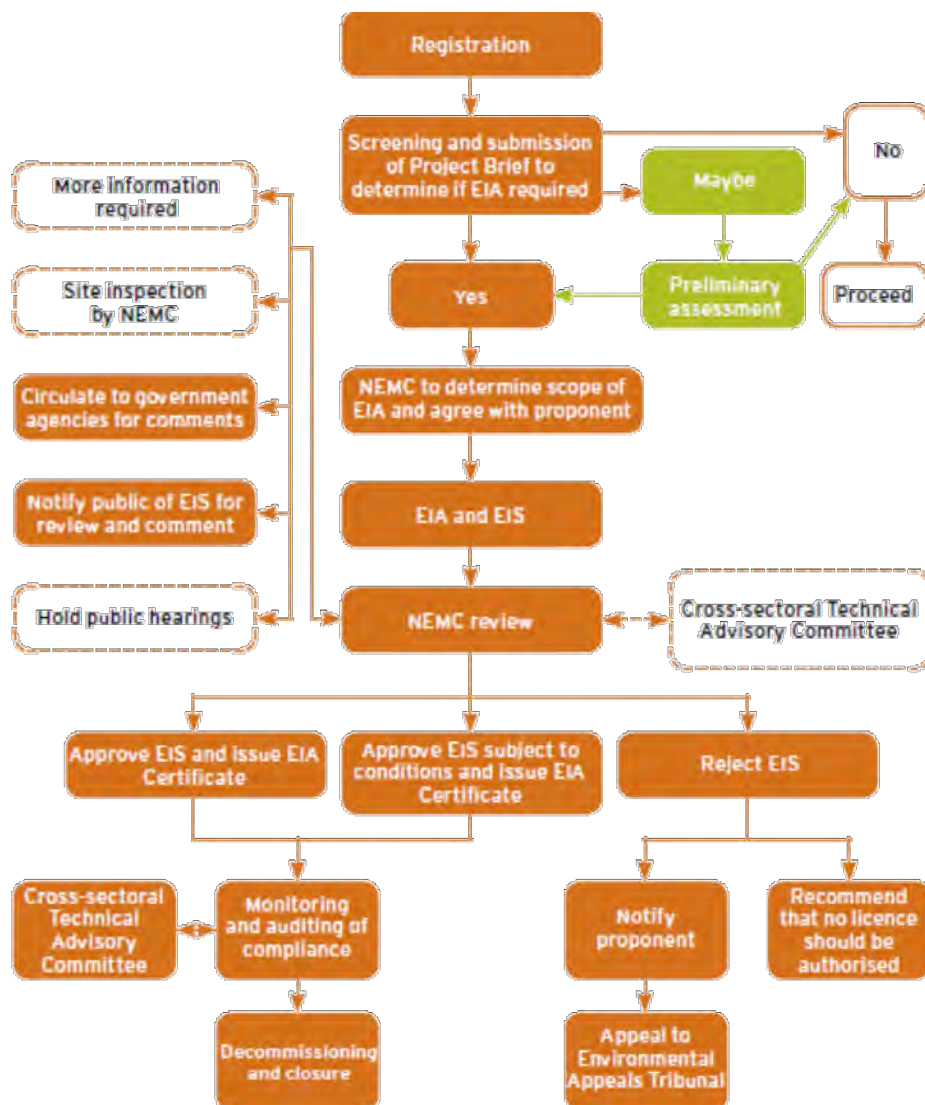


Figure 2 Environmental and Social Impact Assessment Flow in Tanzania

Source: SADC Environmental Legislation Handbook 2012 (p.433)

The First Schedule of the Environmental Impact Assessment and Audit Regulations (2005) lists the 22 sectors that require implementation of an ESIA, and the part for the Agricultural Sector is excerpted in Table 3 below. Since “water resources development projects (dams, water supply, flood control, irrigation, drainage)” is included in the list, this requirement is most likely to be applicable to the COBSI Approach. However, there is no stipulation of the detailed scale for which an ESIA is mandatory. It is, therefore, essential to reconfirm that aspect with the NEMC when implementing the project for adequate environmental and social considerations.

Table 3 List of Projects for which an ESIA is Mandatory in Tanzania

No.	LIST OF PROJECTS REQUIRING AN EIA (MANDATORY LIST)
(i)	Large-scale cultivation
(ii)	Water resources development projects (dams, water supply, flood control, irrigation, drainage)
(iii)	Large scale monoculture (cash and food crops including floriculture)
(iv)	Biological pest control
(v)	Agricultural projects necessitating the resettlement of communities
(vi)	Introduction of new breeds of crops
(vii)	Introduction of Genetically Modified Organisms (GMOs)

Source: Environmental Impact Assessment and Audit Regulations (2005), “First Schedule”

2.4.3 Survey Results (Current Situation/Identified Issues)

(1) Irrigation, Water Management and Maintenance

The Director of NIRC's Planning Department explained that potential irrigable area in Tanzania is twenty-nine (29) million hectares, about only 3% (about 870,000 ha) of which has been developed for irrigation. According to The project on the Revision of the National Irrigation Master Plan in the United Republic of Tanzania, “irrigation developed area was about 460,000 ha in 2015”, which suggests that irrigation development has been progressing at a rapid pace since 2016. Although Tanzania has many traditional irrigation schemes and permanent irrigation facilities sites where irrigation canals are already utilized, very large numbers of undeveloped irrigable areas were identified through the field surveys.

In Tanzania, there are about nine-hundred (900) sites with traditional irrigation schemes that have, for a long time, been developed and farmed next to reinforced concrete structures built by contractors. Materials used in simple weirs for taking irrigation water from rivers include wood, grass or soil (fewer cases), and stones or sacks (weirs installable by farmers) (cf. Figures 2 and 3). Many of the sites have long experience in irrigated agriculture, so it may be relatively easy for farmers to understand COBSI and accept its introduction. Therefore, for sites where irrigated agriculture has been practiced for a while, it is possible to skip the stage of simple weir construction and start off with upgrading to permanent weirs.

As observed in many of the surveyed irrigation sites, irrigation water was not distributed appropriately amongst group members, upstream areas always getting irrigation priority, and maintenance and management activities of irrigation facilities did not seem to be carried out regularly, if not at all. Packaging related technical transfer solutions, COBSI can contribute to addressing such problems faced by existing sites not only by constructing simple weirs and other facilities, but also introducing software. It is also important to note that when introducing COBSI in the future, it is a common practice to implement it downstream existing simple weirs so as not to interfere with farming activities at the existing site.

On the other hand, in areas where traditional irrigation schemes are active, it is essential to coordinate with them—through prior discussion and agreement with all parties involved—when planning to introduce COBSI in the future, particularly in relation with water intake from the same stream, which may be a sensitive issue unless the intake location is downstream of the existing site.

As previously mentioned, there are many such traditional irrigation schemes in Tanzania, and NIRC believes that those schemes need to be formally registered—a process which has been started and is



Figure 3 An Intake Weir Made of Stones at Traditional Irrigation Schemes (Mbeya Region)

Source: JICA Survey Team (June 2022)



Figure 4 Intake Weir Made of Sacks at Traditional Irrigation Schemes (Morogoro Region)

Source: JICA Survey Team (June 2022)

ongoing, since many irrigation schemes are still unregistered. Table 6.4.2 below describes the registration approach to those traditional schemes.

Table 4 NIRC's Registration Approach to Traditional Irrigation Schemes

Condition of Eligibility	Organized by at least 10 farmer members (the irrigated area is not a requirement)
Registration	✓ NIRC provides support to farmers' groups, upon their request, in scheduling construction of facilities and setting up water users' associations, among other matters. ✓ When upgrading irrigation facilities, the feasibility of the upgrade shall be surveyed and identified in relation to water resources reliability, household benefit, social and environmental aspects survey, agricultural factors, geographic conditions, marketing, and so on. If feasibility is identified, the project will proceed to rehabilitation. ✓ The irrigation facilities rehabilitation includes permanent weir, canal lining and gate installation. NIRC will conduct surveying and mobilize excavation equipment during construction (they have their own heavy equipment). ✓ All irrigation schemes need to apply for a water use permit from the Ministry of Water in which case farmers' groups contact NIRC who will provide them with both soft and hard support such as calculating the amount of irrigation water requirements. The farmers' groups then apply to the Ministry of Water for related permits. ✓ In the past, irrigation development in Tanzania was conducted in a top-down manner, and there were many failed cases. Currently, irrigation development has been switched to a bottom-up approach, and many successful sites have been found. At irrigation sites, they consider water management and maintenance of facilities to be important.

Source: JICA survey team.

(2) Expansion Activities and Farmers' Organizations

Governmental organizations responsible for agricultural extension in Tanzania are MOA-DTER and PoRALG, the former being in charge of preparing extension plans, while the latter takes care of implementing them.

1) MOA-DTER

MOA-DTER is in charge of conducting ToT, supervising organization of farmers' groups, FFS (Farmers Field School) training, inputs support, etc. There are fourteen (14) agricultural colleges which extension officers initially graduate from (level 4-5 certificate) before college (level 6 diploma), then university (level 8 degree).

"Political crops" being promoted by MOA-DTER include cashew nuts, tea, coffee, sugarcane, cotton, sunflower, and palm oil, with target crops changing every few years—avocado being currently promoted. Tomatoes are the dominant horticultural crop produced under COBSI in Morogoro and Ulanga Districts. All those crops complement each other, as each region of the country produces its own specific crops.

DTER has a total of about twenty-five (25) officers including the Director and Administration staff, five (5) officers in the Training & Support section, and eleven (11) officers in the Extension & Research section. MOA has no agricultural extension officer who directly intervenes in the field; they usually request PoRALG to arrange and collaboratively conduct all dissemination program activities with them. Budget for such dissemination activities is usually provided by MOA, though PoRALG may also allocate from their own.

2) PoRALG

PoRALG's main tasks include 1) training farmers in terms of agro-production and demo plots as well as providing farming inputs, 2) involving the private sector in the provision of farming inputs, and 3) providing

agro-inputs purchased with government subsidy.

Extension activities are carried out by about seven (7) thousand extension officers throughout the whole country. Those extension officers have a District-level degree, a Ward-level diploma, and a Village-level certificate, all of which are eligible for salary payments when integrating PoRALG. Village-level extension officers are the ones who usually live in the village and are familiar with the farmers' situations. Those field-level officers are responsible for providing extension services (giving information on new diseases and seeds, drafting a list for the government's subsidy program, etc.), collaborating with other agriculture stakeholders and NGOs (e.g. supporting future actors dealing with agriculture and nutrition, identifying agro-dealers, and connecting with farmers), etc.

Challenges in extension activities include insufficient water management and maintenance in existing irrigation schemes, lack of access to up-to-date information on cultivation techniques and farming practices (limited governmental refresh training opportunities), lack of means of transportation for extension activities (cases of borrowings from colleagues reported), lack of means of communicating information, and so on.

Collaboration between PoRALG and Sector-Specific Ministries (SSM), such as the ministry in charge of agriculture, involves both soft and hard planning on policies, criteria, standards, and technical innovations, with the SSM handling preparation and PoRALG taking care of their implementation. Extension officers participating in those activities prepare technical reports which are, then, submitted to both the SSM and PoRALG.

3) Farmers' Organizations

As mentioned above, there are many traditional irrigation schemes in operation in Tanzania, and it is considered that there are no major obstacles in securing farmers' understanding of COBSI and acceptance of its introduction. However, most of those irrigation schemes have no water users groups (Irrigators' Organizations, Water Users Associations, etc.), which may have led to water being unequally, untimely, and inadequately allocated, facilities improperly maintained, damaged parts left unrepaired or unreplaced, and to failure to secure the required amount of irrigation water.

COBSI provides not only skills for irrigation facilities construction, but also capacity in water management, maintenance and farmers' group organization as package components, which could pertinently be utilized in Tanzania to address and solve the abovementioned among other agriculture-related issues.

(3) Farming and Marketing

In general, existing irrigation schemes produce tomatoes, onions, cabbage, eggplant, carrots, and other horticultural crops as well as irrigated maize, beans and watermelons (cf. Figure 5). Some areas also grow rice in the rainy season with two rice plantings per year (made possible in most cases by irrigation canals supplementing rainfall) depending on the location.

Challenges in farming included mainly insufficient irrigation water intake, which can be increased with



Figure 5 Farming at Irrigation Schemes
(Tanga Region)

Source: JICA Survey Team (June 2022)

construction of permanent irrigation facilities, and the lack of specific rules for proper water management and distribution. Moreover, high agricultural input costs, long distances and lack of transportation to markets add up to the limited availability of quality rice seed, causing farmers to reuse the same seeds over and over again, which inevitably results in reduced yields, among other problems.

In general, market prices tend to be high in the dry season when (irrigated) production is low yet demand is high, and the opposite during the rainy season when production is high and demand is low. However, where rice is grown in addition to horticultural crops during the rainy season, the latter becomes expensive due to reduced production as a direct consequence of reduced cultivated areas and wet weather damage. Oppositely, prices become lower in the dry season when horticultural crop production increases, a situation that was also observed with rice.

(4) Environmental and Social Considerations

1) Forest coverage decline and soil erosion caused by cultivation

In the Lushoto hilly areas, Kilimanjaro Region, cultivation has been conducted up to the upstream of the basin where crops such as maize are cultivated (Figure 6). However, issues in the basin management caused by decrease in the amount of water retention trees, such as soil erosion by rain, have been observed.



**Figure 6 Cultivated Hilly Areas
in Tanzania**

Source: JICA Survey Team (June 2022)

Regarding the impacts of climate change in Tanzania, there have been reports about the melting of the glacier on top of Mt. Kilimanjaro—Africa’s highest mountain (elevation: 5,895 m)—as a consequence of rising temperatures after 1912². Moreover, several areas such Dar es Salaam, Kilosa, Mpwapwa, and Kilombero have suffered from significant floods and droughts, affecting lives since 2008. Impacts of climate change on the rain pattern and, consequently, on agricultural activities were recognized by farmers as confirmed during field survey interviews; officers at the Environment Management Unit (EMU) under the Ministry of Agriculture also pointed out the same.

① Excessive use of agricultural chemicals

According to the EMU, Tanzanian agriculture is also experiencing issues caused by excessive use of chemicals and an ensuing increase in soil salinity. To help address such issues, the EMU is collaborating with other organizations to provide farmers with instructions about the type of seeds that match the soil conditions, the right amount of water and agricultural chemicals for each crop, etc. Further, Local Government Agency extension workers have, as part of a series of the extension activities, offered rapid soil test kits to confirm soil health and sensitized on the appropriate use of agricultural chemicals.

² National Climate Change Statistics Report 2019, Tanzania Mainland:

<https://unstats.un.org/unsd/envstats/Compendia/Tanzania%20NCCSR%202019.pdf>

② Water conflicts

According to the final report of the Project on the Revision of National Irrigation Master Plan in the United Republic of Tanzania³, water conflicts tended to increase in recent years in basins prone to water stress. Those conflicts can, as it further points out, be summarized into conflicts between the irrigation and other sectors, between stationary cultivators and grazing farmers, and between farmers upstream and downstream rivers or irrigation schemes. As confirmed in interviews conducted during field surveys, some farmers are often obliged to cultivate vegetables, though hoping to grow rice, because of improper management and distribution of water between the upper and lower watersheds, preventing irrigation water from reaching downstream areas.

