

**MINISTRY OF ELECTRICITY, DAMS, IRRIGATION
& WATER RESOURCES (MEDIWR)**

THE REPUBLIC OF SOUTH SUDAN

**PROJECT FOR
IRRIGATION DEVELOPMENT MASTER PLAN
(IDMP)
IN THE REPUBLIC OF SOUTH SUDAN**

**FINAL REPORT
(ANNEXES, PART I)**

DECEMBER 2015

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

**SANYU CONSULTANTS INC.
ORIENTAL CONSULTANTS GLOBAL CO., LTD.
KOKUSAI KOGYO CO., LTD.**



THE REPUBLIC OF SOUTH SUDAN

MINISTRY OF ELECTRICITY, DAMS, IRRIGATION & WATER RESOURCES



WATER SECTOR

IRRIGATION DEVELOPMENT MASTER PLAN

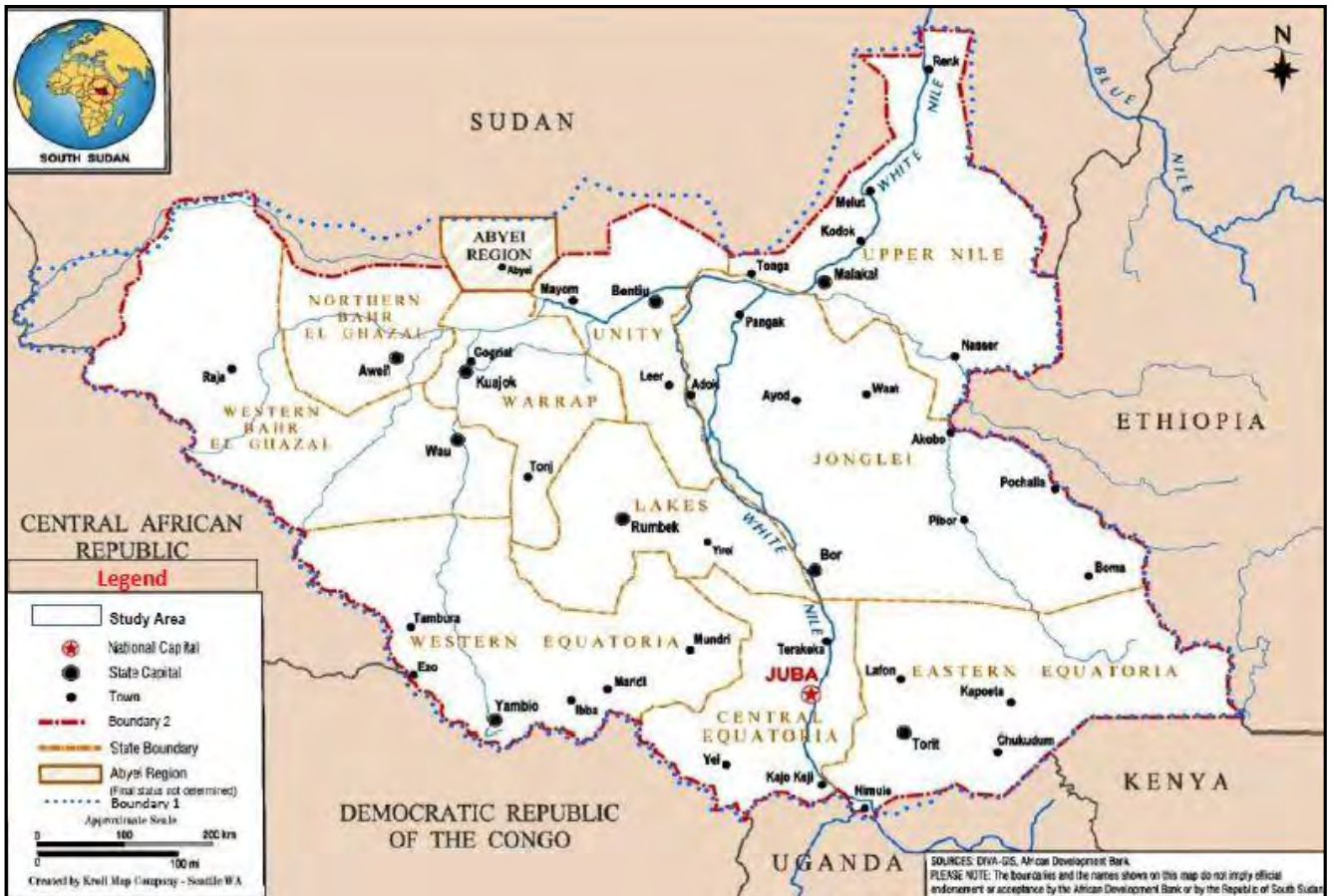
(FINAL REPORT)

***ANNEX-1: POLICY AND INSTITUTIONAL FRAMEWORK IN
RELATION TO WATER SECTOR AND IRRIGATION
SUBSECTOR***

NOVEMBER 2015

THE PROJECT FOR IRRIGATION DEVELOPMENT MASTER PLAN IN THE REPUBLIC OF SOUTH SUDAN (RSS) LOCATION MAP

Map of the Republic of South Sudan



Location Map: Adopted from African Development Bank

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Annex 1: POLICY AND INSTITUTIONAL FRAMEWORK IN RELATION TO WATER SECTOR AND IRRIGATION SUBSECTOR

Annex 1 analyses of the existing policy, institutional, legal and strategic framework. It gives inventory of the plans in place, on-going activities, projects, programmes and the lead players within the overall water sector in South Sudan.

1.1 Overview

IDMP is formulated on the basis of the existing policies and development plans. At the policy level, the then Ministry of Water Resources and Irrigation published 'Water Policy' in November 2007, which outlines the vision of the country for the water sector and establishes basic principles and objectives to guide future water sector development. As a major step for putting into practice the principles laid out in the Water Policy, the Ministry also published 'Water, Sanitation & Hygiene (WASH) Sector Strategic Framework' in August 2011. In line with these policy and strategy, 'Water Act' is currently under preparation to be enforced as Institutional and Legal framework of Water/WASH Sector.

These three (3) documents are formulated consistently by classifying the two (2) major categories, namely Water Resources Management; and Water Supply and Sanitation. Irrigation sector is not specifically described in these documents but it is intimately related to Water Resources Management. Irrigation development, therefore, has to be formulated in accordance with the Water Resources Management subsector policy, strategy and regulatory framework.

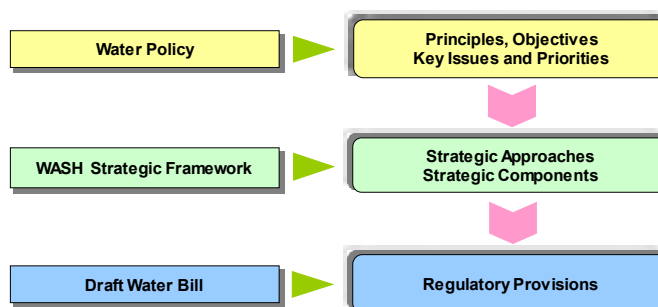


Figure 1.1.1 Policy, Strategy and Draft Bill for WASH

From the side of agriculture sector, the then Ministry of Agriculture, Forestry, Cooperatives and Rural Development (MAFCRD) established 'Agriculture Sector Policy Framework (ASPF) 2012 - 2017' in October 2012. ASPF is also the legitimate policy to guide the future irrigation development in South Sudan, hence constituting the foundation of IDMP along with above water resources management subsector guiding documents.

Other policies such as 'Cooperatives Act in 2011, the then Ministry of Animal Resources and Fisheries, Policy Framework and Strategic Plans 2012 - 2016' in January 2012, 'South Sudan National Environment Policy' in March 2012 by the Ministry of Environment, 'Land Policy (Draft)' being prepared by the South Sudan Land Commission, Investment Promotion Act 2011, Local Government Act of 2009, the States Government Strategic Plans, and Regional frameworks are also the sources of guidance for formulating IDMP.

Along with such institutional and sectorial policy making and strategy documents, the Government of the Republic of South Sudan (GRSS) has initiated the comprehensive national development plan right after the independence, namely 'South Sudan Development Plan (SSDP) 2011 - 2013' in August 2011, which has prioritized the agriculture sector and infrastructure for economic development. As part of the operationalisation process of SSDP, the 'South Sudan Development Initiative (SSDI) 2013 -

2020ö has been drafted.

Draft SSDI has included the five (5) sectors in its scope of work, namely 1) transport and roads, 2) energy, 3) water and sanitation, 4) housing, and 5) health/social infrastructure. The water and sanitation sector has been described with 28 priority programmes, one of which is öWater Resources Development and Management Plans and Interventionsö. IDMP would produce one of the basic inputs towards the materialization of Water Resources Development and Management Master Plans under SSDI. This is namely water resources potential assessment to be carried out in the course of the IDMP formulation that will be a basis for water resources development and utilization. The national plans and each of the sectorial policies, strategies and plans will be described in the following sections.

1.2 South Sudan Development Plan/South Sudan Development Initiative

The South Sudan Development Plan 2011 ö 2013 (SSDP) was published in August 2011 right after the birth of the Republic of South Sudan as the first national development plan to embark on achieving the country's longer term vision, namely South Sudan Vision 2040, which was emphasised by the President of RSS at the end of the International Engagement Conference for South Sudan on 15th December 2011 in Washington DC.

(1) South Sudan Development Plan (SSDP), 2011 – 2013

SSDP presents a comprehensive framework of goals, objectives and performance targets, action plans, and the related allocation of resources. It was set out as a medium-term agenda for development of the country.

SSDP has identified the national priority programme areas with four (4) pillars that are Governance, Economic Development, Social and Human Development, and Conflict Prevention and Security. In relation to IDMP, the agricultural sector and water & sanitation sector have been prioritized under the programme of economic development.

South Sudan Vision 2040

By 2040, South Sudan will be educated and informed; prosperous, productive and innovative; compassionate and tolerant; free, just and peaceful; democratic and accountable; safe, secure and healthy; united and proud. (Press statement by the President of South Sudan, 15th Dec. 2011 in Washington D.C.)

(2) Draft South Sudan Development Initiative (SSDI), 2013 – 2020

With the understanding that capacity and infrastructure challenges place constraints on all the sectors of the economy, the South Sudan Development Initiative (SSDI) 2013 ö 2020 is being formulated as an implementation framework for the SSDP. The draft SSDI has an aim at finding the means through which the African Union and key development partners can assist the RSS in transforming its economy from post-conflict to sustainable development.

It is defined that the draft SSDI is an elaboration of SSDP into actionable plans, reflecting the four priority development pillars and related sector priorities. As well as capacity development implementation, draft SSDI describes the Scope of Work for the five (5) sectors that are transport and roads, energy, water and sanitation, housing and health/social infrastructure.

In water and sanitation sector, total 28 projects have been identified in the priority action plan. Those include Water Resources Development and Management Master Plans and Interventions, urban water supply and sanitation in the major cities of RSS as well as rural areas (described in table 1.2.1 below). Irrigation development is not separately mentioned, but it is assumed to be part and parcel of the envisaged projects/activities such as river measurements and other water monitoring installations; and

water control and delivery infrastructure for different uses, including agriculture.

Table 1.2.1 Water Resources Development and Irrigation in Draft SSDI Water/Sanitation Sectors

Item	Description
Sector Priority	1 of 28
Project Title	Detailed water resources development and management master plans and interventions
Project Description	Carry out assessments and a detailed plan on the potential of groundwater and surface water resources at national and state levels, according to the three river basins in South Sudan. Based on this, elaborate water resource utilization and management
Project Owner	MWRI
Readiness for Implementation	Funding is required for the development of a detail water master plan per State to determine the extent of the requirement as well as the institutional and legal requirements.
Objective and Impact	To provide detailed water resources development and management master plans and interventions as a basis for strategic and clear interventions in using water resources across different sectors
Outputs	Integrated water resources development and management master plans and interventions across the country

Source: Draft SSDI

1.3 Water Policy

The Water Policy was issued in November 2007 during the interim period of CPA. The Water Policy sets its overall goal as to support social development and economic growth by promoting efficient, equitable and sustainable development and use of available water resources, and effective delivery of water and sanitation services in Southern Sudan.

(1) General Recognition of Irrigation in the Policy

The purpose and scope of the Water Policy is stipulated as to provide a framework for optimal allocation of available water resources in Southern Sudan on an equitable and sustainable basis. The Policy remarks that it is important to note that policy should be dynamic and continuously evolving and therefore, periodically re-assessed to meet the future changing needs.

The Policy addresses specific issues in three (3) sub-areas, namely Water Resources Management (WRM), Rural Water Supply and Sanitation (RWSS) and Urban Water Supply and Sanitation (UWSS). Although irrigation is not categorized as a single topic, but the following pick up the descriptions and statements related to irrigation within the Water Policy:

- An important statement referring to the future policy and strategy development is "...civil war has constrained the development of irrigated agriculture to-date but irrigation will form an important component of future strategies for achieving food security and agriculture-based economic growth in Southern Sudan"(page 3).
- It acknowledges that a range of irrigation techniques (traditional and modern) are practiced in different parts of South Sudan. Traditionally settlements along the rivers grow tobacco and vegetable gardens, which are irrigated, maize and cowpeas are planted in the highly fertile moist soils left by receding river flood. The document concludes by saying irrigation has played a critical role in traditional farming systems as a means to secure food supplies, especially in the drought prone areas.
- It states that agriculture is expected to be the single biggest user of water in South Sudan in future and as demand for irrigation water grows there is need to establish policies and strategies to promote efficient and responsible water use and mitigate potential conflicts between competing water users (page 3). The document also suggests cost recovery through fees and

levies charged to water users for specific services such as delivery of irrigation water, operation of dams/reservoirs and issuing of abstraction/discharge permits (page 13).

- It also pays attention to the environmental issues that water uses such as in irrigation and mining can lead to pollution of water sources and other environmental effects such as water logging or salinisation of soils (Page 15), maintenance of minimum flows in rivers and other water courses is important to maintain water quality and protect plants, fish and other animals, and the natural cycle of seasonal flooding replenishes essential nutrients which maintain the productivity of ecosystems upon which people depend for their livelihood activities.

(2) Water Resources Management Policy

The Water Policy provides a guiding framework for all the water sector activities taking into account the regional and international best practices as well as local experiences. There are seven (7) general principles stipulated in the Policy. It states "Water is an important natural resource which is commonly owned by all riparian people, and Access to sufficient water of acceptable quality to satisfy basic needs is considered a human right and shall be given highest priority in development of water resources. It also states that the Government of South Sudan has the duty for effective development and use of water resources.

Other general principles include the recognition of water as both an economic and social good that has to be based on social equity, economic efficiency, system reliability and environmental sustainability in its allocation, the recognition of integrated approach for effective water resources management, which takes into account of hydrological processes and boundaries and linkages with other sectors, the recognition of active participation of water users and stakeholders at the lowest appropriate administrative level, and water sector institutional arrangements with clear separation of functions relating to resource management and services delivery, and efficient allocation of roles and responsibilities between government and non-government agencies.

Based on the above general principles, the chapter of water resources management details the guiding principles and key issues and priorities. As for the water as economic good, the water resources management policy shall take account of the economic value of water and users shall be expected to contribute towards the costs of managing and supplying water according to the volume and quality used. Also for integrated approach, it defines the natural hydrological boundaries, i.e. the river basin or catchment area shall be the basic unit for planning and managing water resources. Also the principle of "polluter pays" is mentioned. Key issues and priorities in the water resources management policy are summarized as follows:

1. Water resources allocation and use: apart from customary laws governing access to grazing and fishing grounds for communal use at a local level, there is currently no formal system for allocating water resources for different social and economic use. Developing procedures for fair and equitable allocation of available water resources is therefore a key priority. Criteria will be developed to guide optimal allocation of water for other use on the basis of social equity, economic efficiency, system reliability and environmental sustainability.
2. Water conservation, quality and environment: in order to protect water bodies, practical mechanisms for systematic water quality monitoring and pollution control will be put in place. The principle of "polluter pays" and "discharge permits" shall be introduced.
3. Water resources assessment and monitoring: to bring together multiple different sectoral

interests in the development of water use plans on the basis of hydrological catchment areas.

4. Water resources planning and development: the river basin or catchment area shall be the basic unit for planning and managing water resources. Water users and stakeholders from other sectors will be involved in planning processes which leads to the development of catchment management strategies.
5. Disaster management: to take deliberate action to mitigate and manage future disasters.
6. Trans-boundary waters: in order to engage effectively with other Nile Basin Stakeholders, GRSS will need to undertake a detailed assessment of its own needs and priorities with regard to development of the Nile waters.
7. Institutional and legal framework for regulating water resources management: an independent authority will be established at GRSS level to oversee water resources management with gradual decentralization of regulatory responsibility to Basin and Sub-Basin levels.
8. Human resource development and capacity building: short, medium and long term strategies shall be developed for human resource development.
9. Research and technical development: scientific research on water issues and identification of low cost and appropriate technologies will be promoted.
10. Financing water resources management: a small portion of costs will be recovered through fees and levies charged to water users for specific services including delivery of irrigation water. Private sector investment will be actively encouraged wherever possible.

1.4 Water, Sanitation and Hygiene (WASH) Sector Strategic Framework

The Water, Sanitation & Hygiene (WASH) Sector Strategic Framework was formulated in August 2011 with purpose of operationalising the Water Policy of 2007 and ensuring its implementation through effective and technically sound strategic approaches, improved capacity and involvement of all stakeholders.

The vision of WASH strategic framework is addressed as "Sustainable harnessing and accountable management of water resources that respond to water related public-health needs, livelihoods and development aspirations of the people of South Sudan in an equitable manner". The Scope of WASH with a time frame of up to 2015 includes the strategic areas that have been identified based on the Water Policy, namely water resources management, urban water supply and sanitation (& hygiene), and rural water supply and sanitation (& hygiene). Besides, WASH describes the overall governance and development strategy.

(1) General Recognition of Irrigation in the Framework

In relation to irrigation, the WASH Strategic Framework noted requirement for a separate policy and regulatory establishment for irrigation development. This is due to the fact that "MWRI" mandate is to allocate and deliver bulk water to irrigated agricultural schemes; but at the on-farm level, it is the responsibility of the Ministry of Agriculture and Forestry (MAF) to distribute and manage that water among farmers on their plots and in crop fields. MWRI realizes that the shared responsibility between the two Ministries calls for a separate policy and regulatory framework for irrigated agriculture and other productive uses, to be adopted/enacted, so as to fully realize the potential of this subsector.

(2) Water Resources Management Subsector Strategy

It is evident that IDMP policy and regulatory framework will be based on both the Water Policy and WASH Strategic Framework, which are the principal documents under which irrigation has been mentioned as part of water resources management; but not addressed separately. The contents of the water resources management sub-sector strategy in WASH are summarized here.

In the sub-sector strategy, irrigation development is mentioned as part and parcel of an emphasis on the necessity of Integrated Water Resources Management: öthe potential of irrigation-based agriculture is great and it will put an increasing demand on the available water resources in South Sudanö. Partial rehabilitation of the largely dilapidated Northern Upper Nile and Aweil rice schemes were recent attempts of using water resources for agricultural and economic development. Such developments, rehabilitated or new, will place a greater stress on the available water resources and thus call for carefully planned Integrated Water Resources Management (IWRM)ö. Following strategic approaches are stipulated, as well:

1. Assessment and monitoring: compiling historical and current water resources information for understanding water resource potential and decision making, improve WASH Information Management System (WIMS).
2. Planning and development: planning, management and development at the lowest possible level of Government and with involvement of all key stakeholders; introducing environmental impact assessment for large-scale project including irrigation.
3. Regulation, allocation and use: bulk water abstractions and diversions have to be regulated in order to ensure equitable access to all uses (legislation, allocation criteria, licensing, etc.)
4. Research and innovation: identify/encourage collaborative research to address crucial water resources management challenges.
5. Setting up WRM institutions: establish WRM regulatory authority at national level and WRM institutions from basins/sub-basins to watersheds
6. Financing water resource management: water as economic good: fees and levies paid by water users

IDMP is to undertake some of the above approaches for their materialization such as compiling the water resource information for understanding water resource potential, introducing environmental impact assessment for irrigation development. Also for planning irrigation institutions, IDMP will work on it in line with the above approaches such as management at the lowest possible level of Government and involvement of stakeholders including the establishment of water users association, and compliance with the regulatory authorities at the national level or of a basin as a unit.

1.5 Draft Water Bill

The Draft Water Bill, which will provide legal settings to the above policy and strategy, is under the process of formulation as of August 2013. Draft Water Bill consists of Preliminary provisions, Water Resources Management, Water Supply and Sanitation, and General Provisions. The proposed provisions pertaining to Water Resources Management consists of the following:

- 1) Principles and Objectives
- 2) Management and Regulation

- 3) Water Resources Planning and Protection
- 4) Permits
- 5) Financial Provisions for Water Resources Management
- 6) Dam Safety and Flood Management
- 7) Trans-boundary Waters

1) Principles and Objectives are just the quotation from the Water Policy except one added guiding principle: 'responsibility for resource management shall be decentralized to the lowest appropriate competent administrative level'. This decentralization principle guides the structuring of the water resources management institutions defined in this Draft Water Act. This institutional structure is described in the provisions of 2) Management and Regulation that defines the establishment of institutions.

In an overarching manner, firstly the Draft Bill/Act stipulates establishment of the Water Council, stipulated in the Chapter 2 of Preliminary. The Water Council covers both water resources management and water supply and sanitation; and it will have a chair and will include members from the related ministries and institutions, including managing directors of the Water Resources Management Authority (WRMA) and the Safe Water Supply and Sanitation Services Regulator (SWSR); and the private sector and civil society. The Water Council works as the principal multi-stakeholder advisory body.

Under the Water Council, Water Resources Management Authority (WRMA) is established to regulate the management, development and use of water resources. WRMA is a corporate body headed by a managing director answerable to the board of directors. Officers and staff will be employed by WRMA. The Basin Water Board in each basin shall be established to be responsible for its defined/delineated basin area. Under the Basin Water Board, catchment/sub-catchment committees shall be established. The committees will be responsible for planning and resolving conflicts within their hydrological boundaries. Water Users Association may be formed as a group of users of water as recognized by and represented to the WRMA. Facilitation of the establishment of irrigation boards has also been mentioned under powers of the Minister.

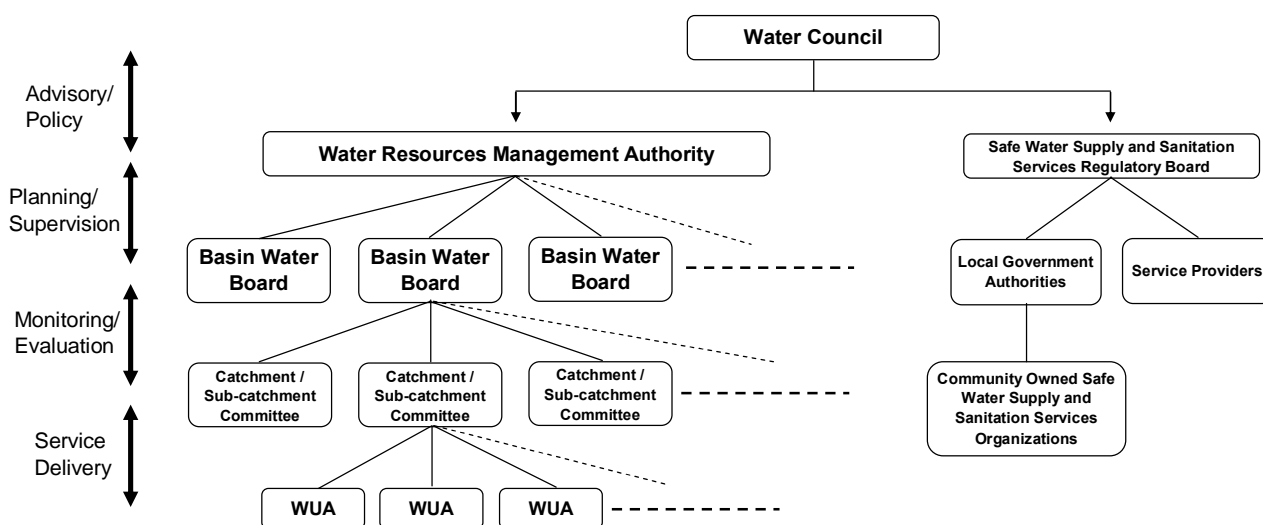


Figure 1.5.1 Proposed Structure of Water Resources Management in the Draft Water Bill

Institutional Framework

WRMA shall prepare integrated water resources management plan based on the plans prepared by the

Water Basin Boards. The Plan includes a) Water balance for each basin, b) Proposed options for meeting forecasting demand for each basin, c) Classifying water resources, d) Requirements of the reserve for each water resource, e) Identifying Protected Zones, f) Any other measure and g) Measures for implementation. Provision for protection in relation to the water resources planning includes a) Water Resources Classification, b) Determination of Reserve, c) Monitoring and Information System, d) Water Shortage Areas, e) Protected Zones, f) Prevention of Pollution (Costs of Pollution Incident, Control of a Pollution Incident, Emergency Pollution Incidents and Duty to Protect Water Resources) and g) Environmental Impact Assessment.

The draft Act stipulates that a permit shall be required for any of the following purposes: 1) Any use of water from a water source (except for use of water without the employment of works, spring of the landowner, storage of water in a reservoir which does not constitute a watercourse), 2) The drainage of any swamp or other land, 3) The disposing any waste into any water source/body of water and 4) Any purpose to be carried out in or in relation to a water resource, which is prescribed by regulations made under this Act.

Major regulations on permit include: 1) The charge for permit holder, 2) Representation of State or Local Government in application of permit, 3) Compliance with lawful, efficient and beneficial use of water in the public interest, 4) Compliance with the integrated water resources management plan and any subsequent plans or strategies, 5) Effect of proposed water use on the water resource and other water use, 6) Classification and the resource quality objectives, 7) Investment in respect of water use, 8) Strategic importance of water use, 9) Quality of water, 10) Probable duration of the activity, k) Precedence of water use for domestic purposes, and 11) Adjustment of diversion point etc. to natural change to cause inequality, deterioration of water quality, and water shortage of domestic purposes.

As significant as the permit provision, the draft Act provides the Financial Provisions for Water Resources Management. The draft Bill stipulates to formulate guidelines and a pricing strategy for the settings charges to be levied by WRMA in consultation with State and Local Government and the Basin Water Boards. The pricing strategy shall take into consideration: 1) Differentiation among geographical areas, and categories of water uses and water users, 2) Achievement of an equitable and efficient allocation of water and water conservation, 3) Compliance with prescribed standards and water management practices based on the user pays and polluter pays principles, 4) Provision of incentives for timely payment of the charges and disincentives for non-payment; and 5) Value of water by using economic parameters such as inflation rate, market values and opportunity costs of water.

The Basin Water Boards may announce such charges to be levied in respect of: 1) Water abstraction; 2) Effluent discharge; 3) Payment for environmental services, 4) Granting of permits required under this draft Bill; and 5) Any other matter for which the Basin Water Board considers charges shall be made pursuant to this Act.

1.6 Agriculture Sector Policy Framework (ASPF) 2012 – 2017

Agriculture Sector Policy Framework (2012 ó 2017) with its setting vision of òFood security for all the people of the Republic of South Sudan, enjoying improved quality of life and environmentö, acknowledged the fact that South Sudanese livelihoods depends mainly on agriculture and livestock husbandry, as about 85% of the households cultivate land while 65% own animals in South Sudan.

In order to realize the mission of then MAFCRD, which is òto create an enabling environment for the transformation of agriculture from a subsistence system into modern, socially and economically

sustainable system through science based, market oriented, competitive and profitable farming while maintaining the integrity of the natural resource base for the benefit of future generations of South Sudanese people; the policy document addressed some key issues for example acceleration of food and agricultural production through commercial smallholder and large scale agriculture, using mechanized and irrigation technology.

The document sets policy guidelines on agricultural production support services. Noting that much of the vulnerability to food insecurity in South Sudan can be attributed to rainfall variability with irrigated agriculture accounting to less than 5% of the total cultivated area, water resources development and irrigation is described as one of the guidelines with the policy statement: promote sustainable irrigation infrastructure and flood management system to contribute to improved agricultural productivity and food security enhancement. The guideline further describes its implementation strategy as follows:

- i. Collaborate with MWRI in developing a National Irrigation and Drainage Policy and Strategy (NIDPS) to ensure integrated water resources management (IWRM) and meet national, regional and continental targets in the water resources sector. The NIDPS should be able to:
 - a. Develop proper land and water resources planning and management and ensure the protection of watersheds and wetlands
 - b. Ensure smallholders and private sector investment in cost-effective irrigation schemes and networks
 - c. Support full participation of women in irrigation and promote their meaningful roles in decision-making processes
 - d. Mobilize resources and implement Irrigation and Drainage Development Program
 - e. Support the establishment of water user association of small farmers and pastoralists and network of such associations to avoid conflict over water
 - f. Ensure networking and linkages with regional and water forums.
- ii. Build institutional and human capacity in irrigation and drainage development
- iii. Support and promote private sector participation in capacity building, feasibility study, scheme design & construction of irrigation, livestock water supplies and aquaculture development
- iv. Support and collaborate with the MWRI in implementing the Water Policy and implementing various water resource development activities
- v. Promote water harvesting technique in arid and semi-arid areas for boosting irrigation agriculture

1.7 Environmental Policy

South Sudan National Environmental Policy was established in 2012 and has been enacted. It covers a wide range of environmental problems, notably the soil degradation due to wide spread deforestation with consequential loss of biodiversity and wildlife habitat, pollution of rivers and the environment due to improper oil drilling activities in the wetlands, over exploitation of fish stocks, conflict over diminishing grazing lands and water points for livestock, prevalence of water-borne diseases due to poor sanitation.

(1) Outline

The goal aims to ensure the protection, conservation and sustainable use of the natural resources without compromising the tenets of inter-generational equity according to the section 1.6. Also the policy indicates guidance under each specific sector. Some of them may guide useful ideas to the irrigation development, so that it shall be reflected in the planning.

The key guidance indicated in the Environmental Policy which is related to the water sector and irrigation subsector is summarized in the table below:

Table 1.7.1 Key Guidance in Relation to Water Sector in the Environmental Policy

Sector	Background and Key Guidance Related to Water Sector / Irrigation
Forestry (Section 2.2)	<ul style="list-style-type: none"> - South Sudan is covered by a total area of approximately 190 thousand Km² of natural forests and woodlands. - Improper management and change of land use have degraded forests. - Major guidance indicated in the Policy related to irrigation is to: <ul style="list-style-type: none"> • Formulate and enact laws/regulations that maintain and preserve ecological functions, integrity of forests, conserve biological diversity, water and soil resources of fragile ecosystems. <p>→ <i>Forest condition is closely related to water condition, therefore irrigation project must avoid degradation of forests, ex. Cutting tree for project site must be minimized.</i></p>
Water Supply and Sanitation (Section 2.3)	<ul style="list-style-type: none"> - Although access to safe and clean water for domestic use is a basic human right, the majority of the people especially in rural areas have no access to potable water. Equally, sanitation coverage in urban areas is very low. - Above problem leads persistent risks of gastrointestinal and other water-borne diseases. - Major guidance indicated in the Policy related to irrigation is to: <ul style="list-style-type: none"> • Promote the accessibility of all people to clean water for domestic purposes and sanitation facilities. • Promote rain harvesting as an alternative source of water for human use. <p>→ <i>Use of water resources by irrigation activities shall consider other purposes of water use. Also discharged water from agricultural land shall satisfy adequate water quality.</i></p>
Agriculture (Section 2.6)	<ul style="list-style-type: none"> - Agricultural sector has big potential to lead economic improvement. On the other hand, it also has risk to affect ecosystem, water degradation, etc. - Related to irrigation, improper land preparation with irrigation may increase soil erosion, destroy natural habitat of fauna and flora. - Major guidance indicated in the Policy related to irrigation is to: <ul style="list-style-type: none"> • Develop agriculture in watershed and riparian zones while safeguarding natural habitats as corridors for the free movement of wild animals; • Promote land use planning and zoning to prevent conversion of specific land use to other uses. <p>→ <i>Irrigation development is closely related to agriculture, therefore planning irrigation project shall consider with indirect impact likely caused by agricultural works.</i></p>
Livestock (Section 2.7)	<ul style="list-style-type: none"> - Cattle are extremely important culturally and economically to the semi-nomadic cultures. It is assumed that a large proportion of the land is covered by rangelands. - The major potential negative impacts on livestock use are the degradation of large areas of land, through overgrazing of rangelands, reduced vegetation cover and organic matter. - It also may increase risks of soil erosion water degradation, soil contamination, also desertification. - Major guidance indicated in the Policy related to irrigation is to: <ul style="list-style-type: none"> • Design programs for improving livestock production based on consideration of the specific climates, terrains, and ecosystems particularly in relation to seasonal

Sector	Background and Key Guidance Related to Water Sector / Irrigation
	<p>grazing patterns and the quantity of available water.</p> <p>→ <i>Irrigation may change water condition especially in downstream. It is possible to affect grazing pattern and available water for cattle activity. So water change must be avoided or minimized.</i></p>
Fisheries (Section 2.8)	<p>– Especially the River Nile, its tributaries and several lakes besides the Sudd wetlands have an enormous potential for fish industry.</p> <p>– One major environmental impact due to improper fishing and over exploitation is decline of fish stocks and loss of species biodiversity.</p> <p>– Major guidance indicated in the Policy related to irrigation is to:</p> <ul style="list-style-type: none"> • Protect fishing communities as well as fish habitats against both encroachment and pollution. <p>→ <i>Irrigation may change water condition. It shall be considered to minimize change of condition likely affecting to fishery activities.</i></p>
Wetlands, Rivers and Lakes (Section 3.7)	<p>– Principal wetlands are the Sudd and Machar swamps which offer considerable socio-economic livelihood opportunities for agricultural, pastoral and fishing communities.</p> <p>– The important issues affecting water resources are construction of dam, canal, dyke, etc. which scheme is used for irrigation project. These would divert and effect changes in the water flow regime and irreversibly or partially destroy downstream ecosystems.</p> <p>– Major guidance indicated in the Policy related to irrigation is to:</p> <ul style="list-style-type: none"> • Legislate the prohibition of settlements or developments undertaken within and along the banks of a rivers, streams and other water bodies; • Develop buffer zones between irrigation schemes and natural water bodies to ensure easily drainage. <p>→ <i>Wetlands as well as rivers and lakes are important area to provide water resources, which area is suitable for irrigation development. On the other hand, those areas are also important for conservation of biodiversity and disaster prevention. Change of water bodies must minimize degradation of natural conservation and disaster prevention.</i></p>

Adopted from South Sudan National Environmental Policy, 2012

Based on the "Environmental Policy", the following strategies are recommended to be put in the irrigation master plan:

- 1) Wisely use of wetlands as well as rivers and lakes for irrigation development in consideration with environmental protection.
- 2) Balance use and impartially share of water resources among agriculture, fisheries, livestock and industry.

(2) Gap Analysis

A gap analysis was carried out in order to grasp how well the RSS legal framework for environmental and social considerations meets international requirements. Base laws/regulations and guidelines for the analysis were based on the following:

South Sudan

- The Environmental Policy, 2012
- South Sudan Environmental Protection and Management Act, 2012 (draft)
- Environmental Regulations, 2012 (draft)
- Wildlife Conservation and National Parks Act, 2003

- The Land Act, 2009

Guidelines Referred to

- JICA Guideline for Environmental and Social Considerations, 2010
- World Bank Operation Manuals OP 4.01: Environmental Assessment (1999), OP 4.10: Indigenous Peoples (2005) and OP 4.12: Involuntary Resettlement (2001)

Results of the gap analysis are summarized in Table 1.7.2.

Table 1.7.2 Results of Gap Analysis

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
1. Underlying Principles		
1.1.Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	Chapter I, Draft Environmental Regulations 2012	Section 6 (1) stipulates that objectives of EIA shall be - To give the necessary recommendations in planning works before a decision is taken by proponents, and - To ensure environmental considerations are addressed and incorporated in the decision making process.
1.2. Such examinations must endeavour to include an analysis of environmental and social costs and benefits in the most quantitative terms possible, as well as a qualitative analysis; these must be conducted in close harmony with the economic, financial, institutional, social, and technical analyses of projects.		Section 6 (7) stipulates that the EIA shall take into account environmental, social, cultural, economic and legal considerations. Also it indicates to the need to develop an environmental management plan which shall include the cost of mitigation measures, etc.
1.3. The findings of the examination of environmental and social considerations must include alternatives and mitigation measures, and must be recorded as separate documents or as a part of other documents. EIA reports must be produced for projects in which there is a reasonable expectation of particularly large adverse environmental impacts.		Section 6 (7) indicates the need to identify and analyse alternatives to the proposed project. Section 8 indicates the structure of an environmental impact statement report in which analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies must be incorporated.
1.4. For projects that have a particularly high potential for adverse impacts or that are highly contentious, a committee of experts may be formed so that JICA may seek their opinions, in order to increase accountability.		Section 6 (5) stipulates that the EIA shall be conducted by experts / firms who have been certified and registered.
2. Examination of Measures		
2.1.Multiple alternatives must be examined in order to avoid or minimize adverse impacts and to choose better project options in terms of environmental and social considerations. In the examination of measures, priority is to be given to avoidance of environmental impacts; when this is not possible, minimization and reduction of impacts must be considered next. Compensation measures must be examined only when impacts cannot be avoided by any of the aforementioned measures.	Chapter I, Draft Environmental Regulations 2012	Section 6 (7) indicates the need to identify and analyse alternatives to the proposed project. Section 8 indicates the structure of environmental impact statement reports in which analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies must be incorporated. Section 6 (1) stipulates the EIA shall anticipate and avoid, minimize or offset the significant adverse biophysical, social and other relevant effects of the development proposal.
2.2.Appropriate follow-up plans and systems,		Section 6 (7) stipulates that the EIA shall develop

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
<p>such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial methods to fund such costs, must be determined. Plans for projects with particularly large potential adverse impacts must be accompanied by detailed environmental management plans.</p>		<p>an environmental management plan with mechanisms for monitoring and evaluation. Also section 8 indicates the format of the environmental impact statement which includes environmental and social management and monitoring plans.</p>
3. Scope of Impacts to Be Assessed		
<p>3.1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.</p>	<p>Draft Environmental Regulations 2012</p>	<p>SCHEDULE II Project Screening Criteria+ describes environmental parameters and scopes to be assessed.</p>
<p>3.2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.</p>		<p>Not clearly mentioned.</p>
4. Compliance with Laws, Standards, and Plans		
<p>4.1. Projects must comply with the laws, ordinances, and standards related to environmental and social considerations established by the governments that have jurisdiction over the project sites (including both national and local governments). They must also conform to the environmental and social consideration policies and plans of the governments that have such jurisdiction.</p>	<p>National Environmental Policy, 2012</p>	<p>Section 4.7. Environmental Standards+ stipulates that legal and technical instruments can be developed to monitor and evaluate temporal and spatial environmental quality parameters.</p>
	<p>Part IV, Draft Environmental Protection and Management Act, 2012</p>	<p>Chapters 3 and 4 describe air pollution and water pollution respectively. However, no concrete standards have been developed.</p>

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
4.2. Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas.	Part V, Draft Environmental Protection and Management Act, 2012	Chapter One, article 154 indicates Environmental Sensitive Areas (ESAs) which are required to be protected for the purpose of meeting the government's international obligations. A notice of designation of ESAs shall be in the form based on the limitations on use of the activities that are permitted or prohibited.
	Wildlife Conservation and National Parks Act, 2003	Section 10 stipulates that no person other than a wildlife official on duty may enter a national park unless in possession of a valid permit issued in respect of that national park.
5. Social Acceptability		
5.1. Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.	Draft Environmental Regulations 2012	Section 6 (8) in Chapter I stipulates that during an EIA study the developer / proponent shall seek the views of any persons / communities who are affected. Also (9) they are required <ul style="list-style-type: none"> - to promulgate the project and its effect / benefit, - to hold appropriate public meetings with affected persons, - to ensure notice is properly distributed prior to the public meetings, - to ensure a suitably qualified coordinator is appointed to receive and report public comments.
5.2. Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities, and all members of groups which are susceptible to environmental and social impacts and may have little access to decision-making processes within society.		SCHEDULE II %Project Screening Criteria+indicates that the project must not cause significant impacts on the various social group or gender, that the project is not located in, and will not affect, any environmentally sensitive area such as an area where important resources are provided to vulnerable groups (fishing community, etc.). No clear statements are found.
6. Ecosystem and Biota		
6.1. Projects must not involve significant conversion or significant degradation of critical natural habitats or critical forests.	Part V, Draft Environmental Protection and Management Act, 2012	Article 154 indicates Environmental Sensitive Areas (ESAs) which are required to be protected for the purpose of meeting the government's international obligations. Article 160 stipulates that no person / institution / business enterprise shall destroy a tree in any forest component which is <ul style="list-style-type: none"> - on public land belonging to or claimed by the government, - close or adjacent to a designated mountain reserve.
	Draft Environmental Regulations 2012	SCHEDULE II %Project Screening Criteria+requires the project cannot be located in ESAs including national parks, areas containing rare or endangered fauna or flora, etc.
6.2. Illegal logging of forests must be avoided. Project proponents etc. are encouraged to obtain certification by forest certification	Draft Environmental Protection and	Part V Chapter One, article 160 stipulates that no person / institution / business enterprise shall destroy a tree in any forest which is

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
systems as a way to ensure the prevention of illegal logging.	Management Act, 2012	<ul style="list-style-type: none"> - on public land belonging to or claimed by the government, - close or adjacent to a designated mountain reserve.
7. Involuntary Resettlement		
7.1. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.	The Land Act, 2009	<p>Section 72. stipulates that:</p> <ul style="list-style-type: none"> - The Government or private company shall proceed with a resettlement plan for the communities affected by an expropriation. - Displaced persons shall be consulted and shall have opportunities to - participate in planning and implementing resettlement programs. - The Government and private companies shall assist internally displaced persons and returnees in their efforts to improve their livelihood.
7.2. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and/or monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.		<p>Section 75 stipulates that the compensation shall be just, equitable, and shall take into account the following factors:</p> <ol style="list-style-type: none"> a) the purpose for which the land is being utilized; b) the land market value; and c) the value of the investment in it by those affected and their interest. <p>Also it stipulates that</p> <ul style="list-style-type: none"> - The compensation shall be in cash or in kind or both according to the agreement. - Where it is necessary to remove any person that is engaged in a customary occupation from land expropriated for public purposes, compensation shall be paid as may be agreed upon.
7.3. Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.		<p>Section 79 stipulates that:</p> <ul style="list-style-type: none"> - Traditional procedures and customary law and practices within communities dealing with restitution claims are legally recognized as long as they comply with equity, natural justice, morality and public order. - Traditional authority and any designated community representative may receive land restitution claims from members of the community or people from outside of the community. - Without prejudice to the attribution of the courts and above, any person who is of the opinion that he or she is entitled to claim restitution of a right in land may file such claim to the Commission.
7.4. For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement		<p>Section 74 stipulates that:</p> <ul style="list-style-type: none"> - A public hearing may be carried out before expropriation for public purposes for large scale development.

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
<p>action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.</p>		<p>- Such a notice shall also be made available to the public and published in the newspapers and any other media which can inform people about the expropriation plan.</p>
8. Indigenous Peoples		
<p>8.1. Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.</p>		<p>Not clearly mentioned.</p>
<p>8.2. When projects may have adverse impacts on indigenous peoples, all of their rights in relation to the land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the United Nations Declaration on the Rights of Indigenous Peoples. Efforts must be made to obtain the consent of indigenous peoples in a process of free, prior, and informed consultation.</p>		
<p>8.3. Measures for the affected indigenous peoples must be prepared as an indigenous peoples plan (which may constitute a part of other documents for environmental and social consideration) and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the indigenous peoples plan, consultations must be made with the affected indigenous peoples based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the indigenous peoples plan include the elements laid out in the World Bank Safeguard Policy, OP4.10, Annex B.</p>		
9. Monitoring		
<p>9.1. After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring.</p>	<p>Chapter I, Draft Environmental Regulations 2012</p>	<p>Section 6 (7) stipulates that the EIA shall develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance, which shall include the cost of mitigation measures and the time frame for implementing the measures. According to Part II: Environmental Audit, an</p>

Requirements in the JICA Guideline and WB-OP	Laws/Regulations of GRSS	Gaps between JICA Guideline and Laws/regulations of GRSS
9.2. In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, such as projects for which mitigation measures should be implemented while monitoring their effectiveness, project proponents etc. must ensure that project plans include feasible monitoring plans.		environmental audit is established: <ul style="list-style-type: none"> - To assess how far project activities / programmes confirm with the environmental management plans as well as with the environmental quality standards. - To provide mechanisms for coherent implementation procedures for the project, - To provide regulatory bodies with a framework for ensuring compliance with, and the performance of an environmental management plan. However, there is no stipulation regarding public involvement or information disclosure under the environmental management / monitoring conducted in the project.
9.3. Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders.		
9.4. When third parties point out, in concrete terms, that environmental or social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.		

1.8 Land Policy

Terrestrial extent of the Republic of South Sudan (RSS), which is a land locked country in continental Africa, comprises extensive and diverse Land and Land Resources. From South to North and West to East, topography, rainfall and vegetation; the most dominant variables to determine the land features; vary so widely and prominently that a wide variety of land can be found in the country. Being a foundation for holding all terrestrial ecosystems, a well-managed land is essential for sustainable development and prosperity of the people who reside on it. Land is not just surface soil and visible topography, but made of all the resource found on its surface and underneath.

According to FAO/UNEP "Land and Land Resources refer to a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and hydrogeological reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc.)" (FAO/UNEP, 1997).

1.8.1 Outline

From the above discussion, it is obvious that both surface and subsurface water is an integral part of land, which is generally termed as one of the land based natural resource of the country. Thus, the land policy of a country must be formulated by taking into account the water resources. In RSS, the Land Policy (draft), 2013, has been adopted by the council of ministers/cabinet recently and now waiting for adoption in legislature. The land policy has given, reasonably, due consideration of water sector in its policy statements.

At foremost, the land policy is having clearly stated goal of strengthening Land Tenure Security for all citizens, which implies that such security will also be applicable to the Water Resources as it is an

integral part of the Land, especially while talking about the agricultural farming and animal husbandry. Furthermore, the guiding land policy principles mentioned about the equitable access to land and statutory recognition of community land right and institution. Such principle is more relevant for the overall socioeconomic development in rural areas where most of the family practices subsistence agriculture and cattle rearing. The secure land tenure/ownership is also having its obligation to use land and natural resources sustainably and with due care by formulating appropriate policy in conjunction with other government policies for agriculture, forestry, water use and environment. However, the policy goal and its guiding principles fail to mention it explicitly and need to be addressed while formulating sectoral policy.

The policy statement one says the water course should fall under public land category. For reducing poverty (policy statement two), it is obligation of the concern authority to initiate development for agriculture and water use by targeting low income land holder while streamlining right over land, water and grazing land by competing stakeholders. And, if required, there is provision of land acquisition for public use, such as irrigation development, in statement four, to resolve the conflicting interest to peruse such development initiative.

Although facilitation for the use of water for irrigated agriculture has not been mentioned explicitly, the policy (statement 13) encourages private/commercial investment on land for agriculture. Under the policy statement 15, it has been pointed out that National and State authorities; in some jurisdictions such as community land used in common, including grazing and water supply; have alienated local communities for public use or sale or lease to private investors of such lands. To resolve such issues, policy envisages that communities should have legal right, through local government (County and Payam) to be part and parcel of lease agreements with private investors.

RSS hosts the sensitive and fragile wetlands based ecosystem (the Sudd) of international importance and connected with the river network system of the country with both in and out flow beyond its border. There is lack of proper land use planning and flood/drought mapping at local, national and regional level. The policy (statement 16) demands to address such issues by enacting necessary legislation and institutional setup/capacity for protection and sustainable use of wetlands, fragile ecosystem, prevention of polluting water (including solid waste discharge from urban area) by collaborative planning and management initiatives involving all stakeholders and line ministries.

People induced modification of natural environment of a landscape for production or any other purpose is generally understood as Land Use. In most of the cases, communities, together with the government, allocate the land for various purposes by taking into account traditions, existing land use policies or other similar guidelines, rules and regulations. Land use involves modification and management of natural land environment; usually called as Land Cover; for the betterment of the community.

After evaluation and assessment of the land and its surrounding environment, community takes decision on land utilisation for different activities and purposes. Accordingly the land cover is modified or altered, which can be observed in most of the landscape. The level of such modification varies from place to place, which depends upon complex decision making process involving various stakeholders. Based on such decision, the land allocation process to the individual, group or any legal entity starts. After allocation of land for specific use, the immediate question arises about its ownership in given land tenure system and its governance and management.

In this section Land Use (LU), Land Governance and Management or Land Administration (LA) and

Provision of Land for Agriculture (PLA), with the emphasis of irrigation development, have been discussed.

1.8.2 Land Use

RSS lacks proper land use mapping and yet to define its land use types or categories properly. However, there are related activities; satellite imagery based mapping. The Land Cover (LC), mainly from the Food and Agriculture Organization of the United Nations (FAO), firstly under the Africover project and most recently mapping, compilation of Land Cover Database and production of Land Cover Atlas of the RSS happened in year 2011.

Under this mapping, 43 single classes used for the interpretation followed by aggregating them into seven (7) main land cover classes, namely (i) Agriculture in terrestrial and aquatic/regularly flooded land (AG), (ii) Trees closed to very open in terrestrial and aquatic/regularly flooded land (TCO), (iii) Shrubs closed to sparse in terrestrial and aquatic/regularly flooded land (SCO), (iv) Herbaceous closed to sparse in terrestrial and aquatic/regularly flooded land (HCO), (v) Urban areas (URB), (vi) Bare Rocks and Soil and/or Other Unconsolidated Material(s) (BS), and (vii) Seasonal/perennial, natural/(artificial) Waterbodies (WAT), which is illustrated in Figure 1.8.1. The classes reflect, besides others, mainly the nature of vegetation cover of the land area, thus difficult to call them LU.

(1) Status of Current Land Use

In the absence of concrete information on LU, various institutions are using one or another source of data to describe it as illustrated in Table 1.8.1. The table shows the FAO LC database was aggregated with emphasise on particular class of LU; in this case Cropland. As it can be seen in the table, the aggregated Agricultural land (Cropland, Grass with Crops and Trees with Crops) stands to 6.9 %.

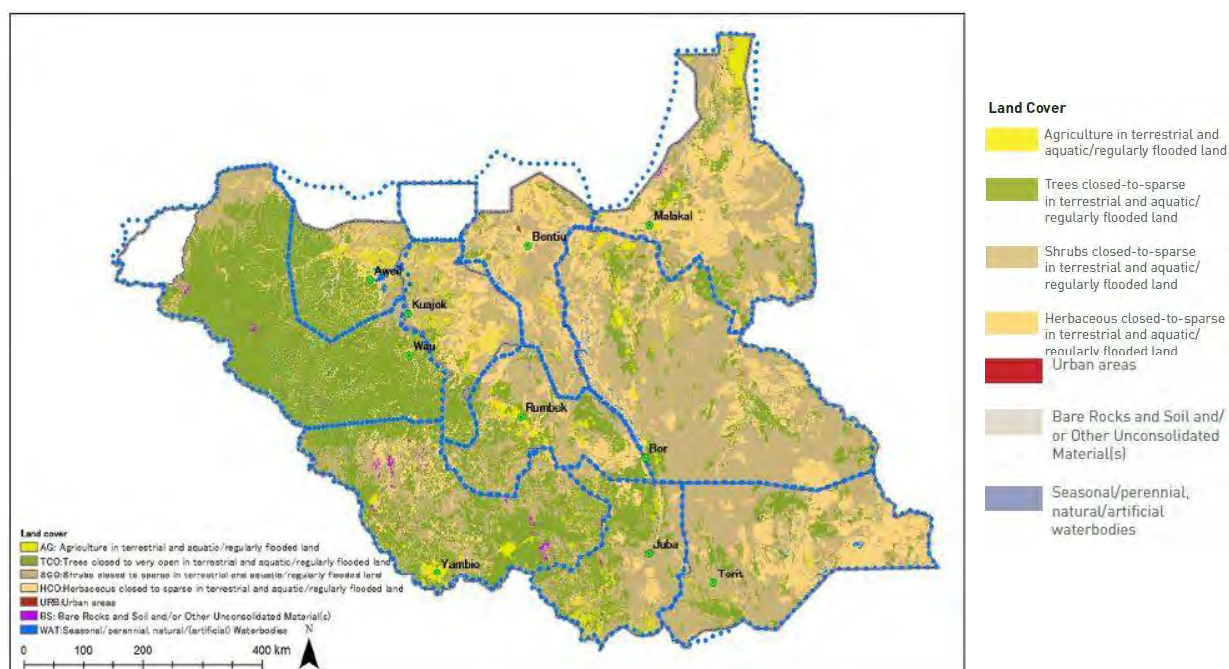


Figure 1.8.1 Land Cover Map of Republic of South Sudan

Adopted from FAO, 2011 Land Cover Database

Table 1.8.1 Current Land Use/Land Cover of South Sudan

Land Use Types	Area Sq. Km. (rounded figure)	Percentage
Cropland	24,777	3.80
Grass with Crops	3,251	0.50
Trees with Crops	17,073	2.60
Grassland	96,338	14.90
Tree land	405,269	62.60
Flood land	94,976	14.70
Water and Rock	4,827	0.70
Urban	370	0.10
Total	646,883	100

Source: World Bank, 2012. Strategic Choice for Realizing South Sudan's Agricultural Potential (Table 1, p. 4) (Aggregated from FAO 2009. Land Cover Database)

(2) Recent Development on Land Use Issues

Land Act, 2009; section 41, 42 and 43; provides general principle of land management for its uses and role of central and state governments. After finalising Land Zoning (LZ); which is demarcating the land for various purposes such as agriculture, commercial, residential, etc.; and gazetting them, the state government is responsible for the formulation and implementation of Utilisation of Land (which is LU) based on well prepared Town and Rural Planning. While doing so, a state has to follow (i) National guidelines and advice of central government, and (ii) LU in the context of social and environmental protection, which is defined in section 69, 70 and 71 of the Land Act, 2009. Furthermore, Local Government Act, 2009, made provision of LU Control and Protection System in Section 92 as a function of Local Government (Payam and County) Councils.

Development of LU Policy for LU management, at national level (such as LU Maps, Hazard Map for disaster preparedness) and at states level (such as Town and Rural LU planning to suite the local conditions) has been defined in recently published Land Policy (draft), 2013, Policy Statement 16ö. However, there are some mismatch, for example in urban area practice of town planning is size based plot classes mainly for land tax purpose without considering property rating (which deprive for resource for urban development) and without any provision for urban Agriculture and Forestry land classes. Furthermore, for LU, Town and Country Planning Act need to be enacted and harmonised with Local Government Act, 2009 and appropriate institutions, with necessary capacity, for preparing LU plan, at National, Regional and Local level should be defined. While doing so consideration of (i) Ecosystem protection (forest, wildlife habitat, wetlands, fragile ecosystem, pasture and water pollution) and sustainable use and (ii) Urban environment management (solid waste, drainage, air pollution) through necessary Environmental Impact Assessment (EIA) regulation are essential, which demands Cross-Sectorial LU management. Thus, there is urgent need of harmonisation of Land Act, 2009, and Sectorial Policy with the Land Policy.

(3) Defining Primary Land Use / Land Cover

For the development planning activities, where land needs to be used extensively, it is desirable to have information on prevailing definitive types of LU/LC classes of the area in question. After evaluating the existing LC of FAO, reviewing the LU related policies and acts described earlier; after consultation with the main stakeholders, specialised institutions and academia listed below, the following types of LU/LC classes could be reasonably defined (See Table 1.8.2).

Table 1.8.2 The Most Common Land Use/Land Cover Types of South Sudan

S. No	Land Use/Land Cover Classes		Definition
	Main	Sub	
1	Agric Land	Irrigated Cropland	Agriculture land supplemented with irrigational water for crop production
		Rain-fed Cropland	Agriculture land depends on only rainfall for crop production
2	Forest Land	Closed Forest Land	Dense forest, mostly natural, but may include plantation if it is with dense canopy
		Open Forest Land	Forest land with open canopy, mostly timber plantation (Tick/Mahogany, predominantly in CE&WE States), but may include natural forest if it is with open canopy
3	Savannah		Landscape with trees of less than 2 meter height embedded with grasses/bushes
4	Grasslands		Landscape with grasses and bushes, but may have scattered trees of less than 2 meter height
5	Settlements		Urban and rural settlements including gardening around the house
6	Rock areas		Very arid areas with no or few vegetation due to unavailability of water
7	Wetlands	Permanent/Seasonal	Also called Swamps or Sudd with standing water round the year/Seasonally flooded swamps/marshes.

Stakeholders and institutions consulted included University of Juba (Dept. of Forestry, College of Natural Resource and Environmental Studies (CNRES); Dept. Agri. Engineering, College of Engineering and Architecture (CEA), Ministries of Central Government; {the then Ministries of Agriculture, Forestry, Cooperative and Rural Development (MAFCRD); Animal Resources and Fisheries (MARF); Housing and Physical Planning (MHPP); Water Resource and Irrigation (MWRI)}; the Ministries of State Governments {Ministry of Physical Infrastructure (MPI), Central Equatoria State (CES); Ministry of Physical Infrastructure and Public Utilities (MPIPU); and Ministry of Agriculture and Forestry (MAF), Western Equatoria State (WES)}; and National Land Commission (NLC).

(4) Streamlining the Land Use and Land Zoning

The livelihood and way of life of a big number of the people in RSS is dominated by livestock rearing (using natural grazing areas and generally Transhumance or Nomadic Type; usually known as Pastoralism). Also a significant number of the same communities keep large numbers of small domestic ruminants along with considerable cultivation of crops; hence they are mostly referred to as agro-pastoralists. Equally important is a distinct part of the population permanently engaged in crops production along with either pigs-/chickens-/bees-keeping or some livestock (mostly settled communities or villages, with some exceptions of slash and burn cultivation; usually they are called Farmers). Both Pastoralists/Agro-pastoralists and Farmers are having, more or less, equal importance in the South Sudanese society as well as economy of the country. And most of the time Farmers and Pastoralist/Agro-pastoralists compete for land and water, which is one of the widely known source of social conflict. Thus it would be desirable to see what would be the implications of LU and LZ for irrigation development for followings:

- Livestock migration route
- Existing and Future ownership of the grazing land

In the absence of proper LU and LZ the only source of LZ; reflecting livestock migration routes and grazing areas; is National Bureau of Statistics (NBS) GIS database as shown in Figure 1.8.2(a). There is no definite information about how the grazing area was zoned or demarcated; however such zoning

might have included the Grasslands, Savannah and Forest Land.

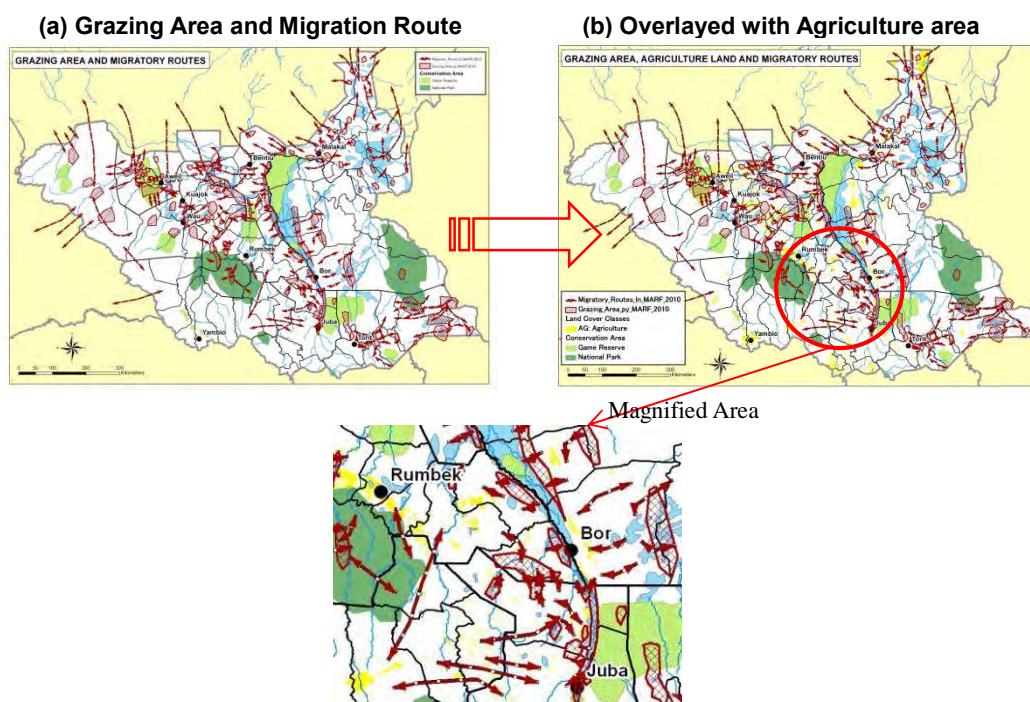


Figure 1.8.2 Transhumance Farming Grazing Area and Migratory Route

It is obvious from the Figure 1.8.2 (a) that some of the migration route/grazing area either passing/overlapping or will pass/overlap through/on Agriculture area in case it has not been streamlined or will not be streamlined in future with LU and LZ mapping and development. After extracting (from FAO, 2011 Land Cover database; shown in Figure 1.8.1) and overlaying the agriculture area on Figure 1.8.2 (a), the resulted Figure 1.8.2 (b) clearly shows that there are some cases of migration route/grazing area passing/overlapping through/on agriculture area.

While talking about the ownership of Grazing Land, it is with the Pastoralist Community under the customary law, which is widely recognised and will be formalised under statutory law after enacting Community Land Act as recommended in Land Policy, 2013. In similar way Farmer Community ownership on the Cropland (which may include various kinds of crop production for example cereals, vegetables, and fruits) will also be formalised. Here we are talking about both general LU and rural areas LZ.

From the explanation above it is essential for RSS to streamline both LU and LZ, specifically for rural areas, to avoid or reduce the Pastoralist-Pastoralist and Pastoralist-Farmer conflict, which cannot be done in the absence of enforceable LU and LZ in terms of both customary and statutory laws. Thus, proper LU and LZ are essential components of the irrigation development to secure Land and Water for both Farmer and Pastoralist.

1.8.3 Land Administration (L.A)

Prevailing LA in the country could be described with the consideration of different eras, namely (i) Colonial; (ii) Independent Sudan till 1970s; (iii) 1980s till Comprehensive Peace Agreement (CPA), 2005; and finally (iv) from CPA interim to independent South Sudan.

(1) Status of Current Land Administration

Prevailing LA in the country could be described with the consideration of era, namely (i) Colonial, (ii)

Independent Sudan till 1970s, (iii) 1980s till Comprehensive Peace Agreement (CPA), 2005, and finally (iv) To date.

- In the colonial era, the land was governed under the Land Settlement and Registration Ordinance Act, 1925, which was enforced for the land registration in big settlement areas, such as Juba, Malakal and Wau; and for the rural area of the country, it was under traditional practices of communal land ownership (owned by the communities, but not registered) under the customary practice.
- Even after independence, the colonial system was in place for a while, including communal land ownership specifically in rural areas of southern Sudan, probably due to remoteness and thinly populated vast land area. However during 1970s, there were some attempts, such as enactment of Unregistered Land Act, 1970, with the provision of all unregistered land would automatically belongs to the state, meaning communal land ownership under customary practices was abolished and ownership transferred to the government. It was further strengthened by enacting Civil Transaction Act of 1984.
- Late 1980s and until CPA, 2005, it was period of turmoil, and one reason was communal land ownership related issues. Signing the CAP; between Government of Sudan and SPLM/SPLA (Sudan People's Liberation Movement/Sudan People's Liberation Army); restored the communal land ownership together with the provision of establishment of Southern Sudan Land Commission (SSLC) for looking after land related issues. Enactment of Interim Constitution of Southern Sudan (ICSS), 2005, further clarify it under the article 180 (sub-article (1) to (7)), with the notion that ownership of communal land, and related traditional practices, under customary law should be managed and protected by law in Southern Sudan.
- After the peace, there were enactments of several laws, including Land Act, 2009 and Local Government Act, 2009, which further defined and elaborated the land ownership. And most recently, the Transitional Constitution of the Republic of South Sudan (TCRSS), 2011, article 169 (sub article (1)) states that all land owned by the people of South Sudan and its usage regulated by the government in accordance with law. The TCRSS has provision (article 171) of NLC, which is focal body for devising necessary policies and acts. Furthermore, Land Policy (draft), 2013, which has been adopted by the Council of Ministers, is under consideration for adoption in the legislature.

Being in transitional period, the LA is still not streamlined, but there is substantial encouraging development as mentioned earlier, specifically Land Act, 2009 and Land Policy (draft), 2013; together with Local Government Act, 2009.

Regarding the LA system, Figure 1.8.3 shows the state government and judiciary govern/manage the land in Juba County following the long establishment procedure since colonial era based on the Land Settlement and Registration Ordinance, 1925. And the same system is also in place for other 4 towns, namely Malakal & Renk, Upper Nile, Bentiu, Unity, and Wau, Western Bahr el Ghazal States. Under this system, planning and physical survey of the land; to determine the location and area of the parcel; is the function of government for creating the "Cadastre" while Land Registrar of the High Court maintain "Registry" where land is registered and title deed is issued. For the rest of the country, the land is still governed/ managed by the community authority (Traditional Chief) under the customary law and, in most of the cases, without proper physical demarcation and registration.

