SWECO

Eastern Nile Technical Regional Office

WATERSHED MANAGEMENT FAST TRACK PROJECT, SUDAN

Lau Watershed Project Area, Maiwut County, Southern Sudan

INTERIM REPORT

Draft Interim Report

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Abbreviations

ACORD	Agency for Corporation on Research and Development
CBO	Community Based Organisation
CIF	Community Initiative Fund
CLMP	Community land use management and development plans
CPA	Comprehensive Peace Agreement
DNP	Dinder National Park
DNRMC	Development and Natural Resource Management Committee
EIA	Environmental Impact Assessment
ENSAP	Eastern Nile Subsidiary Action Programme
ENTRO	Eastern Nile Technical Regional Office
FTWMP	Fast Track Watershed Management Project
GONU	Government of National Unity
GOS	Government of Sudan
GOSS	Government of Southern Sudan
ICRISAT	
IDP	Internally Displaced Population
IWM&D	Integrated Watershed Management and Development
IWRM	Integrated Water Resources Management
LGRP	Local Government Recovery Programme
LIU	Local Implementation Unit
M&E	Monitoring and Evaluation
NGOs	Nongovernmental Organisation
NIP	Nile Interdevelopment Program
NPA	Norwegian Peoples Aid
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PIU	project Implementation Unit
PRA	Participatory Rural Assessment
PRSP	Poverty Reduction Strategy Paper
RRP	Recovery and Rehabilitation Programme
SSP	Support to States Programme
SSRCC	Southern Sudan Recovery Coordination Committee
UNCHR	United Nations Commission for Human Rights
UNDP	United Nations development Programme
WFP	World Food Programme
WRDM	Water Resources Development and Management

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1 Introduction

1.1 Report Structure

This Interim Report forms a part of the detailed preparation of the Fast Track Watershed Management Project (FTWMP) in Lau which is scheduled to be finalised in June 2008 and result in a Project Implementation Plan. The project preparation process is undertaken by a consultant consortium composed of SWECO International (Sweden) and Ahfad University for Women (Sudan)

The FTWMP Interim Report for Lau Watershed Project Area is structured as follows. After a short introduction of the overall project and the Lau watershed project background, a detailed description of project area, target groups as well as the institutional context is provided. Based on this background, the next sections of the document make recommendations for the priority interventions and the participatory approach. This is followed by a section discussing key issues and implications on project design, implementation structure and supporting institutions.

To this Summary Interim Report is attached a number of subject matter reports as described in the Table of Contents.

1.2 The Overall Project

The Fast Track Watershed Management Project in Sudan has emerged from regional cooperation and is focused on national implementation to achieve regional objectives.

The detailed preparation of land and water management initiatives and project governance framework was undertaken during 2007-8 and entailed an iterative consensus building process among the stakeholders namely at federal, state, local and community levels. The detailed project preparation process was coordinated by a consultant consortium composed of SWECO International (Sweden), COWI (Denmark) and Afhad University (Sudan) and resulted in the Project Implementation Plan as presented in this document.

The long-term project development goal of the FTWMP in Sudan is the same as the goal stated in the Project Identification Document (PID) for ENSAP regional cooperation on watershed management and approved by the Eastern Nile Council of Ministers in March 2001, namely:

"Ensure efficient water management and optimal use of the resources through the equitable utilization and no significant harm; ensure cooperation and joint action between the Eastern Nile Countries seeking win-win goals; target poverty eradication and promote economic development; and to ensure that ENSAP results in a move from planning to action"[1]

The specific objective of the Watershed FTP in Sudan is to:

Stimulate, support and demonstrate alternative livelihood practises and local governance systems that contribute to poverty reduction and environmental sustainability

During 2007 the detailed preparation for the watershed management fast track project was undertaken for three pre-selected project sites, explicitly: (i) Lower Atbara in Nile State, (ii) the Bau Locality in Blue Nile State and (iii) Dinder National Park and surroundings bordering the three states Gedarif, Sennar and Blue Nile. The three areas have different characteristics and needs and are located within different ecological zones.

Summary key characteristics are as follows:

Lower Atbara Area:

Key characteristics: Desert area with low rainfall and scare natural resources. Urban-Rural interaction pronounced. Limited Mechanised farming. Limited population pressure due limited livelihoods. Environmental carrying capacity low. Substantial previous experience with community participatory planning and development (Nomadic and semi-nomadic pastoralists excepted). Project area located within one Locality.

Key target groups: Sedentary communities and small scale farmers along the Atbara river. Semi-nomadic and nomadic pastoralists. Women. Land less.

Bau Locality:

Key characteristics: Remote and poorly connected area. War stricken area. One of three disputed areas. Influx of IDPs and land tenure distribution/management still on-going. Recent institutional restructuring and institution building still on-going. Precipitation and natural resources favourable. Area prone to drought and flooding. Very limited experience with community participatory planning. Project area within one Locality.

Key target groups: *Sedentary c*ommunities and small scale farmers. Semi-nomadic and nomadic pastoralists migrating through the area. Women. Landless. Mechanised farmers. Gold panners. Charcoal makers.

Dinder National Park and Surroundings:

Key characteristics: Remote and poorly connected area. Poor access to and degraded natural resources around the Park resulting in encroachment on the Park for livelihoods. Area prone to drought and flooding. Pronounce conflicts between Park management and communities. Cases of conflicts between various population groups over natural resources. Previous experience with community participatory planning and development. Some IDPs. Project area cover three states and five Localities (Rosaries Locality in the Blue Nile State; three localities in Gedaref State; and Dinder Locality in Sennar State)

Key target groups: Sedentary communities bordering the Dinder National Park. Communities within the National Park boundary (Magano and Kadalu). Semi-nomadic and nomadic pastoralists migrating through the area. Women. Landless. Mechanised farmers.

The detailed preparation resulted in the formulation of a Project Implementation Plan for the above listed project areas. The proposed project is characterised by below indicated area specific objectives and overall framework project components.

1. Area specific project objectives:

Lower Atbara Area – To combat desertification, improve environmental resilience and reduce people's vulnerability by promoting more reliable and environmentally sound livelihoods to the people dependent on the meager natural resources in the Lower Atbara.

Bau Area - To reduce the pressure on and conflicts over the natural resources, to capture the long-term development potential of the area, and to build a foundation for sustained peace by promoting alternative, more reliable and environmentally friendly livelihood practices.

Dinder National Park (DNP) Area – To safeguard the natural resources and the biodiversity of the Dinder National Park by improving the Park management and enhance participatory planning and offering alternative livelihoods to target groups who at present depend on the park's natural resources.

The three area specific project objectives were identified based on a participatory assessment of the local root causes, core problems and potential response interventions. The assessment included the evaluation of linkages between: population – livelihood practices- environmental degradation- potential driving forces for change.

2. Key framework project components:

Component 1: Institutional Strengthening in order to strengthen the capacity of relevant local institutions, supporting stakeholders and communities to efficiently, effectively and sustainably fulfil their defined roles and responsibilities within the field of economic development and environmental management. Component 1 includes

two sub-components i) strengthening of supporting institutions and ii) strengthening of Beneficiary Organisation and Community Participation.

Component 2: Project Management to ensure that the FTWMP activities are implemented smoothly and with technical and financial efficiency.

Component 3: Integrated Watershed Management and Development (IWM&D) Interventions with the objective to support local IWRM&D initiatives at local and community level with a strong poverty reduction and environmental focus that will simultaneously deepen local participatory IWRM processes. Component 3 includes various activities under the following intervention areas; i) environmental management, ii) water resources development, iii) agricultural intensification and diversification, iv) improvement of rangelands and v) afforestation and reforestation including support to alternative energy sources as well as vi) promotion of off-farm employment.

1.3 Lau Watershed Project Area in Southern Sudan

After the conclusion of the comprehensive peace agreement (CPA 2005), the ENSAP National Coordinator of Sudan requested ENTRO in 2006 to put aside some of the fund allocated for Sudan watershed management preparation activities to provide flexibility for adding a site in Southern Sudan to the Sudan watershed preparation efforts once consultations between the responsible authorities in the GoNU and GoSS is made.

In an expedited consultation effort between MWRI and the National Coordinator, in October 2007, Lau Watershed was chosen as a fourth fast track watershed management project site in Sudan.

2 Detailed Description of Project Area and Target groups

2.1 Administrative Borders

The Lau Watershed project area is administratively located within Maiwut County, Upper Nile Staten Southern Sudan. Maiwut County has six Payams, named after their Administrative Centres of Maiwut (also, Headquarters of the County), Kigille, Pagak, Jotome, Uleng and Turuw; and River Lau traverse the county territory from northeast to southwest.

Four Payam falls within the Lau Watershed Project area explicitly; Maiwut, Kigille, Jotome, and Turuw Payams. A map of the project area is provided in Figure 2.1.

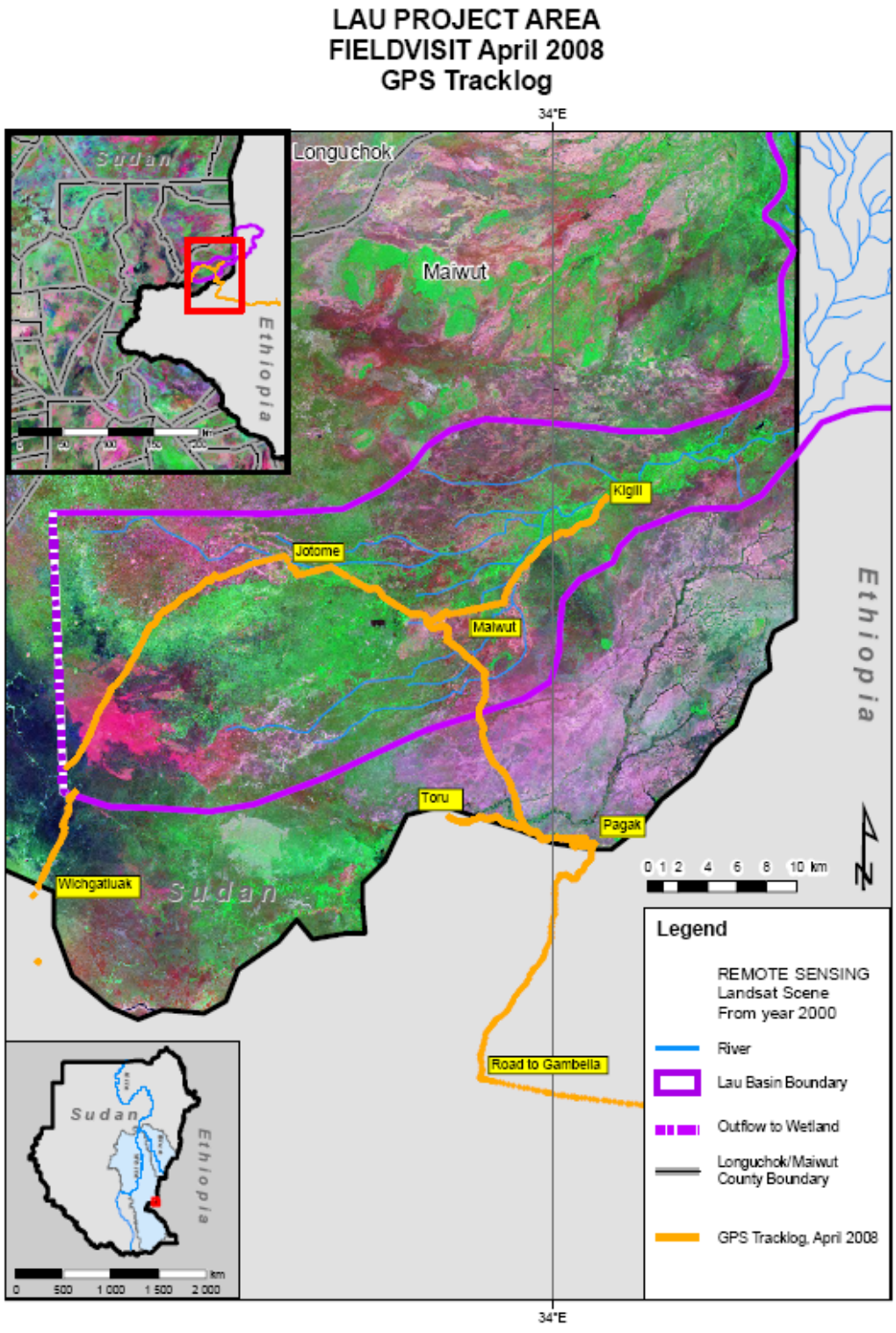


Figure 2.1 Map of Lau Watershed

2.2 Biophysical

2.2.1 Physiography

The Lau watershed lies in the Upper Nile State between latitudes of 8° 30` and 9° 02` N, and longitudes of 33° 40'and 34° 08` E. The watershed has an estimated area of 700 km^2. The altitude ranges from 415 to 1904 m amsl and about 90 percent of the watershed area falls below 500 m asl.

The Law catchment is characterized by rugged densely vegetated mountainous highland terrain at its head and plain lowland at the downstream part. The total Lau watershed (catchment) lies in the southeast of Sudan and southwest of Ethiopia between latitudes of 8° 30` and 9° 02` N, and longitudes of 33° 40'and 34° 20` E. The watershed has a total area of about 1,300 km^2. The Lau watershed consists gently sloping lowland plain in the western direction. The altitude ranges from 415 to 2090 meters above mean sea level (mamsl). About 60 percent of the catchment area falls below 500 m amsl.

2.2.2 Climate

The annual rainfall varies from about 800 mm to over 1700 mm. Rainfall is heavy and concentrated to one rain period, form May to October. The lower part of Lau watershed becomes either mud or water.

The climatic statistics displayed here for Malakal represent the mean value of each meteorological parameter for each month of the year. The sampling period for this data covers 30 years from 1961 to 1990.

The mean annual temperatures in the basin range from about 18 °C on the highlands to about 29 °C on the lowland plains. The mean maximum temperature ranges from 25 to 40 °C while the mean minimum temperature varies from 10 to 20 °C. In the extreme low lands, the temperature regularly rises to over 40 °C during the dry season (in the range from November to April).

2.2.3 Soils

The soil of Lau watershed can be approximately classified into three (see Figure 2.2) as follows.

(a) Aluviums, wadi fills, delta, swamp deposits (covering the bottom of the watershed).

(b) From unconsolidated clays, silts, sands and gravels (up to) unconsolidated sands with some gravel, clays and shales (covering the middle part of the watershed).

(c) From sandstones and conglomerates, with some limestone and cherts (up to) unconsolidated basement complex with outcrops (covering the upper part of the watershed).

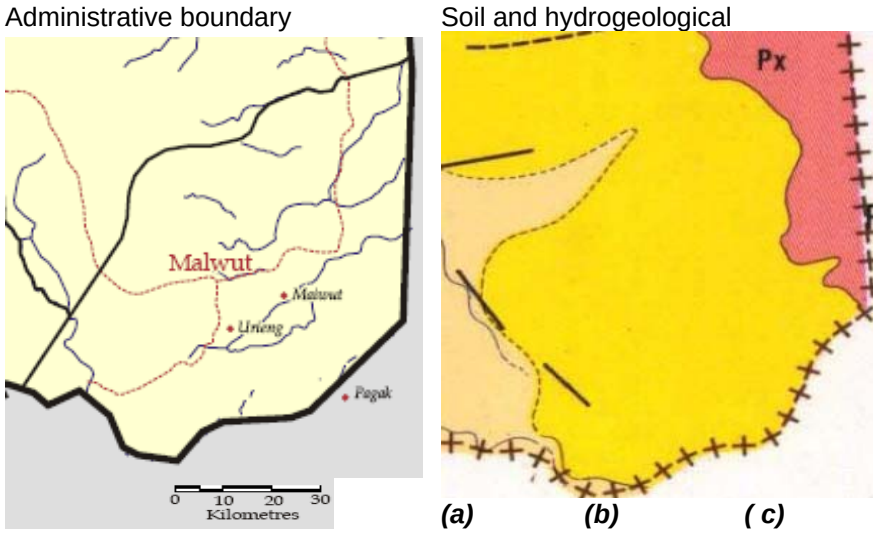


Fig 2.2 Soil and Hydrogeological Map of Lau Watershed and Surroundings

2.2.4 Hydrogeology

The hydrogeology of Lau watershed can be classified into three as that of the soil classification (see Figure 2.2).

(a) This area consists of continuous or subcontinuous aquifers of local to subregional extent, unconsolidated, saturated thickness generally small, permeability variable, water quality generally good, importance generally great and potential variable. Wadi fill and swamp deposits are dominant.
(b) The area general consists of continuous or subcontinuous aquifers of local to subregional extent, unconsolidated, saturated thickness generally small, permeability variable, water quality generally good, importance is generally low and potential variable.
(c) This area consists of rocks that are generally non water bearing. Water occurs in fractured or weathered zones. Local perched perennial or ephermeral aquifers may occur as well as thin saturated layers at depth. The hydrogeological importance is very low and the potential is very low.

2.2.5 Water Resources

The main water source in the Lau watershed is the Lau stream. The Lau stream channel has a total length of about 70 km and has elevation of elevation of 476 m amsl at the Ethio-Sudan border and 415 m amsl at the marshy area (junction with Mechar swamp). The end part of the Law stream is prone to inundation and waterlogging during the wet season.

From the Ethio-Sudan border up to some 30 km downstream (up to Kigille village), Lau stream flow follows through a well defined channel and has a general slope of 1.5 m in 1 km (0.15 percent) . Then after branches into many channels with a general slopes of 0.38 m in 1 km (0.038 percent). These branched channels include Nyinyagwill, Lau and others. Any slight change on the channel system (especially downstream of Kigille) would result in unpredictable flow proportions through the existing or the newly formed channels. Relief and stream order map is provided in Figure.2.3.

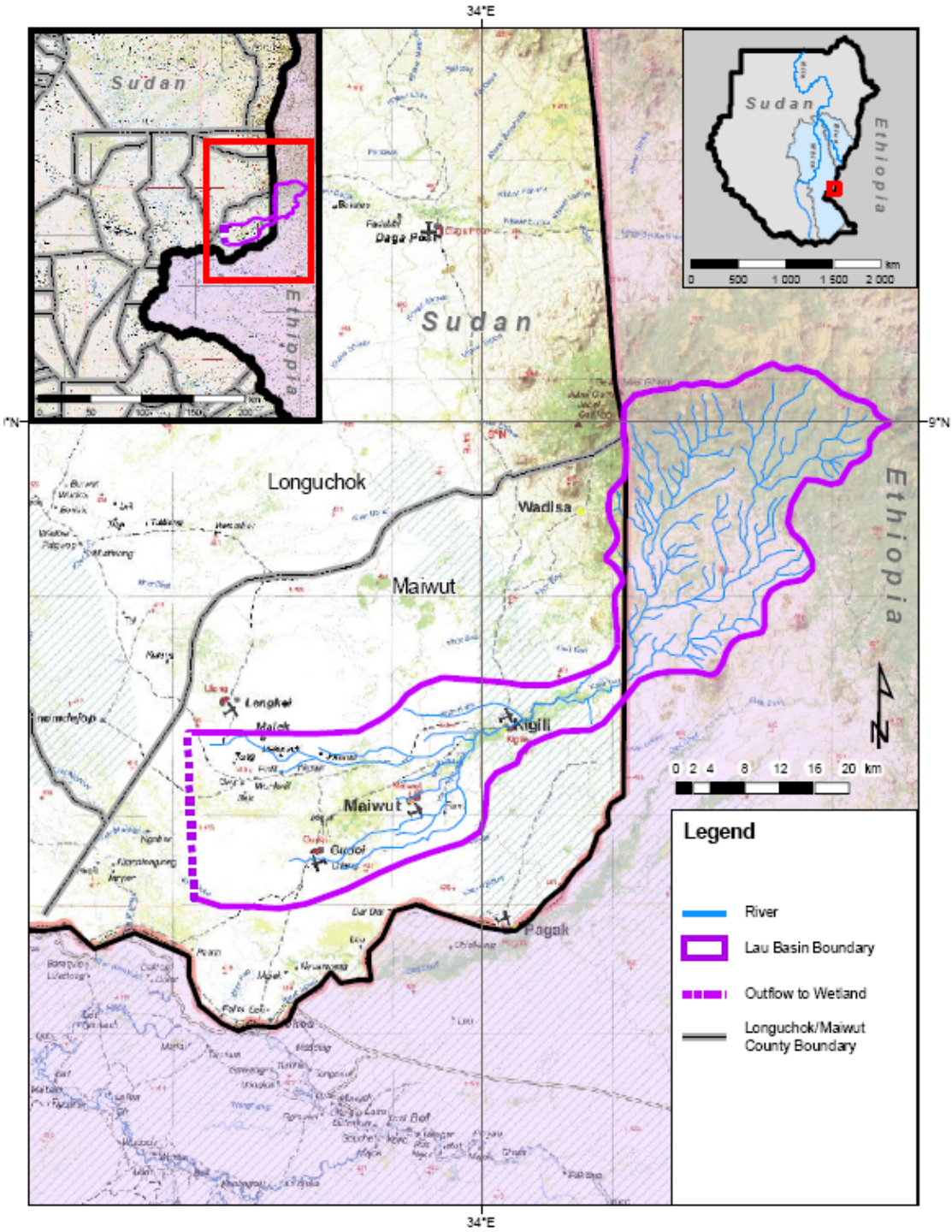


Figure 2.3. Relief and stream order map

Any intervention with regard to utilization of Lau stream should make sure that the flow direction behaviour is not significantly altered as the consequence can not be predicted without very through investigation.

Typical channel reaches of the Lau stream system are shown by Figure 2.4.

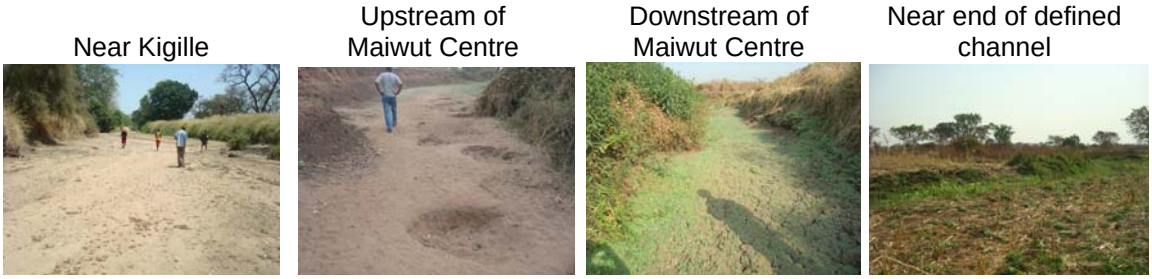


Figure 2.4: Channel reaches of Lau stream

During dry seasons, while many people move long distances with their livestock in search of forage and water, the remaining people within the villages have serious problems of getting adequate water (both in terms of quantity and quality) for domestic use as well as for their livestock that have not moved to other alternative areas.

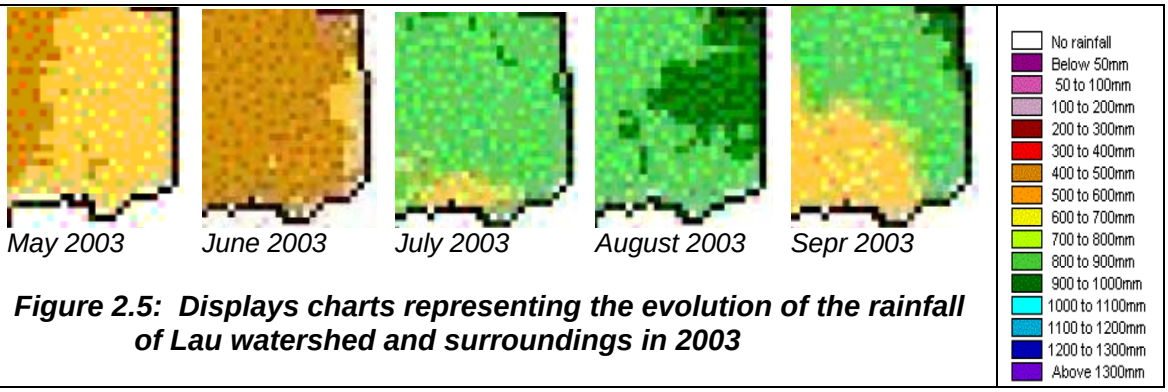


Figure 2.5: Displays charts representing the evolution of the rainfall of Lau watershed and surroundings in 2003

2.2.6 Land cover and Biodiversity

The area comprises woodland savannah, swamps, open grassland and riverine forest as presented in Figure 2.6 Land cover Map.

Four landscape / land use types is passed from Maiwut to Wichgatluak (6-7 hr), namely dense woodland/forest, open savannah woodland with a rich abundance of antelopes, a mostly dried swampy area where Lau River ends and an open pastureland on the bank of Baro River, where the Jotome Payam villages have their dry season camps.

The natural vegetation and forest cover is moderately dense savannah woodland in the upper part of the watershed comprising of Balanites, Tamarindus, Sclerocarya as common species. Most trees are bearing fruit, and are used for eating fresh and making juice. The dominating grasses are Sorghum Sudaneses (Adar), Hyparrhenia sp (both species is a fire climax grasses subjected to periodic burning), Pennisetum ramosum, Lannia spp and Cassia spp.

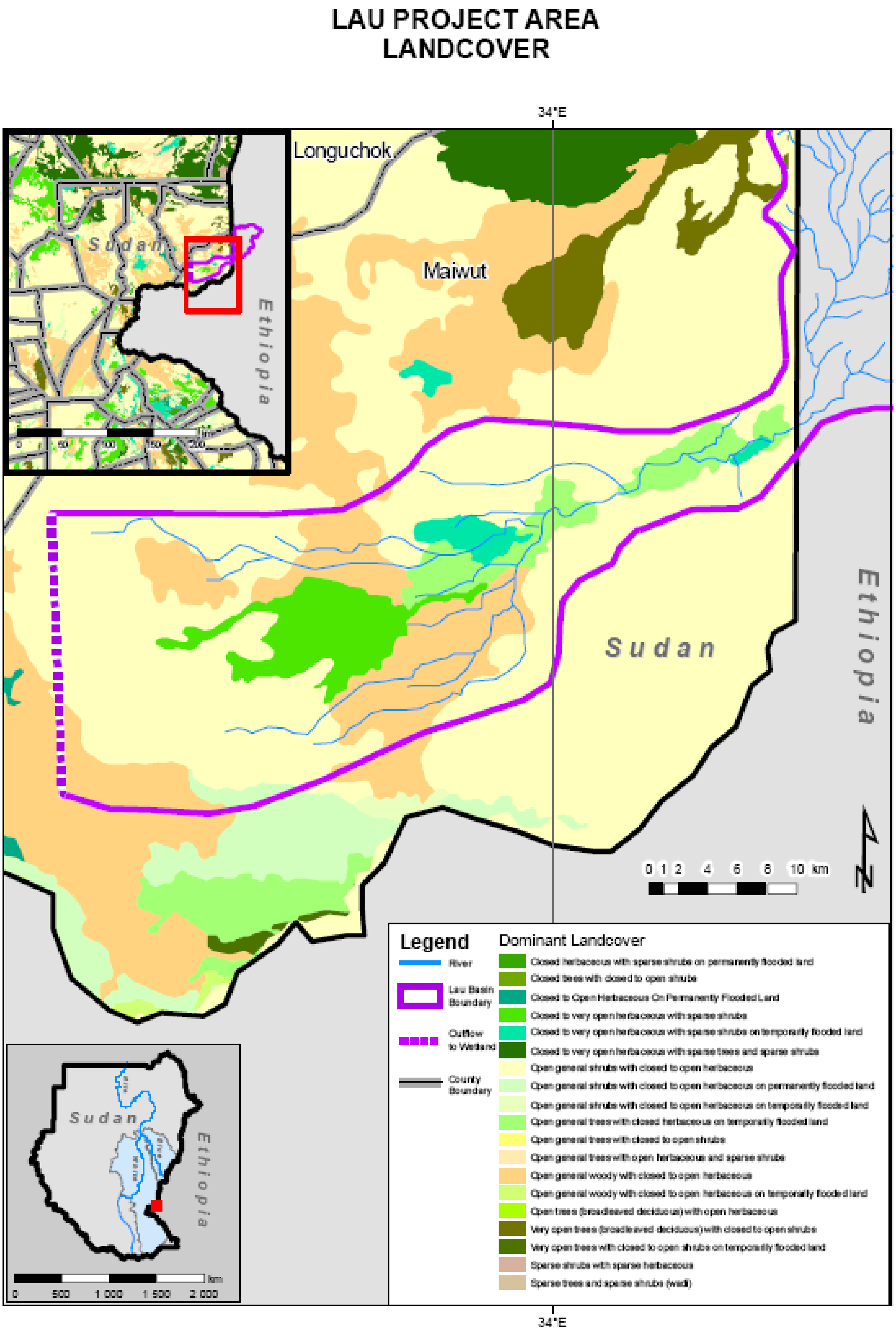


Figure 2.6 Land cover Map

Important species in the riverine vegetation include, Ficus seycomorus, Tamarindus indica, Maytenus senegalensis, Enteda Africana , Syzgium guinenses and Acacia spp.

Forest cover has depleted by 25% between 2005-2008 due to overcutting for fuel wood, construction and clearing for crop cultivation around Maiwut centre. In addition to wood fuel and construction wood, the forest is used by wild honey collectors.

Although there is large forest cover in the area, at the current rate of tree cutting, it will degrade significantly within a short period of time. Joint forest management and tree planting are required.

Plantation is not practised, but would be preferred at homesteads. The preferred tree species for planting are Balanites, Neem and Mango and the preferred location for tree plantations is around the village boundaries.

The plant ecology of the wetlands and flooded grassland mosaic located on the clay plains are important in the livelihood strategies of the agro-pastoral peoples who live on the plains and they also provide habitat and species biodiversity of some considerable importance. The area is an important habitat for large mammal species and wide range of avifaunal species. Wildlife in the area are giraffes, bush elephants (Ethiopian border), warthog, hyenas and various types of antelopes. The birds include the ostrich, African white backed vulture, ruppel's vulture, cattle egret black kite and others. Reptiles include crocodile, monitor lizard and various species of snakes.

2.2.7 Infrastructure

There are no proper networks of roads. Major link roads in the area comprise some stretches of unsurfaced roads that are serviceable only in the dry season since the most parts of the watershed is covered with black cotton soil with gets extremely muddy when it is saturated. Lack of access roads is a serious problem as the main constraint to the development of the area is its far distance location in relation to the large urban and market centres.

The network of roads in the area comprises some stretches of unsurfaced roads that are serviceable only in the dry season.

The area is characterised by poor infrastructure, most of the land became soak during the rainy season (May-November) and the area is crisscrossed by several watercourses. Therefore, movement to and within the area is only possible by small aircrafts (mostly operated by UN WFP). Rough-road 4-wheel drive vehicles can only be used from December to April; but some locations in the area are completely inaccessible using vehicles, unless by bikes.

From Nasir (the major town in the eastern parts of Upper Nile State, about 130 miles from Malakal), Maiwut (the County Headquarters) is six hours drive during dry season, and within the Lau watershed area, there are a number of livelihoods centres, and they are connected (e.g. with Maiwut) either by land or by air as tabulated below:

Maiwut Town	Other Settlements	Distance from Maiwut (mile)	Condition of Airstrip
	Kigille	12	All-weather Airstrip
	Pagak	24	Airstrip functional occasionally during wet season
	Jotome	06	Dry Season Airstrip
	Uleng	10	Dry Season Airstrip
	Turuw	16	Dry Season Airstrip
	Maiwut	00	Airstrip functional occasionally during wet season

2.3 Target groups and socio-economic context

2.3.1 Population

The population of Maiwut County is estimated at 200,000 persons. This is a rough estimate which will be updated in April 2008 for which the national census is scheduled.

The most dominated tribe in the county is the Gaat-Jaak Nuer, living in the centre at Maiwut Town and they spread to the east, south, southwest and northwest of the county. Out of six Payams, five are purely Gaat-Jaak Nuer or dominated by the Gaat-Jaak Nuer. The Payams are delineated based on tribal groups. In the Payam called Kigili located to the northeast of the county starting at Maiwut Centre lives the Burun tribe. The Ethiopian Anyuaks and Nuers of Gambella Region, live on the Ethiopian side close to northeast Mountains from which Lau river system draws its waters. Many Ethiopians are also living on the Sudanese side and working as traders. The Ethiopian traders are concentrated in the two market centers of Maiwut County which are located in Pagak and Maiwut Payams. In addition, those Payams have been receiving and are currently receiving IDPs and repatriating refugees from Ethiopian refugee camps. This group is also mainly Gaat-Jaak-Nuer and Burnus.

The project beneficiaries are defined as those living within the Payams which are within the boundary of the Lau Watershed Project Area, explicitly: Maiwut Payam, Jotome Payam, Jekou Payam and Kigili Payam. The population data for the Payams are as follows:

- Maiwut Payam, 9 Bomas, Population 185,211
- Jotome Payam, 6 Bomas, Population 21,420
- Kigili Payam, 4 Bomas, Population 8,617
- Jikou (Turu) Payam, 6 Bomas, Population 12,529

The project will benefit the population from the four Payams residing along the Lau River. In numbers the direct beneficiaries of physical infrastructure are estimated to approximately 25 000 individuals.

In summary the dominating population groups are:

- Nuers – Agro- Pastoralists;
- Buruns – Agriculturalists with small ruminants;
- Returning IDPs and Refugees; and
- Ethiopian traders.

Gajaak-Nuer and Burnus are the largest target groups. IDPs and Refugees are identified vulnerable groups which have to be targeted separately. Another group to be considered in the project preparation is the Ethiopian traders. This group will most probably not be directly targeted by the FTWMP however they constitute a part of the population and may benefit or be impacted by the project interventions. However, they may be regarded as a resource for some of the interventions.

Marriage between the two main tribal groups Gajaak-Nuer and Burnus take place occasionally.

2.3.2 Livelihood systems

Agro-pastoralism is the leading preoccupation of the people and practised by the Gajaak-Nuer. The Buruns, located at the upper end of the watershed, practice farming and keep small ruminants.

Throughout the region, though the sources of livelihood of the population are cattle-rearing, crop production, fishing, hunting and collection of wild foods. These vary in their relative importance according to the areas of grazing and cultivable land available. Crop production is much less important in the clay plains where the Gajaak-Nuer resides, than animal husbandry. Clay plains are very difficult to work with. Soils are very sticky when wet and very hard when dry. In addition, pests, diseases, droughts, and floods all take their toll of growing crops in the field.

Rearing of cattle is strongly linked with the practice of seasonal migration between the high land and the flood-plains. The Gajaak Nuer in the Lau watershed move towards Mechar swamp area and down to Baro river in search of water and forage for their livestock during dry season. Similarly, they move towards the middle and upper part of the watershed during wet season in order to avoid the problem of grazing land as the Mechar area gets fully covered by water and movement in the nearby locality restricted by saturated muddy heavy black cotton soil. During drought years, the Nuer communities stay for longer periods of time in the marshy areas. This has serious implication on their agricultural activities and food security, since land preparation is often delayed and not properly prepared ahead of the rains.

The area, receives annual rainfall and runoff enough to sustain agricultural practices. Pastoralists who live near the rivers cultivate the banks of the river when the flood recedes, exposing alluvial terraces along the rivers. The farming system is shifting cultivation. Double cropping of maize and beans and single cropping of sorghum are practiced. Land preparation is carried out using hand-hoes as tsetse and lack of knowledge precludes the existence of oxen.

For the Buruns, agriculture is essentially for subsistence in a more sedentary form with some element of shifting and fallowing. Buruns grow a wide range of crops including maize, sorghum, groundnuts, cassava, sesame, sweet potato, cowpea, finger millet the area.

Apart from agriculture, livelihoods in the high lands, are composed of fishing, gathering of wild foods, hunting, keeping of small ruminants and small-scale trade (honey, tobacco).

Photos: Agriculture, small ruminants and honeybees

The relative abundance of land for cultivation means that access to land is not really a problem; especially within the higher more settled areas away from the dry season river bank settlements. At present, there are little conflicts related to agricultural land.

The inhabitants of the area, in general, have been little affected with outside trade or modern advances in technology. Their economic isolation is to a large extent the result of difficulties of communication in the region. Lorry transportation is of increasing importance, but lorries can be used only during the dry season.

2.3.3 Poverty and Status of food security

Despite the extreme attachment of the Nuer to their cattle, the greater part of their diet comes from grain. Grain production in the area rarely suffices for subsistence even in good years. Grain stocks fall at the end of the dry season, and during the rains there is a hungry period until the new crops are harvested. In this case grain is imported from central Sudan, paid for by the sale of cattle. Even if there is grain surplus, the high humidity prevailing throughout the year prevents the storage of grain for more than one season. The relative humidity ranges between 25 to 80% throughout the year. It is highest (between 50 to 80%) during May to November, with an annual mean of 54%. Other food crops include maize, eaten early before the main sorghum crop ripens at a season of distinct food shortage. Various pests attach crops in the area aggravating food insecurity situation. The voracious migratory locust is occasionally reported. Damage to crops is also caused by various birds. Particularly severe crop losses are caused to the sorghum crop by the parasitic witch weed, *Striga spp* due to the cultivating the same land year after year by sorghum (mono-cropping). During the dry season, the Nuer and Burun do fishing, hunt, and gather wild plant foods. Some grains and vegetables supplement this diet. None of the food commodities are solemnly produced for market purposes.

Wealth in the area is defined generally by a man's possession of number of cattle heads or number of wifes according the following crude scale.

No of cattle heads:	**No. of wifes:**
Very Poor: 1-5 cattle	
Poor: 5-20 cattle	Poor: 1 wife
Better off: 50-100 cattle;	
Wealthy: 200 Cattle	Wealthy: 5-10 wifes

With this definition it can be observed that the majority of the population is very poor to poor. The cattle herds observed was not more the 20 per family, which was confirmed during community meetings.

2.3.4 Access to basic services

2.3.4.1Water and Sanitation

Within the target area, potable water supply coverage is very low. Lau stream is still the major source of domestic water supply however this stream is not permanent and whole communities move to where water can be found in the dry season.

Hence, in the Lau watershed, water source for domestic, livestock and others such as for honeybees are extremely small size natural pools established within the natural channels and depressions within plain fields. The other water sources are water under the sandy stream channel abstracted by scooping the sands. These sources hold to little water quantity as compared to the huge demand prevailing in the watershed. Not only inadequate in terms volume but also poor quality due to contamination from human and livestock direct contact with the water body.

Major efforts have been undertaken to improve this situation by locally based international NGOs. The interventions have mainly focused on drilling and the construction of ground water wells. The obstacles have been to find ground water of sufficient yield and quality. No hydrogeological survey has been undertaken.

In Maiwut, there is one hand water pump functioning at the headquarter of the Payam. There are plans to drill five wells in five of the bomas. Jekou Payam has two wells. No water infrastructure is in place in Jotome Payam and only one hand pump is available in Kigili Payam.

Water quality is a problem especially towards dry season when there is a higher concentrate of pollution in the stream. Diarrhoea and stomach problems are generally also a problem due to poor sanitary systems. Pit latrines only exist in public places and market centers. Even if appropriate sanitary solutions coupled with awareness raising has been offered many people still use the bush.

Protection of water points for human consumption is necessary. Separate water points should be established for the livestock.

2.3.4.2 Health

There is a clinic in Maiwut Payam. An improvement of the health center in Maiwut is currently under construction. With the inauguration of this clinic, the Maiwut County will also recruit a Health Director and the health service department at the County will be developed and operational.

In the other Payams, the coverage is as follows:

- Jekou Payam - 2 clinics, 6 staff, with 10-12th grade education and 9 month's training in community health.
- Jotome Payam - 2 clinics, 20 staff, 3 nurses with 3 year's training and health assistance with 10-12th grade and 9 month's training in community health.
- Kgili Payam -1 clinic with 2 staff but no medicine

Up to this point in time, NGOs have worked with health service delivery without a proper local ministry counterpart. Basically all health services delivery in the area are

financially supported by and partly implemented by NGOs. Health services delivery is fragmented and provided by non-public actors mainly NGOs operating in the area.

Most of the basic service delivery i.e. education and clinics are built on stationary solutions while the population is mobile.

There is no sign of mal-nutrition in the study area although there are short periods of seasonal food deficiency.

Major endemic disease includes Malaria. There are also cases of Trachoma, Guinea Worm and other organisms. Social and cultural taboos and misconceptions coupled with a high mobility of population (influx of IDPs, refugees, Ethiopian traders, military staff and the locally based NGOs) makes HIV/AIDS an emerging problem facing the area.. River blindness is reported to be common although the Consultant Team have not come across any blind people. As mentioned previously, diarrhoea and stomach problems are generally also a problem due to poor sanitary systems.

An emerging type of health problem and limitation for development is alcoholism, especially for the young and idle men in the project area.

2.3.4.3 Education

A large proportion of the Maiwut County population is youth, why education is an important issue for the local authority.

- Maiwut Payam has 2 primary schools (1-6 grade) and 1 junior secondary, up to 8th grade.
- Jekou Payam, there are 5 primary schools with 10 teachers, out of which 1 woman, with education level of 10-12th grade.
- Jotome Payam has 6 primary schools with 8 teachers, with training level of 10-12th grade, 800 children go to school, which is everyone in the Payam. Classes are conducted under trees, if any.
- Kigili Payam has one primary school and 1 teacher, but no classroom.

The education level of teachers is low and secondary education is only available in Nasir and in Gambella on the Ethiopian side.

There is still a very high level of illiteracy in the area. Both men and women are incapacitated. Some of the IDP and repatriated refugees hold basic skills in reading and writing.

On the other hand, there is a small influx of investors to Maiwut, who originates from the area and who benefited from displacement in Khartoum or abroad. These repatriating intellectuals will be very instrumental in the future development of the area. The consultant team met with a few of those who were in the area to look for investment opportunities.

2.3.5 Gender Aspects

With minor differences between the two major tribal groups, women are responsible for fetching of domestic water and harvesting of crops and carrying the crops back to the home stead. Fetching water in the dry season means that women must walk long distances and sometimes spend the night away from the homestead.

Women do not own property in the area. All property in the homestead belongs to the husband. A woman cannot buy a cow even if she has the means, without the authority of her husband. Only divorced women and widows have authority over their cows. On the other hand, women can have and do have community leadership positions (community chief or sub-chiefs etc) within the project area. This was explained by the fact that the war distorted traditional ways of leadership system mainly by the fact that the men were involved in the war and absent from the homes. Also during dry season the community chief move with the cattle and his deputy which sometimes is a woman is responsible for the community management.

Conflicts at water-points are common and women from host communities are frustrated by large numbers of returnees placing a burden on limited water resources in the Lau watershed.

New type of livelihood training activities introduced by NGOs, tend to become the privilege and task of men with little involvement of woman. Albeit this, there are exceptions and there is at least one women group established and operational in Kigili.

Cultural attitudes emanating from the tribal character affect key gender issues, including whether tribesmen are willing to look at women's rights beyond a certain level of kinship inclusion, in other words, considering women as individual rights' holders. Some traditional practices remain a serious challenge in addressing some key gender issues. Child marriage of girls continues to be a challenge and increases risk of unbalanced gender power relations and states prone to health hazards and lack of social integrity. Illiteracy among women in Maiwut is at present estimated to be very high.

To sum, the challenges and opportunities that face the area and women in particular include:

1. Workload
2. Poverty and food insecurity
3. Empowerment
4. Conflict
5. HIV/AIDS
6. Early Marriage
7. Abduction and violence against women

2.3.6 Prevalence of Conflicts

Up to 2006, the study area was still characterised by insecurity and the presence of arms in the area was high. Negotiations was undertaken in order to convince the communities (mainly pastoralists) to partake in voluntary disarmament. These failed and the area was disarmed by the government in 2006.

Current conflicts are mostly non-violent and are mainly natural resource based and others are ritual based. The main local disputes in the area and between neighbouring communities are:

- conflict at water sources;
- conflict over grazing lands;
- conflict at fishing grounds; and
- traditional cattle raiding.

Conflict resolution for any type of conflict is the responsibility of the Boma Chiefs. Boma chiefs are sometimes assisted by Payam Administrator and the formed Peace Committees.

2.3.7 Stakeholder interests

Perceived key problems and challenges among the communities were unanimously identified as indicated below.

Perceived Immediate Problems:

- During Dry season: Water shortage
- During Wet season: Isolation due to inaccessibility
- Long-term: Illiteracy and language

Perceived Needs:

- Water for human and livestock consumption
- Education
- Modernized Agriculture
- Improved Cattle Management
- Roads

Community priorities elicited from a few community interviews indicate the provision of basic needs such as drinking water for human and animal consumption, education services, tools and agricultural extension, cattle health services and roads as the main priorities. With these priorities, the Maiwut and Lau watershed area is not much different from other areas in Sudan and national /NGO post-conflict recovery and development priorities.

2.3.8 Environmental Threats

Under the current circumstances when neither the national policy framework nor the local authority capacity is capable of protecting the environment, activities can be undertaken without being properly controlled. With this background, the main threats to the local environment and ecosystem which could be of concern are summarised as:

1. Changes in hydrological pattern and geomorphology
2. Water pollution
3. Soil degradation
4. Overgrazing
5. Deforestation
6. Loss of Wildlife

Consequently, these threats will be considered by the project to the greatest extent possible.

The underlying causes resulting in above threats could be summarised as:

- Lack of institutional enabling framework for environmental protection
- Lack of local level interest and awareness of consequences on local environmental (e.g. sanitation and water borne diseases)
- the creeping processes of population growth and influx, climate change and land degradation

3 Institutional Context

3.1 General Governance system

There are three levels of institutional authority; federal level -Government of Sudan (GOS)/Government of Southern Sudan (GOSS), state level and county level. Within the jurisdiction of counties, there are Payams administrative units and Bomas.

Sudan Federal Government structure is made up of 25 states. The CPA provides for a Government of Southern Sudan (GOSS) under which the 10 southern States fall. Each State comprises of a number of counties. A county is composed of Payams and each Payam is divided into Bomas; and a Boma as a smallest administrative unit of governance in Southern Sudan comprises of a number of villages.

GOSS is headed by a President who is also a 1st Vice President of the Republic of Sudan, the State Government is led by a Governor, the County is supervised by a commissioner, the Payam is run by a Payam Administrator and a Boma is administered by the traditional leadership system. This implies that Payam is the lowest administrative level with government appointed staff.

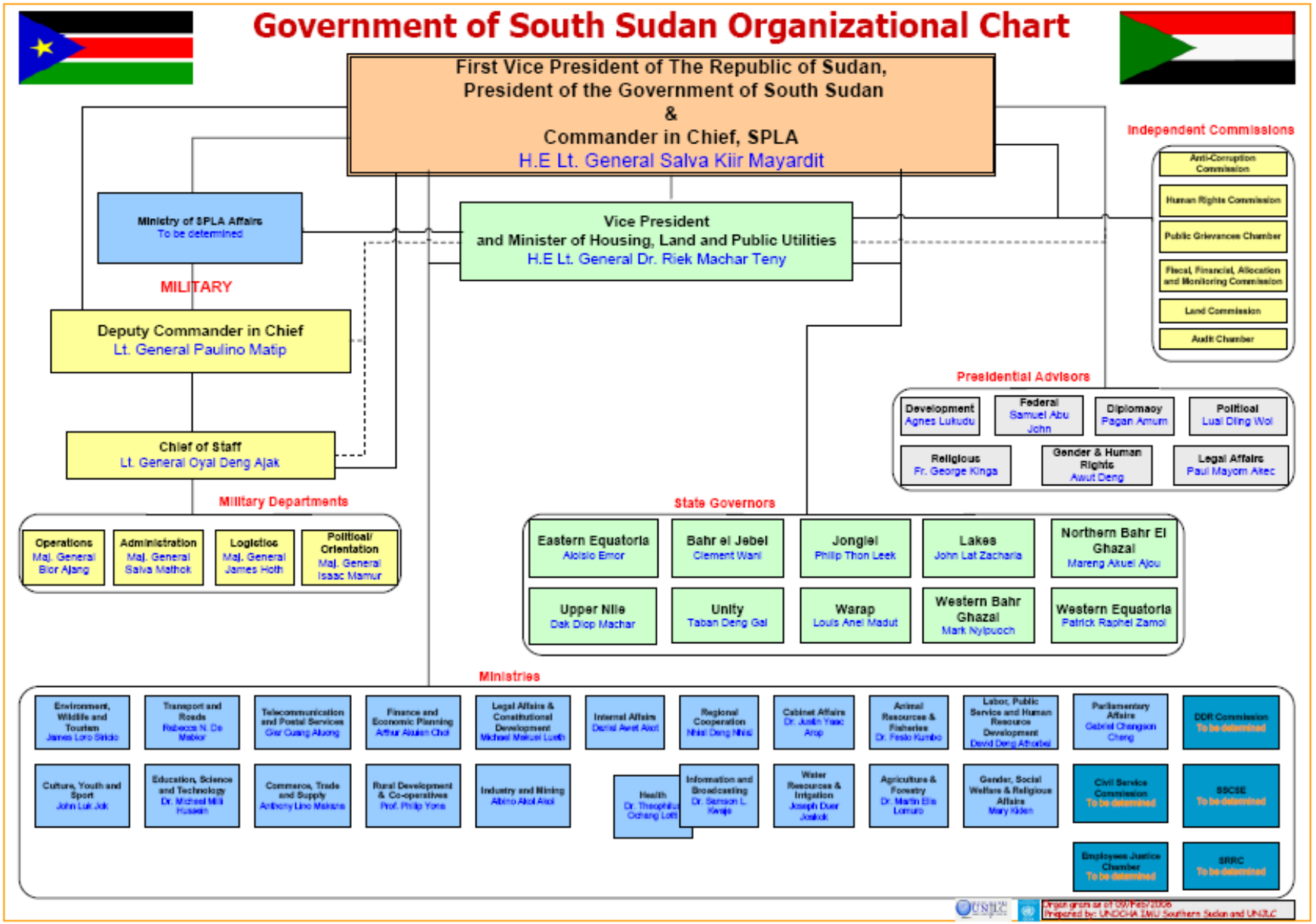
Through the State, technocrats from GOSS line Ministries/Institutions are ported to the counties to execute development projects and Government policies.

During the CPA transition phase, the autonomy of the South has been agreed and the necessary institutions to cater for “one country, two systems“ are functioning. GOSS and the 10 States have the constitutions in place.

The governing framework is in place, although in infant stage. The below figure gives an overview of the GOSS level ministerial set-up and as indicated in the figure. GOSS has established *inter alia* four Federal Ministries directly concerned with **natural resources** being, **the Ministry of Water Resources and Irrigation, the Ministry of Agriculture and Forestry, the Ministry of Animal Resources and Fisheries and the Ministry of Environment and Wildlife Conservation**.