2.4.4 Proposed Plans for Future COBSI Approach Cooperation

(1) Target Areas

Small-scale irrigation potential in Tanzania was identified as high to medium particularly in Kilimanjaro, Tanga, Mbeya, Songwe, and Morogoro Regions based on field surveys and interviews with concerned stakeholders (cf. Figure 7). The northern highland areas of Kilimanjaro and Tanga Regions have high annual rainfall and a larger number of small rivers of suitable sizes and flows for COBSI than those in the plains. The topography is mountainous to hilly with sufficient enough gradients for gravity irrigation to the fields. The Lushoto District in Tanga Region is a major vegetable-growing area where, according to NIRC officials, about 85% of irrigable areas are small-scale (less than 500 ha) and about 50% estimated to be less than 50 ha.



Figure 7 COBSI-Applicable tream (Mbeya Region)

Source: JICA Survey Team (June 2022)

Mbeya Region in the western part of Tanzania, near the border with Zambia, is also known as the breadbasket of the country. There, the field survey team visited sites where farmers' groups practice irrigated agriculture using simple weirs constructed with locally available materials, similar to COBSI's, and cover irrigable potential areas ranging from a few hectares to the 100-hectare level where diversified crops are grown, including rice and horticultural crops. There is, thus, potential for COBSI expansion in this region, and for sites where simple weir-irrigated agriculture is already in practice, it is possible to consider starting off with the construction of permanent weirs through the COBSI upgrade system.

On the other hand, potential for COBSI expansion was low in Pwani Region mainly due to inadequacy of its natural conditions (river size, late-dry-season river discharge, topographical conditions, etc.). This region is flat, with large and medium-sized rivers meandering downstream at a gentle gradient. During the dry season, the discharge of streams connecting to and flowing into those rivers decreases, leaving much of the water in the river bed. As a consequence, agriculture is usually irrigated by pumping water from natural ponds in such rivers. Water also used to be pumped up to storage tanks and flowed by gravity to fields in irrigation schemes constructed in the past with Japanese assistance, making potential

³ The project on the Revision of National Irrigation Master Plan in the United Republic of Tanzania: Final Report (JICA, 2018): <https://libopac.jica.go.jp/images/report/P1000036745.html>

for COBSI introduction in such conditions low.

In the central highlands, areas where annual precipitation is below 750 mm are spread out. On the other hand, the northern and southern regions have mountainous areas with high annual precipitation, identified through field surveys as suitable for developing COBSI, though on a small rather than a large scale due to restricting topographical conditions. Candidate areas for the COBSI approach are 1) northern areas such as Kilimanjaro and Tanga Regions (excluding the central highlands and coastal plains of Pwani Region), 2) southern areas such as Mbeya and Morogoro Regions (including Iringa and Ruvuma Regions where no field surveys were conducted), and 3) western areas such as Kigoma and Rukwa Regions which could not be surveyed either.

It is worth noting that there may be other small irrigation potential areas in addition to those in this report but could not be surveyed in the field, as survey activities were limited by COVID-19 and travel safety restrictions.

(2) Proposed Plans and Concept

Irrigation administration in Tanzania is the responsibility of NIRC who mainly focuses on medium- and large-scale schemes. Small-scale development such as COBSI is also their responsibility, though the situation seems to have practically slipped out of hand. Irrigation services provided by NIRC include provision of expertise, promotion of water users' organization, efficient utilization, equipment provision, maintenance, and marketing. In addition, NIRC registers traditional irrigation schemes and grades them into "improved" schemes. In view of all those points, NIRC's activities are similar to COBSI's dissemination methods.

The Survey Team, thus, proposes that NIRC continues to be in charge of medium- and large-scale irrigation development, while COBSI covers traditional irrigation schemes and smaller-scale areas, a division of tasks proposed to promote efficient and effective irrigation development. According to interviews at the Songwe Regional Office, percentages of farmers benefiting from irrigation development are 5% for large-scale, 5% for medium-scale, and the remaining 90% for small-scale schemes. Since smallholders support still seems insufficient, expansion of the COBSI approach in the country is deemed very significant.

COBSI will be in charge of rehabilitating traditional irrigation schemes as well as developing smaller schemes based on the following intervention perspectives: 1) The government does not need large amounts to fund irrigation development; 2) Water management and facilities maintenance can be conducted sustainably at farm level, as the technology and knowledge will remain among farmers' groups and front-line agricultural extension officers; 3) Dry-season irrigated horticultural crop production contributes to improvement of smallholders' livelihoods, and 4) COBSI can contribute to irrigated area expansion through small-scale irrigation scheme development as well as to capacity building of government officials (irrigation engineers, agronomists, and market, nutrition, and extension officers at the end of the line). A proposed draft concept of the COBSI approach in Tanzania is shown in Figure 8 below.

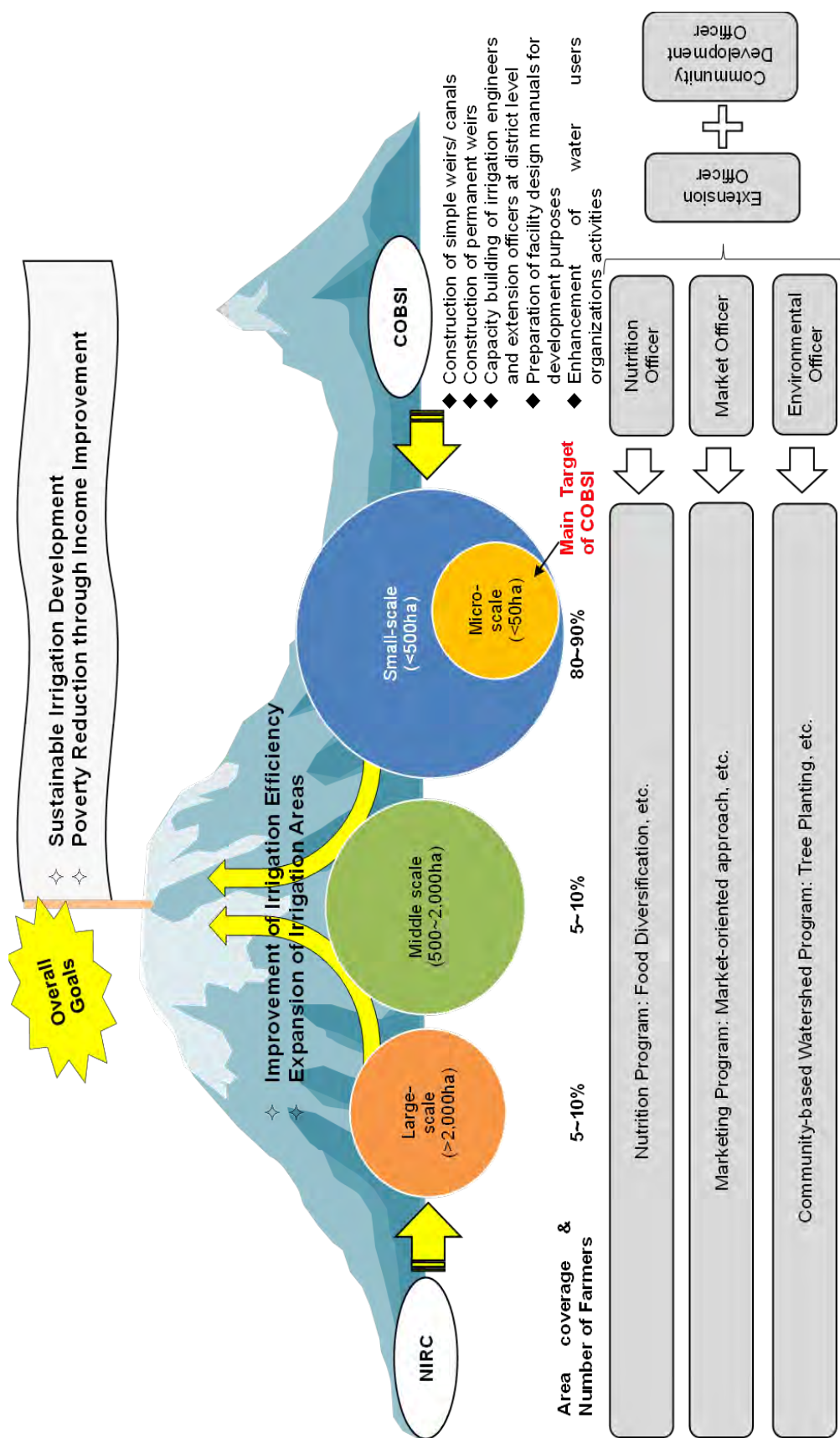


Figure 8 Concept of the COBSI Approach for Tanzania (Draft)

Source: JICA Survey Team

NIRC classifies irrigated development areas into three categories: Large (more than 2,000 ha), medium (500 to 2,000 ha), and small (less than 500 ha). COBSI is classified as small-scale, though it can target even smaller schemes of less than 50 ha per site. As mentioned above, NIRC is also responsible for the latter level but is focusing more on development of “small-scale” schemes larger than 200 ha. In that regard, they have yet to provide sufficient irrigation development and services to micro-scale areas of 50 ha or less. In the absence of precise statistical data, area sizes are estimated to be 5-10% for large-scale, 5-10% for medium-scale, and 80-90% for small-scale. In future cooperation, COBSI should be introduced as part of the small-scale irrigation development category, aiming to contribute to increasing irrigated areas and smallholders’ income, while improving the capacity of government officials.

The overall goals are sustainable irrigation development and poverty reduction through income improvement based on national targets as expected results of enhancement of irrigation efficiency and expansion of irrigated areas. The COBSI approach would also contribute to improving simple weirs and earthen canals, constructing permanent weirs alongside preparation of related design manuals, developing the capacity of irrigation engineers and extension officers, and strengthening farmers’ organizations.

To head more effectively toward those overall goals, the project will collaborate with the concerned agencies to incorporate nutrition improvement, market orientation through SHEP, and watershed conservation programs into training, with the expectation of synergistic effects.

Based on this policy, proposed future COBSI cooperation and support for irrigation development in Tanzania are shown in Table 5 below.

Table 5 Project Concept: Introduction of COBSI Packaged Irrigation Technologies through the COBSI

Approach in Tanzania		
Item	COMPONENT-1	COMPONENT -2
Survey Target	Sites with equipped irrigation facilities (Traditional irrigation scheme: registered / non-registered)	Sites with non-equipped irrigation facilities
Findings related to Small-scale Irrigation	• Irrigation facilities such as simple weirs and irrigation canals already exist, and dry-season irrigation agriculture is practiced. • In general, farmers’ level of knowledge of water management and capabilities of operation and maintenance are not sufficient. Downstream of irrigated areas, especially, tend to lack irrigation water due to insufficient water management. • In areas with irrigation facilities, double or triple rice cultivation in a year is possible. In addition, there are many farmers who cultivate vegetables besides rice. • While rice production is conducted in areas where the elevation is lower, vegetable cultivation is performed on higher altitudes. • Since farmers have constructed and maintained irrigation facilities themselves, they have some extent of knowledge about irrigation farming and water users/ farmers organizations.	• There are many perennial streams. However, most areas do not have any installed irrigation system yet. • Since inefficient irrigation using watering cans and buckets is conducted, irrigated areas are narrow and water resources have not been used efficiently. • An appropriate interval of 2km to 3km should be taken into account when constructing simple weirs [Mountainous areas (southern and northern highland areas)] • Water resources such as streams are more plentiful than in flat areas. • Selecting sites for the COBSI approach should be considered much more carefully than in flat areas due to the existence of many big rocks in the streams and the surroundings.
	[Extension Activities] • Transportation: Shortage of motorbikes, motorbikes spare parts and/or fuel • Office tool: Shortage of PCs, photocopiers, printers, and stationeries • Agricultural inputs for dissemination: Shortage of seeds, chemicals and fertilizers for demo plots	

Item	COMPONENT-1	COMPONENT -2
Survey Target	Sites with equipped irrigation facilities (Traditional irrigation scheme: registered / non-registered)	Sites with non-equipped irrigation facilities
	• Short-staffing of extension officers • Education transfer: Shortage of opportunities to learn new farming information/technologies [Water Users Organizations Activities] • Water Users Organizations at registered schemes have committees in charge of construction, administration, the environment, etc. • Since there are many non-registered schemes, enhancement of Water Users Organizations is deemed necessary. (Registration procedure of "traditional irrigation schemes": Drafting of the organizations' constitution, including the structure of the above-mentioned committees → Submission of the constitution to NIRC). [Cultivation] • Limited access to irrigation water downstream • Limited access to marketed certified rice seeds. Some farmers repeatedly use their own seeds for the following seasons, causing lower and disuniform productivity. [Market] • Since demand for vegetables in the dry season is higher due to shortage of production, dry-season market prices are also higher than in the rainy season. [Environment] • In mountainous areas, the acreage of natural forest has decreased due to plantation agriculture. • Changes in rainfall patterns caused by climate change have been observed. [Nutrition] • Especially in rural areas, problems related to unbalanced diets are seen, and malnutrition is particularly prominent.	
Concept Summary	Increase in production of vegetables and rice through construction of <u>permanent weirs</u> , and enhancement of water, operation and maintenance management	Increase in production of vegetables and rice through construction of <u>simple and permanent weirs</u> , and enhancement of water, operation and maintenance management
Package of Components	• Construction of <u>permanent weirs</u> • Introduction of operation and maintenance technology for irrigation and drainage canals based on the advanced COBSI approach • Enhancement of aquaculture: use of existing paddy fields as fishponds.	• Construction of <u>simple weirs and irrigation canals</u> • Construction of <u>permanent weirs</u> • Introduction of operation and maintenance technology for irrigation and drainage canals based on the advanced COBSI approach • Enhancement of aquaculture: use of existing paddy fields as fishponds
Package of Soft Components	• Capacity building of irrigation and extension officers • Development of manuals on water, operation and maintenance management • Provision of training on water, operation and maintenance management • Promotion of E-extension and dissemination by farmers themselves (FFS and FFD) • Promotion of training on horticulture crop production, including a topic on the appropriate use of agricultural chemicals • Introduction of Market-oriented, SHEP approach • Introduction of community-based watershed conservation (plant, fencing and ditch) • Promotion of training for nutrition improvement • Introduction of the concept of water rights	

Source: JICA Survey Team

(3) Implementation Structure (Draft)

The proposed implementation structure for the COBSI approach is shown in Figure 9 below. NIRC will be the main implementation agency and unit for irrigation development, while MOA and PoRALG—in charge respectively of overall National-level agricultural policy and Provincial and District local governance—will be the cooperating agencies. Irrigation, extension, market, nutrition, and environmental staff are located in the District Office, whereas agriculture-related extension activities destined to farmers are under the control of the District Local Government Authorities (LGA). In actual dissemination activities, the scope of involvement of PoRALG and LGAs is, therefore, large enough to make it necessary to keep in close contact with them. Possible coordination issues between NIRC and PoRALG could be solved through, for example, the crucial inclusion of PoRALG Director as a project's Joint Coordination Committee (JCC) member to help clarify the division of roles. As for the main implementation agency, NIRC is considered as the number one candidate, but it should be noted that PoRALG may also be a potential one.