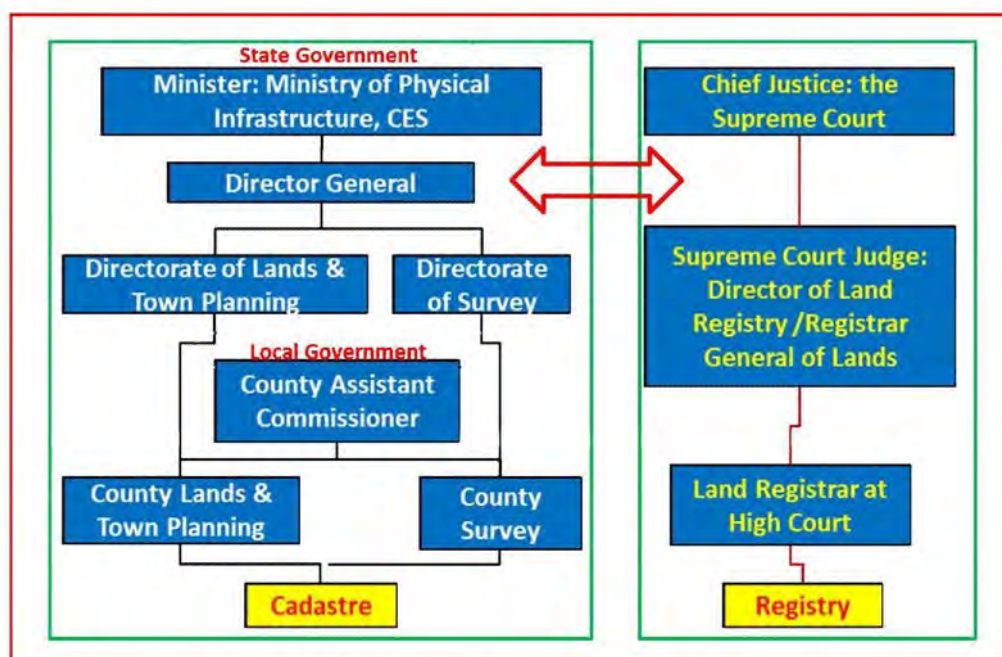


Figure 1.8.3 Structure of Land Administration in CES

(2) Recent Development on Land Administration Issues

Land Act, 2009, under section 9, first time properly classify three types of land; namely Public, Community and Private; and elaborated it in section 10, 11 and 12 respectively. And the ownership mentioned in section 7 (2), where land can be acquired, held and transacted through (a) Customary, (b) Freehold and (c) Leasehold tenure system. These provisions have been incorporated in article 170 (sub articles (1) to (11)), of the TCRSS, 2011.

- Public Land: Government at all levels (central, state and local) occupied land and land used for public utilities and services (such as road, airport), under water areas (such as river, wetland), gazetted forest national park and game reserve and any other land, except privately and community owned. Public land is usually registered under "Freehold Tenure System".
- Community Land: all land under the "Traditional Authority (defined in Chapter XII, Local Government Act, 2009)" and managed under the "Customary Law" is owned by community under "Customary Tenure System" and mostly not registered. Such land, which usually includes community forests, grazing areas, cultivated areas, waterholes, shrines, may be allocated (Section 15, with the provision of Section 16, Land Act, 2009) by the traditional authority and registered with the Local Government, jointly or individually, in the name of community or community member for their livelihood, not for commercial purpose, with the area less than 250 feddan. Prior verification and approval from State Government is needed for the commercial purpose with land area more than 250 feddan.
- Private Land: all the land registered in the name of individual and private entity. At the moment such registration is under "Leasehold Tenure System", but may include "Freehold" as well.

Chapter VII and VIII of Land Act, 2009; together with Section 15 and 88 to 96, Local Government Act, 2009; stipulates the provision of the government bodies who and how the land should be administered and managed while harmonizing the Statutory and Customary practices and laws.

- Central Government: Mainly responsible for devising land and natural resources regulations by enacting policy and legislation and other land related matter of national interests as stipulated in

the Section 42, Land Act, 2009 and Schedule 6A, TCRSS, 2011. Formulation of administrative (Registry) and technical (Cadastre) standards and provide necessary assistance and guidance to the states.

- State Government: Manage the state land and natural resources as stipulated in the Section 43, Land Act, 2009 and Schedule 6B, TCRSS, 2011 by devising necessary states rules and regulations in accordance with National policy and legislation including Registry and Cadastre standards. Land Zoning and Gazetting after demarking (through necessary survey) the land in collaboration with Traditional Authority and open and maintain registry (section 54, 55, 58 and 59, Land Act, 2009) issue certificate of title (section 57, Land Act, 2009) and transfer title (section 56, Land Act, 2009).
- Local Governments: There are three tier of administrative body; namely (a) County, City, Municipality and Town (Councils), (b) Payam and Block Councils (Coordinative administrative Units), and (c) Boma and Quarter Councils (Basic Administrative Units); however Land is managed by the following two local government bodies.
 - o County Land Authority (CLA): For each County, the state government establishes County land authority, with defined number of members and functions as stipulated in Section 44, 45 and 46 of Land Act, 2009, respectively. The CLA facilitates, support and assist the implementation of land registration (Registry) and survey (Cadastre) under the relevant ministry of the state. And CLA gets necessary assistance from the Payam Land Council (PLC) while doing so. Furthermore, it also provides necessary advice and guidance to Traditional Authority on land issues to manage community land in accordance with customary law.
 - o PLC: For each Payam, the state government establishes Payam land council, with defined number of members and functions as stipulated in Section 48, 49 and 50 of Land Act, 2009, respectively. The PLC provides necessary assists to the CLA.

The local and state government, together with NLC and Traditional Authority, also look after the land disputes based on the written complaint from the party. The party should file complain/appeal to first traditional courts (6A, 6B and 6C Courts, section 101, 100 and 99 respectively, Local Government Act, 2009) followed by the government land authorities (Payam, County and concern Ministry of state). The decision of concern ministry of state is final. After that party may file request for arbitration at NLC followed by adjudication in the competent judicial court.

Recent development shows well-structured LA system has been devised; however the implementation is in early stage. The institutions are not yet appropriately equipped and staffed at all level of government body. Recently, two pilot projects (USAID funded and undertaken by Tetra Tech ARD), one each in Yabio County/Yambio Payam, Western Equatoria and Bor County, Jonglei States, have been started for implementation of newly devised LA system explained above. Here the system under development in Yabio County/Yambio Payam, WES is discussed. After drafting and submitting to house for adoption and promulgation of (i) Land Administration Management and Regulation Act, 2013 and (ii) CLA Establishment Regulation, 2013, necessary offices and authorities have been constituted as illustrated in Figure 1.8.4.

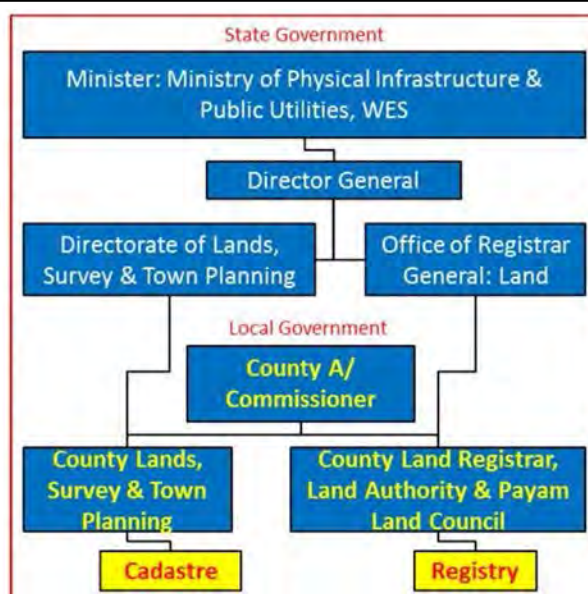


Figure 1.8.4 Structure of Land Administration in WES

Directorate of Lands, Survey and Town Planning under the DG at the MPIPU and County Lands, Survey and Town Planning, which function at local government under the guidance of state government, have been strengthened and Office of the Registrar General is established. The directorate, together with county, perform land survey after necessary planning and maintain the 'Cadastre'. The Registrar General, together with County Registrar and Land Authority and PLC, manages the 'Registry' after receiving necessary information from the cadastre (Figure 1.8.4). Thus, all the functions of land governance/administration are under the ministry.

As it can be seen, in Juba case the 'Cadastre' and 'Registry' is maintained by state/local government and Land Registrar of High Court respectively, while in Yambio case both 'Cadastre' and 'Registry' is maintained by the state/local government. It has been found that the second case is close to provision of recent enacted acts and regulations.

(3) Streamlining the Land Administration

In order to streamline the LA, besides others, the following activities are essential.

- Adoption of Land Policy (draft), 2013.
- Review and necessary amendments of Land Act, 2009 based on provisions of Land Policy, 2013 and harmonizing it. For example
 - o Clearly redefining the procedures to be followed in allocation of land by central, state, local governments and customary authorities, as there are some unclear and overlapping lines of authority among the land administrators,
 - o Extend the restitution (a restoration land to its rightful owner) process and then promulgation of regulations defining restitution procedures. Even TCRSS, 2011 and passage of laws, including Land Act 2009, role and responsibility of LA, Adjudication (judicial decision) and Protection of Land Right remains unclear or unfulfilled and
 - o Others: (a) Issue of land for IDPs (0.39 million) and Returnees (due to civil war and natural calamities); Current institutions and procedure for restitution and compensation of lost land or facilitate to integrate into host communities are absent or inadequate to resolve land conflicts, (b) Issue of poor and landless people; Informal settlements in urban periphery, (c) Operation of land market in urban and rural areas, (d) Sustainable use of natural resources (Agriculture, forest, pasture land and water and environment), etc.

- Need to enact Community Land Act (define land right without any discrimination, such as gender, and modernise LA of Customary Land Right) and harmonise with Land Act, 2009. Local Government Act, 2009, may need to be amended on the inheritance provision of land right for women and children.
- For LU, enact Town and Country Planning Act and Harmonise with Local Government Act, 2009: for National, Regional and Local Area LU plans assigned to appropriate institutions with necessary capacity. While doing so consideration should be given to (i) Ecosystem protection (forest, wildlife habitat, wetlands, fragile ecosystem, pasture and water pollution) for sustainable use and (ii) Urban environment management (solid waste, drainage, air pollution) through necessary EIA regulation. It demands Cross-Sectorial LU management approach and harmonised sectorial policy with the land policy.
- Enact Land Registration Act, Land Survey Act and Land Information Act for LA, defining (i) Land right delivery, (ii) Land adjudication and registration, (iii) Land demarcation, survey and mapping, (iv) Cadastre, (v) Land information system (LIS) management, (vi) Fiscal aspect of land management, such as Land taxation system (LTS) and (vi) Land disputes management.
- Develop LU Policy for LU management as discussed earlier.

Most importantly the land governance/management system must be harmonised with one system and should be practiced in all states. And, as illustrated and mentioned in previous section, the case of Yambio should be adopted as national standard.

Box: Streamlining LA is in Offing: The Chairperson of National Land Commission

- Step 1: Adoption of Land Policy by Legislature
- Step 2: Review and amend the Land Act, 2009, and Local Government Act, 2009 (as required)
- Step 3: Draft, present and adopt the necessary Rules and Regulation
- Step 4: Draft Community Land Laws for management, investment, allocation, sell, etc.

It has been expected that all these steps will be completed by end of the year 2013.

1.8.4 Provision of Land for Agriculture

The Provision of Land for Agriculture (PLA) might be looked at in many ways; however within this context, in order to see how the land is going to be allocated for agriculture, the main factors can be listed as (i) Extent of potential agricultural land, (ii) Current area under Agriculture Land Use and status of food sufficiency, (iii) Total population and population density, and (iv) Government policy for agriculture sector in the country.

- Extent of Potential Agricultural Land: According to the then MAFCRD (Investor Guide, 2012), about 50% of country land area can be considered as "Prime Agricultural Land". Furthermore, during consultation with agricultural and forestry professionals at central and state government ministry and Juba University, it was highlighted that vast area of fertile land, specifically in Greenbelt Area, is yet to be exploited.
- Agriculture Land Use & Food Sufficiency Status: Currently about 6.9 % of total country land area is under agriculture land use (WB, 2012) and it is widely reported that RSS is net food importer.
- Population and Population Density: Total population of RSS is about 8.26 million (NBS, 2013) with the population density of 30 persons per sq. km. About 83% of the people live in rural area. Agriculture and animal husbandry are main source of livelihood of 78% of households. Thus, it can be concluded that the country is thinly populated where most of the people lives in rural

area and practice subsistence agriculture as about 51% of the population live below the poverty line (NBS, 2013).

- Government Agriculture Sector Policy: It is widely reported; including then MAFCRD's Investor Guide, 2012; that the food security is the one of primary focus of the GRSS. Furthermore, government has stated policy of encouraging investment in the agriculture sector with the ambition of becoming net food exporter from currently net food importer.

Thus, it can be safely mentioned that there is plenty of available land, which can be allocated for agriculture. And government policy is in favour of agriculture sector investment.

(1) Availability of Land for Irrigation Development

All the land area currently under agriculture use can be considered as immediately available land and most of them are under rain-fed agriculture. So, even without new land area for agriculture, there is already some potential land, which can be brought under irrigated agriculture land. And on the top of that there is plenty of land available for agriculture, which is currently under different LU/LC types. Such land can be brought under 'Cropland' LU/LC type with due procedure as explained earlier. While developing irrigation for a given area, some portion of land of that area is consumed in the irrigation facilities and rest become the irrigated land. Thus the ownership issues need to be examined by taking into account the followings:

- Beneficiaries of the Irrigated Land Area: The beneficiaries might be new settler, farmer and pastoralist; one of them or combination of them either individual or farming group. In terms of their status of land ownership, they might be land owners or tenants. Thus, for new irrigation project, the land can be assigned to the individual or group under ownership or tenancy categories. However, it would be desirable that the land should be registered in the name of individual under the Private Land categories with Leasehold Tenure.
- Provision of Land for Irrigation Facility Development: It is obvious that some land area need to be used for the irrigation facility development, such as reservoir, intake, canal, access road, etc. Such land can be obtained from one of the land classes; namely Public, Community and Private land. Community land can be obtained by proper consultation with community chiefs and individual members through State and Local Government. For private land compensation mechanism, as mentioned in Land Act, 2009 and TCRSS, 2011, should be followed. All the land used for the facility development should be registered in the name of competent government in Public Land category under Freehold tenure system.

Box 1: Dominant LU in RSS: View of CNRES and CEA, Juba University

Consultation with the faculty member engaged in Agriculture (Dept. of Agri. Engineering) and Forestry (Dept. of Forestry) related field resulted into presence of followings types of LU. LU is not defined for RSS; thus literature and international practices are adopted in academic circle.

- Agriculture Land: Irrigated and rain-fed cropland, mostly subsistence in farming type. Regarding the other types of agricultural land, such as Fruit Orchard, they are mostly exists in landscape, both wild (embedded with forest or bushes) and few planted.
- Forest Land: Plantation for timbers (Tick, mahogany; mostly in Central and Western Equatoria States) and natural forest, which can be divided into open and closed forest. Forest land is mostly found in national parks and game reserve, but also outside of reserve.
- Savanna: Three kinds; dry, equatorial, just savanna; where scattered trees of <2 m height embedded with grass and bushes dominate landscape. All 3 categories are more or less similar in nature as categorisation based on their location. Dry Savanna found in North-eastern part of RSS (Eastern Equatoria State bordering Kenya) while Savanna found in Greenbelt are called as Equatorial Savanna. And rest; found in Jonglei & Lake States and occupy large swath; are just Savanna.
- Grasslands: The landscape with grass & bush and might have few scattered trees. Such land exists mostly in Bahr el Ghazals, Jonglei, Part of Upper Nile and Part of Eastern Equatoria States. Grasslands are widely used for grazing and may be called as pastureland.
- Settlement: Populated areas, city, town & village
- Wet land: Swampy or SUD areas; categorized into permanent and seasonal wetlands.
- Rock areas: Very arid where no or few vegetation present due to unavailability of water even underground, say up to 200m borehole. Such areas also called as Bare Land.

Box 2: Common LU in RSS: Views of Other Stakeholders

- Other consulted stakeholders are, MAFCARD, NLC, MARF, MHPP & MWRI of RSS, MPI of CES, MIPU & MAF of WES, and Land Coordination Forum.
- The stakeholders confirmed that there is no proper LU definition and LU and LZ yet to be mapped.
- In the absence of such data, the RSS is mainly dependent on the LC map, developed by FAO, for extracting relevant information for LU as well.
- According to MAFCARD, LU and LZ are yet to be defined and mapped in RSS. Thus, at present, ecological zones are generally used to determine the types of crops grown in agricultural land. Besides, there are presence of forest land (natural & plantation) pastureland (grassland), and acacia in arid area.
- MARF mentioned about the presence of seasonal as well as permanent öSwampy Landö, öGrazing Areaö, öAgriculture Landö and öFish Pondö. The permanent swampy land and rivers are used as natural fishing ground while seasonal one is used as grazing area in dry season. Agricultural land is mostly framed as subsistence agriculture.
- MHPP is having office of directors for survey and land use; however ministry has yet to start defining and mapping LU.
- During the consultation with two ministries in WES, it has been learnt that the dominant LU of WES are Agriculture land, Forestland, Wetlands, Water body & Rivers, and Planation. And there is presence of few Fruit orchards.
- According to CES, the international definition of LU may be applicable as RSS does not have one. It has been mentioned that common LU types are Agriculture, Forest, Wetland and Grassland.

Box 3: Provision of LA in Juba County, Central Equatoria State

The LA is managed jointly by Ministry of Physical Infrastructure and Land Registrar at High Court, sharing the responsibility of Cadastre and Registry respectively. At the ministry, besides other directorate under the Director General (DG), there are directorate of Survey and directorate of Lands & Town Planning, who jointly oversee the cadastre. Furthermore, there is provision of State Town Planning Board (STPB), headed by DG, to advise the ministry for better LA. STPB is composed of members from stakeholder government institutions. The process of LA in the county is mainly based on the Land Settlement and Registration Ordinance Act, 1925. It is summarised as below for city/town and rural area.

For City/Town Area:

- Preparation of the plan of the new area (layout) by the Ministry and presented to the STPB. After evaluation during a meeting, the layout is adopted and passed by the STPB.
- The minutes of the STPB meeting need to be sent to the office of the Land Registrar.
- The purposed plan and layout of the area is surveyed and map need to be produced and delivered to STPB for evaluation.
- STPB holds a meeting for approval and passed Map after evaluation and corrections, if required.
- The minutes and the approved plan map need to be sent back to Land Registrar office.
- The Land Registrar releases form 10 with cover letter to the Directorate of Survey, which indicates the size, number and other details of the plot. And the copy of the document has to be send to the directorate of Lands & Town Planning as well.
- After processing with due procedure, form 10 returned to the office of the Land Registrar and based on this
 - o Registrar opens a book for that new block.
 - o Land leasing is authorized by the ministry and registered in the office of the Land Registrar, who issue a title deed
 - o After registration, the leasee bring back the title deed to the Directorate of Survey who shows the plot to the owner.

For the rural area:

- The concern Community approved the land allocation of an area and table it to the Local Planning Board (LPB)
- The LPB has to pass the plan; in similar way as STPB of city area; and send it to the state Ministry of Physical Infrastructure.
- After deliberation and evaluation, the ministry passes the plan and send it back to LPB.
- Using the approved plan, the process of land registration started by local government (County/Payam/Boma) under supervision of State Government.

Box 4: Development of Land Administration in Western Equatoria State (Test Case of New System)**Sate Land Administration Structure:**

Under the provision of ICSS, 2005 & TCRSS 2011, Land Act 2009, Local Government Act, 2009, Investment Promotion Act, 2009, and Land Policy (Draft), 2013, the WES government is busy in drafting/adopting necessary Acts and Regulations for devising proper LA in the state. Executive body of LA in the state are (i) MPIPU (ii) County Land Authority (CLA) and (iii) Payam Land Council (PLC) with the advisory role from State Land Commission. There are two main bodies at MPIPU; namely (i) Directorate of Lands, Survey and Town Planning (with three departments; Lands, Survey and Town Planning; headed by directors) under the DG of the MPIPU and (ii) Office of Registrar General (ORG); which govern/administer the land in the state. The former is responsible for physical survey of the parcel and making maps while later is issuance of title deed and maintain the registries. Out of 10 counties, CLA has been constituted in Yambio County, which will be followed in other counties soon. And PLC will follow gradually thereafter. The land record will be kept and maintained in a register at all level that is PLC, CLA and ORG. The land record will be accessible to general public with due procedure and fee. At the moment there is provision of Leasehold Land Title for individual, which is for up to 22 years, with the provision of renewable and inheritance. Soon there will be provision of Freehold Land Title as well.

Piloting the Land Administration under New System:

Currently on going pilot project (USAID funded and undertaken by Tetra Tech ARD) in Yambio county is making headway for LA. It is also having sister pilot project in Bor County of Jonglei State. The pilot project; hosted by MPIPU; is developing simple type of Land Cadastre with low cost approach. There are 5 main components namely (i) Drafting necessary rules and regulation for MPIPU, State Government, (ii) Constituting CLA in Yambio County and providing necessary training for the CLA member and other MPIPU staff while working in the county as well as arranging visit, such as recently team of CLA member sent to Botswana to study the LA system in that country, (iii) Experimenting Land Inventory: Field Survey team is given iPad (having embedded GPS and Camera) and trained to observe and record the four corners coordinates of the land parcel, including all classes (Public, Community and Private Lands). The data is sent to Tetra Tech ARD headquarter in Juba where GIS expert develop parcel boundary map. The physical boundary map/information will be used for registration of land and issuance of land title deeds by maintaining the land registries, (iv) Facilitate investment on the Land; such as how to negotiate and agree; within the legal framework of the LA, and (v) Land conflict management and arbitration.

Land Administration Structure at County Level

There are various departments under the ED (executive Director, who is chief civil servant in the county) and County Commissioner including County Land Survey and CLA who works in coordination with the Survey Department and Registrar General, respectively, of the MPIPU. Composition of the CLA includes (i) One Secretary (civil servant) to manage day to day business, (ii) Representatives one each from five Payams, (iii) Four technical staff from MPIPU, (iv) County Commissioner (chairman of CLA), (v) Paramount Chief, (vi) Women Representative (from County Women Association), (vii) Youth Representative (from County Youth Association), and (viii) Civil Society Representative. The CLA is having 4 sub-committees as follows, namely (i) Financial (Investment), (ii) Ethics, (iii) Dispute Management, and (iv) Land Allotment/ Allocation (work with MPIPU for land allocation).

Box 5: Provision of Land for Agriculture, Views from MAFCRD and MAF of WES**Central Government Level: Status and Initiatives**

At the moment, there is no proper mechanism for land allocation for specific purpose; including agriculture; as LU and LZ maps yet to be prepared. However there are some positive initiations recently. The Investment Promotion Act, 2009, by Investment Authority and Investment Policy by Ministry of Commerce, Supplies and Investment, encourage agricultural investment on land and appropriate land can be allocated, for both Sudanese and Foreigner, with due procedure. MAFCRD prepared Investment Guide booklet titled 'Potential and Opportunity for Investment in Agricultural Crops and Forestry 2012' and Food Security Policy (draft), 2013. This booklet and policy provide some guideline for agricultural land allocation. Furthermore, under food security policy provision of agricultural land, together with feeder agricultural roads, is emphasized and some activities have been initiated. Similarly, under Norwegian People Aid program, Land Suitability Analysis in all 3 Equatoria States was completed and report was published in year 2012, which may be used for allocating suitable land for agriculture.

There are two institutions; namely (i) Land Use and Soil unit (under formation) at MAFCRD, and (ii) Food Security Secretariat, under President Office (currently at NBS); which are going to play key role for provision of land for agriculture. It has been expected that former will advise concern stakeholders for appropriation of suitable land for agriculture while later will materialise it.

State Government: Status and Initiatives, example of WES

From the consultation with MAF, it has been learnt that there are plenty of untapped potential/suitable lands for agriculture. During the colonial time (1940s) the community land were allocated to the resident mainly by taking reference of footpath/trail (at upslope) and stream (at downslope). The size of parcels are considerably large, thus there is ample land area, which can be allocated for agricultural investment by dividing the parcel into two (i) Small size, but sufficient for living for the family, parcel adjacent to road/trail and (ii) Bigger parcel followed the first one up to the stream. All the parcels adjacent to stream from the community can be consolidated for leasing for investment in accordance with well-defined procedure. The community land allocation for agriculture (for livelihood, not commercial) is handled by (a) Community Chief, for less than 10 feddan and (b) MPIPU through PLC/CLA with the consent of Community Chief, for 10 to 250 feddan. Such allocation is registered under leasehold category. For commercial purpose land allocation, all stakeholders collaborate while following established procedure.

WES receives ample amount of rain with 9 months of rainy season followed by only 3 months of dry season. There are some perennial rivers, lakes and swamps as water body in the state. Thus, there is lots of potential to develop irrigated agriculture, specifically by focusing for 3 month dry period and dray area of the state.

Box 6: Land Based Resource Jurisdiction for Use and Exploitation

Jurisdiction on some of the important land based natural resources mentioned by National Land Commission

- Central Government
All Sub-terrain Mining, Forest reserves & plantations, Forest inside declared national parks, Inter-state large perennial rivers (ex. Nile) for harvesting the water ex. irrigation
- State Government
Small quarries, Harvesting timber commercially from forest outside national park, Harvesting water from small perennial river (inter counties) for irrigation
- Local Government (County/Payam)
Harvesting water from small river (seasonal) for irrigation
- Local Community
Collection and use of forest products form forest outside national park, use of natural waterhole for cattle, fishing in river and natural water body, harvesting water for individual farm irrigation.

While using/exploiting the natural resource, due consideration for environmental protection, critical ecosystem protections and sustainability should be given by concern authority.

1.9 State Strategic Plans in relation to Water/Agriculture Sectors

With support of UNDP, in 2012, each State in RSS made State Strategic Plan (SSP) for 2012/13 to 2014/15 through collaboration among states' ministries, council of ministers, legislative assembly and county commissioners; and with inputs from community leaders and other stakeholders, led by ministries of finance and economic development.

1.9.1 Outline

All the SSPs principally followed the four (4) pillars of the SSDP. And their contents are similar, as they are all composed of 1) Background and context; 2) Situational analysis; 3) State strategic direction; 4) Priorities, key issues and strategic interventions; 5) Implementation/Action planning; and 6) Monitoring and evaluation. Table 1.9.1 summarized main descriptions appeared in the State goals, Key strategic directions and issues/challenges of the SSPs in relation to water and agriculture sectors.

Table 1.9.1 Main Descriptions in State Strategic Plans

Item	Summary
1. State Goals	<ol style="list-style-type: none"> 1) To maintain peace and security, 2) To build a democratic, transparent and accountable government, 3) To diversify private sector-led economic growth and sustainable development, 4) To promote well-being and dignity of all the people, 5) To defend sovereignty and territorial integrity, 6) To take into account available local resources, 7) To act as the link between RSS and counties, municipalities in the State, 8) To build institutional and human capacities, provide infrastructure for poverty reduction etc.
2. Key Strategic Directions	<ol style="list-style-type: none"> 1) To achieve rapid rural transformation improving livelihood and employment opportunities, 2) To deepen peace building and improve security, 3) To provide adequate infrastructure (road, housing, etc.) 4) To ensure food security and sustainable livelihood, 5) To conserve the environment 6) To turn fast and stable development, producing high value-added in both quantity and quality 7) To increase crop production and land vegetation cover, 8) To make faster economic development with attracting foreign investment, 9) To increase length of road rehabilitation, etc.
3. Issues/challenges	
3-1 Infrastructure	<ol style="list-style-type: none"> 1) Vague definition of property rights and access to land, 2) Most of roads area unusable during the rainy season, 3) Acute shortage of fund to carry out major construction and rehabilitation, 4) Poor fund and unmaintained road and bridge rehabilitation, 5) Weak legal and regulatory framework, absence and compliance to standards, 6) Unavailability of master plan to guide development in well planned and organized set up,
3-2 Natural resources (Agriculture)	<ol style="list-style-type: none"> 1) Need for agricultural inputs and techniques such as fertilizers storage facilities and Irrigation development 2) The difficulties faced by farmers in accessing markets, 3) Improving preparedness and effective response to food and agricultural threat, 4) Objective to ensure food security and improve livelihoods and income generation, 5) Lack of adequate agricultural extension and training institution, 6) Slow undertake of the new farming methods compounded by lacking of training, 7) Capacity building particularly for farm extension and farm machineries operators, 8) Inadequate infrastructure, no laws and regulations for environmental conservation

Item	Summary
	and protection, 9) Lack of land for investment and insecurity caused by land grabbing,

Adopted from State Strategic Plans of 10 States

1.9.2 Strategic Plans for 10 State Governments

A. Strategic Plan for Upper Nile State (2012-2014) Draft, April 2012	
1. Overview of Strategic Plan	
Purpose	Not mentioned
Guiding Principles	Not mentioned
Key Principles	Not mentioned
2. Background and Context	
Governance System	Not mentioned
Strategic Objectives	<ul style="list-style-type: none"> Infrastructure construct new and upgrading of existing roads to improve access to basic services and market. Improve urban development through introducing development/master plans, Agriculture and livestock enhance agricultural and forest production and productivity in a sustainable manner so as to improve the livelihood in both urban and rural areas of the state, Improve production and productivity of animal resources, and To conserve the environment and manage the habitat to ensure a good standard of living.
Land Area	<ul style="list-style-type: none"> The UNS is the fourth largest state of South Sudan covering an area of 77,283.42 km² consisting 13 counties namely: Akoka, Baliat, Fashoda, longkuchok, Luakpiny, Maban, Maiwute, Makal, Manyo, Melut, Panyikango, Renk and Ulang County.
Geography and Climate	<ul style="list-style-type: none"> The State experiences six months of unimodal rainy season start from south in late April covering whole State by late May, with average annual rainfall of 950 . 1,500 mm per year resulting to high humidity during six months of heavy rain (May . October) and temperatures 27 . 49 degree centigrade. It is rare to have rain during dry season (November . April). The soil cover mainly consists of black cotton soil along river bank and across marshland.
Population	<ul style="list-style-type: none"> Upper Nile State is the fourth most populous state after Jonglei, Central Equatoria and Northern Bahr el-Ghazal respectively with total population of 964,353. The population density is 12.48 and average household size of 6.4 person.
Livelihood	<ul style="list-style-type: none"> Livelihood depends on Agriculture (cultivating sorghum, rice and maize), Livestock production, Fishing, Small scale trade and Casual Labour.
Socio-economic	<ul style="list-style-type: none"> The main socio-Economic activities in the State are: Agriculture, Electricity that generated from diesel powered generator and small scale commercial business.
Poverty	<ul style="list-style-type: none"> 25.7% the living condition indicates that the majority of the people are poor. The Upper Nile is better than other states in the entire country.
Water and Sanitation	<ul style="list-style-type: none"> Limited access to safe water and prevailing poor sanitation situation accelerate the existing low living condition state Less than 35% of the population has access to improved sources of drinking water and only 13% have access to sanitation.
Road Infrastructure	<ul style="list-style-type: none"> Road infrastructure is in its infancy stage with only less than third of the state being accessible during the rainy season. In specific terms, a total of 620 km earth road are completely impossible during the rainy season which normally lasts for half a year.
Agriculture	<ul style="list-style-type: none"> The agricultural production in the state does not satisfy the demand Food production in 2011 is estimated to be a round 25,966MT (47%) which is lower compared to that of the previous year 2010 as well as to the average food production in the state in last four years 2007 . 2010. Factors that contributed to this reality include; delayed and erratic rainfalls, pests, shortage of fuel, machinery spare parts and lack of agricultural financing in the mechanized farming areas in Northern Upper Nile (Renk)
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> A peaceful, democratic, transparent, accountable and prosperous State.
Mission	<ul style="list-style-type: none"> To provide security to the people and their property, ensure sustainable peaceful co-existence, justice and rule of law, promote environmental conservation, equitable distribution of resources, access to services, advocate gender equality and facilitate

	private sector participation in economic growth of the State.
Core Values	Not mentioned
State Goal	<ul style="list-style-type: none"> Enhance good governance, accountability and transparency through an established legal framework, coordination between state institution, capacitated civil service, improved public financial management and zero-tolerance to corruption. Ensure sustainable economic development that improves livelihood of the state people. To enhance access to basic social services so as to promote the well-being and dignity of the people of the state. Reduce conflicts, maintain peace and provide equitable access to justice in the state.
Key Strategic Directions	<ul style="list-style-type: none"> Improving governance; Achieving rapid rural transformation to improve livelihood and expand employment opportunities; Improving and expanding education and health services; and Deepening peace building and improve security.
4. Strategic Goals for Key Sectors	
Not mentioned	
5. Issues and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> Objective to maintain, rehabilitate, provide and operate infrastructure to aymgent poverty reduction, economic growth and service delivery in a sustainable manner Lack of electricity and poor accessibility of electricity is a major challenge within state, the use of diesel generators, the rural areas do not have a source of electricity Poor roads infrastructure most of the roads in the state are unusable during the rainy season due to swamping
Natural Resources and Social Development	<ul style="list-style-type: none"> Objective to ensure food security and improve livelihoods and income generation for thr people of the state, through sustainable use of natural resources and land management Lack of adequate agricultural extension lack of an agricultural training institution in the state has hampered the efforts to develop the capacity of staff Traditional low input-low output subsistence farming has been the main cause of food security in the state
State Mid-term key Priority	<ul style="list-style-type: none"> Provide safe drinking water for domestic and livestock by increasingthe number of existing facility; Construction of roads to connect counties and Payams to state capital and state to the neighboring state; Increase in food security throuh provision of trianing and NFI agricultural input(seeds and tools); and Improve security in all areas of the state.
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> Across RSS monitoring & evaluation rather weak due to weak administrative capacity and sufficient technical skill. The responsibility of M&E lie with State legislative assembly, State secretariat (Governor Office), Council of ministers, executive authorities, State planning and development committee, Fiscal and financial allocation and monitoring office, planning unit/ Directorate at each level and State ministry of Finance and Economic Development. At the end of the planning cycle, a final evaluation is carried out which outcomes will be used for next planning period. 	

B. Strategic Plan for Jonglei State (2012/13-2014/15) Draft, April 2012	
1. Overview of Strategic Plan	
Purpose	<ul style="list-style-type: none"> To co-create a common aspiration that will secure the collective and total buy-in of the entire stakeholder in the state. To contribute to the formulation of a medium term development perspective that outlines the key challenges facing the state and to identify specific priority areas and map a way out with a clear vision and mission, as to how these could be guided. To serve as the basis on which counties develop new strategic plans or revise existing ones, similarly to the SSDP which gives direction from the national level and serves as the basis for the state planning.
Guiding principles	Not mentioned
Key Principles	Not mentioned
2. Background And Context	
Governance System	<ul style="list-style-type: none"> The State has Governor, deputy governor, eleven appointed cabinet ministers, appointed advisors and legislative assembly. The political stratum is headed by the governor and his Deputy while the technical activity is headed by the Secretary General and his supporting staff. Each county is headed by the Commissioner appointed by the president of South Sudan in conjunction with Governor.
Land Area	<ul style="list-style-type: none"> Jonglei State is the largest State in South Sudan covering an estimated area of 124,990 km². Consisting of eleven (11) administrative Counties namely Akobo, Ayod, Bor, Duk, Fachala, Fangak, Nyirol, Pibor, Pigi, Twic east and Uror county.
Geography and Climate	<ul style="list-style-type: none"> Climate is tropical, average annual rainfall of 800 - 1,300mm resulting in high humidity during the six months heavy rains (May - October) and temperature 18 - 40 degree Celsius It ranges from arid to tropical wet-and-dry in the far southwest.
Population	<ul style="list-style-type: none"> Jonglei State is the highest populated state in South Sudan. The population of the State is 1,358,602 according to the 5th 2008 Sudan census, consisting of 54% males and 46% females.
Livelihood	<ul style="list-style-type: none"> The main livelihood system of the people of Jonglei are agriculture (crop farming and animal husbandry), however agriculture production has remained low in Jonglei prompting the state to rely on food imports and food hand-outs. Fish constitutes one of the important protein sources as well as an income earner for communities living near fishing ground It has huge livestock potential but often under-utilized. are kept mainly for prestige and cultural/social status.
Socio-Economic	<ul style="list-style-type: none"> Socio-economic are largely dependent on subsistence farming and pastoralism.
Poverty	<ul style="list-style-type: none"> The level of poverty extremely high and Jonglei State consistently rank among the lowest States in the country with 48.3%.
Water and Sanitation	<ul style="list-style-type: none"> The most of population does not have access to improved sources of drinking water (33%) and Toilet facilities (91%).
Road Infrastructure	<ul style="list-style-type: none"> It has one of the lowest road densities in country. Road infrastructure in Jonglei State still under developed with only less than one fourth of the State being accessible during the rainy season. This greatly affects access to health, education facilities as well as markets.
Agriculture	<ul style="list-style-type: none"> Agriculture production remained low in Jonglei prompting the State to rely on food imports and food hand-outs. Local agriculture production is affected by drought, flood, inadequate agricultural inputs (e.g. seeds and tools), poor roads infrastructure, lack of farming culture and insecurity.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> An exploitation-free society, where the people of Jonglei State live in peace and prosperity, enjoy their fundamental rights and regulate their governing institutions to be transparent in decision making and accountable to the people for their conduct.
Mission	<ul style="list-style-type: none"> The State strives for the promotion of people's democracy, decentralized and responsive administrations and good governance; inter-state/county cooperation and people centred development.
Core Values	<ul style="list-style-type: none"> The people of Jonglei State are the centre of development while the external agencies provide technical and backstopping support. The state will protect and promote the social, political, economic, religious and cultural rights of all ethnic nationalities.

	<ul style="list-style-type: none"> The state is committed to ensure that each individual enjoys rights to food, descent shelter, health, services, education facilities and livelihood. The state is committed to support the poverty eradication programmes, contribute to the attainment of Millennium Goals Development, guarantee the equitable distribution of wealth and resources and reduce regional.
State Goal	<ul style="list-style-type: none"> To build institutional and human capacities, provide infrastructure to enhance poverty reduction, ensure access to equitable social services, accelerate economic growth and sustainable development, ensure security and improve livelihood, build accountable and responsive government and contribute to the attainment of millennium development goals.
Key Strategic Directions	<ul style="list-style-type: none"> Ensure security for all, Provide adequate infrastructure (road, housing, etc.), Provide affordable and sustainable health services with trained workers, Ensure food security and sustainable livelihood, Capacity building and women empowerment, and Conserve the environment.
4. Strategic Goals for Key Sectors	
Infrastructure	<ul style="list-style-type: none"> To construct roads, water, airfields and housing infrastructure and install water, sanitation and electricity utilities in all counties of Jonglei State by 2015.
Agriculture and livestock/Fisheries Development	<ul style="list-style-type: none"> To ensure food security and through increased and diversified agricultural production. To ensure food security through increased livestock and fisheries production by 2015.
Social Development	<ul style="list-style-type: none"> To promote social equity protects and promotes women and children rights and retains positive cultural values.
5. Issue and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> To provide basic infrastructural facilities and services, such as roads and transportation systems, rural & urban water supply and sanitation, housing, electricity through urban planning To improve the welfare of the state through provision of electricity, water and sanitation, and construction, grading and maintenance of roads. To regulate the exploitation of the mineral resources potential in the state <p><u>Challenges</u></p> <ul style="list-style-type: none"> Lack of adequate budget allocation for procurement, operating and maintenance costs for equipments and tools Inadequate of human resource to enhance planning and implementations of projects in the state Lack of statutory laws, guidelines and regulations for appropriate programs/projects implementation
Natural Resources	<ul style="list-style-type: none"> To enhance food security and improve the livelihoods and sources of income for the inhabitants of state To prevent and control livestock diseases To build an inclusive society, protect, empower vulnerable groups. <p><u>Challenges</u></p> <ul style="list-style-type: none"> Lack of good roads network connecting the counties to state Insufficient planning and M&E personnel for the state MAF Insufficient statistical inventory data fish species, quantity and quality as well as livestock population and production Absence of policies
State Key Priorities	<ul style="list-style-type: none"> Construction of roads to connect counties to state capital and increase access to improved water and sanitation facilities Increase output in animal and crop production Empowering Law Enforcement Agencies in terms of mobility, equipment, training, among others in order to reduce violent conflict in the state Enhancing effective Governance and Rule of Law
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> M&E approach will be adopted with the active involvement and participation of all stakeholders from all levels of government. M&E system will provide a continuous tracking and feedback mechanism to all stakeholders in the process. The state ministry of finance will undertake monthly and quarterly monitoring and supervision exercises to project implementation areas and provide overall direction and management of the implementation of the plan. 	

C. Strategic Plan for Unity State (2012/13-2014/15), April 2012	
1. Overview Strategic Plan	
Purpose	<ul style="list-style-type: none"> To mobilize resources and allocate to development priorities, To cope the two decades of civil conflict, which displaced many people into refuge centres and Internally Displaced People (IDPs) camps, and To recover and rehabilitate devastated economy.
Guiding Principles	<ul style="list-style-type: none"> Following the approval of South Sudan Development plan (2011-2013) all states in RSS are preparing their coming years strategic plan which makes the nation one political and economic sphere as needed and agreed.
Key Principles	Not mentioned
2. Background and Context	
Governance System	<ul style="list-style-type: none"> The Executive consists of the Governor, Deputy Governor, the State Ministers and the County Commissioners. The Governor is directly elected by the people through adult suffrage and appoints the Deputy Governor The State Ministers who are, in turn, accountable to the Governor and the State Legislative Assembly in the performance of their functions.
Land Area	<ul style="list-style-type: none"> The total area of the state is 37, 837 km² which covers more than 25% of the country. The state is further structured into 10 counties, 54 Payams, and 227 Bomas. Unity is inhabited predominately by two ethnic groups, the Nuer (majority) and the Dinka (minority).
Geography and Climate	<ul style="list-style-type: none"> The climatic conditions of Unity state suggest that it is semi-arid, which is a unimodal climate with 900 . 1,000 mm of rainfall. It is evident that due to its size and location, the state has a diverse topography with different geographic and climatic zones, and resources. The rains are received between May and November and this is followed with a long dry season between December and April. The soils vary from sandy to black cotton and there is a good drainage at higher ground and water is logged at flat plains especially along the eastern lowlands with River Nile.
Population	<ul style="list-style-type: none"> The total population is estimated at 580,600. This translates into 6.8% of the total population of South Sudan and places the state in the ninth position followed by Western Bahr El Ghazal which has only 333,431(4%). About 55% of unity state population is under the age of 18, 79% resides in rural area, and 26% of the adult population is estimated to be literate. Sixty eight per cent of the total households (HH) depend on animal husbandry or crop production as their primary source of livelihood. Population density is 136/km².
Livelihood	<ul style="list-style-type: none"> Sixty eight per cent of households depend on agriculture for their livelihood. It is also evident that education and health indicators are among the worst, reflecting the impact of protracted conflict and limited provision of social services.
Socio-economic	<ul style="list-style-type: none"> Unemployment and underemployment are very high with little formal sector employment. In Unity State the revenue collected by the state was registered as 10.8% and 5.7% in 2010 and 2011 respectively, indicating much to be done to improve non-oil revenue collection.
Poverty	<ul style="list-style-type: none"> Estimates indicate that sixty eight per cent of population is poor (79% in rural areas and 21% in urban areas) which is even poorer than when compared to national average of 51% below the poverty line. Only 27% of the adult population is literate, compared with 27% of national average.
Water and Sanitation	Not mentioned
Road Infrastructure	<ul style="list-style-type: none"> Inadequate physical infrastructure constrains access to basic social services and curtails production efficiency in many sectors of the economy as well. For instance, only 15km of the total road network is paved particularly in Bentiu town and yet most of the businesses are facilitated by road transport. The road network for instance is limited and in poor state as the major road network across is inaccessible during rainy season
Agriculture	<ul style="list-style-type: none"> 69 per cent of households are reportedly dependent on crop farming or animal husbandry (pastoralism) as a primary source of livelihood. This means that heavy reliance on crop farming which is prone to drought as well as other factors that qualify the state to be considered among the crisis and stressed areas affects not only those depending on farming but also the wider rural economy including the non-farm income sources.

3. Strategic Direction	
Vision	<ul style="list-style-type: none"> United, peaceful and prosperous Unity State based on justice, equality, respect for human rights and the rule of law by 2014.
Mission	<ul style="list-style-type: none"> Ensuring good governance; deepening peace building; preventing conflict and improving security, and reducing poverty through a process of rapid social and economic development.
Core Values	<ul style="list-style-type: none"> Believe in unity and harmonious co-existence Embrace democracy and transparency Respect rule of law and human rights Equitable delivery of public services Sustainable peace and development Promote participatory planning, implementation, monitoring and evaluation
State Goal	Not mentioned
Key Strategic Directions	Not mentioned
4. Strategic Goals for Key Sectors	
Economic Development	<ul style="list-style-type: none"> To ensure sustainable economic development that improves livelihoods of the state population
Social and Human Development	<ul style="list-style-type: none"> To ensure access to basic social services so as to promote the well-being and dignity of the people of the state
5. Issue and Challenges	
Infrastructure Sector	<ul style="list-style-type: none"> Poor road infrastructure within the State and between neighbouring states; Inaccessibility of some counties and most Payams and Bomas by road; Lack of standard airstrip in the state; Lack of building materials in the state and counties; Lack of power source and production in the state; and Poor bridge infrastructure
Natural Resources and Socio Development	<ul style="list-style-type: none"> Environmental pollution; Problem of urban water network system; Lack of modern agricultural inputs; Fishery zone blockage by water reeds; lack of fishing gear; inadequate of professional skills in fisheries; and Lack of dairy and poultry farm in the state; diseases outbreak (FMD, LSD)
State Mid-term Key priority	Not mentioned
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> Make strategic choices about overall policy direction, demonstrate progress, and ensure that the budget reflects government strategic priorities; Build transparency and accountability among government, the State Assembly, donors and the public at large; Reduce uncoordinated donor monitoring requirements and give government more control of its development agenda; and Provide reports to SSLA through the yearly budget process. 	

D. Strategic Plan for Warrap State (2012/3-2014/5), 2012

1. Overview of Strategic Plan	
Purpose	<ul style="list-style-type: none"> To arrive at a common understanding of the problem facing the state and the strategic issues that should be the subject of the plan To chart out the direction for the development of the state in relation to the respective mandates decreed by Republic of South Sudan (RSS) To formulate the strategies and activities the state should take in order to reach its vision and attain its goal and objectives and also achieve millennium development goals To assess and formulate the appropriate strategies on the capability of the state and its development partner institutions to deliver on the identified strategies and activities It is timely for the new born nation to develop a strategic direction of the state development. It will serve the State as a road map around which all type of resources and consensus will be mobilized.

Guiding Principles	<ul style="list-style-type: none"> The arrangement of the sectors into pillars follows the principle of common function as stated in SSDP; State driven: The Warrap State Ministry of Finance, trade and Industry will be the overall coordinator of the plan; Annual planning and budgeting will be developed based on the strategic plan and this will be rolled over to the following year after through annual review on the effectiveness of plan implementation; The strategic plan will be out-put result oriented and will include an indicative budget. This is to permit donors to identify activities to support; The strategic plan will be driven by issues as prioritized by communities; and It takes into account financial and human resource constraint that is currently being developed.
Key Principles	<ul style="list-style-type: none"> Priorities should address the most critical gaps/risk areas. Priorities should be conflict/crisis sensitive. Priorities should be realistic. Priorities should be Gender sensitive. Priorities should take into account the available local resources. Priorities should be evidence based. Priorities should specify the location.
2. Background and Context	
Governance System	<ul style="list-style-type: none"> The State has Governor, Deputy Governor, and eleven appointed cabinet ministers, advisors and legislative assembly. The political body is headed by the Governor and his deputy whiles the administrative headed by secretary general with supporting staff. The county government politically headed by the commissioners with the executive directors for civil administration.
Land Area	<ul style="list-style-type: none"> The area of approximately 45,567 km² with Abyei inclusive but otherwise without Abyei it occupies an area of 35,020 km². Comprises six counties: namely, Tonj South, Tonj East, Tonj North, Gogrial East, Gogrial West and Twic County.
Geography and Climate	<ul style="list-style-type: none"> The climate is tropical, and is characterized by an average annual rainfall of 1000mm resulting in high humidity during six months heavy rain (May . October) and temperature 18 to 40 degree. It ranges from arid to tropical wet and dry in the far southwest.
Population	<ul style="list-style-type: none"> Is the six largest in country with a Population of approximately 953,928 Population density is 27.2 (with exclusion of Abyei Region).
Livelihood	Not mentioned
Socio-economic	<ul style="list-style-type: none"> The Socio-economic indicators the state as compared with the national average and within the region, the evidence suggests that the living conditions in WS are still poor. Lacking behind significantly, highlighting the huge gaps in basic social service delivery
Poverty	<ul style="list-style-type: none"> Generally 91 % of the population living in rural areas and dependent on crop farming or animal husbandry which correlate with poverty about 64% The population in state lives below poverty line and qualifies the state to be the second poorest in the country.
Water and Sanitation	<ul style="list-style-type: none"> Improved access to water is still low. 52% of the population has access to improved sources of drinking water. 92% of the population do not have access to any toilet facility.
Road Infrastructure	<ul style="list-style-type: none"> In term of infrastructure, Warrap State presents one of the lowest capacities in South Sudan as most of the roads can be utilized only during dry seasons. The road network within state is not developed and large administrative areas remain unreachable especially during the rainy season.
Agriculture	<ul style="list-style-type: none"> It is evidence that Warrap falls in a crisis corridor as categorized by FAO and therefore food insecurity is prevalent hence a sign of poverty. The available statistics indicate that about 48.4% of the households are food insecure.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> A peaceful and democratic state with a vibrant ,sustainable and corruption free society /state where citizens live with dignity in prosperity equitably
Mission	<ul style="list-style-type: none"> Attain peace and democracy through respect of human rights, local capacity building, effective self-regulatory practices and encouragement of private sector. All activities of all state ministries, sectors, counties, and all development partners will be coordinated and directed towards achieving this overall state planning direction.
Core Values	<ul style="list-style-type: none"> Equality Impartiality

	<ul style="list-style-type: none"> • Integrity • Professionalism • Transparency and accountability • Responsiveness to the client • Inclusiveness (non-discrimination) • Equity and affirmative Action • Efficiency
State Goal	<ul style="list-style-type: none"> • To build institutional and human capacities, provide infrastructure to enhance poverty reduction, ensure access to equitable social services, accelerate economic growth and sustainable development, ensure food security and improve livelihoods, build accountable and responsive government and contribute to the attainment of millennium development goal
Key Strategic Directions	<ul style="list-style-type: none"> • Turn from under-development to fast and stable development, producing high value -added goods both in quantity and quality step by step in order to meet the domestic market demand and increase sells to other neighbouring states and countries • Strengthen link between economic development and social development and protect natural resources and the environment • Accelerate the building of a comprehensive socio-economic infrastructure and finalize the establishment of a market-oriented economy
4. Strategic Goals for the Key Sectors	
Infrastructure	<ul style="list-style-type: none"> • To construct roads, water, airfields and housing infrastructure and install water, sanitation and electricity utilities in all counties of WS state by 2015
Agriculture and livestock /Fisheries Development	<ul style="list-style-type: none"> • To ensure food security and through increased and diversified economy through agricultural production • To ensure food security through increased livestock and fisheries production by 2015
Social Development	<ul style="list-style-type: none"> • To promote social equity protects and promotes women and children rights and retains positive cultural values
5. Issue and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> • To maintain, rehabilitate, provide and operate infrastructure to enhance poverty reduction, economic growth and service delivery in a sustainable manner • Institutional and human resources development • Land policies and regulations • Enhance and improve roads infrastructure, housing development and physical planning • Enhance partnership, co-ordination and communication
Natural Resources and Social Development	<ul style="list-style-type: none"> • Develop and strengthen institutional system and human resources capacity by rehabilitation and expansion of state agriculture infrastructure such as roads, markets, agricultural inputs provision and training of staffs • Ensure food security levels are improved and reducing poverty by 30% by 2015 • Protect, regenerate and conserve the natural resources by formulating policies for national and sustainable management as well utilization
State Mid-Term Key Priority	<ul style="list-style-type: none"> • Provide safe drinking water for domestic and livestock by increasing the number of existing facility • Construction of roads to connect counties and Payam to state capital and state to neighbouring states • Increase in food security through provision of training and NFI agricultural input (seeds and tools)
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> • The levels of the state have been and are involved in the monitoring and evaluation process • The MoFEP has been undertaking the monitoring and evaluation of the progress on the implementation of the plans. The ministry relies on periodic reports (monthly, quarterly, semi-annual and annual) from the line ministries, agencies localities. • The state office of national bureau of Statistics (NBS) undertakes the monitoring and evaluation of the outcomes and impacts of the plans. • The state will create a strong statistical system to collect and provide the necessary information for the formulation of policies, strategies and plans, monitor and assess progress, outcomes and impacts. 	

E. Strategic Plan for Northern Bahar el Ghazal (2012/13-2014/15), May 2012	
1. Overview of Strategic Plan	
Purpose	<ul style="list-style-type: none"> The strategic plan is designed to provide an important blueprint for our state that identifies the aspirations for our future success. It commits the state government to deliver key policy goals and to allocate its resources accordingly. It provides an overarching initial framework for the building of the state, and to inspire all actors to work together to deliver a shared developmental agenda for the benefit of the people in NBGS.
Guiding Principles	<ul style="list-style-type: none"> The Plan's structure is based on SSDP overarching vision 2040, which sets out a comprehensive vision and agenda for the new nation of South Sudan. South Sudan's Vision 2040, we aspire to build an exemplary nation: a nation that is educated and informed; prosperous, productive and innovative; compassionate and tolerant; free, just and peaceful; democratic and accountable; safe, secure and healthy; and united and proud.
Key Principles	<ul style="list-style-type: none"> Good governance: To build a democratic, transparent, and accountable government, managed by a professional and committed public service, with an effective balance of power among the executive, legislative and judicial branches of government. It lies at the heart of both nation-building and the implementation of policies and programmes in all pillars. Increased prosperity: Diversified private sector-led economic growth and sustainable development which improves livelihoods and reduces poverty. It focuses on rural transformation, building upon the late Dr. John Garang's vision of 'taking towns to the people'. Hence the focus is on agriculture, animal resources, roads transport and infrastructure development that will provide opportunities in isolated regions and create a national market, and on providing social infrastructure development, including particularly water resource management and sanitation services. Enhanced quality of life: To promote the well-being and dignity of all the people of South Sudan by progressively accelerating universal access to basic social services. In addition to education, health, etc., it also includes a child cash benefit transfer system is planned to ensure widespread distribution of the benefits of economic development and a youth programme- a payam-level youth corps dedicated to local development and nation-building. Safety and security: To defend the sovereignty and territorial integrity of South Sudan; prevent the resurgence of conflict and uphold the constitution by providing equitable access to justice and maintaining law and order through institutions which are transparent, accountable and respect human rights and fundamental freedoms.
2. Background and Context	
Governance System	Not mentioned
Land Area	Not mentioned
Geography and Climate	<ul style="list-style-type: none"> In normal years, the rain starts in April/May and withdraws in October-November. It often results in floods affecting the majority of the population. Temperature is also high (i.e., it reaches up to 43.80 C, especially in March & April.). Situated at the edge of Sahara desert and increasing deforestation coupled with global warming, there is a tendency that the state will become the hottest state in the country.
Population	<ul style="list-style-type: none"> The Census results of 2008 put the state population at 720,898 which, however, become subjective as other estimates put the population at slightly over one million. Recently, more than 70,000 returnees flocked to the state and some more are still coming following the referendum and independence. Regarding the ethnic composition, the majorities are Dinka (99%) followed by Jur (1%). Population density in NBGS is 24/sq.km which is higher than South Sudan where it is 13/ km². There is a wide variation in the size of the population between counties, with Aweil East having a population of 309,921 and 43% of the population and Aweil Centre having a population of 41,827 or 6 % of the population.
Livelihood /Socio-Economic	<ul style="list-style-type: none"> Generally, there is limited livelihood opportunities in NBS as the majority of the people are self-employed and they are faced with high risks and vulnerabilities. It is also a home for 55% of the population who have no schooling at all and this means that there is no modern farming practices and therefore the productivity are expected to be very low.
Poverty	<ul style="list-style-type: none"> Poverty is widespread, and is especially acute in rural areas and the more remote

	<p>corners of the country+(ibid.) State wise, NBS is one of the poorest. According to NBS, 76% of the population lives below absolute poverty line-every three person out of four are poor.</p> <ul style="list-style-type: none"> This section reviews the available information on the key characteristics of demography, poverty, socioeconomic activity and human.
Water and Sanitation	Not mentioned
Physical Infrastructure	<ul style="list-style-type: none"> Inadequate office space is a serious constraint to staff functioning and to the provision of training. Physical infrastructure limitations, for example in communications and transport, also severely constrain service delivery and the capacity of citizens to exercise their rights.
Agriculture	<ul style="list-style-type: none"> 80% of the households in the state live in rural areas and depend on crop farming or animal husbandry as their primary source of livelihood.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> NBGS's strategic plan creates a future shaped by choice, not by chance. Keeping our communities peaceful, strong and vibrant, and pursuing shared economic prosperity which will provide a better future for the people. By investing together in our health, education and infrastructure we can secure our top priority: the wellbeing of all our people.
Mission (Target)	<ul style="list-style-type: none"> Targets in the Plan are specific and measurable. They align our top priority visions and goals to specific objectives against which we can measure our success and adjust our strategies accordingly.
Core Values	Refer to the above %Key Principles+
State Goal	<ul style="list-style-type: none"> The four pillars of SSDP: Governance, Economic Development, Social and Human Development, and Conflict Prevention and Security are organizing priorities for the state strategic plan
Key Strategic directions	<p><u>Peace-building and Security Promotion</u></p> <ul style="list-style-type: none"> Institutionalization of inter-country peace conference with Reziget and Missriya, transformation of organized forces through effective implementation of DDR programme and to provide ex-combatants and host communities with a sustainable future, including the reintegration of women and children and returnees Access to justice and respect for human rights across the state enhanced Communities secure and threat posed by small arms reduced Increase the capacity of State Legislative Assembly (SLA) to effectively and efficiently carry out its oversight function through review of the laws passed and increase the numbers of laws passed annually <p><u>Food Security, Rural Development and Infrastructure</u></p> <ul style="list-style-type: none"> To increase crop production and land/ vegetation cover Improved town, interstate, inter-county and feeder roads routinely maintained on sustainable basis and roads safety to enhance economic growth <p><u>Improved and Expanded Social Services</u></p> <ul style="list-style-type: none"> Reduce maternal, infant and child mortality Provide qualified teachers, academic staff and a relevant curriculum for general education By 2015 NBGS is on track to achieve universal access and completion of free primary education and has expanded equitable access to post-primary education. Conducting education under convenient facilities
4. Strategic Goals for Key Sectors	
Infrastructure	<ul style="list-style-type: none"> To maintain, rehabilitate, provide and operate infrastructure to enhance poverty reduction, economic growth and service delivery in a sustainable manner
Agriculture and livestock /Fisheries	<ul style="list-style-type: none"> Refer to below
Natural Resources and Social Development	<ul style="list-style-type: none"> Ensure food security and improve livelihoods and income generation for the people of South Sudan, through sustainable use of natural resources and land management
5. Issue and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> Vague definition of property rights and access to land Enforcement of existing laws Acute shortage of funds to carry out major construction and rehabilitation
Natural	<ul style="list-style-type: none"> The need for improved agricultural inputs and techniques such as seeds and fertilizers,

Resources and Social Development	<p>storage facilities and advisory services, and irrigation development.</p> <ul style="list-style-type: none"> • The difficulties faced by farmers in accessing markets due to the poor road network, lack of other transport modes and nuisance taxes and charges including bribes • Improving preparedness and effective response to food and agricultural threats, such as pests and diseases will also be essential • Infrastructure improvement, provision of public goods and access to extension and veterinary services will be a crucial aspect of the Government's strategic response to this challenge • The lack of a critical mass of farmer and rural producer associations as a means of entering the market place with the aim of minimizing the cost of inputs, accessing loan finance at affordable rates and influencing farm-gate prices • Issues pertaining to property rights and access to land • Limited access to finance resulting from little financial service in formal and informal sector. For instance, the practice of microfinance is nascent stage. • Limited funds to implement plans and projects designed for OVC, street children, other vulnerable groups identified
State Mid-term Key Priority	Not mentioned
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> • Make strategic choices about overall policy direction, demonstrate progress, and ensure that the budget reflects government strategic priorities • Build transparency and accountability among government, the assembly, the public and donors • Reduce uncoordinated donor monitoring requirements and give government more control of its development agenda • Provide reports to SLA through the yearly budget process 	

F. Strategic Plan for Western Bahr el Ghazal State (2012/13-2014/15), May 2012	
1. Overview of Strategic plan	
Purpose	<ul style="list-style-type: none"> • To formulate the strategies and activities the state should take in order to reach its vision and attain its goals and objectives • To assess and formulate the appropriate strategies on the capability of the state and its development partner institutions to deliver on the identified strategies and activities • To serve the state as a road map around which all types of resources and consensus will be mobilized
Guiding Principles	<ul style="list-style-type: none"> • The arrangement of the sectors into pillars follows the principle of common function as stated in SSDP. • The strategic plan will be driven by issues as prioritized by communities. • It takes into account financial and human resource constraint that is currently being developed.
Key Principles	Not mentioned
2. Background and Context	
Governance System	<ul style="list-style-type: none"> • Governor, deputy governor, cabinet ministers, Advisors, legislation assembly • The political stratum is headed by the governor and Deputy while the technical activities headed by the Secretary General and supporting staff,
Land Area	<ul style="list-style-type: none"> • It is second largest state in RSS with a land cover of 91,075 km². • It has three counties (Wau, Raga and Jur).
Geography and Climate	<ul style="list-style-type: none"> • Climate is tropical, average annual rainfall of 800-1,300mm resulting in high humidity during the six months, heavy rains (May . October) and temperature 18 . 40 degree Celsius. • It ranges from arid to tropical wet-and-dry in the far southwest.
population	<ul style="list-style-type: none"> • 333,431 population and density of 3.66 person/km²
Livelihood	<ul style="list-style-type: none"> • Subsistence crop farming 64% is the primary economic activity followed by formal public sector wage/salaries (24%) Majority of the households depend on sorghum, wild honey collection, wild foods and fish as their main sources of food. • Livestock is also another source of livelihood for some limited proportion of the population
Socio-economic	<ul style="list-style-type: none"> • The economy of WBG is of as rural society with households settling in rural areas and overwhelming focused on subsistence agriculture and livestock as the primary activity. • About 53% of the population in WBG lives in rural areas and 63% are engaged in subsistence agriculture as the primary activity.
Poverty	<ul style="list-style-type: none"> • 43.2%: It is higher in rural areas than in urban. • Literacy rate among the age 15 . 24 (34%)

Water and Sanitation	<ul style="list-style-type: none"> • Access to safe water is still low and disproportionately distributed among the three counties of WBG. • 45% of the population has access to improved sources of drinking water and 72% does not have access to any toilet facility, domestic hygiene practices is poor and limited access to toilet facilities.
Road Infrastructure	<ul style="list-style-type: none"> • WBG is poorly served by infrastructure. the net road with in the state is not developed and large administrative areas have remained unreachable. • The inaccessibility to some areas during rainy season is attributed to unmaintained roads and lack of bridges.
Agriculture	<ul style="list-style-type: none"> • The majority of the people who are engaged in agriculture which is rain-fed and characterized by low incomes are women. • Smallholder farmers who account for 65% of the population are usually engaged in crop farming with low levels of production escalating food insecurity. • Most of the agriculture products are imported from neighbouring countries.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> • To make food self-sufficient, peaceful, just, democratic and prosperous and poverty free WBS
Mission	<ul style="list-style-type: none"> • To ensure social justice, security, equitable resource allocation, human dignity and to build a government that is accountable and responsive to needs of the people
Core Values	<ul style="list-style-type: none"> • Maintain the unity of the state and the diversity of its people • Accountability & transparency for actions • Rule of law & Impartiality • Equity in targeting-gender, vulnerability and poverty • Ownership of processes and products
State Goal	<ul style="list-style-type: none"> • To build institutional and human capacities ,provide infrastructure to enhance poverty reduction, ensure access to equitable social services, accelerate economic growth
Key Strategic Directions	<ul style="list-style-type: none"> • Ensure security for all • Provide adequate infrastructure (road, housing, etc.) • Ensure food security and sustainable livelihood • Capacity building and women empowerment • Foster faster economic development and attract foreign investment • Access adequate development funds • Conserve the environment
4. Strategic Goals for Key Sectors	
Infrastructure	<ul style="list-style-type: none"> • To construct roads, water, airfields and housing infrastructure and install water, sanitation and electricity utilities in all counties of WBG by 2015
Agriculture and livestock /Fisheries Development	<ul style="list-style-type: none"> • To ensure food security and through increased and diversified economy through agricultural production • To ensure food security through increased livestock and fisheries production by 2015
Social Development	<ul style="list-style-type: none"> • To promote social equity protects and promotes women and children rights and retains positive cultural values
5. Issue and Challenges	
Physical Infrastructure	<ul style="list-style-type: none"> • Objective to maintain, rehabilitate, provide and operate infrastructure to enhance poverty reduction, economic growth and service delivery in a sustainable manner • Lack of electricity is a major challenge within state, the use of diesel generators, the rural areas do not have a source of electricity. • WBG has very poor and unmaintained road infrastructure. • Lack of urban planning and management guidelines • No clearly demarcated residential areas, industrial zones and business areas and therefore misallocation of essential facilities in residential areas • The development of guideline will set up systems to allocate special areas for investment for industry.
Natural Resources and Social Development	<ul style="list-style-type: none"> • Objective to ensure food security and improve livelihoods and income generation for the people of WBG state, through sustainable use of natural resources and land management • Lack of adequate agricultural extension • Lack of an agricultural training institution in the state has hampered the efforts to develop the capacity of staff. • Traditional low input-low output subsistence farming has been the main cause of food security in the state.