3.1.1 Priorities and Challenges

GOSS has undergone an institutional reform process. The governance framework is now in place and priority has been shifted to the formulation of the enabling environment for efficient execution of its mandate including: filling of vacancies, capacity building of staff, policy formulation and redrafting of the legal system.


Government of South Sudan Organizational Chart
First Vice President of The Republic of Sudan,
President of the Government of South Sudan
&
Commander in Chief, SPLA
H.E Lt. General Salva Kiir Mayardit
Ministry of SPLA Affairs
To be determined
MILITARY
Deputy Commander in Chief
Lt. General Paulino Matip
Chief of Staff
Lt. General Oyal Deng Ajak
Military Departments
Operations
Maj. General
Bior Ajang
Administration
Maj. General
Salva Mathok
Logistics
Maj. General
James Hoth
Political/
Orientation
Maj. General
Issac Mamur
Vice President
and Minister of Housing, Land and Public Utilities
H.E Lt. General Dr. Riek Machar Teny
Independent Commissions
Anti-Corruption Commission
Human Rights Commission
Public Grievances Chamber
Fiscal, Financial, Allocation and Monitoring Commission
Land Commission
Audit Chamber
Presidential Advisors
Development
Agnes Lukudu
Federal
Samuel Abu John
Diplomacy
Pagan Amum
Political
Lual Diing Wol
Religious
Fr. George Kinga
Gender & Human Rights
Awut Deng
Legal Affairs
Paul Mayom Akec
State Governors
Eastern Equatoria
Aloisio Emor
Bahr el Jebel
Clement Wani
Jonglei
Philip Thon Leek
Lakes
John Lat Zacharia
Northern Bahr El Ghazal
Mareng Akuei Ajou
Upper Nile
Dak Diop Machar
Unity
Taban Deng Gai
Warap
Louis Anei Madut
Western Bahr Ghazal
Mark Nyipuoch
Western Equatoria
Patrick Raphel Zamol
Ministries
Environment, Wildlife and Tourism
James Loro Stirdo
Transport and Roads
Rebecca N. De Mabior
Telecommunication and Postal Services
Gier Cuang Aluong
Finance and Economic Planning
Arthur Akuien Chol
Legal Affairs & Constitutional Development
Michael Makuei Lueth
Internal Affairs
Daniel Awet Akot
Regional Cooperation
Nhial Deng Nhial
Cabinet Affairs
Dr. Justin Yaac Arop
Animal Resources & Fisheries
Dr. Festo Kumbo
Labor, Public Service and Human Resource Development
David Deng Athorbei
Parliamentary Affairs
Gabriel Changson Chang
DDR Commission
To be determined
Culture, Youth and Sport
John Luk Jok
Education, Science and Technology
Dr. Micheal Milli Hussein
Commerce, Trade and Supply
Anthony Lino Makana
Rural Development & Co-operatives
Prof. Philip Yona
Industry and Mining
Abino Abol Akol
Health
Dr. Theophilus Ochang Lom
Information and Broadcasting
Dr. Samson L. Kwaje
Water Resources & Irrigation
Joseph Duer Jookok
Agriculture & Forestry
Dr. Martin Elia Lomuro
Gender, Social Welfare & Religious Affairs
Mary Kiden
Civil Service Commission
To be determined
SSCSE
To be determined
Employees Justice Chamber
To be determined
SRRC
To be determined

3.2 Upper Nile State and Maiwut County

At State level, institutions of governance include the Assembly and the Cabinet (Council of Ministers, chaired by the Governor); and the Ministries include:

- Ministry of Physical Infrastructure- Peter Pal Riek
- Minister for Agriculture, Environment and Rural Development - Mr. Samuel Aban Deng
- Minister of Finance, Trade and Economic Planning – Mr. Stephen Dhieu
- Minister for Local Government and Law Enforcement – Mr. Dok Jok Dok
- Minister of Social Development – Sarah Nyanath Young
- Minister of Health – Mr. Moses Kueth Kang
- Minister for Information and Communications - Brig. Gen. Thon Mum Kejok
- Minister of Urban Planning – Mr. Veter Gal
- Minister for Education, Science and Technology – Dr. Muckuan Kak Ajang

For the FTWMP Lau Watershed Project Area, three of the Upper Nile State ministries are identified as key supporting agencies and was consulted by the Project Preparatory Team explicitly: Ministry of Physical Infrastructure; Minister for Agriculture, Environment and Rural Development; and Minister of Finance, Trade and Economic Planning.

3.2.1 Priorities and Challenges

The priority expenditure areas for the State during the 2008 fiscal year are in the following sectors/areas:

- Infrastructure Sector
- Public Administration and Law Enforcement Sector
- Education Sector
- Health Sector

These areas have the most major areas of expenditure thereby needing these high amounts of allocations from the states' resources.

3.3 Maiwut County

At County level, the Commissioner (who is politically appointed by the Upper Nile Governor) is assisted by an Executive Director (a senior Local Government Officer in the County), together with the Heads of the Departments; in addition to the nongovernmental affairs supervisor. Within the payams, there are few rural temporary offices each headed by a Payam Administrator. Down the hierarchy, at the community level, there are Bomas headed by traditional leadership.

The three primary documents which detail the role of local government in the overall governing process of South Sudan are the CPA, the Interim Constitution, and the Framework for Local Government. All three underscore the importance of local

government as an effective level of government by which to deliver services to constituents.

The Maiwut County has a mandate to be an instrumental and an effective local administration unit of the government, responsible for the implementation of all the socio-economic development programmes in the rural areas, hence it leads:

- Delivering of social services (water, health, education, etc)
- Supporting of the agricultural production (including crops husbandry, forestry, animal resources and fisheries)
- Protection of the environment and safeguarding of the wildlife
- Fostering of trade activities and land use planning

In close coordination and collaboration with the State government, the county commissioner oversees the activities being carried out by the nongovernmental actors and the private investors that may choose to work in the County. For Maiwut, the Commissioner is assisted by the SSRCC Coordinator stationed in Pagak, where all the non-governmental agencies are based.

Maiwut County has six Payams, named after their Administrative Centres of Maiwut (also, Headquarters of the County), Kigille, Pagak, Jotome, Uleng and Turuw; and River Lau traverse the county territory from northeast to southwest.

The County shall comprise of five departments, each one managed by a senior director.

County – General Institutional Set-up				
		Commissioner		
		Executive Director		
Education	**Finance**	**Agriculture**	**Health**	**Community Development**
	Financial Management	*Agriculture*	*Health*	*Engineering*
	Procurement	*Forestry*	*Welfare*	
		Fishery		
		Animal Resources		

At the moment, only a few of these or virtually none of these departments are operational in the County.

3.3.1 Priorities and Challenges

Tax revenues are extremely low. Population is dominantly young, why the need for provision of basic education is a high priority. Delivery of other basic services, such as health and drinking water are also key challenges for the County. The inaccessibility during the long wet season forces the few County staff members to relocate to Renk and Malakal which hamper the efficiency.

The County is greatly supported by international nongovernmental organizations, which currently undertake most of the delivery of basic services such as running of health centres, animal health workers, water supply and sanitation and other infrastructure interventions. The transfer of responsibility of such services to County can only start when the County counterpart departments are in place and operational.

One major constraint for sustainable development of the area is the lack of an integrated County Plan. Efforts to assist the County in this exercise are currently support by both CARE International and Save the Children. However, this support has not been properly coordinated by the two organizations.
Land surveying is on-going in the Upper Nile State but slow. Land in Maiwut has not yet been surveyed.

3.4 Project Governance Capacity and Post-conflict context

The capacity of all levels of government to carry out the charges given them under the GOSS interim constitution and their respective state constitutions is challenged in two ways: a high vacancy rate in critical positions and lack of any and/or appropriate skills. All professional and technical positions-whether located at the state or local level-are appointed by the state governments. The first positions filled have been at the state ministry level, leaving many of the local positions, below that of administrator or executive, vacant. To go from emergency relief, to recovery, to sustainable development projects is a challenge. The GOSS have not yet the resources needed to host and manage recovery and sustainable development projects at local levels at far distances.

Local authorities are lacking in the most basic infrastructure for effective administration, and a lot remains to be done for them to operate effectively and in a holistic and participatory manner. Extension services are the responsibility of the County. A major problem is the absence of permanent county staff in the payams. Staffing remains lean because of capacity issues, and the formal appointment of government officials at middle and lower levels remains far from complete. There is also of minimum living and working facilities for civil servants: simple housing, offices, (computer) equipment, transport, electricity (solar panels), water supply and sanitation.

3.5 Beneficiary organisations, civil society and traditional leadership

Successful participatory planning and joint implementation of community projects requires not only the permanent presence of extension staff or but also competent beneficiary organisations. CBOs as legal entities do not currently exist in the study area. Furthermore, farmers' union and pastoralists' union have no representation or branches in study area. On the other hand, traditional leaders are an important group in the study area because informally they still play an important role in regulating village life and allocation of customary land.

Informal committees have been formed or individuals have been selected for partaking in various NGO supported interventions.

Some training in cooperative saving and provision of safety boxes has also been provided by e.g. CARE International.

3.6 Nongovernmental Organisation and Parallel projects

A great number of international NGOs are operating in the project area however, only a few national NGOs are active in the area. See Annex 2 – Stakeholder Matrix for a complete list of NGOs and on-going activities.

One national NGO is called Nile Interdevelopment Program (NIP) and is based in Pagak in Maiwut County. Their project portfolio comprise the following activities i) Water supply and management; ii) Conflict resolution Pastoralists; iii)) Advocacy Nile Environment; iv) delivery of Health Services (NIP are the implementers of the Save the Children programme); and v) Education and children rights groups. Children rights groups deals with child labour and early marriage.

Some of their most crucial activities e.g. health delivery, they manage to operate even during the wet season.

The international NGOs and their on-going programmes are presented in the Table 3.1 below.

Table3.1: Parallel Projects (International NGOs and UN)

Organisation	***Location***	***Projects***	***Of interest for the FTWMP in Lau***
Agency for Corporation on Research and Development, ACORD	Pagak, Maiwut County	i) Animal health Capacity Building ii) Reduction of resource based conflicts (RRBC); iii) Peace committees; iv) women micro-finance and income (finalised); v) Application for animal health clinics	ii) Reduction of resource based conflicts (RRBC)
Norwegian Peoples Aid (NPA)	Pagak, Maiwut County	i)Food for Community project; ii) Provision of training in of selected people at agri.training centre in Central Equatorial state; iii) NPA demonstration garden; iv) Relief to flood victims	iii) NPA demonstration garden
Save the Children	Pagak, Maiwut County	Focus is Health. No direct implementation. Implementation only through national NGOs	
ADRA	Pagak, Maiwut County	i) Repatriation - Way station and transportation	
Care International	Pagak, Maiwut County	i) water and Sanitation 50 boreholes and x pit latrines; ii) Livelihood programme agriculture inputs + accountability training; iii) Local governance- strategic planning; iv) HIV/AIDS	All
PACT South Sudan	Pagak, Maiwut County	i) Training of Peace Committees; ii) Trade and Stabilisation Programme; iii) Urban Water Pagak 2 km; iv) Disarment of pastoralists	i) Training of Peace Committees; ii) Trade and Stabilisation Programme
WFP	Work through NGOs based in Pagak, Maiwut	Relief to flood victims and other vulnerable people	

UNCHR	Work through NGOs based in Pagak, Maiwut e.g. ADRA	Repatriation from Boma Refugee camp in Ethiopia	
UNDP	Malakal, UNS	i) Rule of Law; ii) Local Government Recovery Programme (LGRP); iii) Support to States Programme (SSP); Recovery and Rehabilitation Programme (RRP)	Capacity Building of 5 county dep. In each County (RRP)

The key challenges from NGO perspective were perceived as:

- Requirement of qualification is low (not even class 5 staff is available for training)
- Little NGO coordination
- No roads or roads in bad condition
- Airstrips not operational during long periods in wet season
- Short dry seasons

The activities of the NGOs differ from the up-coming FTWMP since they work mainly with relief and basic service delivery. In addition they work through their own organisations for project implementation in parallel to the government organisation.

4 Priority Interventions

4.1 Area Specific Project Objective

The Watershed FTP is firmly grounded within the international, regional and national sustainable development efforts and it is committed to moving as quickly and as responsibly as possible towards implementing concrete developments in the project areas that will contribute to the following, among others, regional and national development goals.

The FTWMP in Sudan has been designed to contribute to national goals and reform processes by providing local tools to lead the major management transition in the area of pro-poor and environmental governance.

With the initiation of the FTWMP in Lau watershed, the GOSS could acquire missing capacity. The FTWMP could constitute a basis for a learning process and a step towards introducing holistic development planning and participatory approaches. This is especially true for the Lau Watershed project area. The FTWMP would be the first development oriented project to be implemented as an integral part of the government structure and with conditional government and community contribution.

Based on a participatory assessment of the local root causes, core problems and potential response interventions, specific project objectives have been identified.

The specific objective of the FTWMP in Lau Watershed in South Sudan is to:

Restore community capacity to sustain and develop livelihoods in an environmentally responsible manner

4.2 Project Components

The project would consist of four principal components:

1. Capacity Building and Institutional Strengthening
2. Provision of Basic Services
3. Support to Livelihoods
4. Project Management

4.2.1 Component 1: Institutional Strengthening

Institutional development and capacity building, alongside with stakeholder participation, should be acknowledged from the outset as being critical to the project's success and sustainability.

Component 1 includes two sub-components as explained below.

4.2.1.1 Strengthening of Supporting Institutions

It is important to strengthen the role and capacity of the County and supporting institutions in the delivery of basic services with local community participation. To this end, this component will establish the enabling capacity within the Maiwut County through support technical assistance and by conducting trainings program aimed at building capacity in the areas of technical aspects, project management (e.g. transparency, accountability, financial management, procurement), and community participation and empowerment (e.g. participatory planning process and inclusion of population and marginalized segments of the population in decision-making).

As Maiwut County managerial capacity and skills and experience in participatory planning are limited, they will be supported by temporary local implementation unit (LIU) as well as suitable NGOs, private sector actors and TA, who will provide professional staff with the required managerial, technical and social facilitation expertise. NGOs would play a critical advocacy and project facilitation role. A mobile development team would be attached to the LIU.

The FTWMP should aim at more visible and more effective local administrations through making provisions for the equipping of the Maiwut Count and Payam administrations, if necessary. For instance, improved administration and staff quarters and transport at payam level could be considered.

4.2.1.2 Strengthening of Beneficiary Organisation and Community Participation

In order to capacitate communities in managing the local environmental and long term sustainable development, this component moreover aims to develop the capacity of community-based organizations to engage in environmentally sound, socially and gender equitable development initiatives.

Before progress can be made in all aspects of livelihood support, the major problem of human attitudes should be overcome. The possibility of adapting the population to agricultural and other livelihood innovations would need great efforts. Similarly, of the limitations on improved animal production, none is more significant than the reluctance of the people to part with their cattle or to be content to maintain a smaller herd of the optimum size in relation to the available grazing resources. The capacities of available resources and technologies to satisfy the demands of the retaining returning refugees and IDPs after the CPA, and of the growing population for food and other agricultural commodities remains uncertain. To increase food production in a sustainable way and enhance food security should involve:

- Promotion of greater public awareness of the role of the people's participation and people's organizations, especially local communities, small farmers, women's groups, and the youth in sustainable agriculture and rural development;
- Strengthening and developing the management and the internal capacities of the local people's organizations and extension services and to decentralize decision-making to the lowest community level;

It has been observed that the perceived needs are rather homogenous at payam level which can be explained by that payams are divided after location for tribal groupings which in turn are linked to specific eco-systems and livelihood systems. To this end, the FTWMP in Lau would support the establishment of beneficiary organizations –or so called Development and Natural Resources Management

Committees (DNRMCs) - at Payam level. These DNRMCs at Payam level would be coupled with subject matter committees at Boma level.

The set up at beneficiary level should be able to respond to the emerging needs in collaboration with local government. The reason for this set-up is the potential close linkage between Payam Administrator and Payam DNRMC.

4.2.2 Component 2: Provision of Basic Services

The provision of basic needs such as, water for household and livestock, education services, tools, agricultural extension, and road repairs are main priorities, which need to be incorporated in the post-conflict recovery and development priorities. Establishment of more reliable access to water and community and/or joint managed water points for domestic use and livestock supported by technology transfer packages would be the core of this component. Some assistance to promote school attendance could also be considered, as explained in section 4.2.2.2.

4.2.2.1Water Interventions

In the Lau watershed, water source for domestic, livestock and others such as for honeybees are extremely small size natural pools established within the natural channels and depressions within plain fields. The other water sources are water under the sandy stream channel abstracted by scooping the sands. These sources hold to little water quantity as compared to the huge demand prevailing in the watershed. Not only inadequate in terms volume but also poor quality due to contamination from human and livestock direct contact with the water body.

Pond Construction

Ponds can be planned, designed and constructed for multiple purposes: for domestic use, livestock watering, fish production, honeybee watering, irrigation (in a limited amount), etc. must be built near the use they serve and also contain adequate water.

There are two basic types of ponds: embankment and excavation. Excavated ponds are made by digging either the pond itself or the surrounding area to form levees. Ponds of this type are recommended and easily constructed, particularly in areas of flat topography like Lau watershed in Maiwut county.

Subsurface Dam

Storage of water from the rainy season to the dry season is highly important. Subsurface dams, which store water under the ground, can store sufficient quantities of water for domestic use, livestock and minor irrigation. If sited and built properly, subsurface dams can give an appropriate answer to the water-need.

For a better livestock health and access to water and dry season grazing lands simple, affordable, replicable technology of subsurface dams is a very important alternative. By building a subsurface dam in the bed of a dry river, rain and groundwater is filtered, collected and stored underground.

Since Lau is an ephemeral stream, water will not be available all year around. The water in the stream will flow away, leaving behind a dry sandbed. In order to bridge periods of dry and wet seasons, water can be retained by building a dam. However, any attempt to store water on the stream by building dam will face a serious siltation problem. To overcome such problem, the stream water can be stored in subsurface reservoir as far as suitable sites are available. The desirable storage can be obtained by building a dam, behind which water is stored in the sand accumulated on the stream bed, by enlarging the natural aquifer. The water can be harvested using intake pipes and shallow wells constructed near the banks of the stream and/or by gravity at downstream locations.

Abstracting Clean and Safe Water

Many communities in many countries are dependent on groundwater for all their water needs. However, this is not the case in the Lau watershed and surrounding area. Almost all wells drilled have very little yield to meet the high demand exerted by the people. As a result of this people had reverted to the unsafe water supplies they had traditionally used and were walking long distances to scoop shallow pits in Lau stream beds. This fact was observed even in the Maiwut centre (see Plate 5).

In such situations pumped systems utilising sand filters to connect ponds with well-shafts can be developed to abstract clean, safe water from ponds as well as from subsurface reservoirs. This is probably the most effective way of abstracting water from ponds and from the sands under the Lau stream bed.

Sanitation and Hygiene Education

The most prominent service in sanitation can be obtained by building latrines. Simple latrines and ventilated improved pit latrine are recommended for village centres, schools, clinics and other public centres. These latrines can be constructed jointly by the community and external support agencies.

Latrines are most needed by each individual household. However, it would be very difficult and extremely expensive to build such latrines with the help of the external agencies. The workable alternative would be to educate the people how they can build their own latrines with locally available materials and skills. Demonstration latrines should be used for this purpose.

Building latrines in a community is desirable, but will not be sufficient to prevent the occurrence of diarrhoea. It must be combined with hygiene education which is designed to encourage the changes in people's patterns of personal behaviour which are necessary in order to block the faecal-oral transmission route and reduce the spread of disease.

4.2.2.2 Education

There is still a very high level of illiteracy in the area. Men and women are incapacitated by this factor not to contribute to or create new ways of life. This is why, the project should collaborate with other nongovernmental and governmental agencies to promote schooling. The objective of the interventions would be twofold: i) to increase school attendance in communities and reduce drop out rate especially of girls; ii) to increase access to adult literacy. In order to achieve these objectives, interventions would include improved school attendance through household awareness & school feeding programmes and establish / support adult literacy activities in four payams.

4.2.3 Component 3: Livelihood Support

The resource base is good to sustain intensified and diversified livelihoods. The challenge for the FTWMP in Lau Watershed would be to tap these resources in a socially and environmentally acceptable manner and to organise the communities to engage in productive activities as a way to assist them to go from relief dependency to subsistence to making a surplus for the market. This surplus could then be used during times of household emergencies at times of harvest failure etc or for schooling, health care expenses etc.

To this end, an important activity of the preparation has been to identify current and potential income earning opportunities, both on farm and off farm, and current constraints on their realization and extension. Some early observations on potential improved livelihood opportunities as well as on-going activities to build on are listed below. The below listed livelihood interventions are recommended to be coupled with specific activities to increase community long term capability to partake in and manage local sustainable development and reduce community dependency on relief.

4.2.3.1 Agriculture, Animal Production and Agro-forestry

Encourage production and improve market access

The project should encourage farmers in productive areas to produce to capacity. There are numerous reports that farming households in the “greenbelt” region of southern Sudan do not routinely farm to capacity, which was also confirm during field visits. The reasons for this are both structural and security related. First, post conflict military units have been active in the area, disrupting crop yields and discouraging farming too far away from the homestead. Secondly, these farmers see no benefit in farming to capacity as they do not need the food and they have no means of getting the surplus to markets. As many of the surrounding states could benefit from surpluses in these productive areas, the project and other agencies should encourage farming to capacity while working in the longer term to improve access to markets. This is a longer term solution though successful connecting these marketplaces could have a substantial impact on food security status of households throughout southern Sudan.

Among the perceived needs of Maiwut communities are improved cattle management, and modernized agriculture. The natural resource base is also good to sustain well-planned intensified and diversified livelihoods. In addition, communities have requested establishment of more reliable access to water for domestic, livestock, and to allow shifting to more intensive agriculture using small scale agricultural ploughs, hand tools, agricultural inputs, and fishing gears etc. Agriculturally, among the best prospects in terms of soil and water conditions in the flood-plains are sugar-cane and rice growing. Agro-forestry can only be promoted in the intermediate and high lands. Productions of vegetable and tobacco can be up-scaled in the intermediate and high lands.

Improvement of traditional rain-fed farming, and introduction of irrigated farming system

Traditional farming in Maiwut County has a great potential for improvement and thereby increase its productivity if full use is made from its agricultural resources and some features of modern technology which could be transferred from similar climate

and soil environments. Technology packages could be adapted from research stations in central Sudan such as Damazeen Agricultural Research Station, Agady Research Farm, Abu Naama Research Station etc.

Introduction of sustainable irrigated agriculture involving the transfer of modern knowledge and technology will maximize the productivity of the land, ensure food security and overall sustainable development, and thereby promote resettlement, peace and tranquility. The irrigated farming system should be introduced, particularly in the high lands and along the rivers/streams banks, where adequate surface or underground water is available. Technological package for growing food crops, cash crops, and some strategic crops such as sugar-cane etc. can be provided from research stations in central Sudan working on these crops on similar soils. Following information could be extracted from such research stations:

- Identification of basic agronomic practices (land preparation, sowing dates, spacing and seed rates, fertilizers use, pests and disease control, weed control etc.) for specific crops, including field crops and horticultural crops.
- Identification of appropriate irrigation systems and irrigation scheduling i.e. identifying how much and when water is applied.
- Introduction of high yielding crop varieties (hybrid sorghum, hybrid maize) and varieties resistant to pests and diseases.

The above interventions will meet the perceived needs of Maiwut communities in modernizing agricultural practices through provision of technology transfer packages for raising crops yields. Project area should be linked with agricultural research centres of the White Nile University at Malakal and its local demonstration plots for training trainers at the communities' levels. The Agricultural College at the White Nile University may be invited to establish demonstration plots within the project area for agricultural extension purposes. Such demonstration plots can show:

- The use of modern technology in modernizing both traditional rain fed and irrigated agriculture in aspects such as application of fertilizers and pesticides, and the use of ploughs and hand tools.
- Promotion of popular participation and extension components.
- The constraints of traditional farming and the prospects of integrating some of the modern technology in traditional farming.

Improvement of fishing facilities

Fishing undoubtedly offers one of the best prospects for economic development in the area. Greater quantities of commercial fish can be produced through introduction of appropriate technologies, proper control of water levels, regular drainage of isolated lakes, and improvement of transport and marketing arrangements. The development of fish-ponds and commercial fisheries is recognized to hold out very great prospects. There are defined shortages of animal and fish protein in many parts of the Sudan, so it may be that further investigation and investment could be warranted. Salted-sun-dried fish should also be encouraged as cottage industry.

Soil moisture conservation

Rainfall distribution may vary greatly within Maiwut county. In the northern and eastern parts moisture deficiency is often experienced, while in the southern and western parts and in the relatively low areas water logging becomes a frequent problem. Therefore, appropriate soil moisture conservation in the former and ways to dispose of excess water in the latter should be worked out. The Farm Water Management (3.1), Broad Bed and Farrow System (3.1.1), and Surface Drainage (3.1.2), and Recommended Approaches to Water Harvesting and Land Drainage (3.2) reported in (the Lau Watershed Water Resources Potential, Development and Management, Draft Report), showed ICRISAT's experiences in the soil moisture conservation and management of Indian and Ethiopian Vertisols. As the soils and environmental conditions in Maiwut County are almost similar to those where ICRISAT conducted the reported experiments on soil conservation and management, these experiences can be tested under the Maiwut County Vertisols in improving crop production under rain and irrigated farming systems. As far as surface water storage is concerned, the Sudan has a long standing experience in livestock watering, fish production, and irrigating crops. All these experiences are housed in the Ministry of Irrigation and Water Resources, and should be made use of.

Dairy Processing

Livestock is kept for showing wealth, provision of milk and for sale at times of hunger. The population is agro-pastoralists and household animal herds are of small to medium size. The Nuer communities are not interested in animal husbandry for marketing. On the other hand, they are keen on engaging in improved processing of the milk.

To this end, the project could support the introduction of technology for milk churning, dairy processing into ghee and cheese and technologies to preserve milk for the transportation to the market. The activities would mainly benefit women.

Forestry Interventions

Forest cover has depleted by 25% between 2005-2008 due to overcutting for fuel wood, construction and clearing for crop cultivation.
Tree plantation is not practised, but interest is high to engage in agro-forestry and processing of products. Planting is preferred to take place at homesteads and around the village boundaries.
The preferred tree species for planting are Balanites, Neem and Mango and the preferred location for tree plantations is. These trees are bearing fruit, and are used for eating fresh and making juice.

Tapping the forestry products through community driven forestry activities supported by technology transfer packages would mainly include promotion of household agro-forestry and marketing.

4.2.3.2 Diversification of income and Community Initiative Fund

With regard to poverty alleviation, it is proposed that the project framework should be flexible enough to give support to a wide range of alternative and diversified livelihood practices and income sources as listed below

Agriculture:
- Vegetable processing
- Village small-scale edible oil extraction (sesame)
- Grinding machines and basic mills

Livestock:
- Milk processing, ghee, cheese, cutter

Fisheries:
- Fish nets making, repairs and marketing
- Fish handling and processing

Forestry:
- Forest fruits collection and processing: Tamarind, Dehydration of mango juice and mango deen
- Wood handicraft
- Honey collection, processing, packing
- Medicinal and aromatic plants
- Gum Arabic, cleaning, grading and marketing

Local Manufacturing:
- Establishing local manufacturing workshops in basic carpentry, masonry and metal works
- Small scale production of agricultural tools ploughs and hand tools
- Small scale metal manufacturing of metal scissors, metal folding, rolling machines, windows, doors etc.
- Wood manufacturing, windows, doors
- Handicraft, wood
- Transport support implements (animal drawn carts, bicycle trailers) Hand spinning and weaving of cotton
- Manufacturing of improved stoves
- Manufacturing of biogas units

Community Initiative Fund

In addition to major pro-poor development interventions, the communities will also be able to access micro-finance grants and loans for minor individual investment needs.

The rationale for such a grant disbursing fund is that economic options for the target groups are limited and hence do not constitute a viable credit market for banks. Yet communities still require capital to improve production and income. For this reason, the project is setting up a Community Initiative Fund (CIF) to provide under matching grant formula and other financing mechanisms to groups to set up small scale productive enterprises. The project will finance on a cost sharing basis (up to 95% of capital costs) a range of productive activities that are particularly targeted towards the poorer households and women.

4.2.3.3Environmental interventions

Environmentally responsible development is one of the corner stones of the project and a number of interventions will have direct positive impact on the local

environmental conditions and the future environmental management and protection of the area.

Communities will need to undertake careful and agreed local land use planning and resource allocation to avoid conflict between existing and returning peoples and between resource uses. Community development efforts can be done through the promotion of agro-forestry, household woodlots, improved energy efficient stoves, and the development of local institutions for community-based management of natural resources.

Alternative energy

The project area is a remote rural area and will probably not benefit from any rural electrification programme in the near future. Presently, the population uses a significant amount of firewood for cooking. It would therefore be appropriate to support the communities to revert from cutting down the local forest resources from which the communities could benefited from in other ways. The following alternative energy sources are proposed to be promoted by the FTWMP in Lau Watershed and supported by making available community investment funds for any individual investment cost.

Improved cooking stoves - Efficiencies of at least 20% can be achieved with most improved stoves, implying an energy saving of around 25% compared with open fires. Improved stoves can also reduce smoke in the kitchen and its negative impacts upon health by enabling the fuel to be burned more efficiently. Introduction of improved stoves would thus have multiple positive effects, the stoves use less wood putting less pressure on women workload and local forestry resources, reduce smoke and its negative impacts upon health and if locally produced by women it could be a supplementary household income.

Biogas - Considering the prevalence of animal wastes in abundance in the project area there is a great potential to promote construction household and community biogas units. Anaerobic digesters producing biogas (methane) offer a sustainable alternative fuel for cooking, and lighting that is appropriate and economic in rural areas. Promoting use of animal waste and agricultural residue for biogas production is a socially acceptable solution in the area since the communities already dry manure for cooking. Biogas technology was introduced to Sudan in mid 1970s when GTZ designed a unit as part of a project for water hyacinth control in central Sudan. In Sudan, there are currently over 200 installed biogas units, covering a wide range of scales appropriate to family, community, or industrial uses. In the neighbouring Ethiopia, biogas production at community level has also been successful. This experience is not yet available in Southern Sudan.

Solar PV systems for lights etc are proposed to be installed at staff offices and lodges at administrative level.

Alternative Construction Materials

Traditional soil construction techniques are used in 90 percent of buildings in rural areas. The advantages of soil are its very low cost, its local availability and the simplicity of construction. Its disadvantages are its low strength and durability, particularly in high rainfall areas. The more affluent Sudanese therefore rely on brick

construction instead, and the demand for fuel to fire bricks is one of the causes of the deforestation occurring in Sudan.
Compressed and stabilized earth construction techniques combine the advantages of both traditional earth and modern brick construction. The method can be summarized as follows: suitable moist soil consisting of a mixture of clay, silt and sometimes sand, is blended for uniformity before a stabilizing agent such as cement, lime, gypsum or bitumen is added.
The material is then placed in a mechanical or hand-powered press, which crushes the soil-stabilizer mix into a hard, dense brick that is dried naturally, gaining strength in the process. The bricks obtained can be used just like fired clay or concrete bricks.
Modern compressed earth technology has proven effective in many parts of the world, and several buildings, such as the Haj Yousif experimental school in Khartoum North, have already been constructed in Sudan as demonstration projects.

Introducing alternative energy sources and sustainable construction using stabilized earth blocks is believed important step towards a forest in a continued good physical shape in the area.

The recommended response interventions to the identified key environmental issues are summarised below.

Threat	**Project Response**
Sustainable natural resources use & Conflict resolution	Environmental awareness building; Formation of community development and (natural) resource management committees (CDNRMC); Improve the liaison and joint action between communities and local authority
Changes in hydrological pattern	Choice of technology; Compulsory EIA for construction. The project proposals make no provision for mechanized construction of mechanized agriculture.
Water pollution	Awareness building; introduction of improves sanitation, protection of water points
Soil degradation	Improved extension incl. provision of technology packages
Overgrazing	Introduction of information and negotiated regulation as mgt tools; Conflict resolution through working with Development and Natural Management Committees
Deforestation	Promote tree planting culture by establishment of agro-forestry. Introduction of information and negotiated regulation as mgt tools. Introduction of alternative energy sources and construction material.
Loss of Wildlife	Introduction of information and regulation as mgt tools

The above mentioned project responses are likely to result in positive impacts and give the bases for the long term health of the unique ecosystem in the Lau Watershed. Some of these positive impacts are discussed in Annex 4-Social and Environmental Interim report.

4.2.4 Component 4: Project Management

The main purpose of this component is to ensure that the FTWMP activities are implemented smoothly and with technical and financial efficiency.

The project management would mainly be located to the project level implementation unit.

In order to support the running of the FTWMP in Lau Watershed and to assist the participating Maiwut County a Local Implementation Unit (LIU) would be established in Maiwut Centre within the Maiwut County Administration.

The mandate of the LIU consists of: i) managing funds; ii) facilitating the execution of the project interventions through the provision of necessary investments, capacity building and resource development; iii) strengthening and assist stakeholders' organizations for the improved utilization of natural resources for livelihood activities; iv) facilitating the process for the development and institutionalization of improved governance framework (i.e. local guidelines, procedures and bi-laws); v) ensuring replication through mobilization of additional resources; and vi) monitoring of project activities, results and impacts and reporting on implementation, and accounting for resources to the National Project Steering Committee (PSC).

5 The Project Cycle

The project cycle may be viewed as an interactive process between the project and the community, with supporting roles being played by the private sector, NGOs, and other stakeholders (Diagram 1).

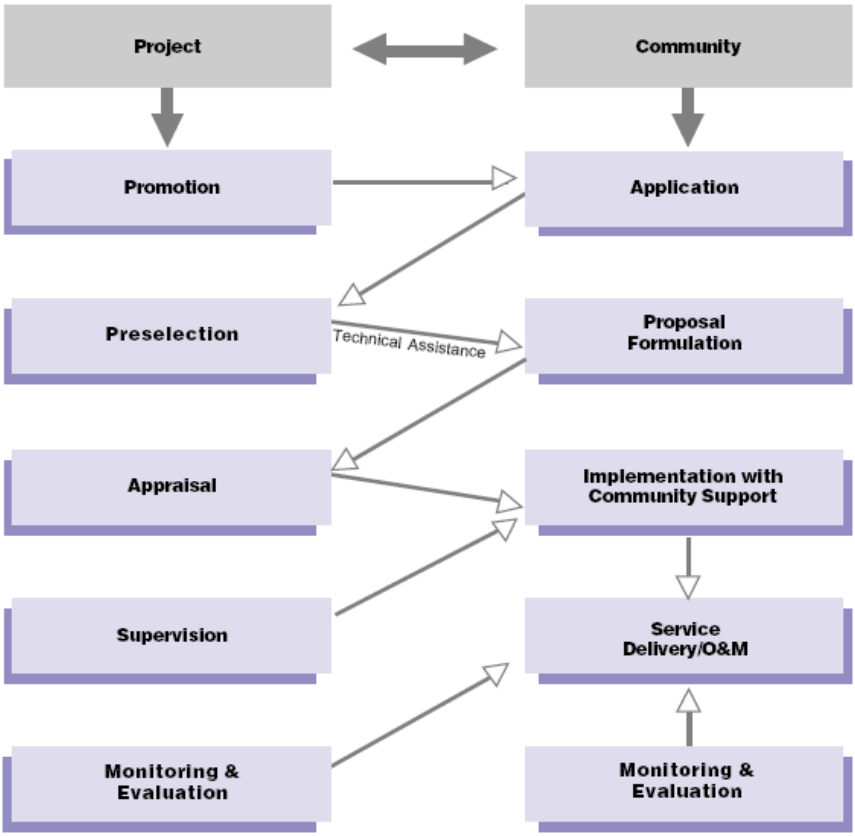


Diagram 1: Project/Community Interactive Roles During the Project Cycle

5.1 Promotion

The promotion phase is the first critical opportunity for the subproject to engage communities in (a) deciding whether or not they want a project; and (b) defining their development priorities, one of which may include WRDM. If WRDM is chosen, this is an occasion for communicating the demand-responsive approach and explaining the project rules.

Options for WRDM investments should link into the multisector projects initial information campaign, which will allow the community to evaluate and decide what type of project best meets its needs. Approaches such as integrated rural accessibility planning may be useful in assisting communities to identify their priorities. If a water project is chosen, the message should be that WRDM is a separate service that must abide by certain basic principles. These principles may be transmitted in an WRDM brochure or flier, which would spell out the basic approach,

rules, and procedures under which WRDM investments may be made. Key themes would include:

- The concept of water as an economic good that requires management and comes at a cost
- Informed choices on the technical options and implications for management and cost
- The community's responsibility for continuous management and finance of operations and maintenance
- Cost recovery rules and tariffs to ensure sustainable service delivery
- Community organization, management, and contracting arrangements
- Minimum technical standards and quality
- Asset ownership, roles, and responsibilities
- Environmental, hygiene, and sanitation aspects
- Application and proposal formulation requirements.

Projects often engage promoters familiar with community facilitation, who can be trained to discuss these issues with prospective communities, perhaps supported by radio and other media campaigns.

5.2 Application

The completion of an application form is the first expression of demand. Successful WRDM projects have found it useful to allocate within the subproject cycle a time period during which communities:

- Confirm WRDM as a development priority
- Assimilate the basic principles and requirements for WRDM investment, transmitted during the promotion phase
- Establish an appropriate organizational structure to oversee the maintenance of the systems and service provision
- Start revenue mobilization
- Apply for assistance under the project.

Communities would meet to confirm their interest in the project in general and in WRDM investments in particular. If WRDM is selected, the meeting will discuss the information received and identify the assistance required to enable the communities to acquire their own water supply and sanitation facilities. Topics of discussion would include:

- Selection of spokespersons
- Participation of all community members
- Analysis of information contained in the flier and application form
- Community interest and form of involvement in the project
- How the community will raise funds for investment and operations and maintenance
- Who could assist the community to understand and prepare to receive project assistance
- Technological options.

Based on these meetings, the interested communities would fill in application forms for:

- The whole project in general
- An application specific to WRDM.

The community may organize these meetings itself, or recruit technical and facilitation assistance to complete these initial steps. The project, through county-level technical staff, may participate in, or observe, the community-level meetings.

5.3 Pre-selection

The pre-selection process enables the project to: (a) screen communities for WRDM investments based on need, commitment, and capability; (b) get an initial assessment of investment and annual budget requirements; and (c) avoid disappointing communities by reducing the number of full-blown proposals that are prepared.

The project will organize a subcommittee responsible for reviewing applications. The applications will be ranked on standard score sheets according to pre-selection criteria. The project will pre-select a limited number of communities, based on financial and staffing capacity.

This activity shall be carried out by the project, in collaboration with technical agency and local government.

5.4 Proposal Formulation

Experience has shown that successful WRDM projects require a committed up-front investment in order to establish durable community organizational arrangements. This is because a WRDM subproject has distinct requirements, insomuch as it:

- Depends on a limited natural resource, water, which is also an economic good, and therefore requires consumers to pay for the service
- Requires consultation and coordination among community members, local governments, investors, development workers, engineers, and other stakeholders
- Lends itself to alternative technical design and levels of service with varying cost and management implications
- Requires an inter-sectoral and integrated approach, including engineering, the environment, health, and education
- Needs a maintenance system that is (a) intensive; (b) managed by the community; (c) supported by additional technical assistance; (d) able to provide spare parts; and (e) backed by a reliable system of financial and administrative management.

Technical assistance can help the community address these sector-specific requirements in their proposals, through:

- Analyzing the existing situation as regards hygiene, water and sanitation, environmental issues, and baseline information; and determining effective demand for sanitation facilities
- Choosing service-level options for water and sanitation services
- Determining the capital cost and the level and mobilization of community contributions
- Formulating a facilities management plan for operations and maintenance and method of organization

- Establishing a financial management plan and a tariff plan to finance the facilities management plan
- Preparing a hygiene and sanitation promotion campaign and linking to sanitation investments
- Identifying and addressing potential environmental and social safeguard concerns
- Identifying responsibilities and ongoing training requirements, including organization and training of the water and sanitation committee.

Pre-selected communities will have to prepare subproject proposals, according to standard guidelines and templates laid out in the operational manual.

Prior to preparation, the communities would receive technical assistance to help them make decisions and complete their proposal request. Technical assistance would be recruited and paid for by the project from among consultants or NGOs, or by hiring a qualified individual in the community. Such personnel would act as facilitators for the community and the water and sanitation committee.

5.5 Appraisal

A sector-specific appraisal format is necessary to assess effective WRDM demand and verify technical, social, and economic feasibility and sustainability

Subproject appraisal is undertaken with a standard appraisal checklist designed to verify and confirm community commitment and capacity to ensure sustainable service delivery. Once projects are selected, a community subproject agreement is signed by the community and the project. This is also signed, if appropriate, by local government and by sector-based or other implementing agencies.

The project would identify an appraisal team for WRDM applications, in conjunction with technical implementing agencies and local government authorities as appropriate.

5.6 Implementation with Community Support

Intensive community-level assistance and training is required at this stage to reinforce ownership, promote health and hygiene benefits, and establish a sound foundation for sustainable service delivery and operations and maintenance. Many lessons have been learned regarding community-based contracting of WRDM services. Two major issues stand out:

- *Adapt contracting mode to fit service-level option.* This can range from simple, witnessed agreements to formal performance-based service and supplier contracts
- *Ensure adequate skills and tools to administer contracts.* .Short and sharp. training modules can explain to water and sanitation committee members what is required in terms of expertise and skills.

All civil works should be accompanied by community development activities. The operations manual should lay out:

- The types of investments eligible under the project
- Procurement of goods, services, and works, including rules, procedures, and responsibilities for bidding, selection, and supervision

- Flow of funds during the investment period
- Construction, which involves supervision of contractors and certification of works.

Three types of arrangements may be envisioned:

- The community manages the funds by themselves
- The community hires a qualified individual or firm and is responsible for supervising them
- The project or local government does the hiring on behalf of the community.

At the same time, each subproject budget should include the provision of technical assistance for training in such vital areas as community organization, health and hygiene education, service delivery management, and operations and maintenance.

The communities should be involved at all stages of subproject implementation, construction, and community development activities. Technical assistance would be recruited to ensure the community development aspects.

5.7 Operations and Maintenance

Lack of effective operations and maintenance is the most common problem of WRDM components. To address this problem, operations and maintenance training should begin during the implementation phase, and focus on the community's capacity to ensure reliable and sustainable service delivery.

Four major elements are emerging in good practice WRDM projects:

1. *Operations and maintenance and facilities management plans.* Operations and maintenance plans should not only list maintenance tasks, but also provide a detailed task schedule focused on preventative maintenance and specifying responsibilities. The project operations manual can provide guidance or models for such schedules, relying on, for example, color-coded cards and other management techniques for regular maintenance and monitoring.

2. *Cost recovery and tariff structures.* The key to achieving sustainable service delivery is an effective system for user payments. Methods for WRDM tariff calculation have been developed that can be adapted to operations and maintenance budgets on an annual and multiyear basis, as well as covering financial needs for future system expansion or equipment replacement.

3. *Community-level training for operations and maintenance.* Methodologies have to be developed for community-level training in WRDM services based on Training Packages designed for its various components.

4. *Performance-based service contracts.* This relatively new approach aims to remunerate a contractor for providing a service at a predefined quality standard, rather than pay the contractor based on time, works, or materials. In its simplest form it could involve paying a village operator a flat monthly fee to cover scheduled routine and periodic maintenance, with incentives for improved service and penalties for a reduction in the service standard. As systems increase in complexity, the use of service contracts, leases, management contracts, or concessions may be appropriate.

Operations and maintenance responsibility starts with the management committees chosen by, and accountable to, the community. Backstopping services, however, need to be planned for, by some mix of the private sector and technical government services.

5.8 Monitoring and Evaluation

Monitoring focuses on whether a project is being implemented as designed, providing timely information for ensuring that progress, quality, and effect of processes and procedures is maintained. Process *evaluation* examines how the project operates and addresses problems in service delivery.

Effective monitoring and evaluation systems should be viewed as tools for helping stakeholders at various levels focus on achieving sustainable service delivery.

Community-level information systems will encourage ownership, transparency, and accountability in the investment phase, as well as promote a longer-term commitment to the monitoring of operations and maintenance. At the government level, as the multi-sector project is set up to launch sector-based investments rather than to provide long-term sector support, the government project unit needs to have a monitoring tool to ensure that:

- WRDM investments are carried out as planned and of acceptable quality
- Sustainability and management issues are addressed after the initial investment (through the community-based systems noted above)
- Sector-based support networks are in place and functioning.

At the project level, information is needed to assess the project's contribution to poverty reduction goals and the poverty reduction strategy paper (PRSP).

Input, output, and outcome indicators for WRDM would be developed in conjunction with the stakeholders and be linked to the project's logical framework as well as to the PRSP development goals and indicators.

The operations manual would specify approaches, procedures, and responsibilities for two broad types of interlocking activities:

1. Subproject performance monitoring

- *Community-level participatory monitoring and assessments.* As part of the software support, the subproject should assist communities to develop their own simple information systems to document and monitor progress and performance of project implementation and post-investment service provision. A wide range of tools and methods that can be adapted to project circumstances has been developed along these lines.

- *Government-level subproject performance monitoring.* In addition to the standard investment progress and completion reports, it is recommended that the subproject cycle include post-investment subproject assessment, at intervals of, for example, six months or one year following completion of the investment. To this end, post-investment evaluation tools for each subproject can also provide the basic data for aggregating, analyzing, and reporting project results in the government's regular progress reports, as well as providing basic information on the project's contribution to poverty reduction objectives.

2. Project performance and impact evaluation

This encompasses the periodic assessment of overall project performance and its causal links with poverty reduction and other project objectives. Within the context of the multi-sector project, these would aim to meet the following milestones:

- Midterm review
- Implementation completion report
- Specific reviews and focused impact studies.

Impact evaluations are the result of a process involving input, outputs, and outcomes, and are essential to understanding how effective projects have been in attaining their expected outcomes and whether these have been sustainable or not (see Diagram 2)

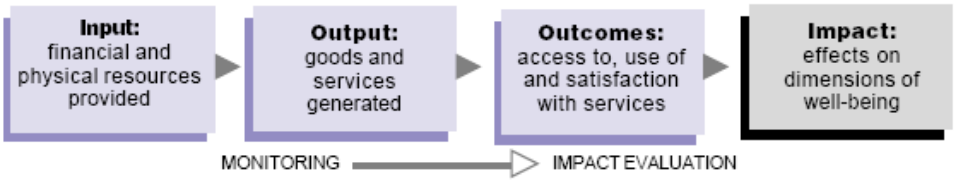


Diagram 2: From Monitoring to Impact Evaluation

As part of the community development activities, technical assistance and training would be provided to the community in the establishment of simple community-based information systems, focused on service-level performance indicators.

6 Key Issues and Implications on Project Design

6.1 Key Issues Summary

For the identification of key issues which would have major implications on the project design, the project preparatory team has focused in particular on the following aspects:

1. Overall post conflict context
2. Transition from Relief to Recovery to Development
3. Management transition to participatory and integrated planning and development
4. Community ownership and contribution
5. Improving livelihoods under current setting
6. Limiting threats to the Natural Resources

With this entry point, the following issues have been identified for special consideration in project design.

Issues

- Post Conflict recovery
- Nation building - GOSS governing framework under development and complete reform
- Population - Relief syndrome – Changing Attitudes
- Resources are there but not tapped
- Infrastructure - Access to water quantity and quality
- Inaccessibility - far distance location in relation to the large urban and market centres
- Local Institutional weakness
- Ongoing interventions - still relief oriented

Challenges

- Weak institutional capacity- staff, framework, roles and mandates
- No community structure in place - little exposure to participatory planning
- Required qualification to build on within the County is low - Language, education and exposure
- Influx of people
- Isolation in wet season
- Information gaps
- How to make use of the natural resources in a productive and sustainable manner
- Infrastructure

Opportunities

- Abundant resources to tap
- Water as an entry point –water can be harvested which can assist in conflict management, productive use of existing resources, save time and energy, changing attitudes
- Cross border trade and exchange
- On-going activities to build on
- Opportunities for providing alternatives and exposure to new technology
- Experience elsewhere in Sudan that can be transferred in small scale
- Labour is available – population dominated by youth

6.2 Implication for Participatory approach

The participatory approach is deemed to be possible during project implementation if sufficient time and support is allocated. The main challenges facing this implementation approach would be:

- Difficulties using participatory tools since the communities have had little or no previous exposure to such methodologies
- Difficulties with mobility in the area for the bio-physical survey
- Difficulties reaching the beneficiaries

In addition, there are a number of other potential problems facing sustainable watershed management in the Sub-basin. These may be summarized as follows:

- the sudden influx of very large numbers of IDP's and refugees returning to their homelands and the consequent pressures this may have on the natural resource base;

- the destruction and neglect of the physical and social infrastructure after 20 years of war and insecurity;

- the rupture and breakdown of the intricate socio-cultural networks within and among the many and various ethnic groups because of the war

Hence, the following could be concluded for the participatory approach in Lau Watershed:

- Community ownership and contribution in all stages explicitly planning, construction and operation and maintenance is one of the cornerstones of the FTWMPs. Another one is social and environmental responsibility. The reason for these principles should also be clearly communicated namely to capacitate the communities and the local authorities and prepare for the era after the presence of international NGOs.

- A participatory project cannot be target-driven right from its start. In its initial phase, the project design should focus on the process of establishing participation rather than on seeking to achieve physical targets.

- Targets of integrated approaches should not be set too ambitiously and should not exceed implementers' capacities.
- It is important to strive for a simple organizational and coordination structure, based on existing structures and clearly stipulating linkages with higher levels.

- It also requires appropriate institutional development at community-level which, in the case of Lau study area, should build on the traditional leadership which still has an important role to play with regard to land use allocation in the Lau watershed. The set up at beneficiary level should be able to respond to the emerging needs in collaboration with local government. It has been observed that the perceived needs are rather homogenous at payam level which can be explained by that payams are divided after location for tribal groupings which in turn are linked to specific eco-systems and livelihood systems. With this background it is proposed that beneficiary organizations –or so called Development and Natural Resources Management Committees (DNRMCs) - are organized at Payam level. This set-up could be coupled with subject matter

committees at community level. Another reason for this set-up is the potential close linkage between Payam Administrator and Payam DNRMC.

- This project will be implemented during the starting up of the recovery phase. Hence, support is first and foremost needed for basic services as is the case for a recovery phase. Hence, the recovery phase will be the entry point for the sustainable development. In other words, sustainable development and poverty alleviation which is the objective of this project must be based on a foundation of provision of basic services such as water supply for drinking, health and education.