The COBSI approach extension system is divided into Central, Regional/District, and Local (dissemination to farmers) levels. JICA experts and Central-level government officials like NIRC will work together to conduct ToT with Regional-level officials to produce training instructors. Then, District-level government officials (irrigation, extension, markets, nutrition, and environment officers) as well as Ward-level extension officers will in turn receive direct training by the abovementioned instructors, followed by expansion to farmers' groups. This training will include KOT, MTT, and an AEW training which is to be held three times a year.

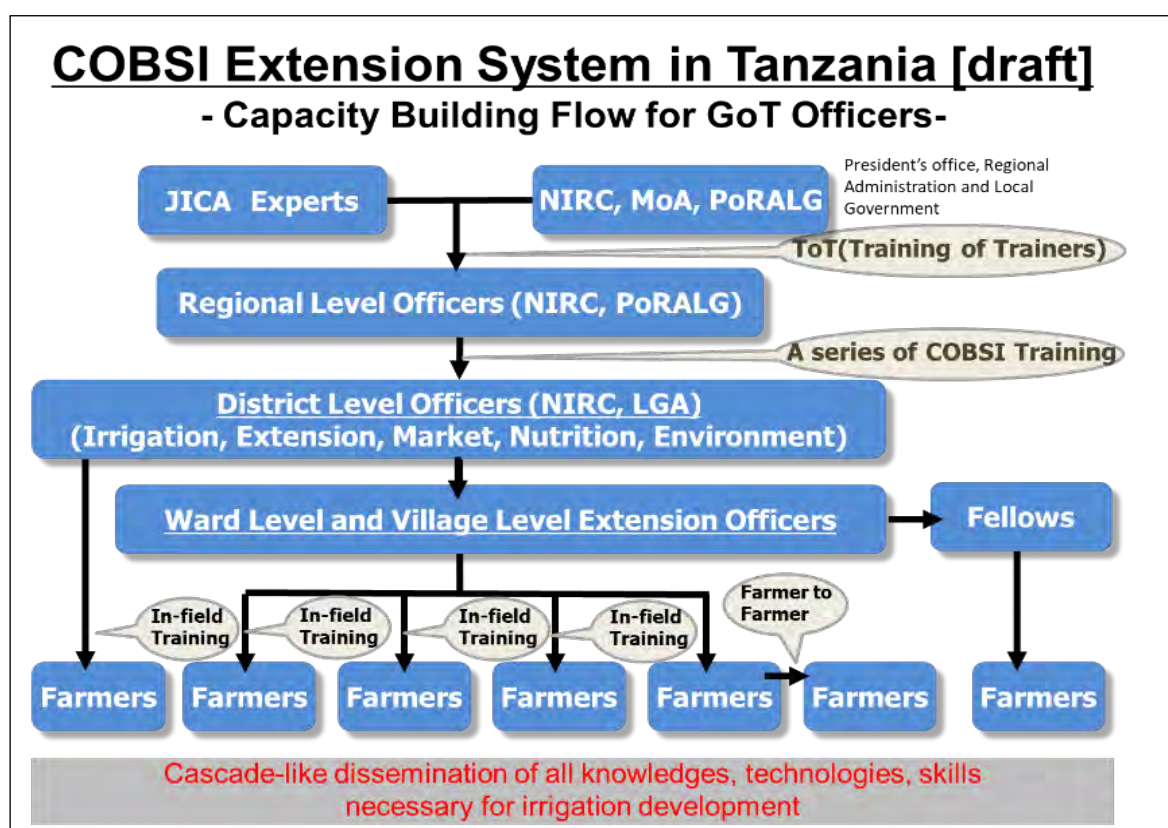


Figure 9 Implementation Structure for the COBSI Approach in Tanzania (Draft)

Source: JICA Survey Team

2.5 MADAGASCAR

Survey Areas in Madagascar

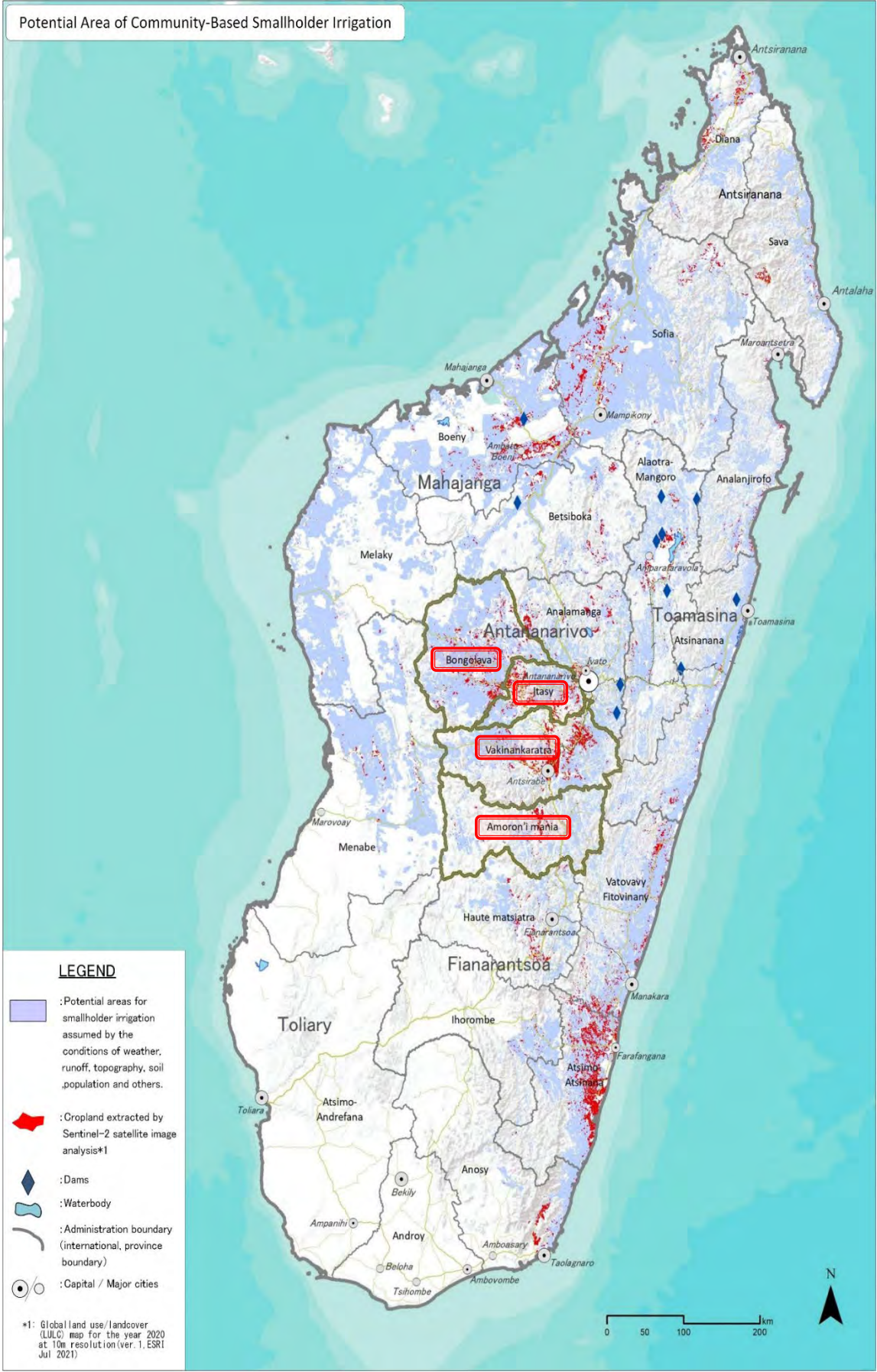


Photo Album



DGR, ANALAMANGA

Dr. Sagawa (Left), Leader of the JICA Survey Team, presenting, at the beginning of the survey, the COBSI approach to the DGR Team who shared the current situation and practices in the irrigation development in Madagascar. (18/July/2022)



DGA, ANALAMANGA

Mr. Director General of Agriculture acknowledging the importance of supporting small-scale holders farming what is locally called “micro- or family-size schemes” which can be potential targets for the COBSI approach. (18/July/2022)



DAPV, ANALAMANGA

Extension, empowerment, and farming inputs procurement are DAPV's major tasks. For COBSI dissemination, DAPV officers suggested the possibility to collaborate with regional agencies such as the DRAE. (19/July/2022)



DGEau, ANALAMANGA

In order to grasp the current water usage authorization procedures in Madagascar, the JICA Survey Team visited the Director General of Water, Mr. RANDRIATSIFERANA R. Simon. (19/July/2022)



DRAE, AMORON'I MANIA

The DRAE officers welcomed the COBSI approach, as it offers knowledge and practical skills of irrigation development, especially for small-scale farmers. The Rural Engineering Regional Department provides supports to farmers through trainings on water management which is a common WUA issue. (20/July/2022)



DRAE and DiREDD, BONGOLAVA

Since the COBSI approach needs to use locally available materials such as wood, the JICA Survey Team involved the DiREDD into the discussion with the DRAE to hear their sustainable development perspectives in relation to the COBSI approach. (20/July/2022)



Traditional Weir constructed by Famers, BONGOLAVA

A traditional weir made of clay soil, reeds, etc. constructed in 2021 based on farmers' own field experiences. Water conflicts occurred at a downstream traditional weir, which ended with its removal by the concerned farmers. (21/July/2022)



Crop Production, BONGOLAVA

While upstream farmers are able to produce rice with enough water in the dry season, the owner of this downstream farmland has to cultivate horticulture crops due to insufficient water volume for cultivating rice. (21/July/2022)



Practice of Water Distribution, ITASY

At the middle stream of a traditional irrigation scheme, a female farmer cultivates vegetables such as tomato, cabbage, etc. On this picture, she is digging an opening in the plot demarcation for channeling water into her other farm plots. (23/July/2022)



Traditional Weir constructed by Farmers, ITASY

The intake water volume from this traditional weir is deemed insufficient. Concerned farmers are anxious to have its capacity improved, so as to increase their production with enough water volume. (25/July/2022)



Site without any Irrigation Facility, ITASY

134 farmers legally set up a Water Users' Association (WUA) and formulated a request for the construction of a permanent weir to the DRAE. Of all the property of this association, 50 ha are already farmed, while another 40 ha are not yet developed due to the inexistence of irrigation facilities. (26/July/2022)



Reforestation on Communal Lands, ITASY

For watershed conservation and soil improvement, local community members and DREDD officers have conducted reforestation activities in the Soavinandriana District with State or Donor budgetary support. If wood is used to implement the COBSI approach, it is worth for referring to such activities at the community level. (25/July/2022)



Upgradable Traditional Weir, AMORON'I MANIA

This traditional weir was washed away by a flood years ago, then rehabilitated through a DRAE Amoron'i Mania project. Nowadays, however, the weir is not functioning as required, so the COBSI approach can be applied to upgrade the existing facility to a permanent structure. (20/July/2022)



Water Management Issue, AMORON'I MANIA

Fokontany leaders are raising the issue of water mismanagement in a Water User's Association. For them, it is essential to ensure equal distribution of irrigation water for rice cultivation. Capacity building of the concerned WUA can be a part of a COBSI training. (21/July/2022)



Traditionally grown vegetable, AMORON'I MANIA

Some farmers water crops using watering cans and/or buckets. The COBSI approach can contribute to improving existing local irrigation methods through the introduction of simple facilities and gravity irrigation for saving farming labor and time (21/July/2022).



A Rural Engineering Regional Department (RERD) Permanent Weir, AMORON'I MANIA

This concrete weir designed and built under RERD supervision is still functioning flawlessly. This experience can be used as a model for upgrading traditional weirs which are meant to be constructed and maintained by farmers themselves. (21/July/2022)



Climate Change-Impacted Irrigation, VAKINANKARATRA

Farmers suffered climate change-related shortage of irrigation water after the original permanent weir was damaged in the 2000's. Later, however, they constructed a temporary one out of their own initiative, though it needs rehabilitation to solve the issue of considerable water loss. (22/July/2022)



Vegetables in A Market in Antsirabe, VAKINANKARATRA

The Antsirabe market resells various vegetables from surrounding areas. Vegetable cultivation occupies an important part of the income sources of small-scale farmers. So, COBSI can contribute to not only increased production but also strategic marketing for better farming income. (23/July/2022)



Rice Production and Market in Antsirabe, VAKINANKARATRA

Most Vakinankaratra Region farmers grow both irrigated and upland rice mainly for self-consumption rather than for sale. Despite that, they expressed the need to increase productivity by rehabilitating damaged irrigation facilities and improving water management. (23/July/2022)



A Potential Stream for COBSI, VAKINANKARATRA

There was a time when farmers attempted to irrigate from this stream but failed. Since they still have a plan to construct a simple weir, COBSI technique and knowledge can be introduced to support such a farmer self-help activity from both aspects of hard and soft components. (25/July/2022)



A Skill for Canal Protection, VAKINANKARATRA

The use of locally available materials is a typical COBSI skill already practiced in the area. A similar technique, promoted through the COBSI approach, can be applied to construct simple weirs based on the site condition. (25/July/2022).