State Mid-Term Key Priority	<ul style="list-style-type: none"> • Provide safe drinking water for domestic and livestock by increasing the number of existing facility • Construction of roads to connect counties& Payams to state capital and state to the neighbouring state • Increase in food security through provision of training and NFI agricultural input(seeds and tools) • Improve security in all areas of the state
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> • M&E is process during the implementation of the activity which is also necessary for the success of the very activity. • M&E of this Strategic plan will be an essential part of accountability both between the state Government, and its citizens and mutual accountability between Gov. and DPs. • The monitoring committee is under the chairpersonship of ministry of finance, trade and industry. • The committee will develop a monitoring plan. 	

G. Strategic Plan for Lakes State (2012/13-2014/15), May 2012	
1. Overview of Strategic Plan	
Purpose	<ul style="list-style-type: none"> • To arrive at a common understanding of the development challenges facing the State and the strategic actions that should be executed in the plan • To chart out the direction for the development of the State in relation to the respective mandates as decreed by Republic of South Sudan (RSS) • To formulate the strategies and activities the State should take in order to reach its vision and attain its goals and objectives and also aim to achieve Millennium Development Goals (MDGs) • To assess & formulate the appropriate strategies on the capability of the State & its development partner institutions to deliver on the identified strategies and activities • as a timing for the new born nation to develop a strategic direction of State development • To serve the State as a road map around which all types of resources and consensus will be mobilized
Guiding Principles	<ul style="list-style-type: none"> • The arrangement of the sectors into pillars follows the principle of common function as stated in SSDP. • State driven: The Lakes State Ministry of Finance, Trade & Industry will be the overall coordinator of the plan. • Annual planning and budgeting: Annual planning and budgeting will be developed based on the Strategic plan and this will be rolled over to the following year after thorough annual reviews on the effectiveness of plan implementation. • Out-put results based: The strategic plan will be out-put result oriented and will include an indicative budget. This is to permit donors to identify activities to support. • Issues driven: The strategic plan will be driven by issues as prioritized by communities. • Realistic: It takes into account financial and human resource constraints that are currently being developed.
Key Principles	<ul style="list-style-type: none"> • The maintenance of peace and security • Promotion of good governance and welfare of the people • Exercise of authority in respect of Lakes State and the Counties within Lakes State • Acting as the link between the RSS and the Counties, Municipalities and Towns • Ensuring the protection of the rights and interests of the people in Lakes State
2. Background and Context	
Governance System	<ul style="list-style-type: none"> • The State executive delegates its functions to 13 Ministries namely; Local government, physical Infrastructure, Finance, Trade and Industry, Information and communication, Education, Health, Agriculture and Forestry, Social Development, Rural development and Co-operatives, Animal resources and Fisheries, Parliamentary Affairs, Labor and Public Service, and Youth, Sport and Culture.
Land Area	<ul style="list-style-type: none"> • Lakes State covers a relatively flat region of approximately 43,595 sq. km.
Geography and Climate	<ul style="list-style-type: none"> • The climate is semi-arid with a unimodal climate with 900-1,000 mm of rainfall. • The soils are sandy to black cotton; good drainage at higher ground and water logged at flat plains especially along the eastern fringes with River Nile. • It has predominantly deciduous vegetation interspaced with economically valuable timber forests, bamboo, and shear nut, neem and mango trees.
Population	<ul style="list-style-type: none"> • The current population of Lakes State constitutes 8.4% of RSS total population of the RSS.

	<ul style="list-style-type: none"> • The population of Lakes is 695,730 with 365,880 males & 329,850 females (2008 NBS). • A population density of 16/km² and an average household size of 8 persons • 15% of the population was under the age of 5 and 50% under the age of 18.
Livelihood	<ul style="list-style-type: none"> • Three agro-ecological zones (Iron Stone Plateau, Central plains and Flood plains) are rain-fed systems characterized by shifting cultivation and inter-cropping of traditional crop varieties. • Also provide opportunities for livestock, forestry and fisheries production to meet internal household food needs. • The main economic activities in Lakes include animal husbandry consisting mainly of rearing cattle, goats and sheep, subsistence agriculture and trade on a small scale is practiced. • Crops produced include mainly ground nuts, sorghum and okra; alongside fishing in the numerous swamps touchfound in all parts of the state.
Socio-Economic (Agriculture)	<ul style="list-style-type: none"> • It is estimated that 89% of households depend on crop farming or animal husbandry. The main livelihoods are pastoralism, farming and fishing. • An estimated 80% of the population is pastoralists, while the rest 20% of the population are agriculturalists and fish mongers. • It is indicated that the proportion of population regarded as food insecure is 21% which is much lower than the average for South Sudan, 36%. Smallholder farmers who account for 65% of the population are usually engaged in crop farming with low levels of food production escalating food insecurity.
Poverty	<ul style="list-style-type: none"> • 49% of the population in the State lives below the poverty line which is slightly lower than the national average of 50.6% (2009 NBHS). • The poverty gap is 22.6 and 46.3 for the general population and among the poor respectively.
Water and Sanitation	<ul style="list-style-type: none"> • The sanitation and safe water provision is extraordinarily low. 4.3% of the population owns a private pit latrine, 1.2 % uses a shared pit latrine and 94% of the population does not have access to any toilet facility (Statistical Year Book, 2010). • 71% of the population is assumed to have improved sources of drinking water (NBHS 2009), this is not reflected in the health status of the people. This figure is significantly higher than the average for South Sudan where 55% has access to improved sources of drinking water.
Road Infrastructure	<ul style="list-style-type: none"> • Road infrastructure is very basic in the state with only about one third of the state being accessible during the rainy season. Entire counties of the State are hardly accessible during the rainy season. • In order to accelerate access to goods and markets, roads need to be opened and upgraded to acceptable minimum standards. • The transport system currently comprises of road, air and water transport modes. The State has a total road distance of 1,383 kilometers of which 1,040 km are under the RSS (Murrum highways). • 343 km are under the State. Along the specified road networks, there are a total of 11 bridges of which only 1 (one) is concrete and the remaining 10 are box-culvert bridges.
Agriculture /Irrigation	<ul style="list-style-type: none"> • The state has huge water resources consisting of Lakes, big rivers (White Nile and its tributaries), seasonal river valleys and swamplands that can potentially support a strong fish industry and commercial irrigation for a range of horticulture crops and water-loving crops like rice and sugar cane. • It is worth mentioning that the main sources of livelihoods in the state are: Agro-pastoralism mainly for Dinka ethnic groups; Farming/pure Agriculture; Fishing along the river Nile at Shambe and nearby areas. • It is true that more than 90% of the State inhabitants depend on subsistence farming system. This is because about 40% of the total land surface is purely agricultural, while the remaining 60% is marginal arable land, forests and wet lands. • Trade and commerce in the state is fairly in progress with poor infrastructure the main obstacle as most of the goods are brought from either East Africa or Khartoum. There are three main business centres in the state namely: Rumbek Centre, Cueibet and Yirol West Markets.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> • A peaceful, united in diversity, healthy, educated, democratic and just communities who are prosperous, self-reliant, food secure, respect human rights and rule of law.
Mission	<ul style="list-style-type: none"> • Mobilization and effective and efficient management of scarce resources, both human and material, that are required for service delivery, reconstruction and sustainable

	development.
Core Values	<ul style="list-style-type: none"> • Lakes State operates in accordance with the highest standards in all relationships with the staff, local and international development partners, states and government. • Lakes State believes in innovation and diligence amongst staff and peaceful coexistence.
State Goal	<ul style="list-style-type: none"> • Equality and non-discrimination: All individuals are equal as human beings and by virtue of the inherent dignity of each human person. All human beings are entitled to their human rights without discrimination of any kind, such as race, color, sex, ethnicity, age, language, religion, political or other opinion, national or social origin, disability, property, birth or other status. • Participation: Government will ensure means that people are entitled to participate in decisions that directly affect them, such as the design, implementation and monitoring of government interventions. Participation should be active, free and meaningful. • Availability: Ensure that public facilities, goods, services and programmes exist in sufficient quantity for its citizens. • Quality: Ensure that state facilities, goods, services and programmes are appropriate and of high quality to serve its citizens. This ensures value for money for maximum satisfaction of the citizens.
Key Strategic Directions	<ul style="list-style-type: none"> • Increasing household incomes and promoting equity: Household consumption expenditure; Gross income of households; Head count poverty measures; Gini-coefficient: state or rural-urban. • Enhancing the availability and quality of gainful employment: Number of Jobs created and Unemployment rate. • Improving stock and quality of economic infrastructure: Increased length of roads rehabilitated and graded within the state. And the percentage of access to electricity, percentage use of electricity as alternative source of energy and increase in generation capacity. • Strengthening good governance: Reduction in rankings of corruption at international level. • Promoting sustainable population and use of the environment and natural resources: The increase in forest covers; increase in number of species, mitigation programmes for climate change effects.
4. Strategic Goals for Key Sectors	
Natural Resources	<p>Sector Objective:</p> <ul style="list-style-type: none"> • To ensure food security and improve livelihoods and income generation for the people of Lakes State, through sustainable use of natural resources and land management • To improve production and productivity of animal resources for sustainable livelihoods <p>Sector Roles and Responsibilities</p> <ul style="list-style-type: none"> • To ensure that the economic benefits from improved agriculture and livestock production are fairly distributed and local economies benefit from off-farm agro-processing • To support the development of a range of farmer /pastoralist business and producer associations • To encourage diversified private sector-led economic growth and sustainable development which improves livelihoods and reduces poverty • To clarify issues pertaining to land to ensure access and tenure which will mitigate conflict and promote private investment especially in agriculture and natural resources • To promote environmental sustainability and strengthen disaster preparedness, • To increase agricultural and animal productivity • To commercialize animal products; especially production of hides and leather for export market
Physical Infrastructure	<p>Sector Objectives</p> <ul style="list-style-type: none"> • To rehabilitate, maintain and construct new physical infrastructures to enhance poverty reduction, economic growth and service delivery in a sustainable manner • To improve access to clean drinking water and improved sanitation • To improve urban development through introducing development/master plans <p>Roles and Responsibilities</p> <ul style="list-style-type: none"> • To expand and improve road transport infrastructure • To expand and improve water and sanitation infrastructure • To improve interstate, trunk and feeder roads routinely maintained on sustainable basis and roads safety to enhance economic growth • To connect roads & bridges to social facilities like markets, towns, schools, health

	facilities etc. <ul style="list-style-type: none"> To enforce policy pertaining to land to ensure access to land and land tenure To avail power supplies to the main town
Rural Development Agriculture and Livestock /Fisheries Development	<p>Overall Sector Objective</p> <ul style="list-style-type: none"> To facilitate equitable and sustainable development towards improved livelihoods through sensitization, mobilization, capacity building and direct involvement of rural communities <p>Strategies</p> <ul style="list-style-type: none"> Increase short term staff capacity training opportunities as well as long term study scholarships sponsorships in higher institutions of learning within and without South Sudan for effective and efficient service delivery Mobilize, facilitate and strengthen communities to initiate community based development projects Promote good governance, democratic principles and accountability within the directory
Social Development	<ul style="list-style-type: none"> Not mention
5. Issue and Challenges	
Natural Resources	<ul style="list-style-type: none"> Support to farmers within the State is limited by the lack of adequate agricultural extension officers, inadequate office space and lack of well trained staff. Lack of an agricultural training institution in the state has hampered the efforts to develop the capacity of the technical staff in crop and animal production. Traditional low input-low output subsistence farming has been the main cause of food insecurity in the state. Slow uptake of the new farming methods compounded by lack of training facilities have slowed down the efforts towards food security. Agricultural food production is important for the population of the state as it contributes a key livelihood for a majority of the population.
Infrastructure Development	<ul style="list-style-type: none"> Lack of electricity for household and business is a major challenge within the state. The use of diesel generators within Lakes State is expensive and inefficient. In the rural areas, social facilities like health centers, police stations and schools do not have a source of electricity and the facilities do not have a budget to finance the fuelling of the generators. The use of solar, wind and mini-hydro power stations to generate electricity for basic health facilities in the rural areas will be of great value. Most of the roads in the state are unusable during the rainy season due to lack of bridges across the rivers. The interstate roads that link the state headquarters to other states are in good condition during the dry season but the feeder roads in the rural areas are unmaintained and unusable. An Infrastructure Project to upgrade the airport to international standards through a tarmacked runway and increasing the security system shall be conducted. The provision of water and sanitation facilities to public facilities like schools, health centers and police stations in the state remain a challenge. A majority of the women in the rural areas have to walk for long distance to access clean drinking water especially during the dry season.
State Mid-term Key Priority	<ul style="list-style-type: none"> Increase in food security by increasing agricultural productivity through provision of training and NFI agricultural input (seeds and tools) to farming community Construction of roads to connect counties and Payams to State capital and to the neighboring States; enhance market facilities and create access to social amenities for Counties and Payams Provide safe drinking water for domestic and livestock by increasing the number of existing facilities
6. Monitoring and Evaluation	
<p>Implementation Monitoring and Evaluation</p> <ul style="list-style-type: none"> The SMOFTI has been undertaking the monitoring and evaluation of the progress on the implementation of the plans. The Ministry relies on periodic reports (monthly, quarterly, semi-annual and annual) from the line ministries, agencies and localities to gather information on progress on plan implementation. The present system of implementation monitoring is faced with a number of challenges. The provision of information (reports) by the line ministries, agencies and localities is patchy. The State is taking steps to build upon the existing system, strengthening the links and capacities (both skills and equipment including communications and computer facilities) in the line ministries, agencies and the localities. It is necessary to mobilize support from other partners to make the system more effective. The results of the exercise will feed into the Monitoring and Evaluation System for the strategic plan and SSDP. 	

Impact Monitoring and Evaluation

- The State Statistics Centre (SSC) undertakes the monitoring and evaluation of the outcomes and impacts of the plans. The SSC has begun to take steps to establish a uniform and consistent national database on economic, social and governance indicators.

Strengthening the Statistical System

- Building upon the existing institutions and mechanisms, the state will create a strong statistical system to collect and provide the necessary information for the formulation of policies, strategies and plans, monitor and assess progress, and outcomes and impacts.

H. Strategic Plan for Western Equatoria State (2012/13-2014/15), September 2012**1. Overview of Strategic Plan**

Purpose	<ul style="list-style-type: none"> • To arrive at a common understanding of the problem facing the state and the strategic issues that should be the subject of the plan • To chart out the direction for the development of the state in relation to the respective mandates decreed by RSS • To formulate the strategies and activities the state should take to reach its vision and attain its goal and objectives and also achieve millennium development goals • To assess and formulate the appropriate strategies on the capability of the state and its development partner institutions to deliver on the identified strategies and activities • To serve the State as a road map around which all type of resources and consensus will be mobilized
Guiding Principles	<ul style="list-style-type: none"> • The arrangement of the sectors into pillars follows the principle of common function as stated in SSDP. • State driven: WE State Ministry of Finance and Economic planning will be the overall coordinator of the plan. • Annual planning and budgeting will be developed based on the strategic plan and this will be rolled over to the following year after through annual review on the effectiveness of plan implementation. • The strategic plan will be out-put result oriented and will include an indicative budget. This is to permit donors to identify activities to support. • The strategic plan will be driven by issues as prioritized by communities. • It takes into account financial and human resource constraint that is currently being developed.
Key Principles	<ul style="list-style-type: none"> • Priorities should address the most critical gaps/risk areas. • Priorities should be conflict/crisis sensitive. • Priorities should be realistic. • Priorities should be Gender sensitive. • Priorities should take into account the available local resources. • Priorities should be evidence based. • Priorities should specify the location.

2. Background and Context

Governance System	<ul style="list-style-type: none"> • The State has Governor, Deputy Governor, and eleven (11) appointed cabinet ministers, advisors and legislative assembly. • The political body is headed by the Governor and his deputy whiles the administrative headed by secretary general with supporting staff. • The county government politically headed by the commissioners with the executive directors for civil administration.
Land Area	<ul style="list-style-type: none"> • WES is among the largest State in RSS and fall on the equatorial green belt covering an area of 79,319 km².
Geography and Climate	<ul style="list-style-type: none"> • WES enjoying good climate with good cultivation soil mostly south part of State and savannah land with sandy and stony soil in the north. Rainfall starting around late march or early April and end in late November or early December with average rainfall of 1,000 . 1,525 mm.
Population	<ul style="list-style-type: none"> • Demographically, the population is envisaged to double in 29 years period which will put strain on the available state resources. Given the census 2008 figure of 619,029. Population growth rate of 2.22% for South Sudan. • Population density is 8.37 person/km².
Livelihood	Not mentioned
Socio-economic	<ul style="list-style-type: none"> • Socio-economic indicators: The living condition in WES is in average better than in other states. • Poor roads have contributed to limited livelihood opportunities in rural areas.

Poverty	<ul style="list-style-type: none"> In WES, poverty is estimated at 42.1% and this means that out of the State projected population of 660,790 people in the State, 278,194 people cannot afford the minimum basket of goods and services. This finding indicates that almost half of the population is lying within poverty level.
Water and Sanitation	<ul style="list-style-type: none"> Access to portable and sufficient water is a great concern throughout WES especially during the dry season. 56% of the population has to walk for more than 30 minutes one way to collect water
Road Infrastructure	<ul style="list-style-type: none"> The network is still basic and most of the areas are inaccessible (worse during rainy season). The transport system currently comprises of road and air transport modes.
Agriculture	<ul style="list-style-type: none"> It is evidence that between 80 . 98% household are engaged in agriculture sector activities but more particularly at subsistence level. This heavy reliance on crop farming is prone to drought as well as intense rain which affect the overall food security in the State. It is apparent that the inability to improve food security level affect nutritional intake which is another form of vulnerability and sign of poverty. Furthermore, farming is still done by the rural poor population which is largely composed of women and the elderly as most of the able-bodied people especially the youth have been engage into activities with fast income retunes especially in the urban areas.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> To build a democratic, transparent and accountable government, managed by a professional and committed public service, with an effective balance of power among the executive, legislative and judicial branches of government
Mission	<ul style="list-style-type: none"> Provision of leadership to build foundation for good governance, rule of law, economic and social prosperity and community wellbeing and enhance quality of life for all
Core Values	<ul style="list-style-type: none"> To consolidate and enhance the democracy so far attained to provide a solid foundation for transformation into a modern and prosperous society To strive to remain peaceful, stable in an environment of good governance To aspire to equip the population with relevant knowledges, information and skill to enable them to respond to development challenges and to compete nationally and internationally To exploit and use its resources gainfully and sustainably to promote competitiveness, independence, self-sustenance and dynamic economy To strive to maintain unity of the state and the diversity of its people, and love the sprite of working together with other partner to achieve business challenges and jointly develop solutions To establish clear guidelines for accountability, transparency, authority and utilizes government resources, equipment and facilities effectively and efficiently for the best possible practice and in order to implement government policies To behave honestly, reliable, trustworthily and working within all applicable rules and guidance To treat human being with utmost reverence to promote maximum self-worth and dignity to respect cultural, political and religious differences Not to discriminate on the basis of gender, religious affiliations, ethnic origin, or age To promote and implement anti-discrimination, equal opportunity and the fundamental principle of human rights
State Goal	<ul style="list-style-type: none"> To build institutional and human capacities, provide infrastructure to enhance poverty reduction, ensure access to equitable social services, accelerate economic growth and sustainable development, ensure food security and improve livelihoods, build accountable and responsive government and contribute to the attainment of millennium development goal
Key Strategic Directions	<ul style="list-style-type: none"> Strengthening the rehabilitation and development of State infrastructure including roads, bridges, and basic government structure and communication system Formation of viable, vibrant, inclusive and competent State Government after the enactment of the State constitution Strengthening basic government systems through mobilization of human, financial and other resources including resources mapping, management, administrative system and empowerment of public servants in planning and statistical acumen Encouragement of trade and domestic production by promotion of free trade and other policies conducive to investors to enhance production and export Strengthening the security organ and justice sector for accountable, transparent and democratic governance for effective delivery of social services Establishment of State Accounting/Financial and Civil service institution to sustainably eradicate the capacity gaps in the civil service

	<ul style="list-style-type: none"> • Provision of more clean and portable water, for improvement of sanitation, health and life expectancy of entire population of the State • Ensuring and enhancement of active community participation in development process, strengthening and establishing diverse communication network and media sector to disseminate government policies and programs to the public
4. Strategic Goals for Key Sectors	
Infrastructure	<ul style="list-style-type: none"> • To construct roads, water, airfields and housing infrastructure and install water, sanitation and electricity utilities in all counties of WES by 2015
Agriculture and livestock /Fisheries Development	<ul style="list-style-type: none"> • To ensure food security and through increased and diversified economy through agricultural production and increased livestock and fisheries production by 2015
Social Development	<ul style="list-style-type: none"> • To promote social equity protects and promotes women and children rights minimize gender disparity against women and retain positive cultural values
5. Issue and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> • Sector objective to provide, rehabilitate, operate and maintain infrastructure to support and promote poverty reduction, better life and economic growth that will endure long <p><u>Challenges</u></p> <ul style="list-style-type: none"> • Roads conditions in the state ranges from fair to poor • Lack roads and bridges construction firms are limited in number • Weak legal and regulatory framework, absence and compliance to standards and codes resulting in shoddy work • Inadequate specialized skilled human resource • Weak local private sector players • Unavailability of master plan to guide development in well planned and organized set up • Inappropriate institutional set-up that does not separate the roles of policy formulation, planning, implementation and regulation
Natural Resources and Social Development	<ul style="list-style-type: none"> • Mass production with mechanized farming, and sustainable use of natural resources and land management for food security and diversification of source of revenue of the state for improvement of quality of life of rural dwellers for poverty eradication and enhancement of economic growth in totality <p><u>Challenges</u></p> <ul style="list-style-type: none"> • Capacity building particularly for farm extension workers, farm machineries operator • Weak farmer organization in production, processing and marketing • Lack of storage facilities • Absence of clear policy on agriculture • Poor land tenure system • Poor and inadequate physical infrastructure such as transport • Lack of logistic facilities to support the delivery of services • Rural emigration
State Mid-term Key Priority	<ul style="list-style-type: none"> • Construction and rehabilitation of feeder roads • Increase in food security and cash crop production through provision of training agricultural input (seeds and tools) and encouragement of farmers with exhibition of demo farms • Provide safe drinking water for domestic and livestock by increasing the number of existing facility • Resettlement of and provision of basin services for IDPs
6. Monitoring and Evaluation	
<ul style="list-style-type: none"> • The levels of the state have been and are involved in the monitoring and evaluation process. • The MoFEP has been undertaking the monitoring and evaluation of the progress on the implementation of the plans. The ministry relies on periodic reports (monthly, quarterly, semi-annual and annual) from the line ministries, agencies localities. • The state office of national bureau of Statistics (NBS) undertakes the monitoring and evaluation of the outcomes and impacts of the plans. • The state will create a strong statistical system to collect and provide the necessary information for the formulation of policies, strategies and plans, monitor and assess progress, outcomes and impacts. 	

I. Strategic Plan for Central Equatoria State (2012/13-2014/15), June 2012	
1. Overview of Strategic plan	
Purpose	Not mentioned
Guiding Principles	Not mentioned
2. Background and Context	
Governance System	<ul style="list-style-type: none"> Governor, Deputy Governor, the state ministers, legislative assembly and the county commissioners.
Land area	<ul style="list-style-type: none"> The total area is 45,025 km². Has six administrative counties: namely, Terekeka, Juba, Lainya, Yei River, Kajo-keji and Morobo.
Geography and Climate	<ul style="list-style-type: none"> The state has a diverse topography with different geographic and ecological zones and resources. Rainfall is at average of 1,000mm per year, which falls between May and November. The soils are sandy, red iron stone plateau to black cotton with good drainage at higher grounds and water logged at plains. In the South of CES, the green belt is suitable for agriculture activities.
Population	<ul style="list-style-type: none"> The state has become the second most populous state in RSS with a total population of 1.2 million, population density of 25.65 persons /km².
Livelihood	<ul style="list-style-type: none"> A round 57% of the population in the state depends on crop farming as source of livelihood whereas 19% receive wages and salaries. Rain-fed agriculture and animal husbandry are the economic base and means of livelihood
Poverty	<ul style="list-style-type: none"> With 44% of the population estimated to live below the poverty line
Socio-economic	<ul style="list-style-type: none"> Living conditions in CES are in average better than other states
Road Infrastructure	<ul style="list-style-type: none"> In the state with only about one third of the state being accessible during the rainy season
Water and Sanitation	<ul style="list-style-type: none"> Almost 60% have access to improved sources of drinking water. About 30% of the state population have access to improved sanitation.
Agriculture	<ul style="list-style-type: none"> Crop cultivation is almost exclusively done by manual means, which together with other constrains resulted in low productivity. The agricultural production in the state does not meet the demand. The most of the agricultural products are imported from neighboring countries.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> A peaceful, democratic, transparent, accountable and prosperous State
Mission	<ul style="list-style-type: none"> To provide security to the people and their property, ensure sustainable peaceful co-existence, justice and rule of law, promote environmental conservation, equitable distribution of resources, access to services, advocate gender equality and facilitate private sector participation in economic growth of the State
Core Values	Not mentioned
State Goal	<ul style="list-style-type: none"> To enhance good governance, accountability and transparency through an established legal framework, coordination between state institution, capacitated civil service, improved public financial management and zero-tolerance to corruption To ensure sustainable economic development that improves livelihood of the state population To enhance access to basic social services so as to promote the well-being and dignity of the people of the state To reduce conflicts, maintain peace & provide equitable access to justice in the state
Strategic Objectives	<ul style="list-style-type: none"> To establish and implement a comprehensive legal framework for the state To enhance agricultural and forest production and productivity in a sustainable manner so as improve the livelihood both urban and rural areas in the state To conserve the environment and manage the habitat to ensure a good standard of living To improve access to basic services and markets through construction of new and upgrading of existing roads To improve access to clean drinking water and improved sanitation To provide security and ensure human rights through law enforcement
4. Strategic Goals for Key Sectors	
Not mentioned	
5. Issues and Challenges	
Economic Development	<ul style="list-style-type: none"> Inadequate infrastructure, no laws and regulations for environmental conservation and protection

	<ul style="list-style-type: none"> • Shortage/poor sanitation and access to water facilities • Lack of land for investment and insecurity caused by land grabbing • Agriculture is predominantly manual, resulting in low productivity; inadequate number of staff. • Partly lack of technical expertise and inadequate forestry policies • Laws and regulations for effective and sustainable forest management and utilization
6. Monitoring and Evaluation	
	<ul style="list-style-type: none"> • The past two state strategic plans for CES, monitoring & evaluation were rather weak due to weak administrative capacity and sufficient technical skill. • The responsibility of M&E lie with State legislative assembly, State secretariat (Governor Office), council of ministers, executive authorities, State planning and development committee, fiscal and financial allocation and monitoring office, planning unit /directorate at each level and State ministry of Finance and Economic Development. • At the end of the planning cycle, a final evaluation is carried out which outcomes will be used for next planning period.

J. Strategic Plan for Eastern Equatoria State (2012/13-2014/15), March 2012	
1. Overview of Strategic plan	
Purpose	<ul style="list-style-type: none"> • To take into account the new realities in RSS and nest and align the state's development strategies and interventions under the guiding national framework of SSDP that considers the principle of common functions+ • To develop an interactive, future oriented strategic decision making mechanism that defines a specific roads map between 2011 and 2013 as stipulated in the vision, mission and values of the people of the state in the implementation of their socio-economic recovery and development • To provide a roadmap of development for EES so as to deliver on the promise of services delivery to the people • To provide the theme for the year's planning process as fostering state development+
Guiding Principles	Not mentioned
Key Principles	Not mentioned
2. Background and Context	
Governance System	<ul style="list-style-type: none"> • Governor, Deputy Governor, the state ministers, advisors legislative Assembly and the county Commissioners • The political stratum is headed by the Governor and his Deputy while the technical activity is headed by the Secretary General and his supporting staff (head of different sections).
Land Area	<ul style="list-style-type: none"> • The total area is 82,540 km². • It is comprised of eight counties of Torit, Magwi, Budi, Ikotos, Lafon /Lopa, Kapoeta North, Kapoeta South and Kapoeta East.
Geography and Climate	<ul style="list-style-type: none"> • The rains prevail from April to November and have an average of 1,500mm in the hills and 750mm in the lowlands. • The soils are sand loams in the higher ground and black cotton soils in the lowlands. The former are well drained while the latter are often water logged and difficult to till during wet season.
Population	<ul style="list-style-type: none"> • Estimated at 906,126 with Magwi and Kapoeta East having the highest number of people • At a growth rate of 3.5% • The population density is still low.
Livelihood	<ul style="list-style-type: none"> • It is agriculture, livestock and a low focus on fishing and subsistence crop farming is the accounts for the biggest proportion of the labor force with 64 %. • The majority of the households depend on Sorghum, wild honey collection, wild foods and fish as their main food sources.
Poverty	<ul style="list-style-type: none"> • 50% (24% urban) of the population estimated to live below the poverty line
Socio-economic	<ul style="list-style-type: none"> • It is evident that several indicators in education, health, water and sanitation and agriculture as well are still poor by any standard in the region. • The state is still struggling and there is general lack of basic infrastructure pointing at large gaps in system and human capital.
Road Infrastructure	<ul style="list-style-type: none"> • The state is poorly served by infrastructure. The roads and even bridges severely limit the provision of social services. In term of access by air, there are seven airstrips which have not been effectively utilised because of lack of maintenance and failure to upgrade some to international standard.
Water and	<ul style="list-style-type: none"> • About 37% of the population do not have access to improved sources of drinking water.

Sanitation	<ul style="list-style-type: none"> only 11% of the population have access to improved sanitation.
Agriculture	<ul style="list-style-type: none"> The structure of the agricultural economy has not evolved positively, and its share in state economy is still very low. The greater Kapoeta Counties (Budi, Kapoeta East, Kapoeta South and Kapoeta North) which occupy the arid to semiarid eastern sector have low levels of agricultural productivity. Beside drought, lack of farm inputs, high pre and post-harvest, pests especially birds, termites and black ants offer explanation to the low levels of agriculture production and productivity.
3. Strategic Direction	
Vision	<ul style="list-style-type: none"> To create a peaceful, democratic, transparent, accountable and harmonious EE State, with healthy citizens having dignity, livelihood, safety and equal opportunity for social and economic progress
Mission	<ul style="list-style-type: none"> To build state capacity for provision of timely, adequate and quality services, to promote peace, security, and reconciliation for promoting peoples, participation in development with equal opportunities for all
Core Values	Not mentioned
State Goal	<ul style="list-style-type: none"> To build institutional and human capacities, provide infrastructure to enhance poverty reduction, ensure access to equitable social services, accelerate economic growth and sustainable development, ensure food security and improve livelihoods, build accountable and responsive government and contribute to the attainment of millennium development goals
Strategic Objectives	<ul style="list-style-type: none"> To promote democratic principles, political pluralism and freedom To improve the lives of the citizens through the provision of basic social services To promote sustainable agriculture to ensure food security To mobilize and explore natural resources for reconstruction & development of the state To dedicate public resources on capacity building, development and provision of gainful employment for the people
4. Strategic Goals for Key Sectors	
Infrastructure	<ul style="list-style-type: none"> To construct roads, water, airfields and housing infrastructure and install water, sanitation and electricity utilities in all counties of EES state by 2015
Agriculture and Animal resources	<ul style="list-style-type: none"> To ensure food security and through enhancing increased and diversified agricultural production To ensure food security through increased livestock & fisheries production by 2015
Social Development	<ul style="list-style-type: none"> To promote social equity protects and promotes women's and children's rights and retains positive cultural values
5. Issues and Challenges	
Infrastructure Development	<ul style="list-style-type: none"> Sector objective: To maintain, rehabilitate, provide & operate infrastructure to enhance poverty reduction, economic growth & service delivery in a sustainable manner <p><u>Challenges</u></p> <ul style="list-style-type: none"> Airstrips are in bad condition and some too close to the town and residential areas. Roads and bridges: Lack of connectivity between capital of state and counties and limited bridges Water and Sanitation: Limited access to water among communities Electricity: Inadequate capacity of the existing generator; and six counties have no electric power plants. Housing/land /Urban management: Poor enforcement of the existing housing policy, procedures, guidelines at the county level. Community land ownership policy preventing the government from implementing town planning activities.
Natural Resources	<ul style="list-style-type: none"> To ensure food security and improve livelihoods and income generation for the people of EES state, through sustainable use of natural resources and land management <p><u>Challenges :</u></p> <ul style="list-style-type: none"> Lack of policies and legal framework on natural resources subsector, land use, private investments and NGOs operation in the state Lack of functional research and training Institutional/centers Poor infrastructure especially access road Weak service delivery system e.g. coordination mechanism, data and information Inadequate technical staff and specialised equipments and inputs to support the work of the sector
State Mid-Term Key Priority	<ul style="list-style-type: none"> Provide safe drinking water for domestic and livestock by increasing the number of existing facility Construction of roads to connect Counties and Payams to the state capital and the state

	<p>to the neighbouring states</p> <ul style="list-style-type: none"> • Increase in food security through provision of training and NFI agricultural input (seeds and tools) • Improve security in all of the state
6. Monitoring and Evaluation	
	<ul style="list-style-type: none"> • The levels of the state have been and are involved in the monitoring and evaluation process. • The MoFEP has been undertaking the monitoring and evaluation of the progress on the implementation of the plans. The ministry relies on periodic reports (monthly, quarterly, semi-annual and annual) from the line ministries, agencies localities. • The state office of national bureau of Statistics (NBS) undertakes the monitoring and evaluation of the outcomes and impacts of the plans. • Monitoring can be seen at two broad levels: (a) The monitoring of inputs and outputs (implementation monitoring) and (b) The monitoring of outcomes and impacts (impact monitoring).

2. INSTITUTIONAL SETTINGS IN RELATION TO IRRIGATION SUBSECTOR

South Sudan is run on the basis of a decentralised system of government with three levels of establishment, namely 1) national government; 2) state level; and local government that includes county headquarters, Payam and Boma as lowest subsequent administrative units of governance.

2.1 National Government

On the 23rd of July, 2013, the GRSS implemented the reduction and restructuring of the Ministries of the National Government. In this exercise, the Ministry of Water Resources and Irrigation (MWRI) was merged with the Ministry of Dams and Electricity, hence became the Ministry of Electricity, Dams, Irrigation and Water Resources (MEDIWR). As for the Ministry of Agriculture, Forestry, Cooperative and Rural Development (MAFCRD) has once changed by merging with the then Ministry of Animal Resources and Fisheries; in addition to the component of Tourism of the Ministry of Wildlife Conservation and Tourism. But, now the former arrangement has been restored, giving back the birth of the Ministry of Livestock and Fisheries Industry (MLFI).

Now, the three (3) ministries of MEDIWR, MAFCRD & MLFI are the responsible agencies for irrigation development and its operation at the National Government level. Although the roles of each ministry for irrigation development have not been practically demarcated, WASH Strategic Framework mentions the requirement of a separate policy and regulatory framework establishment for irrigation as mentioned earlier. IDMP will contribute to formulating that envisaged irrigation policy and regulatory framework.

Apart from MEDIWR, MAFCRD & MLFI, there are other ministries relatively involved in water resources development; utilization; and management (see table 2.1.1 below and the list beneath it).

Table 2.1.1 Ministries of the National Government to be relatively involved in Irrigation Development

Line Ministry	Relations
MEDIWR	Core Institution of IDMP: responsible for allocating and delivering bulk water to the irrigated agricultural schemes and other productive uses. Also it is in charge of the development of hydro-power dam, which can serve irrigation development.
MAFCRD	Core Institution of CAMP: responsible for distributing and managing that water on the farms in irrigation schemes. For this role an irrigation unit exist under the department of agricultural mechanization /engineering within the directorate of agriculture production and extension services
MLFI	Core Institution of CAMP: responsible for managing that water on the cattle migratory routes and other livestock/aquaculture sites
MPM	Petroleum & mining: uses water for refinery, minerals mining. They pay due attention to water contamination from oil fields.

MTII	Industry: it will be in need of water and might face shortages as the industrial development (including agro-industries) progresses. In fact, there has been in this regard plans for sugarcane and cotton planting at Mangalla, Malut, etc.
MoE	Environment: cooperate for IEE and EIA; and IDMP is to propose the procedure for EIA for irrigation development
MWCT	Instruct to pay due attention to wildlife conservation in development and identifies natural reserves (including water) for / in protected and recreation areas.
MLHPP	Land use, zoning and administration are a crucial issue for irrigation development. Details are discussed in Section 1.8.
MTRB	The road network is one of the foundations to identify the irrigation development potential area and river transport navigation should be taking into account for water use. Also, roads design/construction requires information on water levels and stream/river flows
MEST	They aim to double the number of school within 5 years and the school needs to install water and also establish farm for education and supplementing school feeding. Ensure that it guides development of curriculum of training/research institutes and vocational centres; and accreditation of water/sanitation technicians (Human Resource) required for irrigation development and provision of sanitation and hygiene services
MoH	Control of water borne related diseases through preventive campaigns; and ensuring of treatment of water, use of improved sanitary facilities and adoption of hygienic practices

Source: Interviews by IDMP-TT

As abbreviated above, the related Ministries are: Ministry of Petroleum and Mining (MPM); Ministry of Trade, Industry and Investment (MTII), Ministry of Environment (MoE); Ministry of Wildlife Conservation and Tourism (MWC); Ministry of Lands, Housing and Physical Planning (MLHPP); Ministry of Transport, Roads and Bridges (MTRB); Ministry of Health (MoH); and the Ministry of Education, Science and Technology (MEST). The table below summarizes how each ministry will be related, based on the ministry's departments directly linked to the water resources management, which is the basis of irrigation development.

The table below shows the budget of the then MWRI in the fiscal years of 2010, 2011 and 2012. Due to austerity measures introduced in 2012/13 budget was decreased compared to the last two years. The shares of the budget in 2012 are SSP 7 million (16%) for salaries of the HQ, SSP 6 million (13%) for the operating expenditure for the HQ, SSP 4.5 million (10%) for state transfer of salaries and operating expenditure, and SSP 27 million (61%) for the capital expenditure. Capital budget has been spent so far for office buildings, equipments, and safe water supply and sanitation in rural areas.

Table 2.1.2 Budget of Then MWRI and State Transfer

Item	2010	2011	2012
No. of Staff	434	434	
Salary (SSP)	11,991,633	12,091,378	10,595,309
National	8,464,893	8,564,638	7,068,569
State Transfer (280 staff)	3,526,740	3,526,740	3,526,740
Operating Expenditure (SSP)	7,268,260	11,259,175	6,963,596
National	5,795,000	9,785,915	5,947,046
State Transfer	1,473,260	1,473,260	1,016,550
Capital Expenditure (SSP)	35,532,362	34,441,447	27,000,000
Total (SSP)	54,792,255	57,792,000	44,558,905

Adopted from GRSS Approved Budget 2011 (MFEP), and MWRI data

2.2 State and Local Governments

The government structures at the state level are not identical to the national level. With the current reduction and merger of National Ministries, it is anticipated that the States government will also reduce their government. However, there are ministries in charge of agricultural development and water resources management. Table 2.2.1 below and narrative beneath it: list the ministries and

departments in charge of water sector as well as agriculture.

Table 2.2.1 Ministries/Directorates/Departments in Charge of Water & Agriculture Sectors in the State

State	MEDIWR line Ministry	MAFCRD line Ministry
Upper Nile	Department of Water Resources Management and Irrigation State Ministry of Physical Infrastructure and Rural Development	Mechanization and investment unit State Ministry of agriculture and Forestry
Jonglei	Department of Water Resources Management and Irrigation State Ministry of Physical infrastructure	Department of Mechanization State Ministry of Agri. and Forestry
Unity	Department of Water and Sanitation State Ministry of Physical Infrastructure, Urban Development and Natural Resources	Directorate of Agriculture and Extension Services State Ministry of Agriculture and Forestry
Warrap	Directorate of Urban Water, Water Resources Management and Irrigation State Ministry of Physical Infrastructure	Agriculture Mechanization Unit State Ministry of Agriculture and Forestry
NBG	Department of Water Resources Management and Irrigation State Ministry of Water and Rural development	Department of Agriculture and Extension State Ministry of Agriculture and Forestry
WBG	State Ministry of Irrigation and Water	Directorate of Agriculture State Ministry of Agriculture and Forestry
Lakes	Department of Water Resources Management and Irrigation State Ministry of Physical Infrastructure	Directorate of Mechanization State Ministry of Agriculture and Forestry
WE	Department of Water resources State Ministry of Physical Infrastructure and Public Utilities	Department of Agriculture Mechanization State Ministry of Agriculture and Forestry
CE	Directorate of Water Resources Management and Irrigation State Ministry of Physical Infrastructure	Department of Mechanization State Ministry of Agriculture and Forestry
EE	State Ministry of Housing and Public Utilities	Department of Mechanization Crop Production and Irrigation State Ministry of Agriculture

As listed above, for water resources management, mainly working for safe water and sanitation at present, the responsibility falls under the state line ministries responsible for the directorates of water and sanitation. The names of those ministries vary from time to time and from state to the other; but include relevant aspects such as physical infrastructure; housing and public utilities; cooperatives, rural development; urban construction/development; environment; natural resources; and water as well. In each state, there are two line ministries responsible for different facets of agriculture and they are also named differently, but carry related agricultural aspects. These are the Ministry of Agriculture and Forestry; and Ministry of Livestock (or Animal Resources) and Fisheries; and in some states there is adding of either cooperatives and rural development or environment to agriculture and forestry. Both ministries have vital role for promoting irrigated agriculture and other productive uses of water. In fact, generally under directorates/departments of agriculture (crops farming/husbandry), an irrigation unit is to exist at the state level. For instance, in Eastern Equatorial State, the department in charge of irrigation is distinguished under the State Ministry of Agriculture. The county also generally has the departments of water and agriculture.

Part of the Water budget support for the State ministries in charge of water sector is allocated from the National Ministry, namely MEDIWR through the National Ministry of Finance and Economic Planning (MoFEP) through the State Ministries of Finance. The budget transfer to the State Ministry from the then MWRI in 2012 is around 10% of its total budget. MWRI established buildings for the State Directorates of Water and Sanitation; and apart from operating costs and salary support transfers, for the fiscal year 2013, according to the plan for the then MWRI, the transfer of capital to Counties is also included for this year, only to cater for setup or establishment of County Water and Sanitation offices. That capital transfer shares 50% of the transfer to States. The allocation principle for the States and County budget transfers is based on equal allocations.

2.3 Existing Irrigation Schemes

Irrigation activities in South Sudan may be divided into Government-supported medium and large scale developments and small-scale individual farmer initiatives. The following describes the two (2) existing government-supported irrigation schemes.

(1) Northern Upper Nile Irrigation Schemes

Initiated in the 1940s as part and parcel of the White Nile pumps irrigation schemes, Northern Upper Nile Irrigation Schemes are huge and complex and consist of 23 schemes which may be categorized as follows:

- 9 private/government schemes (ranging from 100 to 1,000 ha each) which account for over 50% of irrigated area. MEDIWR supplies irrigation water up to the major canal from where the private owner conveys and distributes to his tenant-farmers
- 14 public schemes which occupy slightly less than 50% of irrigable area. MEDIWR delivers irrigation water down to the feeder canal (Abu Ishirin) from where the then MAF distribute to individual small-scale cultivators (5 feddan each).

Private owners operate on the basis of 15 years leases that are issued by the State Ministry of Agriculture. In their turn, the private owners have placed tenant farmers on their land under a share-cropping arrangement. Similarly, in public schemes, the Government through MAFCRD has a share-cropping agreement with its small-scale tenants.

For both categories of irrigation schemes, the Government bears the cost of operating and maintaining the pumps as well as major irrigation infrastructure. However, in actual situation, the disbursement of operation cost has been suspended due to high fuel cost and the pumps have not been working.

The private owner and the Government are supposed to provide production services and inputs (land preparation, irrigation water, seed, fertilizers and crop protection, marketing) to their respective tenants. Later, they (private owner and Government) reimburse themselves from joint accounts which they maintain with individual tenants. The main characteristics of Northern Upper Nile Irrigation Project are presented in Table 2.3.1.

Table 2.3.1 Main Features of Northern Upper Nile Irrigation Schemes (NUNIS)

Location	Source of water	Water lift Technology	Gross Area	Net Irrigable Area	Irrigated Area 2012
Upper Nile State, Renk Manyo, and Malut	White Nile through controlled intake into a wide channel/reservoir parallel to command area	20 lift pumps located at intervals on right and left banks of the wide channel/reservoir	1,558,800 feddan (654,700 ha)	467,640 feddan (196,410 ha)	Not Available

Adopted from Ministry of Water Resources and Irrigation [Access Bottlenecks Costs and Equity (ABCE) Inception Report]

(2) Aweil Irrigation Rice Scheme (AIRS)

Aweil Irrigation Rice Scheme is the oldest irrigation development in South Sudan having been initiated in 1945 as a Prison farm of 4 feddan. Since then, it has expanded to the present gross area of 22,000 feddan. The scheme's infrastructure was destroyed and abandoned during the civil unrest but was partially rehabilitated by GIZ IS through EU's 5 million Euros funding in the period 2008 to 2012. In October, 2012, GIZ IS handed over the Scheme formally to the Government (MAFCRD), together

with 300 tenant farmers (both large and small-scale) and 92 staff members. Key features of the Scheme are given in Table 2.3.2.

Table 2.3.2 Main Features of Aweil Irrigation Rice Scheme (AIRS)

Location	Source of water	Water lift Technology	Gross Area	Net Irrigable Area	Irrigated Area 2012
Northern Bahr el-Ghazal State, Aweil West and Aweil Centre Counties	Lol River (until recently through uncontrolled entry points into fields; recently some control gates installed)	Seasonal floods during June-October	22,000 feddan (9,240 ha)	11,000 feddan (4,620 ha)	1,600 feddan (672 ha) under rice

Adopted from Ministry of Water Resources and Irrigation (ABCE, Inception Report); Ministry of Agriculture and Forestry

In 2010 MWRI contracted out assessments, surveys, designs and construction of structures in the scheme. That contract delivered the modified water delivery and control infrastructure configuration for the efficient and effective management of water for rice production in ARIS; but due to lack of another capital budget in the subsequent years those efforts stopped there.

Before demobilising, GIZ IS facilitated management arrangement process between MAF, MWRI and NBG State Ministries responsible for Agriculture and Water/Infrastructure. Stakeholders mapping was carried out by the scheme rehabilitation taskforce, culminating in identification of roles that each should play for functioning and sustainability of the scheme. The taskforce then had worked out preliminary management structure. In December 2011, a study tour was organised to Kenya, to learn from the irrigated agriculture organisational structure, before an organisation is enacted for the scheme.

2.4 Private Sector

Although, still limited and weak, private sector in South Sudan is evolving, especially in partnership with regional and international businesses; and a number of local entrepreneurs are coming up, including in the agriculture, finance and construction.

(1) Cooperatives

Cooperatives development is under the administration of the Directorate of Cooperatives in MAFCRD. The directorate is structured with four departments: 1) Administration, 2) Education and training, 3) Marketing and 4) Field management.

Although cooperatives were encouraged in the late 1990s in area that were liberated by SPLA such as Western and Eastern Equatoria, it is only recently that the Government has started promoting cooperative societies after enacting the Cooperatives Act in 2011. In the whole country, a total of 241 cooperative societies have been registered with the Registrar of Cooperatives, to date.

States in which cooperatives are fairly established are: Central Equatoria State, Lakes State, Jonglei State, Western Bahr el-Ghazal State and Warrap State. In Yei and Kajo Keji, cooperatives deal mainly with marketing of grains such as maize and beans. Rice farmers in the Aweil Irrigation Rice Scheme (AIRS) has established a cooperative and registered to the Directorate of Cooperatives Development of Northern Bahr el-Ghazal State in May 2013.

There is a traditional form of cooperation (*Nefir*) in which about 7-10 people come together and collaborate in performing a task till it is finished (building a school, church, mosque, etc). Also when

weeding or harvesting, a *nefir* group can work in a member's field in rotation until all the members fields are done. There is no reason why this traditional collaborative method cannot be repeated in a smallholder irrigation project. The following are the possible roles of a cooperative in an irrigation projects and the table below summarizes the outline sample of two (2) cooperatives:

- Accommodating members savings and providing credit to members
- Consolidating members produce for marketing
- Procurement of inputs in bulk
- Borrowing money from bank at a favourable interest rate

Table 2.4.1 Example of the Cooperative Registration and Constitution

Name and Location	Aweil Rice Farmers Cooperative (ARFC) in NBG State	Ngoth Farming Multi-Purpose Cooperative Group (NFMCG) in Kuajok in Warrap State
Registration	Mar. 7, 2013	Mar. 30, 2012
Contents of the Constitution	<ul style="list-style-type: none"> - Vision / Mission - Name and Address of the Cooperative - Objectives of the Cooperative - Cooperative Principle and Value - Membership - Finances - Meetings / General Provisions - Elections / General Assembly - Executive Committee - Rules and Regulations 	<ul style="list-style-type: none"> - Name and Address of the Cooperative - Objectives and Activities - Membership - Termination and Renewal of Membership - Executive Committee - Funds - Amendment Procedures - Arbitration - Dissolution of the Cooperative - General Election
Objectives and Activities	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - To be a sustainable development producer of the quality and sufficient rice for ARFC, Aweil state and South Sudan community in order to boost food security and economics and eradicate poverty in the country. <p><u>Secondary Objectives:</u></p> <ul style="list-style-type: none"> - To support ARS with mobilization of resources and manpower in rice production - Link rice farmers/beneficiaries with ARS and other developmental partners in regard to support of farmers. - Plan and monitor the rice production with ARS extension officers - Lobby for funds to support the farmers financially and technically and also to purchase small enterprise machines and equipments. - Act as implementing agent for Government policies and regulations that are relating to rice production activities. - Handle the issues of the farmers and solve their problem. - To sit and discuss the issue affecting rice farmers with ARS and seek solutions. - Establish and encourage rice farmer to diversify small farm and non-farm business with rice production to generate income. 	<p><u>Objectives:</u></p> <ul style="list-style-type: none"> - To create large-scale farming for food production both crops, vegetables & fruits for sale. - To promote agro-based enterprises in urban & rural marketing on agriculture inputs, seeds and seedlings. - To invest members contribution to generate income / interest - To develop self-reliant initiatives for better services - Improvement of livelihood and food security of the members - To practice irrigation system in the State. <p><u>Activities:</u></p> <ul style="list-style-type: none"> - Identify farm for production of cash crops, vegetables and fruits. - Identify sources of funding. - To establish poultry rearing, dairy farms and fishing ponds. - To invest the cooperative funds - To establish carpentry and mechanic workshop - Training members on business management - Import and export of food and non-food commodities.
Source of Finance	<ul style="list-style-type: none"> - Membership fees - Annual fees - Interest made on deposits made by the 	<ul style="list-style-type: none"> - Donations from the Government - Donations from International and Domestic Organizations

Name and Location	Aweil Rice Farmers Cooperative (ARFC) in NBG State	Ngoth Farming Multi-Purpose Cooperative Group (NFMCG) in Kuajok in Warrap State
	Cooperative - Fines - Loans from financial institutions - Grants and Donations - Contributions from members - Fund raising events	- Member fees / Fines and penalties - Selling of farm produce - Loans from financial institutions - Hiring equipment and facilities - Gain on investment - Signed contract funds / Contributions

Adopted from Constitutions of Aweil Rice Farmers Cooperative and Ngoth Farming Multi-Purpose Cooperative

(2) Small-scale Irrigation Farming

Although no formal census has been carried out, there is a considerable number of small scale irrigation activities located along the White Nile River and its over 30 tributaries. These activities are based on lifting water either manually using a bucket or by harnessing a portable treadle or petrol pump. The irrigated area per farmer is fairly modest and ranges from 1/8 feddan for bucket irrigation to 3 feddan in the case of petrol pumps. To illustrate the significance of small scale irrigation, some 177 pump-sets were bought through the Agricultural Bank of South Sudan (ABSS) in 2011 alone. These pumps were located around urban centres, with Juba accounting for 62.1% of the purchases while the remainders were shared among Malakal, Wau and Renk towns as shown in the table below.

Table 2.4.2 Number of Pumps Bought through ABSS in 2011

Branch	Juba	Malakal	Wau	Renk	Total
Number of pumps	110	25	27	15	177
Percentage	62.1%	14.1%	15.3%	8.5%	100.0%

Adopted from Agricultural Bank of South Sudan

(3) Government Facilitation

In 2009, MWRI purchased more than 50 irrigation pumps of different sizes/capacities (supplied by Allweiller-Farid Pumps Company, a German Egyptian Joint-venture based in Cairo, Egypt) with an aim of supporting irrigated agriculture entrepreneurs. MWRI then prepared guidelines for distributing them, but to date with exception of a Prison Farm at Rejaf East, there is no any other applicant qualified. The underlying reason for lack of distribution is due to the fact that the initiators do not have necessary resources to finance pre-investment preparation activities and the required civil works; hence the pumps remained in the store.

Given such a situation, for demonstration and piloting purposes, through MWRI in collaboration with the directorates and departments of agriculture, the government attempted to establish water control and delivery infrastructure at small scale government demonstration farms (Torit); and community farms (Adioragot in Aweil East of NBG, Pagarau in Yirol East of Lakes and Wau rice farms) that were communally initiated with support of development partners during Operation Lifeline Sudan (OLS). In fact, a number of international NGOs and UN agencies, including TEARFUND, FAO, CARE, WFP, etc have been assisting communities on water management for agricultural production e.g. through embankment of flood control dikes, water harvesting and provision of pumps.

In 2010 MWRI contracted out assessments, surveys, designs, construction of structures and installation of pumps at those sites. That contract was not successfully concluded partly due to defaulting from the company side and lack of another capital budget in the subsequent years to continue with such efforts.

2.5 Financial Institutions

Among financial institutions operating in South Sudan's agriculture sector are the Agricultural Bank of South Sudan (ABSS), the only locally owned bank; and Kenya Commercial Bank and Equity Bank among foreign banks, especially play an important role in the agricultural finance sector (CAMP Progress Report 1). Here focuses on ABSS in describing the operation. Before the referendum in 2011, the Sudan Agricultural Bank covered the whole of Sudan and had its Head Quarters in Khartoum. The Juba Branch served states in South Sudan. After the Referendum, the Juba Branch was converted into the ABSS whose operations were confined to the new Republic of South Sudan. ABSS has established branches in all the states as of now. Also, there is a newly established Cooperatives Bank, whose activities are yet to emerge.

(1) Focus on Irrigation

Since rainfall is unreliable in much of South Sudan, there is potential for irrigation using the White Nile and some other 38 small rivers within the country as well as water harvested using small dams. Hence ABSS has targeted irrigation for financial support. In this regard, the bank has three types of loans: 1) Short term loans of up to 15 months, 2) Medium term loans of 1-5 years, and 3) Long term loans of 3-10 years.

(2) Loan Portfolio

ABSS buys pump-sets and on-lends the same under one of the three loans categories. ABSS does not provide finance for construction of water harvesting or storage dams. However, apart from irrigation pumps, ABSS provides funding for tractors and associated equipment as well as for inputs and working capital (seed, fertilizers, insecticides, fuel, labour and bags). In 2011, ABSS funded procurement of major agricultural assets as summarized below.

(3) Budgetary provisions

During 2011 financial year, the operational budget for the Bank was as summarized:

Table 2.5.1 Operational Budget of the Agriculture Bank of South Sudan in 2011

Expenditure Item	Amount (SSP)
Farm machinery (tractors, pumps etc)	94,000,000
Spare parts	20,000,000
Inputs (fertilizers)	142,000
Improved seed	8,000
Micro-finance	8,000,000
Bank operational costs (salaries, vehicles, maintenance, etc.)	21,000,000
Contingency	20,000,000
Total	163,150,000

2.6 Training, Research and Educational Institutes/Institutions

The institutes for higher education and research for irrigation development, i.e. civil engineering and agricultural science are found at the universities/collages in South Sudan. There are five (5) public universities in South Sudan, namely University of Juba in Juba, Upper Nile University in Malakal and University of Bahr el-Ghazal in Wau, John Garang Memorial University in Bor, and Rumbek University in Rumbek. University of Juba, the oldest in South Sudan, was established in 1977 and two (2) universities (Upper Nile and Bahr el-Ghazal) were established in 1990. The other universities were established after CPA. There are some private universities or colleges recently established in the

country.

Among them University of Juba is the only one which has the course of civil engineering; College of Engineering and Architecture. In relation to the irrigation development, at the College of Engineering and Architecture, the departments of civil engineering and agricultural engineering offer the studies of 1) Water resources, 2) Agriculture construction, 3) Properties of agricultural materials, and 4) Irrigation & hydraulics engineering.

During the Technical Committee Meeting for IDMP on the 22nd of April 2013, the Head of the Department of Agricultural Engineering, University of Juba, noted that a realistic plan for building capacity of technical personnel should be done in cooperation with the stakeholders. He gave the example of University of Juba where the output of agricultural engineers was declining from 21, 17, 14 and 7 over the next four years.

MEDIWR in collaboration with MAFCRD are establishing capacity building for skills and knowledge in Water, Sanitation and Hygiene (WASH) at Amadi Rural Development Institute. This project is supported by the Dutch Government NUFFIC programmes through The Netherlands Initiative for Capacity in Higher Education (NICHE). The first enrolment of trainees/students in a technician certificate courses is expected by the end of 2015, aiming at graduating water management/development and sanitation technicians.

2.7 Regional Institutions

There are regional institutions, which have been organized among the countries in eastern Africa or along the Nile in relation to water sector. The major ones are Nile Basin Initiative (NBI) and its subsidiary action programmes, the New Partnership for Africa's Development (NEPAD) and the Intergovernmental Authority on Development (IGAD).

(1) Nile Basin Initiative (NBI)

The Nile River Basin is shared by 11 countries and South Sudan is the newest member country of the Nile Basin Initiative (NBI). NBI was established in 1999 among the riparian countries of the Nile with their goal being to promote trans-boundary water cooperation in the region. RSS used to be an observer of NBI from 2006 to 2011 and RSS became the official member of NBI on 5th July 2012.

NBI is administrated with three (3) centres: 1) NBI Secretariat (Nile-SEC) in Entebbe, Uganda 2) NELSAP-CU, the Nile Equatorial Lake Subsidiary Action Program (NELSAP) Coordination Unit (CU) in Kigali, Rwanda and 3) Eastern Nile Technical Regional Office (ENTRO) in Addis Ababa, Ethiopia. Also each country has a focal point. In case of RSS, the Department of the Water Resources Management of MEDIWR takes this role. NBI serves as the institution and platform of multilateral cooperation [e.g. Nile Basin Trust Fund (NBTF) is managed by the World Bank].

NBI has been providing opportunities of trainings for capacity development of water engineers/practitioners in South Sudan. Apart from a number of them who benefited from postgraduate training (masters, diplomas and short courses), in 2013, NBI has administered training for Decision Support System (use of software for simulating river basin management) to the officers of MEDIWR. Also NBTF has provided a fund for trainings in 2103. The fund will be used for conducting a training program for Trans-boundary Water Management targeting 52 technical staff of the government at all levels.

On the other hand, through the three NBI Centres, RSS in collaboration with the other member states

initiated a number of water resources development and management projects and programmes, which include irrigation development; and some of them are either at design stage (MSIOA), study stage (Baro-Akobo/Pibor-Sobat and Nyimur, both supported by AfDB) or ready for implementation (Hydromet), just to mention a few.

(2) NEPAD – CAADP Process

The New Partnership for Africa's Development (NEPAD) has identified agriculture as central to achieving poverty alleviation, food and nutrition security and attaining the Millennium Development Goals (MDGs) (CAADP Pillar I Framework, Sep. 2009). Then the Comprehensive Africa Agriculture Development Programme (CAADP) was endorsed in 2003 as a common framework for simulating and guiding national, regional and continental initiatives on enhanced agriculture productivity. Under CAADP, four (4) continent-wide pillars for investment and action have been identified. These are: 1) Sustainable land and water management, 2) Improving market access, 3) Increasing food supply and reducing hunger, and 4) Improving agricultural research and systems to disseminate appropriate new technologies.

CAMP will be formulated in line with the framework of CAADP, i.e. an investment plan to be formulated under CAMP will be positioned as the investment plan within the framework of CAADP. IDMP as a support plan to CAMP, it will also need to take into consideration the framework of CAADP. Especially IDMP should pay due attention to the Pillar 1: Sustainable Land and Water Management, which includes Agricultural Water Development as one of the four key elements. Following the framework of Pillar 1 would promote partnership and support provision from Development Partners.

(3) IGAD

The Intergovernmental Authority on Development (IGAD) region consist of eight countries Namely Uganda, Kenya, Djibouti, Ethiopia, Eritrea, Somalia, Sudan and South Sudan; and its technical secretariat is based in Djibouti. IGAD establishment originates to the droughts of 1980s; hence environmental sustainability and building of resilience are its core activities. In the region, agriculture is a predominant activity supported by land of differing capacity and utilizing both manual and mechanical means of production. The size of potentially arable land can be increased through irrigation. However, at the moment, less than 1% of the cultivable area in the region is irrigated, and at the moment no collective plan for increasing the area, but every country is planning by its own effort to increase the area under irrigation.

However, a number of programmes have been initiated to foster cooperation among member states and assist them in monitoring and harnessing water resources to avert droughts and support agricultural production. Notably, are the water harvesting projects of Kormoja area (involving Eastern Equatoria in South Sudan and Turkana land in Kenya); the hydrological cycle observation system (IGAD-HYCOS); and the water policy and its implementation protocol.

2.8 Development Partners (DPs)

The development partners have been cooperating with the line ministries of GRSS along with the aid coordination structure, which is one of the implementation strategies of South Sudan Development Plan (SSDP), 2011 to 2013.

2.8.1 Outline

Though the mechanism may have modifications in accordance with the restructuring of the Ministries and entering into the implementation of South Sudan Development Initiative (SSDI), yet the development partners will be following the four (4) development pillars and the budget sector working groups (WGs) in each pillar defined in the SSDP. These pillars are Governance Pillar WG, Economic Development Pillar WG, Human and Social Development Pillar WG and Conflict Prevention and Security Pillar WG. The table below summarizes the projects related to the then MWRI with the assistance of DPs:

Table 2.8.1 Projects Assisted by Development Partners in Water Sector as of August 2103

Development Partner	Program
Multi-donor Trust Fund (MDTF) for South Sudan	Water Supply and Sanitation Program (phased out in June 2013) <ul style="list-style-type: none"> - 528 community water points constructed with water committee establishment - 966,000 people with access to improved water sources - 1,011 additional households with improved sanitation facilities - Nine (9) water-quality laboratories in state capitals - 128 public latrines constructed - 250,000 residents in Juba with access to clean drinking water
Basic Services Fund (BSF) (multi-donor)	Basic Services Fund; Interim Arrangement ;Water Supply and Sanitation (WATSAN) sector (phased out in December 2012) As of November 2012, <ul style="list-style-type: none"> - 570 boreholes were newly constructed; - 530 boreholes were rehabilitated; - 187 water sources (<i>hafirs</i>, sand filters, rainwater harvesting system, small water distribution system, etc.) were constructed; and - Total 275,000 people are benefited.
U.S. Agency for International Development (USAID)	Upgrading and expansion of urban water supply systems in Wau and Malakal along with institutional reform through Sustainable Water and Sanitation in Africa (SUWASA) WASH projects under the Building Resources in Democracy Governance and Election (BRIDGE) Program
Japan International Cooperation Agency (JICA)	Development and implementation for water supply in Malakal/Juba Irrigation Development Master Plan (IDMP) Comprehensive Agriculture Development Master Plan (CAMP)
Germany and France	Successive development of urban water and sanitation systems in Yei, Rumbek, Bor, and Yambio Development of Water Act (under discussion of the third draft)
Netherlands	Water for productive uses: two catchment pilot studies in Lakes and Eastern Equatoria States (Plan has been formulated but the implementation has not taken place yet.) Establishment of a training centre (Under discussion to add the WASH training course to Amadi Rural Development Institute)
United Nations Children's Fund (UNICEF)	Preparation of Rural-WASH Action and Investment Plans WASH services, focusing on schools, health centres, rural communities, and Guinea Worm endemic areas
Egypt	Technical cooperation, including river dredging works, river measurements, construction of safe water points and Feasibility Study for the Construction of Wau Dam on River Sue in 2011
Swiss Development Cooperation (SDC)	WASH Project in Northern Bahr el Ghazal
South Sudan Relief Fund (SSRF)	Water harvesting component of stabilization program in Warrap, Eastern Equatoria, and Lakes
China	Construction of small water distribution systems
Department of Foreign Affairs, Development &	Water harvesting in Jonglei, through Food and Agriculture Organization (FAO) Feasibility Study was completed in 2012 and implementation phase has started

Development Partner	Program
Trade (DFADT) Canada	since 2013.
African Development Bank (AfDB)	Baro, Akobo, and Sobat multipurpose water resources development study, through the Nile Basin Initiative and implemented by the Eastern Nile Technical Regional Office (ENTRO)
European Commission (EC)	Hydrological Cycle Observation System (HYCOS) for Intergovernmental Agency for Development (IGAD) countries, through the World Meteorological Organization (WMO)

Adopted from Fernando and Garvey, *The Rapid Water Sector Needs Assessment and a Way Forward*, the World Bank, January 2013+with update and addition by IDMP-TT, *Multi-Donor Trust Fund for South Sudan 2012 Annual Report*+, and *Basic Services Fund Quarterly Progress Report 3 of 2012+*

Each WG has been chaired by one of the undersecretaries of involved ministries and also co-chaired by chosen development partner. The then Ministry of Water Resources and Irrigation belongs to the Infrastructure Sector Budget Sector Working Group under the Economic Development Pillar WG. Under this Pillar WG, there is also Natural Resources Budget Sector Working Group, to which CAMP related ministries belong; hence this Pillar WG is also closely related to IDMP. MACRD and EU are co-chairing the agriculture related donor group under Natural Resources Sector WG since 2013. The following DPs are currently engaged in the activities related to IDMP:

(1) African Development Bank (AfDB)

Although the GRSS has not become officially a member of the AfDB, it has been preparing *An Infrastructure Action Plan*. The Plan had been recognized by GRSS as an important reference to the national development plan and it was mentioned in the draft SSDI that the Plan needs to be aligned with the draft SSDI and the overarching development plan of the RSS. In fact the Priority Action Plan of Water sector in the draft SSDI is formulated using the Plan as one of the source documentations. The Plan includes water Resources and irrigation development, the contents of which are discussed below.