- Customary systems predominate in the South and 98 percent of Southern Sudan's population lives in rural areas. Customary land access is managed by tribal leaders including chiefs, spiritual leaders and elders.

- Institutional arrangements are required that allow for multi-disciplinary and multi-agency collaboration and across ministries, contributing to breaking through single sector approaches. The FTWMP has to be prepared to deal with development issues and conflicts in a holistic manner. Hence, community mobilisation is recommended to be undertaken by a mobile development team comprising of rural development, agriculture and social facilitators working together as a team. The social facilitator will play an important role in enabling the dialogue and mediate conflicts.

- Due to County's poor managerial capacity and skills and experience in participatory planning, during the initial phase of the project implementation, time and effort must be reserved for training of government officers and extension staff in the following subjects: (i) participatory planning and participatory communication tools such as focus groups discussions and various PRA techniques for participatory problem identification, analysis and prioritisation, and development of sub-projects and action plans, and (ii) the concepts of gender mainstreaming, gender equality and gender analysis during needs assessment, planning and monitoring.

- In view of the fact that in that illiteracy is rampant and communities have not yet been exposed to bottom up development planning and gender mainstreaming, in the initial phase considerable time and effort would be invested to establish and train CBOs and sub-committees to develop basic understanding of the project philosophy and the skills necessary to fulfil their role in the FTWMP. Women need separate organisational channels to be able to voice their interests and concerns and the FTWMP would accommodate this.

- The notion of O&M (operation and maintenance) is not well understood and practised. Many water points and pumps in disrepair because they are not properly operated and maintained. Therefore, the FTWMP would from the very beginning promote O&M and train water users associations in the technical and managerial aspects of O&M of community assets constructed or rehabilitated under the FTWMP. In the case of assets that primarily benefit women, female caretakers should be supported.

- The FTWMP sub-projects would have to go beyond the narrow realm of land and water interventions and for example address women's domestic work burden, for example through drinking water supply, alternative energy sources and intermediate means of transport. This could be a motivating factor for women to

develop an interest in other activities such a tree nurseries, joint forest management, environmental training etc. where benefits are less direct.

- The project planning would be participatory and the scheme organisation and ownership would have to be clear prior to construction. Hence, the project would be phased so that the ownership and organisation of O&M is clear prior to any physical construction.

- Some stakeholders such as women's groups, women headed households, female pastoralists and youth are extremely weak in raising their voices and demanding their rights. For the FTP is will be important to ensure that they are not overlooked and included in the preparation of the projects and its benefits while at the same time take care not to cause conflicts within families. With regard to the women, the project first has to provide intervention to ease there daily work load in order for them to have the time to partake in project interventions. The family as a whole must be mobilsed and come to a consensus on how to divide work load etc. This is also important for promoting the young to partake in schooling programmes.

6.3 Implications for project management

The project must consider how to balance the need for efficient project implementation with the objective of strengthening the governing capacity by avoiding parallel implementation structures. Given the weak institutional capacity in Sudan PCU, PIUs or LIUs are needed given low civil service salaries and incentives. There are no consolidated PIUs for project implementation and a by implementing the FTWMP through a unit at County level staffed by national consultants and technical advisors (since counterparts at this level currently is lacking), the LIUs would be closely integrated within the County and not operate as a parallel unit. The integration would be ensured by having the County as a member in the Steering Committee and Local Project Management Committee. To seconded government staff is often an option, but in this case, there is virtually no staff to second which would hold the required qualification. As mentioned, at several places in this report, the most of the departments within the State Ministries have Directors but few staff.

This means that at local level there would not be a risk of creating a parallel body, even though the daily running of the unit would be outsourced to a nongovernmental organisation or company. Project activities can be outsourced to national NGOs e.g.i) advocacy; ii) mobilisation; iii) participatory M&E

The FTWMP would be the first development orient project to be implemented as an integral part of the government structure and with conditional government contribution.

Another issue to consider is how to avoid too many levels of project steering. GONU, GOSS, Upper Nile State and County, all have an important stake in the project. However, the implementation must be rationalised in order to avoid inefficency and being top-heavy. The project must also ne in line with the Interim Constitution which stresses decentralisation and devolution of powers. For the two project areas located in Edamer Locality and Bau Locality where State and Locality administration were located in the vicinity of each other. The line ministries at GOSS, Upper Nile State and Maiwut County are located far apart and to organise regular steering and project

management meetings with representation from these three levels in addition to the GONU level would be cumbersome. It was realised by the Project Preparatory Team, the there is very little interaction between the Ministries at GOSS level and County level. On the other hand, the interaction between Upper Nile State and County is regular. The Maiwut County Commissioner travels regularly to Malakal, the capital of Upper Nile State, for planning and budgetary meetings and information exchange exercises. The Maiwut County staff also has direct linkages to their respective line Ministries based in Malakal. For instance they partake in training exercises provided by the various State Ministries. It is important that the FTWMP is integrated in the Annual State Sector Plans and Budget.

The possibility of up-scaling the project and learning process would be better if the Upper Nile State is closely involved.

The project would also have to consider the referendum of 2011 and the possibility of GOSS as a sovereign state. In this case, the project must be robust enough to be managed wholly under the GOSS mandate.

Counties are the core institutions of the local government system and are overall responsible for development in their area. The FTWMP will be a part of this responsibility.

Additional assistance will be availed from backstopping from subject matter specialists at state levels as well as from educational and research institutions. Hence, the State level will contribute to implementation by providing technical support and allocating the necessary counterpart recurrent budget for the operation and maintenance of assets built under the project.

The County and project mobile development team will assume responsibility to inform, mobilise, train and facilitate communities within these project sites to engage in the participatory local land use planning as well as implementation and management of the IWM&D initiatives.

The LIU integrated in the Maiwut County will assume responsibility for implementation and supervision, disburse and manage project funds, and contract goods and services from the private sector or NGOs. The LIU will also monitor progress of achievements of set targets (progress monitoring) and of the social targets and compliance with agreed project modalities (process monitoring of the participatory approach and gender mainstreaming). Likewise, they will carry out quality assurance of the implemented priority interventions, e.g. if technical and environmental standards have been observed.

In summary the LIU will undertake the i) final selection and mobilization of communities based on the criteria defined in the Project Operation Manual; ii) assist in the establishment of CBOs or interest groups[1]; iii) assist in assessing community needs and assets; iv) assisting communities in the formulation and monitoring of their development and environmental protection plans and participatory mechanisms for

[1] An interest group could be a smaller group within a community or representing a larger group covering several communities e.g. unions.

the implementation of selected interventions; v) implementation of training and extension services to target groups within the various fields of water supply, agriculture, rangeland and forestry as well as marketing of products.

The decentralized institutional model proposed relies directly on localities as local government structures to facilitate area planning, disburse and manage funds, contract for the required goods and services from either private or NGO sources, and monitor implementation. This institutional model ensures a simple and streamlined flow of funds that allows for building the capacity of localities, which are critical to long-term local development. Throughout the entire process gender equality will be promoted and mechanisms will be devised to ensure that women and other vulnerable groups participate in decision making processes and share in the benefits of the FTWMP. Such mechanisms include the annual monitoring of CBO membership in order to monitor representation of women and vulnerable groups. Such indicators would be linked to triggering of funds e.g. no women representation, no funds or CBO not democratically elected no funds.

6.3.1 Beneficiary Organizations

In order to benefit from the project interventions representative community based organisations with sub-committees must be established and functioning. To this end the county, through the LIU, would assist the communities in forming CBOs (DNRMCS) and provide intensive capacity development in community driven land use management and development planning, needs assessment and community-based project planning, implementation, monitoring and management (including financial management).

Community land use management and development plans (CLMP) would be developed jointly between the communities and the county as part of the environmental awareness building and as a base for participatory development. The CLMP would consider the outcomes of the technical, social and environmental assessments undertaken during the detailed preparation and provided in enclosed working papers. The CLMP would include:

1. Review of livelihood practices
2. Definition of community priorities within the framework of environmental sound livelihood improvement and diversification e.i. identification of priority interventions;
3. Participatory problem diagnosis highlighting the underlying issue that the proposed activity would address and enabling conditions for the activity to lead to positive end results and any other solutions that may address the underlying problem identified;
4. Participatory development of a community land use a management and development plan including demarcation and allocation of land for the Interventions
5. Potential synergies or partners for the proposed activity; and,
6. Estimated community contribution e.g partake in all stages of planning and implementation and contribute in terms of labour, local materials or funds and participate in supervision and monitoring**.**

The representative grassroots organizations have responsibility for mobilizing communities, develop local land use management and development as well as environmental protection plans, prioritize their extension needs, organization of interest groups and collaborating community members for demonstration activities.

They should ensure that participatory and gender sensitive approaches are used and CBO members are representative from a gender and equity perspective and elected democratically. After implementation the communities will be responsible for operation and maintenance of created community assets and mobilise necessary user fees, e.g. water fees, licenses for utilisation of forest products etc.They should undertake monitoring of results and performance.

For minor community and individual needs micro-finance mechanisms will be developed and offered to the communities through the Community Initiative Fund (CIF). The CIF will be managed by the LIU.

CIF funds will be made available according to the following modalities:

- Investments will be made in cash or in kind, [ie the project will purchase the goods for the beneficiaries]
- Beneficiaries must be organized in a formal interest group recognized by the community;
- The interest group or community organization recognized has a real existence beyond receiving the investment, ie has joint activities, regular meetings, etc;
- The interest group or community organization recognized must have been operating with no significant change of membership for at least one year
- The interest group or community organization recognized has demonstrated its ability to operate profitably
- The interest group or community organization recognized is composed primarily of poor people in the community; it may include 'average' people, but not the richer members of the community.

CIF matching grants will be distributed as follows:

- The group of beneficiaries designated by the community organization or interest group will provide a minimum of 5% of the cost of the investment; in the case of purchased equipment, the group will hand over the amount and participate in the purchase; where appropriate, the group may contribute in kind through labour or materials.
- If a second investment is to be made with the same group of beneficiaries, regardless of its circumstances, a significantly higher contribution will be required;
- Project monitoring will ensure that the poorer members are benefiting proportionately, and that the investment is not captured by the elite within the community. Should this be the case, the group will be required to refund the project for the full cost of the investment.

In addition to matching grant mechanisms, other mechanisms may be tested during project implementation such as Joint Liability and Wholesale Funds systems. The proposals to the CIF will be developed by the communities who will also identify the beneficiaries who respond to the poverty criteria. Women are likely to benefit proportionately higher as the activities eligible for financing are mostly undertaken by women.

The CBOs or interest groups would constitute the link between the project and the communities and would be legal entities which have been formed following democratic and gender and equity principles.

6.4 Project Components and Financing

The project would consist of four principal components:

- Capacity Building and Institutional Strengthening
- Support to Livelihoods
- Provision of Basic Services
- Project Management

Total foreign funding for the project is expected to reach US$ 15.00 million, possibly with contributions from several donors. In addition, it is expected that users, beneficiaries and local Government would contribute up to 10% of this cost, hence yielding a total cost estimate of about US$ 16.5 million over a period of five years. In terms of expenditure accounts, a preliminary and cursory analysis shows the reveals features.

Expected Financing Arrangements

Component	Dominant Expenditure Type, and Expected Percent	Comments
Capacity Building and Institutional Strengthening	Technical Assistance and Training, 20%	Primary source of funding would be donor funds
Support to Livelihoods	Technical Assistance, Training and Goods 20%	Primary source of funding would be donor funds
Provision of Basic Services	Civil Works, Goods 50%	Some O&M and Investment Cost Sharing
Project Management	Technical Assistance, 10%	Primary source of funding would be donor funds

6.5 Economic Analysis

Development of an economic analysis framework is still underway. The analysis will rely heavily on projections of incremental production, and stability of production and reduction in poverty, as well as improvement in the environmental concerns, as would be typical in any watershed project. The bulk of the economic analysis will be descriptive, and will rely on some of the information already supplied ion this report.

Plate 1: Black cotton soils in the Lau watershed

Plate 2: Typical land covers in the Lau watershed

Plate 3: Typical consequences of stream bank erosion (along Lau stream channel)

Plate 4: Verter hedges as applied to black cotton soils (experience from other countries)

Near Kigille

Upstream of Maiwut Centre

Downstream of Maiwut Centre

Near end of defined channel

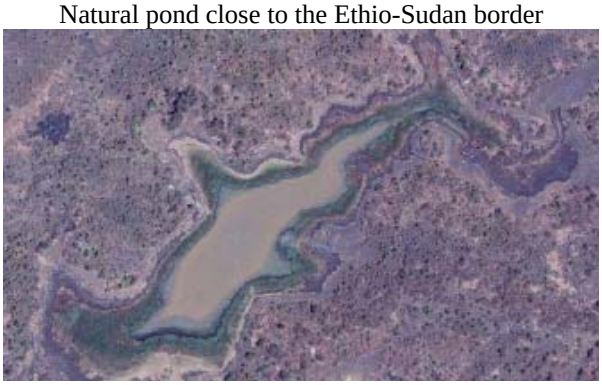
Plate 1: Channel reaches of Lau stream

Upstream from the road Maiuwut-Kigille

Upstream from the road Maiuwut-Kigille

Plate 2: Nyinyagwil stream just downstream of its branching point from Lau stream

Natural pond close to the Ethio-Sudan border



Chagne of Lau stream channel formation

Plate 3: Some of important locations for water resource development

Clay/ ant hill

Black cotton/ clay soil

Plate 4: Dominant soil types

Fetching water from sandy stream bed

Washing closes near the dry stream bed

Water from deep drilled well

Improper handling of a water point

Plate 5: Water for domestic use

Plate 6: Water for agriculture

Plate 7: Water for livestock

Plate 8: Water for fish production

Plate 9: Water for honeybees and ants

Plate 10: Typical potential pond sites

Plate 11: Typical well protected modern ponds (example from other countries)

Plate 12: Typical potential subsurface dam and reservoir sites

Plate 13: Subsurface dam under construction (example from Kenya)

Treadle pumps
(example from other countries)

Hand pump

Plate 14: Human-powered pumps

Clay for impermeable layer

Sand for filter and concrete

Gravel for concrete

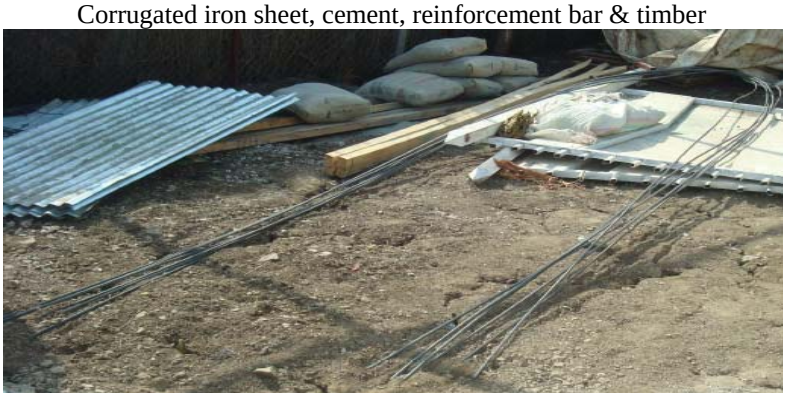
Stone/ bolder for building

Wood for wall

Grass for fence and roof

Plate 15: Local construction materials

Corrugated iron sheet, cement, reinforcement bar & timber



Plastic water tank

Plate 16 : Factory made construction materials

Parts of hand pumps

Pipes and pump rods

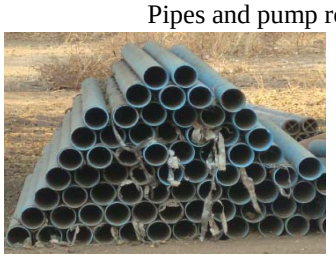


Plate 17: Pumps and pipes

Plate 18: Coordination and service centres

Plate 19: Energy sources

SWECO

Eastern Nile Technical Regional Office

WATERSHED MANAGEMENT FAST TRACK IN SUDAN
DETAIL PROJECT PREPARATION STUDY

Lau Watershed, Maiwut County, Southern Sudan

Water Resources Potential, Development and Management

Draft Interim Report
Stockholm 23 April 2008
SWECO International AB
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SWECO

Abbreviations

BBF	Broad Bed and Furrow
GOSS	Government of Southern Sudan
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
NGO	Non Governmental Organization
PRA	Participatory Rural Appraisal
SSD	Subsurface dam
VOLM	Village Level Operation and Maintenance
WRDM	Water Resources Development and Management

Contents

1. Existing Situation

1.1 Physical Characterstics of Lau Watershed

1.1.1 Physiography

The Lau watershed lies in the Upper Nile State between latitudes of 8° 30` and 9° 02` N, and longitudes of 33° 40'and 34° 08` E. The watershed has an estimated area of 700 km^2. The altitude ranges from 415 to 1904 m amsl and about 90 percent of the watershed area falls below 500 m asl.

The Law catchment is characterized by rugged densely vegetated mountainous highland terrain at its head and plain lowland at the downstream part. The total Lau watershed (catchment) lies in the southeast of Sudan and southwest of Ethiopia between latitudes of 8° 30` and 9° 02` N, and longitudes of 33° 40'and 34° 20` E. The watershed has a total area of about 1,300 km^2. The Lau watershed consists gently sloping lowland plain in the western direction. The altitude ranges from 415 to 2090 meters above mean sea level (m amsl). About 60 percent of the catchment area falls below 500 m amsl.

1.1.2 Climate

The annual rainfall varies from about 800 mm to over 1700 mm. Rainfall is heavy and concentrated to one rain period, form May to October. The lower part of Lau watershed becomes either mud or water.

The climatic statistics displayed here for Malakal represent the mean value of each meteorological parameter for each month of the year. The sampling period for this data covers 30 years from 1961 to 1990.

The mean annual temperatures in the basin range from about 18 °C on the highlands to about 29 °C on the lowland plains. The mean maximum temperature ranges from 25 to 40 °C while the mean minimum temperature varies from 10 to 20 °C. In the extreme low lands, the temperature regularly rises to over 40 °C during the dry season (in the range from November to April).

1.1.3 Soils

Dominant soil types in the Lau watershed are shown by Plate 4. The soil of Lau watershed can be approximately classified into three (see Figure 2) as follows .

(a) Aluviums, wadi fills, delt, swamp deposits (covering the bottom of the watershed).

(b) From unconsolidated clays, silts, sands and garvels (up to) unconsolidated sands with some gravel, clays and shales (covering the middle part of the watershed).

(c) From sandstones and conglomerates, with some limestone and cherts (up to) unconsolidated basement complex with outcrops (covering the upper part of the watershed).

1.1.4 Hydrogeology

The hydrogeology of Lau watershed can be classified into three as that of the soil classification (see Figure 2).

(a) This area consists of continuous or subcontinuous aquifers of local to subregional extent, unconsolidated, saturated thickness generally small, permeability variable, water quality generally good, importance generally great and potential variable. Wadi fill and swamp deposits are dominant.

(b) The area generall cosists of continuous or subcontinuous aquifers of local to subregional extent, unconsolidated, saturated thickness generally small, permeability variable, water quality generally good, importance is generally low and potential variable.

(c) This area consists of rocks that are generally non water bearing. Water occurs in fractured or weathered zones. Local perched perennial or ephermeral aquifers may occur as well as thin saturated layers at depth. The hydrogeological importance is very low and the potential is very low.

1.1.5 Farming System

Agro pastoralism is the leading preoccupation of the people that are almost wholly dependent on crop production, livestock and honey production specially at the upper end of the watershed. (Representative pictures are presented as Plates 6, 7, 8 and 9).

Many people in the Lau watershed move towards Mechar swamp area in search of water and forage for their livestock during dry season. Similarly, they move towards the middle and upper part of the watershed during wet season in order to avoid the problem of grazing land as the Mechar area gets fully covered by water and movement in the nearby locality restricted by saturated muddy heavy black cotton soil.

1.1.6 Roads

There are no proper networks of roads. Major link roads in the area comprise some stretches of unsurfaced roads that are serviceable only in the dry season since the most parts of the watershed is covered with black cotton soil with gets extremely muddy when it is saturated. Lack of access roads is a serious problem as the main constraint to the development of the area is its far distance location in relation to the large urban and market centres.

1.2 Water Resource

The main water source in the Lau watershed is the Lau stream. The Lau stream channel has a total length of about 70 kms and has elevation of elevation of 476 m amsl at the Ethio-Sudan border and 415 m amsl at the marshy area (junction with Mechar swamp). The end part of the Law stream is prone to inundation and waterlogging during the wet season.

From the Ethio-Sudan border up to some 30 km downstream (up to Kigille village), Lau stream flow follows through a well defined channel and has a general slope of 1.5 m in 1 km (0.15 percent) . Then after branches into many channels with a general slopes of 0.38 m in 1 km (0.038 percent). These branched channels include Nyinyagwill, Lau and others. Any slight change on the channel system (especially downstream of Kigille) would result in unpredictable flow proportions through the existing or the newly formed channels. Any intervention with regard to utilization of Lau stream should make sure that the flow direction behaviour is not significantly altered as the consequence can not be predicted without very through investigation. Typical channel reaches of the Lau stream system are shown by Plates 1 and 2.

Since the people within Law watershed are dominantly agro-pastoralist they are some what more or less permanent settlers within the middle and upper part of the watershed. They also use crop residue as a supplementary feed to both cattle and small ruminants in addition to the natural grass, shrubs and fodder tree leaves.

During dry seasons, while many people move long distances with their livestock in search of forage and water, the remaining people within the villages have serious problems of getting adequate water (both in terms of quantity and quality) for domestic use as well as for their livestock that have not moved to other alternative areas.

Potable water supply coverage is extremely very low. Almost all of the villages depend on traditional sources. These traditional water sources are unprotected extremely small size pools and scooping sandy stream beds.

Table 1: Estimated Monthly Temperatures of Lau Watershed on the basis of observed data at Malakal Station (in ^{o}C)

Month	Malakal			Lau watershed		
	Min	**Max**	**Mean**	**Min**	**Max**	**Mean**
January	18.5	34.9	26.7	18.3	34.4	26.4
February	20.1	36.8	28.5	19.8	36.3	28.1
March	23.0	38.7	30.9	22.7	38.2	30.4
April	24.2	38.8	31.5	23.9	38.3	31.1
May	23.7	35.9	29.8	23.4	35.4	29.4
June	22.4	33.1	27.8	22.1	32.7	27.4
July	21.8	31.1	26.5	21.5	30.7	26.1
August	21.7	30.9	26.3	21.4	30.5	26.0
September	21.9	31.9	26.9	21.6	31.5	26.6
October	21.9	33.6	27.8	21.6	33.2	27.4
November	19.9	35.1	27.5	19.6	34.6	27.1
December	18.6	35.0	26.8	18.4	34.5	26.5
Annual	***21.5***	***34.7***	***28.1***	***21.2***	***34.2***	***27.7***

Table 2: Estimated Relative Humidity (RH), Sunshine Hours (SH), and Wind Speed (WS) of Lau Watershed on the basis of observed data at Malakal Station

Month	Malakal			Law watershed		
	RH (%)	**SH (hrs/d)**	**WS (m/sec)**	**RH (%)**	**SH (hrs/d)**	**WS (m/sec)**
January	30.0	9.52	4.44	30.0	9.52	4.44
February	25.0	9.39	3.89	25.0	9.39	3.89
March	29.0	8.39	3.06	29.0	8.39	3.06
April	40.0	8.70	2.78	40.0	8.70	2.78
May	59.0	7.39	2.78	59.0	7.39	2.78
June	70.0	5.60	2.78	70.0	5.60	2.78
July	78.0	4.90	2.22	78.0	4.90	2.22
August	80.0	5.52	1.67	80.0	5.52	1.67
September	78.0	5.90	1.67	78.0	5.90	1.67
October	72.0	7.19	1.67	72.0	7.19	1.67
November	49.0	9.40	2.22	49.0	9.40	2.22
December	35.0	9.61	3.89	35.0	9.61	3.89
Annual	***53.8***	***7.63***	***2.75***	***53.8***	***7.63***	***2.75***

Note*: It is assumed that RH. SH and WS values of Malakal and Lau Watershed are equal.*

Table 3: Monthly Rainfall of the Nearest Stations to Lau Watershed

Station	**Malakal** (Sudan)	**Gambella** (Ethiopia)	**Dembi Dollo** (Ethiopia)	**Begi** (Ethiopia)
Location				
North (deg, min)	09° 33’	08° 15’	08° 32’	09° 16’
East (deg, min)	31° 33’	34° 35’	34° 48’	34° 31’
Altitude (m amsl)	390	526	1705	1672
Month				
January	0.0	2.2	6.2	5.2
February	0.2	4.5	10.1	8.6
March	6.9	29.0	36.4	37.3
April	19.9	57.9	88.3	82.7
May	86.1	151.5	163.1	169.3
June	103.4	154.8	186.0	193.0
July	146.8	193.8	195.5	211.0
August	163.4	198.3	203.6	223.0
September	124.4	170.4	176.1	193.0
October	75.6	103.6	112.5	119.4
November	4.9	33.4	35.5	36.8
December	0.0	13.4	15.8	14.8
Annual	***732***	***1113***	***1229***	***1294***

Table 4: Estimated Mean Monthly Rainfall of Lau Watershed (in mm)

		Min	***Max***	***Lower Watershed***	***Upper Watershed***	***Total***
Avg elev (m amsl)		415	2090	450	1100	700
Area (sq. km)		*	*	700	600	1300
Month	***Ratio***					
January	0.002	1.5	2.9	1.5	2.0	1.8
February	0.003	2.2	4.3	2.3	3.1	2.6
March	0.019	14.1	27.1	14.4	19.4	16.7
April	0.042	31.1	60.0	31.7	42.9	36.9
May	0.124	91.9	177.1	93.7	126.7	108.9
June	0.144	106.7	205.6	108.8	147.2	126.5
July	0.184	136.4	262.7	139.0	188.0	161.6
August	0.201	149.0	287.0	151.9	205.4	176.6
September	0.163	120.8	232.7	123.1	166.6	143.2
October	0.099	73.4	141.4	74.8	101.2	87.0
November	0.018	13.3	25.7	13.6	18.4	15.8
December	0.005	3.7	7.1	3.8	5.1	4.4
Annual (mm)	***1.00***	***744***	***1434***	***759***	***1026***	***882***

Table 5: Estimated Mean Monthly Flow (Input to the Lau Watershed)

	Rianfall in the Upper Watershed	***Estimated Runoff Coeff.***	***Estimated U.Watershed Runoff***	***Total U.Watershed Runoff***
	(mm)	*(%)*	*(mm)*	*(Million m^3)*
January	2.0	0	0.0	0.00
February	3.1	0	0.0	0.00
March	19.4	0	0.0	0.00
April	42.9	0	0.0	0.00
May	126.7	10	12.7	7.60
June	147.2	20	29.4	17.66
July	188.0	30	56.4	33.84
August	205.4	40	82.2	49.30
September	166.6	35	58.3	34.99
October	101.2	15	15.2	9.11
November	18.4	0	0.0	0.00
December	5.1	0	0.0	0.00
Annual	***1026***	***0.25***	***254.2***	***152.5***

Table 6: Drilled boreholes funded by OFDA R1 and drilled by Gardos (local partner)

Location				***Depth***	***Pump***	***Const***	***Condition***
Site	***Payam***	***Deg N***	***Deg E***	***(m)***	***Type***	***Year***	
Bambil	Pagak	8.652	33.850	50	IM II	2005	
Bongmar	Pagak	8.642	33.823	52	IM II	2005	dry
County HQ	Maiwut	-	-	56	IM II	2006	dry
Maiwut clinic	Maiwut	-	-	62	IM II	2006	dry
PHCU	Maiwut	4.473	34.025	37	IM II	2006	dry
Turu clinic	Turu	-	-	44	IM II	2006	
Kurmuc clinic	Turu	8.472	34.020	32	IM II	2006	
Loc Udier	Turu	8.473	34.028	32	IM II	2006	
Loc Kur	Turu	8.485	34.029	32	IM II	2006	
Gardos compound	Turu	8.473	34.025	31.6	IM II	2006	

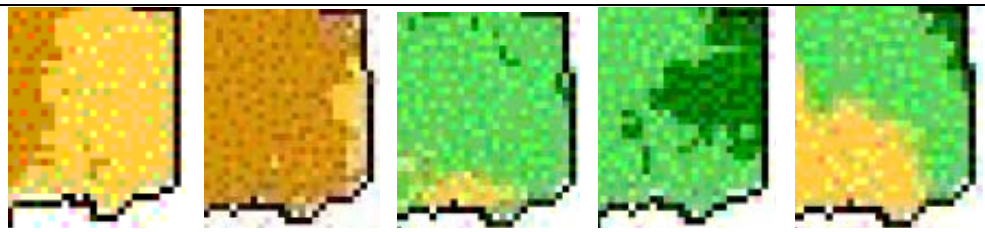


Fig 1: Displays charts representing the evolution of the rainfall of Lau watershed and surroundings in 2003

Administrative boundary

Soil and hydrogeological

(a) ***(b)*** ***(c)***

Fig 2: Soil and Hydrogeological Map of Lau Watershed and Surroundings

2. Water Sources and Uses

In the Lau watershed, water source for domestic, livestock and others such as for honeybees are extremely small size natural pools established within the natural channels and depressions within plain fields. The other water sources are water under the sandy stream channel abstracted by scooping the sands. These sources hold to little water quantity as compared to the huge demand prevailing in the watershed. Not only inadequate in terms volume but also poor quality due to contamination from human and livestock direct contact with the water body.

2.1 Water for Domestic Use

Obviously the water quantity for domestic use is not sufficient and significant measures have to be taken to solve the quantity inadequacy problem. However, physical improvements to quantity will not solve all major problems related to domestic water supplies. The most significant improvements result from behavioural changes that prevent pathogens reaching the immediate human environment, such as sanitary disposal of faeces, hand-washing after defecation and before touching food, and keeping drinking water free from faecal contamination.

If pathogens from human or livestock faeces enter a person's mouth and are swallowed, they will cause diarrhoea. If proper treatment is not given, this can prove fatal, particularly to children. The pathogens can enter the mouth in a number of ways; these include water that is contaminated by faeces directly of being transported by hands or fingers who get in direct contact with the water. The likelihood of diarrhoea can be greatly reduced by blocking the various faecal-oral transmission routes including avoidance of direct contact with water sources.

2.2 Water for Livestock

Water is the most important nutrient for livestock. Water accounts for 50 to 80% of an animal's weight and is involved in every physiological process. Cattle cannot adapt to water restriction; therefore, feed intake will be greatly decreased. If cattle are not eating, they are not growing or producing at a desirable level.

As with feed ingredients, livestock water should meet the nutritional needs of the animal. An adequate and safe water supply is essential to the production of healthy livestock. Water that adversely affects the growth, reproduction, or productivity of livestock and poultry cannot be considered suitable.

Animals themselves can have a major impact on the quality of water in a catchment, principally through faecal contamination. Contamination of the water is inevitable where animals can wander freely into the water source such as streams or ponds. Water

sources to which livestock have ready access are always potential candidates for contamination. Water can serve as a reservoir for many different disease organisms and toxins. Stagnant water contaminated with manure or other nutrients may develop blue-green algae, which can poison livestock, causing muscle tremors, liver damage, and death. Farm pond water needs to be observed for the presence of algae and other harmful organisms during hot, dry weather.

There are some bacterial contaminants that often use water and mud, respectively, as modes of transportation from animal to animal. Maximum effort should be exerted in preventing livestock from drinking water sources that are contaminated with urine.

Though water is the most important nutrient for cattle, providing clean water for livestock is often overlooked. Poor water quality can lead not only to poor performance that goes unnoticed, but can be deadly as well. Special attention should be given to water quality during the hot and dry months when most problems occur.

Water quality is an important consideration in water source (especially pond) management. Ponds are an important source of water for livestock. Livestock will also be healthier if they are not drinking polluted water. Livestock wading in the pond pollute the water with manure, disturb aquatic vegetation, and break down the banks, sometimes leading to failure of the dike or embankment supporting the pond.

Water quality can be better and the pond ecosystem can be healthier if livestock are fenced out of the pond and water from ponds is pumped to a nearby stock tank. Fencing domestic livestock out of the pond will improve water quality and maintain the integrity of dikes around the pond. A number of alternatives for watering livestock are available. Livestock can be watered using a well and stock tank located away from the pond. Alternatively, livestock can drink the pond water, pumped to a stock tank adjacent to the pond.

2.3 Water for Fish Production

People in the Lau watershed have a tradition of fishing despite the difficult situation prevailing for fish production (see Plate 8). Though the Lau stream gets dry during dry seasons, there are some ponds that survive for many days within the dry season. These ponds are situated at few locations along the stream channel are normally very shallow. Fish ponds need to be sufficiently large in area and also deep. Depth is not as important as surface area; 2 to 4 m of water is adequate for proper fish production. The pond should be conveniently located for regular easy access for feeding fish and harvesting the catch.

Ponds constructed for fish production, must be designed and constructed for easy access, adequate volume and, and water level manipulation. The water supply must be sufficient to rapidly fill the pond and maintain a relatively constant water level-one that does not fluctuate greatly throughout the year. Ponds with large overflows of water flush essential nutrients and allow fish to escape. When streams are used as a water

supply, a wise precaution is to build the pond adjacent to the stream (not dam the stream) and have an inlet pipe which can be screened or closed as needed. This provides control over siltation and nuisance fish migration. Pond inlets should be constructed so that inflows can be controlled and filtered. The filter prevents unwanted fish species from entering the pond, and a good outlet design prevents fish loss.

2.4 Water for Honeybees

In Lau watershed, a large amount of bees were seen at many water source points. However, as that of human and livestock, the water sources do not provide accessible and desirable quality of water for the bees.

A clean supply of water is absolutely essential for the operation of a honeybee colony. Bees use water for cooling the hive by evaporation, and for thinning honey to be fed to larva. Bees collecting water is almost as common a sight as bees on flowers. A strong colony of bees will use over a litre of water on a warm day. This occupies 800 workers each making up to 50 trips to the water hole a day.

Honey bees need water and will fly great distances to find it if there is none near the hive. They use the water to dilute the stored honey and feed it to the larvae in the hive. If a source of water is available within 100 meters of the hive, the bees will spend less time seeking water, leaving more time available for pollination.

It is important to have the water supply in place before the hives are introduced to the area, otherwise the bees will become accustomed to watering where they are not wanted and it will be difficult to change their habits.

Bees are experts at locating water. However, beekeepers need to provide water for their bees. A colony is more efficient if workers don't have to travel far for water. The basic requirement for a bee water source is that the bees have a good footing so that they don't fall in and drown, and that the water stays fresh.

Containers of water should have floating material (such as floating sticks) in the water to provide a landing platform and so reduce the risk of the bees drowning (see Plate 9). An alternative is to provide trays of damp sand and fine gravel to provide a beach effect for the bees. The water level may be topped up by having water slowly drip from a container situated somewhat above the tray. Bees sometimes prefer water that is slightly salty.

Certain plants are particularly suitable and favored as a platform for water foraging bees. These plants float on the surface with their roots hanging down in water, so they adjust to any water level in the container. They provide a good secure foothold for the bees while they take up their load of water.

2.5 Estimation of Water Demand

When the need for an improved water supply has been expressed by a community, a preliminary survey should be conducted. Information regarding the existing water supply must be collected to establish the extent of water shortages, and to ensure that the community is sufficiently interested to participate fully in water supply scheme construction (subsurface dam, pond, well, etc.). The potential use of the stored water must be clearly established before selecting the scheme component sites (such as pond site and subsurface dam site). The amount of available labour and the water requirements of the community must also be known in order to determine a suitable pond size. Information required from the community are the following.

- Whether there is sufficient water for domestic purposes and/or for watering livestock in the area.
- The frequency, degree and duration of water shortages.
- The main problem in obtaining water (distance to source, water quality or other factors).
- Whether the community is willing to make land available for a pond (and a protected enclosure immediately upstream of the pond) and to participate fully in pond construction.
- The number of households, the average number of people per household, and the number and type of animals per household within the community. This will give the number of potential users of the pond(s) and hence the required capacity.
- The amount of labour - both human and anima - that will be available to participate in pond construction. This will be used to determine the number of oxen-pairs working each day and hence the size of the pond that can be excavated in a given time.
- The purposes for which the stored water will be used – for domestic purposes or for livestock watering, or both. Where the water is to be used for household purposes and/or livestock watering the pond should be located as near as possible to the majority of households and grazing areas.

The required capacity of ponds and subsurface reservoirs to be constructed depends on the water requirements of potential users (maximum demand and fluctuations in demand during the year), and the expected water losses by evaporation and seepage. The amount of loss by evaporation is directly related to the local climate while seepage losses are related to soil type and, to a lesser extent, to pond design. The pond size required depends on the anticipated use of the stored water – for instance for both domestic purposes and livestock watering. Required pond capacity is also influenced by

the period of time for which the water is to be made available. Finally, the number of ponds to be made in an area will determine the required capacity of each pond.

A good estimate of required pond dimensions and capacities must be made to ensure that the amount of water needed by the community is conserved with the minimum expenditure of human and animal labour. Estimation of the water requirement of a community can be based directly on the number of people and their livestock. The number of people in an area is generally fairly stable and will increase only slowly over time, whereas the number of animals may fluctuate more sharply. Environmental factors, such as the occurrence of drought, may have a significant effect on both human and livestock numbers. However, such changes are unpredictable.

Human water consumption varies considerably according to the availability of water and the standard of living of the people. Depending on the climate and work load, between 3 and 10 litres of water per day are essential to meet a person's basic drinking and food preparation requirements. The amount of water used for other purposes varies widely, but much larger quantities are needed for personal hygiene, cleaning of cooking utensils and laundry. A good water supply, combined with proper sanitation, helps to reduce the incidence of diseases.

The calculation of future human demand should take into account population growth and the increased per capita use which will result from improved supplies. A reasonable assumption of consumption for planning and design purpose for the human population of Lau watershed would be 25 to 30 litres per capita per day. Similarly a reasonable assumption for livestock water requirement is 20 to 30 litres per tropical livestock unit (TLU) per day. Further details of human and livestock water requirements are given in Table 7. Per capita daily water use data can be used to make a rough estimate of a community's water demand.

Table 7: Typical water demand for various types of consumer

Consumer	*Water requirement (l/c/d)*
Human use	
Source > 1.0 km distant	5 – 10
Source 0.5 – 1.0 km distant	10 – 15
Source < 0.25 km distant	15 – 30
Livestock use	
Cattle	25 – 35
Sheep and goats	5 – 15

3. Within Farm Water Management

3.1 Farm Water Management

The main problem in Lau watershed is shortage of water during dry seasons requiring storage facilities and too much water during wet season particularly on clay soils that requires drainage facilities to avid excess water.

There is no generalized and simple way of proposing methods of water conservation for Lau watershed area. A workable suggestion is to base the specific techniques by comparing rainfall with crop requirements:

- When rainfall is less than crop requirements; here the strategy includes land treatment to increase run-off onto cropped areas, fallowing for water conservation, and the use of drought-tolerant crops with suitable management practices.

- When rainfall is equal to crop requirements; here the strategy is local conservation of rainfall, maximizing storage within the soil profile, and storage of excess run-off for subsequent use.

- When rainfall is in excess of crop requirements; in this case the strategies are to drain surplus run-off and store it for subsequent use.

Two techniques, the Broad Bed and Furrow System (BBF) and Surface Drainage, could be applied at many localities within the Lau watershed.

3.1.1 Broad Bed and Furrow System

Broad Bed and Furrow system involves some re-shaping of the soil surface, and so require substantial inputs of energy. In many cases it is not practical to use only hand labour, and animal-drawn implements are necessary.

The Broad Bed and Furrow system has been mainly developed at the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) in India. It is a modern version of the very old concept of encouraging controlled surface drainage by forming the soil surface into beds.

The recommended ICRISAT system consists of broad beds about 100 cm wide separated by sunken furrows about 50 cm wide. The preferred slope along the furrow is between 0.4 and 0.8 percent on vertisols. Two, three, or four rows of crop can be grown on the broad bed, and the bed width and crop geometry can be varied to suit the cultivation and planting equipment. Some examples are shown in Figure 3.

In India the system has been used mainly on deep vertisols (heavy black clay soils sometimes called cotton soils); wide beds are used on a gentle grade and they are formed by ox-drawn wheeled tool carriers. There are extensions of this work on similar soils in Ethiopia with an interesting development of a very simple ridging implement.

All these schemes have, in varying proportions, the following objectives:

i. *To encourage moisture storage in the soil profile*. Deep vertisols may have soil moisture storage up to 250 mm, which is sufficient to support plants through mid-season or late-season spells of drought. The possibility is also increased of double cropping by means of inter-cropping or sequential cropping. The large water storage capacity of the soil supports growth more easily during the subsequent dry but cooler post-rainy season.

ii. *To provide a better drained and more easily cultivated soil in the beds.* There is only a narrow range of moisture conditions during which the soil can be efficiently tilled or planted, and timeliness is a key factor. Only about 20 percent of the deep vertisols in India are cropped during the rains, mainly because of poor workability when wet. The situation is similar in Ethiopia. If a crop can be established during the early rains, the profile is usually near saturation only for short periods during the latter half of the season, water is more efficiently utilized, and there is less need for run-off collection and storage. The possibility is also increased of double cropping by means of inter-cropping or sequential cropping. Tillage of the raised beds may be possible before the rains, introducing the possibility of dry seeding ahead of the rains in areas where the start of the rainy season is fairly reliable, and there is a good chance of follow-up rains to ensure the establishment of the germinating crop. The difficulty of preparing a seed bed during the dry season in these hard clay soils has been greatly improved by the use of broad beds and animal-drawn equipment.

iv. *The possibility of the re-use of run-off stored in small tanks.* Small amounts of life-saving irrigation applications can be very effective in dry spells during the rains, particularly on soils with lower storage capacity than the deep vertisols.

The BBF system is particularly suitable for the vertisols. The technique works best on deep black soils in areas with dependable rainfall averaging 75 cm or more. It has not been as productive in areas of less dependable rainfall, or on shallower black soils - although in the latter cases more productivity is achieved than with traditional farming methods. Other methods, with more emphasis on storage and irrigation within a package which includes BBF, are more likely to be viable for shallower black soils. It is also stressed throughout the ICRISAT research that the BBF system should not be considered in isolation, but only as part of an improved farming systems package.

An important component of the system is an ox-drawn wheeled tool bar, which can be used with ridgers to form the raised bed and also later for carrying precision seeders or planters. The tool carrier is thus used for the initial forming of the beds, the subsequent annual reshaping, and for all tillage, planting, and inter-row cultivation. Even the cost of

the simplest factory made tool bar is beyond the resources of most peasant farmers, but the really cheap wooden ridger.

3.1.2 Surface Drainage

A soil where some form of water control can be important is the vertisols, heavy clay soils, usually dark, also called cracking black clay soils, cotton soils, and self-mulching clays. They are also known colloquially as 'one-day soils' because they are difficult to cultivate when dry and hard, and also unworkable when saturated and sticky, but they do have a short window while drying out when the moisture is just right for cultivation. The physical properties causing this are a high clay content, expand when wet, and shrink and crack when dry. A characteristic surface feature is the development of an uneven surface with raised mounds and shallow depressions caused by repeated cycles of wetting and drying.

Surface drainage is the most practical alternative and has been thoroughly developed and tested at ICRISAT in India, using the broad bed and furrow method. In Ethiopia the occurrence of vertisols is in smaller areas in valley bottoms, which remain either uncropped altogether or only cropped towards the end of the rainy season. Improved ease of cultivation, through surface drainage by raised bed and furrow or by shallow open drains, could lead both to improved production from the areas now cultivated, and also to a large increase in the area used for crop production.

An interesting but specialized need for surface drainage comes from Ethiopia in the growing of ***teff*** which is the main food grain. The seeds are minute and broadcast onto a very fine tilth, and can easily be washed away by any surface run-off. The traditional solution is small open drains to intercept any surface flow.

3.2 Recommended Approaches to Water Harvesting and Land Drainage

The main agriculture related water development and management issue basically deals with water harvesting and land drainage. In principle, there is a possibility of transferring water harvesting and excess water draining methods in other localities is possible.

A close examination of the other factors determining their success, such as socio-cultural environment, the possibility of adapting the population to agricultural innovations, the development policy objective of the country are important for final consideration. This can be achieved by an agro-ecological, social-economic feasibility study covering the proposed area under consideration.

Institutional arrangements should be made to co-ordinate the design and implementation of various water harvesting projects and to built a data base to record the experience. There is need to systematically collect and collate data on soil, natural vegetation and

land use, cropping pattern, rainfall amount and distribution, water resources and crop and water requirements as a national inventory of the potential of water harvesting.

The planning of water harvesting systems should be a part of an integrated land and water resource management plan, and should include the agronomic practices and farmers training.

Local resource users should be involved in all aspects of the planning, designing, implementation, and monitoring of water harvesting systems. As mentioned before, planning should explicitly the effect on downstream water users of the hydrological changes brought out by implementation of water harvesting. Opportunities for equal access of women and other disadvantaged farmers to the benefits of the new technology should be provided; and the relation between land tenure, water rights and the introduced water harvesting technologies should be carefully considered.

Performance assessment of water harvesting system should be carried out to facilitate comparison between various systems. The should include the suitability data and information on the size and type of water harvesting system, crop grown and yield levels, annual rainfall, amount of runoff collected per unit catchment area, socioeconomic impact and social acceptance.

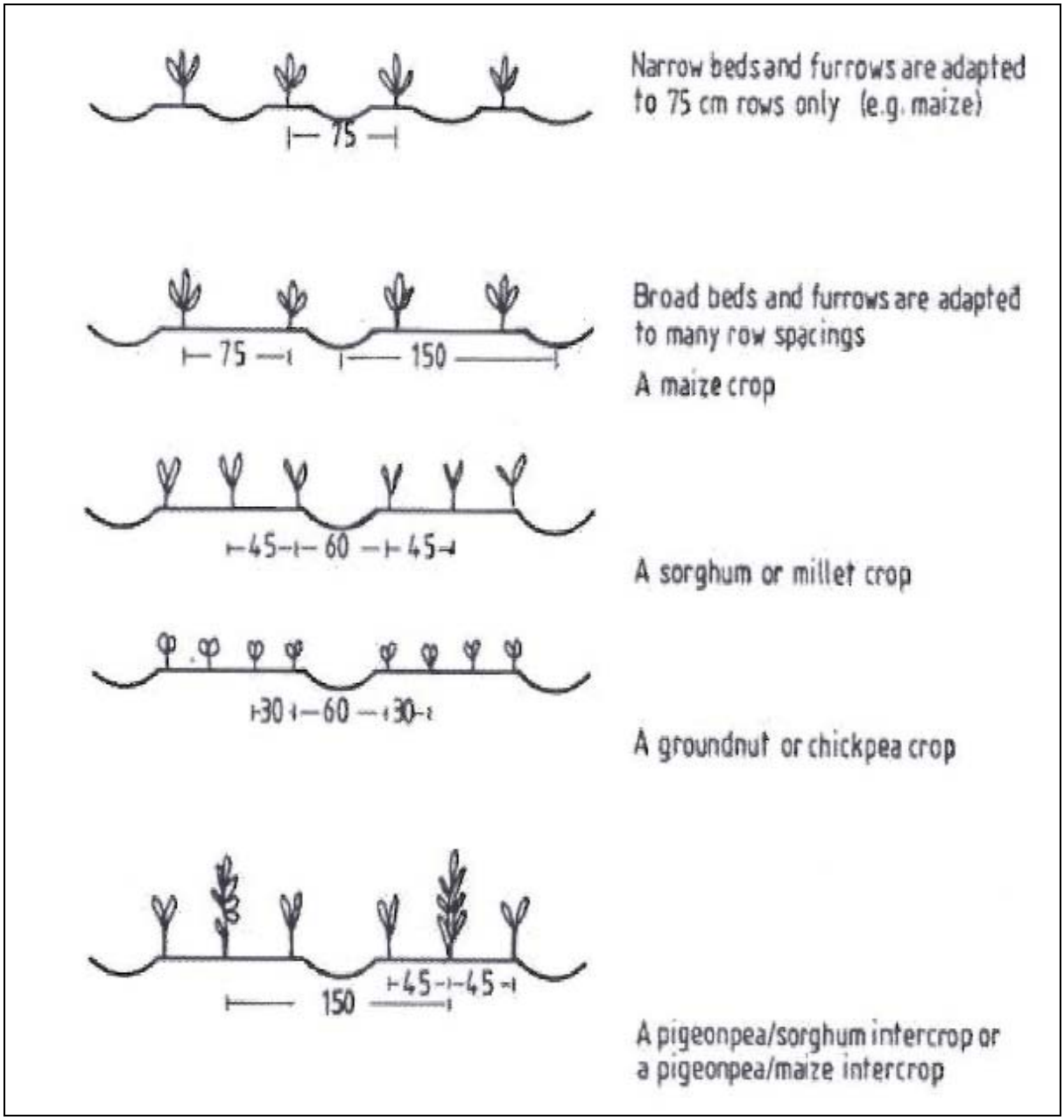


Figure 3: Alternative crop and raw arrangements on broad beds

4. Pond Construction

4.1 Introduction

Ponds can be planned, designed and constructed for multiple purposes: for domestic use, livestock watering, fish production, honeybee watering, irrigation (in a limited amount), etc. must be built near the use they serve and also contain adequate water.

There are two basic types of ponds: embankment and excavation. Excavated ponds are made by digging either the pond itself or the surrounding area to form levees. Ponds of this type are recommended and easily constructed, particularly in areas of flat topography like Lau watershed in Maiwut county.

4.2 Selecting the Pond Site

Selection of the pond site is one of the most important steps in construction. A good pond site contains: (a) Level topography that provides for economical construction, (b) soil with sufficient clay to hold water and (c) an adequate water supply. Before making the final site selection, one should examine all potential sites considering economics, accessibility and safety. Economically speaking, construct a pond that provides the largest volume of water with the least amount of cost.

Because a pond is simply a depression for holding water, the bottom must be composed of soil or rock which minimizes seepage. Clay soils are best for lining ponds because they minimize leakage.

4.3 Excavated ponds

Excavated ponds are the simplest to build in relatively flat terrain like the Lau watershed. Because their capacity is obtained almost solely by excavation, their practical size is limited. They are best suited to locations where the demand for water is small. Because excavated ponds can be built to expose a minimum water surface area in proportion to their volume, they are advantageous in places where evaporation losses are high and water is scarce. The ease with which they can be constructed, their compactness, their relative safety from flood-flow damage, and their low maintenance requirements make them popular.