Irrigated Vegetable Cultivation, VAKINANKARATRA

It is common for farmers to grow several kinds of vegetables under irrigation which helps diversify household food diet. The COBSI approach also seeks to improve nutrition through the introduction of small-scale irrigation. (25/July/2022)



A Broken Permanent Weir, VAKINANKARATRA

Parts of this weir has been washed away by flood, so it is no longer used to irrigate farming. Possible causes of such damage are improper design and/or inappropriate facility location. The COBSI approach includes a component to enhance the engineering capacity of all persons concerned. (25/July/2022)



Preparation for Next Season, VAKINANKARATRA

Farmers start ploughing the rice field for the coming season. The COBSI approach offers supplementary irrigation during the rainy season. This feature helps prevent yield loss in rice production. This approach can also play a crucial role in achieving food self-sufficiency from the aspect of supporting small-scale farmers. (25/July/2022)

Survey Areas in Madagascar Photo Album

Contents

2.5.1	Field Survey Outline	II-5-1
2.5.2	National Development Plans and Legal Frameworks Related to the COBSI Approach	II-5-2
2.5.3	Survey Results (Current Situation/Identified Issues).....	II-5-4
2.5.4	Proposed Plans for Future COBSI Approach Cooperation.....	II-5-7

List of Tables

Table 1	Visited Organizations for Information Collection (Madagascar)	II-5-1
Table 2	Key Legal Frameworks on Environmental and Social Considerations in Madagascar	II-5-2
Table 3	Project Categorization Criteria related to Irrigation Development in Madagascar	II-5-4
Table 4	Proposed COBSI Approach Plans Contributing to Irrigation Development in Madagascar	II-5-9

List of Figures

Figure 1	Distribution Map of Potential Sites (Madagascar).....	II5-1
Figure 2	Location Map of Surveyed Areas.....	II5-1
Figure 3	Environmental and Social Impact Assessment Flow in Madagascar	II5-3
Figure 4	Masonry-Type Traditional Weir (Amoron'i Mania Region).....	II5-4
Figure 5	Partially Collapsed Reinforced Concrete Permanent Weir (Vakinankaratra Region)	II5-4
Figure 6	A Farmer Irrigating a Vegetable Field (Itasy Region).....	II5-5
Figure 7	A Local Market in a Rural Area of Madagascar	II5-5
Figure 8	Central Highland Arid Zone in Madagascar	II5-6
Figure 9	Tree planting activity in Madagascar	II5-6
Figure 10	Draft Concept for the COBSI Approach in Madagascar.....	II5-8
Figure 11	Implementation Structure for the COBSI Approach in Madagascar (Draft).....	II5-12

List of Abbreviation

	(English)	(French)
AEW	Annual Evaluation Workshop	Atelier annuel d'évaluation
CDR	Rural Development Advisor	Conseiller en Développement Rural
CIRAE	District of Agriculture and Livestock	Circonscription de l'Agriculture et de l'Elevage
DAPV	Plant Production Support Directorate	Direction d'Appui à la Production végétale
DGA	Directorate-General of Agriculture	Direction Génie Rural
DGEau	Directorate General for Water	Direction Générale de l'Eau
DGR	Rural Engineering Directorate	Direction Génie Rural
DOPAB	Directorate of Support to Producers' Organization and Agro-business	Direction d'Appui à l'Organisation des Producteurs et de l'Agro-business
DRAE	Regional Directorate of Agriculture and Livestock	Direction Régionale de l'Agriculture et de l'Elevage
DREDD	Regional Directorate of Environment and Sustainable Development	Direction Régionale de l'Environnement et du Développement Durable
DRGPF	Director of Reforestation and Landscape and Forest Management	Direction du Reboisement et de la Gestion des Paysages et des Forêts
EIE	Initial Environmental Evaluation	Etude d'Impact Environnemental
FIFATA	Organization for the Development of Farmers	Association pour le Progrès des Paysans (Fikambanana fampivoarana ny tantsaha ou)
KOT	Kick off Training	
MECIE	The implementation investment compatible with the environment	Mise en Compatibilité des Investissements avec l'Environnement
MEDD	Ministry of Environment and Sustainable Development	Ministère de l'Environnement et du Développement Durable
MINAE	Ministry of Agriculture and Livestock	Ministère de l'Agriculture et de l'Elevage
MTT	Mid-Term Training	
ONE	National Office of Environment	Office National de l'Environnement
ONN	National Office Nutrition	Office National de Nutrition
ORN	Regional Office of Nutrition	Office Régionale de Nutrition
PAPRIZ	Project for Promotion of Productivity Improvement and Industrialization of the Rice Sector	Projet d'Amélioration de la Productivité Rizicole sur les hautes terres centrales
PASAN	Food and Nutrition Improvement Project	Projet d'Amélioration de la Sécurité Alimentaire et de la Nutrition
PGE	General state policy	Politique générale de l'Etat
PND	National Development Plan	Plan National de Développement
PREE	Programme d'Engagement Environnemental	Environnement Engagement Programme
SECRU	Environment, Climate and Emergency Response Department	Service Environnement, Climat et Réponses aux Urgences
SRA	Regional Department of Agriculture	Service Régional de l'Agriculture
SRGR	Regional Department of Rural Engineering	Service Régional du Génie Rural
SRSISE	Regional Department of Information System and Monitoring & Evaluation	Service Régional du Système d'Informations et Suivi Evaluation
WUA	Water User's Association	Association des Usagers de l'Eau

2.5.1 Field Survey Outline

(1) Survey Outline

The Team conducted field surveys in Madagascar from July 16 to 31, 2022 and collected information from organizations listed in Table 1 below. The surveys targeted four (4) Central Highlands Regions—namely Itasy, Vakinankaratra, Amoron'i Mania, and Bongolava, because detailed preliminary satellite image analysis identified them as having relatively high small-scale irrigation development potential. Other selection criteria were travel restrictions set by the JICA Madagascar Office (e.g. within 8 hours' drive each way from/to Antananarivo, the capital city). The Team surveyed natural conditions such as hydrology and topography, conditions of existing irrigation sites/facilities, of farmlands and farming, and of markets alongside interviews with farmers.

Table 1 Visited Organizations for Information Collection (Madagascar)

Categories	Visited Organizations
Malagasy Government	✓ Ministry of Agriculture and Livestock (MINAE) Directorate General of Agriculture (DGA), Rural Engineering Directorate (DGR), Plant Production Support Directorate (DAPV), Environment, Climate and Emergency Response Department (SECRU) ✓ Ministry of Water - Directorate General for Water (DGEau)
Others	✓ Project for Promotion of Productivity Improvement and Industrialization of the Rice Sector (PAPRIZ) ✓ Food and Nutrition Improvement Project (PASAN)

Source: JICA Survey Team

(2) Potential Areas for Small-Scale Irrigation

Figure 1 presents the distribution of potential small-scale irrigation sites in Madagascar based on detailed satellite image analysis results. The country's annual rainfall exceeds 1,000 mm, except for the southwestern region where much lower precipitation is indicative of low potential. However, small-scale irrigation development potential in the rest of Madagascar was generally identified as high relative to surface runoff, topographic gradient, soil types, populations, and land use. A total of thirty-seven (37) irrigation sites in the abovementioned 4 Regions were covered by the field survey team (cf. Figure 2).

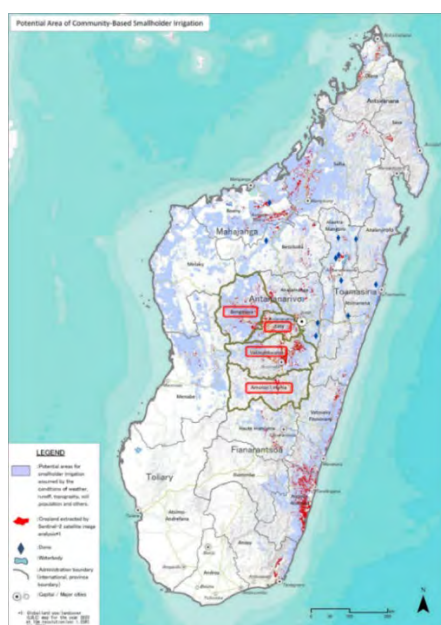


Figure 1 Distribution Map of Potential Sites (Madagascar)

Source: JICA Survey Team

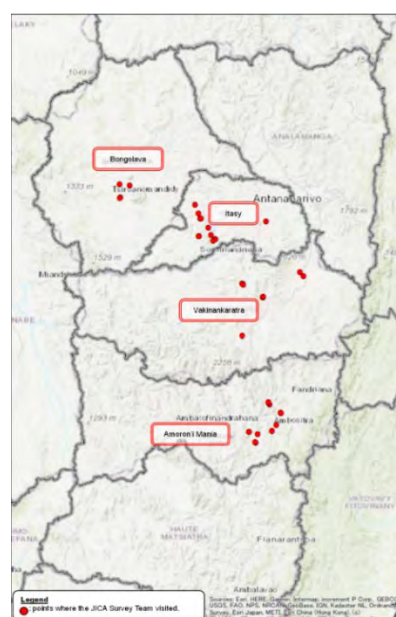


Figure 2 Location Map of Surveyed Areas

Source: JICA Survey Team

2.5.2 National Development Plans and Legal Frameworks Related to the COBSI Approach

(1) Plan National de Développement, 2015-2019

The “*Plan National de Développement (PND)*” 2015-2019, which aims for equitable economic growth, was approved in January 2015. This PND emphasized 1) Governance, law, security, decentralization, democratization, and national unity; 2) Stable macro-economic and national development; 3) Inclusive growth and rural development; 4) Human resources development for nationwide development, and (5) Value addition of natural resources and strengthening of resilience against natural disasters. It prioritized the agriculture sector for economic growth and paid attention to the improvement of irrigation and other agricultural production facilities, modernization of farming, and expansion of markets.

In 2014, the government issued the new National General Policy (“*Politique Générale de l'Etat – PGE*”) for 2014-2019, setting thirteen (13) strategic objectives: 1) Stable macro-economy; 2) Financial innovation; 3) Private sector development and business environment improvement; 4) Foreign trade promotion; 5) Infrastructure development and communication enhancement; 6) Environmental conservation; 7) IT innovation; 8) Sectoral public policy development; 9) Human resources development; 10) Governance and decentralization; 11) Public sector reform; 12) Social business, and 13) Further citizen’s participation. Similarly to the previous PGE drafted by the last Administration, the current PGE set a goal to make of Madagascar an economically emerging country. A newly planned PND (2019-2023) was under formulation to help materialize that goal according to JICA’s “Country Analysis Paper, Madagascar” (2019).

(2) Legal Frameworks on Environmental and Social Considerations

Key legal frameworks on environmental and social considerations in Madagascar are shown in Table 2.

Table 2 Key Legal Frameworks on Environmental and Social Considerations in Madagascar

No.	Name of Legal Framework and Plan in English	Name of Legal Frameworks in French
1	Malagasy Environment Charter: Law No. 2015-003 of February 19 th , 2015	Charte de l'environnement Malagasy: Loi n°2015-003 du 19 février 2015
2	Decree No. 99-954 of December 15 th , 1999 modified by the Decree No. 2004-167 of February 3 rd , 2004 pertaining to Compliance of Investments with the Environment (“MECIE Decree”)	Décret n° 99-954 du 15 décembre 1999 modifié par le Décret n° 2004-167 du 03 février 2004 relatif à la Mise en Compatibilité des Investissements avec l'Environnement (Décret MECIE)
3	Order No. 6830/2001 of June 28 th , 2001 setting the conditions and procedures for public participation to environmental evaluations	Arrêté n° 6830/2001 du 28 juin 2001 fixant les modalités et les procédures de participation à l'évaluation environnementale
4	Interministerial Order No. 4355 of May 13 th , 1997 pertaining to the definition and demarcation of sensitive areas	Arrêté interministériel n°4355 du 13 mai 1997 Portant définition et délimitation des zones sensibles
5	Water Code (Law No. 98-029 of January 20 th , 1999)	Code de l'Eau (Loi n° 98-029 du 20 janvier 1999)
6	CBD Strategy and Action Plan – Madagascar	Stratégie et plan d'action de la CDB – Madagascar
7	National Strategy of Environmental Information and Communication for Sustainable Development (2015-2025)	Stratégie Nationale de l'Information et de la Communication Environnementale pour le Développement Durable (2015-2025)
8	National Climate Change Adaptation Program (NAP) Madagascar	Programme National d'Adaptation au Changement Climatique (PNA) Madagascar
9	National Action Plan to Combat Desertification	Plan d'Action National De Lutte Contre La Desertification

Source: JICA Survey Team (2022)

Article 13 of the Malagasy Environment Charter stipulates that “public or private projects that have potential risks of negative impacts on the environment shall be subjected to environmental impact surveys.” As per

this Charter, project proponents need to prepare an “*Etude d’Impact Environnemental (EIE)*” or a “*Programme d’Engagement Environnemental (PREE)*” report based on the type, scale, and location of projects and obtain the related environmental permit in advance. The detailed procedure for the ESIA is provided for in the MECIE Decree as shown in Figure 3.

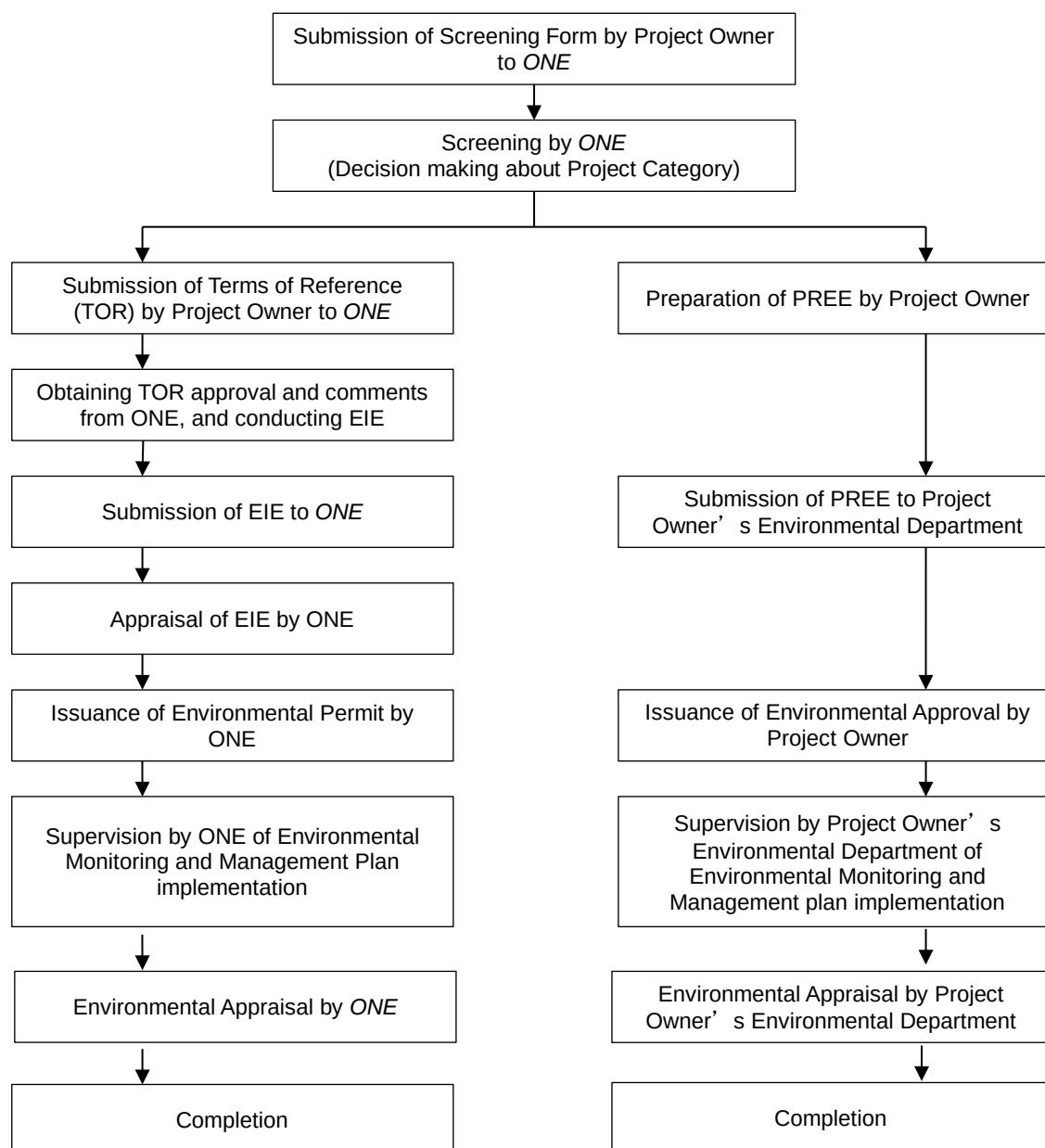


Figure 3 Environmental and Social Impact Assessment Flow in Madagascar

Source: JICA Survey Team

The final decision on the project categorization is made by the ONE—which is an autonomous entity under the Ministry of Environment and Sustainable Development (“*Ministère de l’Environnement et du Développement Durable – MEDD*”)—based on the type, scale, and location of projects described in “Screening Forms” prepared by project owners. If a project requires preparation of an EIE (“EIE-type project”) as a result of screening, EIE documents are appraised and approved by the ONE, but if it is, instead, subject to a PREE (“PREE-type project”), then the related documents are appraised by the project owner’s environmental department.