(2) World Bank: Rapid Water Resources Assessment and Water Sector Needs Assessment

The World Bank was the managing agency for Multi-donor Trust Fund (MDTF) established in 2005 and ended in December 2012. MDTF was used for implementing drinking water, sanitation and hygiene components of WASH sector but not for irrigation. The Bank has made studies on water resources in South Sudan in cooperation with the then MWRI. The deliverables of these studies are *Southern Sudan Preliminary Water Resources Assessment Study (2010)* and *A Rapid Water Sector Needs Assessment and a Way Forward (2012)*. The contents of these documents are discussed below. The Bank also manages the Nile Basin Trust Fund (NBTF) through NBI as mentioned earlier.

(3) GIZ

GIZ is working on mainly urban water sector but it has also been assisting the formulation of Water Act, which is still under discussion before being submitted for the approval of the cabinet, Parliament and its promulgation. The Act is providing the regulations on establishing the Water Resources Management Authority, the Basin Water Boards, catchment/sub-catchment committee and water users associations as well as safe water supply and sanitation sector institutionalization. The provisions related to the water resources management in the coming Water Act will be a guide to develop irrigation institutions.

(4) FAO /DFADT: Water Harvesting (*Haffir* Construction)

FAO/DFADT (then CIDA) carried out a water harvesting study in Jongrei State in 2012. The study is a feasibility study for constructing four (4) *Haffirs* (water harvesting reservoirs) in Uror and Nyirol Counties of Jongrei State. These *Haffirs* are mainly for livestock water with the range of catchment areas from 0.3 km² to 27.3 km². Upon the completion of the feasibility study, the construction of the *Haffirs* was commenced. In 2013 two of them, namely Pul Kar (9.8 km² of catchment area) in Uror County and Boiloch (27.3 km² of catchment area) in Nyirol County will be completing the construction and the other two *Haffirs* will be constructed during the following dry season. Though this *Haffir* is primarily for watering livestock, the concepts of IWRM in reservoir planning, designing and operation will give a reference to an option of availing water for irrigated agriculture, as well. The then MWRI and present MEDIWR embarked on pursuing implementation of improved combined water harvesting (*haffir*) system.

(5) The Netherlands: Water for Productive Use

The Netherlands have been preparing the programme called Water Security for Peace and Economic Development in two (2) states, namely Lakes and Eastern Equatoria. The programme aims at introducing a concept of integrated water resources management in the Naam river basin in Lakes State and in the Kinyetti river basin in the Eastern Equatoria State. The programme activities has started since January 2015 from Kinneti river basin in the EES. This programme will give a model of water for productive use to be incorporated into IDMP implementation in the future.

2.8.2 Recommendations and Proposals from Development Partners

In the water sector, with support of DPs, a number of Capacity Development and institutional building activities; studies; action, investment and implementation plans; and some infrastructure and service delivery establishment is in progress.

(1) AfDB's Infrastructure Action Plan (Draft)

AfDB has been preparing "An Infrastructure Action Plan for South Sudan". The Plan has been recognized by the GRSS as an important reference to the national development plan as mentioned above. The Plan includes the development of agriculture in South Sudan. Under the agriculture development, infrastructure requirement for agriculture is discussed and the Plan proposes the infrastructure development for water resources and irrigation, as well.

The Plan estimates the current area of irrigated farming at only 32,100 ha, out of which 12,700 ha, 300 ha, 500 ha are located in Upper Nile, Jonglei and Western Equatoria States respectively and the remaining 18,600 ha are scattered across the country in small parcels. It also adds the estimated area of 6,000 ha of flood land used for rice production in Northern Bahr el-Ghazal. The Plan suggests the potential irrigation development locations as follows:

- 1) The lowlands: Farmers make use of flooding to supplement water for growing rice
- 2) Areas adjacent to river floodplains: Farmers cultivate short-maturing varieties of sorghum
- 3) Areas around swamps/marshes: Possible extension of the growing season by planting in moist soils left by receding floods
- 4) Drought-prone eastern mountainous semi-arid areas with low water storage and infiltration capacity
- 5) Southwest and western (Green Belt Zone): Modern irrigation techniques can further increase

agricultural production

The Plan also suggests that the best opportunities for expanded smallholder and commercial irrigated-based agriculture appear to be in parts of the Eastern and Western Flood Plains, the Nile-Sobat Rivers area, and the Green Belt zone. The following irrigation schemes are suggested:

- Nile-Sobat River Basin Irrigation Schemes: 654,700 ha of potential area. The average annual rainfall in the basin is 200 to 400 mm, but with the introduction of irrigation, the area acquires huge potential of agricultural production. Within the basin following are also proposed:
 - Between Geigar and Gelhak: pump schemes for smallholder farmers can be developed for as much as 11,840 ha
 - Between Gelhak and Melut: estimated irrigable area of 27,890 ha
 - Between Melut and Malakal: estimated irrigable area of 17,000 ha
- Western and Eastern Flood Plains Irrigation Scheme: 600,000 ha of land could be converted into cropland in Warrap, Unity and Jonglei States. In the zones a large amount of the total landmass is covered by trees, flood land and water with rocks. Environmental assessment must be first undertaken.
- Mangalla Irrigation Scheme: the area has considerable potential to produce sugar cane. 250,000 ha can be irrigated. It has good market as Mangalla is situated only 45 km away from Juba.
- Irrigation Schemes in the Green Belt Zone: it is the zone with the highest agricultural potential. The zone has about 500,000 ha of virgin land under tree cover, some of which can be converted into agricultural land. The introduction of irrigation schemes would provide significant opportunities for year-round cropping.

The Plan proposes, as a first step of developing the potential, to formulate a master plan for irrigation development for the decade ahead. The Plan remarks that the master plan needs to give particular attention to the amounts of existing or potential cropland to be brought under smallholder irrigation schemes and medium- and large-scale commercial farming and the likely investment cost per hectare. Subject to the completion of the master plan, the Plan shows an indicative program for the development of 400,000 ha of irrigated agriculture. It is assumed that 50% for smallholder irrigation and 50% for large-scale commercial farming. Capital costs of smallholder and large-scale schemes are assumed at USD 2,000 and USD 3,000 per hectare respectively based on the World Bank experiences.

(2) The Rapid Water Sector Needs Assessment

This rapid assessment is a joint outcome of the Environment, Natural Resources, Water Resources and Disaster Risk Management Unit for Africa Region of the World Bank and the then MWRI conducted in 2012. The team of this assessment also consulted with JICA assisted CAMP and IDMP and has given valuable comments, suggestions and recommendations to enrich the IDMP. IDMP will take all these into account in formulating the Master Plan.

The assessment proposes a way forward, i.e. interventions and activities to be undertaken and implemented over the three (3) to five (5) years period and the seven (7) programs have been identified based on the findings of the assessment and these programs were discussed and endorsed by sector stakeholders at the validation workshop held on the 6th of August 2012. The proposed programs are shown below and remarks to each program are put by IDMP-TT as there is some progress in the water sector so far from August, 2012.

Table 2.8.2 Proposed Programs by the World Bank Rapid Water Sector Needs Assessment Study 2013

Proposed Programs	Remarks by IDMP-TT
Implementing the WASH Strategic Framework	Draft Water Act to operationalise the strategic framework as well as water policy is under preparation.
Creating irrigation policy and strategy framework	IDMP includes formulating strategic framework for irrigated agriculture. IDMP will be providing inputs to formulate the irrigation policy from actual planning practice.
Developing major hydropower	It is out of scope of IDMP. However, then MWRI and then MED have been merged to one ministry, so it is expected that the dam construction and other water sub-sectors will be more intimately interacted.
Monitoring the social and environmental impacts of water resources management	IDMP includes the formulation of a guideline for Environmental and Social Considerations for Irrigation Development.
Generating and adapting complementary knowledge	The issue on knowledge base is being identified in the process of IDMP.
Assessing the water resources integrated catchment planning and water allocation	IDMP is conducting the water resources assessment of the country and the outcome will support the integrated catchment planning. Also the draft Water Act has been providing the structure of water resources management by basin-catchment, namely establishment of Water Resources Management Authority . Basin Water Boards and Catchment / Sub-catchment Committee . Water Users Association
Integrating catchment planning and water allocation	-Ditto-

3. WATER USE AND IRRIGATION SURVEY

Compared to its neighbours, water resources in South Sudan remain underdeveloped, and much of the sparsely existing infrastructure is not efficiently functioning.

3.1 Current Irrigation Situation

Since the commencement of the formulation, RSS members of the IDMP Task Team carried an assessment on the current situation of irrigation farming in the country. It appeared that irrigation schemes are limited and there are a few practices of small-scale pump or bucket/can irrigation for vegetable growing. The result of the Water Use and Irrigation Survey (WUIS) indicated those situations in each state with some figures.

The interviewees of WUIS in seven states answered to the question of current irrigation scheme/ farm. The total number of the reported irrigation schemes/farms is 35. A remarkable point is 23 schemes/farms are raised in Upper Nile, which occupies 66% of the total, though most of them are vegetable growing. The state which reported the second biggest number of irrigation schemes/farms is Unity but the number is decreased to four (11%). Other five states answered only one or two irrigation schemes/farms. The remaining three states, Central and Eastern Equatoria and Jonglei were no answer.

The major managers of the irrigation schemes are farmers and one association is organized in a scheme in WBG. A national scheme and a state-operated scheme are reported in NBG and WBG, respectively. In Warrap, NGO and returnees/ IDP are raised as scheme managers. Most of those irrigation schemes were established after 2006; however, a scheme in NBG was established in 1944, which is considered to be the irrigation scheme in Aweil.

Current Irrigation Situation (1)

State	Current Irrigation Scheme/ Farm		Irrigation Scheme Manager		Beginning Year	Beneficiary		Water Sources for the Irrigation Scheme/ Farm		Other Water Sources for Irrigation		Water Intake Method	Length of Canal/ Pipe m/scheme	Irrigation Methods at the Field			
	number	%				HH number	Area ha										
CE	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EE	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS	2	6	Farmers	-	2007, 2009	1,000	67	Well	-	-	-	Electric pump	-	Flood	Bucket	Can	-
UN	23	66	Farmers	-	-	-	37,319	River	-	Pond	-	Natural	-	Bucket	Hose	Ridge	Flood
US	4	11	Farmers	-	2006 - 2012	7,000	-	-	-	-	-	-	-	-	-	-	-
WS	2	6	NGO	Returnee/IDP	2012	480	1	Well	-	River	-	Foot pump	50	Sprinkler	-	-	-
NBG	1	3	Nation	-	1944	-	1,150	River	-	Hafr	Well	Culvert	2,000	Flood	-	-	-
WBG	2	6	State	Association	2007, 2011	10	433	River	Well	-	-	Hand pump	-	Drip	-	-	-
WE	1	3	Farmers	-	2008	260	1	River	-	Spring	-	Bucket	-	Bucket	Can	-	-
Total	35	100	-	-	1944 -2012	-	-	-	-	-	-	-	-	-	-	-	-

Current Irrigation Situation (2)

State	Major Cultivated Crops in the Irrigation Fields					Tomato				Rice				Unit Yield			
	No.1	No.2	No.3	No.4	No.5	Area sq.m	Season		Price SSP/kg	Area ha	Yield ton	Unit Yield ton/ha	Season		Sorghum ton/ha	Maize ton/ha	Oil crop ton/ha
							Seeding	Harvesting					Seeding	Harvesting			
CE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS	Kale	Spider plant	Jute	Cucumber	Cowpea	-	-	-	-	-	-	-	-	-	-	-	-
UN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS	Tomato	Onion	Rocket	Okra	-	120	Aug	Oct-Feb	15	-	-	-	-	-	-	-	-
NBG	Rice	Sorghum	Maize	Vegetable	Oil crop	-	-	-	-	672	1,000	1.5	May-jul	Nov-Dec	3.6	2.4	1.7
WBG	Tomato	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Current Irrigation Situation (3)

State	Credit Availability			Water Use Association established	Water Quality Problem	Distance from Nearest Town km
	Credit SSP/person	Number of persons	Money Provider			
CE	-	-	-	-	-	-
EE	-	-	-	-	-	-
JS	-	-	-	-	-	-
LS	-	-	-	-	No	2.0
UN	-	-	Gov.	-	No	-
US	-	-	-	-	-	-
WS	-	-	-	2012	-	1.5
NBG	-	-	-	2011	-	6.0
WBG	-	-	-	-	-	-
WE	750	17	NGO	-	Muddy	5.0

Current Irrigation Situation (4)

State	Major Problems of Irrigation for Farmers				
	Starting of Irrigation		Practice of Irrigation		
CE	-	-	-	-	-
EE	-	-	-	-	-
JS	-	-	-	-	-
LS	High initial cost	Lack of skill	High fuel cost	Land tenure system	Topography
UN	-	-	-	-	-
US	-	-	-	-	-
WS	Lack of tools	Lack of spare parts	Insect damage	Poor soil	-
NBG	Shortage of skill	-	Equipment to clear canals	Water control	Water distribution
WBG	-	-	-	-	-
WE	Finding water source	-	Irrigation facilities	Water shortage in Jan-Mar	-

3.2 Proposed Irrigation Development Plan

As proposed irrigation plans, 19 schemes are raised in six states, whereas schemes whose command areas were mentioned are only three. Recommendation reasons for irrigation development can be divided into two types: high needs and advantages. Suitability for lowland rice is raised in Lakes, Warrap and Western Bahr El Ghazal raise the suitability of soil. Warrap also replied their high population is an advantage of irrigation development.

Proposed Irrigation Development Plan (1)

Site	Water Source	Beneficiary Area ha	Land Condition	Soil Type
CE-1	River	600	Grassland	Clay
EE-1	River	-	Grassland	Loam
JS-1	River	-	Cropping field	Black cotton
JS-2	River	-	Cropping field	Black cotton/Sand
JS-3	River	-	Cropping field	Black cotton
JS-4	Canal	-	Cropping field	Black cotton/Sand
JS-5	River	-	Cropping field	Black cotton
LS-1	River	84	Wetland	Clay/Loam
WS-1	River	-	Bush/Grassland	Clay/Sand
WS-2	River	-	Bush	Clay/Sand
WS-3	River	-	Bush/Grassland	Clay/Sand
WS-4	River	-	Bush	Clay/Sand
WS-5	River	-	Bush	Clay/Sand
WS-6	River	-	Bush	Clay/Sand
WS-7	River	-	Bush	Clay/Sand
WS-8	River	-	Bush	Clay/Sand
WS-9	River	-	Bush	Clay/Sand
WS-10	River	-	Bush	Clay/Sand
WBG-1	River	420	-	-
Total	-	1,104	-	-

Proposed Irrigation Development Plan (2)

Site	Reason of the Recommendation					
	High Needs			Advantages		
CE-1	-	-	-	-	-	-
EE-1	Reduce food shortage	Reduce insecurity	-	-	-	-
JS-1	Increase local production	To large scale farming	-	-	-	-
JS-2	Increase local production	To large scale farming	-	-	-	-
JS-3	Increase local production	To large scale farming	-	-	-	-
JS-4	Increase local production	To large scale farming	-	-	-	-
JS-5	Increase local production	To large scale farming	-	-	-	-
LS-1	-	-	-	Suitable for lowland rice	-	-
WS-1	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-2	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-3	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-4	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-5	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-6	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-7	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-8	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-9	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WS-10	Increase agriculture production	Imporve socio-economics	Substituion for imports	Water from seasonal river	Suitability of soil	High population
WBG-1	-	-	-	Near the river	Suitability of soil	-

3.3 Water Purification Plants

The result of WUIS shows that the population who use water from a water purification plants is 5,000 ó 200,000 persons per plant. The maximum is 200,000 beneficiaries in Central Equatoria and the minimum is 5,000 beneficiaries in Jonglei. The lowest basic unit seems 15 ó 20 litre/day/person, whereas the maximum is 100 litre/day/person in Western Bahr El Ghazal. However, the actual water supply seems not to reach the quantity of the basic unit in many plants.

As the problems of water quality in each plant, following points are raised. The next table shows the names of the standards for water quality that are applied in each plant and the assessment in comparison with the standard. It can be gathered from their answers that those plants in Jonglei and Upper Nile have problem of water quality.

- Water contamination by bacteria/ silt
- Chlorine dosing is not conducted regularly
- Certain check is not conducted

Also, following points were raised as general problems.

- The operation of the plant is suspended
- Rehabilitation of the facilities has not implemented for a long time
- The treatment capacity of the plant is small
- Skill of the staff is not enough for the operation of the plant
- Fuel cost for the operation is very high

Water Purification Plant (1)

Site	Water Supplied Population		Basic Unit lit/day/person	Daily Water Supply	
	number	unit		cu.m/day	lit/day/person
CE-1	200,000	persons	-	460	2.3
EE-1	30,000	persons	15.0	62,000	2,066.7
JS-1	5,000	persons	20.0	640	128.0
UN-1	-	-	-	-	-
UN-2	16,980	HH	20.0	4,800	-
US-1	8,064	persons	20.0-80.0	120	14.9
US-2	32,874	persons	20.0-80.0	340	10.3
WBG-1	58,000	persons	100.0	600	10.3
WE-1	82,461	persons	-	-	-

Water Purification Plant (4)

Site	Water Fee									Collector of the Water Fee	Water Source
	Condition	SSP	unit	Condition	SSP	unit	Condition	SSP	unit		
CE-1	1st class	35	/cu.m	2nd class	25	/cu.m	3rd class	15	/cu.m	Urban Water Corporation	River
EE-1	-	0	/cu.m	-	-	-	-	-	-	Related bills have not yet passed.	River
JS-1	Each HH	50	/month	-	-	-	-	-	-	Urban Water Corporation	River
UN-1	3/4" pipe	30	/month	1" pipe	52	/month	-	-	-	Department of Urban Water	River
UN-2	3/4" pipe	30	/month	1" pipe	52	/month	-	-	-	Department of Urban Water	River
US-1	Donkey	5	/cart	-	-	-	-	-	-	Department of Water Supply and Sanitation	-
US-2	Donkey	5	/cart	-	-	-	-	-	-	Department of Water Supply and Sanitation	-
WBG-1	-	5	/cu.m	-	-	-	-	-	-	Urban Water Cooperation	-
WE-1	-	5-10	/cu.m	-	-	-	-	-	-	Water Management Committee	River

Water Purification Plant (3)

Site	Name of the Water Quality Standard	Water Quality in Comparison with the Standard
CE-1	South Sudan Water Standard	Within the standard's range
EE-1	South Sudan Water Standard	-
JS-1	South Sudanese Drinking Water Standard	Natural quality of the Nile
UN-1	-	Quality is not 100% but 70%
UN-2	-	Quality is not 100% but 70%
US-1	The South Sudan Standards	-
US-2	The South Sudan Standards	-
WBG-1	WHO/ South Sudan Standards	Not below the standard
WE-1	WHO Standard	-

3.4 Registered Wells

The number of registered wells that were reported in WUIS is 11,196. The shortest depth of a borehole is 30 meter in Western Bahr El Ghazal and the longest depth of a borehole is 220 meter in Unity. Beneficiaries of a well is about 250 ó 550 persons and the basic unit is 10 ó 60 lit/day/person. If we assume a model whose beneficiaries are 500 and basic unit is 20 lit/day/person, the daily water supply is calculated to 10 cu.m/day.

As for the quality of the underground water, problems are reported in seven states, which are summarized in the next table. Especially, the contamination in Warrap and Western Equatoria seems to be serious, since some indicators are not acceptable to their standards. A household using a well in Lakes pays 5 SSP/month and users of wells in Warrap pay 0.12 SSP/cu.m though there is no information on water fee in other eight states in WUIS.

Registered Wells (1)

Wells/ Logbooks in States	Registered Wells		Borehole Depth m	Power Type of Pump	Water Supplied Population person/well	Basic Unit lit/day/person	Daily Water Supply	
	number	%					cu.m/day	lit/day/person
CE-1	1,728	15	60	Hands	250-500	-	4,000	-
CE-2			60	Hands	250-500	-	4,000	-
CE-3			60	Hands	250-500	-	4,000	-
CE-4			60	Hands	250-500	-	4,000	-
CE-5			60	Hands	250-500	-	4,000	-
CE-6			60	Hands	250-500	-	4,000	-
EE-1	1,386	12	54	Hands	300	17.0-20.0	-	-
EE-2			54	Hands	300	17.0-20.0	-	-
EE-3			54	Hands	300	17.0-20.0	-	-
EE-4			54	Hands	300	17.0-20.0	-	-
EE-5			54	Hands	300	17.0-20.0	-	-
EE-6			54	Hands	300	17.0-20.0	-	-
EE-7			54	Hands	300	17.0-20.0	-	-
EE-8			54	Hands	300	17.0-20.0	-	-
JS-1	803	7	50-100	Hands	500	20.0	10	20.0
JS-2			50-100	Hands	85,349	20.0	1,707	20.0
JS-3			50-100	Hands	65,588	20.0	1,312	20.0
JS-4			50-100	Hands	139,282	20.0	2,786	20.0
JS-5			50-100	Hands	178,519	20.0	3,570	20.0
JS-6			50-100	Hands	108,674	20.0	2,173	20.0
JS-7			50-100	Hands	136,210	20.0	2,724	20.0
JS-8			50-100	Hands	148,475	20.0	2,970	20.0
JS-9			50-100	Hands	99,068	20.0	1,981	20.0
JS-10			50-100	Hands	110,130	20.0	2,203	20.0
JS-11			50-100	Hands	66,201	20.0	1,324	20.0
LS-1	1,602	14	63	Hands	500	40.0	-	-
LS-2			63	Hands	500	40.0	-	-
LS-3			63	Hands	500	40.0	-	-
LS-4			63	Hands	500	40.0	-	-
LS-5			63	Hands	500	40.0	-	-
LS-6			63	Hands	500	40.0	-	-
LS-7			63	Hands	500	40.0	-	-
LS-8			63	Hands	500	40.0	-	-
UN-1	723	6	70	Hands	250-300	15.0	136	-
UN-2			73	Hands	250-300	15.0	136	-
UN-3			104	Hands	250-300	15.0	136	-
US-1	689	6	40-220	Hands	300-500	-	-	-
US-2			40-220	Hands	300-500	-	-	-
WS	1,957	17	65	Hands	500	10.0	10	20.0
NBG	1,255	11	-	Hands	300	40.0-60.0	50	166.7
WBG-1	760	7	30	Hands	439	-	-	-
WBG-2			45	Hands	439	-	-	-
WBG-3			45	Hands	439	-	-	-
WE-1	293	3	65-90	Hands	548	20.0	-	-
WE-2			65-90	Hands	548	20.0	-	-
Total	11,196	100	-	Hands	-	-	-	-

Registered Wells (2)

Wells/ Logbooks in States	Problems of the Water Quality			
CE-1	High content of iron and nitrate	-	-	-
CE-2	-	-	-	-
CE-3	-	-	-	-
CE-4	-	-	-	-
CE-5	-	-	-	-
CE-6	-	-	-	-
EE-1	High content of salinity	Turbidity and odor	-	-
EE-2	High content of salinity	Turbidity and odor	-	-
EE-3	High content of salinity	Turbidity and odor	-	-
EE-4	High content of salinity	Turbidity and odor	-	-
EE-5	High content of salinity	Turbidity and odor	-	-
EE-6	High content of salinity	Turbidity and odor	-	-
EE-7	High content of salinity	Turbidity and odor	-	-
EE-8	High content of salinity	Turbidity and odor	-	-
JS-1	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-2	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-3	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-4	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-5	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-6	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-7	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-8	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-9	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-10	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
JS-11	Yellowish water	Contamination by toilet	Contamination of water source	Contamination by animal breeding
LS-1	High content of iron	-	-	-
LS-2	High content of iron	-	-	-
LS-3	High content of iron	-	-	-
LS-4	High content of iron	-	-	-
LS-5	High content of iron	-	-	-
LS-6	High content of iron	-	-	-
LS-7	High content of iron	-	-	-
LS-8	High content of iron	-	-	-
UN-1	None	-	-	-
UN-2	None	-	-	-
UN-3	None	-	-	-
US-1	-	-	-	-
US-2	-	-	-	-
WS	Turbidity by gravel-digging	Bad hygiene of containers	Contamination by latrine	-
NBG	None	-	-	-
WBG-1	High content of coliform	Contamination by laterite rocks	-	-
WBG-2	High content of coliform	Contamination by laterite rocks	-	-
WBG-3	High content of coliform	Contamination by laterite rocks	-	-
WE-1	Contamination by latrine	-	-	-
WE-2	Contamination by latrine	-	-	-

Annex-1: Policy and Institutional Framework in Relation to Water Sector and Irrigation Subsector

Registered Wells (3)

Wells/ Logbooks in States	Name/ Contents of the Water Quality Standard	Water Quality in Comparison with the Standard	Water Fee	
			SSP	unit
CE-1	WHO Standard	-	-	-
CE-2	WHO Standard	-	-	-
CE-3	WHO Standard	-	-	-
CE-4	WHO Standard	-	-	-
CE-5	WHO Standard	-	-	-
CE-6	WHO Standard	-	-	-
EE-1	-	-	-	-
EE-2	-	-	-	-
EE-3	-	-	-	-
EE-4	-	-	-	-
EE-5	-	-	-	-
EE-6	-	-	-	-
EE-7	-	-	-	-
EE-8	-	-	-	-
JS-1	South Sudan Standard	Acceptable	-	-
JS-2	South Sudan Standard	Acceptable	-	-
JS-3	South Sudan Standard	Acceptable	-	-
JS-4	South Sudan Standard	Acceptable	-	-
JS-5	South Sudan Standard	Acceptable	-	-
JS-6	South Sudan Standard	Acceptable	-	-
JS-7	South Sudan Standard	Acceptable	-	-
JS-8	South Sudan Standard	Acceptable	-	-
JS-9	South Sudan Standard	Acceptable	-	-
JS-10	South Sudan Standard	Acceptable	-	-
JS-11	South Sudan Standard	Acceptable	-	-
LS-1	WHO/ South Sudan Standard	-	5.00	/HH/month
LS-2	WHO/ South Sudan Standard	-	5.00	-
LS-3	WHO/ South Sudan Standard	-	5.00	-
LS-4	WHO/ South Sudan Standard	-	5.00	-
LS-5	WHO/ South Sudan Standard	-	5.00	-
LS-6	WHO/ South Sudan Standard	-	5.00	-
LS-7	WHO/ South Sudan Standard	-	5.00	-
LS-8	WHO/ South Sudan Standard	-	5.00	-
UN-1	WHO/ South Sudan Standard	Acceptable	-	-
UN-2	WHO/ South Sudan Standard	Acceptable	-	-
UN-3	WHO/ South Sudan Standard	Acceptable	-	-
US-1	-	-	-	-
US-2	-	-	-	-
WS	pH, Turbidity, EC	Some indicators are high	0.12	/cu.m
NBG	-	-	-	-
WBG-1	WHO Standard	Acceptable	-	-
WBG-2	South Sudan Standard	Acceptable	-	-
WBG-3	South Sudan Standard	Acceptable	-	-
WE-1	MWRI Standard	Not all points are safe for drinking	-	-
WE-2	MWRI Standard	-	-	-

3.5 Water Conveyance in Towns

We can see water is conveyed in all ten states though water conveyance trucks are used in only five states; bikes and donkeys carry water in other states. Their daily water supply is estimated around 200 ó 500 cu.m/day/area. However, the water often has problems on the quality. Contamination by bacteria/ detergent or high content of salinity/ iron/ laterite is reported.

Water Conveyance in Towns (1)

State	Registered Number			Water Volume litter/time			Daily Water Supply cu.m/day	Problems of the Water Quality		
	Truck	Donkey	Bike	Truck	Donkey	Bike				
CE	694	-	160	-	-	-	200-300	Not clean	Sometimes no chlorine	-
EE	-	-	-	5,000-8,000	200-400	100-120	-	High content of salinity	Turbidity and odor	Purification plant is suspended
JS	4	-	36	2,862	-	160	197	Contamination by bacteria	Contamination by detergent	-
LS	-	-	-	-	-	-	-	High content of iron	-	-
UN	-	-	-	-	200-400	120	-	River water without treatment	-	-
US	-	120	-	-	-	-	-	-	-	-
WS	-	-	300	-	-	240	504	Problem of hygiene and sanitation	-	-
NBG	-	-	-	-	240-480	200	-	Polution of barrel/ jerry can	-	-
WBG	2	150	-	-	-	-	-	High content of coliform	Contamination by laterite rocks	-
WE	2	-	250-300	2,000	-	120	-	Contamination by latrine	-	-

Water Conveyance in Towns (2)

State	Name/ Contents of the Water Quality Standard	Water Quality in Comparison with the Standard	Water Fee			
			SSP	/unit	SSP	/unit
CE	-	Poor	2.00	jerry can	-	-
EE	South Sudan Standard	-	-	-	-	-
JS	No standard	Natural quality of river water	-	-	-	-
LS	WHO/ South Sudan Standard	Acceptable	5.00	cu.m	-	-
UN	South Sudan Standard	Acceptable	-	-	-	-
US	-	-	-	-	-	-
WS	pH, Turbidity, EC	Some results show higher	0.04	cu.m	-	-
NBG	-	-	5.00	cu.m	-	-
WBG	South Sudan Standard	Increase of coliform/ iron	20-48	cu.m	-	-
WE	MWRI Standard	-	1.00	jerry can	10.00	barrel

3.6 Other Water Sources for Domestic Water

People who cannot take necessary water through taps/ wells/ conveyors take water directly from rivers/ ponds/ haffirs/ swamps/ springs. Originally, a haffir is a small pond for livestock but it seems that haffirs also important water sources for human domestic water in Eastern Equatoria, Jonglei, Upper Nile and Northern Bahr El Ghazal.

Other Sources for Domestic Water

State	Other than Water Supply, Wells and Water Conveyance				
	River	Pond	Hafir	Swamp	Spring
CE	-	-	-	-	-
EE	River	Pond	Hafir	Swamp	Spring
JS	-	Pond	Hafir	Swamp	-
LS	River	-	-	-	-
UN	River	Pond	Hafir	-	-
US	-	-	-	-	-
WS	River	Pond	-	-	-
NBG	River	-	Hafir	-	-
WBG	River	-	-	-	-
WE	River	-	-	-	Spring

3.7 Water Use in Livestock

The situations of stockbreeding are very different in each state. More than 50 percent of the cattle are bred in Lakes. More than 30 percent of the sheep and the goats are bred in Eastern Equatoria. It is considered that the differences of geographical conditions caused a great variety of farming styles, which appears in the livestock population.

Water Use in Livestock

State	Number of Animals						Water Consumption litter/day			Hafir					Constructed year	Capacity cu.m/hafir	
	Cattle		Sheep		Goat		Cattle	Sheep	Goat	Number			Period of Water				
	no.	%	no.	%	no.	%				existing	u/c	total	from	until			month
CE	1,648	0.0	1,226,236	9.6	785,736	4.8	-	-	-	-	-	0	-	-	-	-	-
EE	2,500,000	8.1	4,200,000	32.9	5,200,000	31.9	-	-	-	3	2	5	May	Jan	9	2009	-
JS	2,674,555	8.7	349,860	2.7	1,718,328	10.5	40	8	8	3	-	3	May	Dec	7	2010/2012	30,000-40,000
LS	15,490,000	50.2	330,000	2.6	418,000	2.6	15	5	5	1	-	1	-	-	-	2011	-
UN	2,400,000	7.8	1,800,000	14.1	2,000,000	12.3	20-30	4-6	4-6	6	-	6	Jun	Feb	9	2012	-
US	2,400,000	7.8	1,500,000	11.8	1,700,000	10.4	-	-	-	1	-	1	-	-	-	-	-
WS	2,500,000	8.1	600,000	4.7	2,191,000	13.4	20	5	5	-	2	2	-	-	-	-	-
NBG	1,500,000	4.9	1,800,000	14.1	1,300,000	8.0	50	6	6	1	-	1	Jul	Jan	6	2007	-
WBG	1,200,000	3.9	850,000	6.7	660,000	4.1	25-30	8-10	4-6	-	-	0	-	-	-	-	-
WE	191,295	0.6	107,796	0.8	317,056	1.9	15-20	5-7	6-8	-	-	0	-	-	-	-	-
Total	30,857,498	100.0	12,763,892	100.0	16,290,120	100.0	-	-	-	15	4	19	-	-	-	-	-

3.8 Water Use in Inland Fishing

States which have fishponds are only three but total 22 thousand fishermen are reported in eight states. About 60 percent of the fishermen make a living in Northern Bahr El Ghazal. Fishermen form fishing camps. 159 camps are reported only in Central Equatoria. They also organize fishery associations. 65 associations are registered only in Lakes.

Water Use in Inland Fishing

State	Fishpond					Other Water Source for Fishing				Fishermen				Registered	
	No.	Water Source	Built Year	Designed Capacity		River	Swamp	Lake	/camp	fishermen		camp no.	Association no.	Company no.	
				Max.cu.m	Min.cu.m					/state	%				
CE	2	River/Spring	2006/2011	750.0	337.5	River	-	-	11	1,750	7.9	159	15	1	
EE	-	-	-	-	-	-	Swamp	-	20	1,515	6.9	76	0	0	
JS	-	-	-	-	-	-	River	Swamp	200	3,500	15.8	18	3	2	
LS	-	-	-	-	-	-	River	-	30	150	0.7	5	65	3	
UN	3	River	2001	9.0	4.5	River	Swamp	Pond	12	84	0.4	7	2	0	
US	-	-	-	-	-	-	River	-	more 20	-	-	-	0	0	
WS	-	-	-	-	-	-	River	Swamp	5	150	0.7	30	5	0	
NBG	-	-	-	-	-	-	River	Swamp	370	12,950	58.6	35	3	0	
WBG	-	-	-	-	-	-	River	-	50-60	2,000	9.1	-	7	-	
WE	12	Spring	2004-2012	240.0/150.0	160.0/100.0	River	Swamp	Pond	-	-	-	-	9	-	
Total	17	-	-	-	-	-	-	-	-	22,099	100.0	-	109	6	

3.9 Water Use in Industry and Mining

Six states answered in the questions of the water use in industry and mining of WUIS though Northern Bahr El Ghazal only provided information on the water source. The maximum water volume for industry and mining is reported at 90 cu.m/day in Jonglei. The water use in Central Equatoria is 10 cu.m/day; however, the current demand is estimated at 100 cu.m/day in rainy season and 200 cu.m/day in dry season.

Jonglei has high prospects for the future demand of water in the industrial sector since it is considered that the population will grow a lot and urbanization will be progressed. In terms of water quality, contamination by oil is reported in Unity, whereas three states replied that the water quality was

acceptable, compared to their water quality standards. The water sources in Lakes and NBG are wells and other states take the water from rivers for the industrial use.

Water Use in Industry and Mining (1)

State	Water Volume cu.m/day	Water Quality Problem	Name of the Water Quality Standard	Water Quality in Comparison with the Standard	Water Fee		Water Source
					SSP/month	collector	
CE	10.0	-	-	-	-	Urban Water Corporation	River
EE	-	-	-	-	-	-	-
JS	90.0	None	South Sudan Water Standard	Acceptable	0	-	River
LS	4.8	None	-	Acceptable	2,600	Tax Office, MoF	Well
UN	-	-	-	-	-	-	-
US	-	-	South Sudan Standard	Contaminated by oil	0	-	River
WS	-	-	-	-	-	-	-
NBG	-	-	-	-	-	-	Well
WBG	-	-	WHO Standard	Acceptable	-	Urban Water Supply	River
WE	-	-	-	-	-	-	-
Total	104.8	-	-	-	-	-	-

Water Use in Industry and Mining (2)

State	Water Demand cu.m/day		Prospect for Future Demand
	Rainy	Dry	
CE	100.0	200.0	-
EE	-	-	-
JS	-	-	High demand as population/urbanization growth
LS	low	high	-
UN	-	-	-
US	-	-	-
WS	-	-	-
NBG	-	-	-
WBG	-	-	-
WE	-	-	-

3.10 Water for Hydropower Plans

According to the result of WUIS, six hydropower plants in five states are reported as proposed plans. Though five plans, other than the plan in Eastern Equatoria, seem not to be materialized, we can see five plans include construction of dams. The planned dams in Eastern Equatoria and Western Bahr El Ghazal are multipurpose; domestic water and irrigation water are also provided from the dams, respectively.

Water for Hydropower Plans

Proposed Hydropower Plant	Water Demand for Hydropower cu.m/sec	Plan Includes Dam?	Type of Dam	Other Purpose of Dam	Construction Cost thousand \$
CE-1	-	Yes	Concrete	-	-
CE-2	-	Yes	Concrete	-	-
EE-1	2.1	Yes	Rock fill	Domestic	27,983
WS-1	-	Yes	-	-	-
NBG-1	-	No	-	-	-
WBG-1	-	Yes	Concrete	Irrigation	-

3.11 National Parks/Game Reserves

National Parks / Game Reserves (1)

National Parks / Game Reserves	In Charge of Environmental Issues		Area sq.km	Protection Guidance		
	Directorate of/ Council	Ministry of				
CE-1	-	Environment	60	-	-	-
EE-1	Environment	Wild Life	410	Act 2003	-	-
EE-2	Environment	Wild Life	22,800	Act 2003	-	-
EE-3	Environment	Wild Life	8,400	Act 2003	-	-
EE-4	Environment	Wild Life	1,200	Act 2003	-	-
JS-1	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-2	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-3	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-4	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-5	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-6	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
JS-7	Housing	Physical Infrastructure	-	No fire	No cutting	No enter/dog
LS-1	Public Health	Health	23,000	Act 2003	No human activities	-
LS-2	Public Health	Health	620	Act 2003	No human activities	-
UN-1	Community and Public Health	Health	-	Avoide random killing	No enter	-
UN-2	Community and Public Health	Health	-	Avoide random killing	No enter	-
UN-3	Community and Public Health	Health	-	Avoide random killing	No enter	-
UN-4	Community and Public Health	Health	-	Avoide random killing	No enter	-
US-1	Environment	Environment and Natural Resources	-	-	-	-
WS-1	Town Councils	Health	23,000	Act 2003	Review 2010	-
NBG-1	Wildlife Conservation and Tourism	Wildlife Conservation and Tourism	-	Soldier protection	-	-
WBG-1	-	Health	-	-	-	-
WE-1	Environment	Agriculture, Cooperative and Environment	-	Avoide random killing	-	-
WE-2	Environment	Agriculture, Cooperative and Environment	-	Avoide random killing	-	-

National Parks / Game Reserves (2)

National Parks / Game Reserves	Key Species of Animals															
CE-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EE-1	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	Buffalo	-	-	-	Oryx	-	-	Hyena
EE-2	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	Buffalo	-	-	-	Oryx	-	-	Hyena
EE-3	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	Buffalo	-	-	-	Oryx	-	-	Hyena
EE-4	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	Buffalo	-	-	-	Oryx	-	-	Hyena
JS-1	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-2	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-3	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-4	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-5	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-6	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
JS-7	Lion	-	-	-	Elephant	Giraffe	-	Zebra	Buffalo	Gazelle	-	-	-	-	-	-
LS-1	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	-	-	Antelope	Sitatunga	-	-	Kudu	Hyena
LS-2	Lion	-	Leopard	Cheetah	Elephant	Giraffe	-	-	-	-	Antelope	Sitatunga	-	-	Kudu	Hyena
UN-1	Lion	-	-	-	Elephant	-	Rhino	-	Buffalo	-	-	-	-	-	-	Hippo
UN-2	Lion	-	-	-	Elephant	-	Rhino	-	Buffalo	-	-	-	-	-	-	Hippo
UN-3	Lion	-	-	-	Elephant	-	Rhino	-	Buffalo	-	-	-	-	-	-	Hippo
UN-4	Lion	-	-	-	Elephant	-	Rhino	-	Buffalo	-	-	-	-	-	-	Hippo
US-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS-1	-	-	-	-	Elephant	Giraffe	Rhino	-	Buffalo	-	-	Bushbuck	-	-	-	Hippo
NBG-1	Lion	Tiger	-	-	Elephant	Giraffe	-	-	Buffalo	-	-	-	Deer	Wolf	-	-
WBG-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WE-1	-	-	-	-	Elephant	-	Rhino	-	Buffalo	Gazelle	-	-	-	-	-	Hippo
WE-2	-	-	-	-	Elephant	-	Rhino	-	Buffalo	Gazelle	-	-	-	-	-	Hippo

Total 24 national parks/game reserves were reported in the ten states. The biggest national parks, whose area is about 23 thousand sq. km, are located in Lakes, Warrap and Eastern Equatoria. As for issues of degrading land in parks/ reserves, over grazing of livestock is reported in Central and Eastern Equatoria. Also, pollution by chemical fertilizer is reported in Upper Nile.

National Parks / Game Reserves (3)

National Parks / Game Reserves	Issues of Degrading Land
CE-1	Over grazing
EE-1	Over grazing
EE-2	Over grazing
EE-3	Over grazing
EE-4	Over grazing
JS-1	-
JS-2	-
JS-3	-
JS-4	-
JS-5	-
JS-6	-
JS-7	-
LS-1	-
LS-2	-
UN-1	Pollution by chmical fertilizer
UN-2	Pollution by chmical fertilizer
UN-3	Pollution by chmical fertilizer
UN-4	Pollution by chmical fertilizer
US-1	-
WS-1	-
NBG-1	-
WBG-1	-
WE-1	-
WE-2	-

3.12 Waterborne Diseases and Water Clogging

Eight states replied to the question of waterborne diseases. The disease that was answered most within the eight states as common waterborne diseases is typhoid fever. The second most answered diseases are cholera and Guinea worm. The third diseases are bilharziasis and hookworm disease. Meanwhile, the question of water clogging places was also asked in each state since those places were considered to be easy to break out the disease. The result of the question is indicated in the last column. Water clogging seems to be heavy, especially in Lakes and Unity.

Waterborne Diseases and Water Clogging

State	Common Waterborne Diseases							Water Clogging place
CE	-	Cholera	-	Typhoid	Guinea worm	-	-	-
EE	-	-	-	Typhoid	Guinea worm	Hookworm	-	-
JS	-	-	-	-	-	-	-	-
LS	-	-	-	Typhoid	-	-	-	Whole state
UN	Malaria	Cholera	Bilharziasis	Typhoid	-	-	-	-
US	Malaria	Cholera	-	Typhoid	Guinea worm	-	Amebiasis	5 counties
WS	-	-	-	-	-	-	-	-
NBG	-	Cholera	Bilharziasis	-	-	Hookworm	Amebiasis	Aweil Centre
WBG	-	-	Bilharziasis	-	Guinea worm	-	-	Wau
WE	-	-	-	Typhoid	-	Hookworm	-	-

Water Navigation

State	Major Ports no.	Major Navigation Route depth > 1.2m
CE	2	Juba - Mongala
EE	1	Nimule - Moyo, Uganda
JS	3	Bor - Fangak
LS	1	-
UN	6	-
US	5	-
WS	1	-
NBG	0	-
WBG	1	Wau - Denakok
WE	0	-
Total	20	-

3.13 Water Navigation

20 river ports are raised in eight states with four major navigation routes, whose depth of the water is more than 1.2 meter. The purpose of this item was to grasp the situation of the river flow and the water transportation. States which have plural major ports along the Nile are Upper Nile, Unity, Jonglei and Central Equatoria.

3.14 Social Issues on Water

In WUIS, the current issues/conflicts on water were asked to related officers in water sector of each state. Their answers were gathered into three conflicts as follows. Abbreviated designations of the states whose officers raised the issues/conflicts are indicated after each answer.

a) Conflict between farmers and pastoralists

- Problems between farmers and cattle keepers (LS, UN, WE)
- Big number of cattle from Sudan (UN)
- Cattle and goats eat crops (WS)
- Fighting over feeding of animals (CE)
- Farmers are not allowed pastoralists to keep cattle around their farms/ to use their water points (JS)

- Conflict between famers and pastoralists due to shortage of water (WBG)
- Pastoralists look for water but few water points (WS)
- Conflict between farmers and pastoralists around water points (NBG)

b) Conflict among farmers

- Conflict on water points among farmers (EE, LS)
- Lack of clear drinking water (WS)
- Many people take water from one point (UN)
- Low yield of water and shortage of points (WBG, WE)
- Displacement was caused by fighting over water (CE)
- Fighting over withered crops between upstream and downstream (CE)

c) Other conflicts

- Militia comes from Sudan and loot grass, water, cattle, etc. (NBG, US)
- Women suffer from taking water from a distance (UN)

Social Issues on Water (1)

State	Common Conflicts Related to Water (1)	
CE	-	Fighting over feeding of animals
EE	-	-
JS	Farmers are not allowed pastoralists to keep cattle around their farms	Famers are not allowed pastoralists to use their water points
LS	-	Problems between farmers and pastoralists
UN	Big number of cattle from Sudan	Problems between farmers and cattle keepers
US	-	-
WS	Cattle and goats eat crops	Partoralists look for water but few water points
NBG	-	Conflict between farmers and pastoralists around water points
WBG	-	Conflict between famers and pastoralists due to shortage of water
WE	-	Conflict between famers and pastoralists
Total	-	-

Social Issues on Water (2)

State	Common Conflicts Related to Water (2)	
CE	-	-
EE	-	-
JS	-	-
LS	-	-
UN	-	Women suffer from taking water from a distance
US	Militia come from Sudan and rob farmers of their possessions	-
WS	-	-
NBG	Militia come from Sudan and loot grass, water, cattle, etc.	-
WBG	-	-
WE	-	-
Total	-	-

Social Issues on Water (3)

State	Common Conflicts Related to Water (3)		Proportion of Male/ Female Role (%)					
			Land Owner		Drawing Water		Land Preparation	
			Male	Female	Male	Female	Male	Female
CE	Displacement caused by fighting over water	Fighting over withered crops between upstream and downstream	90	10	5	95	25	75
EE	Conflict on water points among farmers	-	75	25	10	90	50	50
JS	-	-	90	10	5	95	50	50
LS	Conflict around water points	-	75	25	95	5	80	20
UN	Many people take water from one point	-	80	20	5	95	40	60
US	-	-	95	5	15	85	90	10
WS	Lack of clear drinking water	-	75	25	99	1	50	50
NBG	-	-	80	20	10	90	85	15
WBG	Low yeild of water and shortage of points	-	80	20	-	-	50	50
WE	Conflict around water points due to water shortage	-	-	-	-	-	-	-
Total	-	-	82	18	31	70	58	42

3.15 Processing of Agricultural Products

Typical processing ways of agricultural produce are threshing, milling/ polishing and baking. Those raw materials are sorghum, maize, sesame and rice. Groundnut is raised only in a processing facility in Western Equatoria. The processing of groundnut is not so major in comparison with sorghum or maize but the paste making and the oil extracting seem to be conducted widely.

Processing of Agricultural Products

Processing Facilities	Major Raw Materials					Type of Processing				Tendency of Processing Volume
CE-1	-	-	-	-	-	Milling	-	-	-	No change
CE-2	-	-	-	-	-	Milling	-	-	-	No change
EE-1	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-2	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-3	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-4	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-5	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-6	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-7	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
EE-8	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-1	Sorghum	Maize	-	-	-	Milling	-	-	-	Decrease
JS-2	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-3	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-4	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-5	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-6	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-7	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-8	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-9	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-10	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
JS-11	Sorghum	Maize	-	-	-	Milling	-	-	-	Increase
LS-1	Sorghum	Maize	-	Rice	-	Milling	Baking	Threshing	Polishing	Increase
LS-2	Sorghum	Maize	-	Rice	-	Milling	Baking	Threshing	Polishing	-
UN-1	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-2	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-3	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-4	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-5	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-6	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-7	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-8	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-9	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
UN-10	Sorghum	Maize	Sesame	-	-	Milling	Baking	-	-	No change
WE-1	Sorghum	Maize	-	Rice	Groundnut	Milling	Baking	Threshing	Polishing	Increase

3.16 Distribution of Major Agricultural Products

Almost all cereals and beans markets open every day, whereas one of markets in Central Equatoria opens two days a week and markets in Warrap open one day a week. The crops that were chosen as a major crop in each market are shown in the table. Sorghum is the most chosen crop in the survey. The second crop is maize and the third one is groundnut. Rice is raised in four markets in three states, Eastern Equatoria, Lakes and Northern Bahr El Ghazal.

General tendencies in dealing amount in each market are described in the last column. On the other hand, tendencies in dealing amount of some crops in some markets are indicated by colours. Also, a market in Northern Bahr El Ghazal and a market in Western Bahr El Ghazal provide information on dealing amount of their major crops.

Distribution of Major Agricultural Products (1)

Major Marketplace	Open Days days/month	Serial and Bean Produce								Tendency in Dealing Amount
CE-1	-	-	-	-	-	-	-	-	-	-
CE-2	8	-	Maize	-	-	-	-	-	-	-
CE-3	30	-	-	-	-	Groundnut	-	-	-	Fluctuating
EE-1	30	Sorghum	Maize	Beans	-	-	Rice	-	-	Fluctuating
EE-2	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-3	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-4	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-5	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-6	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-7	30	Sorghum	Maize	Beans	-	-	-	-	-	-
EE-8	30	Sorghum	Maize	Beans	-	-	-	-	-	-
JS-1	30	-	-	-	-	-	-	-	-	-
JS-2	30	-	-	-	-	-	-	-	-	-
JS-3	30	-	-	-	-	-	-	-	-	-
JS-4	30	-	-	-	-	-	-	-	-	-
JS-5	30	-	-	-	-	-	-	-	-	-
JS-6	30	-	-	-	-	-	-	-	-	-
JS-7	30	-	-	-	-	-	-	-	-	-
JS-8	30	-	-	-	-	-	-	-	-	-
JS-9	30	-	-	-	-	-	-	-	-	-
JS-10	30	-	-	-	-	-	-	-	-	-
JS-11	30	-	-	-	-	-	-	-	-	-
LS-1	30	Sorghum	Maize	-	-	Groundnut	Rice	Barley	Amaranthus	-
LS-2	30	Sorghum	Maize	-	-	Groundnut	Rice	Barley	Amaranthus	-
LS-3	30	Sorghum	-	-	-	-	-	-	-	-
LS-4	30	Sorghum	-	-	-	-	-	-	-	-
LS-5	30	Sorghum	-	-	-	-	-	-	-	-
LS-6	30	Sorghum	-	-	-	-	-	-	-	-
LS-7	30	Sorghum	-	-	-	-	-	-	-	-
LS-8	30	Sorghum	-	-	-	-	-	-	-	-
UN-1	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-2	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-3	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-4	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-5	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-6	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-7	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-8	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
UN-9	30	Sorghum	Maize	Beans	Sesame	Groundnut	-	-	-	High demand less supply
WS-1	4	Sorghum	-	-	-	-	-	-	-	Fluctuating
WS-2	4	Sorghum	-	-	-	-	-	-	-	Fluctuating
WS-3	4	Sorghum	-	-	-	-	-	-	-	Fluctuating
WS-4	4	Sorghum	-	-	-	Groundnut	-	-	-	Fluctuating
WS-5	4	Sorghum	-	-	-	Groundnut	-	-	-	Fluctuating
WS-6	4	Sorghum	-	-	-	Groundnut	-	-	-	Fluctuating
WS-7	-	-	-	-	-	-	-	-	-	-
NBG-1	30	Sorghum	Maize	-	-	Groundnut	Rice	-	-	-
	Dealing Amount	10-15 t/day	10-15 t/day	-	-	5-7 t/month	7-10 t/day	-	-	-
NBG-2	30	Sorghum	Maize	-	-	Groundnut	Rice	-	-	-
NBG-3	30	-	-	-	-	-	-	-	-	-
NBG-4	30	-	-	-	-	-	-	-	-	-
NBG-5	30	-	-	-	-	-	-	-	-	-
WBG-1	30	Sorghum	-	-	-	Groundnut	-	-	-	-
WBG-2	30	-	-	-	Sesame	-	-	-	-	-
	Dealing Amount	-	-	-	5 kg/day	-	-	-	-	-
WE-1	-	-	-	-	-	-	-	-	-	-
WE-2	-	-	-	-	-	-	-	-	-	-

Legend: Tendency in the dealing amount of each product

: Increasing
 : Decreasing

Annex-1: Policy and Institutional Framework in Relation to Water Sector and Irrigation Subsector

Distribution of Major Agricultural Products (2)																
Major Marketplace	Open Days days/month	Vegetable and Fruit Produce														Tendency in Dealing Amount
CE-1	30	-	-	Tomato	-	-	-	-	-	-	-	-	-	-	-	-
CE-2	-	-	-	-	-	-	-	Onion	-	Rocket	Jute	Kale	-	-	-	-
CE-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EE-1	30	-	-	Tomato	Okra	-	Cassava	Onion	Eggplant	Rocket	Jute	Kale	-	-	-	-
EE-2	30	-	-	Tomato	Okra	-	Cassava	Onion	Eggplant	Rocket	Jute	Kale	-	-	-	-
EE-3	30	-	-	Tomato	Okra	-	Cassava	Onion	Eggplant	Rocket	Jute	Kale	-	-	-	-
EE-4	30	-	-	-	Okra	-	Cassava	Onion	-	-	-	-	-	-	-	-
EE-5	30	-	-	Tomato	Okra	-	Cassava	Onion	Eggplant	Rocket	Jute	Kale	-	-	-	-
EE-6	30	-	-	-	Okra	-	Cassava	Onion	-	-	-	-	-	-	-	-
EE-7	30	-	-	-	Okra	-	Cassava	Onion	-	-	-	-	-	-	-	-
EE-8	30	-	-	-	Okra	-	Cassava	Onion	-	-	-	-	-	-	-	-
JS-1	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-2	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-3	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-4	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-5	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-6	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-7	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-8	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-9	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-10	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JS-11	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS-1	30	-	-	-	-	Okra	-	Onion	-	Rocket	Jute	Kale	Pumpkin	-	-	-
LS-2	30	-	-	-	-	Okra	-	Onion	-	Rocket	Jute	Kale	Pumpkin	-	-	-
LS-3	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Decrease
LS-4	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Decrease
LS-5	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Decrease
LS-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UN-1	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-2	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-3	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-4	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-5	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-6	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-7	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-8	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
UN-9	30	Guava	Lemon	Tomato	Okra	Sweet potato	-	-	-	-	-	-	-	-	-	-
WS-1	30	-	-	Tomato	-	-	-	-	-	Rocket	Jute	-	-	-	Mango	No change
WS-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS-6	30	-	-	Tomato	-	-	-	-	-	Rocket	Jute	-	-	-	Mango	No change
WS-7	30	-	-	Tomato	-	-	-	-	-	Rocket	Jute	-	-	-	Mango	No change
NBG-1	30	-	-	Tomato	Okra	-	-	-	-	-	-	-	Pumpkin	Watermelon	-	-
	Dealing Amount	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NBG-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NBG-3	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NBG-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NBG-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WBG-1	30	-	-	Tomato	Okra	-	Cassava	-	-	-	-	-	-	Watermelon	-	-
WBG-2	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dealing Amount	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WE-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WE-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend: Tendency in the dealing amount of each product
 : Increasing
 : Decreasing

Distribution of Major Agricultural Products (3)

Major Marketplace	Other Cash Products							Tendency in Dealing Amount
	Open Days days/month	Product						
CE-1	-	-	-	-	-	-	-	-
CE-2	-	-	-	-	-	-	-	-
CE-3	-	-	-	-	-	-	-	-
EE-1	-	-	-	-	-	-	-	-
EE-2	-	-	-	-	-	-	-	-
EE-3	-	-	-	-	-	-	-	-
EE-4	-	-	-	-	-	-	-	-
EE-5	-	-	-	-	-	-	-	-
EE-6	-	-	-	-	-	-	-	-
EE-7	-	-	-	-	-	-	-	-
EE-8	-	-	-	-	-	-	-	-
JS-1	-	-	-	-	-	-	-	-
JS-2	-	-	-	-	-	-	-	-
JS-3	-	-	-	-	-	-	-	-
JS-4	-	-	-	-	-	-	-	-
JS-5	-	-	-	-	-	-	-	-
JS-6	-	-	-	-	-	-	-	-
JS-7	-	-	-	-	-	-	-	-
JS-8	-	-	-	-	-	-	-	-
JS-9	-	-	-	-	-	-	-	-
JS-10	-	-	-	-	-	-	-	-
JS-11	-	-	-	-	-	-	-	-
LS-1	-	-	-	-	-	-	-	-
LS-2	-	-	-	-	-	-	-	-
LS-3	-	-	-	-	-	-	-	-
LS-4	-	-	-	-	-	-	-	-
LS-5	-	-	-	-	-	-	-	-
LS-6	-	-	-	-	-	-	-	-
LS-7	-	-	-	-	-	-	-	-
LS-8	-	-	-	-	-	-	-	-
UN-1	-	-	-	-	-	-	-	-
UN-2	-	-	-	-	-	-	-	-
UN-3	-	-	-	-	-	-	-	-
UN-4	-	-	-	-	-	-	-	-
UN-5	-	-	-	-	-	-	-	-
UN-6	-	-	-	-	-	-	-	-
UN-7	-	-	-	-	-	-	-	-
UN-8	-	-	-	-	-	-	-	-
UN-9	-	-	-	-	-	-	-	-
WS-1	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-2	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-3	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-4	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-5	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-6	4	Charcoal	Milk	Livestock	-	-	-	Fluctuation
WS-7	-	-	-	-	-	-	-	-
NBG-1	-	-	-	-	-	-	-	-
	Dealing Amount	-	-	-	-	-	-	-
NBG-2	-	-	-	-	-	-	-	-
NBG-3	-	-	-	-	-	-	-	-
NBG-4	-	-	-	-	Gum acacia	-	-	-
NBG-5	-	-	-	-	-	-	-	-
WBG-1	-	-	-	-	-	-	-	-
WBG-2	30	-	-	-	-	Pepper	Hibiscus	-
	Dealing Amount	-	-	-	-	5 kg/day	5 kg/day	-
WE-1	4	-	-	-	-	-	-	Increase
WE-2	4	-	-	-	-	-	-	Increase

Legend: Tendency in the dealing amount of each product

: Increasing
 : Decreasing

3.17 Agriculture Projects in Private Sector

Existing activities of agricultural projects in private sector are summarized to farming, stockbreeding, forestry, aquaculture, irrigation, marketing and purchasing. The target crops of the projects include sesame, sunflower and groundnut. They are widely cultivated in the whole country and cooking oil can be extracted from them.

Agriculture Projects in Private Sector (1)

State	Name of the Project	Activities of the Project					
CE	-	Plow for farmers	Buy cereals from farmers	-	-	-	-
EE	Plan of timber making	-	Selection of teaks	Cut	Sawing	Transport	-
JS-1	Mama Rebecca Niandeng Agriculture	-	Cultivation	Harvesting	Storing	Transport	Marketing
JS-2	Purap Progressive Farmers	-	Cultivation	Harvesting	Storing	Transport	Marketing
LS	Makernhom Women Farmers Group	Vegetable growing	-	-	-	-	-
UN	Commercial farming	Flowing land	Cultivation	Harvesting	Storing	-	Marketing
WS-1	Aglo Community for Development Committee	Agriculture	Fruit growing	Crossbreeding	-	-	-
WS-2	Ngoth Farming Multipurpose Cooperative Group	Large scale farming	Agro-based enterprise	Small holder irrigation	Poultry rearing	Aquaculture	-
WS-3	Teresa Multipurpose Cooperative	Investment in agriculture	Cultivation	Supplying fruits, vegetables, milk	Poultry rearing	Aquaculture	-
NBG-1	Toch Chol	Rain-fed farming	-	-	-	-	-
NBG-2	Dang	Rain-fed farming	-	-	-	-	-
NBG-3	Gok Anour	Rain-fed farming	-	-	-	-	-
Average	-	-	-	-	-	-	-

Agriculture Projects in Private Sector (2)

State	Target Crops										Sales Price of Sorghum		Organization		
	Yield unit										SSP	unit	Type	Established Year	Staff no.
CE	-	-	-	-	-	-	-	-	-	-	-	-	Company	-	-
EE	Teak	-	-	-	-	-	-	-	-	-	-	-	Company	2012	-
JS-1	Sorghum 90.0 ton	-	-	-	-	-	-	-	-	-	1,800,000	/year	Company	2011	-
JS-2	Sorghum 30.0 ton	-	-	-	-	-	-	-	-	-	600,000	/year	Association	2009	25
LS	Sorghum	Maize	-	-	Groundnut	Beans	-	Vegetables	-	-	-	-	Association	2009	5
UN	Sorghum	-	Sesame	Sunflower	Groundnut	Guar	-	-	-	-	480-500	/90kg	Association	2012	-
WS-1	Sorghum	Maize	-	-	Groundnut	-	Cassava	-	-	-	-	-	NGO	2008	35
WS-2	-	-	-	-	-	-	-	Vegetables	Fruits	Cash crops	-	-	NGO	2011	-
WS-3	Sorghum	Maize	-	-	Groundnut	-	Cassava	-	-	-	-	-	NGO	2012	-
NBG-1	Sorghum 1.5 ton/fed	Maize 1.0 ton/fed	-	-	Groundnut 0.7 ton/fed	-	Cassava	Vegetables	-	-	-	-	Association	-	-
NBG-2	Sorghum 1.5 ton/fed	Maize 1.0 ton/fed	-	-	Groundnut 0.7 ton/fed	-	-	Vegetables	-	-	-	-	Association	-	-
NBG-3	Sorghum 1.5 ton/fed	Maize 1.0 ton/fed	-	-	Groundnut 0.7 ton/fed	-	-	Vegetables	-	-	-	-	Association	-	-
Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22

Agriculture Projects in Private Sector (3)

State	Type	Investor				
		Nationality	Invest in	Type	Nationality	Invest in
CE	-	-	-	-	-	-
EE	Investors partnered with the State	Kenya	-	-	-	-
JS-1	-	-	-	-	-	-
JS-2	-	-	-	-	-	-
LS	Local farmers in the village	RSS	-	NGO	-	-
UN	Company	German	Gum acasia	Company	Sudan	Sorghum, Rice
WS-1	-	-	-	-	-	-
WS-2	-	-	-	-	-	-
WS-3	-	-	-	-	-	-
NBG-1	-	RSS	-	-	-	-
NBG-2	-	RSS	-	-	-	-
NBG-3	-	RSS	-	-	-	-
Average	-	-	-	-	-	-

4. LESSONS FROM THE IRRIGATION PRACTICES OF OTHER COUNTRIES

IDMP TT collected relevant information and documentation from countries of the region and obtained study reports by multilateral development agencies for which narratives are provided below.

4.1 The Challenge of Organizational Reforms -The Case of Gezira Irrigation Scheme

Established in 1925, the Gezira scheme was a clear scenario of land use transformation through tenancy and share cropping. There were indigenous farming communities, the Funj, who were controlling water for agricultural production in the area. The British then brought irrigation system and agreed with them in such a way that the farm plot is to be divided into four quarters. In rotation, one of them used to be cultivated with cotton for Lancashire Factories in Britain; the 2nd with cereals and the 3rd with legumes, both for the farmer; and the fourth left fallow.