The general location of an excavated pond depends largely on the purpose or purposes for which the water is to be used. The specific location is often influenced by topography. Excavated ponds fed by surface runoff can be located in almost any kind of topography. They are, however, most satisfactory and most commonly used in areas of comparatively flat, but well-drained terrain. A pond can be located in a broad natural drainage-way or to one side of a drainage-way if the runoff can be diverted into the

pond. The low point of a natural depression is often a good location. After the pond is filled, excess runoff escapes through regular drainage-ways.

4.3.1 Soils

Sufficient impervious soil at the site is essential to avoid excess seepage losses. The most desirable sites are where fine-textured clay and silty clay extend well below the proposed pond depth. Sites where sandy clay extends to adequate depths generally are satisfactory. Sites where the soil is porous or is underlain by strata of coarse-textured sand or sand-gravel mixtures should be avoided unless there is enough preparation to bear the expense of an artificial lining.

The performance of nearby ponds that are fed by runoff and in a similar soil is a good indicator of the suitability of a proposed site. Such observations of existing ponds can be supplemented by boring enough test holes at intervals over the proposed pond site to determine accurately the kind of material there.

4.3.2 Handling of the excavated material

Although excavated ponds can be built to almost any shape desired, rectangles and circles are commonly used in relatively flat terrain.

The capacity of an excavated pond is determined largely by the purpose or purposes for which water is needed and by the amount of inflow that can be expected in a given period. The required capacity of an excavated pond is difficult to determine because the demand of water can seldom be estimated accurately. For this reason, the pond should be built so that it can be enlarged if the original capacity proves inadequate.

The placement of the material excavated from the pond must be planned in advance of construction operations. Adequate placement prolongs the useful life of the pond, improves its appearance, and facilitates maintenance and establishment of vegetation. The excavated material can be stacked, spread, or removed from the site as conditions, nature of the material, and other circumstances warrant.

If the excavated material is not removed from the site, it should be placed so that its weight does not endanger the stability of the side slopes and rainfall does not wash the material back into the pond. If the material is stacked, it should be placed with side slopes no steeper than the natural angle of repose of the soil. Waste material should not be stacked in a geometric mound, but must be shaped and spread to blend with natural landforms in the area. Because many excavated ponds are in flat terrain, the waste material may be the most conspicuous feature in the landscape.

Perhaps the most satisfactory method of handling excavated material is to remove it from the site. Complete removal, however, is expensive and can seldom be justified

unless the material is needed nearby. Excavated material can sometimes be used advantageously for filling nearby low areas in a field or in building access roads.

4.4 Sealing impervious floors and walls

Excessive seepage in ponds can occur where the soils in the impounding area are too permeable to hold water. Selecting a poor site is often the result of inadequate site investigations and could have been avoided. In some places, it might be the case that no satisfactory site is available, but the need for water is great enough to justify using a site that is somewhat less than satisfactory. In this case the original pond design must include plans for reducing seepage by sealing. In some places excessive removal of the soil mantle during construction, usually to provide material for the embankment, exposes highly pervious material, such as sand, gravel, or rock containing cracks, crevices, or channels. This can be avoided by carefully selecting the source of embankment material.

To prevent excessive seepage, the permeability of the soils need be reduced to a point at which losses are insignificant or at least tolerable. The method depends largely on the proportions of coarse-grained sand and gravel and of fine-grained clay and silt in the soil.

4.4.1 Compaction

Some pond areas can be made relatively impervious by compaction alone if the material contains a wide range of particle sizes (small gravel or coarse sand to fine sand) and enough clay (10 percent or more) and silt to effect a seal.

4.4.2 Clay blankets

Pond areas containing high percentages of coarse-grained soils, but lacking enough clay to prevent excessive seepage, can be sealed by blanketing. The entire area over which water is to be impounded as well as the upstream slope of the embankment must be blanketed. The blanket should consist of a well-graded material containing at least 20 percent clay. The requirements for good blanket material are about the same as those described for earth embankments.

Thickness of the blanket depends on the depth of water to be impounded. The minimum compacted thickness is 30 cm for all depths of water under 3 m. This thickness need to be increased by 15 cm for each 1 m of water over 3 m and above.

Construction is similar to that for earth embankments. All trees and other vegetation must be removed and fill all holes and crevices must be filled before hauling earth material from the borrow area to the pond site in tractor-pulled wheeled scrapers or

similar equipment. The material must be spread uniformly over the area in layers 6 to 8 inches thick.

Clay blankets must be protected against cracking that result from drying. A cover of gravel 30 to 40 cm thick must be spread over the blanket below the anticipated high water level. Rock riprap or other suitable material must be used to protect areas where the water flow into the pond is concentrated.

4.4.3 Waterproof linings

Using waterproof linings is another method of reducing excessive seepage in both coarse-grained and fine-grained soils. Polyethylene liners are gaining wide acceptance as linings for ponds because they virtually eliminate seepage if properly installed.

The pond area must be cleared of all undesired vegetation. All holes must be filled and roots, sharp stones, or other objects that might puncture the film must be removed. If the material is stony or of very coarse texture, it must be covered with a cushion layer of fine-textured material before placing the lining.

4.5 Inlet and Spillway Requirements

Ponds excavated in areas of flat terrain generally require constructed spillways. The surface runoff must enter an excavated pond through a broad shallow channel. The channel should be designed and constructed such that erosion problem is avoided.

In areas where a considerable amount of silt is carried by the inflowing water, a desilting area or filter-strip should be provided in the drainage-way before the silt enters the pond. This area or strip should be as wide and long and should be seeded to an appropriate mix of grasses and forbs. As the water flows through the vegetation, the silt settles out and the water entering the pond is relatively silt free.

The same channel that brings the required water into the pond can be used as a rejection channel for incoming excess water provided the necessary pre-arrangement is done. This provision can easily be implemented by building embankment (with excavated soils) around the pond except the channel that allows water to get into the pond. Since the possible pond sites are likely to be adjacent to Lau stream branching channels, water can easily be diverted into the as well as prevented from getting into pond. The rejected water then follows its natural course since it has no any other path to follow. This arrangement helps to divert the necessary amount of water to be stored at the same time rejecting incoming water in excess of the pond capacity.

4.6 Establishing vegetation

Trees, shrubs, grasses, and forbs should be planted during or soon after construction. The vegetation should be able to survive under prevailing conditions with minimum maintenance. Native varieties are preferred for new plantings.

Trees and shrubs that remain or those planted along the shoreline will be subject to flooding, wave action, or a high water table. The ability to tolerate such drastic changes varies greatly among species. Flood tolerance and resistance to wave action depend on root density and the ability to regenerate from exposed roots.

4.7 Protecting the Pond

Construction of the pond is not complete until you have provided protection against erosion, wave action, trampling by livestock, and any other source of damage. Ponds without this protection may be short lived, and the cost of maintenance is usually high. Fencing is a very important measure in protecting the pond.

4.8 Operating and Maintaining the Pond

A pond, no matter how well planned and built, must be adequately maintained if its intended purposes are to be realized throughout its expected life. Pond must be inspected periodically. Ponds must be examined after heavy rains in order to determine whether it is functioning properly or needs minor repairs. Repairing damage immediately generally eliminates the need for more costly repairs later. Damage may be small, but if neglected it may increase until repair becomes impractical and the entire structure must be replaced.

4.9 The Importance of Fencing

Ponds are an important source of water for domestic use and many cattle herds. However, there will often be difficulties in keeping stock away from improved areas. Livestock wading in the pond pollute the water with manure, disturb aquatic vegetation, and break down the banks. Water quality is better and the pond ecosystem healthier if livestock are fenced out of the pond.

Fencing domestic livestock out of the pond will improve water quality and maintain the integrity of the pond and pond life by reducing pond sedimentation. Fencing provides the protection needed to develop and maintain a good plant cover, the auxiliary spillway, and in other areas. It enhances clean drinking water and eliminates damage or pollution by livestock.

Wire fencing is expensive, live hedges need time and care to establish them, and thorn hedges need regular maintenance. However, complete fencing of areas on which ponds are built is recommended if livestock are grazed or fed in adjacent fields so as to have clean water for domestic use as well as for the livestock.

Livestock can be watered using a well and stock tank located away from the pond. Alternatively, livestock can drink the pond water, pumped to a trough (see Figure 8) adjacent to the pond.

5. Subsurface Dam

5.1 Introduction

Storage of water from the rainy season to the dry season is highly important. Subsurface dams, which store water under the ground, can store sufficient quantities of water for domestic use, livestock and minor irrigation. If sited and built properly, subsurface dams can give an appropriate answer to the water-need.

For a better livestock health and access to water and dry season grazing lands simple, affordable, replicable technology of subsurface dams is a very important alternative. By building a subsurface dam in the bed of a dry river, rain and groundwater is filtered, collected and stored underground.

Since Lau is an ephemeral tream, water will not be available all year around. The water in the stream will flow away, leaving behind a dry sandbed. In order to bridge periods of dry and wet seasons, water can be retained by building a dam. However, any attempt to store water on the stream by building dam will face a serious siltation problem. To overcome such problem, the stream water can be stored in subsurface reservoir as far as suitable sites are available. The desirable storage can be obtained by building a dam, behind which water is stored in the sand accumulated on the stream bed, by enlarging the natural aquifer. The water can be harvested using intake pipes and shallow wells constructed near the banks of the stream and/or by gravity at downstream locations.

5.2 Basic Principles of Subsurface Dams and Reservoirs

Subsurface dams are structures that intercept or obstruct the natural flow in the ground and provide storage for water (reservoir) under the surface of the ground. They are used in stream/river beds where flows of vary from high flows during wet seasons to negligible flows during dry season. the course of the year, from very high flows following rain to negligible flows during the dry season.

A subsurface dam intercepts or obstructs the flow of an aquifer and reduces the variation of the level of the groundwater table upstream of the dam. It is built entirely under the streambed (see Figures 4 and 5).

Subsurface dams are built across streams. A trench is dug across the stream, reaching to the bedrock or other stable impermeable layer like clay. An impervious wall is constructed in the trench, which is then refilled with the excavated material.

The best sites for construction of subsurface dams are those where the soil consists of sands and gravel, with rock or an impermeable layer at a few metres' depth. Ideally, the

dam should be built there where rainwater from a large catchment area flows through a narrow passage.

The optimum zone for constructing a subsurface dams is generally found on gentle slopes in the transition zone between hills and plains. Finding suitable places to build the subsurface dam is harder when the river is wider. In view of an efficient subsurface reservoir it is important that it is based upon impermeable bed or bedrock is underlying the reservoir.

In general the topographical gradient of the construction sites is between 0.2 - 4%. Subsurface reservoirs in sand-rivers are principally recharged by rainwater from flash floods, which originate in catchment areas with higher elevation. A single and short-lived flash flood may fully recharge a reservoir with water. Upon full saturation of the reservoir, the remaining flash floods will pass over the dam without further infiltration, replenishing aquifers downstream.

A few hours after the passing of a flash flood, the surface of the sand-river may look dry again, but the water which in the meantime has been stored in the reservoir can be drawn for many months.

In subsurface dams water may be obtained from the subsurface reservoir from a well upstream of the subsurface dam. The subsurface dam technology is designed to block underground water flow at shallow depth, so that traditional watering points will be lasting longer and new water abstraction points will be created.

5.3 Advantages of a subsurface dam

Subsurface dam is composed of a cut-off wall by which the groundwater flow is dammed (or intrusion of the seawater is prevented), and intake facilities such as filter trench well/shaft and pumps that draw up the stored in the subsurface reservoir.

Water storage in subsurface reservoirs offers as a major advantage that evaporation losses are much less for water stored underground. Since the subsurface dam suffers virtually no loss of stored water from evaporation, it is more advantageous than the surface dam in dry regions.

Evaporation is confined to the upper layer of a sand reservoir. As the water sinks, the evaporation reduces and even completely stops, when the water level sinks to about 60cm below the sand surface.

Further, risk of contamination of the stored water from the surface is reduced because parasites cannot breed in underground water. Contamination of the water by insects and animals cannot take place because the water is not visible at the sand surface. Health hazards such as mosquito breeding are avoided. Reserved water using a subsurface dam is of fairly good quality because it is stored under ground, and it can be used like ordinary well water.

The problem of submergence of land, which is normally associated with surface dams, is not present with subsurface dams. There is no danger of breaching disasters. The surface area can be used in the same way before and after the construction of the subsurface dams. Normally, with no submergence of the reservoir area involved, subsurface dam development does not interfere with current land use. It has only minimal social impact (for example, it does not entail the relocation of residents) and its impact on the ecosystem is minimal as well.

Silting is not a problem for groundwater dams, in contrast to surface dams, which would silt up quickly. Unlike the surface dam, it does not suffer from a reduction of storage space due to sedimentary accumulation.

The absence of surface structures does not obstruct the circulation of water and materials. It also allows migration and interaction of living creatures. Since the cutoff wall, buried underground, is not likely to corrode or deteriorate, the function of the subsurface dam is almost permanently maintained.

The technology is preferred by the community for several reasons: it increases the capacity of traditional wells, it is simple and less expensive to construct, replicable and easily maintainable by the community.

Further it causes less contamination of water and a temporary availability of water avoids attracting permanent human settlement. Maintenance is simple. Construction costs are relatively low.

5.4 Disadvantages of a subsurface dam

Since the utilization of stored groundwater in a subsurface dam requires pumping, operating costs are higher than those of a surface dam.

The size of the voids between the solids of sand determines the capacity of the basin. When the particle size is small, only 5% of the water can be extracted (see Table 8). The volume of reserved water is determined by the volume of those pores (effective porosity), and reaches only 10 to 30% of the volume of the reservoir layer.

Strict control of subsurface dam water is difficult because water can easily been stolen, simply by digging a well. To prevent such practices, agreements must be made on land use and economic activities in the subsurface dam reservoir area, and concerned parties must develop morals to protect the water resource.

Contrary to a surface dam whose site conditions can be examined by visual inspection, surveys for site selection and calculating the water storage capacity of a subsurface dam rely on estimates of underground geological structures. Survey, design and construction processes require trained persons to avoid possible failures.

5.5 Requirements for a subsurface dam site

The construction of a subsurface dam generally requires cutting off where a subsurface valley is covered by an aquifer. Subsurface valleys are usually formed where the ground is undulating. Similar to surface dams, effective sites for subsurface dam development (suitable slopes) can be easily found by tracing subsurface valleys.

River banks must be well-defined and stable. Rocky banks and gorges are the best features. Wide meandering rivers in sand are an indication that no lateral confinement is present and so the risk of lateral flow and leakages is high.

Soil types with large porosity, which can hold large volumes of water, including the alluvial gravel layer, limestone and volcanic rocks are good for SSD construction. A minimum topographic riverbed slope is required. Suitable gradients lie between 0.2% and 4%. This is usually the case in the transition zones between hills and plains. The river stream must be reasonably narrow for the obvious reason of economizing on the materials and labour.

A dense and green vegetation is an obvious sign of a water rich underground. There are commonly known tree species that are used to indicate wetness and water table underground.

5.6 Technical Assessment of Site Suitability

Preliminary guidance based on situations prevailing in Lau watershed are proposed as follows. These guidance points should be treated as initial not as final conclusive lists and specific issues may need to be taken into account for every specific site.

- Scoop holes where people fetch water at least for a month or more after the rainy season, are located. These indicate the former natural subsurface water streams and aquifers to be replenished. Scoop holes provide an indication of present natural barriers. Scoop holes that dry up during the dry season are considered good locations for a dam. ‘Wet’ scoop holes already provide water all through the year. This information is obtained from users.

- Specific tree species which can indicate a high water table are looked for.

- Gradient and recharge possibilities are used as an indication of the volume of a reservoir. A smaller gradient makes a larger reservoir; more recharge will also increase the volume of the reservoir. The depth of the rocks upstream of the dam location is measured: the deeper the rock, the larger the reservoir volume.

- Banks of at least 1.5 m high are recommended to prevent the construction from being too large. If they are not available, though, and tree species or scope holes indicate water presence, subsurface dams can be constructed.

- Locations are sought out with a solid rock foundation. The rock at the base should not be porous.

- The local materials for construction should be readily available and in adequate quantity and quality. Clay or termite hills/heaps should be present. Water needed for the construction must be available in a maximum radius of about 1.0 km.

- A subsurface dam should not be built in a bend, since this will cause bypasses.

- A natural barrier can be used as foundation for a dam. Note: there are risks of seepage when the rock is not impermeable. Scoop holes upstream that dry up very fast after the rainy season are suspicious.

- There must be enough inflow (in mainstreams this is never a problem).

- The stream/river must flow from time to time in order to: (a) provide water for storage, and (b) provide a sand load to fill the reservoir in front of the dam.

- The site in question should be accessible to the beneficiaries and should have at least some reasonable distance from the main road.

- At least 30 households must be participating for 2 reasons: (a) there is enough labour power available; and (b) more people benefit from one subsurface dam. This enlarges cost-effectiveness.

5.7 Construction of Subsurface Dams

5.7.1 The timing of construction

The question being answered here is: "*When is the opportune time to do the construction?*" The best time to undertake construction is at the peak of the dry season, because:

- The lowest possible water table level is reached so that maximum water reserve is acquired.
- It is the time water demand by the people is felt at its highest; community mobilization will be simplified and a big community turn-out for participation will be realized.
- It is the best and desirable time to get access for trucks required for transporting required construction materials and skilled manpower from other locations.

The community is expected at this time to have completed clearing of the access road to the identified subsurface dam site, the construction of a storage structure and all the required amount of clay soil is heaped on site.

5.7.2 Excavation

Sub-surface dams are constructed by building a dam in a trench excavated across the riverbed. The excavation depth ranges from 1 to 3 meters below riverbed level and can be excavated and constructed by hand. Since the material to be excavated is generally sandy, slope stability can become a problem. The maximum acceptable slope is 30° for sandy material.

It is also undulating across the riverbed, being shallow or deep at some sections of the dyke. After the levelling of a trench of about 1.0 meter, another smaller trench measuring 0.3 m deep and 0.3 m wide is dug at the bottom and along the bigger trench to serve as a key joint. The smaller trench must also be levelled thereafter.

Excavation for a sub-surface dam wall is done in the dry season to ensure that the water level in the aquifer is at its lowest and so reduces the need for dewatering the construction area. In case water remains in the trench, the dam has to be build in two stages, while diverting the water away from the construction site

5.7.3 Construction materials

The dam wall can be constructed with any material so long as it creates an impermeable screen. Clay is a suitable material in places where clay is easily obtainable and for highly permeable aquifers of limited depths. Use of clay is labour-intensive but has a lower need for skilled labour when compared with stone structures. The clay should be properly compacted.

The materials used for construction are: clay soil, ordinary cement, building sand and coarse aggregates. The best sand soil is medium to coarse sand within the riverbed (for storage and release of water). Gravel or coarse sand presence on site is ideal.

Fine silt is not suitable because it does not release water easily. Boulders are a hindrance to deep excavation. Clay soil is necessary to construct the cut-off wall of the subsurface dam. Termite hills are a good source of good clay for this purpose and the higher its proportion as a construction material is highly desirable. Concrete on top serves both as a marker to locate the hidden subsurface dam and as a means to press and compact the underlying clay soil in the trench.

5.7.4 Compaction of clay in the trench and construction of a top cover

When the impervious basement on the dyke has been reached, one can start spreading approved sieved clay soil into the trench ready for compaction. Firstly, the trench is made wet all across by spraying water from a watering can. The selected clayey soil is spread across the trench in layers and then properly compacted using a tee-stamper. Depending on the availability of water on worksite, one may adopt dry compaction

when there is no water, but soil-spread-layers should not exceed 10 cm. It is always advisable, though, to practice wet compaction, unless there is absolutely no water on site or nearby.

Correct clay compaction of 15 cm thick with 10% of water mixed in the clay (to result in very hard layers), is of outmost importance. In wet compaction, clay soil is spread in the trench in layers with a maximum width of 15 cm. Water is sprinkled on top of the spread clay soil before compaction. Good compaction is achieved when a heavy blunt object of 10 kg is dropped on the compacted surface and no dent is visible.

When the clay soil compaction has nearly reached the riverbed surface level, a 15 cm concrete cover is lined on top and at the sides of the clay wall to a depth of 0.5 m. This is meant to take care of damages caused by debris carried along during floods. At times and when need arises, the upstream of the clay wall is plastered using dung just to give more guarantee to water tightness.

The clay dam wall top must be submerged for one foot in the sand. In case concrete is still required the volume should be minimal and cement use reduced to the absolute minimum. Otherwise the technology will be too expensive to replicate and the cost benefit aspect will be lost for future reference.

The ***tools*** mostly used include: pickaxes, crowbars, shovels, chisels, hammers, tray, wire sieve, stampers (metallic or wooden), watering cans, basins, wheelbarrows, high discharging capacity dewatering pump.

Table 8: Porosity and extractable volume of water

Soil	***Diameter of particles (mm)***	***Porosity (%, percent)***	***Extractable water (%)***
Silt	< 0.5	38	5
Fine sand	0.5 – 1.0	40	19
Medium sand	1.0 – 1,5	41	25
Coarse sand	1.5 - 5.0	45	35
Fine gravel	5.0 – 19.0	47	41
Coarse gravel	19.0 – 70.0	51	50

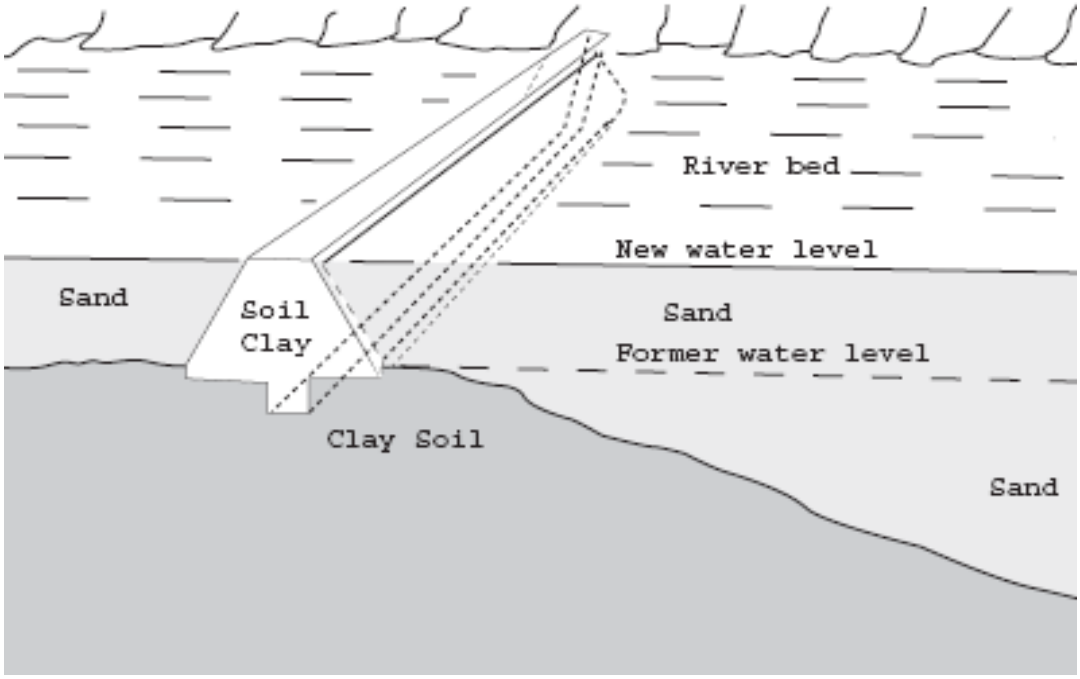


Figure 4: A subsurface dam built of soil on an underground dyke

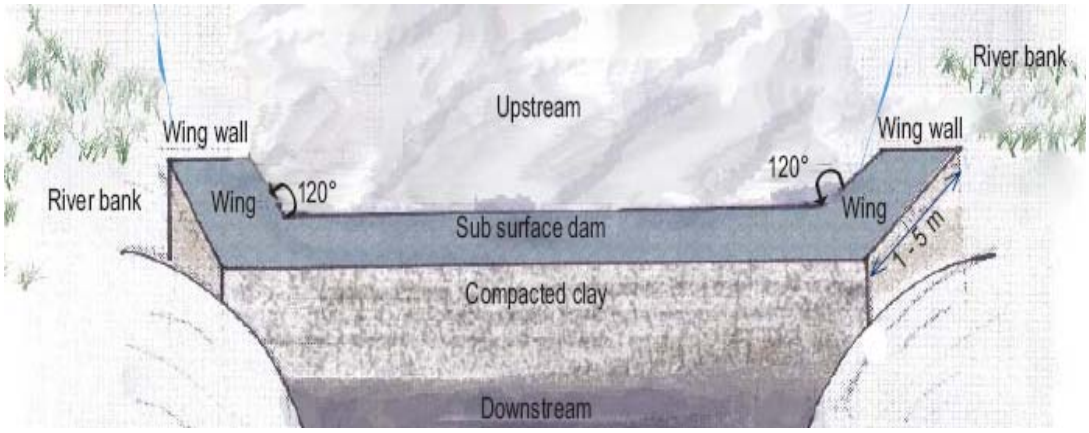


Figure 5: A subsurface dam built of Clay and Concrete

6. Extracting Water from Ponds and Subsurface Reservoirs

6.1 Abstracting Clean and Safe Water

Many communities in many countries are dependent on groundwater for all their water needs. However, this is not the case in the Lau watershed and surrounding area. Almost all wells drilled have very little yield to meet the high demand exerted by the people. As a result of this people had reverted to the unsafe water supplies they had traditionally used and were walking long distances to scoop shallow pits in Lau stream beds. This fact was observed even in the Maiut centre (see Plate 5).

In such situations pumped systems utilising sand filters to connect ponds with well-shafts can be developed to abstract clean, safe water from ponds as well as from subsurface reservoirs. This is probably the most effective way of abstracting water from ponds and from the sands under the Lau stream bed.

Once a trench is dug to connect the pond with the shaft well located at about 10 m from the bank of the pond or from the bank of the stream in the case of subsurface reservoir, it has to be filled with graded sand that acts as a filter. The fill should consist medium sand, coarse sand and gravel. Fine sand should be avoided as far as possible and any impermeable soil (such as clay) should be completely avoided from the filter component. However, the fill between the filter and the ground level should be impermeable soil such as clay or silt-clay.

The pond water or the subsurface reservoir flows through the filter into an offset false well-shaft located near the bank of the pond or stream bank of the stream from which water could be easily abstracted by a suitable human-powered pump. A typical pond-filter-shaft subcomponent is shown by Figures 6 and 7.

This creates a significant opportunity for imitating the traditional ‘sand-abstraction’ systems in order to build filtration galleries and well-shafts. This is simple, low technology abstraction systems which can be easily operated and managed and meet the needs of the Lau watershed communities. This approach provides the conditions that will ensure uncontaminated, safe water and safety for users during the drawing of water

6.2 Dimensions

Depths of hand-dug trenches range from shallow trenches, about 6 metres deep, to deep trenches up to 12 metres deep. The maximum depth of trench related to ponds is 6 m while the maximum depth of trenches associated with subsurface reservoirs may be as deep as 12 m. It is impractical to excavate a trench which is less than a metre in width;

an excavation of about 1.5 metres in width provides adequate working space for the diggers and will allow a final internal width of about 1.2 metres after the well-shaft portion of the trench has been lined.

The volume of the water in the well-shaft below the standing water table acts as a reservoir, which can meet demands on it during the day and should replenish itself during periods when there is no abstraction.

6.3 Excavation

Because trenches are dug by hand their use is restricted to suitable types of ground, such as clays, sands, gravels and mixed soils where only small boulders are encountered. Some communities can use the skill and knowledge of local well-diggers, but for most of the construction sites the excavation is carried out by the villagers themselves under supervision.

Trenches safely dug during the dry season may become unstable when the water level rises in the wet season and therefore must be lined before this occurs to prevent a collapse. In the case of the well-shaft, it is prudent to provide a permanent supporting lining which will support the sides of the well-shaft to be located in the trench; suitable lining materials are concrete, reinforced concrete, ferrocement, masonry, brickwork, etc. However, in situations where similar and simultaneous construction takes place at many places, lining the well-shafts with pre-cast concrete rings fabricated by shared forms and skilled person might be a better alternative than in-situ lining.

To excavate the trench to the water table, excavation below this level should never be attempted until the sides of the excavation have received the support of their permanent lining, from water table to ground level. Excavation below the water table should be carried out within pre-cast concrete caisson rings of a smaller diameter than the rest of the well. The initial caisson ring is provided with a cutting edge and additional rings are placed on top of it; as the material within is excavated, the rings sink progressively under their own weight. To facilitate the ingress of water, these lower rings have to be constructed with porous, or no-fines, concrete and their joints are left unpointed.

6.4 Completion

After construction of the well-shaft has been completed, the bottom is plugged with gravel. This helps to prevent silty material from clay soils, or fines from sandy materials, being drawn into the well. Any annular space between the pre-cast caisson well rings and the side of the excavation should also be filled with gravel; such filling behind the rings which are below the water helps to increase water storage and to prevent the passage of fine silts and sands into the well-shaft. The space behind the top three metres, or so, of the well rings should be backfilled to ground level with puddled clay, or concrete, and the well rings should project about one metre above a concrete apron. This apron provides a sanitary seal to prevent polluted surface water seeping into

the well and should slope away from it and drain into a channel which discharges into a soakaway.

Finally, the concrete lined well-shaft, sealed with a cover slab and provided with a human-powered pump, provides clean and safe water for domestic use, livestock and other uses. Water abstracted by a single human-powered pump can serve the needs of about 300 people. However, it is felt that one pump can not adequately serve the users demand, more than one pump can fitted on such well-shaft.

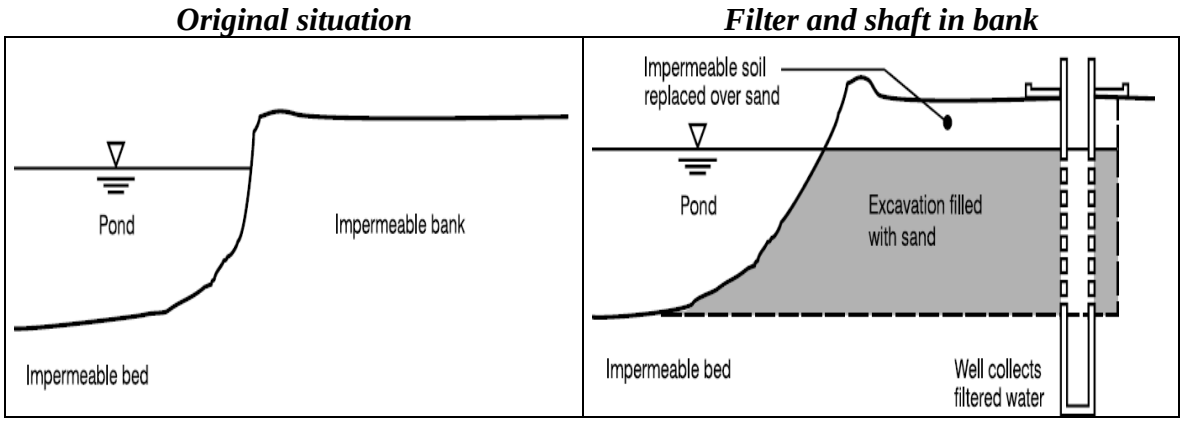


Figure 6: Arrangement of facilities for extracting water from ponds

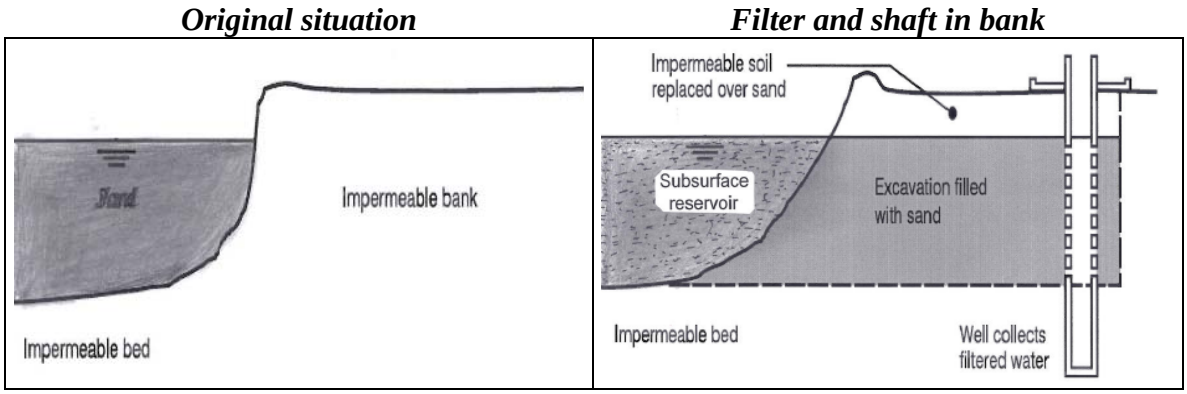


Figure 7: Arrangement of facilities for extracting water from ponds

Figure 8: Livestock watering tough

7. Selecting Proper Human-Powered Pump

7.1 Introduction

Pumps are a common means of lifting water from a clean water source from below point of access to the users. But all pumps have moving parts and are therefore destined to break. Failure often makes the water source inaccessible until the pump is repaired. Proper selection of a pump will reduce undesirable downtime and will empower the local community to manage their water source. Selection of a pump for lifting potable water in a developing country involves investigation of the lifting depth, water characteristics, capacity, demand, preferred method of operation and maintenance sustainability. All of these parameters affect the total lifetime cost of the pumping system.

Water usage often increases when closer access to clean water is made available, and health and hygiene may improve with increased water supply. Because of the increased work required, pump output is usually reduced by increase in well depth. Consideration of these factors will help determine the number of wells and pumps to be installed the meet project objectives. Table 8 provides reported pumping capacities in liters per minute at various depths for some representative pumps.

7.2 Treadle Pumps

Treadle pumps are appropriate for lifting water to heights up to 7 m. A treadle pump uses two pistons at a time with one going down as the other rises. The principle is the same as a hand pump, but the energy applied to move the pistons comes from foot action instead of arms. There is less physical exertion using leg muscles since they are stronger than arms. The treadle pump is promoted heavily as a small farmer irrigation pump, but is also used for pumping potable water. The open top design of most models leaves the pistons completely exposed to the air and elements so that contamination is likely without care. The handle end of the pump is not sealed so care should be taken to avoid contaminants entering the top of the pump.

Treadle pumps work in a comfortable, rhythmic walking motion, lifting from 2,500 up to 5,000 litres per hour by suction from water sources that are below the level of supply point. Treadle pumps of various designs are now available in many African countries. Prices vary from country to country, but most pumps are sold to farmers at between US$50-100.

7.3 Hand Pumps

Direct action and bucket hand pumps are appropriate for lifting water from depths of 12 to 15 m. Direct action pumps and the bucket pump are used to depths of 15 m. The direct action pump has a pump rod connecting the handle to a piston that has a cup seal creating a tight seal inside the rising main. Several direct action pump models have a hollow PVC rod that remains full of air which provides buoyancy to counter some of the weight of the water column being lifted to the surface. As the pump handle is lifted, water is lifted up through the rising main and out the spout, and at the same time water at the bottom of the well is sucked up through a one way foot valve filling the space evacuated by the plunger. When the handle is pushed down the volume of the rod displaces water trapped by the foot valve causing water to rise up and out the spout so water comes out on both the up and down stroke. A bucket pump is similar to the old tried and true windlass and bucket except there are multiple buckets on a chain loop. As the handle of the windlass wheel at the top of the well is turned, full buckets are lifted and empty buckets are lowered. A large diameter well is required to fit the width of the buckets.

7.4 Operation and Maintenance

The most common low cost means of operating a pump by human power, either hand or foot. This requires minimal infrastructure for the water to be made available to the operator.

The use of self priming and hygienically sealed pumps is recommended for most applications. The row pump, suction pump and treadle pump may require priming. A source of clean water near the pump will be necessary before the pump will work. The bucket pump, treadle pump and row pump are not sealed from the environment so that blowing dust, rain or contaminants could get into the pump and contact the water. In some locations a cover is built over the pump to reduce contamination. The more robust steel pumps are sealed and durable for public locations with multiple users.

Village Level Operation and Maintenance (VLOM) is a term that has been coined to label pump systems that can be operated and maintained by the local village community. These pump systems must be durable including some level of corrosion resistance and the pump and spare parts must be affordable. The promotion of local community involvement in maintaining pumps has improved the operation of many water projects. A pump that is completely fabricated with local parts and labor is more easily repaired than a pump fabricated elsewhere, but there are benefits to selecting a very high quality more expensive pump that lasts for years without a major repair.

There are different degrees of VLOM. Manufacturers and development agencies have modified pumps to improve low cost sustainability. One change is to reduce the number of different parts so it is cheaper to have spares on hand. An example is the use of identical parts for a piston pump foot valve and discharge valve. Some pumps have been designed with features that make repair easier. An example is the open top cylinder that

uses a rising main with a larger diameter than the piston cylinder so the rod and deep well piston may be removed without pulling out the rising main pipe. The rope pump, treadle pump and row pump are reported to be simple to make in developing countries. The Bush pump was designed to be manufactured by local skilled mechanics so that all parts and repairs would be local. However, it uses a synthetic cup leather that is manufactured at low cost in industrialized countries. The quality of the locally made replacement part will be lower than if one is shipped from an outside supplier.

If the selected pump is not made locally, multiple pump suppliers should be contacted to determine what is available and who is going to support the equipment after purchase. Ask if there will be special tools to repair their pump, special equipment to lift parts or pipe from the well, and if they will train local mechanics to install and repair. Request a list of suggested spare parts from the supplier and confirm their materials are suitable to the water characteristics. Ask for a guarantee of performance from the supplier.

Handpump standardization has improved the overall utility of pumps in many countries. Standardization reduces the number of pumps local mechanics need to know how to fix, promotes the use of proven pumps and provides a sufficiently large market for a reduced number of spare parts so that local parts suppliers can exist. If there are standardized pumps in the area, it would be wise to select the most suitable pump from that list. Since many deep well (45 m) pumps are also suitable for shallow applications, one type of deep well pump could be used for a project that has a variety of pumping depths. This will increase the initial cost of a multiple pump project since shallow pumps are less expensive to buy and repair.

The application of VLOM principles, when considering pump selection, often involves compromising one principle to take advantage of another. A hand-pump with a low rate of breakdown might be thought preferable to another with a higher rate. However, a hand-pump that breaks down monthly, but can be repaired in a few hours by a local caretaker, is preferable to one that breaks down once a year but requires a month for repairs to be completed and needs replacement parts to be imported and skilled technicians to be available.

Table 9: Human-powered pumps – their reported performance and characteristics

Type	***Depth Range***	***Distinguishing Features***
	Shallow	
Row pump	6 m	Easy to make of PVC pipe
Suction hand pump	7 m	Very common traditional design
Foot Pedal (Treadle) pump	7 m	Powered by your legs instead of arms
	Intermediate	
Direct Action Plunger pump	12 m	Lower cost direct action pump
Bucket pump	15 m	Many buckets on a continuous loop
Direct Action pump	15 m	Discharges water on up and down stroke
	Deep	
Diaphragm pump	45 m	May work in curved bore holes
Rope & Disk pump	60 m	Easy to make in low income countries
Progressive cavity pump	60 m	Continuous output from rotary motion
Piston pump	90 m	Deepest capability

8. Sanitation and Hygiene Education

8.1 Sanitation

8.1.1 Introduction

The most prominent service in sanitation can be obtained by building latrines. Simple latrines and ventilated improved pit latrine are recommended for village centres, schools, clinics and other public centres. These latrines can be constructed jointly by the community and external support agencies.

Latrines are most needed by each individual household. However, it would be very difficult and extremely expensive to build such latrines with the help of the external agencies. The workable alternative would be to educate the people how they can build their own latrines with locally available materials and skills. Demonstration latrines should be used for this purpose.

8.1.2 Simple pit latrines

A family pit latrine should be about 1.2 m diameter, or square, (the smallest dimension that can be dug conveniently), with the pit wholly above the water table. It should be at least 3m deep and, if necessary to attain this depth, the floor level of the building above it should be raised above ground level. With this capacity, the contents of the pit should digest and, in practice, the pit may never become full. By constructing twin pits, it should be possible to dig out a filled pit, after it has stood for a year, without any objectionable smell, whilst the other pit is in use.

Concrete cover slabs should not be cast over the pit. Casting the slab in two pieces can reduce the weight to be carried. As an absolute minimum, communities should be supplied with well-designed steel or timber shuttering for the casting of the slabs, and advice on concrete mix proportions. Well-trained local craftsmen must supervise the mixing and placing of the concrete in the slab.

Pit latrines should be sited at least 100 m away from the nearest water source.

A latrine is a permanent installation. In unstable ground the pit walls should be supported with timber, bricks or blocks. Struts spanning across the pit should be avoided as they will become fouled and will cause smells. The pit cover slab needs to be strong (for obvious reasons) and its top surface should be smooth and easy to keep clean. Concrete is the best material; structural strength can be achieved by a slightly domed shape, or by using steel reinforcement.

8.1.3 The Ventilated Improved Pit (VIP) latrine

The ventilated improved pit latrine was introduced in Africa in the 1970s and has proved successful in rural areas in overcoming problems with flies and odours.

The interior of the superstructure should be darker than the daylight outside and the superstructure building should be well ventilated so as to allow the flow of air into the pit. The pit should have a vent pipe which should be at least 1.0 m diameter and should extend from the pit to about 1 metre above the roof, and the top of it should be fitted with a fine-mesh stainless steel or aluminium fly-screen. Flies which are drawn by smell into the pit will be attracted up the vent pipe by the brightness of daylight at the top it, but cannot escape because of the screen. Wind passing over the vent pipe will cause an updraught, removing any smell and helping to draw flies up to the top of the pipe.

8.1.4 Demonstration latrines

Full-scale demonstration latrines, preferably showing the range of designs for squat-holes, should be built in each village before the start of a sanitation project. It is vitally important that the families should be enabled to provide themselves with what they are happy with, not with what is thought good for them. Each family should be given detailed advice on siting (preferably downwind, away from trees and not too close to places where food is stored or prepared).

It should be clear to the people that casual defecation “out in the bush” spreads disease. Any latrine, provided it is used, is an improvement on no latrine. In rural situations, family pit latrines can provide satisfactory and acceptable sanitation. They are all that most people in the developing world can afford. Given sensitive guidelines and a little technical help, families can build latrines for themselves, at very low cost.

8.2 Hygiene Education

8.2.1 Measures required in addition to building latrines

Building latrines in a community is desirable, but will not be sufficient to prevent the occurrence of diarrhoea. It must be combined with hygiene education which is designed to encourage the changes in people’s patterns of personal behaviour which are necessary in order to block the faecal-oral transmission route and reduce the spread of disease.

Therefore a sanitation project without accompanying hygiene education will have little impact on community health unless:

- Most (preferably all) of the people use the new latrines
- Children’s faeces are properly disposed of
- Latrines are properly maintained and cleaned

- Hands are washed by everyone at critical times; these are: after defecation; after clearing a child's stools; before eating; before preparing food
- Water sources are protected, or water is purified before consumption
- Food is prepared properly. This means: cooked thoroughly; re-heated thoroughly; stored in a way that does not allow it to be contaminated by insects or small animals; cleaned thoroughly before being eaten raw.

8.2.2 Improving the health quality

Whether it is a water supply and/or a sanitation scheme that is proposed, the ultimate aim is to improve the health and quality of life of the community. Technical developments or improvements will give maximum benefit only if they are part of a wider hygiene education programme. This may involve the changing of long held attitudes and practices and may well take considerably longer to achieve than the actual construction of the scheme.

Hygiene education must be a community activity so that everyone goes forward together without any group being left behind. It is usual for the women to be the ones who are primarily concerned with the health of the family, and education will normally concentrate on them. However, it is often the children who are the easiest to educate regarding the benefits of hygiene education, and then they insist on changes being made within the family unit.

Hygiene education is about helping people to understand, firstly, what causes some of their health problems and, secondly, what preventative measures might be possible. It needs to be approached in a very sensitive way, with a great deal of respect being shown to local beliefs and practices.

Diarrhoea is frequently caused by pathogens from human faeces entering a person's mouth. Much, but not all, of hygiene education is concerned with explaining this route, which is called the faecal-oral route, and suggesting ways in which it can be blocked. The likelihood of diarrhoea can be greatly reduced by blocking the various faecal-oral transmission routes. This can be achieved by a combination of building latrines which incorporate blocking mechanisms and hygiene education which is designed to result in changes to people's personal behaviour.

8.2.3 The faecal-oral transmission route, which causes diarrhoea

If pathogens from human faeces enter a person's mouth and are swallowed, they will cause diarrhoea. If proper treatment is not given, this can prove fatal, particularly to children. The pathogens can enter the mouth in a number of ways; these include:

- *Directly from a person's hands or fingers*; pathogens get onto the hands or fingers if hands are not washed after a person has defecated, or, hands come into

contact with someone else's faeces on the ground (such as when small children are crawling or playing on the ground or when adults clear up a child's faeces).

- *Indirectly from a person's hands*, if not washed after defecation: (from food which has been prepared by them, from food which is eaten with dirty hands, from cups or other utensils, handled by dirty hands).

- *From food*, if this has been contaminated by flies which settle first on excreta, in a latrine or on the ground, then transfer faeces to food by settling on it

- *From water;* if it has been contaminated by faeces.

- *From soil*, if this contains faeces, they can be transferred: (by hands which are not washed before eating, or, by crops which are not cleaned properly before cooking, or not cooked properly).

9. Cost Estimates

9.1 Average Construction Cost Estimates

9.1.1 Water supply schemes

The estimated costs for pond scheme and subsurface dam scheme alternatives (based on the preliminary designs as developed by the Consultant). The basic costs of civil works, materials and equipment are based on the information obtained from different contractors and NGOs involved in construction activities within Maiwut County

9.1.2 Water supply schemes

The cost of a subsurface dam scheme is estimated by assuming that the chosen site is suitable for clay-concrete type of construction. In addition, width across the Lau stream bed is 30 m and a 1.0 m wide strip has to be excavated. Similarly, the cost of a pond scheme is estimated with the assumption of a 6.0 m deep pond under the natural ground surface to provide a gross storage of 4,000 m3. The resulting cost estimates are shown by Tables 10 and12.

The users per pond scheme and subsurface dam scheme are assumed to be 300 and 150 persons respectively. The per capita costs for pond schemes are US$ 53.73 (of which US$ 11.20 and US$ 42.53 are contributed by the External Support Agency, ESAs and Community, respectively). Similarly, per capita costs for subsurface dam schemes are US$ 37.53 of which US$ 21.53 and US$ 16.00 are contributed by the ESAs and Community, respectively).

9.1.3 Latrines

Costs estimates of full-scale demonstration latrines and latrines for the public use are given by Table 12.

9.2 Operation and Maintenance Costs

The cost of operating the project when it is finished must be considered at an early stage. For the WRDM schemes of Lau watershed, salaries of caretakers, replacement and maintenance costs for pumps and structures and hand tools must be considered in the Operation and Maintenance budgeting. With proper maintenance, it is expected that

these facilities will have a lifetime of 20 years. The annual operation and maintenance costs of the facilities shall be assumed to be 4.0 percent of the total cost.

9.3 WRDM Programme Partial Costs

The requirements for achieving the water supply component of the WRDM programme targets are estimated at US$ 1218 thousand (see Table 13), out of which US$ 369.04 thousand is contribution of ESAs and US$ 848.96 thousand is the contribution of the users. Due to capacity constraints, the programme will start with costs estimated at US$ 87,000 in 2008 will gradually increase to an annum or US$ 435,000 in 2011.

Similarly, the requirements for achieving the latrine component of the WRDM programme targets are estimated at US$ 228.48 thousand (see Table 14), out of which US$ 175.84 thousand is contribution of ESAs and US$ 52.64 thousand is the contribution of the users. Again, due to capacity constraints, the programme will start with costs estimated at US$ 16,320 in 2008 will gradually increase to an annum or US$ 81,600 in 2011.

The overall summary of constraction cost estimates and expenditure schedule for the entire WRDM component (water supply and latrine) is shown by Table 15. The expected contribution from ESAs is US$ 544,888 whereas the expected labour and local material contribution from the benefiaries is US$ 901,600. This implies that 37.67% and 62.33% of the contribution come from ESAs and the beneficiaries, respectively.