Excerpted from the MECIE Decree—First and Second Schedules, the project categorization criteria related to irrigation development in Madagascar is shown in Table 3. Considering the COBSI Approach targets irrigation areas of 50 ha and under per site, neither an EIE nor a PREE is applicable to it. When implementing the Project, however, it is necessary to confirm this point with the ONE again for adequate environmental and social considerations.

Table 3 Project Categorization Criteria related to Irrigation Development in Madagascar

EIE-Type Projects	PREE-Type Projects
Any hydro-agricultural or agricultural development or rehabilitation project of more than 1,000 ha	Any hydro-agricultural or agricultural development or rehabilitation project of an area comprised between 200 ha and 1,000 ha

Source: MECIE Decree, First and Second schedules

2.5.3 Survey Results (Current Situation/Identified Issues)

(1) Irrigation, Water Management and Maintenance

Madagascar is estimated to have a total irrigation potential area of around 1,517,000 ha, 786,000 ha (52%) of which has already been developed. Many simple weirs—traditional weirs constructed at farmer level—were identified through the field surveys, ranging from a type involving use of wood, grass, and soil with few intake weirs to a more advanced version using stones and sandbags (cf. Figure 4). Besides those, the State constructed reinforced concrete irrigation facilities in the 1980s and 1990s, but—of the ones visited—many were left in damaged condition due to aging and inadequate maintenance. Construction of such facilities require a certain level of technology, but some collapsed or were destroyed due to inappropriate design or installation locations (cf. Figure 5). Farmers' groups reconstructed some of such facilities, though mostly as an emergency measure, though they were not fully functional after repair, as users could not obtain the necessary amount of irrigation water.

As mentioned, the Survey Team confirmed that there were already irrigation facilities in various forms, from simple facilities to permanent structures, and farmers were irrigating agriculture in different ways as seen through field surveys of four (4) Regions in the central highlands. The irrigation potential of the area is high, and the need for irrigation improvement is expected to continue to increase.

Traditional farmers' groups in upstream areas, where water is plentiful, practice rice cultivation even during the dry season, while horticulture tends to be zoned downstream where irrigation water becomes scarce easily. Despite that, cases were observed where tomatoes and cabbages were excessively irrigated when there was sufficient water, besides concerns about fertilizer use and soil runoff (cf. Figure 6).



**Figure 4 Masonry-Type Traditional Weir
(Amaron'i Mania Region)**

Source: JICA Survey Team (July 2022)



**Figure 5 Partially Collapsed Reinforced
Concrete Permanent Weir (Vakinankaratra
Region)**

Source: JICA Survey Team (July 2022)

Water management and operation/maintenance knowledge and capacity often need to be improved so as to instill appropriate irrigation habit.

(2) Expansion Activities and Farmers' Organizations

There needs to be more extension personnel to provide technical guidance on farming and other related issues in Madagascar. Many interviewed farmers answered that they had never received training from any extension officers. Interviewed regional officials explained, in response, that there was a lack of equipment and materials such as motorcycles, spare parts, and fuel as well as computers, printers, and inputs (seeds, fertilizers, and pesticides), which hampers cultivation technology dissemination. Nationwide organizations/associations such as FIFATA¹ are there to support farmers' production activities in compensation, but they are still not sufficient.

Many farmers' organizations are traditional water management groups, and only a limited number of irrigation groups have WUAs. Setting up WUAs is one of the government's criteria for constructing irrigation facilities. However, even WUAs for whom concrete weirs were constructed are facing issues regarding water fee collection and maintenance activities which are deemed insufficient.

(3) Farming and Marketing

Almost all farmers are rice farmers, but some do not rely on that only, producing potatoes and cassava as alternative crops. During the rainy season, most farmers grow rice and vegetables in a limited area mostly for self-consumption while the surplus, especially of rice, gets sold. In the dry season, they extensively produce vegetables, beans, and potatoes using irrigation water, dry-season horticulture being one source of cash besides livestock sales and fish farming using the same water. It is worth noting, however, that rainfed rice paddy yields are declining due to recent impacts of climate change.

There are areas where specific vegetables are produced in abundance, like ginger in the eastern part, onions and peppers in the south, and cucumbers and strawberries around Antananarivo. Prices of some crops (e.g. tomatoes, lettuce) are rainy-season high, some (e.g. cucumbers, leeks, peppers, cowpeas) dry-season high, while those of others like ginger do not change much all year round. Various crop-dependent distribution channels were observed where i) a farmer transports crops to the market, ii) a middleman buys crops in the village and transports them to and retails them in town, or iii) a farmer sells their crops at the market themselves. The farmers seemed to be at different performance levels, some having the potential to earn good profits by seeking market information, while others simply do not.



Figure 6 A Farmer Irrigating a Vegetable Field (Itasy Region)

Source: JICA Survey Team (July 2022)



Figure 7 A Local Market in a Rural Area of Madagascar

Source: JICA Survey Team (July 2022)

¹ "Fikambanana Fampivoarana ny Tantsaha" (Malagasy for Association for the Progress of Farmers)

(4) Environmental and Social Considerations

1) Low forest coverage

The four regions in the central highland arid zone where the field survey was conducted, namely, Itasy, Vakinankaratra, Amoron'i Mania, and Bongrava were originally characterized by low forest coverage, however, logging for firewood, charcoal and housing has led it to further reduced to only a few percent. In addition, where lands are cultivated to the upstream areas of the watershed, rainfall causes a lot of soil run-off, which can fill weirs and canals downstream with sediment, and there are concerns about the impacts on the river environment. According to the DREDD² officer, the low forest coverage is also affecting soil degradation.

In Madagascar, the deforestation of natural forest is prohibited by the national laws, and the cut of trees planted is needed to obtain the permit from the DREDD in principle. In fact, however, there are cases of unpermitted cuts of trees. Under such a circumstance, there are regions that conducts community-wide tree planting activities by obtaining the national budget towards the conservation of watershed and soil improvement (Figure 9).

2) Impacts caused by climate change

As Madagascar had a significant drought in 2021 and been suffered from famine, the country is one of counties that are drastically affected by climate change currently³. In fact, it was confirmed there are farmers who recognize the change of raining pattern caused by climate change makes impacts on their agricultural activities, by farmers' interviews during the field survey. Specifically, farmers are facing difficulties in "water control," for example they cannot get rainfall for making soil of farmlands soft during the hallowing or are suffered from heavy rain at the flood level.

(5) Nutrition

In Itasy, Vakinankaratra, and Amoron'i Mania regions where the field survey was conducted, the JICA has conducted the "Food and Nutrition Improvement Project (called as "PASAN")" since 2019. It has been reported that the malnutrition is particularly prominent in rural areas where the diet is heavily weighted toward carbohydrates and there is a lack of diversity in the foods consumed. In the field survey, it was also confirmed that most farmers eat three meals per day, however, mainly rice with a small amount of side dishes. While there are farmers who cultivate vegetables as well as rice, farmers keep only a few vegetables for their self-consumption and sell most parts because it can be their important cash income especially in dry season.



Figure 8 Central Highland Arid Zone in Madagascar

Source: JICA Survey Team (July 2022)



Figure 9 Tree planting activity in Madagascar

Source: JICA Survey Team (July 2022)

² It is abbreviation for the Direction Régionale de l'Environnement et du Développement Durable (Regional Directorate of Environment and Sustainable Development), and the local agency of MEDD at district level.

³ UN News : <https://news.un.org/en/story/2021/10/1103712>

From the viewpoint of farmers' nutrition status, therefore, there are many rooms for the improvement.

2.5.4 Proposed Plans for Future COBSI Approach Cooperation

(1) Target Areas

All surveyed regions had potential sites accepting the COBSI approach. Areas near the southwestern region were identified as COBSI candidates based on detailed satellite image analysis results, on 4 Regions' field survey outcome, and on interviews with MINAE officials (cf.).

(2) Proposed Plans and Concept

Figure 10 presents the draft concept of the COBSI approach in Madagascar where irrigation development is classified into three categories: Large (1,000 ha or more), medium (200 ha to 1,000 ha), and small (50 ha to 200 ha), the DGR targeting schemes of 50 ha and above, though micro-scale schemes—even smaller than small-scale ones—are yet to be included in their scope of development. The Survey Team categorized the list of sites sourced from DGR 2013 National Data on “registered sites” and identified a total of 1,169,000 ha of farmlands, 42% of which falls under the “large” category, 24% under “medium”, 22% under “small”, and 12% “micro-scale”. Many unregistered micro-scale sites exist, and it is assumed that schemes smaller than 50 ha might actually account for more than 50% of the aforementioned total.

The COBSI approach could contribute to Madagascar's irrigation development, taking into account the following aspects: i) Natural conditions are favorable for introducing COBSI; ii) Many facilities are inadequately constructed and water management/maintenance capacity is not yet sufficient despite the existence of COBSI-potential irrigation sites of a few to several dozen hectares, and iii) COBSI could potentially cover the irrigation development of micro-scale schemes also targeted by the concerned ministry in the future.

MINAE's Directorate of Rural Engineering and COBSI approach projects could work together on “Irrigation Area Expansion” and “Agricultural Productivity Improvement” to achieve the overall goals of “Sustainable Irrigation Development and Resource Management as well as Poverty Reduction through Income Improvement”. The approach would, then, include i) improvement of simple weirs and canals, ii) construction of permanent weirs and development of related design manuals, iii) strengthening of the capacity of irrigation engineers and extension personnel, and iv) strengthening of the capacity of farmers' organizations. In addition, the project would synergistically work with all concerned agencies to incorporate nutrition improvement, market orientation through SHEP, and watershed conservation in training programs to achieve the abovementioned overall goals more effectively.

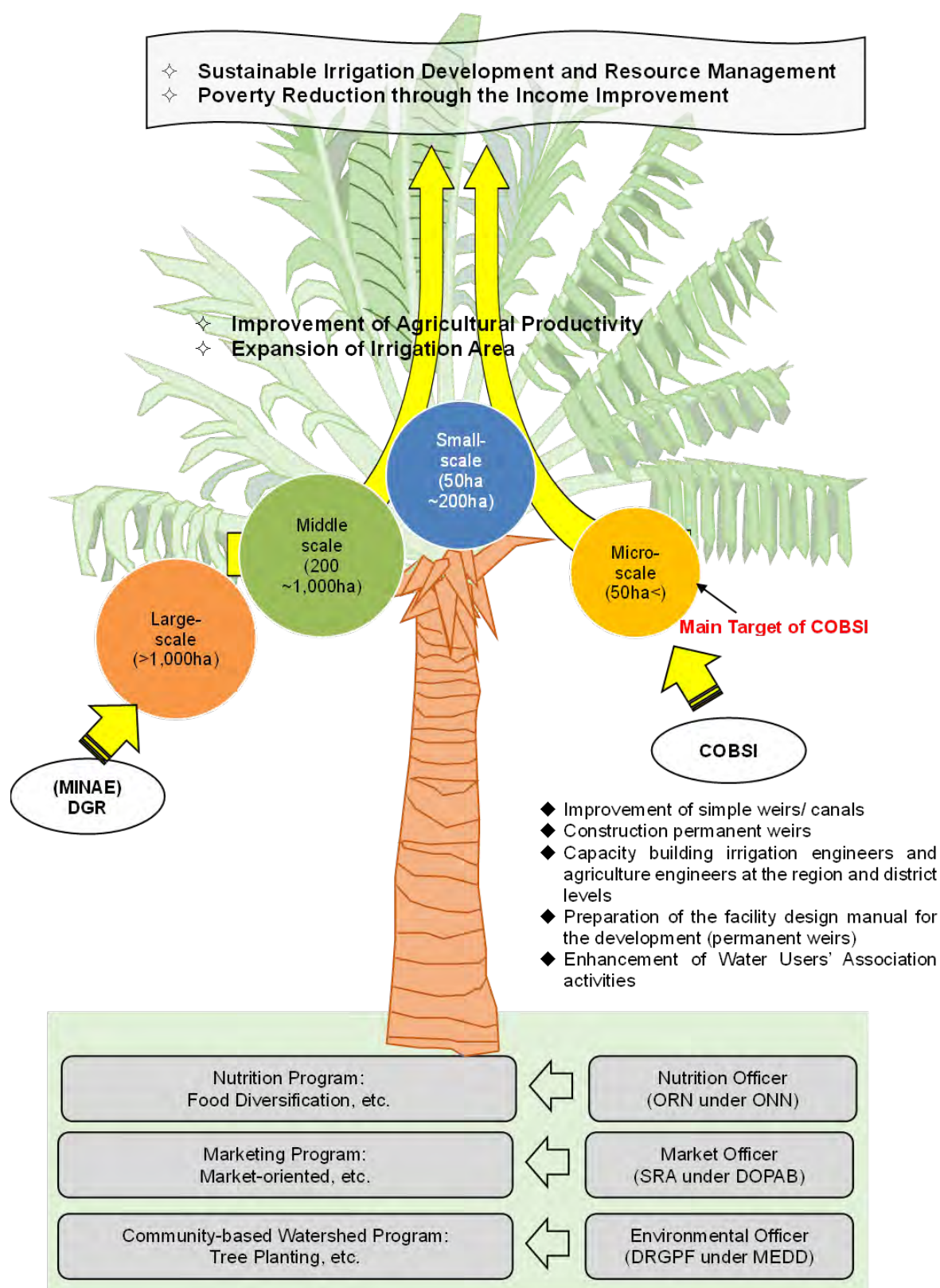


Figure 10 Draft Concept for the COBSI Approach in Madagascar

Source: JICA Survey Team

Based on all those points, COBSI approach plans—which are expected to contribute to Madagascar’s irrigation development—are, thus, put forward in Table 4 below.

Table 4 Proposed COBSI Approach Plans Contributing to Irrigation Development in Madagascar

Item	PLAN-A	PLAN-B	PLAN-C
Name of the Plan	Madagascar COBSI Project	Rehabilitation project of permanent weirs with water management and operation and maintenance technical project	Attach the COBSI approach to the existing or new agriculture projects
Target	• Simple (Traditional) weir and Permanent weir	• Existing Permanent weir	• Simple (Traditional) weir and Permanent weir
Findings related to Small-scale Irrigation	• There are many perennial streams and there is much potential for small-scale irrigation. • The farmers have been constructing simple weirs (namely traditional weirs) and canals for a long time ago to irrigate the paddy field and the upland field. • However, farmers' level of knowledge in water management and capabilities of operation and maintenance is not sufficient, in general. Especially, downstream of the irrigated areas are tended to be shorted irrigation water due to insufficient water management. • Since farmers have constructed and maintained irrigation facilities, they have some extent of knowledge about irrigation farming and irrigators/ farmers' organizations. • Although the farmers are familiar with the traditional weir and canal construction, they do not have enough skill in permanent weir construction.	• There were a lot of permanent weirs constructed by the government during the 1980s to 1990s, however many of them were damaged and the irrigable area decreased. • Because of the problem of location or design of the facility, the permanent weirs were damaged, easily. • DGR targeted more than 50ha of irrigation facilities so the irrigation facilities under 50ha were not rehabilitated by DGR scheme. • The importance of irrigation facilities is increased against climate change even for rice cultivation in the rainy season. • Due to a lack of water management and operation and maintenance of irrigation facilities, even the damaged irrigation facilities were not rehabilitated by the beneficiaries.	• Traditional weirs and canals were already existing and the farmers have enough knowledge of the construction of it. • The importance of irrigation facilities is increased against climate change and all the agricultural improvement project in Madagascar is related to irrigation to increase and stabilize production. • Permanent weir can be constructed by the farmers but they need technical support from the irrigation engineers.