4.1.1 Overview

After independence of the Sudan, the 880,000 ha Gezira Scheme became one of the largest irrigation projects in the world under a single management. Operated under the management of the Government's Sudan Gezira Board (SGB) the scheme can not only contribute 3 to 4 percent to the national GDP but also generate considerable employment. On the other hand, the Gezira, with its controlled rotations and requirements to grow fixed quantities of cotton, performed poorly despite considerable central government budget support. Yields, cropping intensities, and irrigation efficiencies were chronically low, operation and maintenance (O&M) were poorly executed, and cost recovery for water delivery and O&M was weak. While the government wrote off the Scheme's and farmers' debts in 1982 and 1992, accumulated debt rose again to USD 95 million in 2008.

4.1.2 New Gezira Act

In response to weak performance and unsustainable budget support, the Ministry of Finance and National Economy (MoFNE) launched a review of Gezira's management in 1999. After a year of analysis, a joint Government/World Bank report recommended a reform program which was followed by four years of debate among all stakeholders and, eventually, the adoption by Parliament of a new Gezira Act in July 2005. On the basis of worldwide evidence of Water Users' Associations (WUAs) as efficient water management institutions at the farm level and a successful pilot in Gezira, the Act gives greater responsibility to WUAs and reduced responsibilities to the Ministry of Irrigation and Water Resources (MIWR) and the SGB for water management within the Scheme. The Act also guarantees free crop choice for farmers, transfers titles and tradable long-term leases to farmers (replacing previous short term land rental arrangements), substitutes farmers' credit accounts with the SGB with commercial banking, privatizes railways, ginneries and workshops, and refocuses the SGB's responsibilities four areas: (a) Agricultural research, (b) Technology transfer, (c) Market information services and (d) Farmer training.

The Act requires that, before responsibility for the minor canals is handed over to the WUAs, the canals be rehabilitated by the MIWR. The Ministry is also required to establish a separate department for Gezira to foster the reforms. Implementation of the full and integrated package of reforms is expected to lead to substantial improvements in the Scheme's efficiency, productivity, farm incomes and employment, as well as lower government budget allocations.

4.1.3 Implementation Achieved

Freedom of crop choice, payment upon delivery of cotton to ginneries, and credit from the

Agricultural Bank and private commercial banks are now a reality and have led to substantial crop diversification and higher incomes in response to market demand. Some 1,575 WUAs have been established. In November 2009, under the direction of the Board of Directors, the SGB terminated (with compensation provided by the government) 2,500 employees whose roles were no longer consistent with the future responsibilities of the SGB. This action was based on an MDTF-funded study. The World Bank assisted in drafting legal agreements for water purchases and water management.

4.1.4 Implementation not Achieved

The MIWR retains management responsibility for the Sennar dam and main canals and has taken back the responsibility for O&M of the minor and tertiary canals, which it performed ineffectively for many years in the past before being relieved of that responsibility by the SGB. The MIWR has also not established a department for Gezira. Its annual budget is devoted to O&M and not to the rehabilitation of minor canals. As a result, the management of the minor canals has not been transferred to WUAs. Training of WUA managers was not started because it needed coordination with the transfer of water management to the WUAs. Land policy issues have not yet been resolved.

4.1.5 Time for Leadership and Action

The Board of Directors of the Gezira Scheme is responsible for implementing the new Gezira Act and should be commended for taking action to reduce SGB staff numbers. It now needs to ensure that the SGB trains WUAs and brings the SGB, WUAs, and researchers together to verify that free crop choice is not exercised at the cost of spreading crop diseases and parasites. The Board has been unable to ensure that the MIWR fulfils its responsibilities for integrated reform under the Act and it may need support from MoFNE to monitor that the MIWR budget is used for rehabilitation of minor canals as well as O&M. The Gezira Farmers' Union supports the reform program but it should confirm that the majority of farmers support the program. The Union also needs to convince SGB that (after training) farmers will be ready to manage WUAs, in contrast to MIWR contention that farmers are incapable of managing WUAs. Finally, SGB Board of Directors should complete implementation of the full Gezira Act package. If it fails, a high level Commission could be formed to complete the task with the aim of preventing the collapse of a USD 4 ó 6 billion Scheme that has the potential for large and efficient production and employment growth.

4.2 A Success Story of a Public Large-scale Irrigation Scheme -The Case of Office du Niger¹

Faced with a similar challenge, the Office du Niger in Mali shows an experience that is in sharp contrast with the Gezira Scheme. The Office du Niger (ON) in Mali is one of the oldest and largest smallholder irrigation schemes in Sub-Saharan Africa. When development of the scheme began in 1932, it was intended to cover 1 million hectares over 50 years. By 1982, however, only 60,000 hectares had been developed, of which a large part had been abandoned due to poor maintenance and operation. Cotton production had ceased and average paddy yields had slumped to 1.6 t/ha.

However, attempts to rehabilitate the scheme proved successful when physical investments to improve water security were matched with institutional reforms. An impressive turn round has been achieved: In addition to the 50,000 hectares that were still in use at the time, about 10,000 hectares of previously abandoned land was reclaimed and put to productive use. Paddy yields have risen to 6 t/ha while O&M recovery has reached 97 percent.

¹ Source Aw and Dejou 1996; Coulture et al, 2002; AW and Diemer, 2005

These results are attributable to a combination of factors, including:

- Irrigation system improvement and modernization
- Improved water control and management
- Adoption of improved technologies such as high-yielding varieties, fertilizers and improved husbandry practises
- Liberalization of paddy marketing and processing, facilitated by an improved macro-economic climate
- Improved land tenure security
- Institutional restructuring, including: privatization of most commercial functions, contracting out maintenance works to the private sector, downsizing the management agency and its concentration on its core activities of bulk water supply, land administration and agricultural extension
- Participatory approaches that engage farmers in management decisions , eg on O&M fees

The long-term commitment of government and managers and the sustained support of external development partners underpin this success. The work at Office du Niger is, however, not yet complete. There is more to be done on strengthening farmer organizations, improving land tenure security and making the agency more accountable to farmers.

Examples of successful public investment in large-scale irrigation are few, owing to top down planning, shaky economies and institutional failure. To succeed, such projects require transparent, accountable, efficient and financially self-sustaining institutions. The Mali Office du Niger is a good example of the impact of comprehensive but gradual institutional reforms. The programme achieved a turn round from a dirigiste approach to one that is more service-oriented and which, by combining selective investment in hardware and institutional change, has produced impressive results. One reason for success of Office du Niger was that institutional reforms were introduced gradually, thus allowing time for overcoming resistance to change while providing an opportunity for adjustment, adaptation, and fine-tuning.

4.3 Prospects for Smallholder Irrigation Potential in South Sudan

Based on the selected success stories in sub-Sahara Africa, public promotion of small to medium-scale schemes is receiving increasing attention with emphasis being on transferring over irrigation management to farmers.

4.3.1 Justification

In the past, irrigation development in Sub-Saharan Africa countries was often perceived in terms of large-scale irrigation schemes which were developed and managed by public agencies (Sudan, Mali, Madagascar, Kenya and Nigeria). The main argument in support of smallholder irrigation development is based on its potential to considerably enhance a household's food security, income and livelihoods. The following examples of successful investment in small-holder irrigation projects serve to illustrate the potential impact of irrigation on rural communities.

4.3.2 Examples of Successful Investment in Small-holder Irrigation Projects

(1) Tanzania Participatory Irrigation Development Project²

² Source: IFAD, 2007: Agricultural water development for poverty reduction in Eastern and Southern Africa. Rome (Draft

Tanzania Participatory Irrigation Development Project entailed development of small-scale community-based rice schemes which were supplied through run-of-the-river water diversions. Typically, implementation costs were low (USD 1,070/ha) and the project realized a rate of return of 22 per cent while increasing farm incomes by 86 per cent.

As a result, households were able to construct better quality housing, acquire agricultural and household assets, access health services and finance children's education. In four representative sub-project areas (totalling 400 ha), ownership of ox carts and cattle increased considerably, the number of grinding mills rose from two to 12 and the number of shops grew from two to 74.

(2) Maunganidze Irrigation Scheme in Zimbabwe³

Positive results were also achieved by irrigator households at EU-funded smallholder Maunganidze Irrigation Scheme in Zimbabwe. Not only did incomes among participants increase by 200 percent but a previous food deficit was transformed into a food surplus. Farmers' own investment in new housing and in water and sanitation were the most obvious signs of improved livelihoods. Within the Project area, traders reported increased sales of agricultural inputs, groceries and building materials. New grinding mills were established as well as workshops for manufacturing farming equipment such as ox carts. Prior to the project, there was no other significant source of income in the area in spite of an existing excellent access road. It was clear that the discernable changes could only be associated with the onset of the irrigation scheme.

(3) The Ethiopian Social Rehabilitation and Development Fund⁴

The Ethiopian Social Rehabilitation and Development Fund supported construction of earthen dams and river diversions for supplying water to community-based irrigation projects. The lives of the 40,000 participating households were visibly improved in terms of increased incomes as demonstrated by purchases of new household assets such as water pumps, milk cows and radios as well as regular schooling for children.

(4) Agricultural Development Programme in Kano State in Nigeria⁵

With the installation of upstream storage reservoirs in 1970s, farmers in Kano State in Nigeria could no longer use shadoufs to lift water on to their fields that were located on the river flood plains (Fadamas). A few farmers responded by buying small pump-sets which they used to pump irrigation water from shallow wells into their fields. Shallow wells were unintended consequence of increased ground water recharge by recently installed upstream reservoirs. Taking a cue from these individual farmer initiatives, the government in 1982-83 supported an Agricultural Development Programme based in Kano, which sold over 2,000 pumps for cash to individuals or small farmer-groups. Subsequently, Programme engineers introduced a technology from India, which reduced well construction by two thirds with commensurate increase in investment returns. Farmers were responsible for operation and maintenance, with the latter being done by local technicians. However, external monitoring was necessary to avoid depletion of the newly developed aquifer.

report on component study for Collaborative Programme)

³ Source: IFAD, 2007.

⁴ Source: World Bank, 2002a:

⁵ Source: FAO 2001; Smallholder Irrigation technology: Prospects for Sub-Saharan Africa

(5) Irrigation Schemes in Senegal⁶

In Senegal, farmers found that they could no longer easily access flood recession fields along the riverside. With the aim of stabilizing production of rice (which is their staple food), the farmers constructed small village irrigation schemes of 20 hectares or less along the Senegal River. Each scheme usually comprise 40 ó 80 plots of equal size and was supplied from an open channel system fed by 15kW (20 hp) engine pump from the river.

The process entailed farmers investing their labour in clearing bush and digging canals. They then requested assistance from the local government irrigation agency for provision of a pump-set, pipes, site survey, and equipment for helping to lay out the plots. At first, government staff resisted the farmers' initiatives because there were plans for implementing large-scale irrigation schemes in the area. However, a presidential decree directed that the farmers' requests be fulfilled. The result was that in 15 years, at least 700 schemes were built. Infrastructure on the scheme is co-owned by farmers, with irrigation water being provided on an agreed rotation basis. Scheme members are responsible for meeting pump operation and maintenance costs as well as other parts of the irrigation infrastructure. Some of the factors that make these schemes work include:

- Construction through investment of labour by farmers, albeit using donor funded equipment.
- Pursuit of a clear objective i.e food security
- Full autonomy for each village scheme (hydraulically, operationally and managerially)

(6) Niger Pilot Private Irrigation Project, Phase 1⁷

The Niger Pilot Private Irrigation Project, Phase 1 aimed at supporting market-driven investment by individual smallholders in low-cost technology. In this regard, the project identified and disseminated a variety of manual and small-scale mechanized irrigation pumps. These pumps were planned to draw irrigation water from shallow tube-wells which were dug with financial support from the Bank. The result was a doubling of the cultivated area and an overall economic rate of return of 68 percent.

(7) Private Irrigation Promotion Project (PIP2) in Niger⁸

On the basis of lessons learnt from the initial project, The World Bank supported the second phase of the Private Irrigation Promotion Project (PIP2) in Niger. As was the case in the first phase, the Project was designed, among other things, to advance the Government of Niger's agricultural growth.

In formulating the project, the Government of Niger and the Bank jointly again decided to emphasize the role of the private sector and to favour small-scale schemes with individual farm size being less than 10 ha (median=1.5 ha) rather than large scale irrigation schemes. The Bank provided financial support for farmers to acquire improved low-cost water technologies (tube-wells and manual or motorized pumps), variety of irrigation technique, training as well as improved production packages. The funding arrangements were based on a farmer contributing 20% and the Bank 80% for acquisition of physical irrigation facilities. A special concession was, however, given to marginalised groups such as women and the very poor who obtained a 100% grant. Some 30,826 farmers participated in the

⁶ Source: Diemer and Huibers, 1996

⁷ Source: World Bank 2002b: Niger Pilot Private Irrigation Project; Implementation Completion Report.

⁸ Source: The World Bank, 2009; Private Irrigation Promotion Project (PIP2); Implementation Completion and Results Report

project and were involved in irrigated production of onions, pepper, tomatoes and rice. The project was implemented in 6 years between 2002 and 2007.

At completion year, benefits arising from the project were evaluated as illustrated by the following key indicators:

- The overall ERR amounted to 24%
- The area under onion increased by 420% from 828 ha to 3,481ha, while mean onion yield rose from 18.2 tonnes/ha to 34.8 tonnes/ha
- The area under rice expanded by 688% from 180 ha to 1,240 ha while rice yield rose from 2.36 tonnes/ha to 3.65 tonnes/ha

As result of the project, the national irrigated area increased by 5,491 ha equivalent to 7% of the 80,000 ha prior to the Project. Beneficiary farmers achieved increased incomes that were 1.5 to 3 times compared to the average revenue in Niger. Consumption at the household level, was noted to have improved by an average of 10 percent.

(8) Micro-Irrigation Pump Promotion Project (MIPP) in Kenya and Tanzania⁹

In Kenya and Tanzania, DFID supported 'Micro-Irrigation Pump Promotion Project (MIPP)' that created a demand and a supply chain for water treadle pumps. The private sector was then able to manufacture and distribute the pumps at a profit but still at a price that was affordable to farmers.

(9) Zimbabwe Pilot Market Linkage Project¹⁰

Under the IFAD funded Zimbabwe Pilot Market Linkage Project, an NGO facilitated the establishment of growers associations who would grow irrigated crops under contract for sale to a local canning factory. IFAD supported each growers association to establish a collectively owned shallow well and irrigation pump-set which they used to irrigate contract crops for the canning factory but also grain maize in the summer for home consumption and local sale. With an assured market and reliable ground water supplies, farmers were willing to risk investing in inputs for which they were rewarded with higher crop yields as well as a 265 percent increase in farm incomes.

(10) Zimbabwe Chitota Small Irrigation Scheme¹¹

At Chitora, Zimbabwe, a small irrigation scheme of only 9 hectares, with drag-hose sprinklers and an electric pump-set, is one of the most successful irrigation schemes in the country. In operation since 1994, it is run by a group of young people, aged 22 to 27 years, who were without jobs and were dependent on their parents. The 18 young people accepted an offer of irrigation support from Agritex, the government irrigation development agency, which provided the drag-hose, sprinklers, all inputs for the first growing season and training on the use of sprinklers as well as general crop husbandry. The cropping programme is based on high value horticultural crops which are in demand on the outskirts of Harare. Individual farmers' income averages Z\$ 60,000 per year, compared with Z\$16,800 for unskilled labour in Harare City. Hence, the young farmers see no reason to migrate into the towns.

Farmers were involved at every stage of scheme development from planning to implementation and

⁹ Source:IFAD, 2007: Agricultural water development for poverty reduction in Eastern and Southern Africa. Rome (Draft report on component study for Collaborative Programme)

¹⁰ - Ditto -

¹¹ Source: FAO 2001; Smallholder Irrigation technology: Prospects for Sub-Saharan Africa. International Programme for Technology and Research in Irrigation and Drainage; Knowledge Synthesis Report no 3

now have full responsibility for operation and maintenance. The scheme is entirely farmer-managed through a set of by-laws enforced by an elected irrigation management committee that is responsible for coordinating all scheme activities including payment of bills for electricity, maintenance work, monthly subscriptions by members, discipline in the scheme and re-allocation of plots. However, farmers continue to receive occasional extension support from Agritex. The successful performance of the scheme is the result of the farmers' strong sense of ownership as well as the significant income benefits that they get.

4.4 A Collaborative Study by AfDB, IFAD, IWMI, FAO and WB

In the 'Rapid Water Sector Needs Assessment and a Way Forward (Jan. 2013)' by the World Bank, a study of 'Costs and Performance of Irrigation Projects: A Comparison of Sub-Saharan Africa and Other Developing Regions (Inocencio, et al. 2007)' has been introduced as a collaborative work of five donors: the African Development Bank (AfDB), the International Fund for Agricultural Development (IFAD), the International Water Management Institute (IWMI), the Food and Agriculture Organization (FAO), and the World Bank.

The Study collected data from 31 projects in six (6) developing regions of the world including 45 projects from 19 countries in Sub-Saharan Africa. A total of 52 variables were documented on the basis of project completion reports and corresponding project appraisal documents. This study found that unit investment cost is an important determinant of the economic internal rate of return (EIRR) and that Sub-Saharan Africa projects with higher unit investment costs tend to have lower EIRR. The Study also found that the probability of failure is higher in Sub-Saharan Africa than in all other regions. The share of successful projects in Sub-Saharan Africa is 56 percent, while in all other regions with the exception of Southeast Asia the share is more than 70 percent.

Table 4.4.1 shows the average unit investment cost for successful and failed projects in Sub-Saharan Africa estimated by the study. The Study indicates the very high unit costs of failure projects compared to successful ones. The average unit costs of the failure projects are more than four (4) times of the successful ones. The study concluded that the extraordinarily high cost of failed projects causes the overall average unit total cost to be higher in Sub-Saharan Africa than in other regions.

Table 4.4.1 Average Irrigation Project Unit Costs for Sub-Saharan Africa (USD/ha in 2000 Prices)

	New Construction		Rehabilitation	
	Unit Total Cost	Unit Hardware Cost	Unit Total Cost	Unit Hardware Cost
Success Projects	5,726	3,335	3,488	2,160
Failure Projects	23,184	17,364	16,366	9,475

Note: Success projects = an economic internal rate of return (EIRR)>10%; failure projects = EIRR<10%. Total cost is all irrigated-related investment including 'soft' components such as engineering and supervision, agriculture support, institution building, but not nonirrigation-related costs such as power generation or other nonirrigation infrastructure. Hardware cost is total costs less software costs.

Adopted from The World Bank, Rapid Water Sector Needs Assessment and a Way Forward (Jan. 2013)

Table 4.4.2 Most Significant Factors Found to Influence the Unit Cost of Investment and the Performance of Irrigation Projects in Sub-Saharan Africa

Project Components	Factor	Unit Cost	EIRR
Size	Project size	↓	↑
	Average size of subsystem or subproject	↑	↓
Implementation	Cost overrun	↑	↓
	Irrigated area underrun		
	GNP per capita		
Design	% of soft components	↓	↓
	Source of water		↓

	New and rehabilitation	↑	↓
Objectives	Integrated Rural Development Project components	↓	↑
	Crop and farming system	↓	↑

Adopted from The World Bank, Rapid Water Sector Needs Assessment and a Way Forward (Jan. 2013)

Table 4.4.2 shows the 10 most statistically significant variables of the set of 52 variables that affect unit investment cost and project success, analyzed by the Study. As an interesting result, the Study notes that the two variables among the 52 that most relate to ownership of a scheme by the beneficiaries— farmer contribution to the funding of the project and farmer scheme management— do not have a statistically significant effect on either unit investment cost or project success. However, the WB Report adds the remarks that “this analysis has more to do with how one structures a project or programme, including how it would be implemented and the selection of components and investments, than it does with how one formulates and designs individual schemes.”

4.5 Conclusion

As a concluding summary of the lessons learned from the study in other countries, it can be said that the best performing irrigation projects of recent years tend to have the following characteristics:

- Market driven investments by individual smallholder farmers with low-cost technology
- Small-scale community managed irrigation schemes
- Large-scale irrigation with transparent, accountable, efficient and financially self-sustaining institutions (e.g. Office du Niger).
- Unit costs of failure projects tend to be extraordinary high compared to successful ones especially in Sub-Saharan Africa. It indicates the need of careful decision for large-scale investment.

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THE REPUBLIC OF SOUTH SUDAN

MINISTRY OF ELECTRICITY, DAMS, IRRIGATION & WATER RESOURCES



WATER SECTOR

IRRIGATION DEVELOPMENT MASTER PLAN

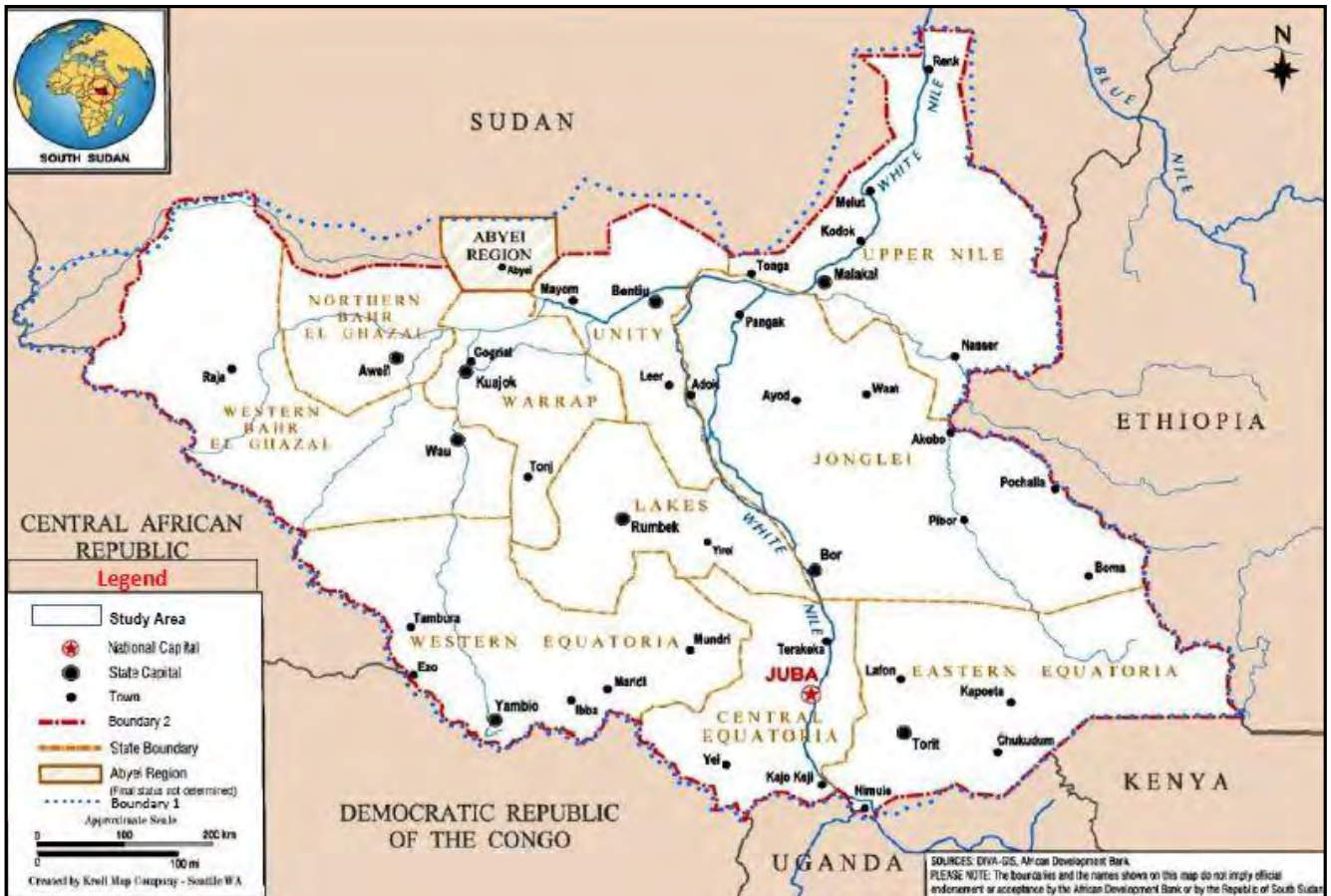
(FINAL REPORT)

ANNEX 2: EXISTING IRRIGATION SCHEMES

NOVEMBER 2015

THE PROJECT FOR IRRIGATION DEVELOPMENT MASTER PLAN IN THE REPUBLIC OF SOUTH SUDAN (RSS) LOCATION MAP

Map of the Republic of South Sudan



Location Map: Adopted from African Development Bank

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ANNEX 2: EXISTING IRRIGATION SCHEMES

Annex 2 describes the feature of existing irrigation schemes in South Sudan, particularly the Aweil Irrigation Rice Scheme (AIRS) in Northern Bahr el-Ghazal State, which depends on floods and Northern Upper Nile Irrigation Schemes (NUNIS) in Upper Nile State that depend on pumping from river intakes. IDMP-TT carried out the field visits to these two existing irrigation schemes, which are the only ones of medium-large scale in South Sudan. For Upper Nile Irrigation Schemes, the outline of the visit is recorded in Annex 2-1. The detail results of the field visit to AIRS are attached as Annexes 2-2 and 2-3.

1. HISTORY OF IRRIGATION DEVELOPMENT IN SOUTH SUDAN

1.1 General

Irrigation schemes development in South Sudan started in the middle of the 20th Century during the British colonial area. The major irrigation schemes developed in this time are the Aweil Irrigation Rice Scheme (AIRS) and Northern Upper Nile Irrigation Schemes (NUNIS). Also Mongalla-Gemmeiza sugar plantation was a planned large-scale irrigation scheme. According to a study, "Natural Resources and Development Potential in the Southern Provinces of the Sudan", carried out just before the independence of Sudan in 1954 reported the already operated pump irrigation schemes for growing cotton between Geigar and Gelhak in the Northern Upper Nile and also the large-scale commercial sugar plantation in the Mongalla-Gemmeiza area was under investigation at that time.

The operation and implementation of those irrigation schemes had been suspended during the civil unrest. To date, Mongalla-Gemmeiza sugar plantation has been abandoned and no concrete schedule yet for revitalization of its activities. Pump stations in the Northern Upper Nile have not been operated due to either incompleteness of necessary rehabilitation or high operation cost; and farmers there are cultivating small-scale farmlands mainly by rain-fed. AIRS has been reactivated with the assistance of EU and execution by GIZ IS from 2007 and handed it over in 2012, though there are a lot of issues to fully operate the scheme in sustainable manner. The government efforts since 2010, to rectify some of the technical and management problems for efficient and effective functioning of the scheme were not completed; and the right direction for this important irrigation development scheme will be provided by IDMP formulation.

The above study in 1954 also reported the practice of small-scale irrigation by the inhabitants. The report describes that the natural flush occurred during the rainy season used to be utilized for grazing land, but there were inhabitants who were attempting to efficiently control the water for crop production. The report picked up a case of Imatong section and Lango section of Latuka tribe as a traditional irrigation practice (see box below). There could have been such irrigation practices in the country.

Irrigation to have been practiced in South Sudan (Natural Resources and Development Potential in the Southern Provinces of the Sudan, 1954, the Southern Development Investigation Team)

An outstanding exception is found in the upper valley of River Koss between the Imatong and Dongatona mountains. ... The Imatong section of Latuka tribe dig ditches from the several perennial stream running down from the Imatong mountains and irrigate by seepage small fields of millet and maize. A more ambitious engineering scheme is carried out by the Lango section of the Latuka. Near Logoforok, the River Koss is a sandy-bedded torrent with an almost perennial flow and a bed width of 10 to 15 m, and is flanked by a strip of fertile, loamy soil on its right bank. At the end of March the Lango build a dam of brushwood and earth which, in the early April spates, raises the level of the water sufficiently for it to spill over the banks on to the fertile strip. Lower down, a similar dam is built which, after the failure of the first, diverts water into an irrigation ditch running diagonally away from the river along a low ridge, probably an old river channel, and thence on to fields. Both

dams fail at high flood, but by then their purpose of enabling the crop of maize and millet to germinate and begin growth before the heavy rains has been achieved. Three crops instead of two are thus raised. The time spent in building the dams is only one day, and for the large number of tribesmen concerned it is a social occasion as much as a constructive effort.+(114 Page)

The study in 1954 also reported the number of potential irrigation development sites as summarized in the box below, though most of the potentials have not been utilized yet. Among them, the report mentions the possible dam construction site known in the Mbili near Wau City on the River Swe, one of the main tributaries of River Jur. Feasibility Study on this potential dam site was carried out by the assistance of Egyptian Government in 2011, but there is no fund earmarked so far to put this study into implementation.

Irrigation Potential cited by “Natural Resources and Development Potential in the Southern Provinces of the Sudan, 1954”

- Between Geigar and Gelhak, where rapid development of pump schemes growing Egyptian cotton is already taking place, there is an additional estimated irrigable area of 26,300 feddan.
- Between Gelhak and Melut there is an estimated total irrigable area of 66,400 feddan, though no development has so far taken place.
- Between Melut and Malakal the total estimated irrigable area is 40,450 feddans; provision of drainage is likely to prove the main problem.
- Small-scale irrigation schemes in the Green Belt and mountain areas for coffee, tea and other high value crop may be possible.
- Irrigation schemes in the deltas of the eastern torrents are worth investigation.
- Naturally flooded toich lands offer considerable possibilities for cultivation of swamp rice, particularly in Bahr El Ghazal.
- One potential large-scale scheme is on the Eastern Plain, where a main canal leaving the Bahr El Jebel at Gemmeiza could command millions of feddan north of Pengko. Another large-scale irrigation project may be possible in the Machar Marshes, which might be canalized and fed from the River Baro and from smaller streams from the Ethiopian hills.
- Ignoring agricultural and economic considerations, the topography alone might well be found suitable for irrigating further areas on the River Sobat, the lower Bahr El Zeraf, the Bahr El Arab, River Pibor, and the Bahr El Jebel between Mongalla and the swamps.
- 50% of the water of the Bahr El Jebel is lost in the Sudd and a further 25% between Malakal and Aswan. A given quantity of water at Juba could therefore be used at least eight times more effectively for irrigation at Juba than in the northern deserts. Owing to the enormous losses in the Bahr El Ghazal, the waters of its tributaries could be used 170 times more efficiently at Wau than in the northern deserts.
- Eastern Plain: (Bahr el-Jebel at Gemmeiza) With perennial command at Pengko, there are millions of land to the north-west, north-east which would present no topographical obstacles to the layout of a very large irrigation scheme.
- Western Plain: Irrigation possibilities by gravity on the left bank of the Bahr el-Jebel are not so obvious but they nevertheless exist.
- Other possible irrigation development sites: River Kinyeti in the Imatong-Acholi horseshoe south of Torit, possibly at Iliu, the River Slingaita in the Didinga hills above Kapoeta, Rivers Kurun, Akoobo and Gila, and Kinyeti.
- Even without storage it should be possible to construct small gravity irrigation schemes on the torrents debouching on to the Eastern Plains (contour basins have been successful).
- River Yei has a very low flow during the crucial dry months of Jan. to Mar. The number of irrigable area is limited, but it is probably well worth a thorough search for them and also for a dam site to impound for dry season use some of the 1 . 6 milliards of water passing Mundri in normal year.
- There is little doubt that in the plains an extension of the hafir programme south of its present limit (north of the Sobat . Bahr El Ghazal . Bahr El Arab line) would prove successful. It is probable that hafirs would be of greater benefit if they were combined with earth dams on the borad, shallow, winding khors of which there are so many hundreds of kilometers, or if combined with banked-off internal drainage schemes in the area of creeping flow.

1.2 Aweil Irrigation Rice Scheme (AIRS)

The Aweil Irrigation Rice Scheme (AIRS) is located just to the north of the town of Aweil in Northern Bahr el-Ghazal State. Paddy production in AIRS was initiated in 1945 by the British Colonial Government District Commissioner as a prison farm with the size of four (4) feddan in the flood plains of river Lol (known locally as toich). By 1947 the rice production area was extended to 21 ha (50 feddan). In 1953, the scheme was taken over by the Sudanese Government Ministry of Agriculture and Forestry and expanded to cover an area of 210 ha (500 feddan). Flood control dikes and a number of basins to enclose the irrigable areas had been built since 1961 covering a total area of 11,000 feddan (4,600 ha).

In 1974, UNDP agreed to provide US\$ 2 million to reorganize AIRS and FAO conducted a feasibility study. The project was aimed at improved mechanized rice production in a pilot area of 550 ha (1,300 feddan). In 1978, the European Economic Community (EEC) approved funding for the development of 4,600 ha (11,000 feddan). It is estimated that 1,100 ha (2,700 feddan) have been levelled and provided with water management structures before the war broke out again in 1983 which in effect closed down the project. From 1983 to 2005 the Scheme was left to disrepair.

After the Comprehensive Peace Agreement (CPA) in 2005, under the Sudan Productive Capacity Recovery Programme (SPCRP) funded by EU the then Ministry of Agriculture and Forestry signed an agreement with GIZ IS to implement the Aweil Irrigation Rehabilitation Project (AIRP) from 2007 with provision of machineries and rehabilitation of three (3) basins totalling to 1,150 ha (2,700 feddan). The project was handed over to the Scheme management, which is under MAFCRD of the National Government in October 2012. In March 2013, Aweil Rice Farmers Cooperative Society Limited was officially established. The cooperation between the Scheme management and the Cooperative will be expected to improve the rice production and marketing.

Table 1.2.1 History of Aweil Irrigation Rice Scheme (AIRS)

Year	Event
1945	British Government Colonial Administration initiated the scheme with 4 feddan.
1947	Rice production area was extended to 21 ha (50 feddan).
1953	Scheme was taken over by the Sudanese Government: 210 ha (500 feddan).
1961-69	Flood protection dikes were built to enclose 4,600ha (11,000 feddan).
1974-78	FAO / UNDP Aweil Rice Project / Land Development Project aimed at 550 ha (1,300 feddan) with improved water control.
1979-83	EEC Aweil Rice Development Project was implemented. Area under fully controlled water management was extended to around 1,100 ha (around 2,700 feddan).
1983	The Scheme was closed due to the civil unrest in 1983 and the plan of expanding the cultivated area to 2,240 ha (5,330 feddan) was not realized.
2007 - 2012	EU / GIZ Aweil Irrigation Rehabilitation Project was implemented. 3 basins (No.7, 8 and 9) with a total of 1,150 ha (2,700 feddan) were rehabilitated.
2012-13	495 ha (1,178 feddan) were allocated to 562 farmers. Some private farmers are also cultivating in basin 15.

Adopted from Kaindi (2009), Jacobsen (2011), and AIRS Annual Report 2012-2013, also interviews to AIRS by IEMP-TT

In 2010 MWRI carried out assessments, surveys and designs to modify water delivery and control infrastructure configuration. Besides, preliminary management structure worked out then by the scheme rehabilitation taskforce, before demobilising, GIZ IS facilitated management arrangement

process between MAF, MWRI and NBS State Ministries responsible for Agriculture and Water/Infrastructure. With support of GIZ IS, in December 2011, a study tour was organised to Kenya, to learn from the irrigated agriculture organisational structure, before an organisation is enacted for the scheme.

1.3 Northern Upper Nile Irrigation Schemes

In the above Study in 1954, it was reported that pumps irrigation schemes, which were historically as private entrepreneurship, began on the White Nile out of compensation money paid on the construction of Jebel Aulia Dam in 1933 ó 37. It was reported that in 1946 Sheikh Mirghani Mohammed Ali pioneered at Geigar the first scheme in the Upper Nile Province. By 1952 a total of eight (8) pump irrigation schemes with a gross area of 7,301 feddan (3,066 ha) were observed operating and the owners of the schemes enjoyed their wealth of irrigation schemes by the cotton boom in the world market. The study reported that there were 71 outstanding applications for licenses in the Upper Nile Province headquarters and some 500 at Renk District headquarters in 1954. The administration at that time was limiting the pump capacity, i.e. pump suction pipe diameter up to 14 inch with monthly debit to water amount of 240,000 m³.

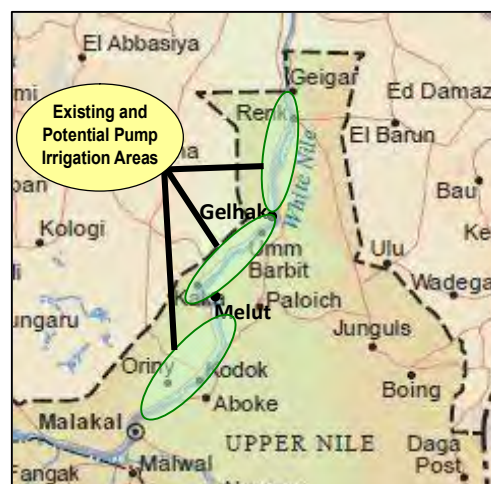


Figure 1.3.1 Existing / Potential Pump Irrigation Areas in Upper Nile State

To date, there are 23 pumps irrigation schemes recognized in the Northern Upper Nile region of which 6 pumps were refurbished by the then MWRI in 2006, although not all of them have been put at use, partly due to the fact that the overall infrastructure of the schemes needs rehabilitation; and due to high cost of inputs (including fuel); hence most of the pumps have not been continuously working. Nevertheless, it is noteworthy that a private company called Bilpam owned by the SPLM attempted to operate some pumps and put some of the schemes at production; but it seems not to have continued for the same reasons mentioned above. The Government of Sudan had updated the year 1989 study, 'White Nile Pump Schemes Modernization Study' in 2003. The Study includes the proposed amalgamation sites for pumps within the South Sudan side: Intisar, Um Jalala, Naifur / Majabi and Joda groups. Due to rising fuel cost, the economic feasibility should be re-examined in the future, in light of the opening up opportunities, pumping using diesel should be replaced with electricity that have reach the area through power interconnection with the Sudan.

Table 1.3.1 Summary of Economic Analysis of the Proposed Irrigation Schemes in South Sudan

Ref.	Group	Area	Capital (USD)	EIRR (%)
W9/10	INTISAR	29,370 fed (12,335 ha)	18,246,973	24
W11	UM JALALA	24,790 fed (9,916 ha)	10,904,316	29
E11/12	NAIFUR / MAJABI	48,397 fed (20,327 ha)	18,340,835	36
E13/14	JODA	59,685 fed (25,068 ha)	22,140,397	35

Adopted from Updating of Sir Alexander Gibb & Partners White Nile Pump Schemes Modernization Study, Republic of Sudan, January 2003

1.4 Other Similar Existing/Planned Projects

Based on the Sudan share from the Nile waters (as measured at Aswan in Egypt), and as per the 1959 Nile Waters Agreement with Egypt; in addition to suitability of land topography and soil type: Across Sudan then, the area designated for irrigation development is approximately a total of 1.95 million ha of land (4.68 million fed), inclusive of large-scale schemes on modern basis and small-scale schemes that include traditional irrigation holdings. The projected area in southern Sudan then, was about 0.270 million ha (0.648 million fed) by the year 2001 as part of overall plan for irrigation development in Sudan before war broke out again in 1983.

This figure resulted from an inventory and assembling of the existing schemes, projects under implementation and the planned of the Irrigated Agricultural Development upstream of Malakal, excluding pumps irrigation schemes downstream of Malakal. Notably among these projects is Mangalla Sugarcane Scheme in Central Equatoria, Penko (Penykou) for different varieties of crops in Jonglei and Aweil Rice Scheme in Northern Bahr el-Ghazal (see map below of the schemes upstream of Malakal). Similar projects whose information is inaccessible now have been either existing or planned. These include supplementary irrigation of coffee in Western Equatoria and traditional water spreading schemes along River Koss in Eastern Equatoria.

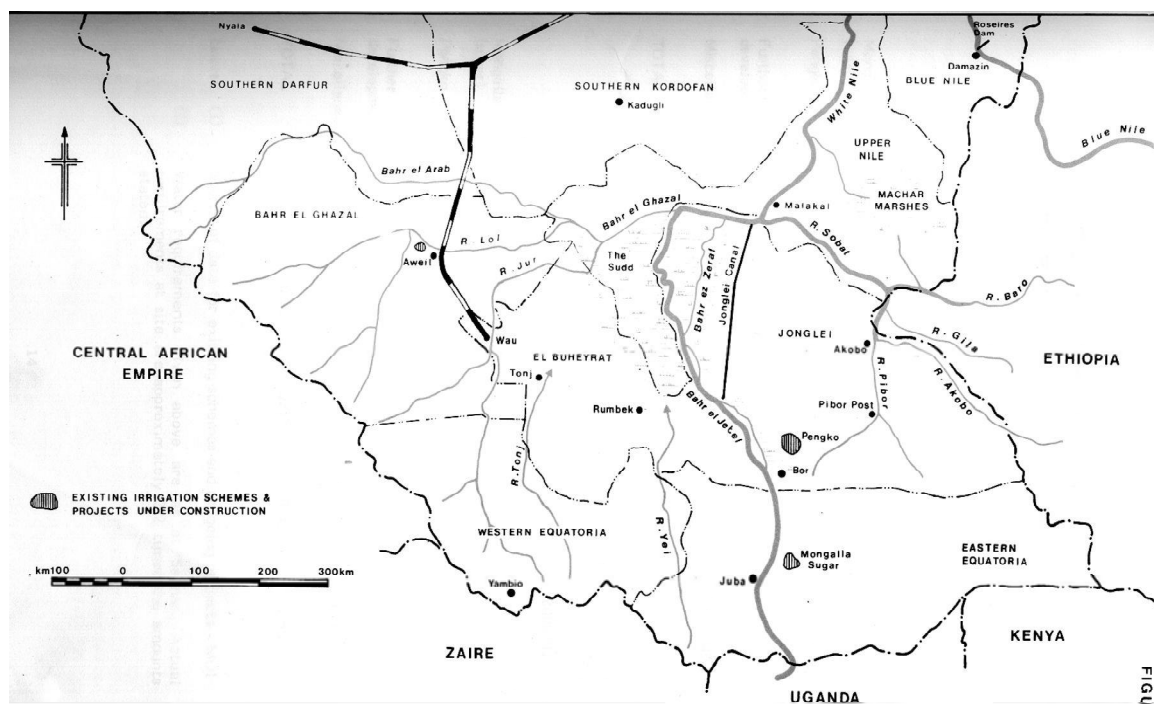


Fig 1.4.1 Map of the schemes upstream of Malakal

Source: The Republic of Sudan, Ministry of Irrigation, Consultants Report on the Nile Waters Study in Support of Irrigation, Volume 3, 1979 (in Liabwel, 1999: development plan for the swamps of Southern Sudan)

ANNEX 2-1

**SITE VISIT TO NORTHERN UPPER NILE
IRRIGATION SCHEMES (NUNIS)**

(IDMP TASK TEAM, AUGUST 2013)

ANNEX 2-1: SITE VISIT TO NORTHERN UPPER NILE IRRIGATION SCHEMES (NUNIS)

RSS-TT Members of IDMP carried out the site visit to the Northern Upper Nile Irrigation Schemes around the town of Renk in Upper Nile State, from the 23rd of August to 31st of August 2013. The site visit report is prepared separately and an outline is narrated below.

The site visit to Northern Upper Nile Irrigation Schemes (NUNIS), revealed that like most irrigation schemes, NUNIS resemble a major system in that size rise gets bigger or smaller as side rises are supplied with water and nurtured. All of rises have been designed to receive the volumes of water required to be supplied. The last upgrade of schemes was completed in 2004-2006

1. OBJECTIVES

The objectives of the sites visit are as follows:

- 1 To have a better understanding about the status of the irrigation facilities, river gauging stations, etc.;
- 2 To confirm the status of operation , maintenance and management of Northern Upper Nile Irrigation Schemes;
- 3 To interview the famer groups;
- 4 To confirm status of wells; and
- 5 To observe the basement complex.

2. SCHEDULE

The site visit to North Upper Nile State was conducted from the 23rd to the 31st of August 2013 and the details as follows:

- On 23 ó 26 August, the task team members conducted the interviews in Malakal, targeting ministries and officials concerned;
- On 26 ó 31 August, the task team conducted the interviews in Renk North, Renk South and Manyo County, targeting famers, famers union and officials concerned.

3. DATA/INFORMATION

The collected data and information of Northern Upper Nile State were about the topographic information, source of water, history, operation & maintenance and management and types of crop, among others. All the information was collected from the schemes, offices, officials, famers concerned and famers, through interviews and filling of questionnaires. They also provided documents for the task team members.

Table 2.3.1 List and Information for NUNIS

No.	Project Name	Area (fed)	Distance from Renk (Km)	No. of farmers	No. of families	Length of the Tail and the Canal (m)		Pump Type	Pump Power (hp)
						Tail	Canal		
1	Fewar North	3000	4	600	3000	1200	51000	Chinese/Yammar	24/18
2	Fewar South	600	9	120	600	800	17550	Blackstone	18
3	Khor Hajaz	600	15	120	600	400	16550	Chinese	18
4	Bandit	1050	25	210	1150	2400	13500	Chinese	18
5	Latbior	3000	35	600	3000	2000	15000	2 Chinese	18/18
6	Joandit	600	45	120	600	1600	9000	2 Chinese	18/24

7	Majak	840	55	168	772	400	19550	Chinese	14
8	Mulbok	10000	73	600	3000	1200	27300	2 Chinese	18/18
9	Melut	3000	355	600	3000	1200	27000	2 Ruston	24/24
Renk North Projects									
10	Abu Khadra	9000	7	1800	5000	2100	25700	Ruston	24/36
11	Mangarra	3000	20	600	3000	500	11500	Chinese	18/24
12	Gaiger	2150	25	430	2000	1100	8170	Chinese	18
13	Teiba	2250	29	450	1500	-	-	-	-
14	Birkat El Agab	28000	29	5600	15000	1200	279600	Ruston	
15	Remula South	2265	35	453	2000	2400	18000	Blackstone/Chinese	28/24
16	Remula North	600	37	120	500	4000	8000	Chinese	18
17	Hamdok	2250	40	450	1500	1200	26000	Chinese/Ruston	24/20
18	Goz Famay	1650	45	330	1500	500	3600	Chinese/Ruston	14/14
19	Bushara	2500	7	500	2000	8000	15000	Blackstone	18/24
20	Wad Dakona	2500		500	2500	9000	8000	2 Chinese	18/14
21	Lol Amara	1500	17	300	2000	9000	9000	Blackstone/Tin ge	18/14
22	Biar Kadok	3000	25	600		8000	4800	2 Chinese	24/18

Adopted from State Ministry of Agriculture and Forestry, Upper Nile State (translated from Arabic)

4. INVESTIGATED IRRIGATION SCHEMES

The irrigation facilities were investigated for the seven (7) schemes: namely, Abu Khadra, Mangary, Geigar, Biraka el-Ajab, Lolo Amahra, Bashair and Taiba. Those seven (7) schemes out of total of 22 schemes among Northern Upper Nile Irrigation schemes have been investigated, to assess the existing situation and operational conditions of their facilities. The facilities investigated include tail canals, supply basins, pump stations, delivery basins, main canals, secondary canals, road culverts, gates, distribution boxes, etc. The table below shows the investigated facilities and their conditions.

Table 2.4.1 Facilities and their Conditions Investigated in NUNIS as August 2013

Type of Facility	Measured Geometric	Dimensions			Shape	Condition
		Top width	Bottom width	Depth		
1. Abu khadara						
Tail canal	Cross section	30 m	N.A	3 m	Irregular trapezoidal	Full with Aquatic weeds and slope side eroded
Tail Canal dike	Cross section	25 m	20 m	3 m	Irregular trapezoidal	Eroded in sides slope and not well compacted
Delivery basin	Cross section	7.2 m	7.2 m	3 m	Square with one side open	Creaks at two corners due to movement of two walls sides
Main canal	Cross section	25 m	20 m	3 m	Irregular trapezoidal	In good condition
Main canal dike	Cross section	7.5 m	12 m	1 m	Irregular trapezoidal	Not compacted
Inlet steel pipe	Cross section	24 inch diameter			Circle	In good condition
2. Barka Scheme						
Tail canal	Cross section	29 m	21 m	3 m	Irregular trapezoidal	Full with Aquatic weeds and slope side eroded
Delivery basin	Cross section	8.94 m	8.94 m	3.36 m	Square with one side open	Creak at two corner, build by brick ,stones and concrete
Main canal	Cross section					

Type of Facility	Measured	Dimensions			Shape	Condition
Main canal dike	Cross section					
Inlet steel pipe	Cross section	3Ø30 inch			Circle	In good condition with one pipe closed
3. Bashara scheme						
Tail canal	Cross section	19 m	10 m	3 m	trapezoidal	Damage
Delivery basin	Cross section	5.35 m		1.62 m		Damage with creak, build with bricks side wall
Main canal	Cross section	14.5 m	5 m	1.5 m	Irregular trapezoidal	Good conditions
Main canal dike	Cross section					
Inlet steel pipe	Cross section	40 mm and 50mm Ø			Circle	Both are damage and closed with soil
4. Lolo Amahra Scheme						
Tail canal	Cross section	20 m	7.5 m	4 m	Irregular trapezoidal	Full of weeds
Facility	Geometric	Top width	Bottom width	Depth		
Delivery basin	Cross section	6.5 m	4 m	1.5 m	Square	Damage with creak on the wall, build by break and cement
Main canal	Cross section	13.3 m	5.8 m	0.88 m	Irregular trapezoidal	damage
Inlet steel pipe	Cross section	2Ø35 inch			Circle	damage
5. Teiba Scheme						
Tail canal	Cross section	14 m	8 m	3 m	Irregular trapezoidal	New, under construction
Delivery basin	Cross section	8.5 m	4.7 m	1.85 m/ 1.4 m	trapezoidal	Good condition (new)
Main canal	Cross section	7.5 m	3.88 m	1.06 m	trapezoidal	Good condition
Inlet steel pipe	Cross section	4Ø0.8 m			Circle	Not fixed
6. Gagar Scheme						
Tail canal	Cross section					
Delivery basin	Cross section	4.84 m	2.7 m	1.5 m	Rectangular	Damage (creak) base with RF concrete, build by break and cement mortar
Main canal	Cross section	8.6 m	3.4 m	1.67 m	Irregular trapezoidal	Good condition
Inlet steel pipe	Cross section	Ø24 inch			Circle	

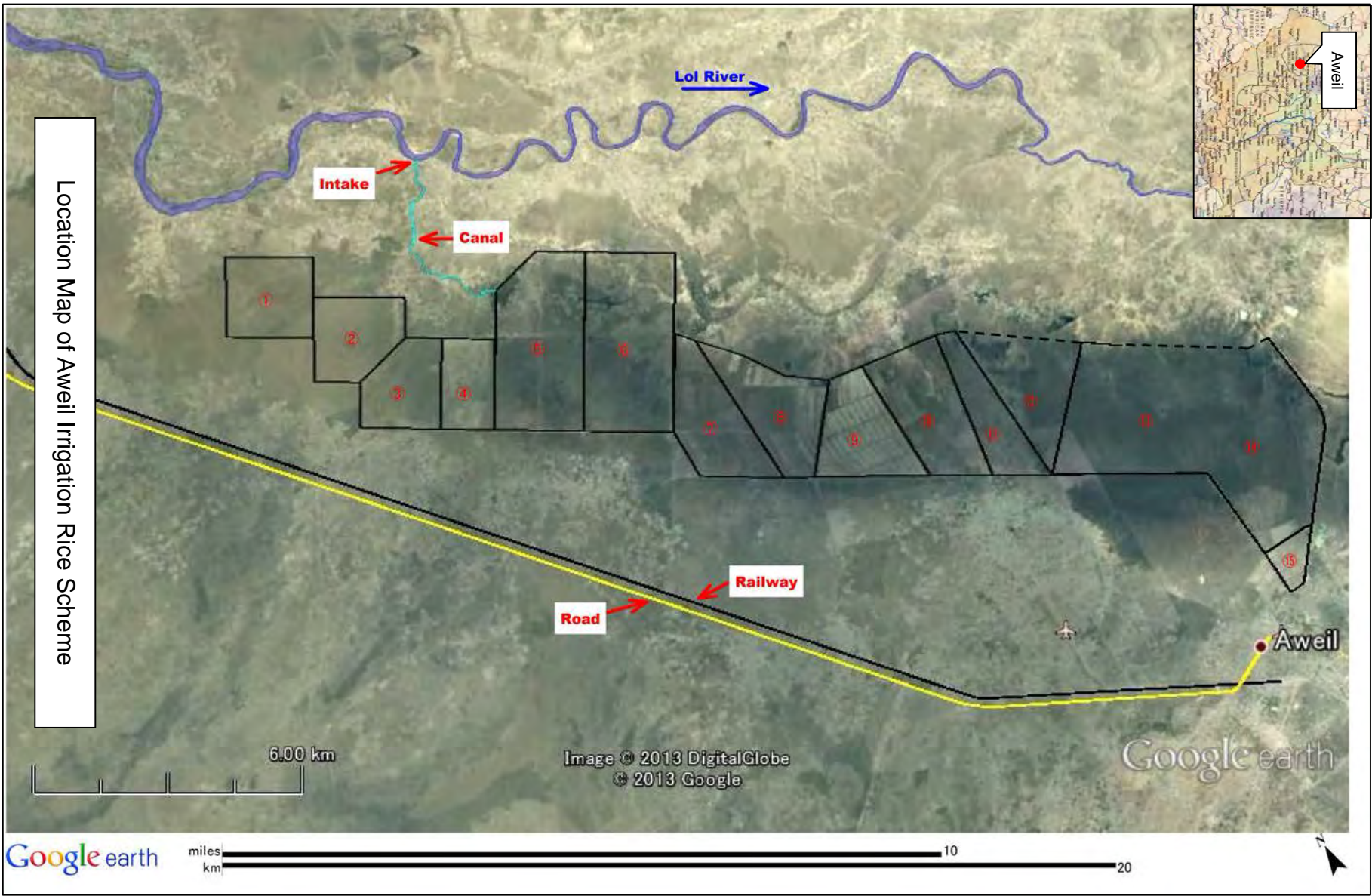
5. FINDINGS AND IMPORTANT INFORMATION

- In some schemes, water was diverted from main canal and stored in *haffirs* for drinking purpose during dry season.
- Due to stoppage of operation of the schemes for more than three years, most of the farmers' villages were moved as a result of lack of drinking water for human and livestock.
- In some area, the town was extended in to the schemes areas or near to schemes area.
- Also due to stoppage of operation of the schemes, the bush trees have overgrown the fields

ANNEX 2-2

**AWEIL IRRIGATION RICE SCHEME FIRST
SITE VISIT REPORT**

(IDMP TASK TEAM, JUNE 2013)



Location Map of Aweil Irrigation Rice Scheme

Photos of Field Survey



Courtesy Call for the State Minister of Agriculture and Forestry



Field Investigation: Aweil Irrigation Rice Scheme



Field Investigation: Aweil Irrigation Rice Scheme



Groundwater Quality Test in Aweil



Interview to Aweil Rice Farmers Cooperative



Interview to Villagers on Flood Experience

ANNEX 2-2: FIRST SITE VISIT TO AWEIL IRRIGATION RICE SCHEME (AIRS)**1. INTRODUCTION****1.1 Objectives of the Site Visit**

This report presents the results of a site visit in Aweil by the IDMP Task Team (IDMP-TT), which has been carrying out site visits as a part of situation analysis of water sector. As one of them, IDMP-TT carried out the site visit to the Aweil Irrigation Rice Scheme (AIRS) in May 2013. Studying AIRS is particularly significant since AIRS is one of few functioning existing irrigation schemes in South Sudan. The actual status of the irrigation scheme would give a lot of clues to the Team for formulating a practical Irrigation Development Master Plan. The specific objectives of the site visit to AIRS are:

- 1) To have a better understanding about the irrigation facilities, river gauging station etc.,
- 2) To confirm the status of operation and management of irrigation scheme, and
- 3) To interview with farmers groups to understand their issues and needs on farming.

1.2 Schedule and Work

The site visit in Aweil in Northern Bahr El Ghazal State (NGBS) was carried out from the 6th of May to the 13th of May, 2013. Total 19 TT members (11 RSS-TT and 8 JICA-TT) joined the visit. IDMP-TT was welcomed by the stakeholders in the field, particularly H.E. Minister of State Agriculture and Forestry gave warmest hospitality to the Team. With the cooperation of the stakeholders as well as the assistance of the State focal point official, the site visit was successfully implemented. Following are the activities carried out during the visit:

Table 1.2.1 Activity Carried out in Aweil (from 6th May to 13th May 2013)

Date	Activity
May 6 (Mon)	Move: Juba . Aweil by Air Courtesy call for the State Minister of Agriculture and Forestry
May 7 (Tue)	Courtesy call for the State Ministry of Physical Infrastructure Courtesy call and interview survey for AIRS Management Office Courtesy call for the State Ministry for Water and Rural Development
May 8 (Wed)	Field investigation of AIRS
May 9 (Thu)	Document collection at AIRS Office Interview survey for FAO field office Interview survey for the State Ministry of Agriculture and Forestry Interview survey for the State Ministry of Water and Rural Development
May 10 (Fri)	Field Investigation of AIRS Groundwater quality survey Interview survey for Aweil Farmers Union and the member farmers Visiting the farm of a farmer group
May 11 (Sat)	Field Investigation of AIRS Groundwater quality survey Interview survey for Aweil Rice Farmers Cooperative Society and member farmers
May 12 (Sun)	Field Investigation of AIRS Groundwater quality survey Survey of agricultural produce markets in Aweil
May 13 (Mon)	Move: Aweil . Juba by Air

2. PROFILE OF AWEIL IRRIGATION RICE SCHEME (AIRS)

2.1 History of Aweil Irrigation Rice Scheme

The Aweil Irrigation Rice Scheme (AIRS) is located just outside the town of Aweil in Northern Bahr El Ghazal State. Paddy production in AIRS was initiated in 1945 by the British Colonial Government District Commissioner as a prison farm with the size of four (4) feddan in the flood plains of river Lol (toich). By 1947 the rice production area was extended to 21 ha (50 feddan). In 1953, the scheme was taken over by the Sudanese Government Ministry of Agriculture and Forestry and expanded to cover an area of 210 ha (500 feddan). Flood protection dikes and a number of basins to enclose the irrigable area had been built since 1961 covering a total area of 11,000 feddan (4,600 ha).

In 1974, UNDP agreed to provide US\$ 2 million to reorganize AIRS and FAO conducted a feasibility study. The project was aimed at improved mechanized rice production in a pilot area of 550 ha (1,300 feddan). In 1978, the European Economic Community (EEC) approved funding for the development of 4,600 ha (11,000 feddan). It is estimated that 1,100 ha (2,700 feddan) have been leveled and provided with water management structures before the war began in 1983 which in effect closed down the project. From 1983 to 2005 the Scheme was undeveloped.

After the Comprehensive Peace Agreement (CPA) in 2005, under the Sudan Productive Capacity Recovery Programme (SPCRP) funded by EU the Ministry of Agriculture and Forestry signed an agreement with GIZ to implement the Aweil Irrigation Rehabilitation Project (AIRP) from 2007 with provision of machineries and rehabilitation of three (3) basins totaling 1,150 ha (2,700 feddan). The project was handed over to the Scheme management, which is under the Ministry of Agriculture, Forestry, Cooperative and Rural Development (MAFCRD) of the National Government in October 2012. In March 2013, Aweil Rice Farmers Cooperative Society Limited was officially established. The cooperation between the Scheme management and the Cooperative will be expected to improve the rice production and marketing.

Table 2.1.1 History of Aweil Irrigation Rice Scheme (AIRS)

Year	Event
1945	British Government Colonial Administration initiated the scheme with 4 feddan.
1947	Rice production area was extended to 21 ha (50 feddan).
1953	Scheme was taken over by the Sudanese Government: 210 ha (500 feddan).
1961-69	Flood protection dikes were built to enclose 4,600ha (11,000 feddan).
1974-78	FAO / UNDP Aweil Rice Project / Land Development Project aimed at 550 ha (1,300 feddan) with improved water control.
1979-83	EEC Aweil Rice Development Project was implemented. Area under fully controlled water management was extended to around 1,100 ha (around 2,700 feddan).
1983	The Scheme was closed due to the civil unrest in 1983 and the plan of expanding the cultivated area to 2,240 ha (5,330 feddan) was not realized.
2007 2012	EU / GIZ Aweil Irrigation Rehabilitation Project was implemented. 3 basins (No.7, 8 and 9) with a total of 1,150 ha (2,700 feddan) were rehabilitated.
2012-13	495 ha (1,178 feddan) were allocated to 562 farmers. Some private farmers are also cultivating in basin 15.

Adopted from: References 1, 2, and 3, also information from AIRS)

2.2 Irrigation and Drainage System

2.2.1 The Water Source

The river Lol seasonally floods into the Aweil low land and thereby provides the necessary irrigation water for AIRS. In June Lol increases its flow near Aweil. In July it overflows its banks into the low land. It reaches its peak flow in September and October and by December or January it is completely retreated. During the dry season from January to May the flow is low or no flow. On last May IDMP-TT observed that some river reaches were dry and even people were able to cross it walking and in the other reaches the flow was considerably low flow and standstill along the river.

2.2.2 Conveyance and Distribution System

In ARIS water is diverted from Lol River by intake channel with length of about five (5) km, and it connects to the main canal with the maximum discharge capacity of 4.81 m³/s as requirement of 2,865 ha (1.68 liter/second per ha). There are about 15 secondary canals with capacities ranging from 116 to 193 liters per second for a field of 12 ha and 20 ha respectively. The basic criterion for the design of the secondary canals is the ability to flood one field with the water depth of 10cm with 48 hours. Including the losses, it is calculated at a water supply of 9.6 liters/s per ha. This comprises the upper system (see Figure 2.2.1).

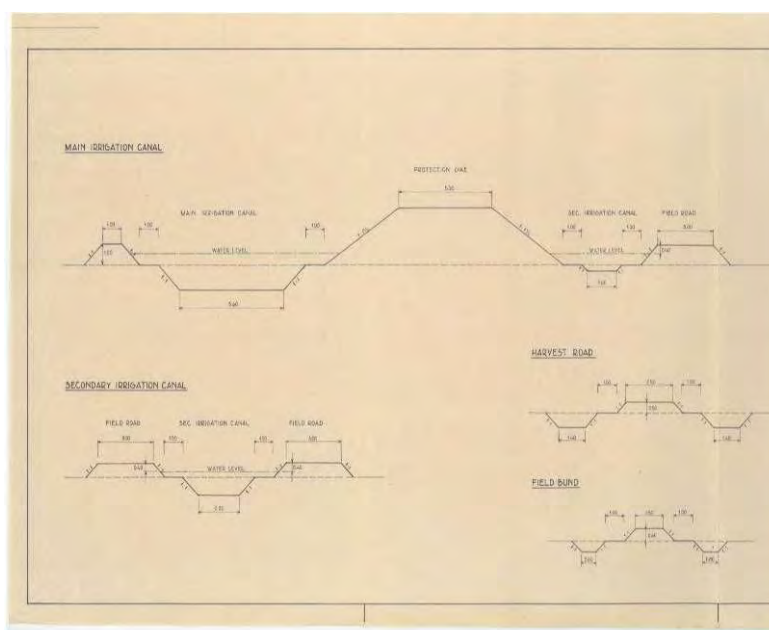


Figure 2.2.1 Cross Sections of the Main and Secondary Irrigation Canals

The secondary irrigation canals are given the letter of the block they are in, followed by a number indicating their position relative to the main canal. The secondary drains are indicated by the letter of the block they are situated in, followed by a number indicating their position relative to outlet to the main drain.

The lower system consists of number of tertiary canals and field canals or irrigation ditches with a capacity of 29 l/s per ha or 250 mm/24 hours. The irrigation ditches supply water through pipe each 12 m long and has diameters of 30 cm and 20 cm. From the intake the water flows to the various secondary canals. The discharge entering each secondary canal regulated with a check structure. Each of the field is served by two inlet structures from which the field ditches and the fields are flooded. Where necessary check structures are designed in the secondary canals to keep the water level at command level but due to lack of maintenance of the irrigation facilities for more than 30 years these check structures are unable to keep the water at the required level.

During the site visit it was observed that the tall grasses and weeds grown along the intake, the main canal, the secondary canals and the tertiary canals. This increased canals roughness and led to low

flow velocity. The amount of silt deposition varies from year to year and is accumulated in the intake, canals and drains. Physical conditions of the canals and lack of silt removal for most of the canals for more than 30 years also plays an important role in the annual silt deposition in the canals. Due to these reasons the canals lost their geometrical shapes and reduced the canals original design discharges to very low capacities which are far from sufficient to supply water to the desired command area.

IDMP-TT last May 2013 inspected the irrigation system of Basin 9. This basin is divided into five (5) blocks and it has one secondary canal, five (5) tertiary canals and about 86 irrigation ditches. Some of these irrigation ditches are blocked and others are damaged and some are functioning. There are also numbers of roads crossing structures or culverts and gates along the secondary canals and the tertiary canals and at the top of Basin 9 there is a settling basin, which was dry.



Block A contains 20 fields with an area of 20 ha for 18 fields and 17 ha for 2 fields of them. In this block there are 2 secondary canals namely IRR A1 and IRR A2, and about 19 irrigation ditches. There are 2 secondary drains namely DR A1 and DR A2 and 1 collective drain namely COLL DR A.

Block B contains 39 fields with areas range from 12 to 24 ha. In this block there are 2 secondary canals namely IRR B1 and IRR B2, and about 39 irrigation ditches. There are 2 secondary drains namely DR B1 and DR B2 and 1 collective drain namely COLL DR B.

Block C contains 43 fields with areas range from 6 to 24 ha. In this block there are 2 secondary canals namely IRR C1 and IRR C2, and about 42 irrigation ditches. There are 2 secondary drains namely DR C1 and DR C2 and 1 collective drain namely COLL DR C.