Table 10: Estimated costs for construction of a single pond water supply scheme

Description	**Unit**	**Cost (US$)**	**Cost (%)**
External support			
Ordinary cement	24 bags	300	1.86
Reinforcement bars, wire nails, binding wire		1000	6.20
Timber (various sizes)		120	0.74
Human-powered pumps (hand & treadle)		2000	12.41
Hand tools		300	1.86
Skilled man power	20 days	500	3.10
Sub-Total		**2860**	**17.74**
Comminty contribution			
Excavation for water storage	4000 m^3	12000	74.44
Excavation for extraction facilities	200 m^3	1000	6.20
Building sand	20 m^3	100	0.62
Other local materials		20	0.12
Access road clearing		100	0.62
Security guards	15 days	100	0.62
Sub-Total		**12760**	**79.16**
Other expenses by the Coordination Unit			
Transportation of materials to site		100	0.62
Supervison feul for project vehicle		400	2.48
Sub-Total		**500**	**3.10**
Grand TOTAL		**16120**	**100.0**

Note: *Useable capacity of the assumed pond = 3000 m^3 and assumed to be sufficient for 300 persons*

Table 11: Estimated cost for construction of a single subsurface dam water supply scheme

Description	**Unit**	**Cost (US$)**	**Cost (%)**
External support			
Ordinary cement	40 bags	500	8.88
Reinforcement bars, wire nails, binding wire		100	1.78
Timber (various sizes)		30	0.53
Human-powered pumps (hand & treadle)		1000	17.76
Hand tools		100	1.78
Skilled man power	40 days	1000	17.76
Sub-Total		**2730**	**48.49**
Comminty contribution			
Clay soil/ Anthill soil	80 m^3	800	14.21
Building sand	20 m^3	100	1.78
Other local materials		50	0.89
Excavation and re-filling	250 m^3	1250	22.20
Access road clearing		100	1.78
Security guards	15 days	100	1.78
Sub-Total		**2400**	**42.63**
Other expenses by the Coordination Unit			
Transportation of materials to site		100	1.78
Supervison feul for project vehicle		400	7.10
Sub-Total		**500**	**8.88**
Grand TOTAL		**5630**	**100.0**

Note: *Useable capacity of the assumed subsurface reservoir* $= 1500\, m^3$ *and assumed to be sufficient for 150 persons*

Table 12: Estimated cost for construction of a single latrine

Description	Unit	Cost (US$)	Cost (%)
External support			
Ordinary cement	12 bags	150	7.35
Reinforcement bars, wire nails, binding wire		100	4.90
Timber (various sizes)		20	0.98
Hand tools		300	14.71
Skilled man power	20 days	500	24.51
Sub-Total		**1070**	**52.45**
Comminty contribution			
Excavation of pit	10 m^3	150	7.35
Building sand	20 m^3	100	4.90
Other local materials		20	0.98
Access road clearing		100	4.90
Security guards	10 days	100	4.90
Sub-Total		**470**	**23.04**
Other expenses by the Coordination Unit			
Transportation of materials to site		100	4.90
Supervison feul for project vehicle		400	19.61
Sub-Total		**500**	**24.51**
Grand TOTAL		**2040**	**100.0**

Table 13: Cost estimates and expenditure schedule of water supply projects

Description	Unit	Year 2008	2009	2010	2011	Total
Number of pond schemes (PSs)		4	12	20	20	**56**
Number of subsurface dam schemes (SSDSs)		4	12	20	20	**56**
Number of pond schemes (PSs) + SSDSs		**8**	**24**	**40**	**40**	**112**
Number of persons served by PSs		1200	3600	6000	6000	**16800**
Number of people served by SSDSs		600	1800	3000	3000	**8400**
Number of people served by PSs + SSDSs		**1800**	**5400**	**9000**	**9000**	**25200**
Cost of PSs contributed by ESAs		13440	40320	67200	67200	**188160**
Cost of PSs contributed by the Community	US$	51040	153120	255200	255200	**714560**
Cost of SSDSs contributed by ESAs	US$	12920	38760	64600	64600	**180880**
Cost of SSDSs contributed by the Community	US$	9600	28800	48000	48000	**134400**
Total cost contributed by ESAs	US$	26360	79080	131800	131800	**369040**
Total cost of contributed by the Community	US$	60640	181920	303200	303200	**848960**
Total Investment Cost	US$	**87000**	**261000**	**435000**	**435000**	**1218000**

Table 14: Cost estimates and expenditure schedule of latrines

Description	Unit	Year 2008	2009	2010	2011	Total
Number of latrines		8	24	40	40	**112**
Number of persons served		1200	3600	6000	6000	**16800**
Cost contributed by ESAs	US$	12560	37680	62800	62800	**175840**
Cost contributed by the Community	US$	3760	11280	18800	18800	**52640**
Total Investment Cost	US$	**16320**	**48960**	**81600**	**81600**	**228480**

Table 15: Summary of constraction cost estimates and expenditure schedule

Description	Unit	Year				Total
		2008	2009	2010	2011	
Water supply schemes						
Cost of PSs contributed by ESAs	US$	26360	79080	131800	131800	**369040**
Cost of PSs contributed by the Community	US$	60640	181920	303200	303200	**848960**
Sub-Total	US$	**83000**	**249000**	**415000**	**415000**	**1162000**
Latrines						
Cost of PSs contributed by ESAs	US$	12560	37680	62800	62800	**175840**
Cost of PSs contributed by the Community	US$	3760	11280	18800	18800	**52640**
Sub-Total	US$	**16320**	**48960**	**81600**	**81600**	**228480**
Total cost contributed by ESAs	US$	38920	116760	194600	194600	**544880**
Total cost of contributed by the Community	US$	64400	193200	322000	322000	**901600**
Total Investment Cost	US$	**103320**	**309960**	**516600**	**496600**	**1446480**

10. Participatory Planning, Design and Construction Process

10.1 Awareness creation visit / Public meetings

This is usually a visit paid to an area by Project Staff a day preceding a Community Dialogue. It is meant to create awareness. The whole community that is going to benefit from the intended/planned intervention, including chiefs, elders (male and female), opinion leaders, group leaders, development workers, youth and children, are contacted. The outcome of the visit is the agreement on the need to hold a community dialogue. The participants, venue and time are all agreed upon by consensus.

10.2 Social survey, dialoguing, site identification, technical and social assessment

Project Staff and Community members (including influential persons e.g. administrators, politicians, elders (both men and women), youth leaders and any other development agencies within the area) hold a meeting during which concerns of the area are discussed. Through a participatory approach and the use of PRA tools, inherent problems are identified and ranked.

Plans on how to solve the problems are discussed plenary. Ownership, number of beneficiaries and their participation and involvement, timing of construction are discussed.

In the case of water problems, community members are educated on the various types of water extraction technologies and their advantages and disadvantages are compared. Here, the pond, subsurface dam and latrine technology mostly happens to outdo the others on its advantages. The community members are then informed of the suitable site selection criteria for a subsurface dam construction.

Finally, the participants are asked to name such sites in their respective areas. These sites are documented for the next course of action, and that is a technical assessment.

Technical assessment of sites recommended by participants as suitable for pond, subsurface dam and latrine construction is undertaken in collaboration with the Project Coordination Unit. The assessment ranks the visited sites in order of their suitability.

10.3 Early formation of a WRDM Committee

It is essential that the community is involved in decision making at an early stage and that local people determine the type of scheme, as far as it is technically possible, which they feel will serve them best.

This is best achieved by the formation of a committee, in which the whole community, whether a small town or just a group of homes around a spring, must be involved. Every effort should be made to make this committee truly representative of all the interests in the community, with men and women being equally represented on it. This committee will make decisions regarding all aspects of the project; these are likely to include such matters as:

- The type of scheme
- The location of water supply points, ponds, subsurface dams, etc
- The method of construction
- Whether the initial contribution should consist of cash or labour
- The method of payment to accumulate funds for eventual repairs
- The daily maintenance and cleanliness of the system

10.4 Memorandum of Understanding

The best suited sites are once more visited and a dialogue (meeting) with the benefiting community is held. During the meeting, the Project Staff and the beneficiaries discuss the impending WRDM projects. Responsibilities are defined; a community committee is established.

Accordingly, a binding document in the form of a social contract or Memorandum of Understanding (MoU) is drawn and signed for by representatives of both the community and the Project. The MoU clearly defines the role of the partners i.e. the Community and Project staff. On the part of the Community the MoU states:

- the construction materials in the Bill of Quantities which the community need to supply during the activity
- the action shall take place only when all the required materials are on site • the duration of work not exceeding an agreed time frame
- security of storage of materials on site and supervision.

On the part of the NGO, the MoU states:

- the organization to supply all the construction materials not locally available
- employ skilled labour on casual basis
- provide technical supervision
- train local Water Committees members and Community Water Workers.

A Community Action Plan (CAP) is also drawn on the implementation schedule until completion. This is documented in a tabular format defining all the activities like: What activity, Whose responsibility, and When to be done/achieved.

10.5 Community Mobilization

This includes the actual movement of resources like transportation of equipment and tools to site, engagement of skilled and unskilled labour and finally commencement of construction phases.

Elderly community members are in charge of mobilizing other community members because of their respected position and accepted authority in the community.

- A member of WRDM Committee will be representing the community in other forums like workshops and meetings. He/she receives some facilitation allowance for the task of mobilization and during workshops/meetings.

- ***Pyam*** Administrator. As a government representative at the grassroots' level, he/she is in charge of coordinating all development activities. He/she advises elderly on community mobilization and participation. He/she receives an allowance during workshops and meeting.

- Women from the community
  - Construct temporary storage structure for materials at work sites
  - Dig quality clay from anthills and transport it to work sites
  - Sieve quality clay ready for compaction
  - Deliver clay to compaction team
  - Fetch water for use at working site and for clay compaction. Other women remain behind and carry out the usual normal homes chores and duties. They receive food during working hours.

- Men from the communities
  - Clear the access road to work site
  - Excavate dam trenches
  - Collect and deliver building sand and ballast to site
  - Spread, moist and compact clay in the trench
  - Assist Community WRDM Workers in concrete mixing and casting of the wall cover
  - Provide security at the site area. They receive food during working hours. Cash allowances for those assisting the Community WRDM Workers.

- Community WRDM Workers/ Construction Site Foremen
  - In charge of all work activities on site
  - Ensure work progress according to plan
  - Carrying out clay suitability tests

- Provide training on the job to other community members on site. Cash incentive after successful completion of activity.

- Government organizations in charge of water development and management
  - Back up technical support during Community Dialogues
  - Technical assessment for pond, subsurface dam and latrine site suitability
  - Impact assessment, monitoring and evaluation of the activities

10.6 Trainings

10.6.1 Trainings for Community WRDM workers

A Curriculum agreed upon between the Project manager and government representatives, is used for Community WRDM Workers training.

The objective of the training curriculum is to impart the community nominees with:

- basic technical skills that would be useful for suitable pond, subsurface dam, sand-filter, well-shaft and latrine site identification.
- knowledge to read and translate simple construction designs.
- Pond, subsurface dam and latrine construction and maintenance skills.

The training content is spread through 10 to 15 days training duration venued within the project area nearest to some completed ponds, subsurface dams and latrines or under construction.

Training manual content:

- technical drawings
- means of water extraction
- river courses and underground formations
- pond, subsurface dam and latrine technology
- well shafts and hydrodynamic wellhead designs
- construction and materials
- human powered pumps installation, operation and maintenance
- community mobilization, organization and management.

Two trainees are nominated from each completed pond, subsurface dam and latrine area for such training. Tool boxes containing masonry kits are issued to the best graduates who are now in the verge of becoming pond, subsurface dam and latrine constructors. Some further advanced training is necessary before they get commissioned to stand on their own.

10.6.2 Trainings for WRDM committees

These are *village level WRDM committees* who are trained *to manage their respective water facilities*. The curriculum is jointly designed by the Project Manager and line ministry representatives.

Participants are derived from all WRDM Committees at the completion of ponds, subsurface dams and latrines.

The training objective is to *enhance community awareness* on their roles in proper use, operation, maintenance and sustenance of the available water resources under their jurisdiction through Management Committees of their respective water facilities.

The 3-day duration training covers the following content:

- formulation of an Beneficiaries Committee.
- roles and responsibilities of Management Committees.
- Pond, subsurface dam, sand-filter, well-shaft and latrine technology – value, criteria and construction.
- natural Resources Management and Maintenance – water points and environment.
- constitution of by-laws.
- conflict resolutions.
- elementary bookkeeping.

The WRDM committees that were trained in the initial projects can be active in their respective areas of operation.

- Conduct technical assessment of pond, subsurface dam and latrine site suitability.
- Facilitate MoUs development.
- Supervise construction works including approval of clay for construction work.
- Provide ordinary cement for pond, subsurface dam and latrine to cover concrete casting.

10.7 Supervision of Construction/Monitoring

As the work continues, supervision is provided to ensure quality workmanship according to plan and design. This is done by regular visits by the project staff and representatives of line ministries when the construction is on-going.

The community elders should also provide supervision, ensuring nothing goes wrong. Full responsibility of supervision, however, lies with the Construction Foreman/ Supervisor.

Data from each completed pond, subsurface dam and latrine are collected on a regular (monthly) basis for at least the first 6 months.

This information is meant to give guidance on water use by livestock against time. It also gives monthly comparison and one is able to monitor the water table of the ponds, subsurface dams and latrines.

A good watertight subsurface dam maintains water at higher level at the upstream at the downstream. If the water level at the upstream is the same downstream, then one is bound to suspect wall leakage or lateral escape of water.

10.8 Completion and Commissioning

After completion of the construction works, a final inspection is done jointly with the community elders, local administrators and community members. This is meant to certify that the works were successful completed. Any suspected defects or poorly done sections are noted. Those that require immediate corrections are acted upon. The rains are waited for to test water tightness.

There is usually a handing over ceremony whereby the responsibilities of managing the water facility are handed over to an elected interim WRDM Committee. Two trainees are selected and recommended by the community members for training on Basic Construction Skills. The organization takes note of all these and reminds the community of their role of monitoring the water use and behaviour of the water table.

11. Basic Principles in WRDM

11.1 Introduction

Community-driven development multisector projects are increasingly being used as a mechanism for channeling funds to communities to undertake development activities. These approaches often provide efficient ways to deliver community-based investments, and can empower communities by allowing them to define their own priorities and to manage subproject implementation.

Water Resources Development and Management (WRDM) is definitely a high priority in Lau watershed communities and there is a high probability that these communities will be actively participating in the planning and implementation of WRDM subprojects. However, a persistent challenge is how to ensure the quality and sustainability of the services that these WRDM subprojects are designed to provide.

11.2 Key Characteristics of WRDM

Lau watershed WRDM provides potable water for domestic uses (for example, drinking, eating, cooking, bathing, and hygiene), livestock, fish production, honey production and requires the supply of high-quality water on a continuous basis. In the Lau watershed, community members (especially women) spend a considerable amount of time trying to provide sufficient water for these uses. The WRDM subcomponent is expected replace/improve traditional sources of water, which have inadequate quantity and also contaminated and in most of the cases also located at a far distant from the household. Improved WRDM solutions include a range of technologies such as improved ponds, subsurface dams and protected water extraction shafts equipped with human-powered operated pumps. The technical solutions are very location specific and will depend on a range of characteristics such as community demand, affordability and willingness to pay, community size and household density, water resources and topographical issues.

The *health benefits* of improved water and sanitation services derive mainly from the safe disposal of human excreta and the adoption of sustained and effective use of water for hygienic purposes. These objectives often need to be achieved through intensive community sensitization campaigns, based on the existing practices and beliefs of the population. Technical solutions for sanitation will depend very much on household preferences and will consider many factors, such as cultural and gender issues, traditional building materials, costs, water supply availability, environmental concerns, and the legal and policy environment.

WRDM services need to be managed and paid for. Experience shows that community-based management solutions are the most appropriate, as long as the community organization is representative, accountable, and has the capacity to implement its tasks, and there is an adequate tariff and cost recovery mechanism in place to pay for the costs of supplying the service. It is essential for communities to make informed choices about the costs to be incurred, as the estimated tariff must take into account maintenance costs as well. Years of experience also show that community-based management committees need access to technical assistance on a continuous basis. This assistance can be provided by local government, a national sectoral agency, or the private sector.

The *institutional and policy framework* in which the multisector project operates, and the rules and procedures adopted during project implementation, are critical to the success and sustainability of community WRDM subprojects. It is important that the roles and responsibilities of stakeholders (primarily communities, the private sector, and the government) are clearly defined, within an appropriate legal framework of ownership and management. This should include, but not be limited to, an autonomous, community-elected water users association to operate the service, set tariffs and manage funds, and ensure continuity in the provision of service.

Capacity building and training at a local level are also highly linked to the project's success. Experience tells that for operations and maintenance to be long lasting, communities need to be trained before, during, and after facility construction, make choices based on all available options, and be given the opportunity to develop their capacity.

Two fundamental characteristics of WRDM can be summarized as follows:

- ***First key characteristic****: WRDM involves the provision of a continuous service, and this service requires management and generates costs.* Understanding this basic concept is fundamental to improving performance of WRDM subprojects. A reliable level of service that the communities can afford and for which they are willing to pay must be ensured.

- ***Second key characteristic****: Water is increasingly viewed as an economic as well as a social good.* This is reflected in the users. willingness to pay for the cost of the service. WRDM practitioners around the globe agree that this concept . referred to as the demand-responsive approach . is essential to successful water supply projects, because it establishes the basis for sustainable operations and maintenance and provides a framework for communities to make informed choices as to the level of service they desire and can afford.

Other related characteristics include:

- *WRDM components have immediate and direct welfare consequences.* The failure or malfunction of WRDM systems has direct welfare consequences on the beneficiaries . they no longer have water for essential daily life. Thus, the social cost of poor operations and maintenance is high.

- *WRDM components are essentially interdisciplinary in nature.* Investments in water supply cannot achieve their full potential benefit, and ultimately their poverty reduction goals, without complementary efforts in hygiene and sanitation, environmental protection, and sustainable water consumption.

- *WRDM investments involve multiple alternatives for design and level of service.* Communities need to be aware of, and participate in, the choice of these alternatives, because it will have implications for the size of the investment and the cost of future operations and maintenance.

- *Adherence to quality standards is an essential ingredient for sustainable service delivery.* Quality work is necessary for ensuring long-lasting investments. Construction and equipment installation must therefore be carried out by trained professionals from the beginning.

- *Sanitation and hygiene aspects should be seen as distinct activities within WRDM.* In contrast to water supply, rural sanitation systems . entailing household latrines and drainage . do not generally lend themselves to a fee-for-service framework. They involve a strong software aspect, which focuses on awareness and behavioral changes that extend to the household level and recognize women as key actors, as well as on synergies with education and health projects.

- *WRDM includes hardware and software aspects.* Successful and sustainable WRDM projects include not only the infrastructure investment (for example, wells, pipes, pumps, and latrines), but also the software aspects of service management and promoting health and hygiene practices.

11.3 Demand-Responsive Approach and Willingness to Pay

Fundamental to WRDM jargon are two concepts, the demand-responsive approach and willingness to pay, both of which are interlinked.

Four overarching principles encompass the notion of the demand-responsive approach: (a) water should increasingly be managed as an economic as well as a social good; (b) management should be focused at the lowest appropriate level; (c) a holistic approach to the use of water resources should be employed; and (d) women should play a key role in the management of water.

The fundamental characteristics of the demand-responsive approach are:

1. *Community members make informed choices* about:

    - Whether to participate in the project

- Technology and service-level options based on their willingness to pay for various levels of service (higher levels of service are more expensive)
- When and how their services are delivered
- How funds are managed and accounted for
- How their services are operated and maintained.

2. *Government plays a facilitative role*, setting clear national policies and strategies, encouraging broad stakeholder consultation, and facilitating capacity building and learning.

3. *An enabling environment is created* for the participation of a wide range of providers of goods, services, and technical assistance to communities, including the private sector and nongovernmental organizations (NGOs).

4. *An adequate flow of information is provided* to the community, and procedures are adopted for facilitating collective action decisions within the community and between the community and other actors.

If it is understand that water is an economic good, it is also true that the poor are no different from anyone else in their willingness to pay for reliable water supply services. In most of the cases the beneficiary community members pay for water supply services, either in time, labor, or money. Experience is also showing that, if asked, households are often willing to pay more for water than the established rate.

Several methods are can be in use to quantify the willingness to pay at the subproject level:

- Determine what people are currently paying under similar and existing schemes (revealed preference surveys)
- Carry out household surveys, using such methods as the contingent valuation method
- Carry out focus group discussions on various service and payment options.

In assessing alternatives methods that can be used to quantify the willingness to pay at the subproject level, the multi-sector project should keep in mind that the whole point of the exercise is to facilitate informed choice on investment options and determine a fair basis for setting tariffs that will ensure sustainable operations. In this context, the key question is: Does the established rate cover the real costs of offering the desired level of WRDM service, and are consumers willing to pay that amount?

11.4 Policy and Institutional Environment

Reliability and sustainability of community-based WRDM services depend on a series of technical, financial, and management support networks, all of which operate within a policy and legal framework.

Understanding the nature, strengths, and weaknesses of this environment will help the task manager to design WRDM interventions that have the greatest chance of sustainable service delivery.

Good practice in WRDM has tended towards decentralized ownership and management of assets and service delivery. This approach agrees well with the trend towards decentralization and community-driven development. The following summarizes the general distribution of roles among stakeholders at various levels:

National agencies (usually ministries) are increasingly acting as adviser, facilitator, and trainer to local governments and communities, who themselves are organizing procurement of WRDM equipment and services. In this revised role, national agencies also define and certify quality norms, procurement standards, and training programs for WRDM equipment and service suppliers.

Local governments (state, county, and similar administrative units) usually provide support to communities (such as villages) in planning, procurement of equipment and services, and training. In some cases, local governments themselves may organize the procurement of equipment and services on behalf of multiple communities.

Communities (usually villages, market centres or administrative centres) should be the owners of the WRDM assets, with the responsibility for ensuring service provision and operations and maintenance. This includes procurement of the equipment and services, as well as setting and collection of user fees to ensure continuous financial self-sufficiency of service delivery and operations and maintenance.

The private sector (including equipment and spare parts suppliers, operations and maintenance providers, and NGOs) are contracted by the communities to provide a range of WRDM support services, which could include equipment and spare parts supply, operations and maintenance, organizational support, and training. These are done under accountable and transparent procurement procedures, and according to national standards and regulations.

11.5 Basic Design Principles

Below are best practice design principles in WRDM to be used when assessing the country situation and designing the project interventions. Annex … highlights these principles in relation to major thematic areas.

1. Promote a demand-responsive approach whereby communities make informed choices regarding their participation, service level, and service delivery mechanisms.

2. Promote institutional reform based on clear roles for key stakeholders whereby communities own their facilities, the private sector provides goods and services, and government facilitates the process.

3. Ensure an appropriate legal framework for ownership and management.

4. Implement WRDM projects within the context of broader community and local government development.

5. Establish financial policies underpinning a demand-responsive approach whereby communities pay part of the capital cost in proportion to the cost of the facilities, and all operations and maintenance costs.

6. Support formation of representative water users associations for planning, implementation, and management of community water supply facilities.

7. Create a competitive environment for allowing communities to access a range of providers of goods and services for all aspects of the project cycle.

8. Integrate water, sanitation, and hygiene education in WRDM projects.

9. Promote user investment in sanitation through public awareness and hygiene education, and strengthen the private sector.s ability to construct facilities.

10. Ensure representative and informed participation of all stakeholders.

11. Include clearly defined capacity building components that enable all stakeholders to play their roles and build partnerships.

12. Set rules to target poor, unserved communities and vulnerable groups in these communities.

13. Support community-based environmental management to improve living conditions and protect water resources.

Annexes

A.1: Checklist for WRDM Subproject Component Design

1. Promotion
- A field-tested communications strategy and program
- Trained promoters or facilitators
- Explanation of policy framework (such as demand-responsive approach) and institutional responsibilities.

2. Application and Pre-selection
- Application form designed and field tested
- Pre-selection criteria and procedures established (including score sheets)
- Community facilitation support available.

3. Proposal Formulation/Community Support
- RWDM proposal templates and guidelines
- Guidelines and resources available for community-level technical assistance
- Procedures for recruiting and paying for community-level technical assistance.

4. Appraisal
- Establishment of appraisal criteria and checklist
- Establishment of qualified evaluation team
- Template community subproject agreement.

5. Implementation (Construction and Community Development)
- Eligible project list
- Procurement guidelines and forms
- Flow of funds guidelines and forms
- Community development guidelines and procurement procedures.

6. Operations and Maintenance
- Guidelines for operations and maintenance management, including cost recovery and contracting
- Community-level training for continued service delivery and operations and maintenance management.

7. Monitoring and Evaluation
- Midterm review
- Implementation completion report
- Specific reviews and focused impact studies.

A.2: Sample List of Service-Based Performance Indicators for RWDM

Coverage

- Percentage of households/population with access
- If houses are excluded, what are the reasons?
- Point sources: within a certain distance
- Connections: based on # of households with connections.

Quality, Sanitary, and Environmental Conditions

- Water quality parameters (for example, lead, arsenic, cadmium)
- Measured: daily, monthly, annually
- Other quality parameters (for example, taste, color)
- Sanitary conditions at and around the point sources (for example, protecting potable water sources from animals, proper drainage).

Availability

- Number of days per month service provided, number of hours per day
- Average waiting times at point sources
- Number of days/hours service interrupted.

Operations and Maintenance

- Accomplishment of routine and periodic maintenance tasks according to schedule
- Response time to repair breakdowns
- Types, number, and cost of repairs
- Types, number, and cost of spare parts replacements.

Financial Issues

- Does established tariff level cover recurrent administrative and operations and maintenance costs, major repairs, and system rehabilitation and expansion?
- Cost recovery: amount of tariff arrears, percentage of consumers who have paid
- Is there a positive cash flow? Account balance? Is this sufficient to cover major repairs?
- Maintenance of bank account, financial records
- Is there an audit mechanism? If so, when was the last audit and what were the results?

Consumer Relations

- Time for collecting user fees
- Responsiveness to complaints and inquiries
- Customer satisfaction (from surveys)
- Does management body provide periodic reports to community?

A.3: Checklist for RWDM Project Monitoring and Evaluation Indicators

According to Project Cycle Stages

Pre-planning

- Information about project received by local government stakeholders and communities
- Self-assessment forms distributed and collected
- Partner organization contracted

Planning

- Community-based organizations mobilized, formed, and registered
- Feasibility studies and designs completed
- Staff in local government trained by the project

Implementation

- Percentage and total population covered by water supply facilities
- New sanitation facilities under construction, completed, and under rehabilitation by type
- Percentage community coverage by hygiene promotion
- Community-based organizations trained by type of training
- Project agreements maintained with local authorities
- Sector development plans and budget allocations approved

Operations and Maintenance

- Operations and maintenance expenditure and cost recovery rates
- Water quality
- Number of water users
- Sanitation facilities in regular use
- For hygiene awareness, hand-washing after toilet use

According to Stakeholders Involved

Village/Community – Indicators Phase

- Local government held community-wide meeting for community participation in project planning and management for (a) technology selection; (b) procurement of material in bulk; and (c) ratifying operations and maintenance charges *(planning, implementation)*
- Percentage of households that contributed cash/labor/kind against total number of user households *(planning, implementation)*
- Percentage of operations and maintenance collection against the required target ***(operations and maintenance)***

County – Indicators Phase

- Multidisciplinary group in place *(pre-planning)*
- Amount of proposals approved by (date) as a percentage of allocations made and communicated by the state for the year *(planning)*
- Percentage of periodic review visits undertaken in the last quarter as against planned for the quarter *(planning, implementation, and operations and maintenance)*

Nile State/ GOSS – Indicators Phase

- Is there a signed MOU with the government based on a vision document along with an action plan? *(pre-planning)*
- Percentage of persons (different stakeholders) trained as against targeted in the quarter as per state's capacity building plan *(all phases)*
- Percentage of periodic review visits undertaken in the last quarter as against planned for the quarter *(planning, implementation, and operations and maintenance)*

A.4: Duties and Responsibilities a Typical Village WRDM Committee

1. Functions of the Village WRDM Committee:
   a) The Village WRDM Committee shall collect contribution (cash/labor) for construction works and money from beneficiaries for the operation and maintenance of schemes.
   b) The contribution of members and statement of income and expenditure of Village WRDM Committee shall be made open to public.

   The Village WRDM Committee, along with its support organization, shall discuss all possible options of the drinking water supply scheme and the drainage system for excess flood; and shall select the optimum option based on its merits and demerits and on the labour and financial capacity of the villagers.

2. The committee, with the participation of the village, shall place all the community action plans before the general meeting of the village, wherein one adult member from each household must be necessarily present. The meeting will be held according to the determined quorum. (Quorum: Presence of adult members of more than half of the households of each cluster in the village).

3. The committee shall measure, in every season (wet and dry), the water at the source and shall maintain its record. It also shall prepare a plan of necessary environmental arrangement to conserve the source of water.

4. The committee shall conduct the capacity development programs and shall get deposited the prescribed contribution for latrine, compost pit, soak pit, garbage pit, rain water tank, tree plantations, rain and flood water harvesting, etc., according to the demand and shall make the amount of grant available to the beneficiary. At the same time, it shall also get deposited the prescribed contribution and maintenance advance for the proposed scheme.

5. The Village WRDM Committee shall be free to determine the water-fee for the operation and maintenance of the constructed drinking water scheme/schemes in the village and the existing ones in whichever condition it may be. To maintain uninterrupted water supply in the village the Village WRDM Committee shall prepare the annual income/expenditure budget, by fixing the water tariff to be levied upon the consumers and place it before the general meeting of the village to pass a resolution to pay all the dues regarding the operation, maintenance, wear and tear, etc., for the water supply scheme/schemes, from the said proposed water-fee.

6. In case of any conflict on issues like construction of water supply schemes, maintenance, acquisition of land for construction, water pollution, water tariff collection, etc., the committee, with assistance of village level institutions, is free to settle the issue.

7. In order to plan, execute, operate and maintain the drinking water and environmental sanitation works in the village, the WRDM committee shall be free to determine the technological options in the general meeting and assign the various responsibilities to members; form rules of environmental sanitation, cleanliness of home and village and prescribe token pecuniary punishment in cases of their being ignored; deposit the amount so levied in its accounts and issue valid receipt to the person concerned.

Implementation Phase

8. The committee shall undertake to upkeep all pass books and cashbooks of joint and other accounts, voucher files, related store books; register of labor contributions, scheme proceedings, visitors and suggestions, measurement of source, latrines, baseline, healthy home survey, and other allied registers.

9. Storing and maintenance of the material and updating the documents shall be the responsibility of the WRDM committee and it can select and authorize any person for this work, on a voluntary or honorarium basis.

10. Completion of scheme according to the agreement with the concerned organization, making demands of payment and completion of all formalities shall be the responsibility of the WRDM committee. Preparing of the financial accounts and accounts of physical progress shall be the responsibility of the committee, which it will put up before the general meeting and obtain its approval after informing the Multi-Sector Programme Coordination Unit.

Post-Implementation Phase

11. The committee shall be fully responsible to acquire all the constructed works and operate and maintain them. The committee shall have the right to nominate any person/persons (voluntary/selected on honorarium basis) according to the accepted rules for the maintenance of works.

12. The committee shall have the right to collect the amount determined for the operation and maintenance of works from each family and deposit the same every month in the bank account of the committee.

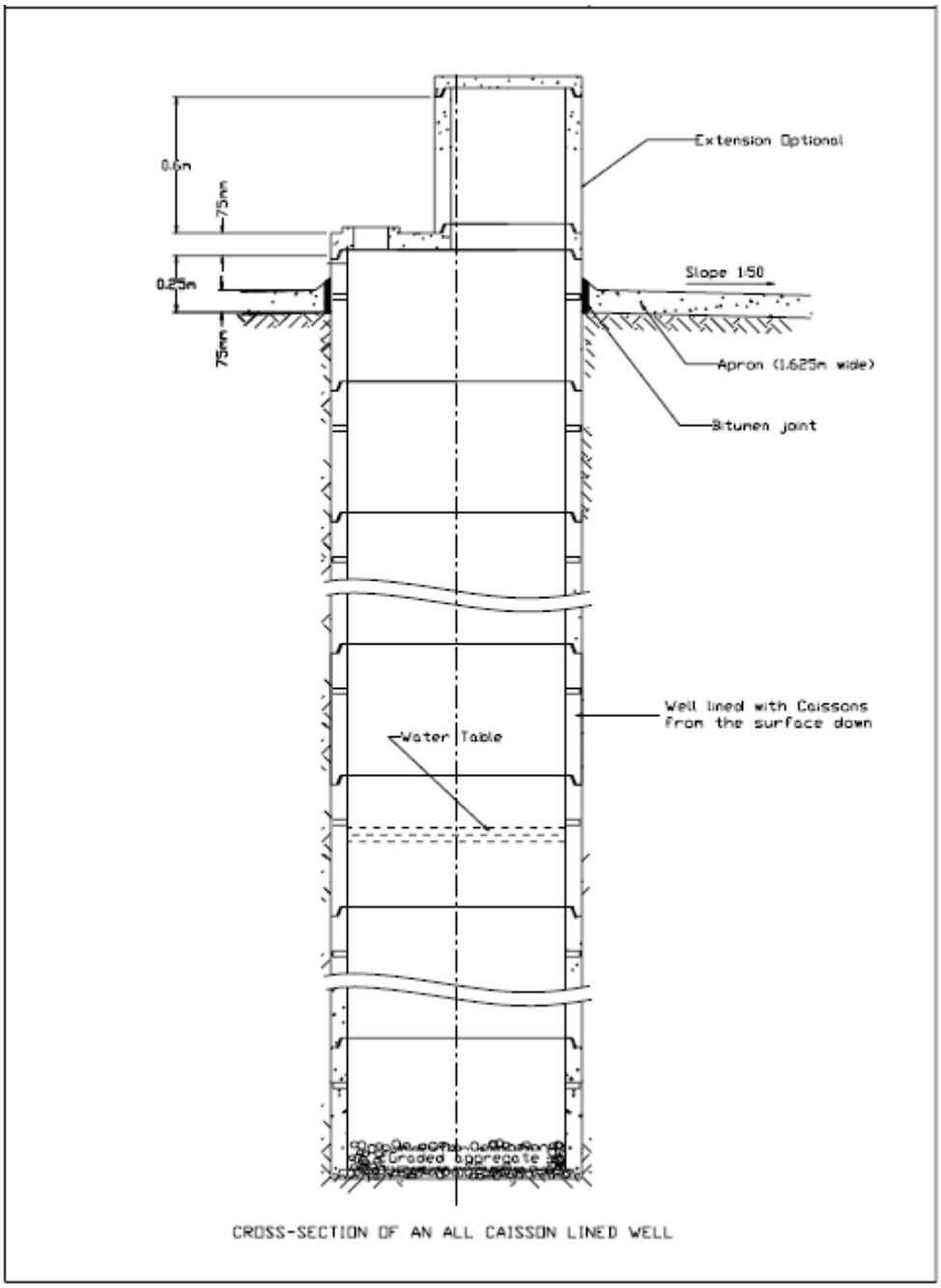
13. In order to meet the maintenance expenditure, the committee shall have the right to increase or decrease the actual costs of water.

14. To ensure benefits of the constructed works of drinking water, sanitation, health, and environmental awareness the committee shall undertake healthy home survey at every (say six) months and discuss the results with village community.

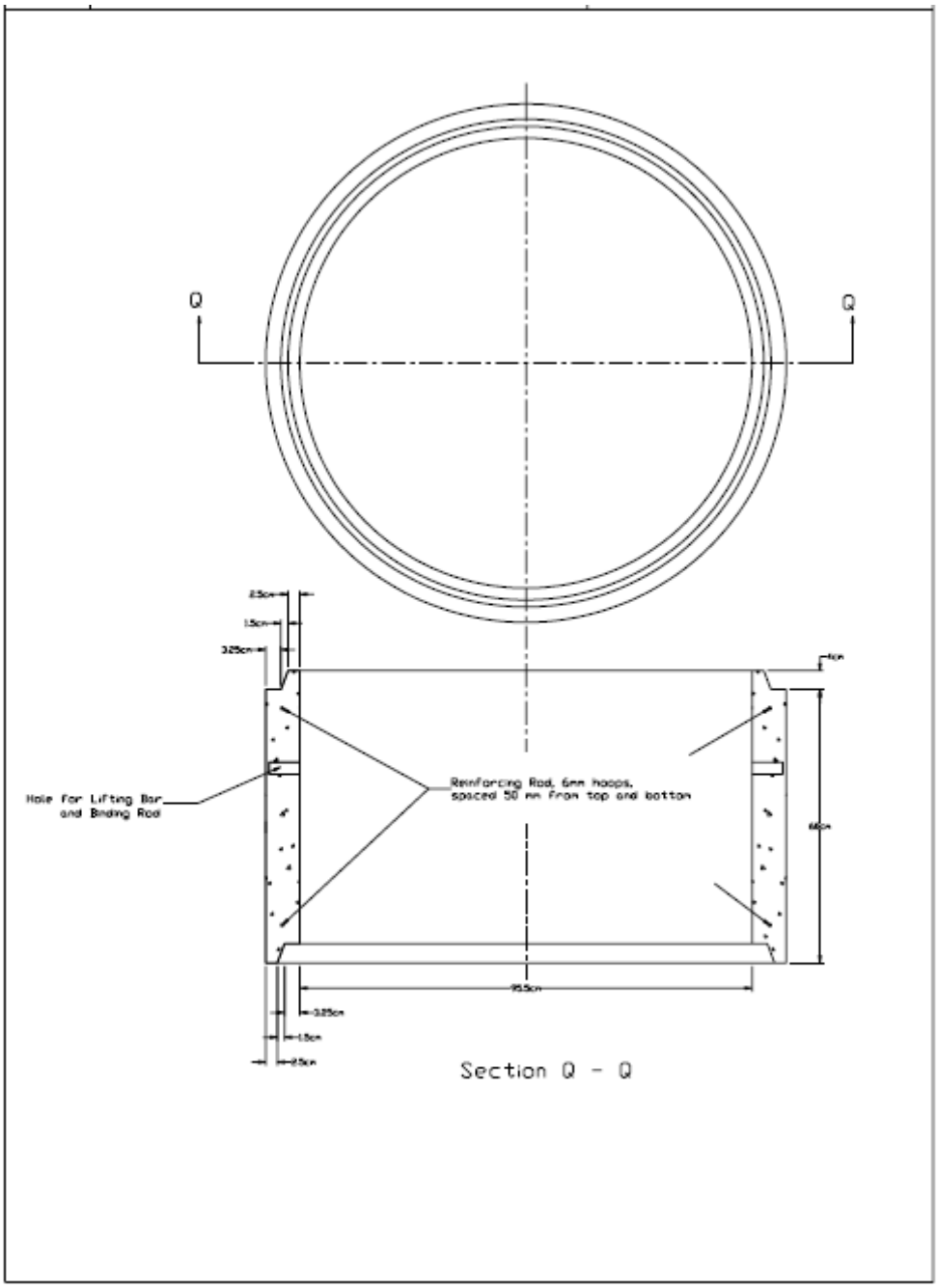
15. Committee will hold at least one meeting every (say one) month. This meeting would review construction works, community development works and physical and financial progresses made towards operation and maintenance.

16. Protecting/preventing water sources: Open defecation, grazing of cattle, disposal of dead bodies, and rubbish dumping shall not be allowed within around 100 meters of the water source. If any one is found doing so, the committee shall have the right to impose a fine of (say 1.0 Sudanese Pound) and even increase the pecuniary punishment in case the offence is repeated.

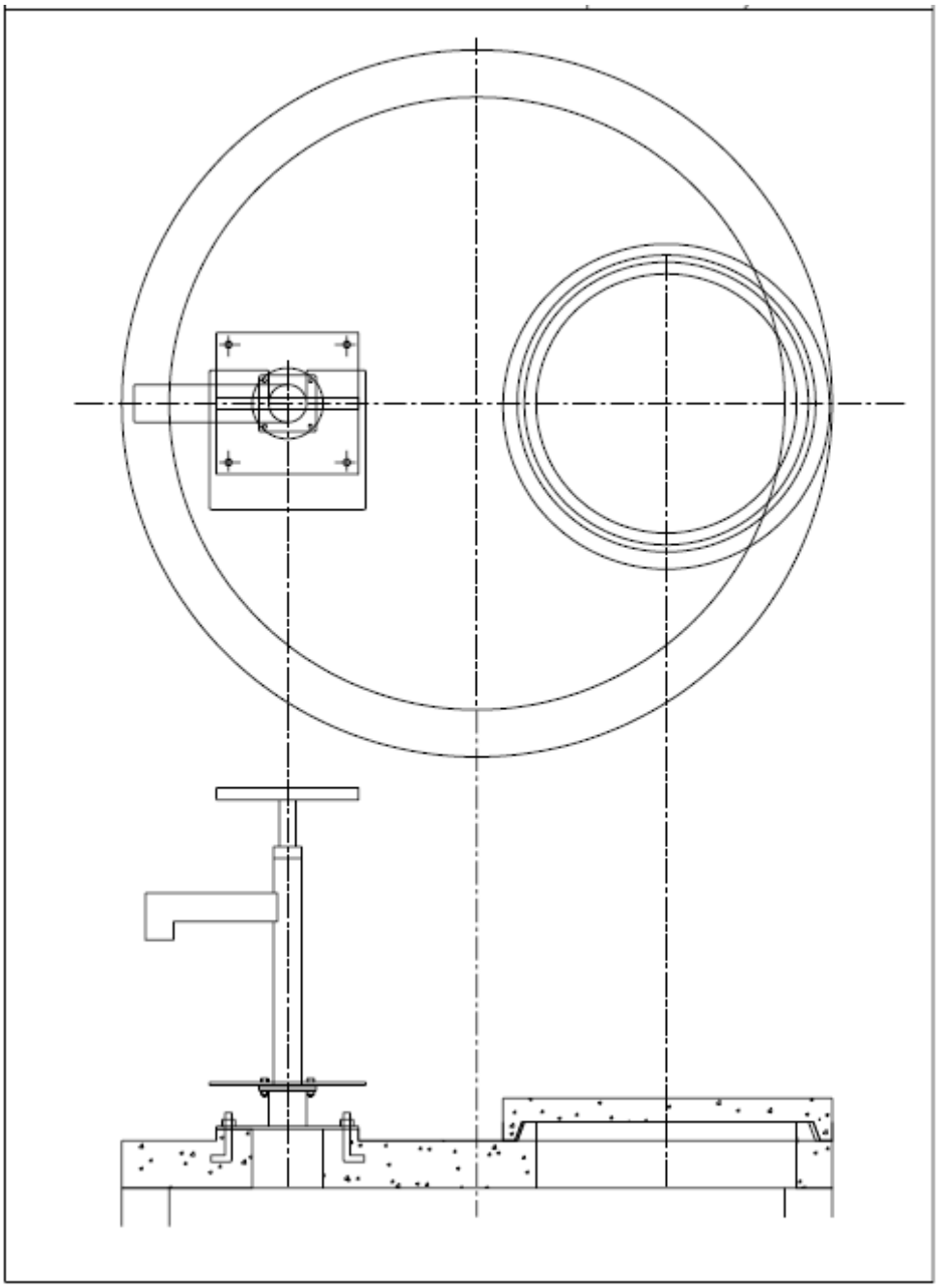
A.5: Drawings of Well-Shaft Caisson and Cover



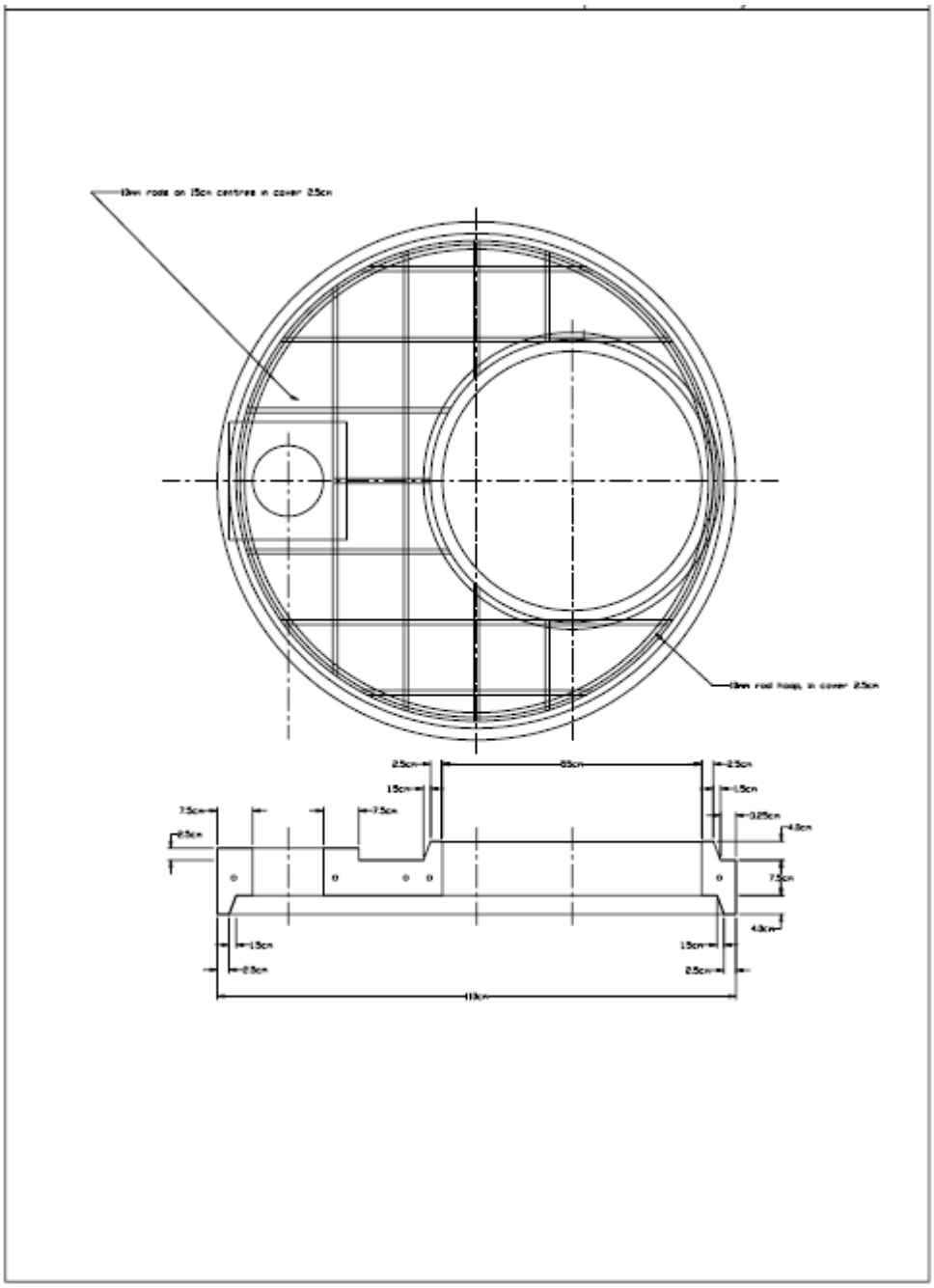
Caisson Lined Well – Drawn by: Steve Abbott (May 2000)



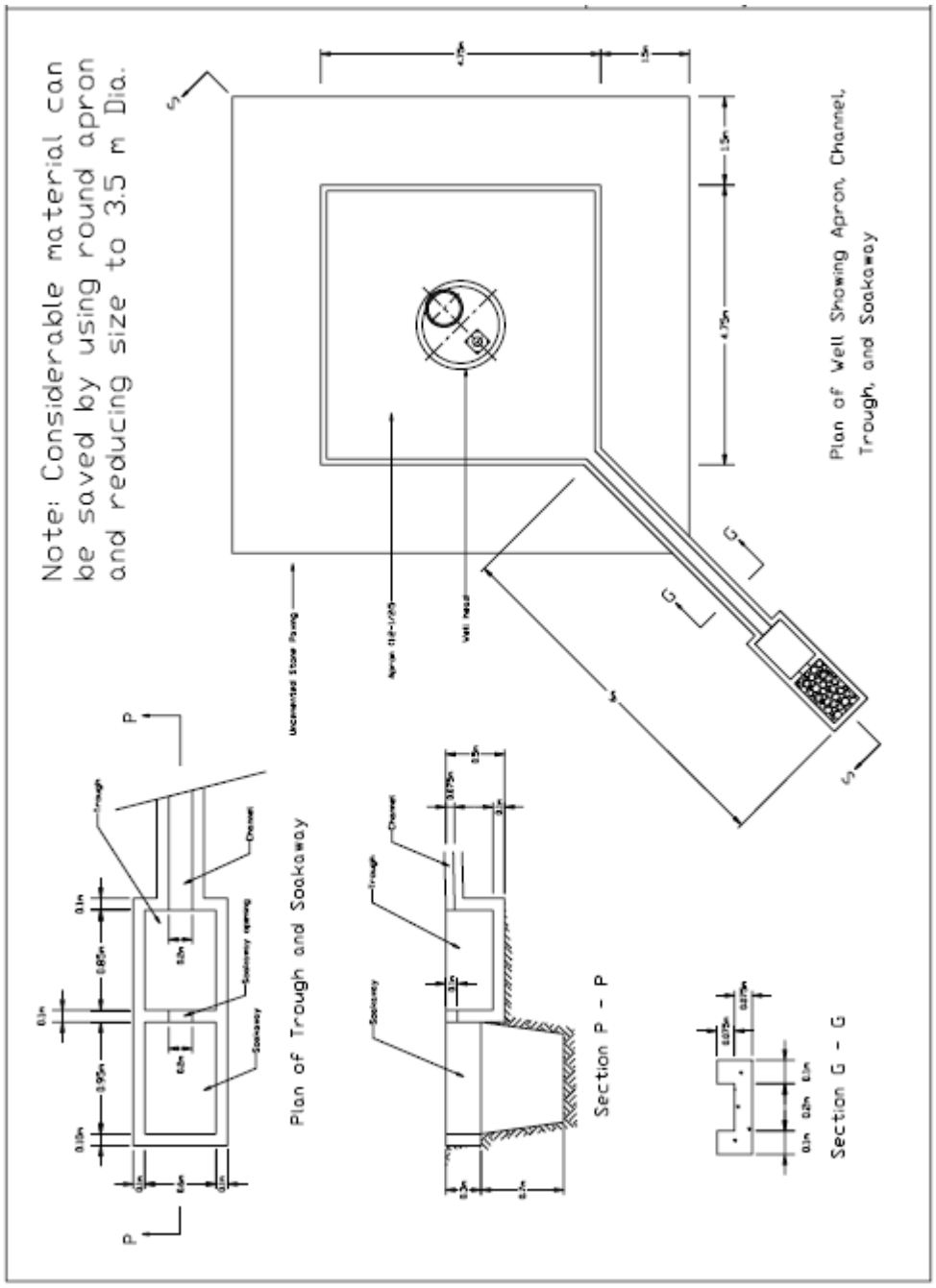
Caisson Ring Detail – Drawn by: Steve Abbott (May 2000)



Cover Assembly with Pump – Drawn by: Steve Abbott (May 2000)



Cover Detail (110 cm) – Drawn by: Steve Abbott (May 2000)



Drainage Detail (Square Apron) – Drawn by: Steve Abbott (May 2000)

Eastern Nile Technical Regional Office

WATERSHED MANAGEMENT FAST TRACK PROJECT IN SUDAN DETAILED PROJECT PREPARATION STUDY

Lau Watershed, Maiwut County, Southern Sudan

Social and Environmental Interim Report

Draft Interim
Stockholm 21 April 2008
SWECO International AB
SWECO International

Project No. 1989151000

SWECO

Abbreviations

ACORD	Agency for Corporation on Research and Development
CBO	Community Based Organisation
CIF	Community Initiative Fund
CLMP	Community land use management and development plans
CPA	Comprehensive Peace Agreement
DNP	Dinder National Park
DNRMC	Development and Natural Resource Management Committee
EIA	Environmental Impact Assessment
ENSAP	Eastern Nile Subsidiary Action Programme
ENTRO	Eastern Nile Technical Regional Office
FTWMP	Fast Track Watershed Management Project
GONU	Government of National Unity
GOS	Government of Sudan
GOSS	Government of Southern Sudan
ICRISAT	
IDP	Internally Displaced Population
IWM&D	Integrated Watershed Management and Development
IWRM	Integrated Water Resources Management
LGRP	Local Government Recovery Programme
LIU	Local Implementation Unit
M&E	Monitoring and Evaluation
NGOs	Nongovernmental Organisation
NIP	Nile Interdevelopment Program
NPA	Norwegian Peoples Aid
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PIU	project Implementation Unit
PRA	Participatory Rural Assessment
PRSP	Poverty Reduction Strategy Paper
RRP	Recovery and Rehabilitation Programme
SSP	Support to States Programme
SSRCC	Southern Sudan Recovery Coordination Committee
UNCHR	United Nations Commission for Human Rights
UNDP	United Nations development Programme
WFP	World Food Programme
WRDM	Water Resources Development and Management

Table of Contents

1 Introduction

This social and environmental analysis of the fast track watershed management project and its specific interventions in Lau Watershed Project Area focuses in particular on:

- Social and environmental baseline assessment
- Analysis of key issues to consider in project preparation
- Identification of potential positive environmental and social impacts of the watershed management activities and measures to improve these.
- Identification of potential environmental and social risks and measures to mitigate these.