Item	PLAN-A	PLAN-B	PLAN-C
Name of the Plan	Madagascar COBSI Project	Rehabilitation project of permanent weirs with water management and operation and maintenance technical project	Attach the COBSI approach to the existing or new agriculture projects
	[Extension Activities] • Transportation: Shortage of motorbikes, and spare parts and/or fuel for motorbikes. • Office tool: Shortage of PCs, photocopy machines, printers, and stationeries. • Agricultural input for dissemination: Shortage of seed, chemical and fertilizer for demo plots. • Few numbers of governmental extension officers. • There are Farmer organizations e.g. FIFATA. • Education transfer: Shortage of opportunity to learn the new information/technology. [Irrigators' Organization Activities] • There are many traditional water user groups, but only a few groups have established WUAs. The establishment of WUA is a criterion for the construction of permanent weir by MINAE. • However, even the WUAs activities at the permanent weir schemes are not sufficient for collecting water fees and maintenance activities. [Cultivation] • Limited area of cultivation, so increasing productivity is important. • Productivity is decreased due to the changing in rainfall amount and timing (climate change). • Limited accessibility of irrigation water downstream. • Limited accessibility to buy certified seeds, agricultural chemicals, and fertilizers, so the productivity became lower. [Market] • Since the demand for vegetables in the dry season is higher than the one in the rainy season in several vegetables due to the shortage of production, the market prices in the dry season are also higher than in the rainy season. Vegetable production during the dry season can be a good income source for farmers. [Environment] • The forest cover area was limited in the hilly places due to the human cutting for firewood, charcoal making, building houses and etc. Due to this, soil erosion has easily occurred, and it caused both the sedimentation of weirs and canals and farmland loss. • The changes in rainfall patterns caused by climate change have been observed. [Nutrition] Especially in rural areas, problems with an unbalanced diet are seen, and malnutrition is particularly prominent.		
Concept Summary	Increases in production of vegetables and rice through the improvement of <u>traditional weirs</u> , the construction of <u>permanent weirs</u> , and enhancement of operation, maintenance and water management.	Increases in production of vegetables and rice through the <u>rehabilitation of permanent weirs</u> , and enhancement of operation, maintenance and water management.	Increases in production of vegetables and rice through the construction of <u>permanent weirs</u> , and enhancement of operation, maintenance and water management.
Package of Hard Components	• <u>Improvement of traditional weirs</u> • <u>Construction of permanent weirs</u> • Introduction of operation and maintenance technology for irrigation and drainage canals based on the advanced COBSI approach. • Enhancement of aquaculture: usage of existing paddy fields as fishponds.	• <u>Rehabilitation of permanent weirs</u> • Introduction of operation and maintenance technology for irrigation and drainage canals based on the advanced COBSI approach.	• <u>Construction of permanent weirs</u> • Introduction of operation and maintenance technology for irrigation and drainage canals based on the advanced COBSI approach.
Package of Soft Components	• Capacity building for irrigation and agriculture engineers. • Development of manuals on operation, maintenance and water management.	• Development of manuals on operation, maintenance and water management • Provision of training on operation, maintenance and water management	• Capacity building for irrigation and agriculture engineers • Development of manuals on operation, maintenance and water management

Item	PLAN-A	PLAN-B	PLAN-C
Name of the Plan	Madagascar COBSI Project	Rehabilitation project of permanent weirs with water management and operation and maintenance technical project	Attach the COBSI approach to the existing or new agriculture projects
	• Provision of training on operation, maintenance and water management. • Promotion of dissemination by farmers themselves (FFS, and FFD). • Promotion of training on the production of horticulture crops including a topic regarding the appropriate use of agricultural chemicals • Introduction of Market-oriented; SHEP approach. • Introduction of community-based watershed conservation (plant, fencing and ditch). • Promotion of training for the nutrition improvement. • Introduction of the concept of water rights.		• Provision of training on operation, maintenance and water management

Source: JICA Survey Team

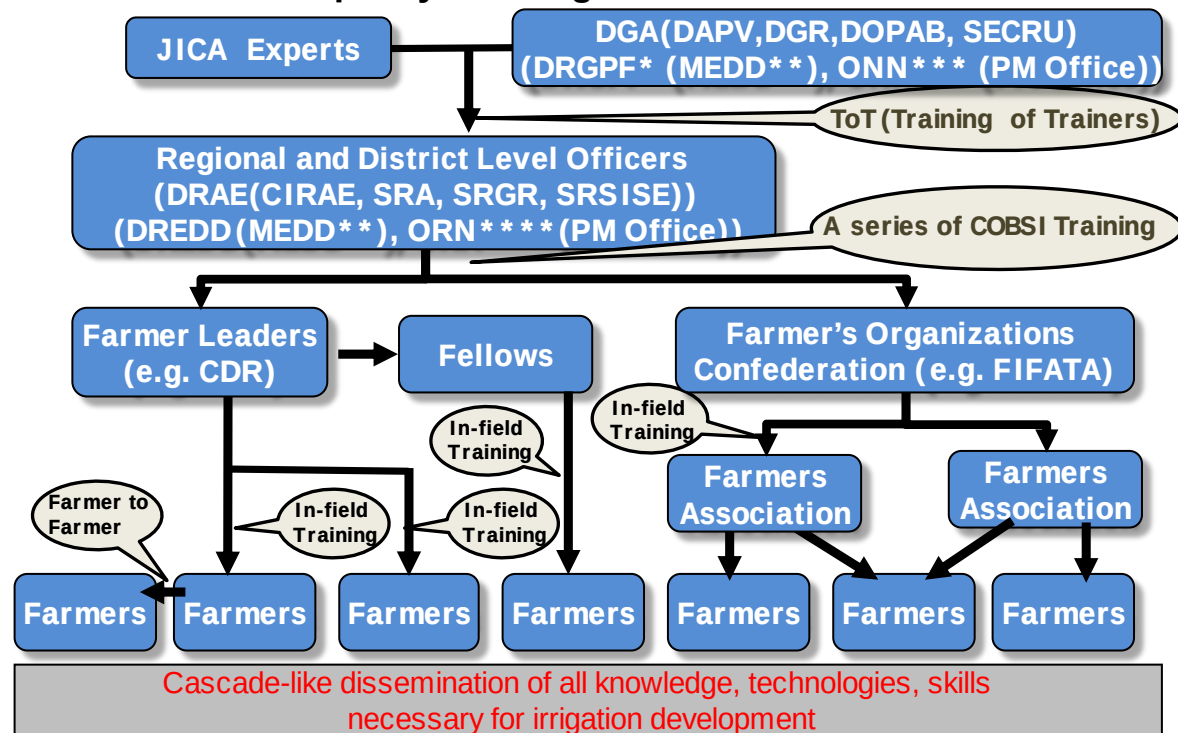
(3) Implementation Structure (Draft)

Figure 11 presents the proposed implementation structure for the COBSI approach in Madagascar. MINAE's Directorate General of Agriculture would be the leading implementation agency, with ONN and MEDD as cooperating agencies respectively for nutrition improvement and for watershed conservation. The COBSI approach dissemination system is layered into Central, Regional/ District, and Local (farmers-to-farmer) levels. Firstly, Central government (e.g. DGA) officials and JICA experts train Regional/ District-level officers through ToT to become "trainers" who will, in turn, conduct training for farmers' group leaders and farmers' organizations (e.g. FIFATA) who are next in line for dissemination to farmers' groups and as far down as individual farmers.

This training includes KOT, MTT, and an AEW, so one (1) cycle of the training course includes three series of training sessions per year for farmers' groups. Understanding that there is a shortage of extension personnel (officers/agents) in Madagascar, the training could be conducted directly with the farmers' group leaders and farmers' organizations like FIFATA instead of extension agents.

COBSI Extension System in Madagascar [draft]

- Capacity Building Flow for Officers -



*: Directorate of reforestation and landscapes and forest management. **: Ministry of Environment and Sustainable Development
: National Office of Nutrition, *: Regional Office of Nutrition

Figure 11 Implementation Structure for the COBSI Approach in Madagascar (Draft)

Source: JICA Survey Team

APPENDIX 3 MATERIALS FOR THE GCF SURVEY IN ZAMBIA

APPENDIX 3-1 DEVELOPING GCF SAP CN AND FP FOR POST E-COBSI



PostE-COBSI

Post Expansion of Community-Based Smallholder Irrigation Development Project

Developing GCF SAP CN and FP for Post E-COBSI

22 April 2022



III-1-1

2

Agenda

1. GCF and GCF SAP Procedure
2. NDA and DAE for Post E-COBSI
3. Post E-COBSI Outline
4. Rough Budget
5. CN & FP Preparation (with Sample Timeline)
6. Useful Reference Documents
7. Annex: Activities per Province

GCF Strategic Result Area

Green Climate Fund: GCF

Largest Global Fund dedicated to help fight Climate Change.

8 Strategic Result Areas		Post E-COBSI
Mitigation: Reduce Emission	Energy Generation & Access	
	Low-Emission Transport	
	Buildings, Cities, Industries, and Appliances	
	Forestry and Land Use	
Adaptation: Increase Resilience	Most Vulnerable People and Communities	
	Health, Well-Being, Food, and Water Security	✓
	Infrastructure & Built Environment	
	Eco-Systems & Ecosystem Service	

* Revised result areas based on the adopted Integrated Results Management Framework (July 2021)

4

1. GCF and GCF SAP Procedure

GCF SAP

SAP Approval Process: Notes for CN



Simplified Approval Process Pilot Scheme: SAP

- Ready for **Scaling Up** & have the **Potential for Transformation, Promoting Paradigm Shift** to Low-Emission and Climate Resilient Development
- GCF Financing up to **10 million USD** of the Total Project Budget
- Environmental/ Social Risks & Impact are **Minimum/ None**
- **Co-Finance** is **MUST** (including In-Kind Contribution)

- ✓ SAP: <https://www.greenclimate.fund/projects/sap>
- ✓ Reference Documents and Templates: <https://www.greenclimate.fund/projects/sap/resources>
- ✓ CN of Other Projects for Reference (filter by "Concept Note" for Publication/Document, Operational Documents: <https://www.greenclimate.fund/publications/documents>)

SAP Approval Process: Notes for CN

General Note for CN Procedure

- Develop **CN** along with **Environmental and Social Safeguards (ESS)**.
 - ✓ CN Template: <https://www.greencliminate.fund/document/simplified-approval-process-concept-note> (Last 3 pages are ESS)
 - ✓ Concept Note User's Guide: <https://www.greencliminate.fund/document/gcf-concept-note-user-guide>
 - ✓ ESS Guideline: Guidelines for the Environmental and Social Screening of Activities proposed under the SAP (<https://www.greencliminate.fund/document/guidelines-environmental-and-social-screening-activities-proposed-under-simplified-approval>)
- CN could be submitted by either **NDA or AE/ DAE**
- **Discuss thoroughly** with Zambia Meteorological Department (implementing partner), JICA, NDA, and DAE before finalizing the CN.
- Submit CN via **Online Submission System (OSS)**
 - ✓ SAP Online Submission System (SAP OSS) - User guide: <https://www.greencliminate.fund/document/simplified-approval-process-online-submission-system-sap-oss-user-guide>
- Submitted CN (v.0) would be reviewed by GCF Secretariat, and their initial comment would be shared within **2 to 3 weeks**.
- Back and forth discussion with the Secretariat and revision would take place to finalize the CN.

General Note for Project Preparation Facility (PPF)

PPF Guideline: <https://www.greenclimate.fund/document/project-preparation-facility-guidelines>

- PPF financial resources could be utilized for high potential CN to **prepare the funding proposal** for the following areas for simplified PPF activities;
 - i) Pre-feasibility/ feasibility studies and Project Design (FP Annex 2)
 - ii) Environment, social and gender studies (FP Annex 4)
 - iii) Risk assessments (FP Annex 7)
- **PPF Funding**
 - Funding in the form of grants, repayable grants, or equity to undertake project preparation activities by themselves.
 - **AEs organize the procurement and implementation process directly** and are accountable for the oversight and reporting of the approved funding and activities.
 - Request up to **USD 300,000** for simplified PPF funding
- **PPF Service**
 - The GCF provides project preparation services directly to AEs through a roster of independent consultancy firms (8), ensuring fast and quality delivery to **AEs who do not wish to take on the procurement and project management of PPF activities by themselves.**

Notes for FP Procedure

- **SAP FP Preparation Guideline** (2019): <https://www.greenclimate.fund/document/simplified-approval-process-sap-funding-proposal-preparation-guidelines-practical-manual>
- **Guidance Note to support the completion of the IRMF elements of the revised funding proposal template for PAP and SAP** (2022) <https://www.greenclimate.fund/document/guidance-note-support-completion-irmf-elements-revised-funding-proposal-template-pap-and>
- Funding proposal (FN) could be submitted by **AE/ NAE**.
- Prepare FP and Appendix 1 to 9 and submit.
- FP would be reviewed by the Secretariat and their first comment would be shared within **4 to 6 weeks** after the submission.
- FP v.1 has to be submitted no later than **190 days before the expected GCF Board Meeting for approval**.
- Lengthy revision process would take place. For example, FP for JICA GCF Project in East Timor was revised up to version 12.
- Once agreed with the Secretariat, FP would be reviewed by the **Independent Technical Advisory Panel (iTAP)**.
- FP would be **approved at the Board Meeting** which is held 3 times a year.