Block D contains 41 fields of mainly 12 ha each. In this block there are 3 secondary canals namely IRR D1, IRR D2 and IRR D3, and about 42 irrigation ditches. There are 3 secondary drains namely DR D1, DR D2 and DR D3 and 1 collective drain namely COLL DR D.

Block E contains 42 fields with areas range from 6 to 24 ha. In this block there are 2 secondary canals namely IRR E1 and IRR E2, and about 42 irrigation ditches. There are 3 secondary drains namely DR E1, DR E2 and DR E3.

The canal outlets is a masonry structures combined with steel pipe each 12m long and has diameters of 30cm and 20cm through which is the water is admitted from the secondary irrigation canals into irrigation ditches (See photo below). The outlets acts as a discharge measuring devices and there are like head regulators for the irrigation ditches. The outlets are general open because the water supply source is a canal without storage and the water is diverted to the fields when the canal is running.



2.2.3 Drainage System

The drainage network of the scheme consists of main drainage canal, Secondary drainage canals (collective drainage), Tertiary drainage canals and field drainage canals. The secondary drains are indicated by the letter of the block they are situated in, followed by a number indicating their position relative to the outlet to the main drain.

The main drain has been designed on the south side of the Scheme. This drain will not convey the runoff from the highland; instead an embankment has been projected in the south of the main drain. The main drainage system has been designed for a discharge of 2.5 l/s per ha (20mm in 24 hours). This discharge does not allow for immediate drainage of heavy rainstorm; following normal practices, the fields will act as a temporary buffer. The field drainage has been designed for a discharge of 11.6 l/s per ha or 100 mm/24 hours.

Basin 9 has been implemented based on the so-called *ōWageningenö*. The Block A to D will have unimpeded gravity drainage. In Block E, however, gravity drainage will be impeded during the peak flood period of an exceptional year. In such a case, the mobile pumps have to be used for drainage of the block.

The fields drained using the outlet structures of the secondary drains. The outlet structures are provided with stoplogs to keep the water level in the field at the required level. The secondary drains have a free outfall into the main drain. The main drain conveys only the excess water from the Scheme.

2.2.4 Irrigation Water Requirements

The irrigation water requirements were originally for 2,865 ha. For the Project in late 1970s, it has been calculated in every week 1/6 of the Scheme or 477 ha has to be treated. The potential evapotranspiration given had been calculated. Starting from late June (week 26), 1/6 of each block will be given 15 cm of water for soaking each week; subsequently, the land will be puddled.

The crop factor increases from 1.0 to 1.45 at flowering stage and decreased to 0.8 when the crop ripens. The gross water requirement is the water necessary for inundations plus the crop water requirements (potential Evapotranspiration x crop factor x % of the area).

The effective rainfall has been estimated at 70% of the average rainfall. The net irrigation water requirement consists of gross crop water requirement less effective rainfall. The overall efficiency of 60% for the Project has been included in the water supply.

2.2.5 Flood Protection

The embankment (dike) near the Kar Atong Creek has been designed at 436 m lengthwise, the dike has a slope of 0.26 m/km, which is the average slope of the *toich* (low land). The crest of the dike has been 5m wide; side slopes were designed at 1:1 when water pressure is 1 m or less; otherwise it is 1: 1.5. The exiting dikes around the developed basins or Basin 1 to Basin 2 are functioning except the dike surrounding Basin 9. Most of the dikes are eroded and damaged, and overtopped during the flood.

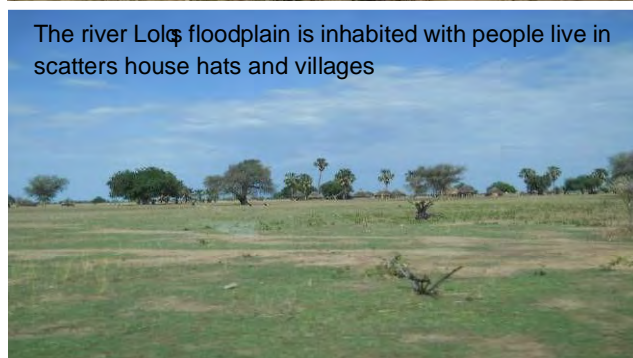
2.3 Flood Control System

The Aweil town is allotted in the low land of North West of RSS with an elevation less than 400 m and it has swamping areas in the northeast side and Lol river and its floodplain in the northwest part and also river Koum is flown in the south part. The highest part of the town is on the north western part.

AIRS receives the flood water from river Lol spilling over banks at different places along the river course in the north part of the Scheme during the rainy season from June to September and also the rain water flood flows from the high land in the northwest part of the Scheme which combines the collection of rain-water from highlands.



River Lol on 8th May 2013 with some stagnant waters



The river Lol's floodplain is inhabited with people live in scatters house hats and villages



Some house hats within the floodplain between scheme and river

2.4 Water Distribution System

After signing the CPA, the Scheme water distribution system in Basin 7, 8 and 9 was rehabilitated by GIZ from 2007. The water distribution system of AIRS consists of 1) Intake, 2) Main Canal, 3) Secondary Canal, 4) Field Canal, 5) Drainage Canal and Main Drainage. Following explain each facility:

2.4.1 Intake

The intake is located at Marriem Village, North East of Aweil Town with Coordinate: N 08 56 27.2, E 027 17 14.3 and elevation of 425m. It is a traditional intake with no hydraulic structure and it has the following cross- section.

The source of water supply for AIRS is Lol River, which is seasonal river flowing from Western Bahr EL Ghazal to North East direction, with canal length of approximately 3 km.

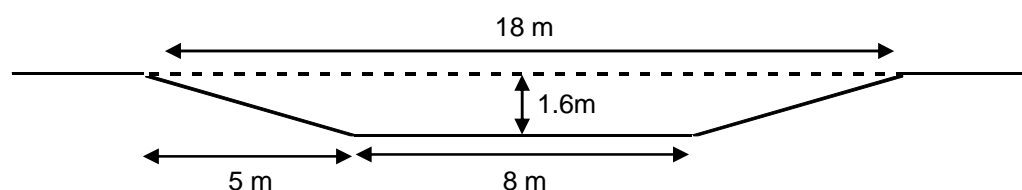


Figure 2.4.1 Cross-section of Intake of AIRS

2.4.2 Main Canal

After the Water reaches Basin 5, water flows beside the constructed dike to the direction of Basin 6 to

Basin 7, then Basin 8, Basin 9 up to Basin 15, and opposite to the direction Basin 4, Basin 3, Basin 2 to Basin 1.

2.4.3 Secondary Canals

Water is conveyed from the main canal into small one between two basins, which is called secondary canal through gates.

2.4.4 Field Canal

It is the smaller canals taking water from the secondary canal to the filed (Basins) through small steel pipes gates with diameter of 30 cm.

Finally Attention was given to Basin 9 as selected example to understand the water distribution system, taking into account some existing differences.

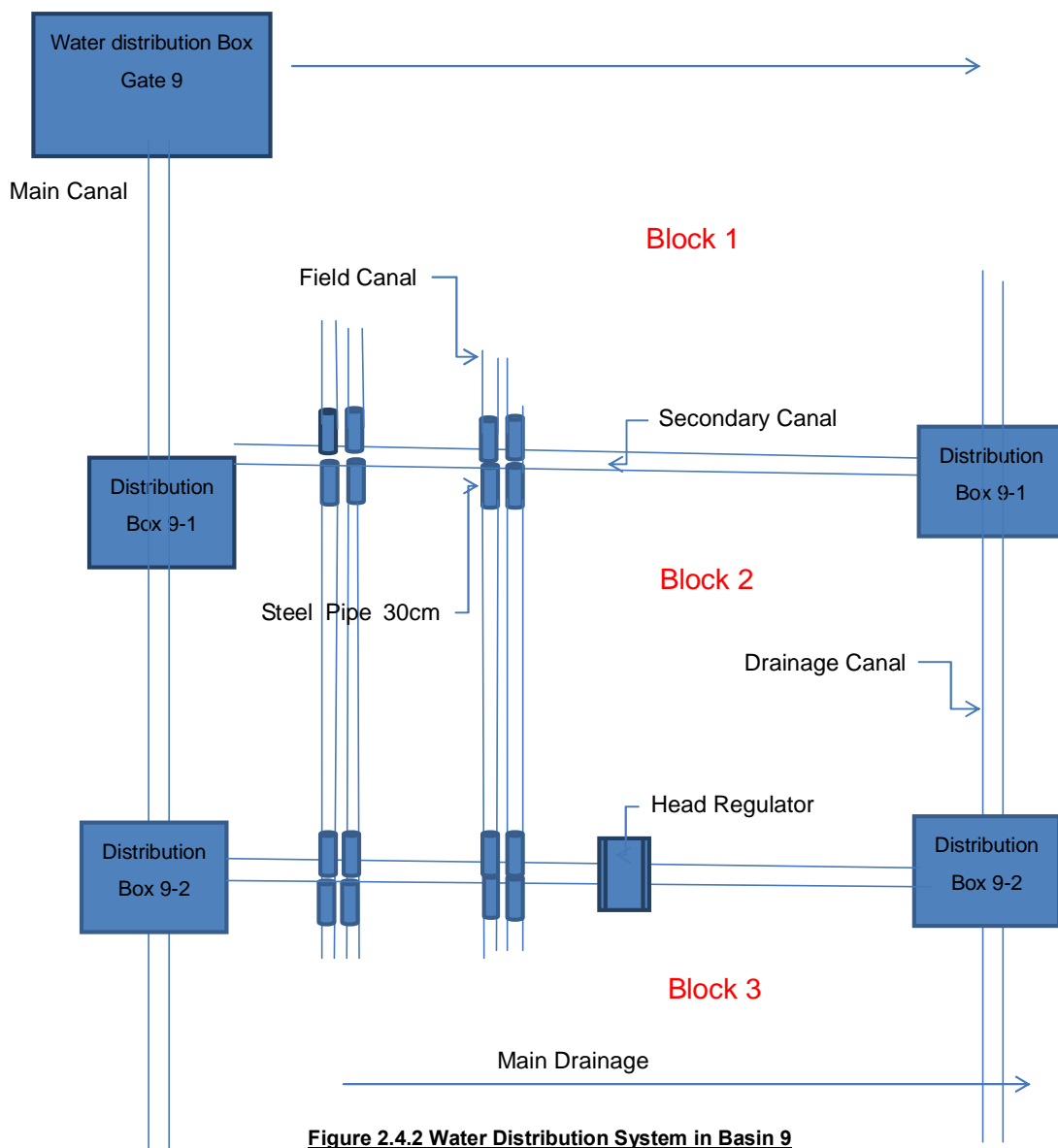


Figure 2.4.2 Water Distribution System in Basin 9

Table 2.4.1 Distribution System Elements for Basin 9

S/No	Element	Quantity	Observation
1	Distribution Box (9)	1	Controlling Water and distribution
2	Main Canal	1	Main canal that flowing from the source (Lol River)
3	Secondary Canal	5	Conveying water to Blocks from Main Canal
4	Field canal	96	Distributing water from Secondary canals to the filed
5	Blocks Block 1 = 16 filed canal Block 2 = 18 filed canal Block3 = 22 filed canal Block 4 = 20 filed canal Block 5 = 20 filed canal	5	Basin 9 are divided into 5 blocks
6	Head regulator	6	It is head regulator across secondary canal
7	Drain collector	1	Collecting access water from secondary irrigation canals to Main Drainage

2.5 Operation and Maintenance

AIRS is owned by the National Government, namely the Ministry of Agriculture and Forestry and Cooperative and Rural Development (MAFCRD) and it manages through the AIRS office in Aweil, the role of State Ministry of Agriculture and Forestry (State MAF) is to advise and assist what the national Ministry requests them to do.

The Scheme is run under the tenancy system. The Scheme role is to plow (land preparation), providing seeds, sowing, water management, providing empty sacks, and transporting produce, as well. Tenant farmers are to weed, irrigate and harvest. Contract between farmers and the Scheme is one-year basis. Every year farmers have to renew the contract. As long as the performance of the farmers is good, they will be provided with the same plot. The Scheme sets aside an area of 37 feddan for experimental farm.

In 2012, 483 farmers made the tenant contract with the Scheme. Basically one (1) farmer gets two (2) feddan. Few farmers can get maximum four (4) feddan if he is considered as capable farmer. Selection of farmer is going through the chiefs of three (3) Payams, namely Aweil, Maduany and Udhum. In this year, the same farmers would be selected. After GIZ left, MAFCRD is preparing the new rule. It will come up in near future.

Selection of tenant farmers is currently from the above three (3) Payams around the Basin 7 - 9 (operational basins). The Scheme goes through community leaders for the selection. Household sizes & financial capacities are considered in the selection. Selection is not conducted every year. This year no selection has been done for new farmers. Also 72 farmers out of 80 staff in the Scheme cultivated 72 feddan (1 feddan each on average) according to the annual report 2012 /13 of the Scheme.

The Scheme and farmers share the harvest according to each contribution of cost. The shares of the Scheme and farmers in 2008/09 and 2009/2010 were 40% and 60% respectively but the shares in 2010/2011 changed to 48% for the Scheme and 52% for farmer. Farmers are not happy about it.

3. EXISTING SITUATIONS OF AIRS

3.1 Existing Situation of Farmers in the Area

3.1.1 General Features of the Farmers in the Area

1) Cropping pattern outside AIRS

IDMP-TT interviewed representative farmers from three (3) farmer groups outside AIRS. Figure 3.1.1 shows the general cropping pattern outside AIRS by the interview survey. The cultivation is under rain-fed and almost all of crops are sowed in May. According to the figure, it seems that farmers tend to grow vegetables with long harvesting period, such as okra and pumpkin leaves, which are the major relish to sorghum, the traditional staple food of the region.

Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Rain		Light Rain	Light Rain	Heavy Rain	Heavy Rain	Heavy Rain	Light Rain	Light Rain				
Crops												
Sorghum	×	○				□						
Maize	×	○				□						
Sesame	×	○				□						
Groundnuts	×	○					□					
Hibiscus	×		○									
Okra	×	○										
Pumpkin	×	○										
Watermelon					○		□					

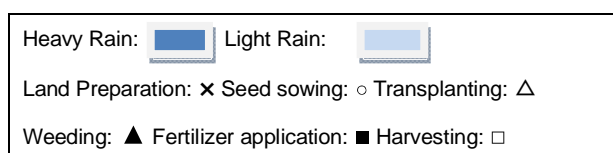


Figure 3.1.1 Cropping Pattern outside AIRS

From the groups interviewed, the crop production of Malgoldit Group in 2012 is shown in Table 3.1.1. Number of the members of this group is 11 and there are 45 workers within the group. In this year the number of member has increased to 54 people. Their land belongs to community (Aweil Central County). To focus on the cereals, sorghum and maize, the yield of maize has more than four (4) times of Sorghum. But farmers still put the priority in cultivating sorghum as it is their traditional staple food. Self production of sorghum is cheaper for farmers than buying it from market.

And the unit price of maize is also higher than sorghum. With regard to comparing sesame to groundnuts, sesame is more profitable than groundnuts since the yield of sesame is low but the unit price is very high. Moreover as a very profitable crop, watermelon crop in just one (1) feddan earns SSP8,000 of gross cash income.

Table 3.1.1 Crop Production by Magoldit Group in 2012

Crop	Cropped Area (fed)	Production (Yield)	Sold Amount	Unit Price	Gross Cash Income (SSP)	Market Remark
Sorghum	60	80bag: 8,000kg (133kg/fed)	60bag (6,000kg)	300 SSP/bag	18,000	WFP through MAF Affected by flood
Maize	10	60bag: 6,000kg (600kg/fed)	50bag (5,000kg)	450 SSP/bag	22,500	WFP through MAF
Sesame	50	160bag: 12,000kg (240kg/fed)	140bag (10,500kg)	650 SSP/bag	91,000	WFP through MAF
Groundnut	100	1200bag: 90,000kg (900kg/fed)	500bag (37,500kg)	150 SSP/bag	75,000	WFP through MAF 600bag: paid for worker
Hibiscus	5	30bag: 2,250kg (450kg/fed)	25bag (1,875kg)	10 SSP/44kg	426	Local market
Eggplant	0.5	For workersqhome consumption	-	-	-	-
Water melon	1	2 lorry	2 lorry	4,000 SSP/lorry	8,000	Local market
Okra	5	40bag: 3,000kg	20bag (1,500kg)	600 SSP/bag	12,000	Local market

(note: 1 bag for sorghum and maize: 100kg, others 75kg), Hibiscus: 1 kantara = 44kg

Adopted from: Aweil site visit by IDMP-TT, May 2013

2) Farming Practices

Some farmers pay for 1) using tractor for land preparation, 2) hiring labor for sowing, weeding, harvesting, and transporting, and 3) storage for crops. On the other hand, others do not hire labor except for household workers. Most of farmers, they do not use fertilizers, pesticides and / or insecticides for crops though crops are damaged by mosaic virus, fungus, insect etc. According to the farmers interviewed, the loss of crops due to bird is little per farmer. Because all the farmers are cultivating along with the same cropping calendar, the damage by bird does not concentrate on one farm plot but is scattered all over the farming areas.

It seems that there are some classes among farmers such as trader-farmer, large-scale farmer, small-scale farmer, and landless farm laborer. According to a farmer of AIRS, at the time of weeding farm laborers with their manager come at the field and farm laborers are hired by the farmer of AIRS. More detailed survey should be done to understand the structure of farming population so as to plan better for poverty reduction.

3) Opinions from farmers

IDMP-TT asked farmers outside AIRS for their opinions on AIRS. Following are the responses:

- They can contract with AIRS, but the main staple food is still sorghum for them implying the allocation of their labor for sorghum crop should not be hindered. A woman farmer said that if she grew rice, she would be forced to buy sorghum. As she has limited resource, she will go with sorghum.
- A farmer said, he cultivated rice for 49 feddan in 2008, but the whole crop was lost due to flood (equivalent to SSP 7000). He protested it is risky cultivating rice with no guarantee. Although the flood affected his crop, the Government could not give support.

3.1.2 Tenant Farmers in AIRS

1) Cropping calendar of Rice in AIRS

Figure 3.1.2 shows typical cropping pattern of rice in AIRS. Generally, the rainy season is from May to November. When the rainy season passed about one and a half month, namely soil is somewhat saturated, the seed sowing starts. So the timing of sowing depends on rainfall. In some days later of emergence, farmers implement the first weeding. And then they take water, first irrigation, into the field to approximately 50cm (the height of the knee). After a week when the water level becomes as low as ankle-depth, they irrigate again as before. This irrigation is continued till October. Rice seeds are directly sown on the field. Nursery preparation and transplanting of seedling are not practiced.

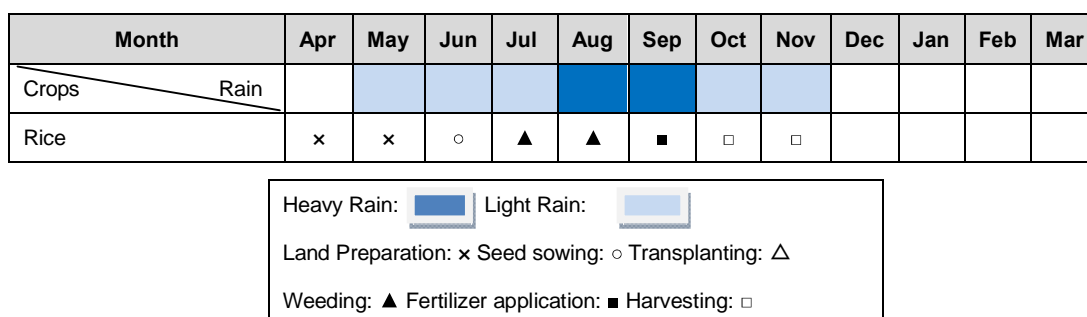


Figure 3.1.2 Cropping Pattern of Rice in AIRS

2) Production Cost and Farming Practices

Farmers start working in their plots after AIRS management completes sowing. In short, they use the plots from weeding to harvesting. As a result of interview survey for farmers in AIRS, Table 3.1.2 shows the production cost of rice cropping. Farmers pay much for hiring laborers for two or three time-weeding. The detailed cost of weeding is as follows; 10SSP/day x 30 persons = 300SSP/ feddan.

Table 3.1.2 Cost of Rice Cropping in AIRS

	Labor						Fertilizers
	Weeding	Harvesting	Collecting	Loading	Threshing	Weighing	sack(50kg)
	Fed	Fed	fed	sack	fed	sack	
Case1	1st:300 2nd:300	400	-	-	10	-	78
Case2	1st:300 2nd:300	150	150	-	-	-	78
Case3	1st :300 2nd:300 3rd:300	-	50	1	10	1	78
Case4	1st:300 2nd:250 3rd:200	-	50	1	10	1	78
Case5	1st :150 2nd :60	100	50	-	-	-	78

Source: IDMP-TT, May 2013

Farmers have the land not only in AIRS but also outside the Scheme to cultivate sorghum, maize, sesame, ground nuts etc. Farm size outside the Scheme is from two (2) feddan to more than 20 feddan. Some farmers own livestock such as cattle, goat, sheep and chicken for the dowry of marriage of their sons or self consumption. The problems on farming practice are as follows:

1. Lack of machine for harvesting

2. Lack of TSP and Urea (fertilizers)
3. No. of tractor is few, lack of spare parts
4. No storage for crop on the field (they dry paddy for 10 days and after paddy is sacked, they have to wait others to fill the truck for transportation.)
5. No storage of equipments / tools (they have to bring the tools back home every time)
6. Clean water for drinking water is not there. They have to bring water from town.
7. Lack of health center
8. Transport: 11 km from town, they use bicycle. Some women come by bus near the Scheme and walk for four (4) km.

3) Yield Level of Paddy

Significant issues for rice production in the Scheme are the low yield level and milling to strengthen marketing. The records and field interviews to farmers or Scheme management reveal the current low yield of rice production. According to the Scheme management, the yield in year 2012 varied from 0.35t/fed to 1.12t/fed or 0.83t/ha to 2.67t/ha. Rice farmers in the Scheme interviewed by the Task Team gave following numbers for their yield:

Table 3.1.3 Rice Yield Level of Interviewed Farmers in AIRS

Farmer	2011		2012	
	Production sack (kg)	Yield Kg/ha	Production sack (kg)	Yield Kg/ha
A	60 (4,200)	1,667	70 (4,900)	1,944
B	11 (770)	917	21 (1,470)	1,750
C	6 (420)	250	26 (1,820)	1,083
D	16 (1,120)	1,333	22 (1,540)	1,833
E	16 (1,120)	1,333	20 (1,400)	1,667

According to them, they started contracting with the Scheme from 2009 and their yield level is getting better as they get used to rice farming and Urea was available in this year. However, their yield level is still as low as less than 2t/ha. Following table summarizes the past records found in the office of AIRS:

Table 3.1.4 Historical Records of the Rice Production in AIRS

Year	Area (ha)	Yield		Variety	Remark	Data Source
		Total (t)	t/ha			
1977	218	188.96	0.867	C-20	Data of basin 4. In other 2 basins, only few managed to harvest	Ref 4
1981 a	459.3	746.7	1.626	6 varieties	a+b = c+d+e+f+g+h a: central mechanized farm b: tenants farm	Ref 5
1981 b	414.5	1,250.9	3.018	6 varieties		
1981Total	873.8	1,997.6	2.286		Breakdown of the area and yield by variety in 1981.	
1981 c	321.6	446.8	1.389	C-20		
1981 d	55.4	127.3	2.298	RPW 6-7		
1981 e	3.0	4.8	1.600	CR 189.4		
1981 f	1.0	2.3	2.250	BR-4		
1981 g	169.8	612.6	3.608	B 1990		
1981 h	323.0	803.9	2.489	Bhavani		
1981Total	873.8	1,997.7	2.286			
2012/13	494.8	647.060	1.308	BG-400, BR-4		Ref 3

In the report of FAO / UNDP (reference 4), there is a description of the struggle with water and weeds:

“Not only was the rainfall in June and July (the peak period of the planting season) much higher than in previous years, but the sheetwater that ran from the higher land toward the Scheme filled

up the drainage canals to such an extent that all the gates of the drainage canals had to be closed. The result was that the fields could not be drained of the excessive rainwater and as from 25 June, it became impossible for the machines to move into the fields.

As from 25 June, the machinery could no longer enter the fields and at that date the position was as follows:

<i>Area ploughed</i>	<i>5190 acres (2076 ha)</i>
<i>Area harrowed</i>	<i>3200 acres (1280 ha)</i>
<i>Area planted</i>	<i>1882 acres (753 ha)</i>

After that date it became impossible to do any seeding by hand as the fields had become very weedy indeed.”(Report on the 1977 Growing Season Aweil Rice Scheme, FAO/UNDP)

It is indicated that during the period of EEC funded Aweil Rice Development Project, introducing controlled water management and improved varieties had been coming up with better performance in terms of yield level. Due to the civil unrest, the improvement process was stopped and started again after the CPA. Looking back the past records, there is a potential to drastically improve the current yield level. The Study report for EEC funded Aweil Rice Development Project estimated the target yield at 4t/ha.

Not only water management improvement but also agronomical approach will be required according to the causes of low yield given by the farmers, the Scheme management, FAO agronomist and others. Following are the causes reported by them:

1. Flood protection is not properly done (dikes are cut) while dike is not steady and its height is not enough. Water is adequate but uncontrollable. Due to flood in rainy season, crop is damaged in some years. The timing of irrigation and control is the cause of water shortage.
2. Weather factor: in some year drought occurs, and other year heavy flood.
3. Weeding is one of the issues. Proper farm operation is not done.
4. Fertilizers are not used.
5. Pesticides are not used. (some damages by pests)
6. Variety of rice has grown wild (mixture of variety resulting in low quality)
7. There is no rotation system (loss of soil fertility without fertilizing), water management is not properly done.

3.2 Existing Situation of Farmers’ Organizations

3.2.1 Aweil Farmers’ Union

1) Outline

The Aweil Farmers’ Union was initiated 2012 with a view to addressing the concerns of farmers within Northern Bahr El Ghazal State. The Union has a constitution and is registered with the Department of National affairs (Ministry of Justice) as well as with the State MAF.

Farmers around AIRS apply to join the Farmers’ Union in their own individual capacity. At the time of the site visit, the Union had enlisted a total of 3,500 members (2,000 men and 1,500 women). Members can cultivate individual plot or alternatively come together in groups to operate a single relatively larger farm unit. Malgolit Group is an example of this collective approach. The group started with 11 members (this year members have increased to 54) and is operating a 500 feddan farm

with 45 laborers as a commercial undertaking (Table 3.1.3 above shows their performance).

Land is communally owned, and whether operating individually or as a group, members have to negotiate access to land with traditional authorities (chief and elders) who then safeguard the members' cultivation rights.

Some Union members are also members of the State Chamber of Commerce (e.g. the secretary of the Union is the acting chairman of Chamber of Commerce). The overlapping membership helps the two organizations to share information on traded commodities (prices and volume) as well as on agricultural produce (sources and quantities). This allows the Union to attain its objective of price stabilization through balancing farmers' and consumers' interests.

Some members are farmers during the rainy season and traders during the dry season which gives them a perspective of both concerns. When such farmer-traders and leaders deliver their produce to the Union, ordinary members feel confident that the union will not cheat them. Members' confidence is further increased with twice-a-year general meeting, when the Union leadership is held accountable to the members. In addition, by sharing membership (and leaders) with the Chamber of Commerce, the Union Committee and members are likely to become more business-oriented in their work.

Membership to the Union is through a monthly subscription of SSP25 or a lump sum payment of SSP300 per year. There is an executive committee of 15 members, who was elected by members at an annual general meeting and whose mandate is to oversee the work of the Union. An annual general meeting of members is held twice a year in January and June, while the executive committee of 15 members meets twice a month to review and plan Union's activities. The Union operates from a rented office at Aweil Town. However, the committee has recently acquired a plot (30m by 25m) on which it plans to build its own office.

The Union has a rather broad set of objectives which include: contributing towards national food security, attaining household self-sufficiency, equalizing the rights of large and small scale farmers, producing for export, contributing to general economic development and facilitating members to obtain credit as well as loans

Presently, the Union is giving emphasis on three (3) activities:

- Training members, in collaboration with the State MAF, particularly regarding timely planting of rain-fed crops
- Controlling / stabilizing market prices for agricultural commodities
- Collecting farmers' produce and looking for markets

For the time being, the Committee members are not paid any sitting honorarium and work on a voluntary basis. During the time of harvesting, however, they were paid in kind (rice, sorghum, etc) using produce given by farmers as their membership subscriptions. Up to now, the Union does not have permanent employees. However there is an office cleaner, who is paid 750 SSP per month. Together with the office rent of SSP1,500, it will bring total monthly expenditure to 2,250 SSP/month.

2) Current Challenges

The main challenges facing the Union members are:

- Lack of quality seeds, forcing members to buy what is in the shops or to re-use their own seeds retained from previous harvest.

- Lack of fertilizers and other agro-chemicals
- Inadequate storage facilities for produce bought from farmers leading to risk of post harvest losses
- Insufficient number of private tractors (only 10-12 tractors around Aweil) in relation to the high demand for plowing services. This constraint is made worse by unavailability of spare parts locally
- Floods hazard (last year rain was excessive and floods were widespread resulting in crop and house damage)
- Lack of credit facilities from banks or other financial intermediaries. This not only reduces members' ability to procure farm inputs and machinery but also constrains the Union's capacity to purchase farm produce from members
- Bad roads and lack of vehicles, which slow collection of farm produce from members
- Members taking a long time to pay their annual membership fees, which results in an insufficient cash flow for meeting monthly expenses. Hence, the Committee members are, sometimes, compelled to use their own money.

3) Future Plans

Future plans of the Union include:

- Buying and installing an oil press (sesame, ground nuts)
- Procuring tractors for plowing
- Improving feeder roads leading to members' farms

4) Support from Other Institutions

In the past, the Union has received support from several institutions:

- MAFCRD assisted members to attend workshops organized by the State Government.
- Last year, the State Government supported the Union members to participate in a trade fair in Juba City.
- AIRS has helped members with plowing tractors after the members agreed to supply diesel for the plowing exercise.
- Last year, FAO bought seeds (sorghum, ground nut) from the Union for subsequent distribution to returnee (IDP) and other needy farmers.

With a view to gaining access to institutions that might give support, the Union is affiliated to the National Farmers' Union in Juba. Such anticipated benefits include participation in training workshops and trade fairs as well as access to information on markets within and outside the country.

3.2.2 Aweil Rice Farmers Cooperative Society

1) Outline

Aweil Rice Farmers Cooperative Society was started in March 2012 with the support of the Scheme Management, which assisted initial subscribers to draw a Constitution and to hold briefing meetings with prospective members. After extensive consultations, the members agreed on a Constitution for 'Aweil Rice Farmers' Cooperative'. The Cooperative was then registered under the Cooperative Act, 2011, by the Department of Cooperative Development, Northern Bahr El Ghazal State at Aweil City (certificate no. 6, March 2013).

As stated in the Constitution, the primary objectives of the Cooperative are to contribute to food security by producing irrigated rice sustainably as well as to improve members' general economic welfare. Other objectives are:

- Fighting hunger in Northern El Ghazal State and extending the same to other States.
- Helping farmers to acquire farming skills.
- Encouraging children to go to school.
- Linking farmers with institutions that might provide technical and financial support in rice production as well as in other income generating activities
- Providing an opportunity to bring the irrigation community together so that they can know each other better

Among other requirements, the main qualifications for membership are: being a rice farmer who has signed a tenant agreement with AIRS and being over 18 years old. Cooperative members operate an irrigated farm of two (2) feddan each although some farmers have been allocated 4 ó 6 feddan on the basis of their management capacity.

Membership is voluntary but all farmers of AIRS are expected to join after paying SSP50 initial registration fee and SSP120 annual subscription fee. Up to the time of the site visit, the Cooperative had 447 members (247 men and 200 women). The relatively high participation of women is because their husbands are employed outside Aweil.

To facilitate communication within the Cooperative organization, the registered members are organized into three (3) groups on the basis of the three (3) Payams that are neighboring AIRS, i.e. Aweil, Maduany and Udhum.

The constitution has specified the rights and obligations of members. For instance, the constitution has underlined members' right to receive benefits from the activities of the Cooperative. On the other hand, members are obliged to work together in the operation, use and maintenance of irrigation facilities.

The Cooperative's constitution has provided for a governance structure and procedures, including frequency of members meetings, election and dismissal of management committee. The Committee has 15 members but there are three (3) sub-committees of seven (7) members from each of three (3) Payams that are associated with the Scheme. In addition, the Cooperative is affiliated to the Farmers' Union of Bahr El Ghazal State. In the past the latter has played a useful role in resolving any serious disagreements between farmers and the Scheme management (e.g. regarding cancellation of leases for underperforming farmers).

At present, the Cooperative office is temporarily located at the joint office of the Farmers Union and the Chamber of Commerce. However, the Committee is planning to build a cooperative office at a suitable location within the irrigation Scheme.

2) Roles and Activities of the Cooperative

Since its establishment, the Cooperative has discharged the following roles and responsibilities:

- Creating awareness among farmers on cropping calendar and cultivation practices
- Collecting annual subscription fee at the rate of 10 SSP/month or 1 sack (70kg) of paddy /year (all the members have paid for last year)

- Allocating loans to farmers using funds in the Cooperative bank account (Last year the Cooperative collected membership and subscription fee amounting to SSP22,300 and received a subsidy of SSP5,000 from the National MAFCRD).
- Assisting the Scheme management in supervising water distribution
- Mobilizing farmers for weeding rice and clearing tertiary canal and other water channels
- Assisting the Scheme management to de-silt some secondary canals using World Food Programme (WFP) food for work arrangement

3) Main Challenges Facing the Cooperative and its Members

The Cooperative and its members are presently faced with the following major challenges:

- Lack of improved varieties, compelling farmers to rely on old varieties supplied from research/demonstration farm.
- Owing to budgetary constraints the Scheme does not supply members with fertilizers particularly Triple Super Phosphate (TSP, which induces high paddy yields) and Urea as well as other agro-chemicals,.
- Insufficient and unreliable supply of irrigation water because intake and canals are silted

Committee members believe the above constraints explain why they realize low paddy yields which range from five (5) sacks to 18 sacks per feddan or 525 kg to 1,350 kg per feddan (The highest yield was attained by a woman because of her thorough weeding and careful water management)

In the past, the Cooperative has attempted to take counter measures against these challenges. In one instance, the Cooperative assisted the Scheme to procure Urea fertilizer from a local merchant by giving an undertaking that members will pay after harvest. In another case, farmers contributed money for diesel procurement in order to enable the Scheme management to plow rice fields. Both cost items were reflected in the schedule of production cost between the Scheme and farmers at the time of crop sharing.

Cooperative members use approximately half of their paddy production for household consumption. To obtain white rice ready for cooking, paddy is pounded in a traditional pestle and mortar and then winnowed to separate chaff from grains (This is women's work). However, the resulting rice contains a high proportion of broken grains which makes it difficult to compete with imported rice both locally at Aweil and in other towns in South Sudan. Marketing of surplus rice produced in Aweil is therefore a challenge. Poor roads within and outside the Scheme and lack of functional milling facilities (Rice Mill installed by GIZ failed to operate) worsen the marketing problem. As a result, farmers are able to receive only modest paddy/rice prices as shown below.

Table 3.2.1 Price of Paddy and White Rice

Crops	Unit	Min. price	Mean Price
Paddy Rice(before Milling)	70 kg (1kg)	SSP 120 SSP 1.71	130 . 150 SSP
Rice (after traditional milling)	25 kg (1kg)	SSP 210 SSP 8.40	210 . 210 SSP

Note: After milling, the weight of rice becomes around 65% of paddy. Therefore unit price of milled rice is very high, it needs taking into account the total weight becomes 65% of paddy.

Adopted from: Aweil Site Survey by IDMP-TT, May 2013

Post-harvest losses are considerable and arise from: (a) Grain shattering during harvesting (At the time of field visit, women were reported to be still collecting scattered paddy grains in the fields) and

(b) spillage when transporting with scheme trucks and trailer and during storage (gunny sacks are plastic and tear easily).

Another problem confronting farmers consist in poor health facilities and lack of clean drinking water within the Scheme. This exposes farmers to diseases which reduce their capacity to work in their farms.

4) Future Plans of the Cooperative

According to the chairman, the Cooperative has ambitious plans, which include:

- Acquiring good quality seeds
- Erecting shelters in the fields
- Purchasing an assortment of farm machinery (tractors, combine harvester, loader)
- Moving the Cooperative Office to a suitable location within the Scheme
- Constructing a produce store in Aweil Town
- Exporting rice to international markets
- Expanding the Scheme (Last year area under irrigated rice was 1,500 feddan; this year 3,000 feddan is expected)

Institutions that have helped the Cooperative in the past

- AIRS office assisted in preparing the Constitution of the Cooperative. In addition, management support members on planning and coordinating activities relating to paddy rice production.
- Last year, National MAFCRD gave the Cooperative a subsidy of SSP 5,000.
- World Food Programme supported members in de-silting secondary canals through food for work.

3.3 Existing Situation of Facilities and Equipment

3.3.1 Irrigation and Drainage

(1) Irrigation Facilities Background

Aweil Rise Scheme is a Government owned project which was established in 1940~~ø~~ by then British Government and it started with 50 fed only which was operated by the prisons. The objectives of the project is to serve the population of Aweil Town by producing enough food, create job opportunity to the people of Aweil, suitability of the area for rice cultivation and for improving the social economic conditions.

The project started with no Irrigation facilities until 1963 where dikes were constructed all around the Scheme and the Scheme was divided into basins and internal roads. In 1973, FAO came in and established the irrigation facilities, like irrigation canal, drainage canal and etc. which were well operative till 1983 where the civil war broke out.

According to the information collected from the State Ministry of Agriculture and Forestry as well as AIRS, the general feature of the Scheme is as follows:

1. The area of the Scheme is 11,000 feddan or 4,620 hectares.
2. AIRS intake is located on River Lol
3. There are 15 basins in the Scheme. Basin 1-6 and 10-14 have not been developed but only three (3) basins, namely basin 7 with an area of 1,050 feddan, basin 8 with an area of 850

feddan and basin 9 with an area of 820 feddan, which were rehabilitated by GIZ in 2009. The total area of three basins is 2,720 feddan. Basin 15 was given to the prisoners to use it for cultivation of seed production.

As mentioned above irrigation facilities for Basin 1-6 and 10-14 have not been developed and if there are existed ones, they are damaged and the land use for those basins is bush grass and some of them were used for sorghum cultivation.

(2) Types of the Irrigation Facilities

The Table below summarizes the types of irrigation facilities and their current conditions in AIRS.

Table 3.3.1 Conditions of Existing Irrigation Facilities

Facilities	Conditions	Explanations
Water Intake Facilities	Poor	Lack of the maintenance No fund to remove the sediment
Gate to Division Box	Poor	No spare parts and regular maintenance
Canal Principal and Branches	Poor	- Because the canal and branches have more than 20 years without maintenance - are all full with grasses and weeds
Gate to Secondary Canal	Poor	Lack of funds to employed casual labours for operation and maintenance
Secondary Canal and Branches	Poor	Lack of funds to employed casual labours for operation and maintenance
Gate to Tertiary Canal	Poor	Lack of funds to employed casual labours for operation and maintenance
Tertiary canal	Poor	Lack of funds to employed casual labours for operation and maintenance
Gate to Farmland	Poor	Lack of funds to employed casual labours for operation and maintenance
Dike	Fair	Only Dykes from basin 7 to basin 15 is in a fair condition. The rest are poor
Diversion		No diversion structure in scheme

a. Intake: an opening which convey water from the sources to the irrigation canal.

Water intake for the Scheme is not in good condition because of lack of maintenance, it is silted and a lot of grasses need to be removed. Also the intake is said not in the right location that is why; there is the proposal to relocate it to upstream to the existing one. This proposal, however, needs careful examination.



b. Irrigation Canals: an artificial open channel for transporting water for crop irrigation.

As for supply canals and drains for three (3) basins, some are functional and others need rehabilitation. Also some of the gates are functional and others are totally damaged and there are no spare parts for them.



c. Dike: an embankment constructed to prevent flooding.

Dikes in basin 7, 8 and 9, field irrigation culvert and drainage for the three (3) basins are in good condition. Dikes from basin 15 to 7 are fair, but dikes from basin 6 to 1 do not exist. Access road and bridges for most of the basins 7, 8 and 9 are functional, and for other basins the roads not exist. It needs to be constructed.

d. Control Gates: an irrigation water control gate for controlling the amount of water delayed downstream. The gate includes a frame and a pair of panels in the frame hinged connected at adjoining horizontal side edges and forming a wedge shape extending upstream.

e. Bridge: a structure carrying a road, path, railroad, or canal across a river, ravine, road, rail road, or other obstacle.

f. Stilling Basins: stilling basins are transition structures constructed to dissipate excess energy confined by high velocity flow at the outlet of conduit or tunnel so that the flow beyond the basin does not endanger the stability of bed and banks of downstream channel

g. Head regulator: the distributary head regulator is constructed at the upstream end of a channel where it takes off from the main canal or a branch canal or a major distributary.



h. Check gates: an irrigation gate system installed in a channel (such as a ditch or canal) for controlling the flow of water through the channel maintaining a desired level of water upstream from the irrigation gate system or for controlling water flow downstream from the irrigation gate system.



i. Culvert pipes: a culvert is a structure that is designed hydraulically to take advantage of submergence to increase hydraulic capacity. It is also a structure used to convey surface runoff through embankments. A culvert can be a structure, as distinguished from bridges, that is usually covered with an embankment and is composed of structural material around the entire perimeter. These include steel and concrete pipe culverts and concrete box culverts.



j. Drainage box: drain constructed with upright sides, and with flat top and bottom.



(3) Conditions of the Irrigation Facilities:

As mentioned above the Scheme started with no irrigation facilities since 1940 ϕ till FAO came in and established irrigation facilities which were operative till the war broke out in 1983. Since that time, these facilities have never experienced any maintenance due to lack of budget, equipment, and lack of technical staff, who has the technical know-how to carry out the job. In 2006 the activities started in the Scheme which were sponsored by EU and implemented by GIZ. The activity which was carried out includes clearing of the push on the dikes, maintenance of the canals, bridges and roads. All these activities have been done only in basin nine (9), eight (8) and part of basin seven (7). The Scheme was handed to the Government on 2012 up to date, and no more maintenance has been done to the irrigation facilities and the status of these facilities from basin one up to basin six (6) is in a very bad condition because the maintenance has not been done since it was established in 1940 ϕ .

The IDMP-TT during its visit to AIRS has managed to carry out some inspection work for the existing irrigation facilities, to examine the look unto it. Therefore the TT came up with inspection sheet which states the location, type, purpose and condition of the irrigation facility. These sheets will be attached to this report to give clearer picture about the condition of the irrigation facilities in AIRS.

3.3.2 Flood Control

The existing dike is to performance the safeguarding of the Scheme from flood coming from the river

Lol spilling over the bank, the dike was being constructed around all the basins to also help to control the water for irrigation system.

From the south part of the Scheme, flood caused by rain is flown from highlands passing through few culverts of the road Aweil- Nymall and causes some damage for villages located in the area between the road and the Scheme. Flood water pass through the village as only water way as described by villagers in Udhum.

The topography of Aweil Town is flat and is prone to flooding, although the town itself lies on higher ground than the surrounding plains. The town lies close to the confluence of the Lol River with the Pongo River. The average elevation of the Aweil Town is about 420 meters (1,394 ft) above sea level. During the rainy season, the plain-dwellers or villagers seek refuge on higher ground in the Aweil Town. This flatness has led to the poor drainage of the Aweil Town and its surrounding. Flood control system is highly required to protect the people and their properties.



Drainage system in Aweil, Mabar village road

According to the Director General of the Ministry of Physical Infrastructure, the state government has the plan to create the canal starting from the highlands to drainage to divert rain water to the swamp area in the north east part of the town or into the river Koum. The plan has not started yet, although some activities for draining rain water has been done such as digging canal along the road to Wau.

3.4 Existing Situation of Operation and Maintenance of Irrigation Facilities

3.4.1 General Practices for O &M of Irrigation Facilities

Operation and Maintenance of the Scheme is primarily the responsibility of the AIRS office. With the support of MAFCRD and others, the Scheme Office is performing their O&M practices. Following descriptions and Table summarize the current practice of O&M by the AIRS office:

1. Water intake facilities: the operation activities are to open the facility when supplying water to the field and closed it when the water supply need was satisfied. And this activity can continue for seven day if the rainfall is available, and the activity extends more if there is dry spell.
2. Maintenance of water intake facilities: activities are to cleaning and repairing any damage in the facilities, once a year before the beginning of rainy season. Some operation and maintenance activities used to take place for water intake gate, principal canal and branches.
3. Gates to secondary canal: the operation is to open the gate for seven days or more if there are dry spell. And the MAFCRD provides the lubricant if needed for services and maintenances of the gates.
4. The irrigation for one block can take three (3) days or more.

Table 3.4.1 General Activities of O&M in AIRS

Facilities	Activities	Note	Supported by	Type of Support	
Water Intake Facilities	Operation	Opening when water is needed and close if water is enough	-It takes 7 days if it is not raining -It takes more than 7 days if it is raining	MAFCRD State MAFi	- salary - food for work
	Maintenance	Cleaning Building intake facilities	Every season during the dry period	MAFCRD	- salary - funds
Gate to Division Boxes	Operation				
	Maintenance				
Canal Principal and Branches	Operation				
	Maintenance				
Gate to Secondary Canal	Operation	Open the culvert gate (boxes gates) for the time water is needed	For the block is flow up to 3 days	MAFCRD	Salaries
	Maintenance	Apply the oil to assist easy opening the gates	If needed	MAFCRD	Salaries
Secondary Canal and Branches	Operation				
	Maintenance				
Gate to Tertiary Canal	Operation				
	Maintenance				
Tertiary canal	Operation				
	Maintenance				
Gate to Farmland	Operation				
	Maintenance				
Dike	Operation				
	Maintenance				

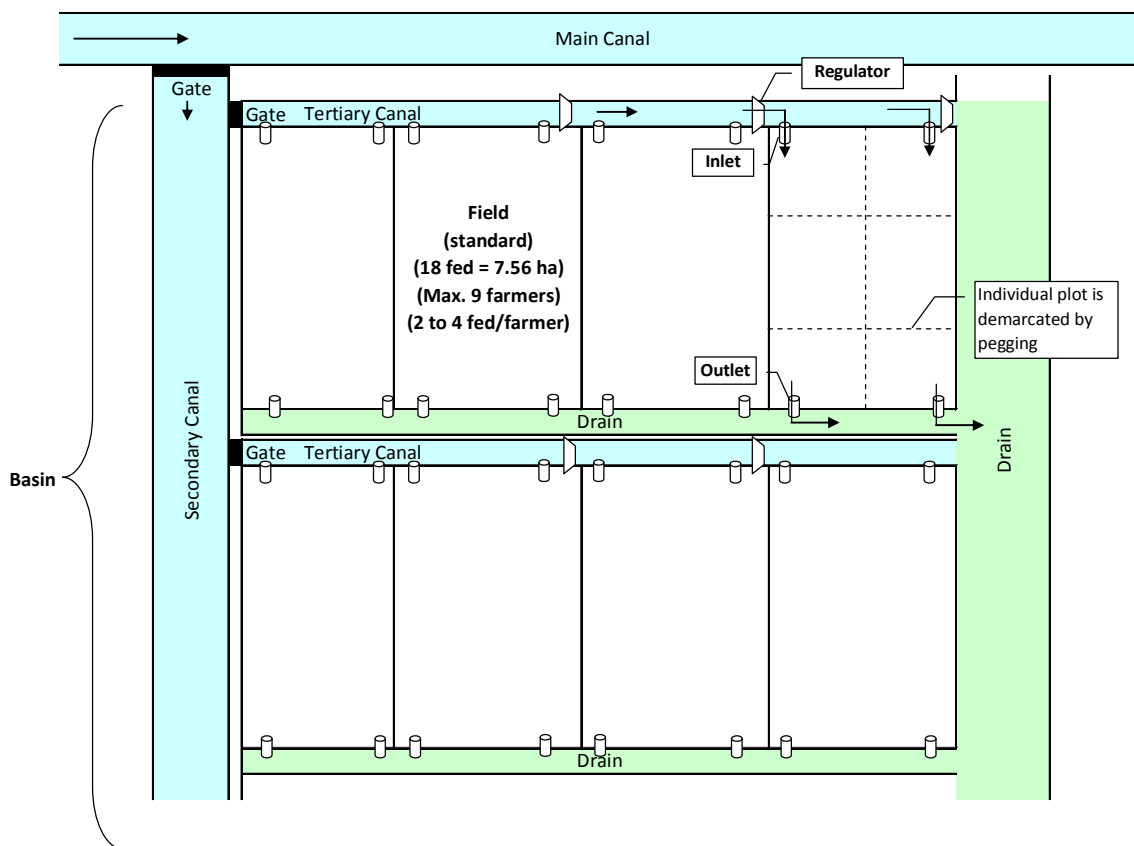
3.4.2 Demarcation of O&M Work between the Scheme and Farmers

While most of the part of O&M is undertaken by the Scheme, the role of farmers in O&M of the irrigation facilities is little. From the main intake up to the tertiary canal, i.e. just at the intake of the field, all the gates and regulators are controlled by the Scheme. Farmers are not allowed to operate the gates and regulators by themselves. When the farmers notice unequal water distribution among the fields, blocks and basins, they are obliged to report to the Scheme to rectify the situation by the gate or regulator operation.

The responsible part of the farmers is to control inlets and outlets of the fields. In the Scheme, a Basin is divided into Blocks and a Block is divided into Fields. Standard size of a field is around 18 feddan or 7.56 ha. Inside a field, each contract farmer acquires their plot. The plots inside the field are demarcated by peg. Therefore, water control has to be carried out in a field as one unit. Farmers in the same field need to cooperate as a group for water management on the field. Since the standard of farm plot is two (2) feddan per farmer, nine (9) farmers are grouped into one as average.

Typical water management in a field is as follows: there are normally two (2) inlets and outlets in a field. Firstly the outlets are closed and one inlet is opened to irrigate half of the field. Secondly another inlet is opened to irrigate the remaining half. Then the outlets are opened when draining water from the field. In this operation farmers in the same field is to work together. Figure 3.4.1 illustrates the water management of the field.

Outline of Present Water Management



Operation Responsibility

Scheme:

- Gate at the head of Secondary Canal
- Gate at the head of Tertiary Canal
- Regulators in the Tertiary Canal

Farmers:

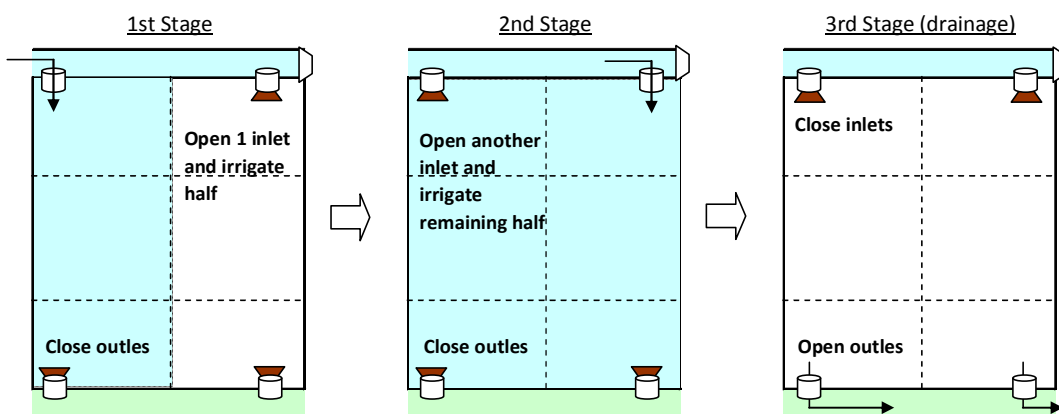
- Inlets of the Plot
- Outlets of the Plot

All the gates and regulators are controlled by the Scheme.

If any water shortage, farmers report the Scheme and then operators of the Scheme open / close the gates / regulators

Rotational irrigation is practiced by gate and regulator control according to the availability of water.

Water Management within the Field (Standard 18 feddan = 7.56 ha)



Farmers within the Plot manage water as a group

Figure 3.4.1 Water Management Operation Demarcation between AIRS and Farmers

3.5 Existing Situations of Support Institutions

3.5.1 State Ministry of Agriculture and Forestry

When the Aweil Irrigation Rehabilitation Project had been implemented by GIZ from 2008 to 2012, the State Ministry of Agriculture and Forestry (MAF) cooperated with AIRS for activities as following.

- Ploughing
- Maintenance of dikes and canals
- Seed germination testing
- Daily maintenance of machines
- Sharing the stocked crop among the farmers

To implement above activities the State MAF supported AIRS by assigning the staff who are Agronomist (1), Extension Officer (2), Accountant (1), Operator for tractor (5) and Operator for machines (2). In addition, the State MAF has three (3) tractors to implement ploughing and harrowing and provides the fuel of 15 drums (200 little. 1,200 SSP/drum). The State MAF contributed SSP180,000 including salary and fuel to AIRS. This budget comes from the revenue of forest managed by the State MAF and renting a tractor.

Following are the challenges of the State MAF mentioned by the officers:

- Rehabilitation / improvement around intake of river Lol for drainage.
- Lack of extension officer / engineer
- Lack of machine and operator (combine harvester, tractor, etc.)
- Post-harvest loss estimated at 20% ~ 30%
- Lack of fertilizers
- Establishment of credit service
- Provision of motorbike for extension officer

The State MAF has the plan of irrigation projects that are different from AIRS. In that plan they are considering to cultivate rice and sugar cane at Wuakmouk and Aluok respectively. These areas are located in the south of Aweil town. The water source is Kuwen seasonal river.

3.5.2 Aweil Irrigation Rice Scheme (AIRS)

From October 2012, the Scheme has been transferred to the National Government. The Scheme is the property of the National Ministry of Agriculture, Forestry, Cooperative and Rural Development (MAFCRD). As the owner is the National Ministry, the State Ministry does not fully step on the management of AIRS but just advise.

1) Scheme Structure

The scheme has eight (8) sections and departments under the Management, namely Administration section, Masonry and Carpentry Section, Logistics Section, Agronomy Section, Irrigation Section, Extension section, Department of workshop, Department of farm operation. Table below summarizes the no. of staff in each section / department and its mandate.

Table 3.5.1 Structure and Staffing of AIRS (As of April 24, 2013)

Section / Department	No. of Staff	Qualification	Ave. Age	Role / Responsibility
Management	M: 1	Diploma Agr. 1	58	• Direct the activities
Administration	13 (M:6,F:7)	Diploma acc. 1 Secondary 1	48	• Control resources • Coordination and Supervision of all the work
Masonry & Carpentry	M: 4	Primary 1	53	
Logistics	11 (M:8, F:3)	Secondary 1	51	
Agronomy	M: 5	Secondary 2	48	• Land preparation (plowing, harrowing and sowing) • Weeding (1 st , 2 nd and 3 rd) • Fertilizer application • Harvesting, threshing, winnowing sacking, weighing and loading • Storing
Irrigation	M: 6	Intermediate 1 Secondary 1	56	
Extension	M: 11	B.S. Agr. 1 Diploma Agr. 1 Secondary 3 Primary 2 Certificate Agr. 1	49	• Land preparation (plowing, harrowing and sowing) • Demarcation and allocation of plot to farmers • Supervision of weeding • Fertilizer application • Harvesting, threshing, winnowing sacking, weighing and loading
Workshop	M: 15	Secondary 1 Certificate 1	52	Maintenance of tractors and machines
Farm Operation	M: 14	Primary 1 Certificate 1	52	• Land preparation (plowing, harrowing and sowing) • Maintenance of tractors and machines • Transport of rice
Total	80 (M:70, F:10)		51	

Note: project manager at the Management has been changed as of May 2013.

Adopted from: AIRS

About the ages of staff, the number of staff with less than 30 years old, from 30 to 39, 40 to 49, 50 to 59, and 60 & over are 1 (1%), 13 (17%), 24 (31%), 21 (27%) and 18 (24%) respectively. The average age of all the staff is calculated at 51 years old. The share of younger staff is lower than elder staff. In the future a recruitment plan of the staff would be required for sustainable operation.

2) Financial Status

Until 2012, GIZ supported the budget for the project implementation. MAFCRD allocates a block grant to the Scheme. Since 2009 the budget has been transferred from the National Ministry of Finance to the State Ministry of Finance. Then the State Ministry of Finance transfers the budget to the State MAF. Finally the budget for AIRS is disbursed from the State MAF, which covers salary of staff, fuel, etc. The budget for the Scheme is accounted for the MAFCRD and therefore, the National Ministry is supposed to supervise the expenditure of the Scheme.

Farmers are also contributing to fuel for tractor in order not to delay the operation. The Scheme earns part of their revenue by their own by leasing trucks (1000SSP/trip). Of course the share of harvest covers the part of expenditure. As of March 2013, monthly expenditure was SSP10,783. (incentives, loan to staff, stationery, office utensil etc.)

The Scheme prepares the annual budget plan. Apart from the salary and fringe benefits of the staff, the operation cost of the Scheme for year 2013/14 is budgeted at around five (5) million SSP out of which purchase of fertilizer occupies 47%, followed by field operation cost such as plowing, sowing at 22%,

and spare parts and equipments at 15%. The allocation of the budget for operation cost from the National and State Government is not certain at this moment of the survey. Provided the Scheme would operate 3,000 feddan in this year, the budget for operation would be 1,666 SSP/feddan, which looks quite high. According to the annual report of the Scheme, the average rice yield of the Scheme in 2012 /2013 was 7.8 sacks/feddan, which is equivalent to around SSP1,100. It is already deficit to the Scheme. Following are the challenges of the Scheme mentioned:

- Lack of fertilizers especially TSP
- Dikes have so many cuts to control water and some canals are closed
- Farmers operate with fear from unstable conditions. AIRS consists of 15 basins and the last basin is 27 km away from the intake. Although the three basins were rehabilitated by GIZ Project, drainage is not well installed and the irrigation system does not really work.
- Farmers are still using traditional cultivation method. Agriculture mechanization is limited. Some of the machines are only available but the lack of spare parts is a big issue. Introducing combine harvester would make in time harvesting (*but without line planting, combine harvester application is not effective*).
- There are thefts to steal rice on the field.
- Lack of committed approach, i.e. the role of stakeholders is not clear. The Scheme was a national project and it needed the involvement of stakeholders, e.g. joint meeting of State MAF and Ministry of Water and Rural Development is required. Furthermore, staffing is also a problem: the area of the Scheme is big but staff is not enough and not well qualified. It is necessary to involve State in planning.
- Lack of financial institutions to cushion farmers' uncertain economic situations
- The scheme does have a sufficient number of extension staff to provide services for farmers.
- There is a lack of vision: where the Government is heading for.
- Seed bulking is being carried out and trying to avoid mixture of varieties not to lower the quality of rice. There are three (3) varieties grown in the Scheme: BG-400, BR-4, and BG-90. BG-90 is no longer used due to problem of color (it becomes black). NERICA is now under trial.
- Milling gives different grade. Currently installed rice mill has not been functioning due to default. The capacity of rice mill is also limited making the marketing difficult to expand. Now the price of paddy rice is 80SSP/sack=70kg, which is very low.

3) Plan for Improvement

AIS managing office is currently considering a plan for improvement, but the plan has not yet documented in the paper. As a thinking, the manager raised following:

- Looking for spare parts
- How we can train staff
- How we can expand scheme
- How we can have clear budget flow
- Increasing the number of tractor

4) Extension Service of the Scheme

Following are the types of extension services the Scheme provides:

- Leveling & Paddling in May: they have 3 levelers. They do in areas where it is slopes.
- Plowing in February: 3 Plow, but fuel shortage delays the operation.
- Seeding from mid May to June: seed drill was used long time ago. Now planter is used. Seeds are broadcasted.
- Gate Control from July to October: 2 week after planting. When rice grows up to 5 ó 6 cm. Irrigation workers operate the gates. For water management, they select farmers for operation to work with irrigation workers.
- Fertilizing before planting: teach farmers how to use fertilizers, the Scheme buys fertilizer from traders and give it to farmers. Money is collected from farmers later on. It is ideal to apply TSP after harrowing and Urea after three weeks of planting (top-dressing), but TSP is currently not available.
- No pest control, but they hire guard for bird scaring. Last year they hired 10 guards.
- Harvesting: manual work using sickles. If there is combine harvester, operation will be efficient (*Asked that applying combine harvester needs to apply line planting, the Head of Extension answered that those tillers stepped by the machine can be manually harvested. It means with current way of planting (direct broadcast sowing) combined harvester could not fully function. Supplementary manual work will be required.*)
- The Scheme provides sacks to farmers. Number of sack is controlled with numbering the sack. Transport to mill: 3 trailers and 2 trucks to transport rice from field to mill store. All the rice is collected from farmers and transported to mill store. Then the Scheme gives back the share to farmers. Farmers have to come to the store to collect their share by their own mean.
- Milling machine provided by GIZ has some default and it needs to fix it.
- Selling: Farmers sell rice by themselves. No marketing support.

5) Other Services

They provide introductory trainings: how to get a new technology / how to do threshing / how to weed / how to do water management / how to make water supply / how to harvest, how to thresh / enhancing awareness of farmers on Agriculture. They train farmers around 100 and rest is expected by farmer-to-farmer extension.

6) Relationship with the Other Stakeholders

Currently above-mentioned services have been provided by the managing office without cooperation. There was Food for Work to clean canal last year by WFP. AIRS office receives the following support.

- MAFCRD: Salary (According to the manager, salary comes from State Ministry)
- State Ministry of Agriculture; 4 tractors, Salary
- Tractors are not in good condition (no spare parts)

7) Constraints

- No refresher training for staff
- Poor communication with MWRI
- Lack of extension officer: currently five (5) officers (Head, Assistant Head, Clerk and two (2) extension officers), who have to cover 5,000 feddan.(staff list shows 11 staff, though)
- A lack of extension tools: less plowing machines, no spare parts for tractors, a lack of fertilizers, a lack of combined harvesters, no video as a tool for extension training, only three (3) vehicles for means of transportation for extension workers.
- Asked for the priority, the head of Extension told 1st: structure of scheme (man-power), 2nd: lack of fertilizers, 3rd: lack of combine harvester. Water availability came 4th from his point of view.

3.5.3 State Ministry of Water and Rural Development

The State Ministry of Water and Rural Development became independent again in 2012 two years after they were merged with the State Ministry of Physical Infrastructure in 2010. The department that is in charge of Irrigation under the State Ministry is the Department of Water Resource Management and Irrigation. The current situation of the department related to the AIRS is mentioned below.

1) Number of the staff in the Department of Water Resource Management and Irrigation

According to the Acting Director of Water Resources, the number of the staff of each category is as follows. It is notable that there are some staff who are specialized in the activities of AIRS, such as River Technicians and Rice Scheme Supervisor.

Table 3.5.2 Number of Staff by Category

Category of staff	Number
Unclassified Staff (Drivers, Cleaning staff etc.)	12
Classified Staff:	
Mashon (Head Engineer in charge of Dikes etc)	2
River Technician (In charge of gauging Station)	2
River Technician (In charge of the Rice Scheme)	2
Rice Scheme Supervisor	1
Mechanic in charge of vehicle etc	1
Radio Operator	1
IT Staff	1
Total	22

2) Activities on AIRS

The department currently has no activities related to the operation of the Scheme, even though the department has some staff to cooperate with the Scheme. According to the Acting director, the reason is the budget limitation. However, no coordination with the irrigation section of the AIRS managing office is more significant cause of their lacking in roles in the Scheme.

In addition, the department was not involved in the Scheme even at the time when the Aweil Irrigation Rehabilitation Project had been implemented by GIZ from 2008 to 2012. This is because the implementation agency of the project was the State Ministry of Agriculture and Forestry. During the time, the State Ministry of Agriculture and Forestry had the Department of Mechanization and Irrigation and the Department of Rice Scheme Project as shown in the Figure 3.5.1 (The Irrigation Unit and the Department of Rice Scheme Project have currently been merged with the structure of the AIRS managing office.).

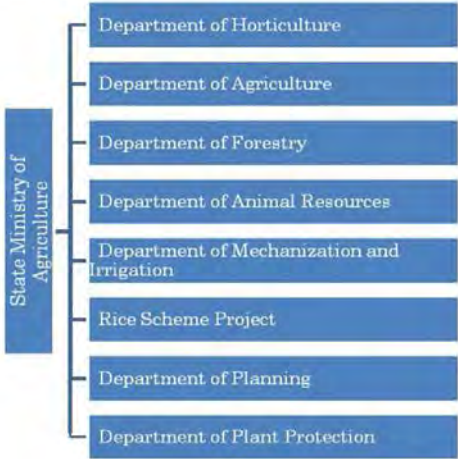


Figure3.5.1 Organogram of the State Ministry of Agriculture and Forestry (NBGS) until Oct. 2012 in the Period of GIZ Project

Source: IDMP-TT



Figure3.5.2 Organogram of the State Ministry of Agriculture and Forestry (NBGS) since Oct. 2012 after GIZ Project

Source: IDMP-TT

3) Future Coordination with the Scheme

Whereas the department does not have any relation with the Scheme at this moment, the acting director showed his willingness to join the AIRS activities, such as Construction of Dikes and Dams for the Schemes and Teaching farmers the methods of on-farm water management. To achieve this, the department needs to do two things. One is the establishment of coordination mechanism with the relevant institutions, such as the AIRS managing office, the State Ministry of Agriculture & Forestry, and the State Ministry of Physical Infrastructure. The other is taking action through the utilization of the current budget and human resources. Even though the budget may be limited, the department is financially supported by the Ministry of Water Resources and Irrigation (MWRI) and most of the staff do not have any activities at all. If the department manages the budget and staff well, it may be possible for them to promote the schemes in cooperation with the relevant institutions.