This present interim report focuses on the following parts of the full assessment:
- Social and environmental baseline assessment; and
- Analysis of social and environmental key issues to consider for the project preparation.

The present interim report draws together the social and environmental assessment elements that emerged from the first field visit and supplements with additional findings from desk reviews of existing documentation and findings. Hence, the initial social as well as environmental aspects indicated in this report will be studied in detailed and if possible be validated during the detailed assessment field mission to be undertaken in mid-April 2008.

The final social and environmental assessment findings will have a bearing on the Project Design and feed into the Operational Manual and the Environmental and Social Management Framework.

1.1 Approach and Methodology

The social and environmental analysis started with a two week mission to southern Sudan and has entailed initial field surveys and selected consultations. During this first mission it has been proven to be a challenge to adhere to the original proposed methodology for the social and environmental assessment which involve extended field surveys, participatory rural appraisals (PRAs) and participatory community assessments of opportunities in selected study areas. The methodology for the detailed project preparation for the Lau Project Area has been revised as discussed below.

According to the TOR, the Consultant is to develop a participatory methodology for the planning, implementation and monitoring of sub-projects for working with the various stakeholders. Hence, the proposed methodology was to – in addition to traditional tools

for social assessments in the field – test the first steps of a "preliminary participatory project cycle" in the selected Lau Watershed project area. The participatory project cycle would thereafter be modified and adjusted according to experience gained and develop it further. This undertaking would also generate additional data that could feed into the socio-economic assessment above and provide important indications as to the social feasibility of the proposed project interventions.

As a starting point the following course of action would be undertaken:

1. Information meetings with local authority and collection of data to establish socio-economic profile of the area;

2. Orientation meetings at village or village cluster level;

3. Socio- and agro-economic baseline survey using

- Focus group meetings based on a checklist covering the following topics:
a. Population and social diversity;
b. Socio-economic and livelihood conditions;
c. Access to land, land use pattern and utilisation of natural resources and resource dependency;
d. Local institutions, participation experience and social infrastructure;
e. Gender issues;

-Participatory mapping of land use in the area and seasonal calendars

a. Participatory problem identification, analysis and prioritisation
b. Participatory identification of solutions to most urgent problems
c. Participatory development of a community action plan
d. Verification of problem analysis and solutions with locality and unit authorities

However, the above described methodology has been proven difficult to undertake in the Lau project area, mainly due to three reasons:

- Difficulties with mobility in the area for the bio-physical survey
- Difficulties reaching the beneficiaries
- Difficulties using participatory tools since the communities have had little or no previous exposure to such methodologies

The first and main obstacle to perform the participatory social and environmental assessment has been the specific setting in Lau where there is no road network which makes it challenge to reach the primary beneficiaries even in the dry season. The communities are located far away from accessible areas both during wet and dry season. In the wet season the roads are inundated and this is why the communities are completely cut-off from any means of communication. In the dry season the communities move away from the there homes to the marshy areas far away from any road networks.

The second major obstacle is the meagre experience with participatory approaches to planning of development projects. The main reason is the long period of conflict and civil

war during which Southern Sudan has had little exposure to long term development interventions.

Hence, activities 4-6 have therefore proven to be a too advanced type of activity in this early stage of the post-conflict era. Instead, the project preparation team will base the assessment on their own observations and analysis, consultations with supporting institutions and national expertise, review of secondary information and develop from this somewhat rudimentary knowledge base develop a menu of potential interventions. The second step would be to go back to the primary beneficiaries for assessing social acceptability and feasibility.

A review of lessons learnt from parallel projects has also started to establish options and constraints for the participatory approach in the Lau Project Area. Further information will be gathered from interviews with key informants. The results will among others feed into the development of a participatory methodology.

The third problem is the lack of reliable data with regard to socio-economic indicators from the national and local authorities which can be explained by the fact that the state apparatus is in an infant stage of development.

The findings from the social assessment (as well as other assessments) will be operationalised into procedures for inclusion into the project implementation plan and **Project Implementation Plan and Environmental and Social Management Framework (ESMF)**. The most important sections will comprise procedures for the following aspects:

Identification of vulnerable sub-groups;
- Targeted sub-projects to address the vulnerability aspect identified for each of these sub groups;
- Composition of community committees;
- Criteria for priority selection of villages and target groups;
- Role of NGOs and CBOs in different aspects of project;
- Procurement and supervision procedures for sub-projects

Monitoring and evaluation will be an important section of the PIP and provide:
- Relevant M & E indicators that will help to assess the achievement of sub-project objectives and the effect of the sub-projects on the livelihood of different beneficiary groups;
- Channels for community involvement in project M & E

The process framework will be integrated into the project operational manual.

2 Social Baseline Assessment

The social assessment deals with the social dynamics and social key issues in the project area using five conceptual entry points1 for analysis: i) cultural setting; ii) social diversity and gender; iii) stakeholder interests; iv) institutions; and v) social risks/exclusion in line with the WB understanding of social assessment. The purpose is primarily to inform project design on social dynamics, conflicts and risks that should be addressed and later monitored to avoid detrimental effects on the project outcome. The purpose is also to ensure inclusiveness, i.e. that all key stakeholder and beneficiaries are considered and biases against more vulnerable beneficiary groups ruled out.

The assessment of the local stakeholders and potential beneficiaries is described and their priority needs, interest in participating in the project and the potential and constraints of working with the identified stakeholders will be established.

Elements of the social assessment are summarised in the Interim Report and in the attached appendix (or annex) Dynamic Stakeholder Data Base.

2.1 Population and Cultural setting

2.1.1 Population

The population of Maiwut County is estimated at 200,000 persons. This is a rough estimate which will be updated in April 2008 for which the national census is scheduled.

The most dominated tribe in the county is the Gaat-Jaak Nuer, living in the centre at Maiwut Town and they spread to the east, south, southwest and northwest of the county. Out of six Payams, five are purely Gaat-Jaak Nuer or dominated by the Gaat-Jaak Nuer. The Payams are delineated based on tribal groups. In the Payam called Kigili located to the northeast of the county starting at Maiwut Centre lives the Burun tribe. The Ethiopian Anyuaks and Nuers of Gambella Region, live on the Ethiopian side close to northeast Mountains from which Lau river system draws its waters. Other tribes found on Ethiopian side within the upper catchments of Lau River are the Koma and Oromo on the same western side of the catchments from which Lau rises. Many Ethiopians are also living on the Sudanese side and working as traders. The Ethiopian traders are concentrated in the two market centers of Maiwut county which are located in Pagak and Maiwut Payams.

The project beneficiaries are defined as those living within the Payams which are within the boundary of the Lau Watershed Project Area, explicitly: Maiwut Payam, Jotome Payam, Jikou (Turu) Payam and Kigili Payam.

Maiwut Payam, 9 Bomas, Population 185,211

[1] In line with World Bank Guidelines for Social Assessment, e.g. WB/Social Development Department: Social Analysis Guidelines in Natural Resource Management. Incorporating Social Dimensions into Bank-Supported Projects, 2005.

Jotome Payam, 6 Bomas, Population 21,420

Kigili Payam, 4 Bomas, Population 8,617

Jikou (Turu) Payam, 6 Bomas, Population 12,529

The population figures will be validated after the national census scheduled for mid-April 2008.
Targeted Population in numbers are approximately 25 000 individuals located in the four payams.

Those Payams are inhabited by the Gajaak-Nuer and Burnus. In addition, those Payams have been receiving and are currently receiving IDPs and repatriating refugees from Ethiopian refugee camps. This target group is mainly also Gaat-Jaak-Nuer and Burnus, however may have to be targeted separately since they have lost some of the traditional way of living and livelihood skills. On the other hand they may bring back new skills to the area in for instance wood-carving etc.

Another group to be considered in the project preparation is the Ethiopian traders. This group will most probably not be directly targeted by the FTWM project however they constitute a part of the population and may benefit or be impacted by the project interventions. However, they may be regarded as a resource for some of the interventions.

2.1.2 The Neur - Agro-Pastoralists

2.1.2.1 General

The Nuer live mostly in Southern Sudan, in the east Upper Nile State around the junction of the Nile River with the Bahr el Ghazal and Sobat Rivers, and extending up the Sobat across the Ethiopian border. The Center of the Nuer area is around Lake No.

The Nuers, tall and very dark people, are related to the Dinka, who live to their west, and their culture is very similar. The Nuers call themselves Naath, meaning "human beings." The Nuer, Dinka and Atwot (Atuot) are sometimes considered one ethnic group**.** The similarities include features of their social structure, the kinship reckoning and extended family systems, aspects of marriage and divorce, rites of passage, and even religious concepts of God, man, spirits, sin, and sacrifices.

The Nuer language is a Nilotic language closely related to the language of the Dinka and Atwot. The language is uniform with no definable dialects. The Nuers are spread between Sudan and Ethiopia with a population: 840,000 Sudan; 40,000 Ethiopia.

According to the Anthropological classification of tribal divisions in Africa, Nuer tribe belongs to the Nilotic groupings that are found in East Africa. There are good numbers of Nilotic tribes in South Sudan and Ethiopia. These Nilotic tribes includes the Nuer, Dinka, Shilluk (Chollo), Annuak, and many others. Nuers are the second largest tribe in the South Sudan, the first being the Dinka in terms of numbers. They are also found in

the Gambella region located in Western Ethiopia. They are divided conventionally into three regional groupings of: (1) Western or Homeland Nuer, (2) Central or Zeraf Valley Nuer, and (3) the Eastern Nuer. Eastern Nuer lives in Upper Nile State, South Sudan, and in Gambella State, Ethiopia. These Eastern Jikany are divided into (a) **Gaat-Jaak,** (b) Gaat-Jiok, and (c) Gaat-Guang respectively. In Maiwut, the Gaat-Jaak Nuer tribe is in majority. They occupy the Eastern frontier of the Nuerland, which is the end point of the Nuer eastward migration. In all, eleven (11) major subdivisions make up what is known as “the Nuer tribe”.

Their religion is Monotheistic Animism 99%. Cattle play an important part in Nuer religion and ritual. Cows are dedicated to the spirits of the owner's lineages and any personal spirits that may have possessed them at any time. The Nuer believe they establish contact with these ancestor spirits by rubbing ashes along the backs of oxen or cows dedicated to them, through the sacrifice of cattle. No important Nuer ceremony of any kind is complete without such a sacrifice. The Nuers have a traditional religious worldview usually called "animistic." But they worship a supreme being called Kowth who has various manifestations with which some claim to have personal relationships. The Nuers pray for health and well-being, offering sacrifices to Kowth so he will answer their petitions. There is no organized religious hierarchy or system, but many individuals serve as diviners and healers.

They do not believe in a place of afterlife for the spirit, and their religious concepts deal with concerns of this life. They do believe the spirits of the dead can affect their current life. The more recently deceased, the more influence they have. The Nuer honor and appease the spirits of their ancestors. Cattle are sacrificed to God and the spirits.

At their initiation, boys receive six horizontal cuts in the forehead and are given cattle; thereafter they belong to an age grade, with whom they will advance into various positions within the clan over the period of their lives. Descent is patrilineal, and when a man marries he receives more cattle from his father. There is no centralized political authority, but rather a number of autonomous village communities. Spiritual leaders, known as leopard skin chiefs, are employed in the mediation of disputes. Age set, differentiation of social role based on age, commonly found in small-scale societies of North America and East Africa. Age sets are a type of sodality (nonresidential groups that cut across kinship ties and thus promote broader social solidarity) of young men who usually cooperate in secret ritual or craft performances together; individuals generally remain closely associated with their age set throughout their life. They are initiated into maturity and pass through age grades, the more general term denoting recognized stages of maturation that entail distinct rights and duties. Age grades may be marked by changes in biological state, such as puberty, or by socially recognized status changes such as marriage and the birth of a child. Persons of junior grade may defer to those of more senior grade who in turn teach, test, or lead their juniors.

Archaeologists indicate that the introduction of cattle in this area is related to the development of the distinct people the Nuer are descended from. Oral traditions indicate that the Nuer have moved east of the Nile River only during the last 200 years. They began an especially active migration about the mid 1800s. As they moved gradually east, they pushed the Anuak farther east into Ethiopia. During this period many Dinka people were incorporated into the Nuer community. Atuot and Nuer traditions indicate origins with the Dinka in what is now known as Western Nuerland. These traditions say the separation of the three occurred due to a dispute over cattle ownership.

The Nuer worldview is built around the herds and prestige is measured by the quantity and quality of the cattle a man owns. Men and women take the names of their favorite oxen or cows and prefer to be greeted by their cattle names. While they do engage in agricultural pursuits, the care of cattle is the only labor they enjoy. It is said that conversation on virtually any subject will inevitably involve a discussion of cattle.

The Nuer are organized into what might be called "tribes," which consist of further sub-divisions by lineage. The lineages are a major structural factor for political order. The territorial groupings and lineage groupings are more closely aligned for some purposes than for others. There is no overall political authority in the tribal structure. Political activity involves various grouping or separation of the many territorial and clan sections. In Maiwut, the administrative borders, the Payams and the smaller Bomas are divided according to such tribal sub-division by linage.

British influence, under the "condominium" with Egypt from the turn of the 20th century, caused a major change for the Nuer. British colonial policy was focused on establishing fixed boundaries between the Dinka and the Nuer. This effectively halted a long-term dynamic process of cultural change that had been happening among these peoples for centuries. They have not been active in national politics of the Sudan.

Parallel to territorial divisions are clan lineages descended through the male line from a single ancestor. These lineages are significant in the control and distribution of resources, and tend to coalesce with the territorial sections. Marriages must be outside one's own clan and are made legal by the payment of cattle by the man's clan to the woman's clan, shared among various persons in the clan. In the Maiwut County, there is inter-marriage between the Nuer and the Buruns.

Marriage takes place in stages, however. A marriage is not finalized until the bride has born at least two children. When a third child is born, the marriage is considered "tied." At this point, the wife and the children become full members of the husband's clan. Women desire to have approximately six children. A man may have multiple wives, who do not necessarily live close to each other. But they will all live in the area of the husband's clan.

Women wear wire and bead necklaces and headdresses. Young men are initiated by circumcision and six cuts across the forehead.

2.1.2.2 Livelihood systems

The Nuer economy and social life in general and in Maiwut revolve around cattle, which graze on the marshy areas during the dry season and in the hills as well as close to the Lau stream during the wet season. During the dry season, the Nuer also fish, hunt, and gather wild plant foods (mangoes, tamarind and other locally named fruits).

Their culture is organized around cattle. But since the Nuer people live in the Upper Nile valley, Nile perch is also an essential part of their economy. Grains and vegetables supplement this diet. None of the food commodities are solemnly produced for market purposes. The crops grown are Maize, Dura (Sorghum), Millet, Beans, Sesame and

small quantities of sweet potatoes and tomatoes. Some vegetables are produced for sell.

The target groups have to some extent been trained in growing vegetables such as tomatoes. Cattle are not primarily for food, but Neur do drink milk. Milk is important and concern was expressed by the Nuer women in Maiwut that children do not get enough with milk during the dry season since all the cattle has to move to the marshy areas for water. Cattle are owned by the family, herded by men and milked by women but under the control of the head of the household. Meat is eaten at important celebrations when an animal is sacrificed.

Livelihoods for the great majority of the area are consequently based on a combination of livestock ownership, crop production, fishing, gathering of wild foods and hunting, and small-scale trade. It has become almost traditional to describe the Nuer as pastoralists, then to note the importance of crop production in their livelihoods.

The Nuer living pattern changes according to the seasons of the year. As the rivers flood, the people have to move farther back onto higher ground, where the women cultivate millet and maize while the men herd the cattle nearby. In the dry season, the younger men take the cattle herds closer to the receding rivers. In the Lau watershed project area, whole communities - except a few e.g elderly women and children – move with the cattle due to the lack of water at their wet season homestead. Cooperative extended family groups live around communal cattle camps.

The Gajaak-Nuer people of the study area remain strongly transhumant, while the Burun community are sedentary or shifting cultivators. During the later part of the rainy season (August to October) flooding restricts communities to small areas of flood-free land. Transhumance patterns are strongly determined by water and pasture. For instance, to avoid excessive wetness in the lowlands, from May they move to the higher ground to the north and northeast where drainage is good for cultivation and grazing. In November during the dry season they move towards the swamps/marshes in southwest, west and northwest, so as to access water. Also, here apart from grazing their animals on the lush grass in the Toich (seasonal floodplains), they plant and grow some crops (especially maize) in the moist soils left by the receding flooding. This is not common for the rest of Nuers. Under normal circumstances the community could achieve subsistence in food, unless natural hazards occur like birds (locusts) attack to crops.

Nuer build only temporary houses or shelters. Houses in wet-season settlements have circular mud walls over stick frames with thatched roofs. The wet-season homestead is the base from which they move during dry season in search for water and grazing land. As grain is harvested, it is dried on temporary scaffolds. In dry-season camps, men sleep with the cattle in shelters made from local grasses. Women may remain in or near the wet season areas when the men follow the receding waters toward the lower areas.

Due to the extreme water shortage in and around their wet season homesteads in Lau watershed, the communities stay for a very long period of time in the marshy areas. This has serious implication on their agricultural activities, since land preparation are often delayed and not properly prepared ahead of the rains.

The livestock sector remains very traditional without sufficient animal health care, but the pastoralists of the area depend much on NGO supported vaccination campaigns. Mainly the livestock wealth is for traditional practices and marriage purposes, but a few

enlightened persons do sell their cattle occasionally to solve some pertinent family problems like education fees and clothes for family and other functions. Hence, in general when subsistence agriculture fails, the area still depends on relief. When bring this issue for discussion with the community in Maiwut, they explained that actually cattle could be sold if it is used for productive investment and as a way to increase the future income. If such opening exists, it should be considered by the project and possible promoted without such solutions being forced upon the target groups.

The grazing lands are accessed in common, while access to cultivated lands is limited to the cultivator.

During the dry season the waters gradually recede to isolated pools, swamps and permanent rivers leaving many areas without water for livestock or human use. Pasture is not limiting for most of the year but fresh growth is restricted to small areas of toich around pools, swamps or permanent rivers in the height of the dry season.

Pastoralism is the leading preoccupation of the people that are almost wholly dependent on livestock. But the pastoralists living near Baro River cultivate the banks of the river when the flood recedes. People are also engaged in the cultivation of sorghum, bean, sesame, mango, banana etc., for their livelihood. The farming system is shifting cultivation, which is practised in the Baro plains where alluvial terraces along the Baro River are cultivated. Double cropping of maize and beans and single cropping of sorghum are practiced. Land preparation is carried out using hand-hoes as tsetse precludes the existence of oxen.

2.1.3 Livelihood, Challenges and Priorities – Maiwut Payam

People migrate to Baro River between December and April due to lack of water. There are two cropping periods during the rainy season, that is, 1st cropping period between May and July and the 2nd between September and November. Maize and Millet are the two major crops grown. Groundnut, tomato, okra and cabbage are also grown. There is neither mechanised farming nor animal traction practiced. Crops are cultivated using hand tools.
There are currently 15 individuals who regularly collect honey. There is no gender difference related to honey collection. There are also 20 individuals occupied with furniture making by collecting wood from the forest.
The local market is well situated and stocked, but few local products were visible, e.g. dried okra and onions. Other products were imported from other parts of Sudan and Ethiopia, see in Photo 4.

Sorghum from WFP was distributed to Maiwut for the first time during this dry season in bags, see Photo No 5.

The main problem in the Payam is water supply. During the dry season, that is, between December and April, due to shortage of water supply, people move with their livestock to Baro River, which is 35 km away. Lau River dries from December to April and flow starts in May. Lau river is located just around the corner of the Payam administration office. Second ranked problem is watering of cattle and third is lack of farm tools.

The second most important problem is watering of cattle. An organisation called ADDAR planned to make a dam, but failed. Thus, the provision of water to cattle is still a high priority.

In order to increase agriculture production, provision of more modern hand tools and introduction of animal traction are required.

Serious bank erosion was observed at Lau River close to the Payam office, see in Photo 3. This requires application most appropriate soil conservation methods.

2.1.4 Livelihood, Challenges and Priorities – Jekou Payam

with a total 12,529 inhabitants, 90% = 10218 persons migrate to Jekou River in the dry season, which takes ca 2 hrs on foot (ca 10 km). The remaining 2311 stay, mainly in Toru. 800 persons are settled returnees from the war refugee camps.
Farming of maize and sorghum is the main occupation, the later not too successful due to quela quela. Livestock owned per household ranges 1-5 cows, 2-3 goats, 2-3 sheep, 4-6 chicken. There are two cropping periods per year of maize and sorghum, complemented with groundnut, sesame and eggplant.

A standard size of a farm is 20x30 m, which gives 3 bags of maize, 50kg each, per year. Other sources of food include is fishing. The normal catch is about 5-6 per day using spear only. Wild food is also collected e.g. fruit from trees to supplement cereals and protein.

Division of labour: most farm work is done by men, except harvesting and processing. Cattle herding is done by boys, girls and old men. Collection of wild fruit is done by all. Fishing is done primarily by men, but women also fish.

The family size of the Pajam Administrator is 12 persons, 3 wives and 8 children, 15-16 bags of maize is required to feed the family, but he can only produce 3-4 bags, thus he sells 2 cows per year to buy the remaining at the market. Also firewood and maize beer are sold for cash by other villagers. Charcoal is not produced in order to protect the forest, only dry wood is taken for firewood.

The following are the priority areas for interventions in order of priority:

1. Water:
2. School building
3. Grinding machine (voiced by the one lady participant)
4. Agricultural tools

2.1.5 Livelihood, Challenges and Priorities – Jotomé Payam

100% = persons migrate to Baro River, which takes ca 3 hrs on foot (ca 18xx km). The inhabitants practise mixed agriculture, maize is the major crop, but also sorghum is planted. They migrate to the 14 local camps along the Baro River in January, where they plant their first crop of maize. They do not fertilise their crops. The average family size is 6 persons, and they produce about 5 bags of maize/ family. The requirement is 30 bags of maize, and ca 2 cows and maize beer are sold to buy the difference. A cow can fetch

ca 800 ETB, a bottle of beer 5 ETB, The market for selling cows is Maiwut or Gambella. The average livestock holding is 11 cows, 4 sheep, 3 goats and 4 chicken. Cattle are ranged communally, by boys and elderly. Crop cultivation is done by hand hoe, and fishing is done by nets across the Baro River, by every member of the family who is not too old. They would prefer to use oxen for ploughing, but they need training to do that. Women participate in all farming activities.

All belongings and household items are carried on the head, see Photo 26, when migrating to Baro River, donkeys would be preferred but considered too expensive.

At the camp they only use crop residues as fuel, while in Jotome villages they use fuel wood. Wood at the camp is also used for construction of tukuls, wood taken from the other side of Baro River, in Ethiopia. Cow dung is sun dried and fired to smoke away the tsetse fly in the midst of the cattle herd.

There is no practise to make charcoal. Wildlife is not hunted, due to lack of rifles, but some soldiers do hunt.

There is an intense competition with wildlife for grazing land and crops. Lions, hyenas and leopards kill their animals, about a hundred a year, 50 cows, 20 sheep and 30 goats. This happens when the antelopes migrate and wild animals lack their prey.

The following are the priority areas for interventions:

1. Water: both boreholes and hafirs are needed at Jotome, which would stop them from migrating, but still cattle herd would need to be grazed at riverside during the dry season due to lack of grazing areas in Jotome.
2. Health, medicine major problem, vaccination has taken place via WHO and Save the Children.
3. School building
4. Grinding machine (voiced by the one lady participant)
5. Agricultural tools, especially oxen plough, pangas and axes, were voiced by the present women
6. Improved equipment for fishing
7. Transport means
8. Protection of the farms and cattle from wildlife.

2.1.6 The Buruns - Agriculturalists

2.1.6.1 General

The second largest tribe of the the Mawuit county are the Burun. Their language is Burun. Different Burun groups speak different Nilotic dialects related to Shilluk, Anyuak, Dinka and Nuer.

The Burun sometimes known as, ‘Mabaano people’ ‘Maban’ or ‘Chai’ are a Nilotic people and occupy the plains between the Nile east of Renk up to the foot of the

Ethiopian Highlands. Consisting of several independent groups and they number about 100,000.

The Burun group domicile in Southern Blue Nile are found in the following settlements: Wullu, Buot, Gowali, Wedega, Mayak, Mapo, Karenkaren, Kurmuk, Yabus, Jorot and Jale; while in Upper Nile the groups are Mabano, Buldid found in Maiwut district. Other main towns are Maban (Buny), Kigale and Dago.

The Burun land is flat-lying plains between the Nile and the foothills of the Ethiopian Highlands. The vegetation varies from poor to rich savannah and the area receives enough annual rainfall to sustain agricultural practices.

The Burun are originally Luo and are said to have separated from the Shilluk in Soba near Khartoum presumably in the wake of the collapse of the last Christian Kingdom of Makkura. They arrived at their present location after returning from the Baro River area.

The Burun have two important annual social events:
The first is the sacrifice, confession and blessing feast (kornga). Performed in October of each year the community confesses and asks God for forgiveness for the years' sins and wrong doings. They also request for tolerance, good health for humans and animals. The people go very early in the morning to the nearby stream and wash away all the bad things. On return to the homestead, they slaughter animals, drink sorghum beer and dance (dukka-conkon). In this ceremony people put on their best clothing and decorations with beads, (burngo).

The second is the harvest feast (Gatti) which is performed in December. In this ceremony the matured boys and girls are prepared for marriage; animals are slaughtered; food and beer served. The boys and girls appear in their smartest look, wearing necklaces (linyan).

Marriage among the Burun is for reproduction of children and for the expansion of the family. Marriage is according to age-group. It begins in the wake of the harvest feast and is accompanied by two ceremonies. The 4 months spent in the wedding room (chanyo) and the small ceremony in which the groom wears a special necklace and moves a short distance within the village; the big marriage ceremony occurs in March in which the bride is given new harvest and taken to her husband’s house, placed near the maternal uncle’s home. The Burun dowry is 5 pigs, 10 goats, hoes and axes usually paid by the maternal uncle.
The new married wife gives birth at her husband’s house. If it so happens that she delivers in her parent's home, the husband is fined a pig before taking her home. The children are named after the family names but sometimes animal, birds, trees’ names may also be used. Naming is performed after 10 days from birth in a ceremony in which a goat is slaughtered and people eat meat, drink beer.

The Burun never had a system of administration before the colonial administration imposed its system. The only people with authority in the Burun society are the spiritual leaders.

The Burun believe in a supreme being (God) with whom they communicate through a medium. The sacrifice feast they perform in October is meant to confess all sins and ask God to be tolerant and grant good health to both human and animals.

Burun culture is essentially orally transmitted through the art of making agricultural implements, hunting and other social activities; in songs, music and dance in which the body is decorated.

The Burun people neighbour the Dinka to the west and Nuer to the South. They are a peaceful people and their Nuer neighbours have taken advantage of that by taking over much of their land and assimilating them. A small Burun Diaspora is found in the Bungo refugee camp in western Ethiopia. Repatriation from this camp is on-going.

2.1.6.2 Livelihood systems

The Burun society is organised into clans based on matrilineal lineages. Being an agrarian society most of their social values relate to agricultural production. In addition, hunting and collection of wild fruits and honey as well as fishing constitute additional means of livelihoods.

The economy is essentially subsistence based and the Burun people are largely reliant on crops and practice a more sedentary form of farming though still with some element of shifting and fallowing. They grow a wider range of crops including maize, sorghum, groundnut, cassava, sesame, sweet potato, cowpea, finger millet Main crop is maize, average production is 5 bags of maize per family. Other crops are sorghum, simsim, pumpkin, onions, tomato, groundnut, okra, eggplants, and carrot. They also have two cropping periods.
The Burun in Maiwut keep few cattle received through inter-tribe marriage, raise sheep goats and fowls for domestic use and for trade with the neighbours. They do not drink milk. They practise mixed farming, but have few cows, and 6-7 goats per family. Fishing is made by hooks and spears.

Livelihoods for the great majority of the area are based on a combination of crop production, fishing, gathering of wild foods, hunting, keeping of small ruminants and small-scale trade (honey, tobacco).

The relative abundance of land for cultivation means that access to land is not really a problem, especially within the higher more settled areas away from the dry season river bank settlements. In Maiwut, and the surrounding areas, one notices large chunks of uncultivated land, and it was asserted that one was free to cultivate as much land as he could clear.

Fishing is the third main source of livelihood, and is practiced by most members of the community and especially by poorer households. Men, women and children take part. Some individuals who lack other resources have come to specialize in fishing. Fishing takes place at varying times of year in different sites. In most areas fishing is a key dry season activity while livestock are at the toich. Fish are used both fresh as a main source of food during the dry season and hungry period and, dried, for sale.

Everyone collects honey, but 12 persons have received special training. Wild fruits are mainly collected by women.

Sometimes they get maize from NPA; Norwegina Peoples Aid, 1 bag/family.

Cash income is generated by sale of fruit, fish and tomato.

2.1.7 Challenges and Priorities

1. Health
2. Education
3. Water

2.1.8 Refugees and IDPs

Data from the inter-agency mission led by UNHCR and SPLM/Sudan Relief and Rehabilitation Commission (SRRC) authorities indicate that 56,118 returnees have been received in Maiwut County since January 2005. The breakdown of returnees in Maiwut County is as follows:

Payam	Returning IDPs	Returning refugees (from Ethiopia)	Total
Maiwut	3,743	5,742	9,485
Jotome	4,201	7,810	12,011
Uleng	5,901	1,990	7,891
Pagak	4,231	6,391 (unclear)	11,640
Turu	2,190	2,190 (unclear)	6,391
Kigile	2,921	4,779	7,700

Another 13 500 thousands of IDPs and returnees from Ethiopia are expected to be received by the Way station located in Pagak in Maiwut County during 2008 and 2009. 6,000 refugees are returning from the Bonga Camp. 5000 returnees coming from Boma and other camps are expected to be relocated within the Maiwut County is today unclear.

Returnees are provided with five days food rations while at the Way station and a three month food ration once they are transported to their final payams of return. Distributions of non-food items include construction tools.

The repatriation operation from Ethiopia is expected to take place on two major roads: from Gambella to Pagak and from Assosa to Maban. In January 2008, UNHCR together with the implementing partner ADRA deployed a team to Pagak, Upper Nile State, to prepare that corridor for returns from Ethiopia.

One of the challenges ahead of repatriation of refugees from Ethiopia to Upper Nile State is the reconstruction of the bridge connecting Gambella (Ethiopia) and Pagak (Sudan) which collapsed during the rainy season.

The repatriation from refugee camps in Ethiopia is driven by the fact that those camps have been redundant after the signing of the CPA and will be closed by the end of 2008. In Maiwut, as in other parts of Southern Sudan, there is a gap between the timing of repatriation and the national recovery and infrastructure rehabilitation process.

As mentioned in previous sections, this group is mainly also Gaat-Jaak Nuer and Burnus, however may have to be targeted separately since they have lost some of the traditional way of living and livelihood skills. On the other hand they may bring back new skills to the area in for instance wood-carving etc.

Some of the young people to be repatriated and reintegrated are born in refugee camps and may not be accustomed with the way of living in their - by heritage – original Payams. Most of the returning IDPs and refugees have had access to basic services such as water and sanitation, education and health services. When returning to the various Payams of Maiwut County they will have to start a new life without such basic services.

Another aspect to be specifically considered is how to reintegrate the returnees in the traditional livelihood systems or engage them in new livelihoods activities. It is rare for people in refugee camps to obtain work permits in their host country. One major challenge is that some of the returnees have been sitting idle for so long that they are no longer used to partake in proactive and productive activities. On the other hand, they have been engaged in vocational training activities in the camps and therefore possess specific skills which could be built on. Especially since many of these skills are currently lacking in the rural areas of Southern Sudan. During consultations in Maiwut, a few returning men said that they would like to get assisted in starting wood carving activities since they have been trained in wood carving in Ethiopia. It was not completely understood by the consultant team what hindered them from get started without support from outside. Most likely it could be explained by the relief syndrome.

For the IDPs, the situation is different they may have lost knowledge about the traditional livelihoods however, they have most probably have to sustain their life in more peaceful places by engagement in whatever available jobs and has therefore not been sitting idle. The IDPs also possess new skills which could be very useful in recovery process in general and for the up-coming project in particular. As an example, the team met with young community members who were experienced in construction works of buildings gained from during their time in Khartoum and elsewhere in north Sudan.

However, these same young men did not engage in the construction works currently taking place in Maiwut for instance the construction of the County administration buildings and the large health clinic. When asked about this, the men claimed that all construction is undertaken by Ethiopian entrepreneurs and the only use Ethiopian workers. The consultant team, also brought up this issue for discussion with the county administration and the Ethiopian entrepreneurs. Their side of the story is that local people are unreliable, lazy and expensive. Both NGOs and the entrepreneurs have dead-lines for their undertakings. From these observations, the Consultant Team interpret that engaging local people in local infrastructure development has not been an objective or a monitored indicator for project (intervention) success. Instead output indicators such as number of wells, no. buildings are at focus.

2.1.9 Ethiopian Traders

The fourth group to be considered in the project preparation is the Ethiopian traders. This group will most probably not be directly targeted by the FTWM project however they constitute a part of the population and may benefit or be impacted by the project interventions. Furthermore, they may be regarded as a resource for some of the interventions.

The total number of Ethiopian traders in the study area is not known but could be estimated to less than 1000 and to be concentrated to the two market areas in Pagak and Maiwut. Although few in numbers they dominate the markets. All commodities are traded in Birr, the Ethiopian currency, and not in Sudanese Pounds. Even the food at the market areas is flavored by the Ethiopian traditional kitchen.

Most of the traders are young and work together as shop owners as husband and wife or brother and sister.

In addition there are temporally Ethiopian works coming with the Ethiopian entrepreneurs and engaged in various type of basic infrastructure construction. Also Kenyan entrepreneurs are sometimes contracted.

2.2 Access to Basic Services

With access to basic services, we mean access to water supply, heath care and education. Even if not specific for the project area and the information is out-dated the data contained in table 1 below gives an overall picture of the severe status in southern Sudan with respect to the MDG goals. Table 1 shows the Millennium Development Goal Indicators for North and South Sudan as compared to Middle East and North African (MENA) countries. Table 2 shows figures from more recent sources for Southern Sudan.

Table 1: Millennium development goal indicators (2003):

	Sudan		
	North	South	MENA
MDG 1: Poverty & Hunger			
Prev. Child malnutrition %<5	35	..	17
Prev. Child malnutirition (wasting) (%<5)	15	21	7
MDG 4: Child Mortality			
<5 MR/1000	105	250	54
IMR	68	150	43
Measles Imm. (% of children 12-23m)	58	34	86
MDG 5: Maternal Mortality			
MMR/100,000	509	1700	360
Births attended by skilled health staff (%)	57	6	63
MDG6: HIV/AIDS, Malaria & TB			
(% children <5 with fever) treated with antimalarial	50	36	..
Incidence of TB/ 100,000	180	325	66
TB cases detected under DOTS (%)	58	6	..
MDG 7: Environment			
Access to an improved water source (%)	70	39	90
Access to improved sanitation (%)	64	29	83

Source: World Bank (Sudan Health Status Report) 2003; SPLM Health Secretariat – Feb 2004

Southern Sudan	
Rural population without access to safe water supplies (2005)	75 %
Percentage of the estimated 6,500 water points currently not functioning properly	65 %
Population using improved sanitation facilities	< 30 %
Source: Government of Sudan and United Nations Country Team (2004). *Sudan Millennium Development Goals: Interim Unified Report 2004;* United Nations Sudan Joint Assessment Mission (2005). *Volume III Cluster Report;* Nile Basin Initiative (2005). *National Nile Basin Water Quality Monitoring Baseline Report for Sudan*	

2.2.1 Water and Sanitation

Within the target area, potable water supply coverage is very low. Lau stream is still the major source of domestic water supply however this stream is not permanent and whole communities move to where water can be found in the dry season. Major efforts have

been undertaken to improve this situation by locally based international NGOs. The interventions have mainly focused on drilling and the construction of ground water wells. The obstacles have been to find ground water of sufficient yield and quality. Some areas, especially in Maiwut, are also characterized by hard rock which has resulted in severe damages to several of the drilling machines brought to the area by Ethiopian or Kenyan entrepreneurs.

In Maiwut, there is one hand water pump functioning in the headquarter of the payam. There are plans to drill five wells in five of villages as shown in the table.

No	Maiwut - Boma Name	Water wells in the process of drilling	Priority order for more wells required
1	Parish		4
2	Palang	1	
3	Kulomg		3
4	**Matar**	1 (1 already supplying)	
5	Charijikow	1	
6	Lollimg		2
7	Meth	1	
8	Wakkari		1
9	Lerpini	1	

Care International has hired an Ethiopian contractor to drill 5 wells in Matar (completed), Palang, Lerpini, Charijikow and Meth Boma, see table above. The well in Matar was completed 14 days after mobilisation to a depth of 85 m, although the quality and yield of water is unknown, but water column is 30 m. The first well is currently to be finalised with a concrete slab and installation of Indian Mark II hand pump. An earlier hired Kenyan contractor failed to get water with a smaller rig. The mobilisation of a second contractor (Ethiopian contractor) has delayed the well drilling programme by one year. Well drilling equipment is shown in Photo 1 and 2.
In Jekou Payam has two wells. No water infrastructure is in place in Jotome Payam and only one hand pump is available in Kigili center

No	Jekou-Bouma Name	Facilites
1	Lolnyng	
2	Niang	
3	Jerusalem	
4	Turu	2 wells exist
5	Kiach	
6	Nyetok	

No	Kigili-Boma Name	Well priority
1	Abajabi	2
2	Katen Boey	3
3	Wankey	
4	Wadissa	1
5	Maiwut two	
6	Tuch	

Diarrhea and stomach problems are generally also a problem due to poor sanitary systems. The concept of pit latrines is still not socially acceptable except in public places and market centers. Even if appropriate sanitary solutions coupled with awareness raising has been offered many people still use the bush. Protection of water points for human consumption is necessary. Separate water points should be established for the livestock. Water quality is a problem especially towards dry season when there is a higher concentrate of pollution in the stream.

2.2.2 Health

There is no sign of mal-nutrition in the limited area which was visited during the first visit to the study area. It also seems as the population in general means to buy food commodities when the household storage is emptied. The consultant team witnessed during its mission in February/March (mid-dry season) sorgum bags were sold in Maiwut centre. The price was double the price in Juba namely1 bag of sorghum in Juba is 50 SP. 1 bag of sorghum in Maiwut centre was sold for 100 SP in beginning of March 2008. The sale was organized by county staff.

Major endemic disease includes Malaria. Malaria would be the major death vector during the longer wet season. There are also cases of Trachoma, Guinea Worm and other organisms. HIV/AIDS is a serious emerging problem facing the area considering the influx of IDPs and refugees, influx of Ethiopian entrepreneurs, the major military presence and the extensive number of small locally based NGOs. Social and cultural taboos and misconceptions exist and now coupled with a high mobility of population River blindness is reported to be common although the Consultant Team have not come across any blind people.

An emerging type of health problem and limitation for development is alcoholism, especially for the young and idle men in the project area.

There is a clinic/health centre in Maiwut Payam. An improvement of the health clinic In Maiwut is currently under construction. With the inauguration of this clinic, the Maiwut County will also recruit a Health Director and the health service department be developed.
In the other Payams, the coverage is as follows:

- Jekou Payam - 2 clinics, 6 staff, with 10-12th grade education and 9 month's training in community health.
- Jotome Payam - 2 clinics, 20 staff, 3 nurses with 3 year's training and health assistance with 10-12th grade and 9 month's training in community health. Common diseases are malaria and diarrhoea, caused by contaminated water.
- Kgili Payam -1 clinic with 2 staff but no medicine

Up to this point in time, NGOs have worked with health service delivery without a proper local ministry counterpart. Basically all health services delivery in the area are financially supported by and partly implemented by NGOs. Health services delivery is fragmented and provided by non-public actors mainly NGOs operating in the area.

Most of the basic service delivery i.e. education and clinics are built on stationary solutions while the population is mobile.

2.2.3 Education

A large proportion of the Maiwut County population is youth, why education is an important issue for the local authority.

- Maiwut Payam has 2 primary schools (1-6 grade) and 1 junior secondary, up to 8th grade.
- Jekou Payam, there are 5 primary schools with 10 teachers, out of which 1 woman, with education level of 10-12th grade.
- Jotome Payam has 6 primary schools with 8 teachers, with training level of 10-12th grade, 800 children go to school, which is everyone in the Payam. Classes are conducted under trees, if any.
- Kigili Payam has one primary school and 1 teacher exist, but no classroom.

Secondary education is available in Nasir and in Gambella on the Ethiopian side. The quality of the education is estimated to be poor. The overall female enrolment is reported to be about 25%.

There is still a very high level of illiteracy in the area. Men and women are incapacitated by this factor not to contribute to or create new ways of life. However, there are intellectuals from the area who benefited from displacement who will be very instrumental in the future development of the area. The consultant team met with a few of those who were in the area to look for investment opportunities.

Some of the repatriated refugees may also hold basic skills in reading and writing, however they differ from the intellectuals returning from abroad and north by the fact that they have no financial means to start up small scale enterprises. In addition, they somewhat still suffer from the relief syndrome having been sitting idle for many years in refugee camps.

2.3 Gender Aspects

The observations from the first mission can be summarised as follows:

- Women do not own property in the area. All property in the homestead belongs to the husband. A woman cannot buy a cow even if she has the means, without the authority of her husband. Only divorced women and widows have authority over their cows

- Conflicts at water-points are common -women from host communities are frustrated by large numbers of returnees placing a burden on limited water resources in the Lau watershed.

- Women are responsible for fetching of domestic water and harvesting of crops and carrying the crops back to the home stead. Hence, opposite from what is stated in the ToR, the women are very much involved in heavy duties which are undertaken

outside the homestead. Fetching water in the dry season means that women must walk long distances and sometimes spend the night away from the homestead.

- Some women, the elderly and the disabled as well as the children tend to remain in the settlements, as younger and more active members of the community move with the cattle to the river banks.

- Some of the NGOs interventions with regard to improving basic services in the area such as provision of drinking water through construction of wells are supposed to be based on community contribution in the form of labor and collection of locally available material such as river sand. Several attempts by the local authorities and NGOs to engage the community men in such activities have failed while when approaching the women to engage in this type of unpaid community development work, the sand has been collected by the women themselves for the construction of the wells.

- New type of livelihood training activities introduced by NGOs, tend to become the privilege and task of men with little involvement of woman.

- Women can have and do have community leadership positions (community chief or sub-chiefs etc) within the project area. This was explained by the fact that the war distorted traditional ways of leadership system mainly by the fact that the men were involved in the war and absent from the homes. Also during dry season the community chief move with the cattle and his deputy which sometimes is a women is responsible for the community management.

- Women are involved in the locally formed peace committees which have been formed with the support of NGOs to deal with local community (internal or between communities) or domestic conflicts.

- Illiteracy among women in Maiwut is at present estimated to be very high.

Traditionally, Nilotic women are considered as a pipeline of human life and are protected and cared for, even by people who are not relatives. Many African societies consider marriage to be created by God. Politically, woman is considered a bridge-builder. Through inter-marriage she builds alliances for her family. Marriage is a political institution and not a function of romance or sexual desire. The marriage of a daughter is also an economic event, linked to cattle through the Bride-wealth. The Bride-wealth consists of a number of cattle. There are no marriage documents, but the Bride-wealth gives the father a right to his children. Over time, the cattle change many hands and it is difficult to return them as they reproduce, multiply or are lost due to disease and cattle raiders. A Nilotic girl is expected to learn life skills from other female members of the family. She learns to manage the household, to teach the children to respect the elders, and to be a good wife and mother. As a mother, a woman is considered the center of the family. Her opinion is valued when it comes to family or community affairs, such as marriage or conflict resolution. Most Southern Sudanese women are illiterate. Formal education is viewed as an investment in the family. Generally, this investment is reserved for the male children, because they are the ones to build up the family name. This is also true for any vocational training. It is assumed that whatever learning a female child acquires will be lost when she marries into another family. Women are not to be abused physically, because of their reproductive importance. It is considered a

disgrace for a man to beat his wife. But of course in reality, domestic violence does occurt. Yet in Nilotic communities, the involvement of the extended family and community elders is an effective support mechanism that encourages the husband and wife to work through problems in constructive ways.

Basic Nilotic values guide the elders, who everyone in the community looks to as the authority on the ways of life. People depend upon the elders to apply their intuitive understanding of these values in solving domestic and community problems. Generally, these values include trust, cooperation, putting the community first, gratitude, and respectfulness. Certain values are based upon gender differences.

A general division of labor is recognized in familial duties-- there is woman's work and there is man's work. These are norms and regulations similar to those that guide most social systems. Food preparation and caring for the young is woman's work; hunting and looking after the cattle is man's work. Adults are expected to care for the young and the young to care for the elderly.

Traditionally arranged marriage during childhood is common and the estimated adolescent mothers are common. One of the NGOs in the Maiwut area is working with child rights focusing on early marriage and child labour.

The Nuer groom must pay 20-40 heads of cattle, the marriage is completed only after the wife has born 2 children. If the wife only bears one child and the husband asks for a divorce he can also ask for either the return of the cattle or the first child. Divorce therefore is very difficult. Another interesting fact is that if a husband dies then the husbands family must provide a brother to the widow and any children born to the brother are considered the deceased's children.

It has been estimated that 65% of the population of southern Sudan is female. The women who are taking up their government posts in the capital of south Sudan are potential role models if they would have more contact with local-level women's organizations.

In Southern Sudan, there has not been a systematic and comprehensive assessment on prevalence and forms of gender-based violence, though is thought to be very prevalent anecdotally. Nevertheless, the war has led to a widespread form of a 'new' type of violence. Female genital mutilation, on the other hand, is reportedly to be rare in the Maiwut County according to locally based NGOs and secondary information. Although, the FTWMP will focus on gender rights with respect to livelihood opportunities and not with the above described type of gender issues, the project may lead to reduced isolation of the target communities and increased exposure to the societal changes at large including women's rights which may have a positive effect in the long term perspective.

Cultural attitudes emanating from the tribal character affect key gender issues, including whether tribesmen are willing to look at women's rights beyond a certain level of kinship inclusion, in other words, considering women as individual rights' holders. Some traditional practices remain a serious challenge in addressing some key gender issues. Child marriage of girls continues to be a challenge and increases risk of unbalanced gender power relations and states prone to health hazards and lack of social integrity. There are many barriers to the concept of the "best interest of women" embedded in the

cultural practices and tribal nature also in the Nuer and Burun society. Unless those are clearly understood and a dialogue is opened with the project target beneficiaries regarding those barriers ahead of each women targeted intervention, interventions may remain only short-term.

2.4 Prevalence of Conflicts

In a situation where even under normal conditions there is competition over natural resources, there is a danger of conflict flaring up caused by the return of IDPs and refugees into the study area.

The main local disputes in the area and between neighboring communities are:
- conflict at water sources;
- conflict over grazing lands;
- conflict at fishing grounds; and
- traditional cattle raiding.

It is indicated in secondary information, that the Nuers are an excitable people and individuals are very independent and prone to take offense. When violence or the threat of violence erupts, age-mates or family leaders are called on to cool things off. In dire circumstances, a special group called the leopard-skin chiefs is invoked. These special individuals have no formal political authority, but are honored for moral and spiritual authority. The chiefs may even offer sanctuary to murderers. They can then moderate negotiations for compensation, the only alternative to violent clan feuds. Most conflicts involve cattle. Fines for offenses are assessed in cattle.

Like many of his pastoral neighbors, a Nuer man's dearest possession is his cattle. Life depends on cattle and a Nuer will risk his life to defend them or to raid his neighbor's cattle. During consultations in Maiwut centre the Nuer men complained that since the disarmament of their communities in 2006 they can no longer protect their cattle from raiding and wildlife. The cattle raiding has ceased since 2006 when the local tribes were disarmed by the government. Considering, that Maiwut is a border area and the high presence of military forces in the area and consequently high numbers of arms, the effects of the disarmament may be short-lived.

In Maiwut there are also conflicts at household water points. Such conflicts are different from the traditional ones since these water conflicts involve the women. Both Nuer and Burun women are impacted.

At present, there are little conflicts related to agricultural land.

Key findings from the community relating to land use rights are:
- Territorial occupation by the communities has not changed significantly in the past 20 years except for people dislocated by the conflict or natural disaster like flooding and are slowly returning to areas of origin or to places that they hope to secure better livelihood opportunities.
- Traditional institutions of chiefs, sub-chiefs or headmen exist and have strong bearing on the socio-economic welfare of the communities including land administration/management.

- There is a strong legacy of territorial disputes mainly between community groups, e.g. disputes over grazing and fishing areas or watering points.
- Access to land to support livelihoods requires a strong emphasis on communal land use rights

Temporary access issues for the project to consider:
- Acknowledge the difference between land use from land ownership.
- Emerging institutions have limited capacity to engage on and effectively respond to land and property issues.
- Opportunity exists to address specific issues:
  - women rights and participation in decision-making;
  - negotiated access to community land; and
  - strengthening direct access to land.

2.5 Community based organisation, civil society and traditional leadership

There are very few formal community based organisations (CBOs), however the traditional leadership system is still strong. It was expected that the social structures would have been destructed during the long time of armed conflict in the area. This presumption was proven not true for the Maiwut area where it is still the traditional leadership system which is responsible for the allocation of land use rights and management of land use conflicts.

A number of peace committees have been formed support by PACT international. Those are democratically formed and representative of population including 30 % women and a few Ethiopians. In Kigili, there is one women association with its own house, equipped with sewing machines. There are also other committees, e.g. a development committee.

A great number of international NGOs are operating in the project area however, only a few local NGOs are active in the area out of which only one has proven to be competent and reliable according to the various international NGOs operating in the project area.

3 Social Key Issues and implications on Project Design

3.1 Stakeholder interests

Perceived key problems and challenges among the communities were unanimously identified as indicated below.

Perceived Immediate Problems:
- During Dry season: Water shortage
- During Wet season: Isolation due to inaccessibility

- Long-term: Illiteracy and language

Perceived Needs:
- Water for human and livestock consumption
- Education
- Improved Cattle Management
- Modernized Agriculture
- Roads

Community priorities elicited from a few community interviews indicate the provision of basic needs such as drinking water for human and animal consumption, education services, tools and agricultural extension, cattle health services and roads as the main priorities. With these priorities, the Maiwut and Lau watershed area is not much different from other areas in Sudan and national /NGO post-conflict recovery and development priorities.
The young men met wanted to be skilled mechanics and drivers.