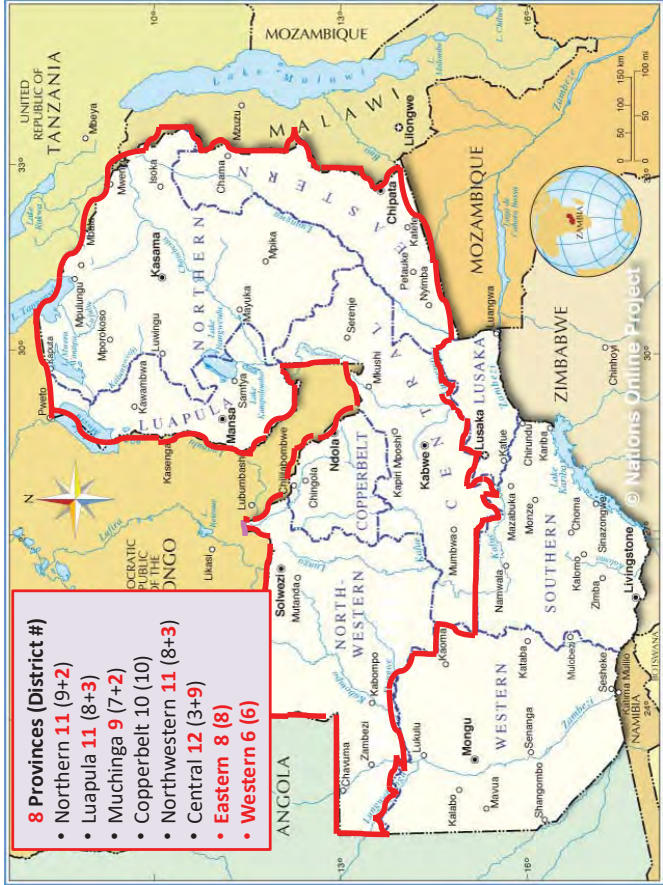
Annex for FP

* Template/ Format is available at <https://www.greenclimate.fund/projects/sap/resources>

Annex 1	Letter of No-Objection Letter (NDA)
Annex 2	Pre-feasibility Study <i>Ref Doc: Guidance for preparing pre-feasibility study under SAP</i>
Annex 2a	Logical Framework
Annex 2b	Timetable
Annex 3	Detailed Budget
Annex 4	Gender Assessment and Action Plan
Annex 5	Co-Finance Letter
Annex 6	Term Sheet
Annex 7	Risk Assessment and Management
Annex 8	Procurement Plan
Annex 9a	Legal Due Diligence
Annex 9b	Legal Opinion Certificate of Internal Approval

2. NDA and DAE for Post E-COBSI

Target Area: 8 Provinces, 78 Districts (45+33)



Post E-COBSI: Expected Result (1)

1,275 CEO/BEO*1 (= all CEO/BEO in the targeted districts)

trained on Simple Weir/ Water Management/ SHEP/ Nutrition.

5,100*2

Simple Weir constructed, which means

Increase in 5,100 ha*3 Irrigated Area.

150 + α*4 Permanent Weir constructed.

1,603*5 Rain-gauge Stations installed (1/camp).

68*5 Automatic Weather Stations installed (1/district).

Note: Number to be further refined based on the discussion. E.g., Discussion with Zambia Meteorological Department about how many/ where to install the rain-gauge station and automatic weather station.

Target Area: 8 Provinces, 78 Districts (45+33)

Northern	Luapula	Muchinga	Copperbelt	North-western	Central	Eastern	Western
III	III	I, IIa, III	IIa, III	III	I, IIa, III	IIa	IIa, IIb, III
11 (9+2)	11 (8+3)	9 (7+2)	10	11 (8+3)	12 (3+9)	8	6
Kasama	Chembe	Isoka	Chililabombwe	Ikkeleng'I	Selenge	Chandiza	Kaoma
Luwingu	Chipili	Kanchibiya	Chingola	Kalumbila	Chitambo	Katete	Nkeyema
Mbala	Kawambwa	Luvushimanda	Kalulushi	Kasempa	Mkushi	Lumezi	Limulunga
Mporokoso	Mansa	Mafinga	Kitwe	Manyinga	Chibombo	Lundazi	Luampa
Mungwi	Milenge	Mpika	Luanshya	Mufumbwe	Chisamba	Lusangazi	Lukulu
Nsama	Mwansa-Bombwe	Nakonde	Lufwanyama	Mushindamo	Itezhi-Tezhi	Petauke	Mongu (West)
Lupososhi	Mwense	Shiwang'andu	Masaiti	Mwinilunga	Kabwe	Sinda	
Lunte	Nchelenge	Chama	Mpongwe	Solwezi	Kapiri Mposhi	Vubwi	
Senga Hill	Chiengi	Chinsali	Mufulira	Chavuma	Luan		
Kaputa	Chifunabuli		Ndola	Kabompo	Mumbwa		
Mpulungu	Samfya			Zambezi	Ngabwe		
					Shibuyunji		

Green Cell:
New Province/ District

Post E-COBSI: Expected Result (1) - Notes

Note 1	The calculation is based on the number of Blocks and Camps of the targeted Districts, not the actual number of CEO/ BEO assigned for the targeted Districts = verification required to .
Note 2	4 Simple Wier Sites developed by 1 CEO (based on T-COBSI).
Note 3	1 Simple Wier Site = around 1 ha irrigated area (based on T-COBSI).
Note 4	Around 20% of the Simple Weir has the potential to be upgraded to the Permanent Weir. However, the number presented is modified and is subject to change depending on the budget and the feasibility.
Note 5	- Number of Rain-gauge stations/ Automatic Weather Stations excludes those camps/ districts targeted by the World Bank Funded Project "Transforming Landscapes for Resilience and Development in Zambia". - To be discussed thoroughly with Zambia Meteorological Department on locations and number of the stations. - Districts that overlap with WB Project are as follows; - Northern Province: Mbala, Mungwi, Nsama, Mpulungu - Luapul Province: Kawabwa, Nchelenge, Chifunabuli, Samfya - Muchinga Province: Isoka, Kanchibiya, Luvushimanda, Mafinga, Mpika, Chama - Actual activities and budget required for the dissemination of the information to the community and action taken at the community level requires to be discussed with the Meteorological Department, SCARLA and WB.

Post E-COBSI: Expected Result (2)

Direct Beneficiaries: 510,000 person (102,000 HH)

* COBSI (Simple Weir) + SHEP + Nutrition

* Average 5.0 member per household (based on 2018 DHS)

Indirect Beneficiaries: 6,009,000 person

* 38.84% of the total population

* Calculation based on the Rural Population of the targeted districts as they would benefit from the Early Warning System

Based on Zambia Data Portal by Central Statistic Office
(<https://zambia.opendataforafrica.org/xmsofg/total-population>)

21

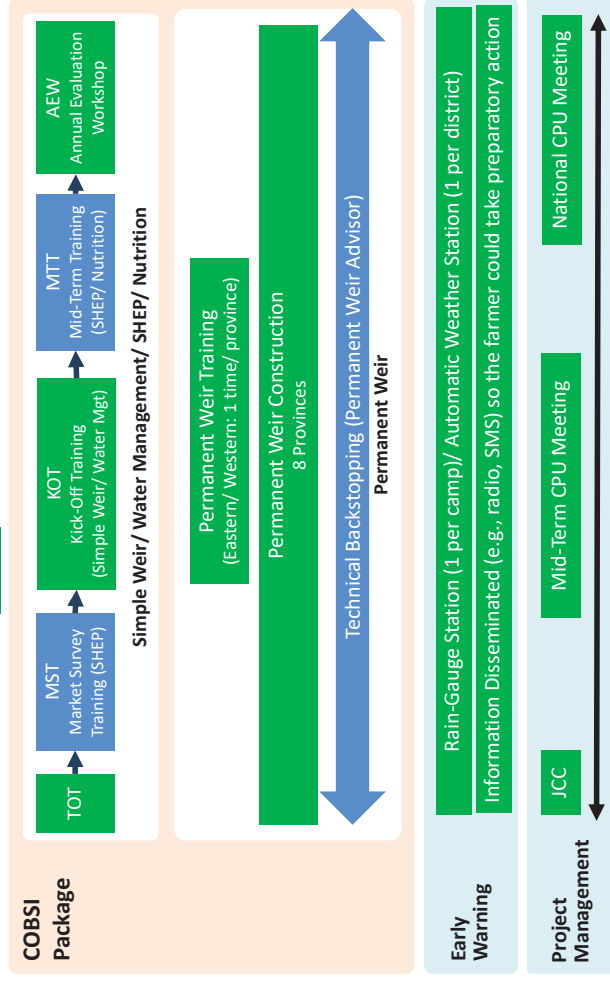
Post E-COBSI Activities for 4 Groups

Group	Province	Total	No. of District	Total	Activities (Example)
1 E-COBSI FU Provinces	Northern Luapula Murchinga	3	(9) (8) (7)	24	1) Permanent Weir Construction (continue with Simple Weir Construction)
2 E-COBSI New Province	Copperbelt North-Western Central	3	(10) (8) (3)	21	1) Permanent Weir Construction (continue with Simple Weir Construction)
3 Post E-COBSI New Province/ Districts	Northern Luapula Murchinga North-Western Central Eastern Western	7	(2) (3) (2) (3) (9) (8) (6)	33	1) Training for Trainers 2) COBSI Basic Package Training: Simple Weir, Water Management, SHEP, Nutrition 3) Training for Permanent Weir (Eastern and Western Province) 4) Permanent Weir Construction
4 Post E-COBSI (Remaining BEO/ CEO who could not receive either COBSI-Study, T-COBSI, E-COBSI Training)	Northern Luapula Murchinga Copperbelt North-Western Central	6	(9) (8) (7) (10) (8) (3)	45	1) COBSI Basic Package Training for CEO/BEO who could not join E-COBSI training.

**Green Cell:
New Province/ District**

23

Post E-COBSI: Activity Wise Budget (Idea)



Post E-COBSI Activities per Provinces (1)

E-COBSI FU Provinces (include Post E-COBSI New Districts)

Province	Activities	Note
1 Northern (52 CEO/ BEO trained)	a. COBSI Basic Package Training for 11 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station & Automatic Weather Station d. Information dissemination + utilization for prepared action.	COBSI Basic Package Training • All CEO/BEO for Kapua & Mpulungu District (2 "New" Districts) • Remaining CEO/BEO who has not joined training by E-COBSI (9 districts). • Basic Package Training x 2 years (3 CEO/BEO/ district/ training)
2 Luapula (73 CEO/ BEO trained)	a. COBSI Basic Package Training for 11 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station & Automatic Weather Station d. Information dissemination + utilization for prepared action.	COBSI Basic Package Training • All CEO/BEO for Chiengi, Chifunabuli, Samfya District (3 "New Districts") • Remaining CEO/BEO who has not joined training by E-COBSI (8 districts). • Basic Package Training x 2 years (3 CEO/BEO/ district/ training)
3 Murchinga (73 CEO/ BEO trained)	a. COBSI Basic Package Training for 9 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station & Automatic Weather Station d. Information dissemination + utilization for prepared action.	COBSI Basic Package Training • All CEO/BEO for Chama & Chinsali District (2 "New Districts") • Remaining CEO/BEO who has not joined training by E-COBSI (7 districts). • Basic Package Training x 3 years (3 CEO/BEO/ district/ training)

Note: COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition

24

Post E-COBSI Activities per Provinces (2)

E-COBSI New Provinces (includes Post E-COBSI New Districts)

Province	Activities	Note
1 Central (320 CEO/ BEO trained)	a. COBSI Basic Package Training for 12 districts	COBSI Basic Package Training - All CEO/BEO beside Selenge, Chitambo and Mkushi Districts (9 "New" Districts) - Remaining CEO/BEO who has not joined training by E-COBSI (3 districts). - Basic Package Training x 9 times = 4 years to conduct for 2 groups (3 CEO/BEO/ district/ training)
	b. Permanent Weir Construction	
	c. Installation of Rain-Gauge Station & Automatic Weather Station	
	d. Information dissemination + utilization for prepared action.	
2 Copperbelt (133 CEO/ BEO trained)	a. COBSI Basic Package Training for 10 districts	COBSI Basic Package Training - Remaining CEO/BEO who has not joined training by E-COBSI (10 districts). - Basic Package Training x 5 years (3 CEO/BEO/ district/ training)
	b. Permanent Weir Construction	
	c. Installation of Rain-Gauge Station & Automatic Weather Station	
	d. Information dissemination + utilization for prepared action.	
3 North-Western (259 CEO/ BEO trained)	a. COBSI Basic Package Training for 11 districts	COBSI Basic Package Training - All CEO/BEO for Chavuma, Kabompo, Zambezi District (3 "New Districts) - Remaining CEO/BEO who has not joined training by E-COBSI (8 districts). - Basic Package Training x 8 times = 3 years to conduct for 2 groups (3 CEO/BEO/ district/ training)
	b. Permanent Weir Construction	
	c. Installation of Rain-Gauge Station & Automatic Weather Station	
	d. Information dissemination + utilization for prepared action.	

Note: COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition

Post E-COBSI Activities per Provinces (3)

Post E-COBSI New Provinces

Province	Activities	Note
1 Eastern (223 CEO/ BEO trained)	a. Training of Trainers	COBSI Basic Package Training Basic Package Training x 9 times = 4 years to conduct for 2 groups (3 CEO/BEO/ district/ training)
	b. COBSI Basic Package Training for 8 districts	
	c. Training for Permanent Weir	
	d. Permanent Weir Construction	
	e. Installation of Rain-Gauge Station & Automatic Weather Station	
	f. Information dissemination + utilization for prepared action.	
2 Western (142 CEO/ BEO trained)	a. Training of Trainers	COBSI Basic Package Training Basic Package Training x 8 times = 3 years to conduct for 2 groups (3 CEO/BEO/ district/ training)
	b. COBSI Basic Package Training for 6 districts	
	c. Training for Permanent Weir	
	d. Permanent Weir Construction	
	e. Installation of Rain-Gauge Station & Automatic Weather Station	
	f. Information dissemination + utilization for prepared action.	

Note: COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition

Post E-COBSI Project Schedule

Rough Overall Schedule

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
COBSI						
Package for 8 Provinces: Simple Weir/ Water Management/ SHEP/ Nutrition						
Permanent Weir	Training		8 Provinces			Monitoring
	Construction		Eastern/ Western			
Early Warning System						
Rain-Gauge Station						
Automatic Weather Station						
Information Dissemination to the community + Farmers Actions						
Monitoring/ Evaluation						Evaluation
Planning for Way Forward						

Impact Measurement: Example

Reference Documents

- SAP Technical Guidelines: Agriculture
- SAP Technical Guidelines: Water Security

Expected Results	Indicators
Fund Level Impact	
Increased resilience and enhanced livelihoods of the vulnerable people, communities, and regions	Number of males and females benefitting from the adoption of diversified, climate-resilient livelihood options.
Project Outcome	
Strengthened adaptive capacity and reduced exposure to climate risk	Number of males and females reached from (or total geographic coverage of) climate-related early warning systems and other risk reduction measures established or strengthened.
Strengthened awareness of climate threats and risk-reduction processes	Number of males and females made aware of climate threats and related appropriate responses.