3.5.4 State Ministry of Physical Infrastructure

In 2012, the Ministry was split to two: 1) Ministry of Water, Cooperatives and Rural Development and 2) Ministry of Physical Infrastructure, which is dealing with electricity and housing. Since 2008, land was categorized into agricultural land, buildings and others. Now the State Ministry has made layout of 10,000 plots for housing (1st class: 40m x 30m, 2nd class: 30m x 25m, and 3rd class: 25m x 20m). Also the State Ministry is to open for investment area.

Role demarcation between MAF and MPI in general are: planning by MAF, design by Consultant and implementation by MPI. As for the AIRS, when farmers association applies for land plot to the State Ministry of Agriculture and Forestry (MAF), the State Ministry of Physical Infrastructure (MPI) will send engineers to survey the plot. Now the State Ministry is providing services as its own budget, but taking survey charge of 0.5 SSP/m² is under process to introduce. The role of State MAF is cultivation, while the role of State MPI in AIRS is to produce a document for farmers to prove the allocated area so that State MAF can give approval to the plot allocation to the farmers.

State MPI has 87 staff but no staff is attached to the AIRS. State MPI does not have any daily work for AIRS. MPI has a machinery to dig holes, but not for water. The work with machinery is left for the National Government.

3.5.5 National MAFCRD

AIRS is the property of the National Government, namely the Scheme belongs to MAFCRD. Since EU-GIZ was supporting AIRS, the focal point of MAFCRD for AIRS is DG of Special Projects & Donor Coordination. The line departments of the Ministry such as the Department of Mechanization are therefore to supervise the Scheme, as well, but the issue is lack of qualified staff.

As AIRS is a historical irrigation scheme, the Ministry has a will to maintain the Scheme. One issue is to clarify the management line of the Scheme. After handing over of the Scheme from GIZ, it seems that the management line is still not clear. For the effective operation of the Scheme, the roles of MAFCRD, State MAF, the Scheme management and farmers will have to be clarified. MAFCRD is also supervising the irrigation scheme in Renk and there are two (2) proposed agricultural schemes in Tonchol (sorghum) and Bentiu (rice). It needs to clarify the job description between National and State Governments toward effective management of the schemes.

3.6 Groundwater

3.6.1 Purpose of the Groundwater Survey

On the groundwater survey in Aweil site, there were three major purposes. These were:

- To look through the topography of north-western hedge of Sudd Basin,
- To grasp groundwater condition at Basement Complex Zone, and
- To observe the conditions of existing deep wells at Wak Abail Well-field.

Sudd Basin is one of the world largest flat and wet basins, enclosed by impervious basement rocks of Pre-Cambrian age. Sudd Basin is consisted of unconsolidated fluvial deposits as completely flat plane, while the area consisted of the basement complex shows a very gentle undulation with a few kilometers span. Aweil site is situated on the border between Sudd Basin and the Basement Complex Zone, slightly inside of the Basement Zone. Thus, it was easy to observe the both features of Sudd Basin and Pre-Cambrian Basement Zone in Aweil site.

Northeastern corner of Sudd Basin is underlain by famous Nubian Sandstone, which is the African largest aquifer connected from Libya, Egypt and Sudan. There is Wak Abail Well-field around 10km north of Aweil, and there were several deep wells thought to be tapping groundwater from the Nubian Sandstone. To observe the situation of these deep wells was one of the purposes to make groundwater survey in this site.

3.6.2 Findings

1) Topography and Geology

Sudd Basin, supposedly one of the African largest wetland, is formed by fluvial deposits in still unconsolidated. Recent alluvial deposits cover the surface overlying diluvial

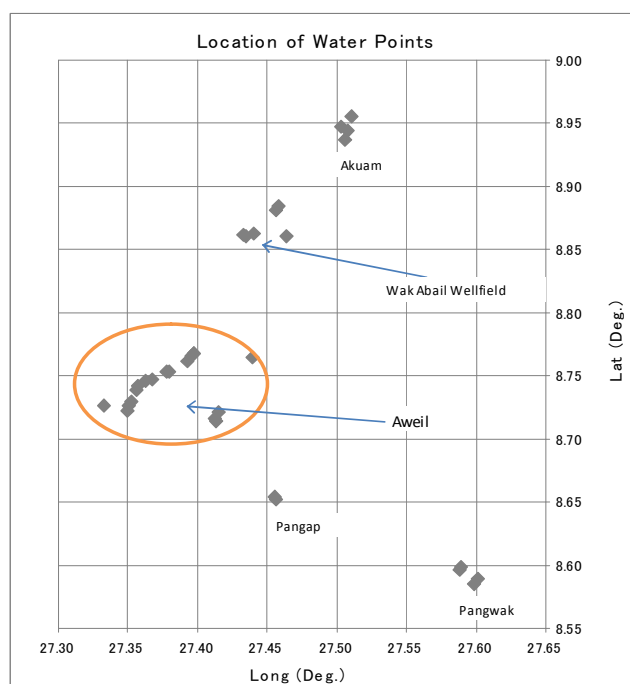


Figure 3.6.1 Location of Wells Observed

deposits and Umm Ruwaba Formation of Tertiary, and thus, the basin shows just flat feature everywhere. The flat land is not yet wet but it will soon be inundated.

In the south of Aweil, including the central town area, the Basement Complex of mainly Pre-Cambrian age is exposed widely. The surface of the basement is usually weathered and covered by Laterite. Most of the hard Laterite layers have been excavated already but the weathered rock surface forms very gentle long span undulation, showing a characteristic landscape along with long straight roads.

2) Situation of Wells

During the site visit, more than 30 points of wells were observed in between Latitude $8^{\circ} 35'06.3''$ to $8^{\circ} 57'18.4''$ N and from Longitude $27^{\circ} 19'57.3''$ to $27^{\circ} 36'04.8''$ E, including Aweil Town area and Wak Abail Well-field (referred to Figure 3.6.1).

Wak Abail Well-field

At first the IDMP-TT visited Wak Abail Well-field. However, it was quite unexpected that the well-field was completely abandoned. They said the well field was constructed in 2009 by Ayat Company from the north Government and it was funded from unity fund, but abandoned in the same year by the Government, as well. Total ten (10) deep wells were drilled and nine (9) were succeeded. However, now all wells were clogged by iron plates welded, a diesel generator and several distribution pipes were left to stand without any cares. Later, the TT visited to the Ministry of Water and Rural Development, Urban Water Office, to meet with the deputy director of Urban Water. He said the well-field was constructed and abandoned by quite political reason, and there was no technical data on the wells. He said he still continued to collect any data on the well-field through an official route.

Dug-wells

The TT observed some hand dug-wells but most of them were already abandoned, because a new hand-pump equipped well was constructed nearby. In this time, the TT measured the depth of groundwater table at two of dug-wells and the depths were from 3.00 to 3.55m from the ground surface. In both of them, aquifers were hard Laterite layer.

Hand-pump equipped wells

In most of the villages to which the TT visited had some wells with a hand-pump (India Mark II) equipped. Most of them were well operated by the villagers but a few hand-pump wells were already broken and abandoned, they were not so old though.

Based on the hearing from the villagers, the depth of wells were from 30 to 63m in maximum, groundwater table were from 4.0 to 45m, the pump cylinder were set from 15 to 51m depth, although there were some doubt. In all of those wells observed, the TT conducted simple groundwater quality tests; measurement of pH and EC values, and water temperatures (refer to the next section).

Level II well facilities

In the relatively large villages (having large population) near around Aweil, such as Akeum and Pangwak, there is so-called "Level II Facility" which consisted of tube well(s), mechanical pump, elevated tank(s) and communal taps. In the both villages, submersible pumps were installed in deep wells and pumps were operated by solar energy generation system. They said the depths of the deep wells were from 60 to 84m, pump depths were from 40 to 21m, and statistic water levels were from 4.0 to 20m. In the case of Akeum, the system was constructed by AID and funded by SIDA. In these

facilities, simple groundwater quality tests were conducted, using water samples taken from the communal tap nearby the elevated tanks.

3) Water Quality Tests

A series of simple groundwater quality tests consisted of pH value, EC value, and water temperature measurements. When it was available, the depths to groundwater table from the ground surface were also measured using a water table detector. Measuring equipment; pH meter, EC meter, and water table detector, were brought from Japan by the Hydrogeologist.

The results of the water quality measurement were summarized in Table 3.6.1, together with some well information such as well depth, pump depth, and/or statistic water level obtained through hearing from the villagers, these were sometimes not so accurate though.

Among the water qualities measured in this time, remarkably low pH values were detected in Aweil town center and in the south-east of the town, in Mallen Allen village. Measured pH values in Aweil town were 5.36 ó 5.88 and in the village were extremely low as less than 5.0 (4.54 ó 4.89). It is the level that must be worried about affection to human beings if they drink the water continuously for long time. For EC values also, some very low EC values less than 10 mS/m, but it means salinity free and much better than too high EC values.

Groundwater temperatures actually measured by the TT range from 27.2 to 32.0°C. Some water samples were passed through elevated tank or delivery pipes, so average groundwater temperature should be nearly or less than 30.0°C.

Table 3.6.1 Summary on Hydrogeological Reconnaissance in Aweil

Date	No.	Location	Lat			Log			pH	EC mS/m	Temp °C	Well-dep m	SWL m	Pump Depth
			°	'	"	°	'	"						
10-May	1	Wak Abail Wellfield No.1	8	51	44.8	27	26	25.7	-clogged-					
	2	No.2	8	51	40.9	27	25	59.1						
	3	No.3	8	51	37.8	27	26	5.2						
	4	MoWR	8	45	54.0	27	26	21.2	7.08	54.2	26.7			
	5	Genkou	8	52	51.7	27	27	23.1	7.10	37.9	28.8	49		15
	6		8	53	2.3	27	27	28.5	7.12	51.4	27.2			29
	7	Haldul	8	51	38.4	27	27	50.2	7.45	24.6	29.7	44		
	8	Akuem Soler System	8	56	41.2	27	30	29.3	7.30	24.7	32.0	60		48
	9	System 2	8	56	51.9	27	30	10.6	7.04	30.8	31.5	84		40
	10	System 3	8	57	18.4	27	30	36.4	7.09	29.0	32.2	63	20	
	11	Akuem SE	8	56	14.1	27	30	21.3	6.93	31.7	31.9		25	51
11-May	1	Aweil State Hospital	8	46	4.9	27	23	51.8	6.33	29.2	31.0		3.55*	
	2	Primary School	8	46	4.9	27	23	49.9	5.82	36.1	31.1			
	3	TV Station	8	45	56.5	27	23	42.4	6.25	35.5	31.4			
	4	Road side	8	45	42.3	27	23	31.9	5.77	18.11	31.6			
	5	University Entrance	8	45	10.9	27	22	46.9	5.36	5.26	32.0			
	6	--	8	45	11.6	27	22	39.4	5.45	7.35	31.6			
	7	Gate Way (Maffer)	8	44	51.5	27	22	1.3	5.71	4.44	31.9			
	8	Maffer West	8	44	44.4	27	21	45.5	5.50	7.43	31.4	62	24	
	9	Warkuec	8	44	32.5	27	21	24.0	6.08	11.38	30.9			
	10	--	8	44	20.9	27	21	23.4	6.06	9.53	30.8		4.5	
	11	Apada	8	43	45.3	27	21	9.0	6.30	12.92	31.3	30	27	
	12	--	8	43	35.2	27	21	1.4	6.00	11.15	31.4			
	13	Apada Primary School	8	43	19.5	27	20	59.4	6.00	3.84	31.1	60	45	
	14	Udhaba	8	43	34.2	27	19	57.3	6.02	7.33	31.4	42		21
	15	Kuom	8	43	18.1	27	24	55.4	6.48	29.8	30.1			
	16	Kuom deep	8	42	59.6	27	24	44.3	5.88	19.64	29.8			
12-May	1	Kuom far deep	8	42	49.8	27	24	47.1	6.68	19.6	30.0	62	27	
	2	Pangap (by PACT)	8	39	13.7	27	27	19.8	5.79	10.33	30.2			24
	3	Pangap (by FAO)	8	39	9.6	27	27	21.9	5.82	9.98	30.3			
	4	Mallen Aleen	8	35	54.6	27	35	22.2	4.54	3.19	31.6			
	5	--	8	35	48.1	27	35	18.7	4.89	3.29	31.1			
	6	Mallen Aleen -Police St. (Dug well)	8	35	6.3	27	35	54.7	-	-	-		3.00*	
	7	Mallen Aleen (Soler Tank)	8	35	20.1	27	36	4.8	6.16	5.53	31.5	60	4	21
														Note *: actually measured others were hearing.

3.6.3 Conclusion

In Aweil site, two of the most typical geomorphologic features; vast and completely flat Sudd Basin formed by fluvial deposits in the north, and almost flat but gently undulated Basement Complex Zone in the south, were observed.

Basement complex of Pre-Cambrian age is impervious and forming a bottom of huge volume of unconsolidated deposits filling up the Sudd Basin. Thus, the Sudd Basin itself is a huge scale groundwater basin storing enormous volume of groundwater inside because the deposits filling up the basin are fluvial deposits such as gravel, sand, silt, and clay, easily containing groundwater excepting clayey deposits.

Pre-Cambrian basement complex is the most basic geological unit in Africa, forming a direct or indirect basement of the all of countries. The basement complex is consisted of Granites or Gneiss geologically, usually hard and massive forming mountains or vast hills where it outcrops. In hilly zones or flat low areas, it used to be covered by weathered zone or Laterite cover, and these layers usually contain groundwater, forming small scale aquifers. During the site investigation, the TT could observe both the features of Sudd Basin and Basement complex zone.

There were many wells; hand dug-wells, hand-pump equipped shallow wells, and deep wells equipped mechanical pump, in Aweil Town and in most of the villages surrounding Aweil. The TT conducted simple groundwater quality tests at more than 30 wells in the north and the south of Aweil, including the center of Aweil Town. Then, the TT found out that groundwater qualities of wells in the north (Sudd Basin) were rather good, however, groundwater in the Aweil Town and farther south of the town (in Mallen Allen village) had a problem; very low pH values which mean quite acid groundwater. SSDWG (South Sudan Domestic Water Guideline) showed permissible pH values are between 6.5 and 8.5, whereas pH values observed in Aweil center were from 5.36 to 5.82, and the values measured in the village ranged from 4.54 to 4.89, far less than 5.0 (refer to Figure 3.6.2 Distribution of pH values). Such acid water may cause any health disturbance when they continue drinking such water for long period. Fresh water supply system for the villagers shall be secured as soon as possible.

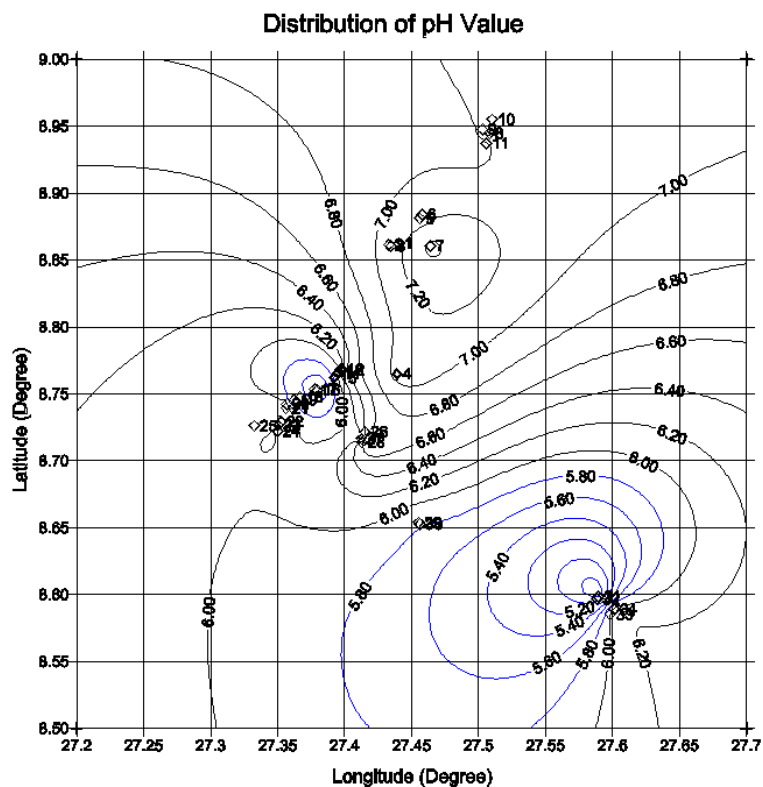


Figure 3.6.2 Distribution of pH Values

3.7 Other Valuable Information/Data

There were valuable Information for the scheme obtained from FAO office in aweil which include,

- Feasibility study for scheme,
- Rainfall data from 1985 up to date, research booklet and
- The information containing the story of the scheme in Arabic Language.

Also soil information from FAO official told us that, Northern Bahr El Ghazal soil are Clay, Clay loam and Sandy clay soil.

The list of information/data collected from AIRS is attached as APPENDIX-1.

4. LESSONS LEARNED TO DEVELOP STRATEGIES AND MASTER PLAN

In arriving at lessons that can be learnt from Aweil site visit, three considerations were considered important, namely:

- Major achievements of the project since initiation
- Areas where the project could have done better with the resources it had
- Where things might have gone wrong in the process of pursuing project objectives

4.1 Overall

4.1.1 Aweil Pointed at Irrigation Possibilities

Although no controlled abstraction from River Lol was accomplished, flood flow was harnessed in quantities and durations that could support crop production in an otherwise semi-arid environment. This was a significant achievement. Aweil has demonstrated that where similar river and land conditions exist, engineering interventions can create potential for a medium to large-scale irrigation project.

4.1.2 Feasibility of the Rehabilitation: seeking for optimum alternatives

Lol River is a seasonal river. Water flows from mid July to January. Hence the irrigated agriculture can be practiced only once per year. Currently, rice seeds are sown directly on the field in June and rain water is used from germination to seedling stage. Irrigation starts afterwards. This extensive farming method may be one of the reasons for current very low yield level. With only one irrigation crop per year and extensive farming, it would be difficult to expect high return from the farm field. This low yield level and one crop by irrigation would make cost-benefit efficiency so low that the project might not be economically feasible.

When planning and designing the rehabilitation of the scheme, economic aspects, i.e. cost-benefit efficiency should be carefully taken into consideration. Through agronomical improvement including application of transplanting method (shifting seedling time to July could also be investigated from agronomical point of view), the current yield level could be drastically improved with stable water supply. Or planning the irrigation facility, e.g. constructing reservoir, to enable year-round irrigation might be an alternative, although the physical and social costs might be high.

As reference, here extracts the economic analysis of Aweil Project Study, by Enroconsult in 1979. In the study, the financial and economic internal rates of return to develop 2,865 ha were estimated at 16.5% and 25.7% with the conditions as follows:

- Total area of the First Stage: 2,865 ha
- Field layout: 200m width x 800m or 1,200m length (16ha or 24 ha or 38 fed or 57 fed)
- Flood protection (0.5m raises dike at the right bank of the Lol river: flood once in 50 years)

- Kar Atong canal design discharge: 4.83m³/s.
- Cropping Pattern: single crop: rice (within 168 days plant before the end of June and harvest before the end of November)
- Direct sowing / target yield: 4t/ha.

The report commends that "The production potential has never been fulfilled. This is mostly due to a lack of investments and the failure to establish a full-water control system. There is enough evidence to suggest that the water resources available are adequate for irrigated rice production. The soils have also proven to be capable of producing a good crop and the climate is favorable during the crop season."

4.1.3 Cost of Irrigation Development

Together with demining activities, the total cost of rehabilitating Basins 7,8 and 9 amounted to some 5, million Euros. The lesson to learn is that irrigation is necessarily a costly undertaking. Hence in preparing the master plan, cost will be an important consideration in prioritizing identified projects and models. Hence during the planning stage, it might be worthwhile to explore how the cost can be shared with prospective beneficiaries. At the time of Aweil site survey, the two farmer organizations (Farmers' Union and Cooperative Society) gave the impression that they were capable of discussing with an implementing agency how to share development cost so long as they are guaranteed irrigation water supply, supported with quality inputs and assured of produce markets. For instance, both organizations had ambitious future plans, which among other things included procurement of tractor, quality seed and fertilizers.

4.1.4 Prioritizing Project Components

With the budget at its disposal, the Aweil Irrigation Rehabilitation Project procured tractors, a rice mill, and a range of farm machinery. The project also uprooted trees from basin embankments and leveled the land within basin 7, 8 and 9. These were all important activities. However, the project forgot to give top priority to the most critical intervention of them all: constructing a permanent controllable intake. This would have been followed by de-silting and reshaping of the main and secondary canals. Once these three priority elements had been completed, the remaining budget could then have been directed towards buying tractors, uprooting trees and buying the rice mill in that order etc.

Such a prioritized development sequence would have provided security and reliability of water supply (at least during the 4-months flood season) to the farming community. Consequently, the area presently under irrigation would most probably be bigger and paddy yields higher.

The lesson to learn is that when the budget is limited (as it usually is), sequencing of development components should accord priority to securing irrigation water abstraction and main conveyance channels.

4.1.5 Personnel with Multiple Skills

AIRS has demonstrated that it is possible to establish an irrigation production system through deployment of a mix of different professional skills (hydrology, agronomy, engineering, management). The Scheme's total production of 8,000 bags of paddy/year that has been sustained over the last two years, is the result of this multidisciplinary effort. And any shortcomings in the Scheme, (e.g. non-functional machinery for plowing and de-silting or lack of high quality seed varieties), can be attributed to lack of competencies in such critical areas as mechanical engineering and agronomy.

The lesson to learn is that a future irrigation development plan must anticipate and provide for training as well as deployment of personnel with various skills. Together with irrigation water and other inputs, it is these competencies that can transform irrigation plans into tangible outputs (bags/tons of irrigated produce).

4.2 Technical Aspects

4.2.1 Design of the Scheme as Large-scale Commercial Farming

It is understood from the field visit that the Scheme was not necessarily designed to accommodate small-scale or peasant farmers to settle in, as the Scheme actually started with the labor of prisoners in history. The large farm plot seems to be meant for large-scale commercial farm: it is advantageous for mechanization and extensive farming application could be covered by efficient farm operation and the magnitude of the area (scale-economy). In such layout of the farmland, farmers opt to be laborer with non freedom for choice or discretion. Peasant farmers are constrained with limited capital investment and hence the capable of cultivating smaller plots, but they can practice intensive farming.



AIRS Field (very large for paddy)

Current scheme design is rather for estate and in this case the management entity either Government or private investment (privatization) would have big role to operate the scheme. Should the role of the operation (or ownership) was intended to transfer to farmer side (particularly small-scale / peasant farmers), the thought of design of the scheme would have to be re-examined. Also in order to introduce transplanting with paddy field, the plot should be divided into small plots so that leveling of land is well achieved and water retention would also be easier.



Paddy field in Japan ¹⁾

4.2.2 Water Management and Farm Layouts

Presently, a farmer is allocated a standard two (2) feddan plot (farm) which is marked out with pegs. There are some 7 to 19 farm plots in a field. Each field is irrigated as a single unit implying that farmers within the same field must co-ordinate how and when water enters and leaves the field. Co-ordination is also necessary between fields sharing the same tertiary canal since water may have to be rotated from one field to the other.

In cultivating paddy rice, land leveling is critical for water control. Hence, if one farm-plot is unlevel, water management becomes difficult not only in the specific plot but also in the entire field. For this reason a farmer's water control in his own plot is fairly limited. In spite of this, it was surprising that only few conflicts were reported. This might be due to the discipline that was reportedly applied at the time of Project rehabilitation (2006-2012).

¹⁾ The photo is quoted from web: <http://tokorin.cocolog-nifty.com/photos/huukei2/070413.html>

A lesson to learn is that consideration needs to be given to possibility of demarcating individual plots with bunds of modest height so that (a) a farmer can have an opportunity to level his/her plot better and therefore carry out more precise on-farm water management. (b) A farmer can identify him/herself with a plot whose boundaries he/she can see thus increasing motivation for improving the plots potential through leveling and applying organic manure. However, such inter-plot bunds might interfere with tractor-based land preparation operations, an inconvenience that can be mitigated by adopting rice- transplanting techniques.

4.2.3 Choice of Project Machinery

For medium to large-scale irrigation schemes, heavy machinery is required at the time of project implementation as well as during operation and maintenance of the irrigation system. In Aweil Scheme, there is a large mix of broken-down tractors, trucks and earth-moving machinery. Apart from budgetary constraints, spares are not readily available because the idle machinery consists of many brands and specifications. The lesson to learn is that in planning implementation of future irrigation schemes, an important consideration is the need to minimize idle time of project machinery and equipment. This objective can be realized, in part, by reducing the number of brands as well as giving preference to suppliers with reliable back-up of locally available spare parts

4.2.4 Agronomical Aspects

Although the Scheme was meant to paddy field, it has been found that during planting stage, the scheme thoroughly relies on rain water. Nursery preparation is not practiced but direct broadcast seeding is the actual planting method in the scheme. At the beginning of rainy season, namely in mid of June rice seeds are directly broadcasted on the field using a seeder. The quantity of seeds is 70 kg/fed or 166 kg/ha. This amount is density planting that has difficulty to make use of characteristic of tillering and to tolerate of falling down. Growing health seedling determines the later growth.

Due to no use of herbicides at this stage, rice is put in the competition with weeds. This could be one of the causes for low yield of the Scheme. This is an observation of the rice farming in the Scheme. There will be other aspects in improving the rice farming. Improvement of rice farming such as introduction of transplanting with controlled water management will be required as well as physical rehabilitation of the Scheme to increase the yield level.

Weeds compete with rice plant for water and nutrients. They also act as alternative host plants for different insect pests. Therefore, destruction of weeds from rice crop is of paramount importance. Generally, the weed infestation is more serious in dry sown rice than in flooded or transplanted rice.

By way of example, the yield reduction in rice due to weeds alone is estimated to be around 15-20% for transplanted rice, 30-35% for direct seeded rice under puddle conditions and over 50% for upland rice. The losses are more under direct seeded conditions, mainly because of lack of precise water control and poor land preparation. Following describe the weed control measures:

1. Prepare the Land Thoroughly

A thoroughly prepared land before planting or sowing helps the crop in two ways. First, the weeds are greatly reduced by repeated cultivation. Secondly, it gives the crop a good start by ensuring regular germination and vigorous growth and enables it to compete with weeds on more favorable terms.

2. Practice Straight Row Planting

Straight row planting or sowing is more effective to operate rotary weeder or wheel hoe in between two rows of crops. Rotary weeder can effectively operate only in soft mud. So before operation excess water from the field should be drained out. On the other hand, wheel hoe is smoothly drawn on the upland soil with proper moisture conditions. But it is not very effective due to the fact that weeds near the crop plants escape destruction. Deep hoeing too near the crop rows injures the root system of the crop. In the absence of a rotary weeder or wheel hoe, labourers are employed for hand weeding. They pull the weeds by hand and incorporate them deep in the mud or throw them out of the field. This practice can easily be done in line sown crop.

3. Flooding Rice at Effective Water Depth

Proper water management controls germination and growth of weeds. This method is useful and effective only when plenty of water is available either through irrigation or through heavy rains to completely submerge the weeds for 6-8 weeks. However, aquatic weeds or broad leaved weeds are not affected by this treatment.

Under continuous soil saturation (1 cm water up to the late dough stage), more sedges grow than broad leaved weeds and grasses. Submerging the field to 15 cm four (4) days after transplanting to the late dough stage practically suppresses most of the grasses and sedges. Flooding the rice to control grasses and sedges includes the following stages.

- a. Flood the field 5 to 10 cm. deep starting on the 5th to 7th day after transplanting. The water must be deep enough to cover the weeds but not the rice seedlings.
- b. Keep the field flooded for 14 days until about 3 weeks after transplanting.

Flooding, however, has its own drawbacks. Heavy expenditure and great efforts are involved in constructing high bunds or embankments around the fields to confine the water in a particular area. Furthermore, as these bunds cannot be cultivated, weeds growing on them serve as a source of weed infection and provide shelter to pests and pathogens. Most weed seeds require much longer submergence than the growing plants. For these reasons, flooding, unless properly carried out, is usually unsuccessful in eliminating weeds.

Diversification and intensification of the cropping pattern will also be a measure to improve the scheme productivity and profitability. The study by Euroconsult in 1979 (Ref. 7) suggests, for instance, the possibilities of crop intensification such as adding leguminous catch crop which could thrive on residual moisture after the rice has been harvested and harvesting of ratoon rice crop. According to the water availability, crop diversification and intensification should be studied for practice.

4.3 Management of the Irrigation Scheme

4.3.1 From Sharecropping to Cost Recovery Arrangement

Current arrangement of the rice production between the Rice Scheme and farmers is based on Sharecropping system, which is to share the harvest between the Scheme and farmers according to their share of the production cost. Farmers and the Scheme are to renew contract every year and the ratio of the share is revised, e.g. the shares between the Scheme and farmers in 2009/10 were 40% and 60% respectively, while the shares in 2012 /13 is stipulated in the contract as 48% for the Scheme and 52% for farmers. Following table shows the calculation of the share in 2012 /13 crop season:

However, this system does not always give enough incentive to farmers to grow well, since the payment to the Scheme from their income is considered very high. The harvest is a gross income from the farming activity and as a result of tenancy the farmer has to pay 48% of share to the Scheme. This is as if your income tax is 48%. As the public entity, the Scheme does not have to produce profit. To give more incentive to farmers to be innovative in rice farming to increase the production, it is recommended that the Scheme apply "Cost Recovery System" instead of "Sharecropping System". Farmers are to pay constant tenant fee to the Scheme and any surplus the farmers produce will fall into their hands. In this arrangement, farmers would get more incentive than current arrangement.

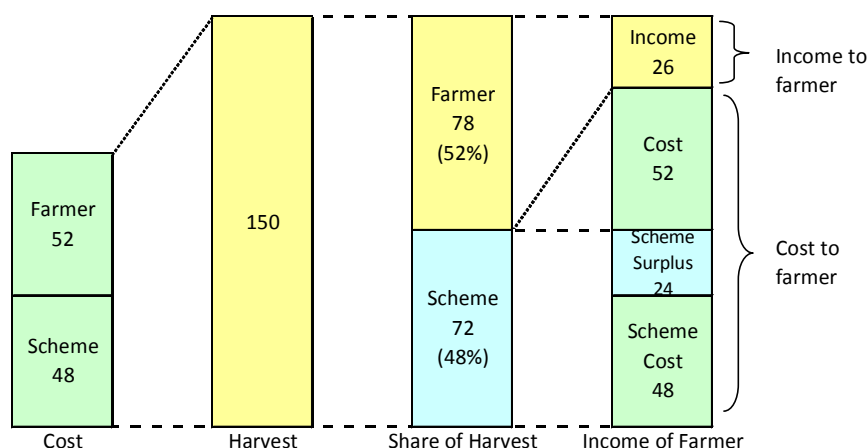
Table 4.3.1 Sharing Arrangement between the Scheme and Farmers

No.	Activity	Cost (SSP per feddan)	
		Scheme	Farmer
1	Land preparation	360	
2	Seed supply	150	
3	Fertilizer & pesticides (50kg)		78
4	Weeding		500
5	Harvesting		280
6	Threshing & winnowing		150
7	Farmers share transport		15
8	Empty sacks (15 sacks@3)	45	
9	Plastic sheet		150
10	Security guards	20	
11	Loading		15
12	Transportation of produce	360	
13	Off-loading at stores	15	
14	O & M of irrigation system	150	
	Total	1,100	1,188
	Share (%)	48%	52%

Source: AIRS

In this case, of course, the options to include the salary of staff, depreciation of the facilities and some administrative charge to be revenue for the Government could be incorporated into the production cost, when the Scheme calculates the tenant fee. Also considering the capacity of the Scheme, the responsibility of the Scheme should be transferred to the farmers in order to expand the irrigated area of the Scheme and transferring the responsibilities to farmers would reduce the cost borne by the Scheme, so that cost recovery base of the Scheme will be lowered, i.e. tenant fee will be decrease. In this case farmers will also be given another room to make effort in reducing the production cost.

Sharecropping System



Scheme Cost Recovery Basis

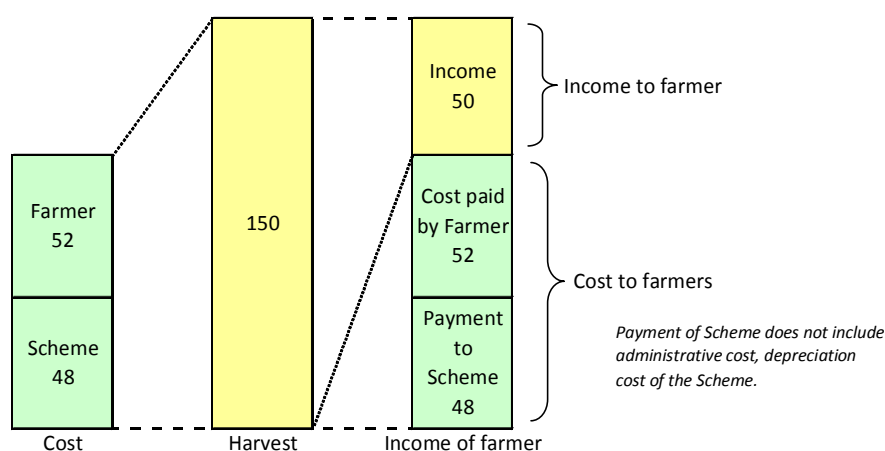


Figure 4.3.1 Comparison of Sharecropping and Cost Recovery Systems

4.3.2 Expected Farmers’ Roles

In both 2012 and 2013, the Scheme had budgetary constraints which reduced the Management’s capacity to carry out its responsibilities of plowing, input supply and de-silting canals. It is farmers and their Co-operative who came to the assistance of Management by contributing their paddy rice or their labor. On the basis of the farmers’ intervention, it can be concluded that the share-cropping model was not working as originally intended since farmers were taking up management responsibilities.

The lesson to learn is that in drawing out the Master Plan, there will be need for exploring alternative models that broaden the areas of farmer participation. In particular, future irrigation schemes are likely to recognize the potential and ambitions of farmers and their farmers’ organizations, by transferring a wider range of roles and responsibilities to the farmers (tertiary canal water management, land preparation, input procurement, marketing). The Scheme management can then focus on:

- Operation and maintenance of main irrigation infrastructure (intake, main and secondary canals down to tertiary canal off-take)
- Research on irrigated crop production, and development and multiplication of high quality seeds
- provision of technical advisory services to the farming community (irrigation methods, on-farm water management, crop cultural practices)
- Research on and dissemination of market information to farmers

In return for providing the above four services, Scheme management can then be entitled to charge Operation and Maintenance (O&M) fees which beneficiary farmers will pay.

It can be envisaged that such a new arrangement will be accompanied by a shift from one season lease (can be referred to as a house-fly lease!) to a more secure long term lease of say 20-50 years. (Note: external investors in Agriculture are already negotiating 30-99 years lease for sizeable tracts of land as compared to Aweil farmerø two (2) feddan land)

4.3.3 Irrigation Management Transfer

It would be necessary to transfer the roles of the Scheme to farmer side in order to expand the irrigation scheme considering the capacity of the Scheme. Even at the current situation, the shortage of the skilled staff has been addressed as a major challenge of the Scheme. Currently the operation and management of irrigation facilities are under the responsibility of the Scheme except for the inlets and outlets of the field /plot (see Figure 3.4.1 in Section 3.4). As expanding the irrigated area in the future, the workloads of operating the facilities up to field / plot side will soon exceed the staff capacity of the Scheme.

Irrigation Management Transfer (IMT) will also enable to reduce the cost of the Scheme; hence the public expenditure will be curbed instead of swelling. As for farmer side, they will get more room to exercise their discretion. It is also expected that bringing the operation authority close to the field level will increase the efficiency of water use. Farmers could seek for reducing production cost as their part of share increases, as well.

As well as expanding the ARIS, establishing public (National or State) irrigation schemes in nation wide, significant share of roles should be given to farmers in the scheme. For such institutional set up, establishing Water Users Association (WUA) by the water users, i.e. scheme farmers will be necessary. In case of AIRS, it would be a debate whether the recently established FarmersøCooperative should take this role or establish WUA as another independent entity.

4.3.4 Support and Cooperation of Different Institutions

During the site survey, it became clear that there was considerable networking of different institutions. The driving force underlying these institutional interactions was the pursuit of mutually beneficial interests. Two examples will illustrate this:

The Farmers Union at Aweil interacted with the local Chamber of Commerce, Aweil FarmersøCo-operative, Aweil Irrigation Rice Scheme, National farmersøUnion, MAFCRD at national and State levels as well as the FAO

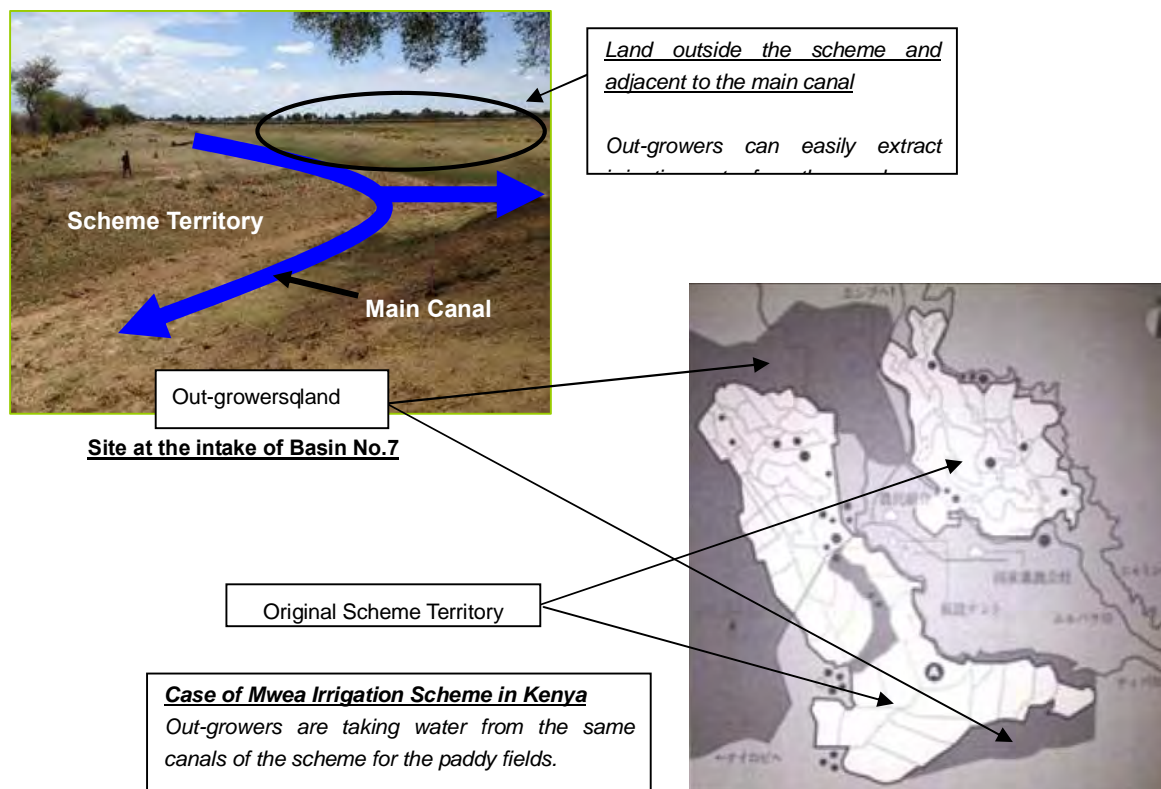
Aweil irrigation Rice scheme reported its engagement with National MAFCRD, State Ministry of Agriculture, Aweil FarmersøCo-operative, Private sector (individual and companies), Traditional local authorities and World Food Programme.

The lesson to learn is that in formulating the master plan, irrigation development must be placed within a wider context of many institutional stakeholders whose support or lack of it can influence the outcome of irrigation initiatives.

4.3.5 Future Anticipation on Conflicts with Out-growers

In the future, when the scheme starts generating very good income to the growers, there will be high competition among farmers to get land (tenancy contract) in the scheme. Those who could not get the

contract with the scheme may develop their own farm beside the scheme and may take water from the main canal of the scheme (out-grower). Since the main canal is situated as a boundary of the scheme and outside scheme, out-growers can easily access to the water in the main canal of the scheme.



The increase of out-growers may cause the water shortage of the area as a whole and result in the general low yield in the whole area. This anticipation comes from the case of Mwea Irrigation Scheme in Kenya. When the rice cultivation becomes profitable in the scheme, people around the scheme started developing their own paddy field and taking water from the canals of the scheme. Consequently the water demand exceeded the water supply capacity of the canals and water shortage as a whole area occurred resulting in lowering the yield level in the whole area. In Mwea, expansion of out-growers has not been able to control. Learning lessons from Mwea, as far as common natural resources should be shared by people, this kind of incidence might happen as the Aweil scheme gets successful.

4.4 Marketing of Agricultural Produce

4.4.1 Marketing as an Irrigation Planning Issue

Aweil produces an agricultural commodity (paddy) with a fairly long post-harvest shelf-life. However, bad roads to potential market destinations and lack of processing facilities have posed a major marketing challenge both to the scheme management and farmers. The lesson to learn for irrigation master planning is that access to markets must be a key consideration in specifying the location as well as type of crop to be irrigated. In addition, Aweil teaches that if a similar rice project is going to be planned (based on small scale farmers), several small to medium size milling machines, operated by private individuals or companies, would be preferred as opposed to a single large rice mill. With several small-scale mills, breaks down of one will leave others available for milling services. In any case, any planned large-scale irrigation development must give sufficient attention to an appropriate processing facility.

4.4.2 Rice Marketing


Marketing of rice is a crucial issue for decision making of expansion of the rice scheme. According to the current situation, the most critical issue is the rice milling facility. The mill installed by GIZ at the Aweil Rice Irrigation Scheme has not been functioning yet and the paddy collected for the Scheme has not been marketed but stored for seed multiplication. As for the share of farmers, they are selling as paddy to local markets or otherwise mill basically at home using a manual tool for home consumption.

It is the expectation that if the paddy is milled at good quality, it will easily be marketed in and around the country. According to the interview to farmers, it was reported that traders from Yambio used to come to Aweil to collect rice. At current time, traders from Warrap sometimes come for rice trading. Through market survey it has been found that most of the cereals are coming from Sudan and Uganda. These cereals are transported by big trucks. They may rather be going back to their home with empty carriage. If it is so, rice could be a prospective commodity for this long distance traveler to fetch to their home for trade.

Also rice farmers testified their shift of preference of staple food from sorghum to rice, as rice is easier cooking and can eat without relish unlike sorghum. This kind of opinion is heard in other countries, as well. As long as quality white rice can be produced, the Scheme can make advertisement in nationwide and traders could be attracted. Anyway prospects of rice marketing should be studied more.

4.5 Conceivable Interventions for Improving AIRS

Taking into consideration above, following interventions could be conceived:

<p>Physical Improvement</p> <p><u>Rehabilitation of the Irrigation Facilities / Plot Layout Improvement</u></p> <p style="text-align: center;"></p> <ol style="list-style-type: none"> 1) Expansion of the Irrigated Area (all the 15 basins) 2) <i>Expansion of the irrigated Area (increase more than 15 basins)</i> 3) <i>Reservoir for dry season irrigation</i>
<p>Agricultural Improvement</p> <ol style="list-style-type: none"> 1) Introduction of transplanting method 2) Improving rice cultivation (all other aspects) 3) Cropping Pattern development (Rice only, or Rice + Horticulture)
<p>Irrigation Management Transfer (Overall Management Transfer)</p> <p>To expand the scheme, it would be necessary to transfer the roles of the Scheme to farmers considering the capacity of the Scheme (Government). Farmers have once assisted the Scheme for procurement of fuel (farmers procured it by their own). Current sharecropping system would also be superseded.</p> <ol style="list-style-type: none"> 1) Establishing Water Users Association or establishing irrigation committee in the existing Aweil Farmers Cooperative (Capacity development of both Scheme and farmers for relocation of roles). 2) Transfer of gate / regulator control (operation) 3) Transfer of maintenance of the facilities 4) Transfer of input procurement (seeds, fertilizers, pesticides) 5) Transfer of transport 6) Transfer of post-harvest processing 7) Transfer of marketing (pay for only fixed rent to the Scheme)
<p>Rice Marketing Development</p> <ol style="list-style-type: none"> 1) Establishing milling system 2) Survey of demand in Sudan 3) Trucks transporting foods and goods go back home with empty? If so, they could purchase rice in Aweil when they go home and sell rice in their homes. 4) The Scheme can make advertisement throughout the country or abroad.

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ANNEX 2-3

THE AWEIL IRRIGATION RICE SCHEME SECOND SITE VISIT

(IDMP TASK TEAM, MAY 2013)

ANNEX 2-3: SECOND SITE VISIT TO AWEIL IRRIGATION RICE SCHEME (AIRS)

1. INTRODUCTION

IDMT Task Team (the Team) has already visited AIRS to have a better understanding about the status of the irrigation facilities and their operation and maintenance through the interview from management office and site visit of AIRS in May 2013 (Dry season). The Team, however, had not recognized actual status of AIRS in flood season at that time.

Date: 21st ó 25th October, 2013

Participants: Makuac, Robert, Pagan, Moses, Gai, Doki, Tsumura, Chihara, Otsuki

State Focal Point: Deng Deng Bol (Agriculture), Picoth Ariath (Water)

2. OBJECTIVES OF THE 2nd VISIT

- To assess the operation and maintenance of the AIRS in flood season,
- To collect Information of traditional decision making systems and traditional farming organization in the community level,
- To assess the situation of flood and drainage in AIRS, and

3. MEETINGS WITH THE RELEVANT INSTITUTIONS

3.1 Meeting with the State Ministry of Agriculture and Forestry (MAF)

Date: 21st October, 2013

Interviewee: Mr. Joseph Garang, Director General, State MAF (Tel: 0955-349361)

The Team has managed to meet with the official of the state ministry and the reasons are to know the role and responsibilities of the ministry towards AIRS especially during the flood season. The meeting was attended by the D.G of the Ministry and Former Director of crop production and the findings of the meeting are:

- 1) The state ministry has a responsibility as part of AIRS management.
- 2) The state ministry is providing technical staff and offer tractors to AIRS.
- 3) The state ministry assists the project with fuel of tractors.
- 4) And the staffs of the AIRS are in the pay role of the Ministry except the Manager of AIRS.
- 5) The area cultivated in this year (2013) is 2,400 fed which is represented in basin 15, 9, 8 and however, 200 fed of paddy were lost due to flood.
- 6) Sources of the flood are rainfall and overflowing of river Lol and the duration of the flood is from July to October and the peak of the flood is from August and September.
- 7) Water control is the major problem due to poor system. Proper de-silting of canal is needed. Drainage pipes are filled due to siltation.
- 8) Combined harvester will be useful for AIRS if drainage problem is solved.
- 9) According to his view, the rice can harvested twice if the water is available and he recommends for water storage by constructing dam to use during the dry season.

- 10) Rice mills of AIRS are now operating since GIZ has dispatched mechanic last August. Capacity of rice mill is 2 ton/hour.
- 11) Milled rice produced in AIRS sells to market by 5 SSP/kg.

3.2 Meeting with State Ministry of Physical Infrastructure (MOPI)

Date: 23rd October, 2013

Interviewee: Mr. Klilliam Anyuon, Director General, State MOPI (Tel: 0955-770303)

The purpose of the meeting is to know the roles and the responsibilities of the Ministry toward AIRS and the meeting was attended by the Team and the D.G. the findings of the meeting are:

- 1) By opening of the drainage canal around the town, it has contributed to minimize the flood in Aweil town, but the counties around Aweil town are still affected by the flood badly.
- 2) The ministry has played a role in opening the roads with proper culverts as a mitigation options for the flood.
- 3) In addition to that with the help of the developing partners, the ministry is conducting an assessment about the flood and the result has not yet to be out.
- 4) As mitigation options for flood, the ministry has proposed construction of concrete drainage system from the high land to the low land, diverting connections of the three rivers (Lol, Kum and Akuem rivers) and dragging of the river.
- 5) In terms of operation and maintenance, the state MOPI, the state MAF and AIRS Management is planning to work together regarding the technical assistance.
- 6) In regards to flood damage, the MOPI stated that flood was mitigated in comparison with several years back, it stopped for some years. But nowadays, it becomes every year and especially, the damages are more at the counties than Aweil town in this year.
- 7) The source of the flood is rainfall according to the D.G and it starts in general from July to August, however it has started from September to October in this year.
- 8) In regards to budget allocation, the state MOPI stated that the AIRS is attached to the state MAF, therefore, the state MOPI has not allocated any budget for it. The only budget was allocated by the MOPI for the drainage canal around the town as a mitigation option for flood protection.
- 9) In regards to water storage, the ministry has proposed river Akwem and river Lol for dam construction.

3.3 Meeting with the State Ministry of Water, Cooperative and Rural Development (MWCRD)

Mr. Abraham Aleu Ngong, Acting Director of Water & Sanitation, State MWCRD
(Tel: 0917-800198)

Mr. Wal Akoon, Deputy Assistant Director, Irrigation Section, State MWCRD
(Tel: 0954-760519)

The purpose is to know the roles and the responsibilities of the state Ministry towards AIRS, the meeting was attended by the Team and the Acting DG. During the meeting the Acting DG stated that the role of the Ministry is to deliver services to the poor people and to monitor the source of the flood

and create awareness among the communities about the flood and measuring of river Lol water levels. The Acting DG stated that there is no relation between AIRS irrigation office and the directorate of water and irrigation in the Ministry of water. He also stated that there is no budget allocation for flood mitigations and there is no any flood mitigation options and what is going on is an assessment which the result is not yet out. In regard to the cooperative and rural development he does not know the role of it in the ministry, and also this year they have contributed nothing to mitigate the flood in AIRS. And he does not able to mention the flood damages this year comparing to the last year. The source of floods are rainfall and overflowing of river Lol also the duration of flood is from July to October from sometime and peak of flood from August, September and October. Lastly, he promised to provide the Team about water level of Aweil town.

3.4 Meeting with the ARIS Management Office

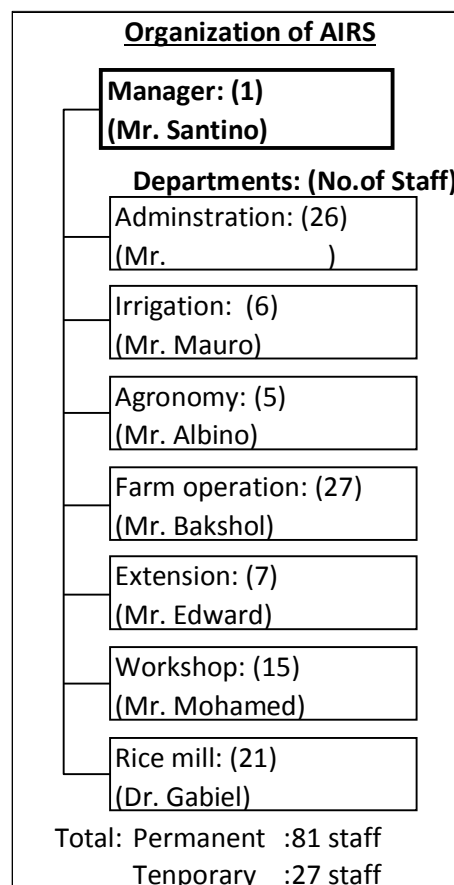
Date: 24th October, 2013

Interviewee:

- Mr. Santino Deng Ngong, Manager (Tel: 0956-955080)
- Mr. Maugesto Thou, Field Supervisor (Tel: 0956-955039)
- Mr. Mauro Mawien, Irrigation Officer (Tel: N/A)
- Mr. Edward Ruai Aut, Extension Officer (Tel: 0917-228597, 0927-233397)
- Mr. Albino Garang, Senior Agronomy Officer (Tel: 0956-231534)
- Mr. Peter Akhon, Member of Cooperative (Tel: 0955-849489)

Role of the AIRS during the flood:

- 1) Monitoring of the irrigation facilities, like repairing the cut in the Dyke, clearing of the weeds from the canal, opening and closing of the gate, mobilization of the community for help, farmers only participate when the water level become so high and farmers are not allowed the operation of gates to close and open the canals.
- 2) There is no water users association, it is only cooperatives.
- 3) There is no budget allocated for flood mitigation.
- 4) AIRS is composed of seven(7) departments under the Manager. Number of total permanent staff is 81 out of 108 including temporary staff.
- 5) In regard to the relationship between State MWCRD and AIRS Management office, the manager stated that there is no relation
- 6) Challenges are; a) shortage of fuel for the equipment, b) the AIRS has not been stabilized, c) no full manager that can plan for full year, d) lack of staff capacity especially in the irrigation staff and e) all of these challenges can be handled when there is a clear system



for the scheme.

- 7) There are so many plans in, but it cannot be implemented due to lack of budget.
- 8) In regards to water storage management, the manager stated that anything relate to the scheme is to be managed by the AIRS.
- 9) State MAF has the direct responsible for the AIRS and their contribution is to the maximum, the state MOPI has no any contributions even rather from the State MWCRD.
- 10) The Manager is used to be invited to participate in the budgeting, when the budget is short, the AIRS has no way to do, and there is no document regarding the budget in AIRS which can be provided to the Team.
- 11) GIZ did not accept suggestions from the AIRS staff; that was the reason why the productivity is less than before when FAO has been operating in the scheme.
- 12) The agronomy officer (Mr. Albino Garang) stated that, FAO has studied and surveyed the field before cultivation and arranged the basins, canal, Dykes and the irrigation system, but GIZ started without any studies and they has rejected the opinions of agronomy staff, that's why the production is low.
- 13) The AIRS is willing to get assistance from the farmers in regard to operation and maintenance of the canals, but the farmers do not accept it because, those works have to be done by the government according to their conception.
- 14) Water level in Lol river was used to measure up to nymllel under the FAO's operation these activities were stopped when FAO left because of lack of measuring equipment and qualified staff.
- 15) Capacity of the rice mill is 2 ton/hour and AIRS operates it 3-4 hours a day. The ARIS sells milled rice 5 SSP/kg for grade-1 and 4SSP for grade-2.
- 16) Sharecropping has become 59% for farmers and 41% for the Scheme from this year.

4. SITE VISIT OF AIRS

Date: 24th October, 2013

Accompaniers from AIRS Management Office:

Mr. Santino Deng Ngong, Manager

Mr. Mauro Mawien, Irrigation Officer

Mr. Williams, Irrigation Officer

With collaboration with AIRS Management Office, the Team made a field visit to the scheme to assess the flood sources and the challenges during the operation and maintenance of the irrigation facilities. The team was leaded by the Managing Director, irrigation Officer and other staffs from the scheme.



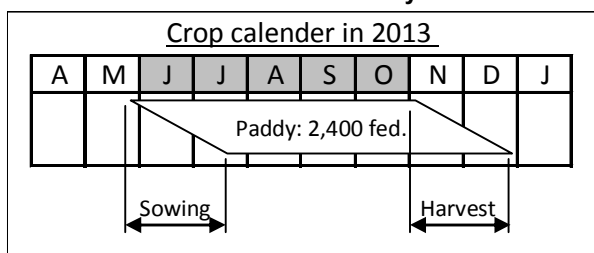
Irrigation Canal (Basin 9)

From the field visit, the team came out with some of the findings below:

- 1) The major problems of the flooding is associated with irrigation canal as from the 1st visit, it has been known that the irrigation canals are not functioning also are not in good condition and full of weeds, and so many cut and the dyke besides these there are no proper water control structures in the canals.
- 2) and so many cuts on the Dyke which were created by some of the communities around to prevent their houses from flood and due to lack of maintenance of the Dykes.



Cuts in the Protection Dykes



Paddy cultivation in 2013 was started at end of May and scheduled harvesting from beginning of November with completing in the end of the year.

- 3) The drainage networks are not systemized, the main drainage canal is connected by river Lol and it drains water direct from river Lol, so when the water level is high in the drainage canal, it flows to the irrigation canal.
- 4) To drain the water from the irrigation canal in the above case, the water has to be pumped out by a pipe of 42cm diameter to the drainage side.
- 5) No budget allocated for the mitigation of the floods in AIRS from the state of from the National Ministry of Agriculture and Forestry (MAFTARFCRD).



Irrigation Canal (Basin 9)

5. INFORMATION COLLECTION OF TRADITIONAL DECISION MAKING SYSTEMS AND TRADITIONAL FARMING ORGANIZATION IN THE COMMUNITY LEVEL

5.1 Interview with AIRS Farmers

- 1) Main responsibilities of farmers during flood season are follows;
 - Assists in removing and cleaning bushes, broken woods, grasses and sediment from canals.
 - Assists on maintenance of the broken dykes.
 - Assists on monitoring water level in scheme and report to the management office.

In addition to the above mentioned activities farmers are also responsible for weeding, monitoring, harvesting and reporting to the management office. Although water use association they do not have it refer to their report.

Farmers are facing some difficulties during the flood season such as long grasses, sometime snakes

while the activities are done manually due to lack of machines.

1) Suggestion of dam construction:

In case the dam is constructed due to water shortage in Lol River the management will be based on share of government and community management.

2) Sources of the Flood:

Refer to the Farmers; there are two main sources of flood, Rainfall and over flow from river Lol. It starts from July up to September.

3) Mitigation options:

Refer to the farmers, they maintain the canals, culverts, and making dykes in the scheme and around villages.

4) Conflicts among Communities on dykes

Refer to the farmers, there is no conflict between communities on dykes because dykes were been made in agreement with communities.

5.2 Interview with Communities Leaders

1) Community Structure:

Based on the following, Clan is a small unit of community structure and is form by a couple of two people. Several clan forms a community. Then community forms the tribe. Generally the traditional system exists as follows:

Co- leader (Allam chol), sub executive chief (Matem) and Executive chief (Allam Thit).

2) Role and Responsibilities:

Representative executive chief (Co- leader) (Allam chol) is known by wearing a black belt and his responsibilities is to solve the problem between two people or more, based on his mandate the punishment will not be more than one cow at the village level.

Sub executive chief (Matem) is known by wearing a red belt with white color and he is acting in the absence of the executive chief.

Executive chief (Allam Thit) is known by wearing red belt and his is the last rank in the community and responsible for solving the issues that the punishment is more than a cow at Payam and county level.

3) Roles of Boys and Girls;

Boys are looking after cattle and some family activities. Girls are taking home responsibilities like cooking and care for the young ones.

4) Conflicts among the Communities:

Refer to the Leaders, if there is a conflict between farmers and cattle keepers, the two village leaders should sit together to resolved the problem. Cows



or money is their punishment based on the community law.

5) **Water Shortage:**

In case of water shortage the community prioritizes cattle because it is the source of income and dowry.

6) **Other Activities:**

The community has some activities during the dry season like cultivating some vegetable by using river or digging wells.

7) **Participation of Communities:**

Participant in terms of irrigated scheme (AIRS), it is found that the participants are the farmers and community members in and around the scheme.

8) **Ownership of the Scheme:**

In the Community Leaders perception AIRS is belonging to the community simply because it is their land.

9) **Constrains facing the Community:**

The main constrain facing the communities are: Bad feeder roads linking the villages to payam, no proper water control structures in place, and lack of safe and clean drinking water.

6. CONCLUSIONS

1) In conclusions the Team would like to thank ARIS management for their esteem cooperation with the Team and the valuable information that they provided to the team.

2) Some of the finding that the team has come out with is that the AIRS has to have a fixed management system that can budget and plan for the scheme which will contribute positively for solution of the other technical issues.

3) The Team has also found out that the state MAF is contributing more than the national MAFTARFCRD to the AIRS although there is no clear budget from both the two ministries (state and national) which has been allocated to the scheme.

4) The source of the flood is rainfall and overflow water from river Lol starting from July up to October and there is no flood monitoring system besides the cuts in the Dykes and no proper water control structures in the irrigation facilities.



7. SUGGESTIONS

Based on the information the Team got from the interviews, the Team suggested the followings:

- 1) Fixed management system has to be in place in order to plan for the activities of the scheme.
- 2) Solving the financial constrian by allocating appropriate budget from all levels.
- 3) Improving of a bater relationship to establish between relevant ministries at all levels.
- 4) Proper water control structures and flood monitoring system has to be constructed.



References

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3. Irrigation Rehabilitation Project (AIRP), GIZ-IS.
4. Carl Christian Jacobsen, 2011, *Consultancy for the development of options for an appropriated management structure for the Irrigation Sector at national, state and local level*, Sudan Productive Capacity Recovery Programme-SPCRP, Aweil Irrigation Rehabilitation Project (AIRP), GIZ-IS.
5. Aweil Rice Irrigation Scheme, 2013, *Annual Report 2012-2013*.
6. Sir Alexander Gibb and Partners, 2003, *White Nile Pump Schemes Modernization Study*, Republic of Sudan. January 2003.
7. FAO/UNDP Land Development Project Aweil Rice Scheme, 1978, *Report on the 1977 Growing Season Aweil Rice Scheme*.
8. Euroconsult, 1981, *Quarterly Report No.7 Oct – Nov 1981, Aweil Rice Development Project*.
9. Euroconsult, 1982, *Technical Note No.5 Annual Report Agronomy Department 1981 season, Aweil Rice Development Project*. European Economic Community European Development Fund, Brussels and Ministry of Agriculture and Natural Resources Southern Region, Juba, The Democratic Republic of the Sudan,
10. Euroconsult, 1979, *Aweil Project Study (Phase 2)*, Ministry for National Planning, Democratic Republic of the Sudan.
11. Aweil Rice FarmersøCooperative, 2013, *Constitution*.