3.2 Post-conflict context

The following key issues relate to the post conflict context.

1. Transition from Relief to Recovery to Development?
2. Management transition to participatory and integrated planning and development?
3. Community ownership and contribution?
4. Improving livelihoods under current setting?
5. Limiting threats to the Natural Resources?

The project framework was originally set-up as a sustainable development project dealing with diversification of livelihoods and reduction of environmentally unsustainable livelihood practices such as deforestation and overgrazing resulting in destruction of local ecosystem services and negative impacts on the Nile basin water resources. However, the situation in Southern Sudan is different where at present the natural resource base is good but where the social, institutional and infrastructural issues are a major challenge.

Current perceived needs and ongoing support has recently gone from relief to recovery phase. The on-going recovery phase includes provision of basic services such as water, health and education. The timely provision of such services is important since there is still a major gap between repatriation interventions and recovery interventions in host communities. However, the provision of services is provided by non-public and non-local actors why the sustainability aspect of the operation of currently built infrastructure and staff management is not yet on the agenda.

Also local administration is focused on immediate needs for the communities such as the need for agricultural tools and inputs and fishing gears etc and less focused on long term

development needs and how this process could be supported by the local authority and extension services.

Community ownership and contribution in all stages explicitly planning, construction and operation and maintenance is one of the cornerstones of the FTWM projects. Another one is social and environmental responsibility. The reason for these principles should also be clearly communicated namely to capacitate the communities and the local authorities and prepare for the era after the presence of international NGOs.

With regard to the willingness of community contribution for provision of water, the consultant team understood that there is a readiness among the communities to contribute however it has not been a condition before for relief and the on-going recovery process. It is therefore interpreted by the team that it is possible if the conditions are clear to the communities and if the outputs are of major importance.

Management transition to participatory and community driven planning and development may need to be preceded by awareness building within areas such as identification of potential income earning opportunities and environmental issues.

3.3 Implications for Project Interventions

The resource base is good to sustain intensified and diversified livelihoods. The challenge for the project would be to tap these resources in a socially and environmentally manner and how to organise the communities to engage in such productive activities as a way to assist them to go from relief dependency to subsistence to making a surplus for the market. This surplus could then be used during times of household emergencies at times of harvest failure etc or for schooling, health care expenses etc.

To this end it will be important to identify current and potential income earning opportunities, both on farm and off farm, and current constraints on their realization and extension. Some early observations on potential improved livelihood opportunities as well as on-going activities to build on are listed below. The below listed livelihood interventions are recommended to be coupled with specific activities to iincrease community long term capability to partake in and manage local sustainable development and reduce community dependency on relief. These activities may include:

1. Awareness building in participatory planning with regard to community and livelihood development
2. Environmental awareness building
3. Formation of community development and (natural) resource management committees (CDNRMC)
4. Improve the liaison and joint action between communities and local authority
5. Protection of wildlife, forestry and water quality

3.3.1 Identified Livelihood support opportunities

1. **Establish more reliable access to water** for domestic use and livestock and to allow local communities to shift to more intensive agriculture
- Community and/or joint managed water points supported by technology transfer packages- sub-surface dams, shallow wells and deep boreholes.

2. **Make use of livestock for productive livelihood activities** which are socially acceptable, such as milk and cheese processing?

3. **Modernising agricultural practises** through provision of technology transfer packages for raising crops yields and income through linking the project area with agricultural research centres in Southern Sudan and local demonstration plots. Currently, it seems like selected community members are sent for training outside of the Maiwut County which limits out-reach to a larger target group. Instead it may be proposed to establish local demonstration centres and plots
- Soil husbandry; Up-scaling of vegetable production and marketing

4. **Tapping the forestry products** through community driven forestry activities supported by technology transfer packages –
-Promotion of agro-forestry and marketing
-Increasing coverage of trees of economic value in the area in order to meet the forest products demand of the local people
-Up-scaling of honey production and marketing
-Establishment and joint (community and local administration) management of reserve forests

7. **Diversification of income.** With regard to poverty alleviation, it is proposed that the project framework should be flexible enough to give support to a wide range of alternative and diversified livelihood practices and income sources as listed below

Agriculture:
- Vegetable processing, tomato paste and drying of ……
- Village small-scale edible oil extraction (sesame)
- Grinding machines and basic mills

Livestock:
- Milk processing, ghee, cheese, cutter

Fisheries:
- Fish nets making, repairs and marketing
- Fish handling and processing

Forestry:
- Forest fruits collection and processing: Tamarind, Dehydration of mango juice and mango deen
- Wood handicraft
- Honey collection, processing, packing
- Medicinal and aromatic plants
- Gum Arabic, cleaning, grading and marketing

Local Manufacturing:

- Establishing local manufacturing workshops in basic carpentry, masonry and metal works
- Small scale production of agricultural tools ploughs and hand tools
- Small scale metal manufacturing of metal scissors, metal folding, rolling machines, windows, doors etc.
- Wood manufacturing, windows, doors
- Handicraft, wood
- Transport support implements (animal drawn carts, bicycle trailers) Hand spinning and weaving of cotton
- Manufacturing of improved stoves
- Manufacturing of biogas units

Environmental interventions are discussed in the environmental sections of this report.

3.4 Implications for the Participatory Approach

The objective of the participatory approach is to successfully undertake the below listed activities and base the interventions from the findings:
a. Participatory mapping of problem identification, analysis and prioritisation
b. Participatory identification of solutions to most urgent problems
c. Participatory development of a community action plan
d. Verification of problem analysis and solutions with locality and unit authorities
e. Community partaking and contribution to implementation and management of community projects.

The above described methodology has been proven difficult to undertake in the Lau project area during project preparation. Nevertheless, the methodology is deemed to be possible during project implementation if sufficient time and support is allocated. The main challenges facing this implementation approach would be:

- Difficulties using participatory tools since the communities have had little or no previous exposure to such methodologies
- Difficulties with mobility in the area for the bio-physical survey
- Difficulties reaching the beneficiaries

In addition, there are a number of other potential problems facing sustainable watershed management in the Sub-basin. These may be summarized as follows:

- the sudden influx of very large numbers of IDP's and refugees returning to their homelands and the consequent pressures this may have on the natural resource base;

- the destruction and neglect of the physical and social infrastructure after 20 years of war and insecurity;

- the rupture and breakdown of the intricate socio-cultural networks within and among the many and various ethnic groups because of the war

3.4.1 Accessibility and Outreach

The first and main obstacle to perform the participatory implementation approach is the specific setting in Lau where there is no road network which makes it challenge to reach the primary beneficiaries even in the dry season. The communities are located far away from accessible areas both during wet and dry season. In the wet season the roads are inundated why the communities are completely cut-off from any means of communication. In the dry season the Nuer communities move away from their homes to the marshy areas far away from any road networks.

Hence, a large portion of the target group are located in remote and inaccessible areas, permanently or for parts of the year. First of all most of the target areas are inaccessible during wet season, why many of the on-going interventions are stalled. Another aspect is the transhumant patterns in the area, when the Nuer communities move to the marshy areas during dry season. This implies that, only a few community members are available during this period when most of the project interventions would take place. How to promote partaking in e.g. construction of water points when the young and active members of the community are absent?

The answer to this question is, that it is important to early mobilise the community for the selection of team members to stay behind and engage in important community projects. In fact, this would be conditional for benefiting from the project as part of the community contribution.

Another implication is that, in most areas, project interventions have to be preceded by access road clearing.

High transportation costs institute a constraint for marketing of production however there is access to both local (Maiwut and Pagak) and regional markets (Gambella).

3.4.2 Seasonal activities

The implementation must adopt to the climatic conditions and the consultant team will make an effort to carefully design the project accordingly and identify specific activities which are suitable for the dry and wet season respectively as well as for different geographically intervention areas.

From Kigili and up-stream – the area may be accessible also during wet season. The air strip is better prepared than in Maiwut and the soil is not as clayish. Hence, some activities could take place in this area in both seasons.

In Maiwut and Jotome Payams mobility is very challenging during wet season due to inundation and the muddy black cotton soil. The Maiwut air port is not always operational during the wet season.

Dry season - Any construction works would have to be undertaken during dry season from January/February to April.

Wet season – Community mobilisation by mobile extension team including participatory development of community plans and subject matter training. – Institutional strengthening of Maiwut County trough staff training and advisory services.

Project team may adjusted by the season i.e. more staff during dry season to undertake several parallel interventions

3.4.3 Community ownership and partaking

The second major obstacle is the meagre experience with participatory and conditional approaches based on community ownership in all stages. The main reason is the long period of conflict and civil war during which Southern Sudan has received major relief support however, has had little exposure to donor supported long term development interventions which have been a driving force in the dissemination of the popular participation agenda.

It would therefore be important to communicate to the beneficiaries that the FTWM project is different from previous relief and recovery interventions in the area in terms of implementation principles. In summary, it is recommended that the implementation consider the following issues:

- Inclusion of beneficiaries and contribution should be more important than dead-lines for demonstrating progress in terms of structures on the ground.
- Interventions should be conditional to community participation and contribution
- Management transition to participatory and community driven planning and development may need to be preceded by an extended period of mobilisation and awareness building
- Mobile and interdisciplinary development teams to spend time with communities

3.4.4 Conflict resolution

There is a risk that local conflicts could erupt during project implementation, both cultural driven conflicts (cattle raiding) and around competition of resources (landuse inflicted conflicts). In 2006, the population was disarmed by the government and since this then the area has become safer. As indicated above, there is a risk that –especially the pastoralists- will try to re-establish arms stock.

The traditional leadership system which is responsible for the allocation of land use rights and management of land use conflicts are still important, why the project is recommended to include community leaders as key driving forces for community sustainable development.

There is also an opportunity to build and include, as a resource, the Peace committees existing in the project area. In the next mission the consultant team will assess the potential to engage the Peace Committees and Traditional Chiefs in the project implementation process.

A few local NGOs are active in the area out of which only one has proven to be reliable according to the various international NGOs operating in the project area.

3.4.5 Gender and Vulnerable Groups

3.4.5.1 Women

This FTWMP could build on the landmark rights for women set out in the Interim Constitution of Southern Sudan. The 25% minimum quota for women's representation has great potential for advancing women's rights, and some progress has been made in women's participation at the central government level, but this has not yet reached the local level. The FTWMP should therefore strive for 25% minimum quota for women's representation in the project.

It would be important to provide support to local women's groups to enable their participation in reintegration and recovery process. It is women who have to stand in line at boreholes to collect water for their families. Conflicts at water-points are common -- because women from host communities are frustrated by large numbers of returnees placing a burden on limited water resources in the Lau watershed and they frequently target returnee women. In the Brunus society the women are the bread winner and responsible to make sure there is food on the table. The lack of adequate and timely provision of seeds and tools affects the lives of these women and their families. Reintegration processes often focus on reducing potential conflicts between men in the returnee and host communities, ignoring the women.

To sum, the challenges and opportunities that face the area and women in particular include:

1. Conflict
2. Poverty and food insecurity
3. Empowerment and Rule of human rights
4. HIV/AIDS
5. Early Marriage
6. Abduction and violence against women

Economic development is imperative to improve women's situation. With regard to empowerment of women in Maiwut, the women may suffer from inequality of employment opportunities. There is a need for FTWMP interventions to early sensitize towards integration of gender in the vocational training and keeping girls in school for formal education.

Some stakeholders such as women's groups, women headed households, female pastoralists and youth are extremely weak in raising their voices and demanding their rights. For the FTP is will be important to ensure that they are not overlooked and included in the preparation of the projects and its benefits while at the same time take care not to cause conflicts within families. With regard to the women, the project first has to provide intervention to ease there daily work load in order for them to have the time to partake in project interventions. The family as a whole must be mobilsed and come to a consensus on how to divide work load etc. This is also important for promoting the young to partake in schooling programmes.

3.4.5.2 Vulnerable groups

Projected vulnerable groups for 2008 in Upper Nile State was identified end of 2007 by the Norwegian Peoples Aid (NPA). The mapping includes Maiwut county and the figures are presented per Payam (Table x).

Maiwut	Flood Victims		2007 Returnees		IDP's		Projected 2008 Retns		Total 2008	
County	**HHs**	**Pop**	**HHs**	**Pop**	**HHs**	**Pop**	**HHs**	**Pop**	**HHs**	**Pop**
Pagak	198	1188	295	1772	120	720	160	960	773	4640
Maiwut	182	1092	10	60	0	0	141	844	333	1996
Uleng	207	1242	48	290	0	0	153	918	408	2450
Jikou	203	1218	139	832	0	0	156	941	498	2991
Kigile	109	654	0	0	0	0	86	507	195	1161
Jotome	179	1074	154	924	0	0	137	830	470	2828
Sub-Tot	**1078**	**6468**	**646**	**3878**	**120**	**720**	**833**	**5000**	**2677**	**16066**

It is worth noting that the targets for the repatriation of returning refugees for 2008 will most probably not be reached. Consequently, the repatriation will continue in 2009. However, the total number of returnees will probably not exceed 5000. The reason for the slow progress is the collapse of the bridge on the border between Ethiopia and Sudan. These new estimates emerged from consultations in March 2008 with organisations responsible for the repatriation from Boma Refugee camp in Ethiopia.

3.4.6 Local supporting institutions

Local institutional framework and capacity to support coordinated and sustainable land and water management is furthermore a challenge which needs special attention in project preparation and design. These aspects are further discussed in the Institutional Interim Report.

3.4.7 Conclusions for participatory approach

Hence, the following could be concluded for the participatory approach in Lau Watershed:

- A participatory project cannot be target-driven right from its start. In its initial phase, the project design should focus on the process of establishing participation rather than on seeking to achieve physical targets.

- It is important to strive for a simple organizational and coordination structure, based on existing structures and clearly stipulating linkages with higher levels.

- It also requires appropriate institutional development at community-level which, in the case of Lau study area, should build on the traditional leadership which still has an important role to play with regard to land use allocation in the Lau watershed. The set up at beneficiary level should be able to respond to the emerging needs in collaboration with local government. It has been observed that the perceived needs are rather homogenous at payam level which can be explained by that payams are divided after location for tribal groupings which in turn are linked to specific eco-systems and livelihood systems. With this background it is proposed that beneficiary organizations –or so called Development and Natural Resources Management Committees (DNRMCs) - are organized at Payam level. This set-up could be coupled with subject matter committees at community level. Another reason for this set-up is the potential close linkage between Payam Administrator and Payam DNRMC.

- Institutional arrangements are required that allow for multi-disciplinary and multi-agency collaboration and across ministries, contributing to breaking through single sector approaches. To this end, the central project (steering) and implementation should be undertaken at County level and not at State or national level.

- This project will be implemented during the starting up of the recovery phase. Hence, support is first and foremost needed for basic services as is the case for a recovery phase. Hence, the recovery phase will be the entry point for the sustainable development. In other words, sustainable development and poverty alleviation which is the objective of this project must be based on a foundation of provision of basic services such as water supply for drinking, health and education.

- Customary systems predominate in the South and 98 percent of Southern Sudan's population lives in rural areas. Customary land access is managed by tribal leaders including chiefs, spiritual leaders and elders.

4 Environmental Baseline and Analysis

4.1 Environmental Baseline and Threats

4.1.1 Hydrology and geomorphology

The minor differences in relief, the considerable rainfall that occurs in the summer, combined with a number of permanent streams and small rivers habit of overflowing their banks, all combined causes various degrees of flooding. It is the degree and extent of flooding which determines the type of natural vegetation, the utility of land for grazing or cultivation, and indeed the whole nature of the region as a field for human occupation. The main ecosystems resulting from above interactions are:

- Marches or (Nuer toich) in the flood plain which is inundated for a period of four to six months every year. The flood plain has been built up by the deposition of the alluvial material. Selective erosion has played its part in removing finer particles in suspension after rainstorms.
- The intermediate land which is crossed by numerous streams and rivers and for sometimes flooded because of the impeded drainage.
- High lands normally escape flooding and have sufficiently permeable soils to drain quickly after rain.

The Lau river is not perennial and dry season water shortage is acute. In the wet season on the other hand the rain is intensive and plentiful resulting in inundation of the area. The abundance volumes of water ends up in large marshy areas. No major infrastructure is in place to capture the water. From water resources assessment based on data on climatic data and field surveys in the area, there is evident that water resources are sufficient to cover community demand of the Lau river as well as the environmental demands. Instead, there are other characteristics of the system that will determine the proposed structures involved for capturing water.

4.1.1.1 Threats

The unique hydrological and ecological conditions in Lau Watershed have given rise to a rich diversity of livelihood and socio-economic systems. These have over time developed a close response the seasonal changes in hydrology and ecology. Thus, any changes in the hydrology caused by modification of channel geometries and flow directions along stream reaches and dam constructions etc could have unexpected consequences on ecological condition and as a turn the human livelihoods.

4.1.2 Vertisols

Black cotton soils occupy the lower part of Lau watershed comprising nearly level to gentle mild slope flood plains. The key as well as dominant environment issue is highly

associated with the black cotton soils covering more than two-third of the watershed area. Black cotton has many names: “black cotton soils” (because of their colour and sponginess) is its widely used name in agriculture is “vertisols”. Similarly “expansive clay” or “heavy clay soils” is its name in engineering.

Black cotton soils owe their specific properties to the presence of swelling clay minerals. As a result of wetting and drying, massive expansion and contraction of the clay minerals takes place. Contraction leads to the formation of the wide and deep cracks that can be wide enough to make the terrain treacherous for animals. This massive expansion and contraction can cause the formation of distinctive micro-topographic features of knolls and basins that develop by internal mass movements in the soil and heaving of the underlying material to the surface.

Black cotton soils are comparatively fertile soils, found mostly on land with slopes not exceeding 8 percent. Their clay content ranges from 35 to 80 percent. Indeed, the percentage of clay largely determines the black cotton soils’ physical properties. Clay soils hold a great of water, which slowly filters into the ground and then slowly drains away. This process means that clay soils are often waterlogged during the rainy season, which in Lau watershed takes place from May to early November. When clay soils are wet, they swell and become plastic - thick, slick and heavy. During the dry season, which lasts from November to May, these once-waterlogged soils lose their moisture and shrink. Cracks, some as large as 10 centimeters wide and 1 meter deep, *are* not uncommon. Moreover, these once-muddy, now water-starved, soils become hard and brittle

(Photo Plate 1).

Such characteristics mean that normal cropping practices cannot exploit the soils’ full potential. That’s because farmers must delay sowing seeds until September as soils remain waterlogged after the heavy rains. If farmers could till this land during the rainy season, they could increase their yields by the extending the growing season.

A small amount of rainfall as little as 6 mm can make these soils impassable to all traffic. The sticky plastic nature of the soils causes them to pack up under wheels, animals feet, clog cultivation implements, once ‘adhered’ the clay is extremely difficult to dislodge.

Because these soils present unique engineering difficulties, due to their high linear extensibility, special designs for structures and buildings are necessary, but these generally fail to prevent structural damage to buildings, roads and irrigation schemes even when designed and implemented at great cost.

4.1.2.1 Threats

Vertisols are on flat terrain in Lau Watershed and this reduces the chances of sheet and gully erosion, but increases the chances of water logging. However, the major soil degradation types confronting the Sudan Vertisols under the current cropping systems in Sudan in general of both irrigated and rain-fed areas are soil compaction due to heavy machinery use, nutrient depletion due to lack of fertilizers use, and loss of soil organic matter.

4.1.3 Water Quality and Environmental Health

Water quality and in turn health is a problem in the project area. Sanitary disposal of faeces and keeping drinking water free from faecal contamination is not properly undertaken in the study area. In addition, the traditional water sources i.e. extremely small size pools and scooping sandy stream beds, are unprotected.

There are no large point sources for pollution basically due to lack of large scale economic activity in the area. On the other hand, water quality at traditional water points such as unprotected small size pools and scooping sandy stream beds are locally polluted from pathogens.

4.1.3.1 Threats

Oil exploration is not expected to be undertaken within the study area. Instead, the greatest threat to the quality, for the near future, is the sanitary behavioural of the of the people and the habit of using same water source for animals and households.

The most significant improvements result from behavioural changes that prevent pathogens reaching the immediate human environment coupled with physical interventions protecting the water sources.

4.1.4 Vegetation Cover

The area comprises woodland savanna, swamps, open grassland and riverine forest.

Around Kigili, in the upper part of the Lau river, the forest cover is a moderately dense savanna woodland comprising of Balanites, Tamarindus, Sclerocarya as common species. The following are common tree species both indigenous and exotic:

No	Scientific name	Common name Nuer	Common name Burun
1	Balanites aegyptica	Thaue	Shubow
2	?	Oleng	Oruk
3	Tamarindus indica	Bow	Tenten
4	Sclerocarya birrea	Kamel	Teken
5	Carisa papaya	Papaya	
6	Mangifera indica	Mango	

The dominating grasses are Sorghum Sudaneses (Adar), Hyparrhenia sp (both species is a fire climax grasses subjected to periodic burning), Pennisetum ramosum, Lannia spp and Cassia spp.

Important species in the riverine vegetation include, Ficus seycomorus, Tamarindus indica, Maytenus senegalensis, Enteda Africana , Syzgium guinenses and Acacia spp.

In Maiwut region, the natural vegetation of the area is savanna woodland with moderately dense canopy cover. The major indigenous tree species found are shown in the table below. Forest cover has depleted by 25% between 2005-2008 due to overcutting for fuel wood, construction and clearing for crop cultivation. In addition to wood fuel and construction wood, the forest is used by wild honey collectors.

Popular and frequently occurring trees are the following:

No	Scientific name	Common name (Neur)
1	Balanites aegyptica	Thaue
2	Anogeissus leiocarpus	Reak
3	Ceiba pentandra	Lath
4	Kigelia africana	Luael
5	Azadiracta indica	Neem
6	Mangifera indica	Mango

The preferred tree species for planting are Balanites, Neem and Mango and the preferred location for tree plantations is around the village boundaries.

Although there is large forest cover in the area, at the current rate of tree cutting, it will degrade significantly within a short period of time. Joint forest management and tree planting are required.

In Jekou, the forest cover in the area comprises woodland savanna and this has decreased over the years. Common tree species include:

No	Scientific name	Common name (Nuer)	Preferred for plantation
1	Scelrocarya birrea	Camel	
2	Balanites aegyptica	Thaue	2
3	Tamarindus indica	Bow	3
4	Acacia polycantha	Cuaw Dok	
5	?	Uleng	1
7	Adansonia digitata	Dhuony	
8	Acacia seyal	?	

Plantation is not practised, but would be preferred at homesteads. Most trees are bearing fruit, and are used for eating fresh and making juice.

From Jontome to Wichgatluak at Baro river, four landscape / land use types were passed on the lengthy (6-7 hr) trip, namely dense woodland/forest, open savannah woodland with a rich abundance of antelopes, a mostly dried swampy area where Lau river ends and an open pastureland on the bank of Baro River, where the Jotome Payam villages have their dry season camps.

See Photo 12-14 for view of the four landscape types.

Dominant species in the woodlands was Acacia seyal.

Three types of swamp vegetation are distinguished: (a) *Cyperus papyrus* swamp, (b) *Typha domingensis* swamp, and (c) *Vossia cuspidata* swamp.

Cyperus papyrus Swamps: These swamps form a fringe along water courses, pools and other water with deep and constant depth. The plants form a floating mat upon which other species – mainly climbers are found.
Typha domingensis Swamps: These are most extensive away from the river channels. The vegetation is not floating but rooted into the substrate covered by very shallow water. There are few other plant species. This is probably the extensive swamp type in the Machar Marshes
Vossia cuspidata Swamps: This vegetation is found next to flowing water. It has creeping, submerged or floating stolons. It is often associated with water hyacinth.

4.1.4.1 Threats

The forest is threatened if some livelihood practices continue to be uncontrolled for instance cutting down of trees for fuel wood, for construction material, for animal feed and in order to clear land for agriculture.

As people return there will be a need to clear land for farming, which will involve considerable cutting of trees and burning. It will be important that as far as is possible that they do not occupy marginal land. It will be important the most fertile of traditional crop areas are not alienated for agro-industrial schemes.
With economic development comes increased household wealth. To this end, there could be a risk among the Nuer community that this surplus is invested in more livestock heads. If that would be a trend it could in turn result in new problems such as overgrazing.

4.1.5 Wildlife

The plant ecology of the wetlands and flooded grassland mosaic located on the clay plains are important in the livelihood strategies of the agro-pastoral peoples who live on the plains and they also provide habitat and species biodiversity of some considerable importance. Most famously they are home to the White-eared Kob (*Kobus kob subspp. leucotis*) and to the Nile Lechwe (*Kobus megaceros*). The white eared kob undertake a massive migration of some 1,500 kms. Both listed by IUCN as threatened species. In

addition the area is an important habitat for large mammal species and wide range of avifaunal species. Other wildlife in the area are giraffes, elephants, Warthog Ostrich and various types of antelopes

There is an intense competition with wildlife for grazing land and crops. Lions, hyenas and leopards kill their animals, about a hundred a year, 50 cows, 20 sheep and 30 goats. This happens when the antelopes migrate and wild animals lack their prey. Wildlife is currently not hunted, due to lack of rifles, but some soldiers do hunt.

4.1.5.1 Threats

Change of land use for more intensified agriculture is not expected to be a major threat to biodiversity and wildlife in the near future.

Hunting on the other hand, is uncontrolled and seems to be socially acceptable and is done by the population at all levels from communities to soldiers from the local military base to local authority staff as witnessed by the consultant team.

4.1.6 Environmental management and protection

The policy framework for environmental management and protection and related issues such as land use planning and land tenure is still lacking. In addition, the policy statements that have been heard from the Government have not been satisfactory from environmental experts perspective, as visualized in the two below paragraphs.

-A USAID assessment of environmental threats and opportunities in Southern Sudan (Catterson et al., 2003) noted with concern the views expressed by the Technical Committee on Natural Resources Management and Utilization that the wetlands in Southern Sudan "*represent prime agricultural lands in Southern Sudan. Although these wetlands can also be used for livestock watering and grazing, sanctuaries to thousands of bird species etc., their main function should be for the production of cereal crops such as maize, sorghum, rice, etc."*
-The same USAID report referring to agricultural and land use policy directions of the Southern Sudan administration considered that they would like to return to the "*status quo ante*" typified by a "command and control" approach as their central theme of agricultural and natural resource policy. The Report concluded that great care will be needed in agricultural and rural development to avoid policies, actions and decisions that erode peoples' actual or perceived land and resource tenure rights.

Under the current circumstances when neither the national policy framework nor the local authority capacity is capable of protecting the environment, activities can be undertaken without being properly controlled. With this background, the main threats to the local environment and ecosystem which could be of concern are summarised as:

1. Changes in hydrological pattern and geomorphology
2. Water pollution
3. Soil degradation
4. Overgrazing
5. Deforestation
6. Loss of Wildlife

Consequently, these threats will be considered by the project to the greatest extent possible.

The underlying causes resulting in above threats could be summarised as:

- Lack of institutional enabling framework for environmental protection
- Lack of local level interest and awareness of consequences on local environmental (e.g. sanitation and water borne diseases)
- The creeping processes of population growth and influx, climate change and land degradation.

4.2 Implications on Project

4.2.1.1 Project Responses and Positive Impacts

Environmentally responsible development is one of the corner stones of the project and a number of interventions will have direct positive impact on the local environmental conditions and the future environmental management and protection of the area. The recommended response interventions to the identified key environmental issues are discussed below.

Threat	Project Response
Changes in hydrological pattern	Choice of technology; Compulsory EIA for construction. The project proposals make no provision for mechanized construction of mechanized agriculture.
Water pollution	Awareness building; introduction of improves sanitation, protection of water points
Soil degradation	Improved extension incl. provision of technology packages
Overgrazing	Introduction of information, closures and regulation as mgt tools; Conflict resolution through working with Development and Natural Management Committees
Deforestation	Introduction of information, closures and regulation as mgt tools, introduction of alternative energy sources and construction material, community mgt and guards
Loss of Wildlife	Introduction of information and regulation as mgt tools

The above mentioned project responses are likely to result in positive impacts and give the bases for the long term health of the unique ecosystem in the Lau Watershed. Some of these positive impacts are discussed in this section.

Negative consequences from mismanagement and overuse of local natural resources will be clearly communicated to the beneficiaries, that they can relate to. It is expected that environmental awareness will thus improve both at community and local authority levels.

The risk of surface water pollution will be minimized by training and certifying the physical protection of water sources from direct human and livestock contact, wich in turn will improve the health status of the population.

Mainstreaming environmental considerations into all County departments:
Improved environmental management procedures should be supported at local authority level, especially with regard to integrated land use planning and sustainable use of the local resources. Specific interventions for protection of wildlife, rangeland closures and forestry reserves are also recommended. To this end, improved liaison and joint action between communities and local authority could be promoted but also stricter enforcement and guarding of protected areas. In this way, the long term sustainable use of the local resources could be ensured.

In order to avoid soil degradation, the project proposals make no provision for mechanized construction of mechanized agriculture.

The sustainability of the rain-fed agriculture should follow some strategic approaches which would maintain soil fertility and conserve moisture. All sectors, such as research, extension, crop rotation etc., are expected to play effective roles in the promotion of peace and development. Thus, the development of the capabilities of these sectors including their infrastructure, technical facilities, and human resources is essential.
Beneficiaries' sensitization over the collective planning, construction and maintenance of development works will produce a positive impact on the biophysical environment. The implementation of the proposed project components will significantly contribute to the improvement of their livelihood by enhancing food security, improving farmers' income and creating rural jobs.

Introducing alternative energy sources and sustainable construction using stabilized earth blocks is believed important step towards a forest in a continued good physical shape in the area.

4.2.1.2 Alternative energy – socio-economic considerations

Introduction of alternative energy sources such as promoting use of animal waste and agricultural residue for biogas production. The social acceptability will be further assessed. Furthermore, introduction of improved stoves could have multiple positive effects, the stoves use less wood putting less pressure on women workload and local forestry resources, if locally produced by women it could be a supplementary household income.
The project area is a remote rural area and will probably not benefit from any rural electrification programme for some time. Presently, the population uses a significant amount of firewood and charcoal for cooking. The unavailability and the acute shortages of the conventional energy supply (electricity) to rural people have forced them to use other available energy sources like biomass. It would therefore be appropriate to support to the communities to revert from cutting down the local forest resources which ecosystem services could be benefited from in other ways. The following alternative energy sources are proposed to be promoted by the project and supported by making available community investment funds for any individual investment cost:

Improved cooking stoves - It has been learnt from previous efforts in Sudan, that women involved in income generating activities are more interested in energy saving stoves as a means of saving time and labour. Efficiencies of at least 20% can be achieved with most improved stoves, implying an energy saving of around 25% compared with open fires. Improved stoves can also reduce smoke in the kitchen and its negative impacts upon health by enabling the fuel to be burned more efficiently.

Biogas - Biogas technology was introduced to Sudan in mid 1970s when GTZ designed a unit as part of a project for water hyacinth control in central Sudan. Anaerobic digesters producing biogas (methane) offer a sustainable alternative fuel for cooking, and lighting that is appropriate and economic in rural areas. In Sudan, there are currently over 200 installed biogas units, covering a wide range of scales appropriate to family, community, or industrial uses. This experience is unfortunately not available in Southern Sudan. Nevertheless, considering the prevalence of animal wastes in abundance in the project area there is a great potential to promote construction household and community biogas units.

Solar Energy (PV System) - The favourable climatic conditions have brought about a rapid development of solar energy technology in the past three decades (solar water heaters, PV for lighting, solar cookers, etc.). The low income of farmers and high cost of PV devices make the popularization of PV systems for lighting difficult. The presence of the PV system in Sudan and the Sudan energy strategy and policies, and the implementation of the national 1000 villages solar energy supply, and the past long experiences in Sudan still argues for introducing solar energy as one of the project activities. Solar energy could for instance be used for local administration buildings, training centres and project offices and housing.

LPG –The market and private sector capacity coupled with the low willingness to pay for alternative energy sources in the study area limits the potential for promoting LPG solutions within the project fame work. Currently, the fire wood is in abundance, hence the willingness to put the little household saving on this commodity is not estimated to be very great.

Based on the above analysis, the project is recommended to promote use of improved stoves and biogas units at community level and solar PV systems for lights etc and biogas units at staff offices and lodges at administrative level.

4.2.1.3 Alternative Construction Materials – Socio-economic considerations

The Sudan post-conflict environmental assessment undertaken by UNEP in 2007, argues for the promotion of alternative construction techniques which builds on traditional techniques. The document reads:

“Traditional soil construction techniques are used in 80 percent of buildings in Sudan, and this figure rises to over 90 percent in rural areas (2000 data). The advantages of soil are its very low cost, its local availability and the simplicity of construction. Its disadvantages are its low strength and durability, particularly in high rainfall areas. The more affluent

Sudanese therefore rely on brick construction instead, and the demand for fuel to fire bricks is one of the causes of the deforestation occurring in Sudan.

Compressed and stabilized earth construction techniques combine the advantages of both traditional earth and modern brick construction. The method can be summarized as follows: suitable moist soil consisting of a mixture of clay, silt and sometimes sand, is blended for uniformity before a stabilizing agent such as cement, lime, gypsum or bitumen is added.
The material is then placed in a mechanical or hand-powered press, which crushes the soil-stabilizer mix into a hard, dense brick that is dried naturally, gaining strength in the process. The bricks obtained can be used just like fired clay or concrete bricks.
Modern compressed earth technology has proven effective in many parts of the world, and several buildings, such as the Haj Yousif experimental school in Khartoum North, have already been constructed in Sudan as demonstration projects.
The environmental savings are significant, as studies have shown that compressed earth construction uses approximately only one to two percent of the energy for material development per cubic metre that cement and fired bricks use [6.18].

The economics of compressed earth indicate that – if introduced correctly – the technology can be commercially selfsustaining, as it can compete with brick and cement on cost grounds. The main obstacle to market entry is its novelty and a lack of local knowledge.
International agencies in Sudan use considerable amounts of fired bricks to build their offices and residential compounds.
Compressed earth technology offers the opportunity for the UN and other international aid organizations to reduce the negative impact of their presence and extend the 'do no harm' principle to include the environment."

It is recommended that this technique is introduced and tested in the Lau Watershed project area, as a means to achieve long term sustainable development in the area. The technology and capacity already exist within the Ministry of Environment (GONU) in Khartoum.

4.2.2 Negative Impacts

The potential negative impacts identified due to implementation of the proposed interventions are limited. These impacts could be reduced through systematic application of mitigation/optimization measures and adequate environmental monitoring

It is very essential for any environmental impact assessment to consider the nature of black cotton soil as it is the dominant environmental component in Lau watershed. The potential negative impacts could result from the trucks that transport construction materials. Tracks will create deep-cuts on grounds that covered by black cotton soils and also demolish banks of streams.

Construction of works will require the lifting of materials (earth, rubble, sand and gravel) in quantities enough to modify the environment, perhaps even becoming obstacles to the movement of people and livestock in the area.

Foundation of static or rigged structures such as buildings and culverts require expensive treatment. The main problem originates from the nature of "expansive soils"

(shrinking and expanding) that do not suit static structures. If proper engineering measure is not taken, problems such as cracks, unbalanced settlement, dislocation, etc.

Some clearing of land for feeder roads and agricultural land will be undertaken but in a controlled manner properly in conformity with county land use plans.

Water will be captured for use by the communities which will slightly change the hydrological conditions. If recommended mitigation measures (see below section 4.3.3) are adhered to, the impacts will be minor.

4.2.3 Mitigation Measures

All planning and implementation processes will consider mitigation measures for possible negative impacts.

Any intervention with regard to utilization of Lau stream should make sure that the flow direction behaviour is not significantly altered as the consequence can not be predicted without very through investigation.
Modification of channel geometries and flow directions along stream reaches due to water storage works is avoided. Over ground works for storing water are also avoided. It is also proposed that routes that are frequently used by trucks be surfaced with materials such as gravel and stone at least at selected critical locations. Channel crossings must be provided with ford structure in order to avoid deep cuts and muddy situations.

The main objective of agricultural interventions is to raise the sustainable level of production of the land, water and vegetation from subsistence level to market oriented production through the application of sustainable resources use systems. The strategy should be based on research findings of similar situations in the Sudan and elsewhere. Black cotton soils are inherently fertile. Crop-livestock interactions have proved to be positive in most of the systems. As most of the proposed black cotton soil management technologies result in higher availability of fodder and drinking water throughout the dry season, livestock performance will be improved.

The project will promote hygiene education, promote and popularize domestic latrines. Environmental sanitation training/sensitization activities will target the local potable water and market infrastructure management committees.

The Coordination unit will support the County health services and develop health awareness, especially among women and children, on the prophylactic measures to take to control water-borne diseases or those caused by the presence of bodies of water.

4.2.4 Project Sustainability

To guarantee the sustainability of operations described earlier, the project was designed on a participatory basis and contains measures aimed at holding the beneficiaries accountable. Grassroots and Maiwut County department representatives will be associated with the project planning and design from the preparatory phase. Project

activities will be planned and designed to meet the priority needs of the beneficiaries. The project provides for campaigns to sensitize, organize and train the beneficiaries.

5 Environmental and Social Monitoring

The Coordination Unit will be responsible for project environmental and social monitoring. The Unit will include an environmental expert charged, among other things, with implementing the Environmental and Social Management Plan (ESMP). In terms of monitoring the specific indicators relating to the quality of water and soils, the Coordination Unit will sign memoranda of understanding and/or agreements with beneficiaries.

The ESMF prepared for the FTWMP in Sudan ensures consistency with environmental and social regulations and laws of Sudan, at the National, State and local-levels as well as with the World Bank safeguard policies. It describes the instruments that will be used to ensure compliance with the triggered Safeguard Policies and develop documents as required in addition to the EA (such as e.g. Resettlement Action Plans/Policy Frameworks, and others as specified by the safeguards policies). As part of the project implementation plan it also describes required training, capacity-building, monitoring measures and institutional arrangements for implementation.

5.1 Project Impact indicators

The impact indicators to be monitored at periodic intervals will be divided in the following thematic areas:

Human welfare
- Changes in household livelihoods (assessts, income and income sources)
- Changes in gender work loads
- Changes in human health
- Changes in literarcy statistics (not direct impact of project but an interesting externality indicator)

Community capacity
- Changes in performance of community projects ie. number of community proposals submitted, approved and implemented and completed showing extent of community involvement
- Changes in performance of community organisations in terms of members, financial management and outreach of community projects (disaggregated by gender in each socio-economic and livelihood group and type of benefits)
- Changes in prevalence of land use induced conflicts and coping strategies
- Changes in Experience with extension services
- Changes in Experience with income generating activities

Institutional Capacity
- Changes in staff expertise and experience
- Changes in land use planning procedures and management tools
- Changes in experience and procedures for participatory approaches

Agricultural productivity
- Changes in crop yields
- Changes in livestock productivity

Natural resources conditions
- Changes in soil fertility
- Changes in soil erosion rates
- Changes in vegetation cover
- Changes in sediment load
- Changes in water quality
- Changes in biodiversity and wildlife

The recommended monitoring methods are:

Hunting -Wildlife inspectors/guards should keep records of all instances of poaching.
Habitat Quality -Biannual (Wet Season & Dry Season) monitoring of mammals and bird communities should be used to determine changes in habitat quality. Butterflies should be used as an indicator on an annual basis.
Forest Cover -Annual Monitoring of the extent of forest cover should be made using satellite imagery and field visits.
Area of forestry reserve (if established)
Water quality – Annual monitoring of dry season pathogen content at water points
Range condition-Annual Monitoring of the extent and condition of grazing land should be made using satellite imagery and field visits.
Area of closures (if established)
Animal Populations – Annual head counts by animal health works

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SWECO

Eastern Nile Technical Regional Office

WATERSHED MANAGEMENT FAST TRACK PROJECT, SUDAN

INSTITUTIONAL INTERIM REPORT

Draft Interim Report

Stockholm 21 April 2008
SWECO International AB

Project No. 1989151300

ra02e 2005-01-17

SWECO

Abbreviations

ACORD	Agency for Corporation on Research and Development
CBO	Community Based Organisation
CIF	Community Initiative Fund
CLMP	Community land use management and development plans
CPA	Comprehensive Peace Agreement
DNP	Dinder National Park
DNRMC	Development and Natural Resource Management Committee
EIA	Environmental Impact Assessment
ENSAP	Eastern Nile Subsidiary Action Programme
ENTRO	Eastern Nile Technical Regional Office
FTWMP	Fast Track Watershed Management Project
GONU	Government of National Unity
GOS	Government of Sudan
GOSS	Government of Southern Sudan
ICRISAT	
IDP	Internally Displaced Population
IWM&D	Integrated Watershed Management and Development
IWRM	Integrated Water Resources Management
LGRP	Local Government Recovery Programme
LIU	Local Implementation Unit
M&E	Monitoring and Evaluation
NGOs	Nongovernmental Organisation
NIP	Nile Interdevelopment Program
NPA	Norwegian Peoples Aid
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PIU	project Implementation Unit
PRA	Participatory Rural Assessment
PRSP	Poverty Reduction Strategy Paper
RRP	Recovery and Rehabilitation Programme
SSP	Support to States Programme
SSRCC	Southern Sudan Recovery Coordination Committee
UNCHR	United Nations Commission for Human Rights
UNDP	United Nations development Programme
WFP	World Food Programme
WRDM	Water Resources Development and Management

Table of Contents

1 Introduction

The methodology for the institutional assessment is divided in two focus areas:

1. Overview description of institutional set-up and context; and
2. Analysis of institutional key issues to consider in Project Implementation.

The capacity analysis focuses in particular, on the ability of the County to:

- Identify, develop and allocate land;
- Jointly with communities define and manage infrastructure; and
- Mobilize community resources.

The specific interest groups relevant for the Lau Watershed project area are provided in Annex 1: Project Stakeholder Matrix

2 Institutional Context

2.1 General Governance system

There are three levels of institutional authority; federal level -Government of Sudan (GOS)/Government of Southern Sudan (GOSS), state level and county level. Within the jurisdiction of counties, there are Payams administrative units and Bomas.

Sudan Federal Government structure is made up of 25 states. The CPA provides for a Government of Southern Sudan (GOSS) under which the 10 southern States fall. Each State comprises of a number of counties. A county is composed of Payams and each Payam is divided into Bomas; and a Boma as a smallest administrative unit of governance in Southern Sudan comprises of a number of villages.

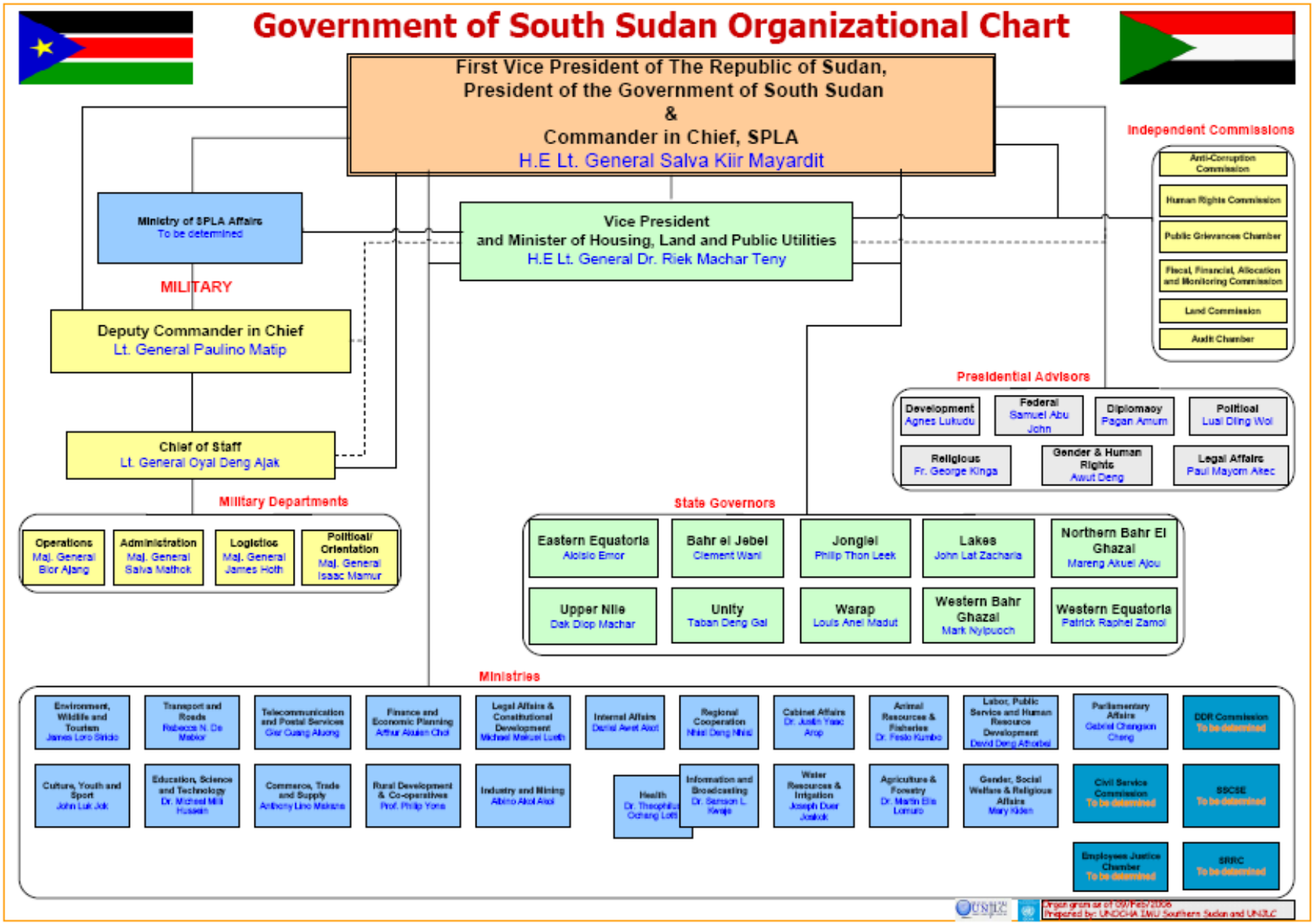
GOSS is headed by a President who is also a 1st Vice President of the Republic of Sudan, the State Government is led by a Governor, the County is supervised by a commissioner, the Payam is run by a Payam Administrator and a Boma is administered by the traditional leadership system. This implies that Payam is the lowest administrative level with government appointed staff.

Through the State, technocrats from GOSS line Ministries/Institutions are ported to the counties to execute development projects and Government policies.

During the CPA transition phase, the autonomy of the South has been agreed and the necessary institutions to cater for “one country, two systems“ are functioning. GOSS and the 10 States have the constitutions in place.

2.2 GOSS level

The governing framework is in place, although in infant stage. The below figure gives an overview of the GOSS level ministerial set-up and as indicated in the figure. GOSS has established *inter alia* four Federal Ministries directly concerned with **natural resources** being, **the Ministry of Water Resources and Irrigation, the Ministry of Agriculture and Forestry, the Ministry of Animal Resources and Fisheries and the Ministry of Environment and Wildlife Conservation**.


Government of South Sudan Organizational Chart
First Vice President of The Republic of Sudan,
President of the Government of South Sudan
&
Commander in Chief, SPLA
H.E Lt. General Salva Kiir Mayardit
Ministry of SPLA Affairs
To be determined
MILITARY
Deputy Commander in Chief
Lt. General Paulino Matip
Chief of Staff
Lt. General Oyal Deng Ajak
Vice President
and Minister of Housing, Land and Public Utilities
H.E Lt. General Dr. Riek Machar Teny
Independent Commissions
Anti-Corruption Commission
Human Rights Commission
Public Grievances Chamber
Fiscal, Financial, Allocation and Monitoring Commission
Land Commission
Audit Chamber
Presidential Advisors
Development
Agnes Lukudu
Federal
Samuel Abu John
Diplomacy
Pagan Amum
Political
Lual Ding Wol
Religious
Fr. George Kinga
Gender & Human Rights
Awut Deng
Legal Affairs
Paul Mayom Akec
Military Departments
Operations
Maj. General Bior Ajang
Administration
Maj. General Salva Mathok
Logistics
Maj. General James Hoth
Political/ Orientation
Maj. General Issac Mamur
State Governors
Eastern Equatoria
Aloisio Emor
Bahr el Jebel
Clement Wani
Jonglei
Philip Thon Leek
Lakes
John Lat Zacharia
Northern Bahr El Ghazal
Mareng Akuei Ajou
Upper Nile
Dak Diop Machar
Unity
Taban Deng Gai
Warap
Louis Anei Madut
Western Bahr Ghazal
Mark Nyipuoch
Western Equatoria
Patrick Raphel Zamol
Ministries
Environment, Wildlife and Tourism
James Loro Stirdo
Transport and Roads
Rebecca N. De Mabior
Telecommunication and Postal Services
Gier Cuang Aluong
Finance and Economic Planning
Arthur Akuien Chol
Legal Affairs & Constitutional Development
Michael Makuei Lueth
Internal Affairs
Daniel Awet Akot
Regional Cooperation
Nhial Deng Nhial
Cabinet Affairs
Dr. Justin Yaac Arop
Animal Resources & Fisheries
Dr. Festo Kumbo
Labor, Public Service and Human Resource Development
David Deng Athorbei
Parliamentary Affairs
Gabriel Changson Chang
DDR Commission
To be determined
Culture, Youth and Sport
John Luk Jok
Education, Science and Technology
Dr. Micheal Milli Hussein
Commerce, Trade and Supply
Anthony Lino Makana
Rural Development & Co-operatives
Prof. Philip Yona
Industry and Mining
Abino Abol Akol
Health
Dr. Theophilus Ochang Lom
Information and Broadcasting
Dr. Samson L. Kwaje
Water Resources & Irrigation
Joseph Duer Jokiok
Agriculture & Forestry
Dr. Martin Elia Lomuro
Gender, Social Welfare & Religious Affairs
Mary Kiden
Civil Service Commission
To be determined
SSCSE
To be determined
Employees Justice Chamber
To be determined
SRRC
To be determined

2.2.1 Ministry of Water Resources and Irrigation

Ministry of Water Resources and Irrigation (MWRI) is the GOSS counterpart Ministry for the FTWMP-Lau Project Area. A project coordinator and a GOSS multi-sectoral working group are appointed for the FTWMP-Lau Watershed Project Area.

MWRI comprises of six Directorates:

- Survey
- Irrigation and diversification
- Hydrology and Projects
- Wetlands and Water Management
- Administration and Finance
- Planning

Meteorology, however is not organized under the MWRI but under Ministry of Aviation.