Indicative SAP Activity Matrix: Example

Reference Documents

- SAP Technical Guidelines: Agriculture
- SAP Technical Guidelines: Water Security

Sample SAP-ABLE Activity	Sample Indicator
Increased in water availability and use-efficiency through water harvesting and efficient irrigation interventions	• Number of farmers applying promoted water-saving technologies. • Number of hectares where water-saving technologies are applied. • Area brought under cultivation through water harvesting techniques
Strengthening of early warning systems	Status of the development and the use of early warning system (qualitative indicator)

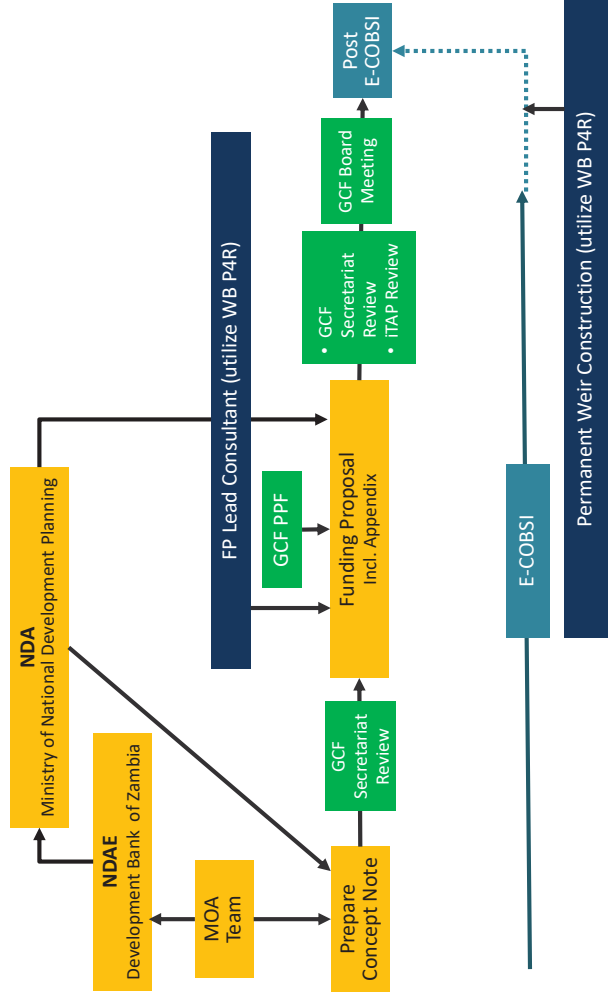
4. Budget (Rough Estimate as of Apr 2022)

Budget: Rough Estimate (as of Apr 2022)

Component: Output-Based	USD	Note
Component 1: Secure Water		
COBSI Basic Package Training (Simple Weir & Water Management) and Permanent Weir Training	640,000	GCF, Include TDA, Lodging, Transport, Venue, Master Trainer' Cost Eastern Province to be supported by Muchinga Province, Western Province to be supported by Copperbelt Province
COBSI Permanent Weir Construction	4,470,000	GCF for Construction Cost (USD 2,7700,000) JICA most likely to cover Technical Backstopping Expert Cost (USD 1,600,000)
Component 2: Improve Livelihood		
COBSI Basic Package Training (SHEP & Nutrition)	250,000	JICA (most likely)
Component 3: Early Warning System		
Installation of Rain-Gauge Station	720,000	GCF, Euro 400 (= USD 450)/ station
Installation of Automatic Weather Station	2,720,000	GCF, USD 40,000/ station
Data Analysis and Dissemination of Information to the community	?	GCF, Budget to be set based on SCRALA experience
Component 4: Monitoring & Evaluation		
Meetings & Fuel	2,550,000	GCF, Meetings include such as Yearly JCC, Mid-term CPU Meeting, and National CPU Meeting.
Project Management Cost		
	500,000+α	GCF covers 5% of the GCF investment amount. To be shared with Co-Financers
Total	11,850,000	Excluding Zambia Government Contribution - GCF: USD 10,000,000, JICA: USD 1,850,000

5. CN & FP Preparation with Sample Timeline

Post E-COBSI CN & FP Preparation (Idea)



Timeline: Example

Schedule	Activity
By end of June 2022	Develop CN by MOA Team by consulting Zambia Meteorology Department (and JICA)
July 2022	Discuss with the Development Bank of Zambia (DNAE) and Ministry of National Development Planning (NDA)
Beginning of August 2022	Submit to GCF
September 2022	Apply for Project Preparation Facility Start developing FP and Annex
January 2023	Submit FN to GCF Note: v1 to be submitted no later than 190 days before the targeted GCF Board Meeting
	Review by GCF Secretariat + Review by iTAP
July/ August 2023	GCF Board Meeting – Approval
January 2024	Disbursement (assumption: 1 st disbursement to take place 6 month after the Board approval)

Reference Documents (1)

GCF Guideline

- **For CN Development**
 - ✓ Concept Note User's Guide
<https://www.greenclimate.fund/document/gcf-concept-note-users-guide>
 - ✓ Guidance for the Environmental and Social Screening of Activities Proposed under the Simplified Approval Process
<https://www.greenclimate.fund/document/guidelines-environmental-and-social-screening-activities-proposed-under-simplified-approval>
 - ✓ Simplified Approval Process Online Submission System (SAP OSS): User guide
<https://www.greenclimate.fund/document/simplified-approval-process-online-submission-system-sap-oss-user-guide>
- **For Applying for Project Preparation Facility (PPF)**
 - ✓ Project Preparation Facility Guideline
<https://www.greenclimate.fund/document/project-preparation-facility-guidelines>

6. Useful Reference Documents

GCF Guideline

- **For FP Development**
 - ✓ Simplified Approval Process (SAP) Funding Proposal Preparation Guidelines <https://www.greenclimate.fund/document/simplified-approval-process-sap-funding-proposal-preparation-guidelines-practical-manual>
 - ✓ Guidance Note to support the completion of the IFMIF elements of the revised funding proposal template for PAP and SAP <https://www.greenclimate.fund/document/guidance-note-support-completion-irmf-elements-revised-funding-proposal-template-pap-and>
 - ✓ Guidance for preparing a pre-feasibility study under the Simplified Approval Process <https://www.greenclimate.fund/document/guidance-preparing-pre-feasibility-study-under-simplified-approval-process>

- **Technical Guideline**
 - ✓ SAP Technical Guidelines: Agriculture <https://www.greenclimate.fund/document/sap-technical-guidelines-agriculture>
 - ✓ SAP Technical Guidelines: Water security <https://www.greenclimate.fund/document/sap-technical-guidelines-water-security>
- * Includes Approach, Impact Measurement, Indicative SAP Activity Matrix for Agriculture, and Project Scenario

Other Documents

- ✓ GCF Integrated Results Management Framework (2021) <https://www.greenclimate.fund/document/integrated-results-management-framework>
- ✓ Zambia Country Programme (submitted to GCF in 2017) <https://www.greenclimate.fund/document/zambia-country-programme>
- ✓ ZAMBIA's Intended Nationally Determined Contribution (INDC) to the 2015 Agreement on Climate https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Zambia%20First/Final%20Zambia%27S+INDC_1.pdf
- ✓ Revised INDC (2021) https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Zambia%20First/Final%20Zambia%27S+INDC_1.pdf

Post E-COBSI Activities: Northern Province

E-COBSI FU Provinces (include Post E-COBSI New Districts)
52 CEO/ BEO expected to be trained = around 108 ha Irrigated Area

Activities		
a. COBSI Basic Package Training for 11 districts		
b. Permanent Weir Construction	<i>* To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install.</i> <i>* Exclude those districts/ camps targeted by the WB project.</i>	
c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 145 stations - Automatic Weather Station: 7 stations		
<i>* Information dissemination + utilization for prepared action.</i>		
d.		
Note		
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition		
• All CEO/BEO for Kaputa & Mpulungu District (2 “New” Districts)		
• Remaining CEO/BEO who has not joined training by E-COBSI (9 districts).		
• Basic Package Training x 2 years (3 CEO/BEO/ district/ training/ year x 2 years)		
c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district)		
• District: 7 Districts = 7 Automatic Weather Station Kasama, Luwingu, Mporokoso, Lupososhi, Lunte, Senge Hill, Kaputa, Mplulungu		
• Camp: 145 Camps = 145 Rain-Gauge Station Kasama (47 camps), Luwingu (18), Mporokoso (13), Lupososhi (14), Lunte (23), Senge Hill (20), Kaputa (10)		

7. Annex: Activities per Province

Post E-COBSI Activities: Luapula Province

E-COBSI FU Provinces (include Post E-COBSI New Districts)
73 CEO/ BEO expected to be trained = around 293 ha Irrigated Area

Activities	
a. COBSI Basic Package Training for 11 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 135 stations - Automatic Weather Station: 7 stations * To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition • All CEO/BEO for Chiengi, Chifunabuli, Samfya District (3 “New Districts”) • Remaining CEO/BEO who has not joined training by E-COBSI (8 districts) . • Basic Package Training x 2 years (3 CEO/BEO/ district/ training/ year x 2 years) c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 7 Districts = 7 Automatic Weather Station Chembe, Chipili, Mansa, Milenge, Mwansa-Bombwe, Mwense, Chiengi • Camp: 135 Camps = 135 Rain-Gauge Station Chembe (12 camps), Chipili (21), Mansa (38), Milenge (23), Mwansa-Bombwe (12), Mwense (14), Chiengi (15)	

41

Post E-COBSI Activities: Central Province

E-COBSI New Provinces (include Post E-COBSI New Districts)
320 CEO/ BEO expected to be trained = around 1,280 ha Irrigated Area

Activities	
a. COBSI Basic Package Training for 12 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 310 stations - Automatic Weather Station: 12 stations * To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition • All CEO/BEO for Chibombo, Chisamba, Itezhi-Tezhi, Kabwe, Kapiri Mposhi, Luano, Mumbwa, Ngabwe, Shibuyunji District (9 “New Districts”) • Remaining CEO/BEO who has not joined training by E-COBSI (3 districts) . • Basic Package Training x 9 times = 4 years to conduct for 2 groups/ year (3 CEO/BEO/ district/ training/ year) = Year 1: 1 group, Year 2: 2 groups, Year 3: 2 groups, Year 4: 2 groups, Year 5: 2 groups c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 12 Districts = 12 Automatic Weather Station (all targeted districts) • Camp: 310 Camps = 310 Rain-Gauge Station Selenge (42 camps), Chilambo (13), Mkushi (35), Chibombo (27), Chisamba (25), Itezhi-Tezhi (15), Kabwe (19), Kapiri Mposhi (54), Luano (17), Mumbwa (29), Ngabwe (9), Shibuyunji (25)	

43

Post E-COBSI Activities: Muchinga Province

E-COBSI FU Provinces (include Post E-COBSI New Districts)
73 CEO/ BEO expected to be trained = around 293 ha Irrigated Area

Activities	
a. COBSI Basic Package Training for 9 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 79 stations - Automatic Weather Station: 3 stations * To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition • All CEO/BEO for Chama & Chinsali District (2 “New Districts”) • Remaining CEO/BEO who has not joined training by E-COBSI (7 districts) . • Basic Package Training x 3 years (3 CEO/BEO/ district/ training/ year x 3 years) c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 3 Districts = 3 Automatic Weather Station Nakonde, Shiwang'andu, Chinsali • Camp: 79 Camps = 79 Rain-Gauge Station Nakonde (25 camps), Shiwang'andu (26), Chinsali (28)	

42

Post E-COBSI Activities: Copperbelt Province

E-COBSI New Provinces (include Post E-COBSI New Districts)
133 CEO/ BEO expected to be trained = around 532 ha Irrigated Area

Activities	
a. COBSI Basic Package Training for 10 districts b. Permanent Weir Construction c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 234 stations - Automatic Weather Station: 10 stations * To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition • Remaining CEO/BEO who has not joined training by E-COBSI (10 districts) . • Basic Package Training x 5 years (3 CEO/BEO/ district/ training/ year x 5 years) c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 10 Districts = 10 Automatic Weather Station (all targeted districts) • Camp: X Camps = X Rain-Gauge Station Chililabombwe (x camps), Chingola (x), Kalulushi (x), Kitwe (x), Luanshya (x), Lufwanyama (x), Masaiti (X), Mpongwe (x), Mufira (X), Ndola (X)	

44

Post E-COBSI Activities: North-Western Province

E-COBSI New Provinces (include Post E-COBSI New Districts)
259 CEO/ BEO expected to be trained = around 1,036 ha Irrigated Area

Activities	
a. COBSI Basic Package Training for 11 districts	
b. Permanent Weir Construction	
c. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 322 stations - Automatic Weather Station: 11 stations	
* To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
a. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition	
• All CEO/BEO for Chavuma, Kabompo, Zambezi District (3 "New" Districts) • Remaining CEO/BEO who has not joined training by E-COBSI (8 districts). • Basic Package Training x 8 times = 3 years to conduct for 2 groups/ year (3 CEO/BEO/ district/ training/ year) = Year 1: 1 group, Year 2: 2 groups, Year 3: 2 groups, Year 4: 2 groups, Year 5: 1 group	
c. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 11 Districts = 11 Automatic Weather Station (all targeted districts) • Camp: 322 Camps = 322 Rain-Gauge Station	
Ikkelengi (17 camps), Kalumbila (39), Kasempa (34), Manyinga (22), Mufumbwe (27), Mushindamo (20), Mwinilunga (38), Solwezi (26), Chavuma (27), Kabompo (30), Zambezi (42)	

45

Post E-COBSI Activities: Western Province

Post E-COBSI New Provinces
142 CEO/ BEO expected to be trained = around 568 ha Irrigated Area

Activities	
a. Training of Trainers	
b. COBSI Basic Package Training for 6 districts	
c. Training for Permanent Weir	
d. Permanent Weir Construction	
e. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 122 stations - Automatic Weather Station: 6 stations	
* To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
b. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition	
• Remaining CEO/BEO who has not joined training by E-COBSI (10 districts). • Basic Package Training x 8 times = 3 years to conduct for 2 groups/ year (3 CEO/BEO/ district/ training/ year) = Year 1: 1 group, Year 2: 2 groups, Year 3: 2 groups, Year 4: 2 groups, Year 5: 1 group	
e. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 6 Districts = 6 Automatic Weather Station (all targeted districts) • Camp: 122 Camps = 122 Rain-Gauge Station	
Kaoma (20 camps), Nkeyema (24), Limulunga (9), Luampa (25), Lukulu (33), Mongu (11)	

47

Post E-COBSI Activities: Eastern Province

Post E-COBSI New Provinces
223 CEO/ BEO expected to be trained = around 892 ha Irrigated Area

Activities	
a. Training of Trainers	
b. COBSI Basic Package Training for 8 districts	
c. Training for Permanent Weir	
d. Permanent Weir Construction	
e. Installation of Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district): - Rain-Gauge station: 193 stations - Automatic Weather Station: 8 stations	
* To be discussed thoroughly with Meteorological Department WHICH camp/ district to install and WHERE to install. * Exclude those districts/ camps targeted by the WB project.	
d. Information dissemination + utilization for prepared action.	
Note	
b. COBSI Basic Package Training = Market Survey + Simple Weir + Water Management + SHEP + Nutrition	
• COBSI Basic Package Training for all CEO/BEO in the targeted districts (8 districts). • Basic Package Training x 9 times = 4 years to conduct for 2 groups/ year (3 CEO/BEO/ district/ training/ year) = Year 1: 1 group, Year 2: 2 groups, Year 3: 2 groups, Year 4: 2 groups, Year 5: 2 groups	
e. Rain-Gauge Station (1 station/ camp) & Automatic Weather Station (1 station/ district) • District: 8 Districts = 8 Automatic Weather Station (all targeted districts) • Camp: 193 Camps = 193 Rain-Gauge Station	
Chandiza (24 camps), Katete (34), Lumezi (18), Lundazi (19), Lusangazi (10), Petauke (43), Sinda (30), Vubwi (15)	

46