APPENDIX - 1

COLLECTED DOCUMENTS FROM AIRS

APPENDIX -1: COLLECTED DOCUMENTS FROM AIRS**List of the Documents Collected from AIRS**

No	Title	Date of Issue	Issued by	Type of Style	Remarks
1	Aweil Irrigation Rehabilitation Project / Assessment of Existing Irrigation Machinery and Equipment / Final Report	March 2009	United Nations / gtz	Booklet	
2	Aweil Irrigation Scheme / Technical Assessment of the Flood Protection Embankment/Access Road and Design of a Repair/Maintenance Unit at Scheme Management	July 2010	United Nations / gtz	Booklet	
3	FAO/UNDP land Development Project / Aweil Rice Scheme / Report on the 1977 Growing Season	February 1978	FAO / UNDP	Booklet	
4	Aweil Rice Development Project / Land Development Programme / 1982/83	November 1982	Irrigation Department	Booklet	
5	Aweil Rice Scheme	-	-	Drawing	S = 1:25,000
6	Aweil Project Study . Phase 2 / Lay-out Irrigation Scheme (Drawing No.1 - Sheet 1 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000
7	Aweil Project Study . Phase 2 / Lay-out Irrigation Scheme (Drawing No.1 - Sheet 2 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000
8	Aweil Project Study . Phase 2 / Lay-out Irrigation Scheme (Drawing No.1 ^C - Sheet 1 of 3)	September 1981	Euroconsult (The Netherlands)	Drawing	S = 1:10,000
9	Aweil Project Study . Phase 2 / Longitudinal Section Main Irrigation Canal (A and B) (Drawing No.2 - Sheet 1 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:100
10	Aweil Project Study . Phase 2 / Longitudinal Section Main Irrigation Canal (C and D) (Drawing No.2 - Sheet 2 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:100
11	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Irrigation Canals A1 and B1 (Drawing No.3)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
12	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Irrigation Canals B2 and C1 (Drawing No.4)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
13	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Irrigation Canals C2 (Drawing No.5)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
14	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Irrigation Canals E1 and E2 (Drawing No.6)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
15	Aweil Project Study . Phase 2 / Longitudinal Section Main Drainage Canal (B and C) (Drawing No.7 - Sheet 1 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:100
16	Aweil Project Study . Phase 2 / Longitudinal Section Main Drainage Canal (D and E) (Drawing No.7 - Sheet 2 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:100
17	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Drainage Canals A1 and A2, Collector Drain A (Drawing No.8)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
18	Aweil Project Study . Phase 2 / Longitudinal	July 1979	Euroconsult	Drawing	S =

No	Title	Date of Issue	Issued by	Type of Style	Remarks
	Section Secondary Drainage Canals B1 and B2, Collector Drain B (Drawing No.9)		(The Netherlands)		1:10,000 / 1:20
19	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Drainage Canals C1 and C2, Collector Drain C (Drawing No.10)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
20	Aweil Project Study . Phase 2 / Longitudinal Section Secondary Drainage Canals E1, E2 and E3, Collector Drain E (Drawing No.11)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:20
21	Aweil Project Study . Phase 2 / Longitudinal Section Dike 1-2 (To Udhum) and Dike 4-5 (To Akong) (Drawing No.12)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:10,000 / 1:100
22	Aweil Project Study . Phase 2 / Typical Cross Sections (Drawing No.13)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:100
23	Aweil Project Study . Phase 2 / Structures (Drawing No.14 . Sheet 1 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:100
24	Aweil Project Study . Phase 2 / Structures (Drawing No.14 . Sheet 2 of 2)	July 1979	Euroconsult (The Netherlands)	Drawing	S = 1:50
25	Rainfall Records Seasonal Work Programme / Analysis, Reading in mm 1932 . 1977	-	-	-	
26	ARS Report on duty trips (Hydrology)	24 June - 11 July 1977	H.W. Underhill AGLW	File	
27	Aweil Irrigation Scheme Rehabilitation Project Socio-economic baseline Survey	Aug. 2009	Joseph Kariuki, Kenya	Binding	
28	Work reports and programmes, Land development / Irrigation	1981	A. Milder, Project Manager	File	
29	Aweil Rice Development Project Technical note No.5 Annual report Agronomy Dept.	1981 season	Euroconsult Arnhem, The Netherland	Booklet	
30	Aweil Rice Development Project No. 5100.31.48.015 fin. Agreement No. 3110 /Sou Report no.13 Annex Security in Aweil and District	Jun-84	Euroconsult Arnhem, The Netherland	Booklet	
31	PENGKO Pilot Project Technical note No.12 Agriculture Research Results Rainy season 1979	Apr-80	ILACO Arnhem, The Netherland	Booklet	
32	PENGKO Pilot Project Technical note No.14 Agriculture Research Results Dry season 1978 / 1979	Sep 1979 Code 5.10.016	ILACO Arnhem, The Netherland	Booklet	
33	PENGKO Pilot Project Technical note No.16 Agriculture Research Results Dry season 1979 / 1980	Sep 1979 Code 5.10.016	ILACO Arnhem, The Netherland	Booklet	
34	PENGKO Pilot Project Technical note No.8 Agriculture Research Results 1978, Research Programme 1979	1978, 1979	ILACO Arnhem, The Netherland	Booklet	
35	PENGKO Pilot Project Progress report No.18, April - June, July 1980		ILACO Arnhem, The Netherland	Booklet	
36	Sudan Productive Capacity Recovery Programme (SPCRP) ARIP	Revised 30/07/2009	Gtz	Biding	

No	Title	Date of Issue	Issued by	Type of Style	Remarks
37	File No.1 Survey Nyamlel gaging station	1979	Aweil Irrigation office	File	
38	Nyamlel gauge	Sep 1982	Aweil Irrigation office	File	
39	Kuom Gauge	Aug 1977	Aweil Irrigation office	File	
40	AWEIL RICE DEVELOPMENT PROJECT / IRRIGATION PROGRAMME FOR THE 1982 CROPPING SEASON.	JULY, 1982.	IRRIGATION DEPARTMENT	Booklet	
41	AWEIL RICE DEVELOPMENT PROJECT / Project number 4100.032.48.50 / fin. Agreement 2504/SOU / Quarterly Report no. 7	October - December 1981	Euro consult	Booklet	
42	INTERNAL MEMO IRRIGATION DEPARTMENT	15/9/82	Irrigation Engineer	Copy	1 sheet
43	Table II.2 Maintenance activities, labor requirement 1981 season	May-81	W. Boissevain	Copy	7 sheets (Page No.9 - 15)
44	Aweil Rice Scheme, Climate and Hydrology	Jan-76	M.Schellekens	File	
45	Soil Surveyor/ Interpreter	1978	K.Klinkenberg	Final Report/File	
46	Measurements Discharges	25/3/1976		File	
47	Associate Expert soil survey	Mar-Apr 1975	De Pauw Eddy	File	Report no.2
48	FAO/UNDP Land Development Project	15-Dec-75	Amos Awen and A.Mulder	File	
49	Land Development 82/83 Leveling	Nov-82	Boissevain	File	
50	Conclusion and Recommendation			File	
51	Survey Records			File	
52	Hydraulic calculation irrigation canals			Sheet 1	Phase 2 study, Aweil
53	Construction Dimensions structures irrigation Canal			Sheet 2	
54	Pvs, Brugger, Spillways, and Checkstructures			Paper no.16	

APPENDIX - 2

LIST OF PERSONNEL INTERVIEWED AT AIRS

APPENDIX - 2: LIST OF PERSONNEL INTERVIEWED**List of Personnel Interviewed**

No	Name	Title	Office
1	Hon. Minister Ayii Bol Akol	Minister	Northern Bahr El Ghazal State Ministry of Agriculture and Forestry
2	Mr. Santino Deng	Project manager	Office of Aweil Irrigation Rice Scheme (AIRS)
3	Mr. Kerubino Bol	Head of Extension services department in AIRS	AIRS
4	Mr. Mauro Mawien Majok	Senior survey/ Head of Irrigation Engineer	AIRS
5	Mr. Mohamad Hamid Kalifa	Workshop manager	AIRS: Overall supervision of operators, mechanics, Drivers, welders, blacksmith, etc.
6	Mr. Christo Nuoi	Deputy Workshop manager	AIRS: Deputize the workshop manager and he is senior mechanic
7	Mr. William Dut	Mechanic	AIRS: Repair and maintenance of tractors and implements
8	Mr. Wol Ngor Mou	Mechanic	AIRS: Repair and maintenance of tractors and implements
9	Mr. Issac chol	Mechanic	AIRS: Repair and maintenance of tractors and implements
10	Mr. Cirilo Koch	A/Mechanic	AIRS: Deputize mechanic
11	Mr. Madut Marach	A/Mechanic	AIRS: Deputize mechanic
12	Mr. Angui Deng	A/Mechanic	AIRS: Deputize mechanic
13	Mr. Marco Aguer Dordit	DG of Infrastructure	Northern Bahr El Ghazal State Ministry of Physical Infrastructure
14	Mr. William	Director	Northern Bahr El Ghazal State Ministry of Physical Infrastructure
15	Mr. Lita Jakson	Project Officer Emergency and Rehabilitation Coordination Unit	FAO South Sudan Aweil Field Office
16	Mr. Kiir Awen Mayan	Agronomist	FAO South Sudan Aweil Field Office
17	Mr. Adup Deng	Farmer	Northern Bahr El Ghazal State Farmer Union
18	Mr. Ghuch Mathue	Farmer	Northern Bahr El Ghazal State Farmer Union
19	Mr. Abudalla Wado Abudalla	Farmer	Aweil Payam
20	Mr. Dut Majok	Farmer, Deputy Director, Chairman	Aweil Rice Farmers Cooperative Society
21	Mr. Ajou Lual	Farmer	
22	Mr. Anjuro Den	Farmer	Udum Payam
23	Mr. Thal Puel	Farmer	Udum Payam
24	Mayuuien	Farmer	Udum Payam
25	Mr. Deng Nyinkuany	Deputy director,	State Ministry of water and development, Urban water Office

APPENDIX - 3

FACILITY INSPECTION SHEET

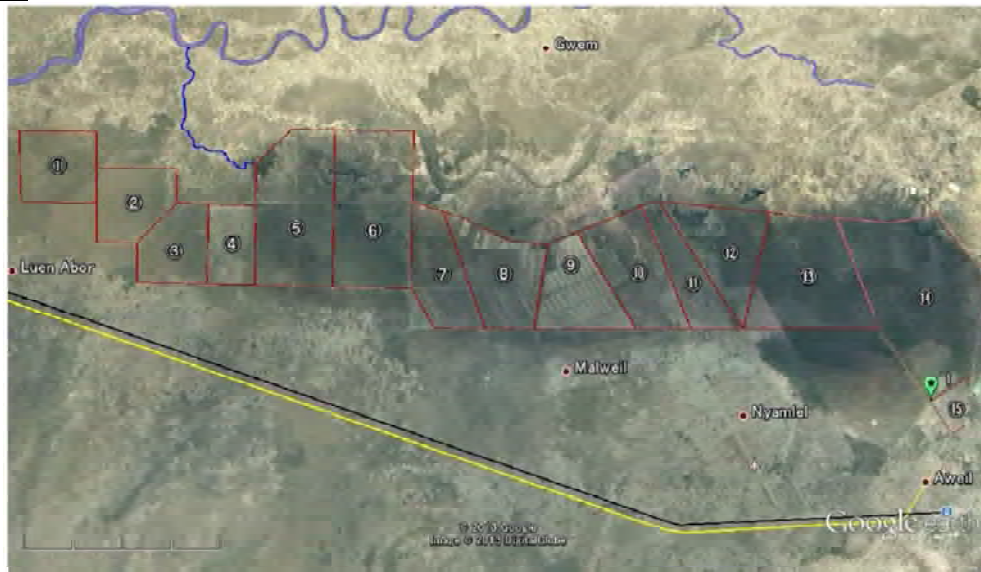
Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	1
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	15	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Culvate Pipe	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 47 - 7.7		E 27 - 24 - 11.3	
Elevation (EL. - m.)	426 m	Materials of Structure (Concrete, Wood, Steel, etc.)	Steel	
Dimensions (Height: H, Width: W, Length: L, Thickness: Thk, etc.) L = 11.5m , D= 0.78m				
Construction Year	1970	Construction period	7 days	
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hector)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				
B.M. elevation 422m				
N 8 -47 -7.7 E 27- 24 -12. 4				

Inspection Sheet for Irrigation & Drainage Facilities

Serial No.	1
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Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

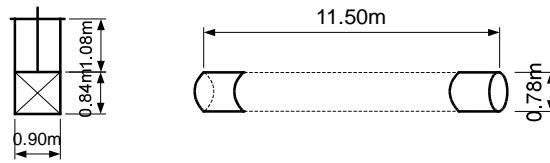


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	2
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	14	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Bridge	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Bridge and Drainage			
Coordinates (Latitude and Longitude)	N 8 - 48 - 3.0		E 27 - 24 - 6.8	
Elevation (EL. - m.)	426 m	Materials of Structure (Concrete, Wood, Steel, etc.)	Concret - stones	
Dimensions (Height: H, Width: W, Length: L, Thickness: Thk, etc.)	L = 5.6m W=3.6 H= 1.85m Th = . 23			
Construction Year	1977- 1987	Construction period	1 Month	
Construction Cost		Funded by	Sudan Government	
Implmented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2012/4	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hecter)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	slite crack	Deformation		
Remarks/Others				

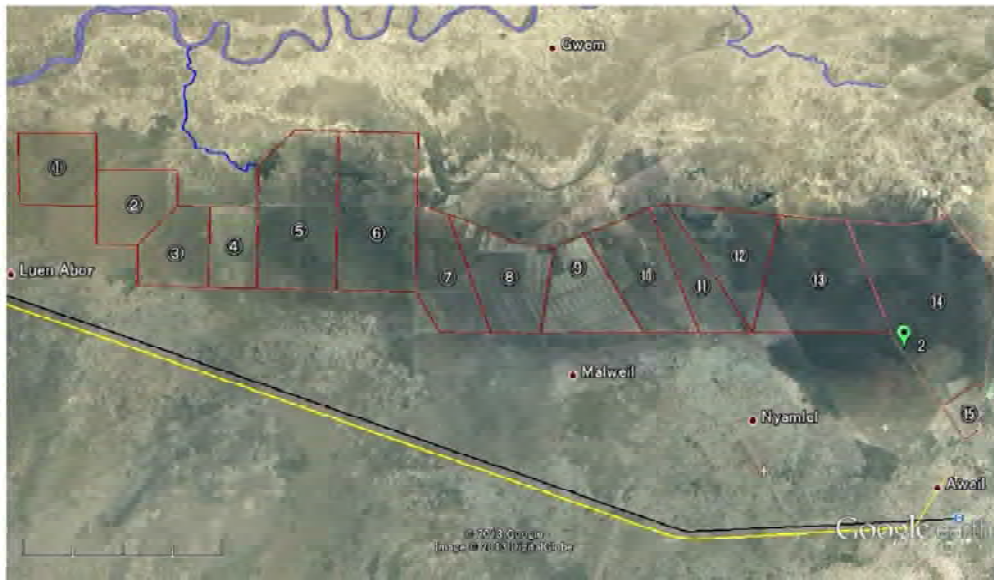
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

2

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

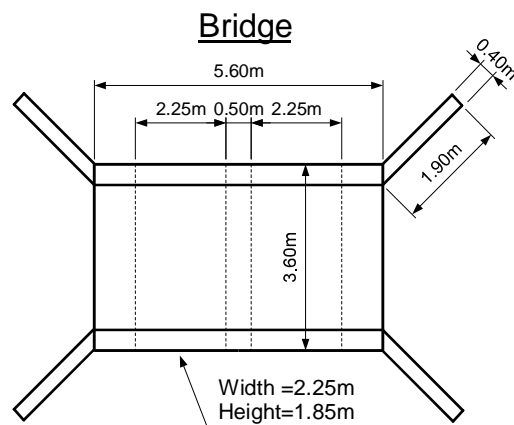


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	3
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	12 - 13	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Dyke	
Purpose of Facility (Irrigation, Drainage, Flood Control., etc.)	Flood protection and water distribution			
Coordinates (Latitude and Longitude)	N 8 - 49 - 19.7		E 27 - 22 - 28.1	
Elevation (EL. - m.)	424m Top	Materials of Structure (Concrete, Wood, Steel, etc.)	local Material	
Dimensions (Height: H, Width: W, Length: L, Thickness: Thk, etc.)	Bottom = 13m H= 1 m Tob = 3.3 m			
Construction Year	1963	Construction period	Jun - July	
Construction Cost	Sudan Government	Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	-	Rehabilitation by (if any)	-	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddin or Hectar)				
Function (Operative or Inoperative)	Inoperative			
Damage (Crack, rust, etc.)		Deformation	Damage	
Remarks/Others				
.....				
.....				

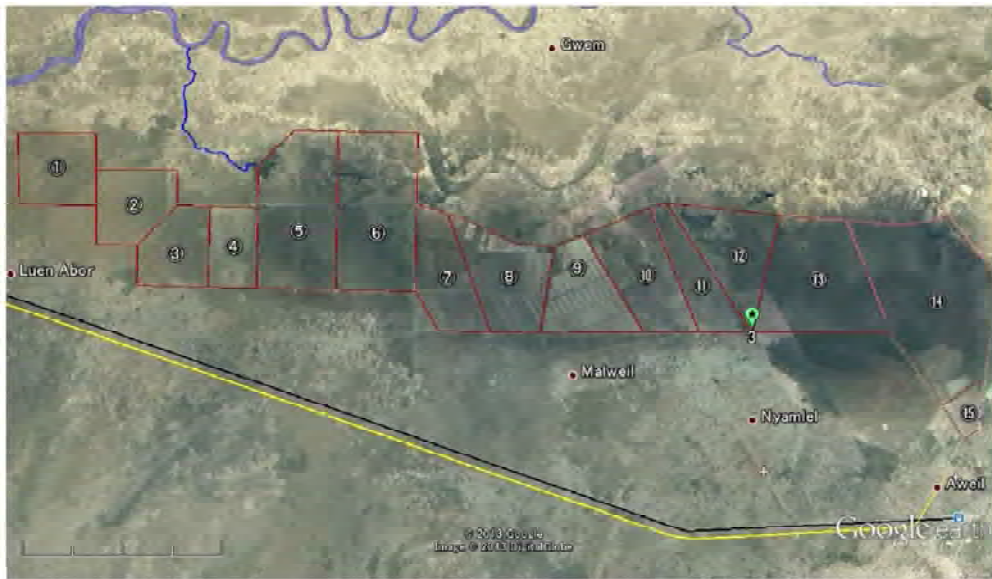
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

3

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

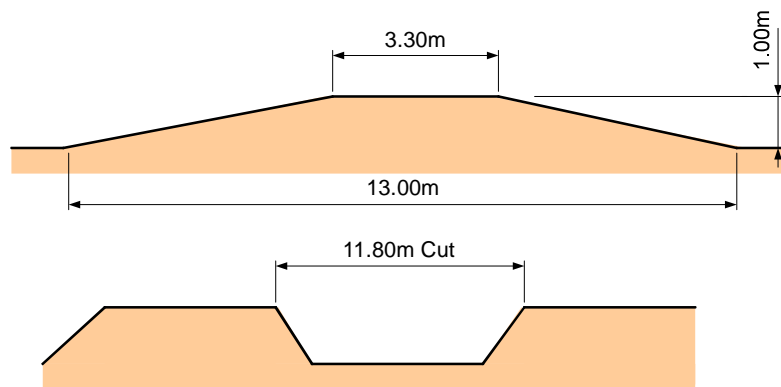


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	4
Inspection Date (Time, DD/MM/YY)	10/03\2013	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	10	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Culvate Pipe	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Drainage			
Coordinates (Latitude and Longitude)	N 8 - 49 - 40.6		E 27 - 21 - 45.3	
Elevation (EL. - m.)	426m	Materials of Structure (Concrete, Wood, Steel, etc.)	Steel	
Dimensions (Height: H, Width: W, Length: L, Thickness: Thk, etc.) D= 0.75m L= 7.9m				
Construction Year	1963	Construction period	March - May	
Construction Cost		Funded by	Sudan Government	
Implmented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	-	Rehabilitation by (if any)	-	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hector)				
Function (Operative or Inoperative)	Inoperative			
Damage (Crack, rust, etc.)		Deformation	Damage	
Remarks/Others				

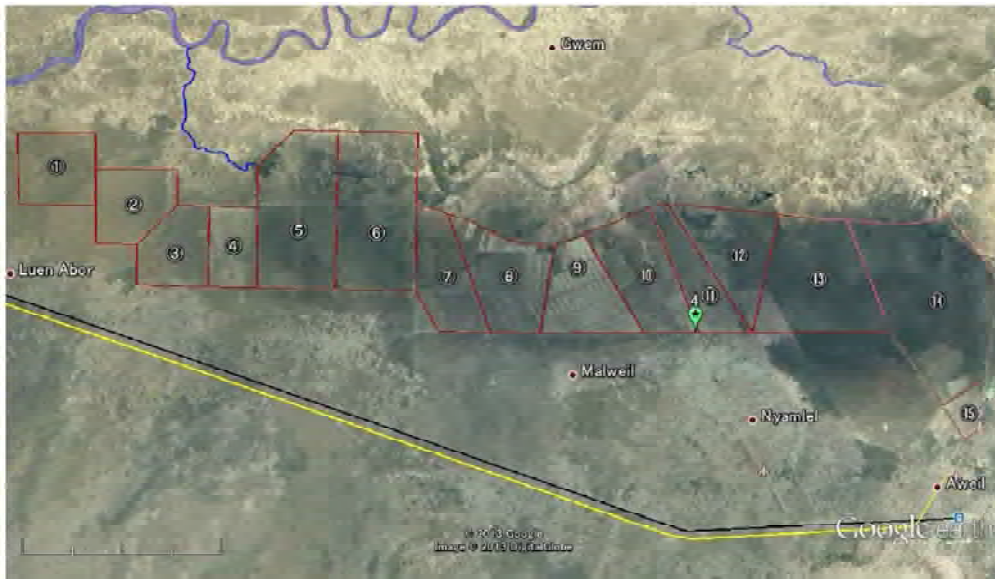
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

4

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

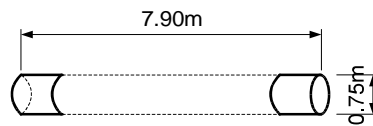


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	5
Inspection Date (Time, DD/MM/YY)		Name of Inspector	Robert	
Name of Scheme		Basin No.	9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Check Gate	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Check Gate			
Coordinates (Latitude and Longitude)	N 8 - 50 - 2.2		E 27 - 21 - 7.5	
Elevation (EL. - m.)		Materials of Structure (Concrete, Wood, Steel, etc.)	Stones and Concrete	
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year		Construction period		
Construction Cost		Funded by		
Implmented by		Owned by		
Operated by		Maintained by		
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hecter)				
Function (Operative or Inoperative)				
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

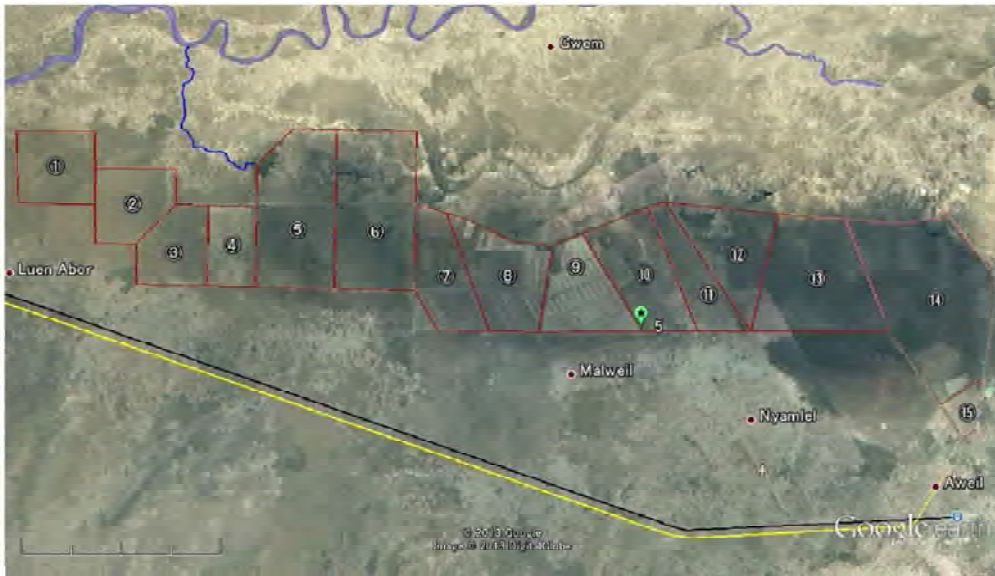
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

5

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

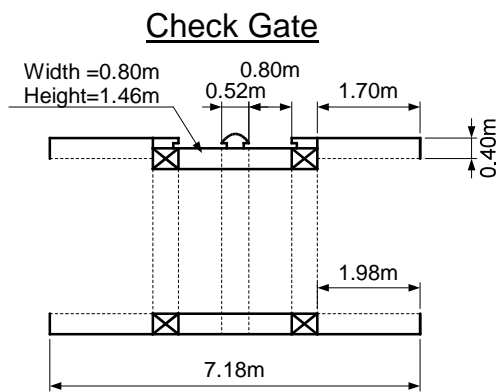


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	6
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme		Basin No.	9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Check Gates	
Purpose of Facility (Irrigation, Drainage, Flood Control., etc.)	Control of Irrigation water			
Coordinates (Latitude and Longitude)	N 8 - 50 - 30.3		E 27 - 20 -18.0	
Elevation (EL. - m.)	436m	Materials of Structure (Concrete, Wood, Steel, etc.)	Stones and Concrete	
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1976	Construction period	1 Month	
Construction Cost		Funded by	FAO	
Implemented by	FAO	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hector)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	-	Deformation	Good	
Remarks/Others				

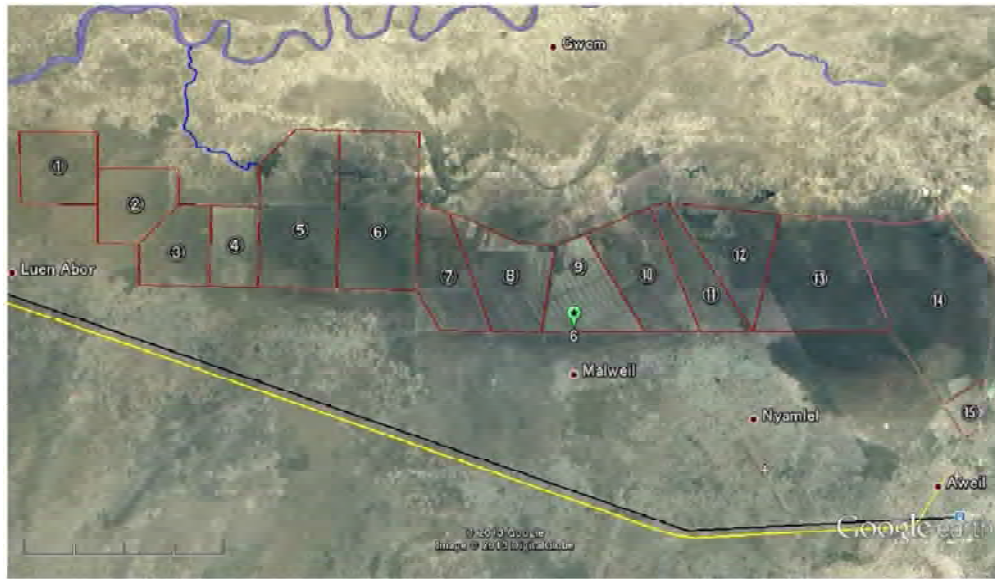
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

6

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

Check Gate

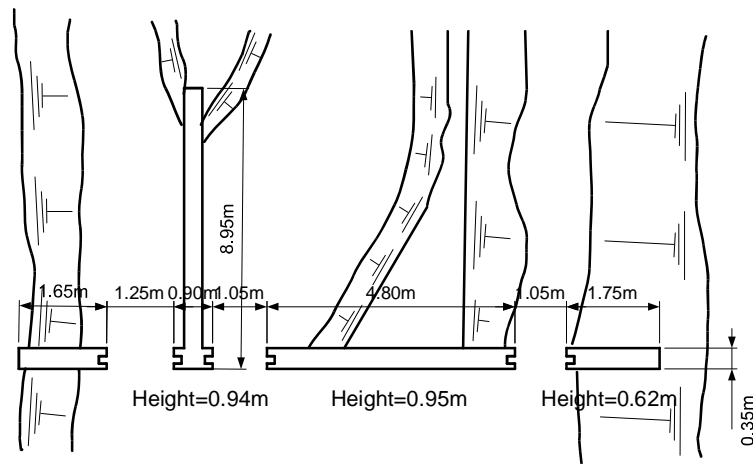


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	7
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme		Basin No.	9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Secondary Irrigation Canal	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 50 - 30.5		E 27 - 20 - 17.4	
Elevation (EL. - m.)	429m Bottom	Materials of Structure (Concrete, Wood, Steel, etc.)	Local Materials	
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.) Bottom =6.20m Tob=10.4m H=1.20m			
Construction Year	1963	Construction period		
Construction Cost	Sudan Government	Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	FAO 1974-89 GIZ 2009	Rehabilitation by (if any)	FAO - GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddans or Hectors)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

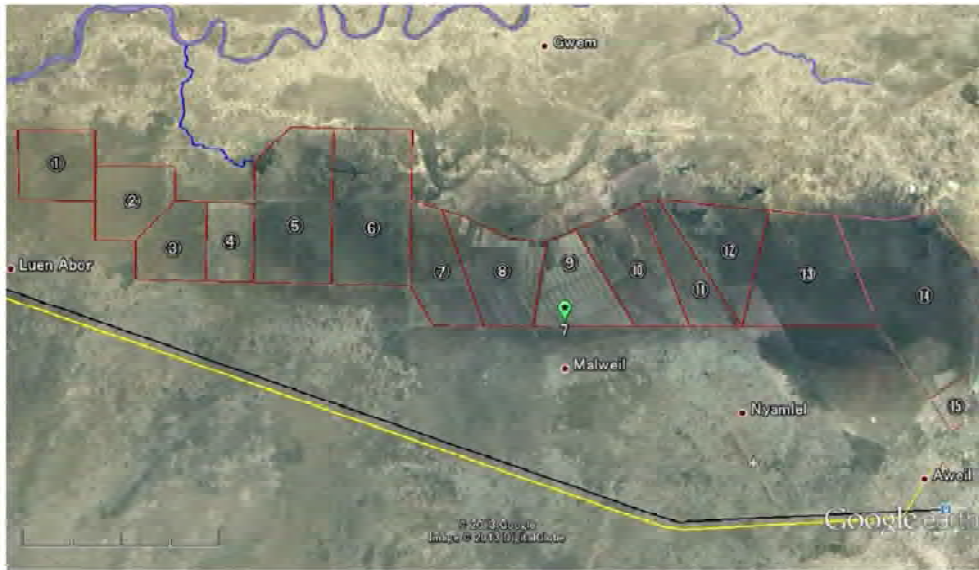
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

7

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

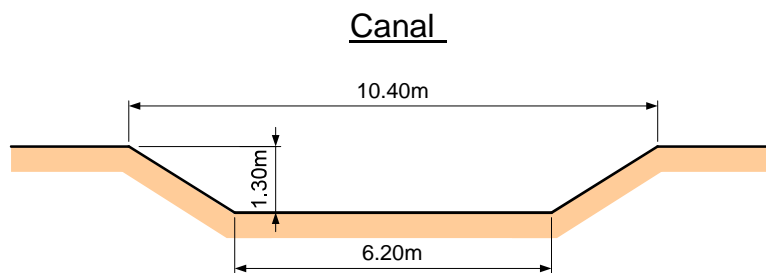


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	8
Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	8 - 9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Irrigation Canal	
Purpose of Facility (Irrigation, Drainage, Flood Control., etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 50 - 44.0		E 27 - 19 - 55.7	
Elevation (EL. - m.)	426m	Materials of Structure (Concrete, Wood, Steel, etc.)	Stone and concrete	
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1977	Construction period	3 Months	
Construction Cost	FAO	Funded by	FAO	
Implmented by	FAO	Owned by	Sudan government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hector)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	crack	Deformation	-	
Remarks/Others				

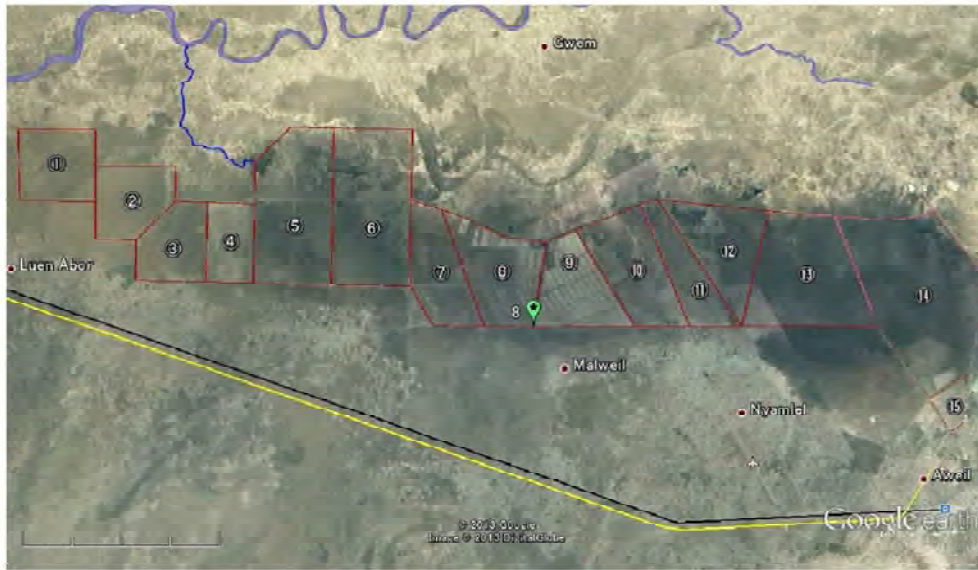
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

8

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

Check Gate

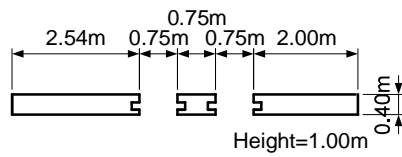


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	9
Inspection Date (Time, DD/MM/YY)	2013/10/3	Name of Inspector	Robert	
Name of Scheme		Basin No.	9 - 15	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Stilling Basin	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Water Control Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 51 - 38.2		E 27 - 20 - 40.9	
Elevation (EL. - m.)	432m Top	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1976	Construction period	3 Months	
Construction Cost		Funded by	FAO	
Implemented by	FAO	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	-	Deformation	-	
Remarks/Others				

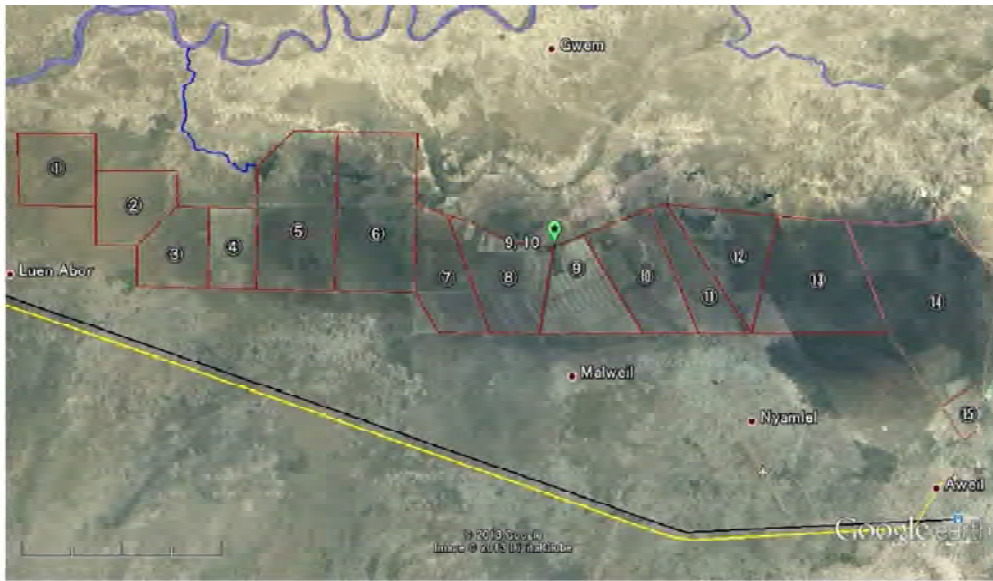
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

9

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

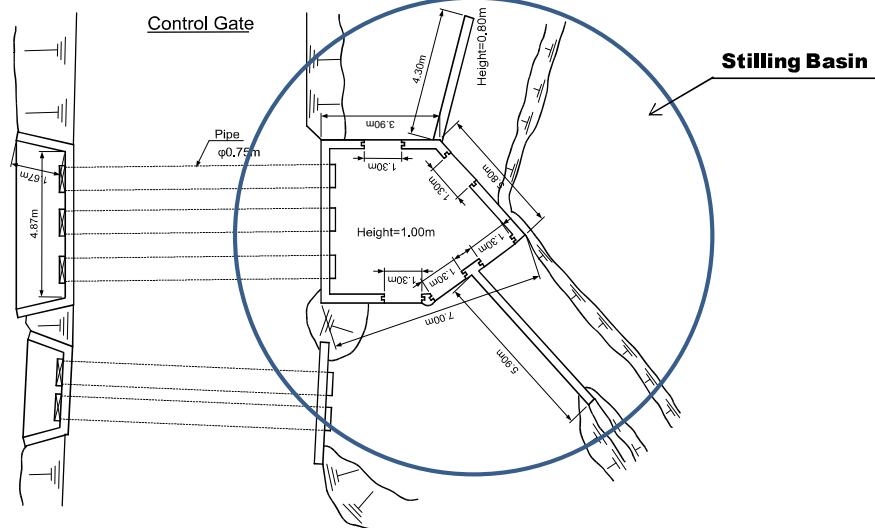


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities

Serial No.	10
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Inspection Date (Time, DD/MM/YY)	2013/10/5	Name of Inspector	Robert
Name of Scheme	AIRS	Basin No.	9 -15
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Control Gate
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Water Control		
Coordinates (Latitude and Longitude)	N 8 - 51 - 38.6	E 27 - 20 - 40.8	
Elevation (EL. - m.)	429m	Materials of Structure (Concrete, Wood, Steel, etc.)	Concrete, Steel and Stone
Dimensions (Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1976 - 89	Construction period	1 Month
Construction Cost		Funded by	FAO
Implemented by	FAO	Owned by	Sudan Government
Operated by	AIRS	Maintained by	AIRS
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)	
Command Area (Feddan or Hector)			
Function (Operative or Inoperative)	Operative		
Damage (Crack, rust, etc.)	All gates required maintenance	Deformation	
Remarks/Others			

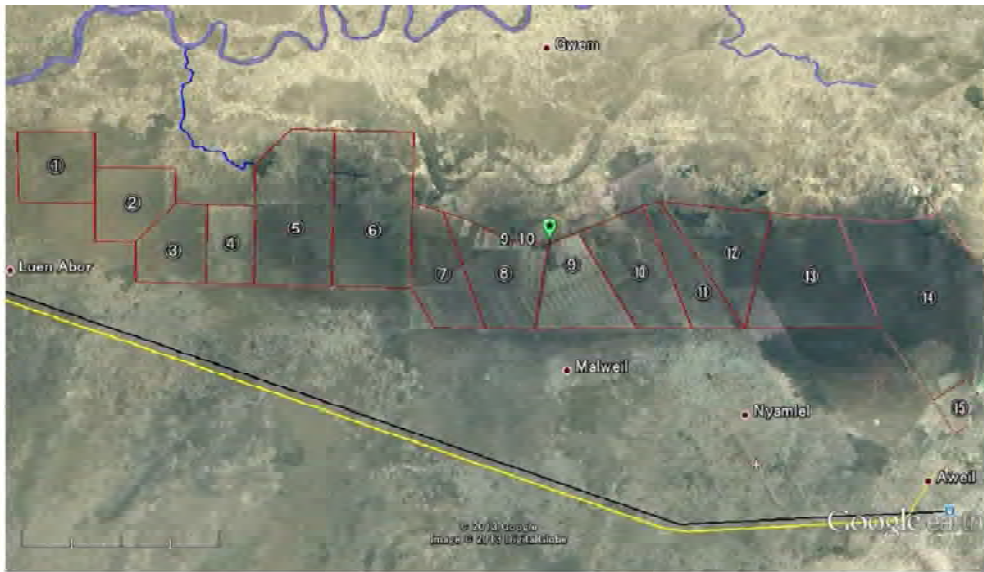
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

10

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

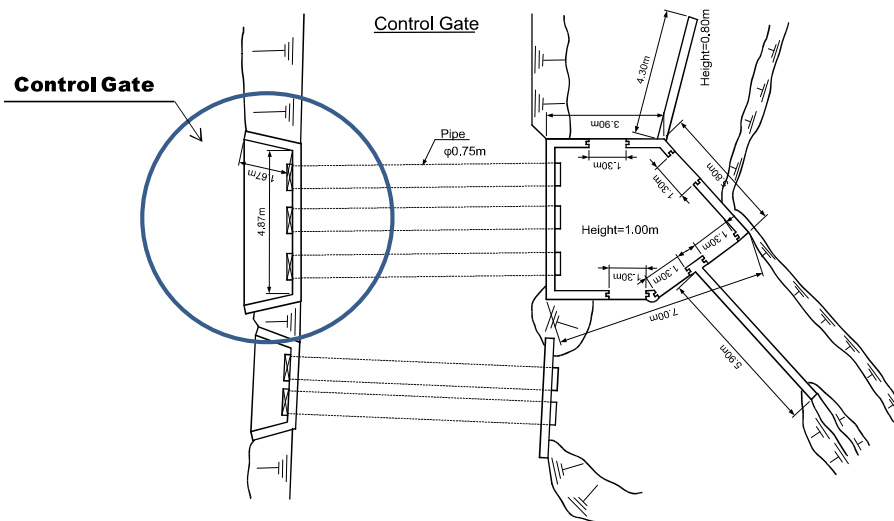


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	11
Inspection Date (Time, DD/MM/YY)	2013/11/5	Name of Inspector	Robert	
Name of Scheme	AIRS	Basin No.	7	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Intake Gate	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 53 - 4.0		E 27 - 19 - 19.4	
Elevation (EL. - m.)	428m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1963	Construction period	3 Months	
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	Crock	Deformation		
Remarks/Others				

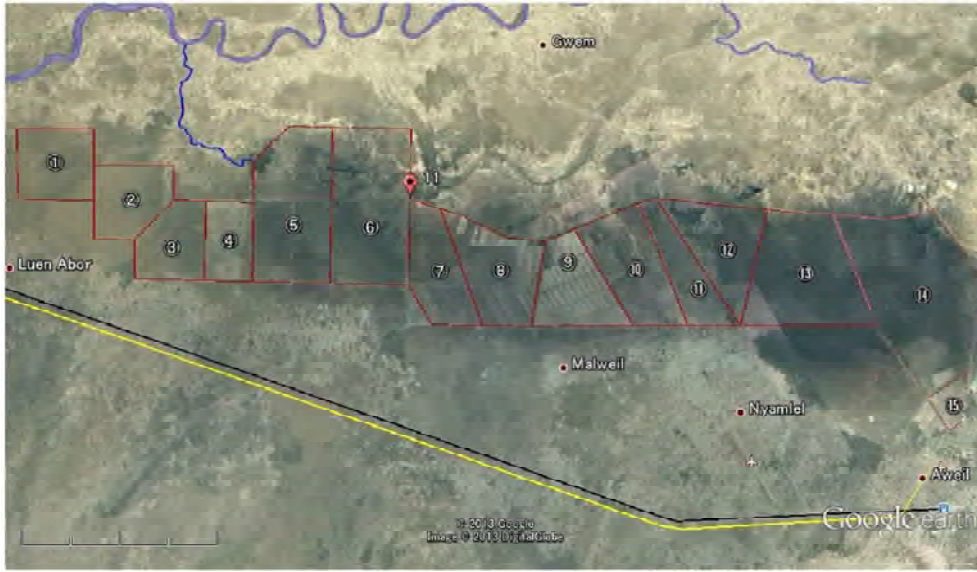
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

11

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

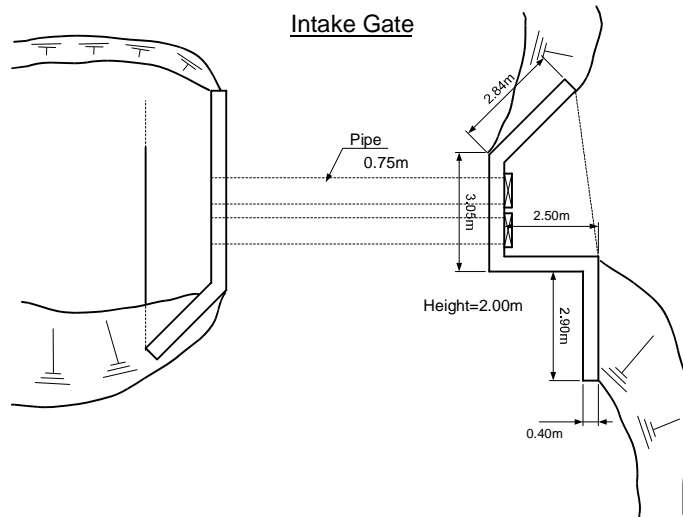


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	12
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Intake	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 27.2		E 27 - 17 - 14.3	
Elevation (EL. - m.)	434m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

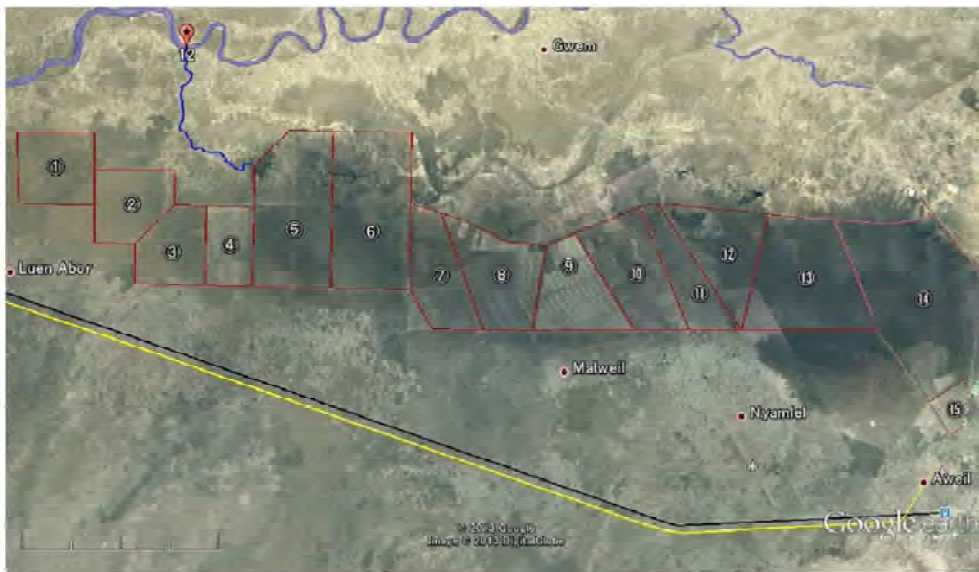
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

12

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

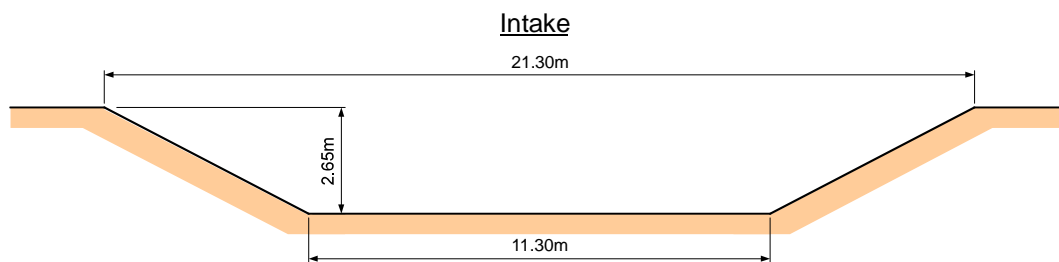


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	13
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Main Canal Cross Section No.2	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 15.8		E 27 - 17 - 32.8	
Elevation (EL. - m.)	426m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

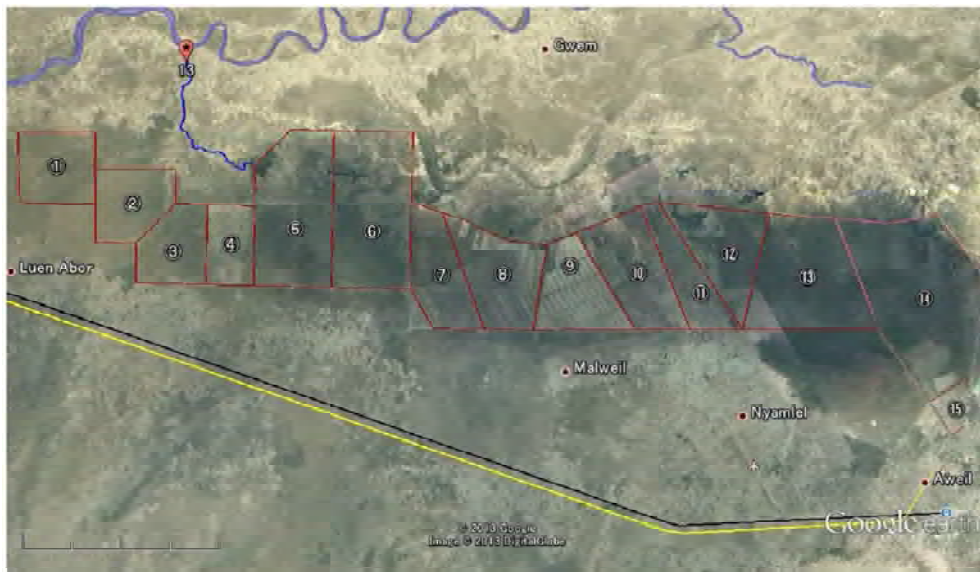
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

13

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

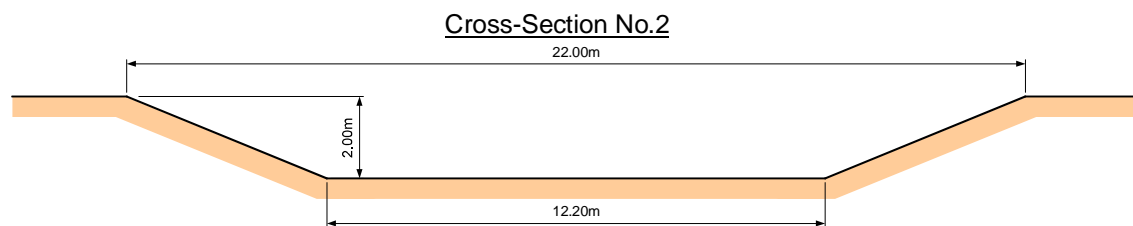


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	14
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Main Canal Cross Section No.3	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 9.9		E 27 - 17 - 34.0	
Elevation (EL. - m.)	426m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

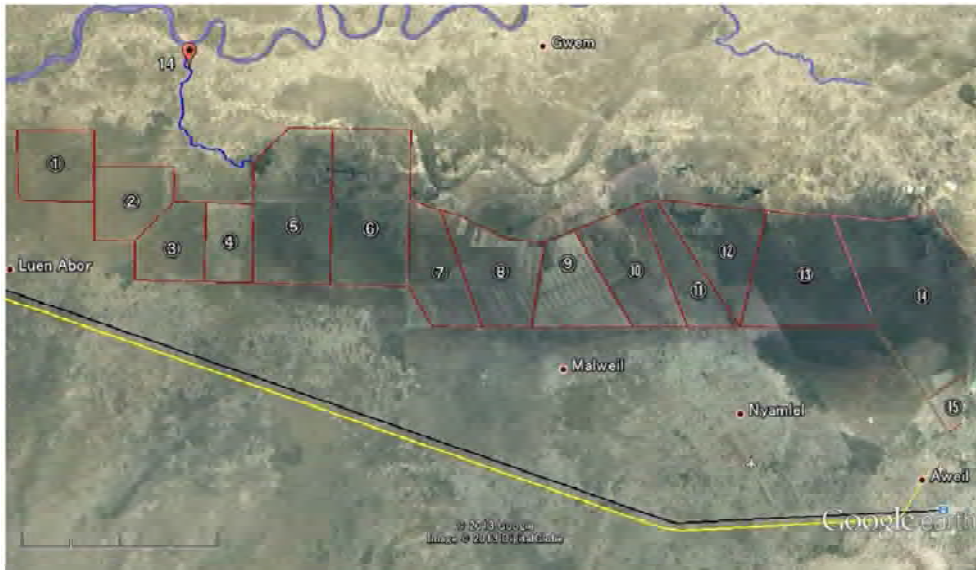
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

14

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

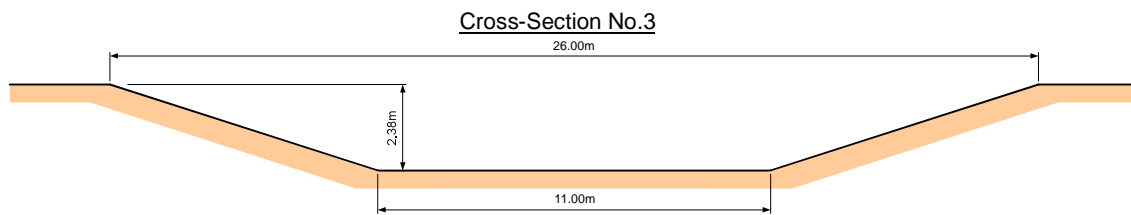


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	15
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Main Canal Cross Section No.4	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 1.3		E 27 - 17 - 21.4	
Elevation (EL. - m.)	424m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

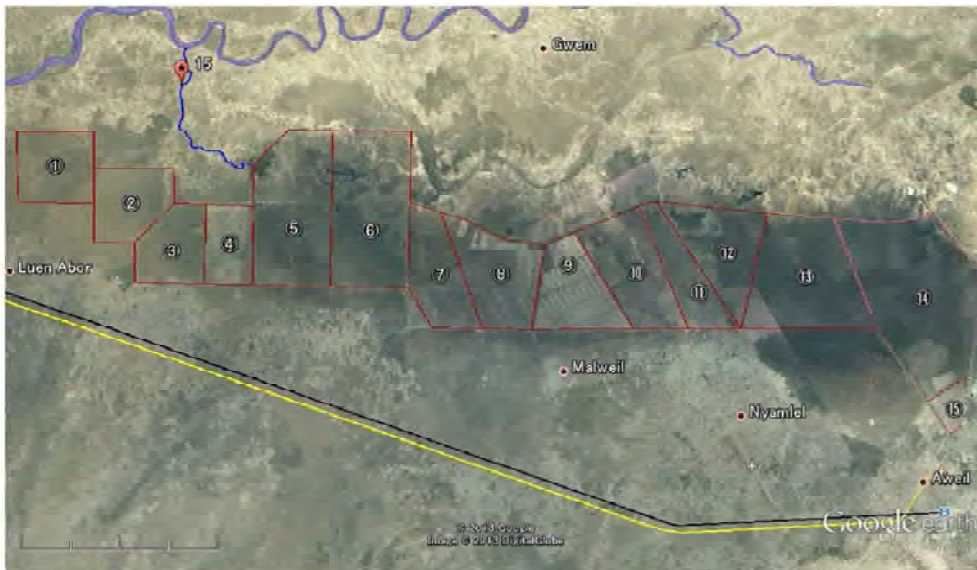
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

15

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

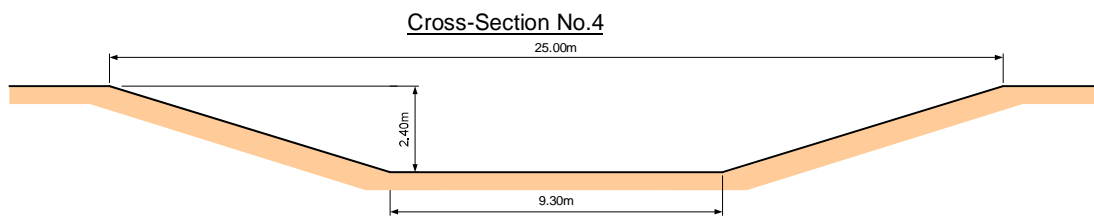


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	16
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Main Canal Cross Section No.5	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 6.7		E 27 - 17 - 11.7	
Elevation (EL. - m.)	430m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others Distination : 1.5 km from intake				
.....				
.....				

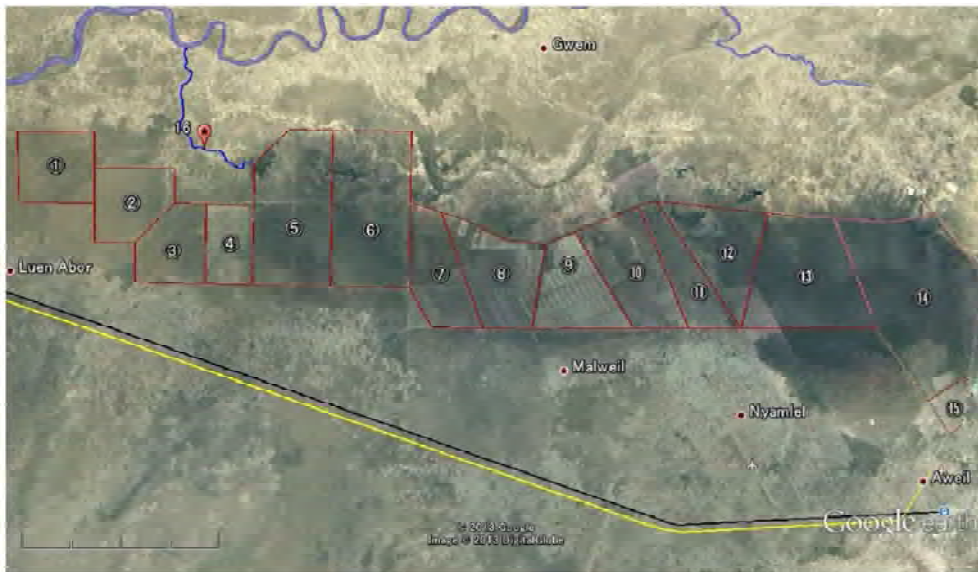
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

16

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

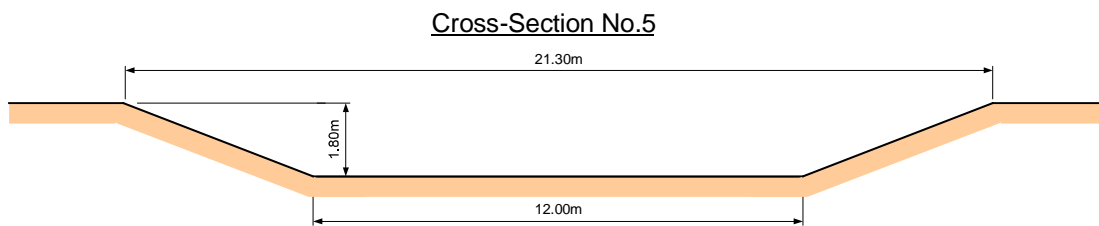


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	17
Inspection Date (Time, DD/MM/YY)	11/05/2013	Name of Inspector	Robert	
Name of Scheme	AIRS			
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Main Canal Cross Section No.6	
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation			
Coordinates (Latitude and Longitude)	N 8 - 56 - 38.6		E 27 - 17 - 39.3	
Elevation (EL. - m.)	424m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year	1956	Construction period		
Construction Cost		Funded by	Sudan Government	
Implemented by	Sudan Government	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)		Rehabilitation by (if any)		
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

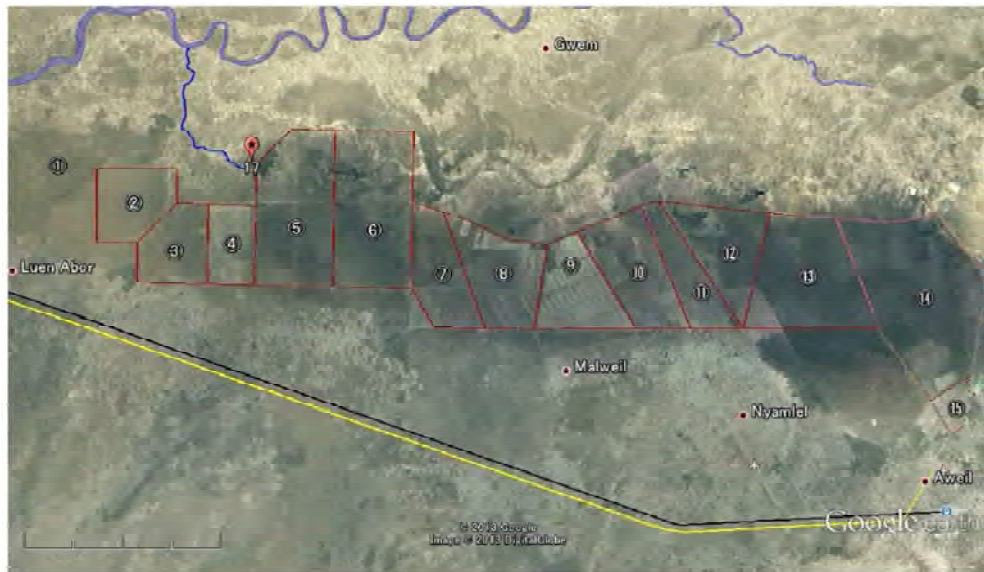
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

17

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

Cross-Section No.6

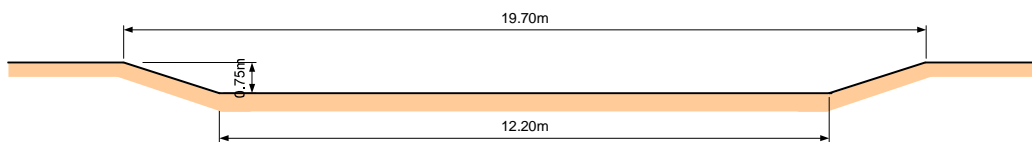


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	18
Inspection Date (Time, DD/MM/YY)	2013/11/5	Name of Inspector	Robert	
Name of Scheme			9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)	Drianage Box	
Purpose of Facility (Irrigation, Drainage, Flood Control., etc.)	Drianage	Drianag Box		
Coordinates (Latitude and Latitude)	N 8 - 50 - 56.2	E 27 - 21 - 6.5		
Elevation (EL. - m.)	433m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year		Construction period		
Construction Cost		Funded by	FAO	
Implmented by	FAO	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hector)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)		Deformation		
Remarks/Others				

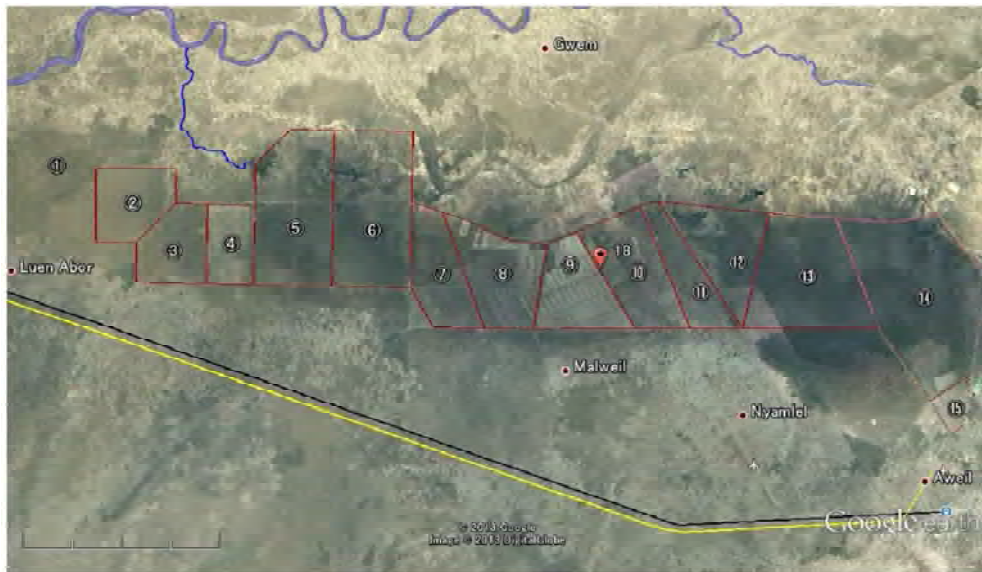
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

18

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

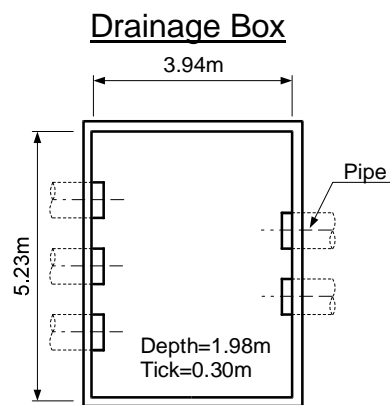


Photo Record

(Front View, Plan, Side View, etc.)



Inspection Sheet for Irrigation & Drainage Facilities			Serial No.	19
Inspection Date (Time, DD/MM/YY)	2013/11/5	Name of Inspector	Robert	
Name of Scheme			9	
Name of Facility		Type of Facility (Intake, Canal, Turnout, etc.)		
Purpose of Facility (Irrigation, Drainage, Flood Control, etc.)	Irrigation	Head regulator		
Coordinates (Latitude and Longitude)	N 8 - 50 - 56.9	E 27 - 21 - 1.6		
Elevation (EL. - m.)	434m	Materials of Structure (Concrete, Wood, Steel, etc.)		
Dimensions	(Height: H, Width: W, Length: L, Thickness: Thk, etc.)			
Construction Year		Construction period		
Construction Cost		Funded by	FAO	
Implemented by	FAO	Owned by	Sudan Government	
Operated by	AIRS	Maintained by	AIRS	
Rehabilitation Year (if any)	2009	Rehabilitation by (if any)	GIZ	
Design Discharge Volume (cu.m./sec.)		Actual Discharge Volume (cu.m./sec.)		
Command Area (Feddan or Hectar)				
Function (Operative or Inoperative)	Operative			
Damage (Crack, rust, etc.)	-	Deformation	-	
Remarks/Others				

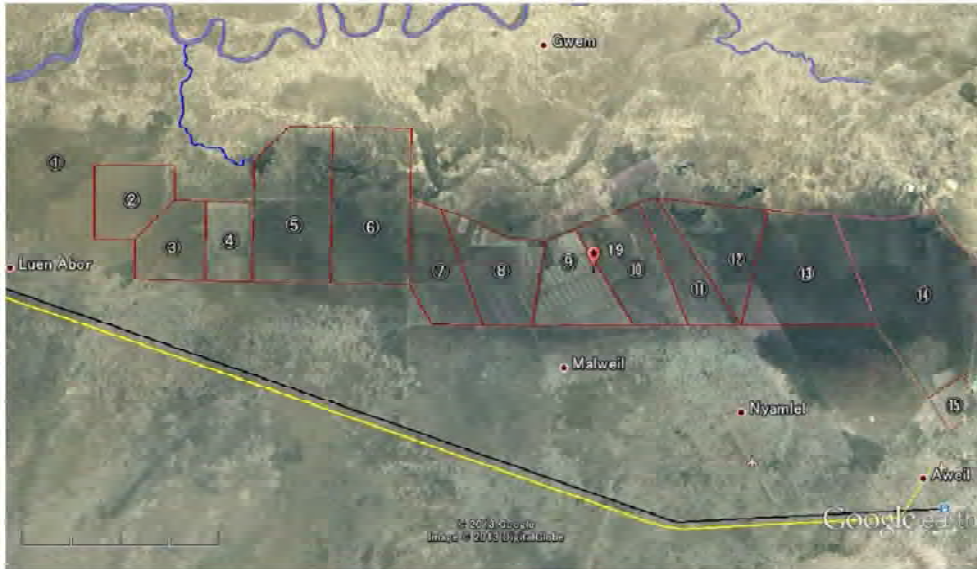
Inspection Sheet for Irrigation & Drainage Facilities

Serial No.

19

Location Map

(Sketch: General Plan, etc.)



Schematic View and Dimensions of Facility

(Sketch: Front View, Plan, Side View, etc.)

Head Regulator

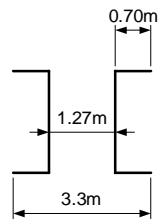


Photo Record

(Front View, Plan, Side View, etc.)