2.2.1.1 Priorities and Challenges

As a result of two decades of war that ended in 2005, millions of people in Southern Sudan especially women and children do not have access to safe drinking water. Only 40 per cent of the population has access to safe drinking water and less than 30 per cent practice good hygiene and sanitation thus putting millions of lives in danger of water borne diseases. With this background it is natural that the Water Policy of Southern Sudan focuses on delivery of basic services such as rural water supply. The guiding principles for Rural Water Supply and sanitation spelled in the GOSS Water Policy are as follows:

- Access to sufficient water of acceptable quality to satisfy basic needs is considered a human right and shall be accorded highest priority in water resources development.
- Sanitation and hygiene education shall be actively promoted in order to maximize the social and economic benefits of rural water supply development.
- Investment in Rural Water Supply and sanitation shall be targeted firstly to those areas which are currently unsaved or experiencing acute water shortage.
- Selection of technologies appropriate for the delivery of Rural Water Supply and sanitation services shall be guided by criteria on social, equity, economic efficiency, system reliability and environmental sustainability.
- Rural communities shall be supported to take an active role in planning, management and financing Rural Water Supply and sanitation schemes on a sustainable basis.
- Involvement of private sector and NGOs in the delivery of goods and services shall be actively encouraged and supported wherever appropriate

Some environmentally related water issues are:

- Planned large dams and related development schemes;
- Traditional dams;
- Wetland conservation;
- Invasive plant species;
- Water pollution;
- Groundwater exploitation;
- Transboundary issues and regional issues; and
- Freshwater fisheries.

2.2.2 Ministry of Environment, Wildlife Conservation and Tourism

Environment and wildlife issues are the mandate of the Ministry of Environment, Wildlife Conservation and Tourism (MEWCT). The UNEP Post conflict environmental assessment of Sudan reports that the MEWCT has over 600 allocated staff positions at the regional and state level. Wildlife staff excluded. It is not clear from the report if those positions are filled. As for the other GOSS ministries, almost all of the MEWCT staff is newly appointed and relatively inexperienced in civil servant tasks. The exception is the wildlife sector, where the GOSS has inherited some of the expertise developed by the SPLM during the conflict period.

As indicated in the above section environmental responsibilities for key water issues are under the MWRI. Other ministries with environmental responsibilities include the Ministry of Agriculture and Forestry (MAF), the Ministry of Animal Resources and Fisheries (MARF) and the Ministry of Industry and Mining (MIM).

The Environmental Framework Act (2001) provides a mandate for state-level environmental administration and legislation, which was reinforced by the Interim Constitution in 2005. Still, State governments in the south have virtually no environmental administrations or capacity.

2.2.2.1 Priorities and challenges

Southern Sudan has just come out of a war and to sustain biodiversity, is naturally not one of the Governments priorities which is visualised by that this area is poorly regulated, enforcement is weak and institutional set-up at state level is developing slowly. Environmental hazardous activities such as oil exploration are lacking regulating environmental legislation.

The UNEP report, 2007, conludes that the GOSS core structure for environmental governance is considered to be appropriate and well designed at the ministerial level. Three major issues, however, need to be resolved in order to progress further in organizational development and capacity-building:

- organizing the large number of wildlife forces (7,300) and maintaining a balance in the ministry between the three directorates of environment, wildlife and tourism;
- determining the role of the ministry in practical issues such as the implementation of practical policies and the enforcement of environmental legislation; if appropriate, a semi-autonomous Environmental Protection Authority or similar unit may need to be developed; and
- determining the relationship between GOSS and southern states on environmental governance, in order to progress associated capacity-building and legislative development.

The report continues to state that leaving Southern Sudan without any environmental controls during the post-conflict period is considered to be an unacceptable risk for its environment.

The priority sectors are:

- Environmental impact assessment and project development permitting;
- Urban planning and environmental health, including waste management; and
- Oil industry environmental legislation (in cooperation with GONU).

The main project implication is the necessity to agree with implementing agencies on the use of the project specific ESMF and to provide training on the same and lastly to provide sufficient budget resources for the implementation.

2.3 Upper Nile State

At State level, institutions of governance include the Assembly and the Cabinet (Council of Ministers, chaired by the Governor); and the Ministries include:

- Ministry of Physical Infrastructure- Peter Pal Riek
- Minister for Agriculture, Environment and Rural Development - Mr. Samuel Aban Deng
- Minister of Finance, Trade and Economic Planning – Mr. Stephen Dhieu
- Minister for Local Government and Law Enforcement – Mr. Dok Jok Dok
- Minister of Social Development – Sarah Nyanath Young
- Minister of Health – Mr. Moses Kueth Kang
- Minister for Information and Communications - Brig. Gen. Thon Mum Kejok
- Minister of Urban Planning – Mr. Veter Gal
- Minister for Education, Science and Technology – Dr. Muckuan Kak Ajang

For the FTWMP Lau Watershed Project Area, three of the Upper Nile State ministries are identified as key supporting agencies and was consulted by the Project Preparatory Team explicitly: Ministry of Physical Infrastructure; Minister for Agriculture, Environment and Rural Development; and Minister of Finance, Trade and Economic Planning. The priorities and constraints expressed by the ministries are presented below.

2.3.1 Ministry of Physical Infrastructure

Under national level water is organised under the national Ministry of Water Resources and Irrigation, while the Urban Water Corporation is organised under Ministry of Housing, Land and Public Utility.

At Upper Nile State level, rural water and irrigation is organised under Ministry of Physical Infrastructure. State Ministry of Physical Infrastructure has four directorates:

- Irrigation and Diversification
- Rural Water
- Electrification
- Civil Aviation

The State Ministry of Physical Infrastructure has a staff base of 35 senior level technicians (diplomas or degree), mainly geologists, within the water departments. The Renk line office also has staff of which some are attached to NGOs.

2.3.1.1 Priorities and Challenges

In Upper Nile State rural water supply has failed due to saline ground water polluted by minerals such as copper, lead etc. To this end geophysical study is needed.
Haffirs on the other hand has been successful and there are almost 75 in number in the Upper Nile State. Although there are health problems both for human and animal consumption but sedimentation not a problem. Most of the basic services delivery is currently undertaken by or incorporation with NGOs.

One internal constraint pointed out by the H.E. Minister, is the language problem. Many of the staff only speak and are educated in the Arbic language but the working language is English.

2.3.2 Ministry of Agriculture, Environment and Rural Development

In Upper Nile State, the Ministry of Agriculture, Environment and Rural Development comprise of four directorates:

- Agriculture
- Forestry
- Animal Resources & Fisheries
- Tourism and Environment

Manpower within the ministry is listed below.

Department/Location	Classified Staff
Agriculture:	
Malakal	78
Renk	53
Manyo	11
Forestry	No Data
Animal Health	43
Animal Production	36
Fisheries	98
Tourism	13

2.3.2.1 Priorities and Challenges

In the annual report for 2007, it is stated “Upper Nile State is among the top five agricultural states in all of Sudan. It leads in crop production and could qualify as Southern Sudan Bread Basket.” It continues, “Although the State is suitable for a wide range of crops only a few crops are grown. Cro diversification could be a strategy in increasing and stabilising food availability. This should be promoted through agricultural extension services. Improvement of fishing methods and fish preservation technology is a priority to increase fish production and enhance its contribution as a source food and income.”

The same report stresses that the main external constraints are population displacement, reduced inputs, drought floods and insecurity. Internal constraints are lack of skilled staff. The Fisheries Training Institute (FTI) and some of the dairy and poultry farms are currently occupied by the army.

Animal Resources are divided in Animal Health and Animal Production. Animal production directorate deals with i) Range and pasture management; ii) Hides and skins; and iii) Dairy and poultry. Animal Health interventions have come further than interventions dealing with the production side. The importance of fishery is recognised and some extension workshops on fish processing were undertaken last year to 3 counties (not Maiwut).

2.3.3 Minister of Finance, Trade and Economic Planning

Ministry of Finance, Trade and Economic Planning (MFTEP) is among other responsibilities tasked with planning coordination and annual budgeting for the Upper Nile State. To this end, the MFTEP has prepared its first State Sector Plans and Budget, the one for 2008. This task was achieved with the assistance of the UNDP Support to the States Programme (SSP). The SSP also facilitates the Strategic Planning process for 2007-2009.

One constraint expressed in the meeting with the H.E. Minister was the lack of a mechanism for the coordination of the large number of UN and NGO programmes. The MFTEP has difficulties obtaining information of the on-going and planned external support given to the counties, which undermines the budget allocation.

2.4 Maiwut County

At County level, the Commissioner (who is politically appointed by the Governor) is assisted by an Executive Director (a senior Local Government Officer in the County), together with the Heads of the Departments (Education, Water, Livestock, fisheries, wildlife, and community development); in addition to the nongovernmental affairs supervisor.

County is meant to be an instrumental and an effective local administration unit of the government, responsible for the implementation of all the socio-economic development programmes in the rural areas; hence it leads:

- Delivering of social services (water, health, education, etc)
- Supporting of the agricultural production (including crops husbandry, forestry, animal resources and fisheries)
- Protection of the environment and safeguarding of the wildlife
- Fostering of trade activities and land use planning

At Payam level, the commissioner is assisted by a Payam Administrator (a Local Government Officer assigned by the Commissioner), together with the Native Administrators and Community Leaders.

In close coordination and collaboration with the State government, the county commissioner oversees the activities being carried out by the nongovernmental actors and the private investors that may choose to work in the County. For Maiwut, the Commissioner is assisted by the SSRCC Coordinator stationed in Pagak, where all the non-govermental agencies are based.

Maiwut County has six Payams, named after their Administrative Centres of Maiwut (also, Headquarters of the County), Kigille, Pagak, Jotome, Uleng and Turuw; and River Lau traverse the county territory from northeast to southwest.

The County shall comprise of five departments, each one managed by a senior director.

County – General Institutional Set-up				
		Commissioner		
		Executive Director		
Education	**Finance**	**Agriculture**	**Health**	**Community Development**
	Financial Management	*Agriculture*	*Health*	*Engineering*
	Procurement	*Forestry*	*Welfare*	
		Fishery		
		Animal Resources		

At the moment, only a few of these or virtually none of these departments are operational in the County. For Instance, the finance department is still located in Renk. The Health department was supposed to start its operations in March 2008 in connection with the inauguration of the health centre in Maiwut. For the other departments focal points have been appointed, however the staff do not hold the requested educational level. The departments have neither offices nor resources needed for efficient operation. The County Administration offices are currently under construction (March 2008). Staff lodging is also yet to be established.

(photo of admin building under construction by CARE International)

Within the payams, there are few rural temporary offices each headed by a Payam Administrator. Down the hierarchy, at the community level, there are Bomas headed by traditional leadership.

The three primary documents which detail the role of local government in the overall governing process of South Sudan are the CPA, the Interim Constitution, and the Framework for Local Government. All three underscore the importance of local government as an effective level of government by which to deliver services to constituents.

The CPA states that there will be a decentralized system of government with significant devolution of powers. The 5th Draft of the Local Government Framework, written after the CPA was signed, captures the principles of governance and of local government which include civic participation, transparency, rule of law, equity and equality subsidiary decisions and functions delegated to the lower competent level of government responsiveness, accountability and efficiency and effectiveness
(Creative Associates International, 2007)

2.4.1 Basic Data

Commissioner, H.E. Colonel Gatluak Riek Jak
Acting Commissioner, Mr. Kam Both Ter
Deputy, Mr.Chot Luang Thok.

Kigili Payam, Mr. Agulme Betah
Maiwut Payam administrator, Mr. Mathew Riek Gak
Jotome Pajam Administrator, Mr. Tut Dhiel Thoan

Jekou Payam Administrator, Mr. Simon Domok Ruey

No	Kigili-Boma Name
1	Abajabi
2	Katen Boey
3	Wankey
4	Wadissa
5	Maiwut two
6	Tuch

No	Maiwut -Boma Name
1	Parish
2	Palang
3	Kulomg
4	**Matar**
5	Charijikow
6	Lollimg
7	Meth
8	Wakkari
9	Lerpini

No	Jekou-Bouma Name
1	Lolnyng
2	Niang
3	Jerusalem
4	Turu
5	Kiach
6	Nyetok

No	Boma Name
1	Wor
2	Chom Chuk
3	Phingpiz
4	Nwangore
5	Wunkir
6	Wungony
7	Dopdop

2.4.1.1 Priorities and Challenges

Tax revenues are extremely low. Population is dominantly young, why the need for provision of basic education is a high priority. Delivery of other basic services such as health and drinking water.are also key challenges for the County. The inaccessibility during the long wet season forces the few County staff members to relocate to Renk and Malakal which hamper the efficiency.

The County is greatly supported by international nongovernmental organizations, which currently undertake most of the delivery of basic services such as running of health centres, animal health workers, water supply and sanitation and other infrastructure interventions. The transfer of responsibility of such services to County can only start when the County counterpart departments are in place and operational. One major constraint for sustainable development of the area is the lack of an

integrated County Plan. Efforts to assist the County in this exercise are currently support by both CARE International and Save the Children. However, this support has not been properly coordinated by the two organizations.
Land surveying is on-going in the Upper Nile State but slow. Land in Maiwut has not yet been surveyed.

2.5 Beneficiary organisations, civil society and traditional leadership

Successful participatory planning and joint implementation of community projects requires not only the permanent presence of extension staff or but also competent beneficiary organisations. CBOs as legal entities do not currently exist in the study area. Furthermore, farmers' union and pastoralists' union have no representation or branches in study area. On the other hand, traditional leaders are an important group in the study area because informally they still play an important role in regulating village life and allocation of customary land.

It was expected that the social structures would have been destructed during the long time of armed conflict in the area. This presumption was proven not true for the Maiwut area where it is still the traditional leadership system which is responsible for the allocation of land use rights and management of land use conflicts. Their involvement in the FTWMP is very much needed when it comes to issues involving rational natural resources use and management and resolution of conflicts

Informal committees been formed or individuals have been selected for partaking in various NGO supported interventions. When asked by the preparatory team about the selection process, most of the NGOs seem to have given this responsibility to the Payam Administrators who apparently undertake the selection in close cooperation with the Boma chiefs. It is not clear how the selection process has been convened.

It is certain though that a number of informal peace committees have been formed supported by PACT international. Those are democratically formed and representative of population including 30 % women and representation of other minority groups such as Ethiopians.

Some training in cooperative saving and provision of safety boxes has also been provided by e.g. CARE International.

2.6 Nongovernmental Organisation and Parallel projects

A great number of international NGOs are operating in the project area however, only a few national NGOs are active in the area out of which only one has proven to be competent and reliable according to the various international NGOs operating in the project area.

This national NGO is called Nile Interdevelopment Program (NIP) and is based in Pagak in Maiwut County. Their project portfolio comprise the following activities i) Water supply and management; ii) Conflict resolution Pastoralists; iii)) Advocacy Nile Environment; iv) delivery of Health Services (NIP are the implementers of the Save the Children programme); and v) Education and children rights groups. Children rights groups deals with child labour and early marriage.

Some of their most crucial activities e.g. health delivery, they manage to operate even during the wet season. This means that health workers walk in mud for seven hours in order to reach their destination for reporting and receiving supplies of medicine.

The international NGOs and their on-going programmes are presented in the Table x below.

Table X: Parallel Projects (International NGOs and UN)

Organisation	***Location***	***Projects***	***Of interest for the FTWMP in Lau***
Agency for Corporation on Research and Development, ACORD	Pagak, Maiwut County	i) Animal health Capacity Building ii) Reduction of resource based conflicts (RRBC); iii) Peace committees; iv) women micro-finance and income (finalised); v) Application for animal health clinics	ii) Reduction of resource based conflicts (RRBC)
Norwegian Peoples Aid (NPA)	Pagak, Maiwut County	i)Food for Community project; ii) Provision of training in of selected people at agri.training centre in Central Equatorial state; iii) NPA demonstration garden; iv) Relief to flood victims	iii) NPA demonstration garden
Save the Children	Pagak, Maiwut County	Focus is Health. No direct implementation. Implementation only through national NGOs	
ADRA	Pagak, Maiwut County	i) Repatriation - Way station and transportation	
Care International	Pagak, Maiwut County	i) water and Sanitation 50 boreholes and x pit latrines; ii) Livelihood programme agriculture inputs + accountability training; iii) Local governance- strategic planning; iv) HIV/AIDS	All
PACT South Sudan	Pagak, Maiwut County	i) Training of Peace Committees; ii) Trade and Stabilisation Programme; iii) Urban Water Pagak 2 km; iv) Disarment of pastoralists	i) Training of Peace Committees; ii) Trade and Stabilisation Programme
WFP	Work through NGOs based in Pagak, Maiwut	Relief to flood victims and other vulnerable people	
UNCHR	Work through NGOs based in Pagak, Maiwut e.g. ADRA	Repatriation from Boma Refugee camp in Ethiopia	

UNDP	Malakal, UNS	i) Rule of Law; ii) Local Government Recovery Programme (LGRP); iii) Support to States Programme (SSP); Recovery and Rehabilitation Programme (RRP)	Capacity Building of 5 county dep. In each County (RRP)

The key challenges from NGO perspective were perceived as:

- Requirement of qualification is low (not even class 5 staff is available for training)
- Little NGO coordination
- No roads or roads in bad condition
- Airstrips not operational during long periods in wet season
- Short dry seasons

The activities of the NGOs differ from the up-coming FTWMP since they work mainly with relief and basic service delivery. In addition they work through their own organisations for project implementation in parallel to the government organisation.

2.7 Country Strategy and Policy Context

Poverty alleviation and sustainable development are the main objectives of the **Millennium Development Goals (MDG)**, which were agreed upon at the United Nations Millennium Summit in September 2000 to provide a benchmark of indicators to measure development progress. The ENSAP as a whole and the FTWMP in particular will contribute to achieve the MDGs of poverty alleviation and sustainable development, and in addition will promote regional peace and security. Specifically, Millennium Development Goal 1, eradicate extreme poverty; Goal 7, ensure environmental sustainability and particular the target to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation; and Goal 8, develop a global partnership for development, will be addressed directly by the FTWMP in Sudan

For Southern Sudan, the policy framework for **environmental management and protection** and related issues such as land use planning and land tenure is still lacking. As of early 2008, the process of legislation development within GOSS is still in its early stages. The legal basis for environmental governance is therefore effectively absent in Southern Sudan at this time.

At the level of general principles, environmental protection is a national objective, which is not subject to interpretation by other levels of government.
In Chapter 2 of the Constitution, Article 11 states that for the State of Sudan as a whole, the conservation of the environment, and of biodiversity in particular, should be pursued, and that the State should ensure a sustainable utilization of natural resources, including by prohibiting actions that would adversely affect the existence of specific species.

With regard to the Climate Change, the Higher Council for Environment and Natural Resources has formulated a **National Adaptation Programme of Action** (NAPA) dated July 2007. The three highest priority sectors where urgent and immediate action is needed were identified through the NAPA consultation process to be agriculture, water, and public health. The proposed project deals with several of the key adaptation needs which have been identified for both in the agricultural and

water sector. Moreover, it addresses mitigation issues by supporting major reforestation interventions and investment in alternative energy sources, such as solar energy.

Moreover, the parties to the CPA jointly developed a **National Poverty Eradication Strategy** concept note. This commits the new national authorities to the following objectives and actions in the context of forging a sound recovery and development programme aimed at achieving the MDGs:

- Implementing the Comprehensive Peace Agreement;
- Building a decentralized, multi-layered governance structure spanning the National Government (NG), Government of Southern Sudan (GOSS), state and appropriate local levels, that is characterized by transparency, accountability and equitable resource allocations;
- Crafting relevant and flexible policies to ensure a stable macro-economic framework consistent with post-conflict challenges;
- Implementing comprehensive capacity building and institutional strengthening programmes at all levels;
- Creating an enabling environment for private sector promotion, with a special emphasis on rural development and small and medium enterprises, including access to credit on reasonable terms;
- Empowering local communities, vulnerable groups, youth, women's and civil society organisations;
- Managing natural resources in an environmentally-friendly and sound way;
- Exerting maximum efforts to create and spread a culture of peace that creates stability and effectively minimizes the possibility of future conflict;
- Promoting an accessible service delivery system compatible with achieving the MDGs; and
- Creating a sound, simple monitoring and evaluation system to track progress in addressing poverty and tackling the MDG challenge.

Land Policy in the South is currently based on customary law, and there are considerable inconsistencies in how customary laws are applied in different States. One common principle is that "land belongs to the people" which is different from the North where nearly all land has been declared government land. It is generally agreed that land laws in the South are not sound because of the lack of tenure security. In addition, the conditions for land utilization are not clear. This lack of tenure security and lack of clarity on land utilization conditions weaken incentives to invest. The JAM considers that a land law review is required. There is an upcoming Land Commission for Southern Sudan that will consider future land policy in detail for the South. It is anticipated that land policy in the future constitution will be based on the conclusions and recommendations of the Land Commission.

With the adoption of CPA, there are now three new documents that affect the legal framework of land policies for Southern Sudan; they are the CPA, the GOSS Constitution and the GOSS State Constitutions.

The land policies in the CPA specify that each of the ten states has the right to govern the management, leasing and use of land in their states. During the interim period (December 31, 2004 - July, 2011), the GOS, the GOSS, and the state governments have legislative rights to proceed with urban development, planning and housing needs. According to the CPA, only the Southern state courts have the authority to enforce the management, lease and utilization of lands belonging to the State,

however, national laws, including the ownership of land, have not been adopted by the GOSS at this time.

The CPA appears to contradict the application of old land rights and policies. According to the IDD OCHA June, 2006 report, previous land acts and planning laws are no longer enforceable.

The land policies in the GOSS Constitution state that every citizen has the right to acquire or own property, including women. Private property may only be taken with a court order and is not to be taken without just compensation. Land laws are to be developed to incorporate international trends and practices with consideration for customary laws, practices and local heritage. Traditional lands are to be defined and protected by laws and include consideration for seasonal access rights. Compensation shall be given if land is taken for subterranean resources. Statutory land regulations for land tenure and usage shall include consideration of customary land rights. The government at all levels is responsible for incorporating customary land rights under customary land law.

The Constitution also includes a requirement for a Southern Sudan Land Commission to be formed to assist all levels of government in formulating land policies and laws for the governance of land rights.

Customary systems predominate in the South and 98 percent of Southern Sudan's population lives in rural areas. Customary land access is managed by tribal leaders including chiefs, spiritual leaders and elders.

The FTWMP in Lau Watershed would mainly be implemented on land regulated under the customary law.

The Watershed FTP is firmly grounded within the international, regional and national sustainable development efforts and it is committed to moving as quickly and as responsibly as possible towards implementing concrete developments in the project areas that will contribute to the following, among others, regional and national development goals.

The FTWMP in Sudan has been designed to contribute to national goals and reform processes by providing local tools to lead the major management transition in the area of pro-poor and environmental governance.

3 Key Institutional and Watershed Governance issues

3.1 Integrated and sustainable development planning/policy

The State level is responsible for land–use planning. Inter-sectoral planning is still under development. However, under the new interim constitution and decentralization process, there are new directives for inter-sectoral planning.

The present land and water governance structure is also inadequate to provide security of access to land and water resources, conservation of natural resources, equitable and economic use of these resources. At stake are the discretionary powers of the federal and state governments to allocate land without due consideration to customary use and environmental impact. The Comprehensive Peace Agreement has instituted a mechanism in the form of the State Land Commissions. In South, this Commission is not yet operational. Although, it seems that customary land rights has a higher “legal” status and is better considered than in north.

County has the responsibility for land use planning within its jurisdiction based on State directives. Nevertheless, at this early stage of the post-conflict era, it can be concluded there is low capacity in the area of development planning in terms of analytical basis, depth of explanation, clarity of objectives, prioritization, link to budgets, and monitoring. Many different and individual project proposals have been suggested to the project preparation team by County and NGOs but most of them are focused on basic service delivery. It is uncertain to what extent the water balance, environmental criteria and other important base-line data of is considered in the local development planning. No integrated land use development strategies or plans have been available.

Implementation of the on-going policy and regulatory efforts at state level that will be supported by the project are: inter-sectoral land-use planning considering customary use and environmental impact, enforcement of environmental regulations and decentralisation of decision-making.

3.2 Participatory planning and management

Generally in Sudan, few localities and counties use participatory processes or attempt to involve communities in the planning. In Sudan in general, there are examples of recent interventions where participatory planning and management is evident. These have often been supported by external financiers. In Maiwut, where most of the external support has focused on relief and fast tracked delivery of basic services participatory planning and implementation has had to take a back-step for the importance of actually getting structures on the ground. Introduction of participatory planning and community management of basic infrastructure is a process that in the case of this area could be expected to take time. This coupled with short dry season in the study area has forced NGOs to be dead-line oriented rather than oriented towards objectives such as sustainability. Once these structures are in place they will be handed over to the County and Communities. It is the opinion of the Project preparatory Team that transfer of management is a challenge without community ownership early in the process.

The implementation of participatory planning requires not only the permanent presence of County extension staff (which is currently not the case) but also . On the other hand, resource people for community mobilisation are available among locally based national and international NGOs. Competent beneficiary organisations are also required for successful participatory planning and joint implementation of community projects. CBOs as legal entities do not currently exist in the study area. Furthermore, farmers' union and pastoralists' union have no representation in study area. On the other hand, traditional leaders are an important group in the study area because informally they still play an important role in regulating village life and allocation of customary land.

Another weak point is the absence of a banking system in the Maiwut County. The closest bank is in Renk.

3.3 Service Delivery

Delivery of services is delegated primarily to local government, from the county down to payams. The list of services provided includes construction and maintenance of interior roads; public health--covering mosquito control, waste collection and disposal, and health clinics; slaughter houses; markets and primary education. Local governments also approve building permits of class three level plots and collect fees.

Given the limited resources, there is a great opportunity for involving residents, NGOs and other institutions in the provision of services. Through this process, public - private partnerships can be created, citizen participation in-kind projects can be developed and residents can be involved in labor based infrastructure construction projects. Local government officials, as they work on capital projects, can also gain experience in budgeting, financial management and project management, all skills necessary for officials as they are transferred more responsibility.

In terms of provision of water infrastructure, water infrastructure construction is often characterised by poor technical design, operation and maintenance which is surprising since most of them are provided by international NGOs. There is also distrust vis a vis community capacity of managing water points.

3.4 Project Governance Capacity and project Implications

3.4.1 Government Level

GOSS is faced with major challenges striving to efficiently carry out its mandate. Still, the on-going complete review of the whole governance framework creates a major opportunity for reform. Secondly, the donor support but most and foremost the injection of oil revenue will greatly boosted the financial resources also for the Government of Southern Sudan (GOSS) and the Upper Nile State, enabling such reform to be translated into concrete action.

In Sudan "Capacity Building and Institutional Development" is the first of nine "clusters" of the Joint Appraisal Mission's Report and is seen as fundamental to the success of Sudan's programme of equitable and sustainable development.

Already the unique GONU/GOSS structure has begun taking form. For the first time in FY06, the GOSS has an independent budget of US$1.7 billion, which it allocates without reference to the GONU. The GOSS is developing South-specific plans in all key sectors and will be solely responsible for the delivery of health, education and water, and largely responsible for transport infrastructure. The GOSS also has the right to collect its own taxes and internal customs levies and raise its own license revenue.

Table 1: Southern Sudan - Summary Budget 2006 by Sector

	Budget ($m)	**%**	**Actual ($m)**	**%**	**Execution Rate (%)**
Accountability	14	1.0	285	18.5	2 036
Finance and Economic Planning	*(5)*	*(0.4)*	*(278)*	*(18.1)*	*(5 560)*
Economic Functions	18	1.3	21	1.4	117
Education	137	9.9	104	6.8	76
Health	109	7.9	63	4.1	58
Infrastructure	279	20.3	166	10.8	60
Natural Resources & Rural Dev.	59	4.3	55	3.6	93
Public Administration	26	1.9	85	5.5	327
Rule of Law	74	5.4	162	10.5	219
Security	533	38.7	555	36.1	104
Of which SPLA	*(526)*	*(38.2)*	*(552)*	*(35.9)*	*(105)*
Social & Humanitarian Affairs	13	0.9	39	2.5	300
Transfers	115	8.4	3	0.2	3
Reserves					
Total	**1 377**		**1 538**		**112**

Source: World Bank, Juba 2007

“Regarding budget distribution, the percentage received for agriculture *per se* (component of Natural Resources and Rural Development) is small compared to other sectors and is directed to the establishment of the senior cadre. However, staffing is still weak with paid appointments only at federal and state levels resulting in Ministers, Directors-Generals and Directors with no staff to direct and no general operational funds. Sectoral operational activities are presently limited to UN agency and NGO rehabilitation programmes linked to humanitarian aid programmes previously organised through Khartoum and from Lokichokkio, (Kenya). These are now organised from Juba providing a much greater coherence connecting to support for returning refugees, IDPs and marginalized communities with food aid and providing support to health, education, agriculture and civil development programmes for the settled and returning families throughout the South”(FAO/WFP Crop And Food Security Assessment Mission To Southern Sudan, 21 January 2008)

The capacity of all levels of government to carry out the charges given them under the GOSS interim constitution and their respective state constitutions is challenged in two ways: a high vacancy rate in critical positions and lack of any and/or appropriate

skills. All professional and technical positions-whether located at the state or local level-are appointed by the state governments. The first positions filled have been at the state ministry level, leaving many of the local positions, below that of administrator or executive, vacant.

Actual numbers of vacancies are difficult to determine as not all positions have been created. In addition to vacancies in key positions, the skills necessary to carry out participatory planning are limited, as is the understanding of how to implement a participatory process.

Modern institutions of governance that have been introduced in the county include county and payams levels. These are drawn from the CPA. However, local authorities are lacking in the most basic infrastructure for effective administration, and a lot remains to be done for them to operate effectively and in a holistic and participatory manner.
Southern Sudan is coming out of war. To go from emergency relief, to recovery, to sustainable development projects is a challenge. The GOSS have not yet the resources needed to host and manage recovery and sustainable development projects. With the initiation of the FTWMP in Lau watershed, the GOSS could acquire this capacity. The FTWMP could constitute a basis for a learning process and a step towards introducing holistic development planning and participatory approaches.

Extension services are the responsibility of the County. A major problem is the absence of permanent county staff in the payams. Staffing remains lean because of capacity issues, and the formal appointment of government officials at middle and lower levels remains far from complete. There is also of minimum living and working facilities for civil servants: simple housing, offices, (computer) equipment, transport, electricity (solar panels), water supply and sanitation.

The FTWMP should aim at more visible and more effective local administrations through making provisions for the equipping of local authorities if necessary.

The project must consider how to balance the need for efficient project implementation with the objective of strengthening the governing capacity by avoiding parallel implementation structures. Given the weak institutional capacity in Sudan PIUs or LIUs are needed given low civil service salaries and incentives. There are no consolidated PIUs for project implementation and a by implementing the FTWMP through a unit at County level staffed by national consultants and technical advisors (since counterparts at this level currently is lacking), the LIUs would be closely integrated within the County and not operate as a parallel unit. The integration would be ensured by having the County as a member in the Steering Committee and Local Project Management Committee. To seconded government staff is often an option, but in this case, there is virtually no staff to second which would hold the required qualification. As mentioned, at several places in this report, the most of the departments within the State Ministries have Directors but few staff.

This means that at local level there would not be a risk of creating a parallel body, even though the daily running of the unit would be outsourced to a nongovernmental organisation or company. Project activities can be outsourced to national NGOs e.g.i) advocay; ii) mobilisation; iii) participatory M&E

The FTWMP would be the first development orient project to be implemented as an integral part of the government structure and with conditional government contribution.

Another issue to consider is how to avoid too many levels of project steering. GONU, GOSS, Upper Nile State and County, all have an important stake in the project. However, the implementation must be rationalised in order to avoid inefficency and being top-heavy. The project must also ne in line with the Interim Constitution which stresses decentralisation and devolution of powers. For the two project areas located in Edamer Locality and Bau Locality where State and Locality administration were located in the vicinity of each other. The line ministries at GOSS, Upper Nile State and Maiwut County are located far apart and to organise regular steering and project management meetings with representation from these three levels in addition to the GONU level would be cumbersome. It was realised by the Project Preparatory Team, the there is very little interaction between the Ministries at GOSS level and County level. On the other hand, the interaction between Upper Nile State and County is regular. The Maiwut County Commissioner travels regularly to Malakal, the capital of Upper Nile State, for planning and budgetary meetings and information exchange exercises. The Maiwut County staff also has direct linkages to their respective line Ministries based in Malakal. For instance they partake in training exercises provided by the various State Ministries. It is important that the FTWMP is integrated in the Annual State Sector Plans and Budget.

The possibility of up-scaling the project and learning process would be better if the Upper Nile State is closely involved.

We also have to consider the referendum of 2011 and the possibility of GOSS as a sovereign state. In this case, the project must be robust enough to be managed wholly under the GOSS mandate.

3.4.2 Beneficiary Organizations

Communities will need to undertake careful and agreed local land use planning and resource allocation to avoid conflict between existing and returning peoples and between resource uses. Community development efforts can be done through the promotion of agro-forestry, household woodlots, improved energy efficient stoves, regulation of charcoal production and the development of local institutions for community-based management of natural resources.

Targets of integrated approaches should not be set too ambitiously and should not exceed implementers' capacities.

The CBOs or committees would constitute the link between the County, project and the communities and would be legal entities which have been formed following democratic and gender and equity principles.

Representative community based organisations with sub-committees must be established and functioning in order to benefit from the IWM&D interventions. The role of communities during implementation would be to partake in all stages of implementation and contribute in terms of labour, local materials or funds and participate in supervision and monitoring. The representative grassroots organizations would have responsibility for mobilizing communities and prioritize their extension needs, development of community development and natural resources management plans, organization of interest groups and collaborating community members for demonstration activities. They should ensure that participatory and gender sensitive approaches are used and CBO members are representative from a gender and equity perspective and elected democratically. After implementation the communities would be responsible for operation and maintenance of created community assets and mobilise necessary user fees, e.g. water fees, licenses for utilisation of forest products etc.They should undertake monitoring of results and performance.

Sub-committees could be organised in any given community i.e. i) water points management committee; ii) farmers' committee; iii) forestry committee; iv) livestock and rangeland committee and v) off-farm income generating committee. Women should be represented in each committee and if needed also as a separate committee. Environmentally sustainable livelihood improvement would be the common objective of each sub-committee.

To this end the following issues have to be considered:

- It is important to strive for a simple organizational and coordination structure, based on existing structures and clearly stipulating linkages with higher levels.

- It also requires appropriate institutional development at community-level which, in the case of Lau study area, should build on the traditional leadership which still has an important role to play with regard to land use allocation in the Lau watershed. The set up at beneficiary level should be able to respond to the emerging needs in collaboration with local government. It has been observed that the perceived needs are rather homogenous at payam level which can be explained by that payams are divided after location for tribal groupings which in turn are linked to specific eco-systems and livelihood systems. With this background it is proposed that beneficiary organizations – or so called Development and Natural Resources Management Committees

(DNRMCs) - are organized at Payam level. This set-up could be coupled with subject matter committees at community level. Another reason for this set-up is the potential close linkage between Payam Administrator and Payam DNRMC.

- Institutional arrangements are required that allow for multi-disciplinary and multi-agency collaboration and across ministries, contributing to breaking through single sector approaches. To this end, the central project (steering) and implementation should be undertaken at County level and not at State or national level.

3.5 Regional Coordination with Parallel Interventions

3.5.1 Parallel interventions at regional level

While the Watershed FTP in Sudan deals with building capacity at local level and policy and regulatory reform at State level, it will be undertaken in parallel with national and regional efforts working towards the same overriding goals. Several projects under the NBI and ENSAP umbrella are therefore relevant for information exchange and coordination and in particular those listed below.´

NBI/ SVP Projects:

1. Nile Transboundary Environmental Action Programme. (NTEAP has its project office in Sudan.)
2. Efficient Water Use for Agricultural Production
3. Water Resources Planning and Management
4. Confidence Building and Stakeholder Involvement.
5. Applied Training
6. Socioeconomic Development and Benefit Sharing

ENSAP/IDEN Projects:

1. Baro-Akobo Multi- Purpose Water Resources Sub-Project
2. Irrigation and Drainage Project
3. Flood Preparedness and Early Warning in the Eastern Nile
4. Eastern Nile Watershed Management Project: The Watershed FTP in Sudan is prepared in parallel sub-projects in Egypt and Ethiopia under the same umbrella project with the common objective.

ENTRO's role would be to ensure information exchange between this project and the parallel initiatives in Egypt and Ethiopia. It would also be able to coordinate this project with parallel initiatives under the NBI umbrella in order to promote synergy..

ENTRO would also play an important role in the follow up of the programmatic aspects of the project and documentation of the lessons learned and knowledge generated.

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SWECO

Eastern Nile Technical Regional Office

WATERSHED MANAGEMENT FAST TRACK PROJECT, SUDAN

ANNEX: FINANCE AND ECONOMICS INTERIM REPORT

Draft Interim Report

Stockholm April 2008
SWECO International AB

Project No. 1989151300

ra02e 2005-01-17

AHFAD University

SWECO

Abbreviations

ACORD	Agency for Corporation on Research and Development
CBO	Community Based Organisation
CIF	Community Initiative Fund
CLMP	Community land use management and development plans
CPA	Comprehensive Peace Agreement
DNP	Dinder National Park
DNRMC	Development and Natural Resource Management Committee
EIA	Environmental Impact Assessment
ENSAP	Eastern Nile Subsidiary Action Programme
ENTRO	Eastern Nile Technical Regional Office
FTWMP	Fast Track Watershed Management Project
GONU	Government of National Unity
GOS	Government of Sudan
GOSS	Government of Southern Sudan
ICRISAT	
IDP	Internally Displaced Population
IWM&D	Integrated Watershed Management and Development
IWRM	Integrated Water Resources Management
LGRP	Local Government Recovery Programme
LIU	Local Implementation Unit
M&E	Monitoring and Evaluation
NGOs	Nongovernmental Organisation
NIP	Nile Interdevelopment Program
NPA	Norwegian Peoples Aid
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PIU	Project Implementation Unit
PIT	Personal Income Tax
PRA	Participatory Rural Assessment
PRSP	Poverty Reduction Strategy Paper
RRP	Recovery and Rehabilitation Programme
SDG	Sudanese Pound
SSP	Support to States Programme
SSRCC	Southern Sudan Recovery Coordination Committee
UNCHR	United Nations Commission for Human Rights
UNDP	United Nations development Programme
WFP	World Food Programme
VAT	Value Added tax
WRDM	Water Resources Development and Management

Table of Contents

1 Introduction

The purpose of this Annex Report is to document available information concerning the Upper Nile State in general and Maiwut County in particular. The report is organized in five chapters:

- Introduction
- Upper Nile State Annual Budget for 2008
- Economic Situation and Household Livelihoods
- Project Specific Notes and Observations
- Project Costs and Economic Analysis

2 Upper Nile State Annual Budget for 2008

This chapter is drawn from the GOSS document titled: Upper Nile State Annual Plan and Budget for 2008. Below are the highlights of the projected financial resources to implement the activities that are presented in the State Annual Plan for 2008.

For the sake of comparison, it should be noted that the Budget Law for Southern Sudan amounts to 3.49 billion Sudanese pounds[1]. The budget proposes to raise revenues from Oil, Personal Income Tax (PIT), customs duties, Value Added Tax (VAT) levies, corporate, airport fee, nationality and immigration fee, and non tax revenues. It also pledged for provision of general reserve fund for the Government of Southern Sudan (GoSS) for 48 million during the fiscal year 2008.
The 2008 budget chapter one salaries total is Sudanese pounds SDG 1.88 billion, Operational cost is SDG 798 million, and the Capital amount is SDG 738 million.

2.1 Upper Nile State Financial Resources Envelope for 2008

The total projected financial resources envelop for the Upper Nile State for 2008 is **SDG 131 million (US$65.5 Million)** constituting the following sources:

1. GOSS block transfer to the State and Counties totalling to SDG 30.8 million with the following allocations:

a) State Council of Ministers SDG 1 million
b) State Legislative Assembly SDG 3.8 million
c) State and Counties SDG 26 million

[1] Sudan Tribune, Daily, February 29, 2008, South Sudan Parliament Passes 2008 Budget Law

2. GOSS Ministries' Conditional Grants totalling to SDG 18.3 million with the following specific allocations:

a) Education: SDG 16, 818, 966 for Salaries
b) Animal Resources: SDG 841, 044 for Salaries
c) Gender: SDG 29, 000 for operating costs
d) Commerce: SDG 20, 000 for operating costs
e) Cooperatives: SDG 18, 000 for capital costs
e) Health: SDG 552, 720 for Salaries
f) Culture: SDG 12, 500 for operating costs
g) Agriculture: SDG 44, 580 operating costs
h) Agriculture; SDG 30, 000 for capital costs

3. State Oil Revenue SDG 60 million

4. State and Counties non-oil revenue SDG 22 million

Roughly speaking, the percent allocation of public funds for the Maiwut County would be one part in twelve or about **SDG 10 to 12** million in 2008. Detailed breakdown for the allocation of public funds for the Maiwut County has been made available to the project team County, and the analysis is ongoing.

2.2 State Priority Expenditure Areas for 2008

The priority expenditure areas for the State during the 2008 fiscal year are in the following sectors/areas:

- Infrastructure Sector
- Public Administration and Law Enforcement Sector
- Education Sector
- Health Sector

These areas have the most major areas of expenditure thereby needing these high amounts of allocations from the states' resources.

2.3 Ceiling Allocations Across Sectors in 2008

The Table below presents budget ceiling allocations to the sectors of the Upper Nile State:

Ceilings for 2008 Budget by Sector in Upper Nile State

SECTOR	2008 PROPOSED BUDGET			
	Salaries/ Job Specific Allowances	Operational Costs	Capital Costs	Total Ceiling per Sector (SDG)
Accountability & Economic	6,207,774	2,568,824	5,444,026	14,220,624
Conditional Grant	-	20,000	-	20,000
Sub Total	**6,207,774**	**2,588,824**	**5,444,026**	**14,240,624**
Health	9,095,982	1,199,926	3,553,440	13,849,348
Conditional Grant	552,720	-	-	552,720
Sub Total	**9,648,702**	**1,199,926**	**3,553,440**	**14,402,068**
Infrastructure	3,533,412	465,486	22,557,064	26,555,962
Conditional Grant	-	-	18,000	18,000
Sub Total	**3,533,412**	**465,486**	**22,575,064**	**26,573,962**
Public Administration	16,008,580	5,939,286	5,969,846	27,917,712
Sub Total	**16,008,580**	**5,939,286**	**5,969,846**	**27,917,712**
Education	6,239,250	1,239,885	3,584,773	11,063,908
Conditional Grant	16,818,966	-	-	16,818,966
Sub Total	**23,058,216**	**1,239,885**	**3,584,773**	**27,882,874**
Natural Resources & Social Development	8,938,632	803,428	3,380,590	13,122,650
Conditional Grant	841,044	86,080	30,000	957,124
Sub Total	**9,779,676**	**889,508**	**3,410,590**	**14,079,774**
Security	-	-	-	
Sub Total	-	-	-	-
Counties	4,367,160	-	1,702,636	6,069,796
Sub Total	**4,367,160**	**-**	**1,702,636**	**6,069,796**
Grand Total	**72,603,520**	**12,322,915**	**46,240,375**	**131,166,810**

It should be note that State security matters within the security sector will be catered under the emergency and disaster relief budget line of the state council of ministers' operational budget.

2.4 Description of Key Sectors in Budget

2.4.1 Infrastructure Sector

This sector is composed of the following departments/units:

1. Roads and Bridges
2. River Transport
3. Mechanical Transport

2.5 Description of Key Sectors in Budget

2.5.1 Infrastructure Sector

This sector is composed of the following departments/units:

- Roads and Bridges
- River Transport
- Mechanical Transport
- Housing
- Town Planning
- Lands
- Survey
- Rural Water
- Cooperatives
- Head Quarters

Urban water, Electricity, Irrigation and Airport are under the ministry for supervision purposes. They are mainly budgeted by the GOSS (Juba

Sector Objective (s):

Rehabilitate and provide infrastructure to stimulate investment and efficient service delivery, leading to poverty reduction and enhance economic growth

Sector Expenditure Areas for 2008 and Description:

<u>Programme Areas</u>:

- Road development and transport safety.
- Housing development.

- River transport safety.
- Mechanical transport development.
- Town planning development.
- Land development.
- Survey plan and development of human environment.
- Rural water development.
- Cooperatives development.
- General administration and management.

Main Activities under each Sector Expenditure Area:

I. **Road development and transport safety:**
- Construction and maintenance of roads and bridges.
- Purchase of specialized plant, equipment and machinery.

II. **Housing development:**
- Preparation and design of building projects.
- Construction and rehabilitation of government houses.

III. **River transport safety:**
- Monitor river transport safety; registration and supervision of private boats.
- Maintenance of steamer Merowe and Cargo barges.

IV. **Mechanical transport development:**
- Administrating and maintenance of government vehicles.
- Provision of spare parts, fuel and lubrications.

V. **Town planning and development**:
- Develop policies and conduct meetings of town planning and implementation of policies.

VI. **Land and public utilities:**
- Management of land ownership documents, and adherence to land laws.

VII. **Survey plan and development of human environment:**
- Planning of lands for various utilities in the state and production of master plans and field surveys.

VIII. **Rural water supply and sanitation:**
- Construction and maintenance of water facilities and provision of sanitary facilities and hygiene promotion.

IX. **Cooperative development:**
- Establishment of cooperative units in the counties to encourage community development and craftsmanship.

X. **Administration and general management**:
-To provide strategic direction for the ministry, support the line department, coordinate, monitor and control the activities of various developments.

2.5.2 Natural Resources and Social Development Sector

Institutionally Natural Resources & Social Development Sector in Upper Nile State is served by two Ministries which are:

Ministry of Agriculture, Environment and Rural Development comprising the following:

- Directorate of Agriculture
- Directorate of Forestry
- Directorate of Animal Resources
- Directorate of Fisheries
- Directorate of Tourism & Environment

Ministry of Social Development comprising the following:

- Directorate of Youth and Sports
- Directorate of Religious Affairs
- Directorate of Culture
- Directorate of Social Welfare
- Directorate of Community Development

Sector Objective (s)

The Natural Resources and Social Development Sector aim at enhancing on a sustainable basis the generation of revenue from the Natural Resource potential in the state and to facilitate rural socio-economic development.

The objectives of the sector are as follows:

- To improve livelihood and income and ensure food security for all the people in the State, through sustainable management of natural resources and the environment.
- To increase access to land, safe water and improved sanitation for all
- Build a society that is inclusive, equitable and peaceful.

Sector Expenditure Areas and Description

<u>Programme Area One: Agriculture:</u>

- Establishment and rehabilitation of agricultural schemes, cereal, oil crops and legumes.
- Provision of agricultural input in the area of machinery such as tractor, farm implements such as sprayers.

- Promotion of water harvesting techniques (hafirs in schemes, canalization and water ways)
- Establishment of orchards.
- Plant protection and extension services.
- Training and Research
- Capacity building in agro forestry development planning.
- Support establishment of farmers' organizations in the State.

Programme Area Two: Forestry, Tourism and Environment:

- Tourism and Forestry Conservation activities to protect forests and Tourism areas
- Gazetting forest reserves and tourism centres and rehabilitation of reserves, boundary re-demarcation and re- a forestation.
- Tourism and hotel administration
- Promotion and establishment of hotels at State level through local administration.

Programme Area Three: Animal Resources and Fisheries:

- Fish farming, exploration of fish conservation areas and erection of fishing camps.
- Procurement and distribution of fishing gears to Counties on a cost recovery basis and promote establishment of fish ponds especially in areas distant from rivers.
- Establishment of livestock development projects
- Establishment of animal dispensary and animal health centres, dairy farming, ranching cross breeding and artificial insemination and poultry farming.
- Disease and vector control, disease and vector surveillance, emergency response activities, distribution of veterinary drugs, vaccines and equipments.
-

Programme Area Four: Community and Social Development:

- Support youth and sports association activities.
- Construction of youth centres,
- Promotion of social welfare activities and support the protection of vulnerable groups, disabled, orphans and widows, old aged and children in general.
- Support literacy and education campaigns such as adult education programmes
- Promote and support peace and reconciliation activities/initiatives of religions, inter- religious dialogues and conflict resolution.
- Management and establishment of cultural centres at the level of the State and Counties.
- Development of and coordination of gender policies (gender violence).

- Support women training in micro enterprises/business activities.

Main Activities under each Sector Expenditure Area

Main Activities under Agriculture and Natural Resources sub-sector:

- Purchase of 20 assorted items for extension services
- Purchase of vehicles one boat for monitoring of fish landing sites
- Exploration of fish concentration areas and erection of fishing camps
- Procurement and distribution of fishing gear to Counties on cost recovery basis
- Establishment of livestock development projects
- Establishment of animal dispensary and animal health centres, diary
- Construction of one type II slaughter house in Malakal and type III in eleven Counties,
- Rehabilitation of 5 block building dormitories, classes
- Construction of one store.
- Purchase of one incubator,
- Provision of one generator for lighting
- Distribution of veterinary vaccines and equipment
- Purchase of laboratory equipments
- Purchase of breeder stock, feeds, eggs crates, one hatchery machine
- Rehabilitation of offices and classes.
- Purchase of office stationeries.
- Purchase of fuel and petrol
- Renovation and refurnishing of existing guest house for the State

Main Activities under Community/Social Development Sub-sector

- Rehabilitation of 2 Culture, Youth & Sports Centres
- Rehabilitation of 2 Culture, Youth & Sports Centres
- Renovation of the existing guest house
- Rehabilitation of Old Age , Orphans
- Conduct resource mobilization training workshops for rural communities (vulnerable groups)
- Construction of three (3) resource centres in Nasir, Panyikango and Melut,
- Construction of Community & Religious Affairs Offices
- Renovation/Rehabilitation of the Malakal Stadium

3 Economic Situation and Household Livelihoods[2]

While the economy of southern Sudan remains largely informal and is based primarily on subsistence agriculture and livestock, anecdotal evidence seems to indicate that household livelihoods have improved after the signing of the CPA. Resettlement activities have returned many previously displaced to their homes, allowing these households to resume their livelihoods. This promises to bolster agricultural production in the years in ahead. Migration to urban areas has resulted in rapid population growth in many of the urban centers throughout the region. This has increased market dependence and led to substantial increases in demand for various agricultural commodities. As demand has increased so has trade, both locally and with communities across the border in Uganda and Kenya.

As urban areas continue to expand, the need to improve infrastructure has increased. Foreign companies, eager to invest in the rebuilding of southern Sudan, have stepped in to fill this need. Many have begun to partner with local governments and are actively employing local labor. Consequently, construction and infrastructure projects have become common in certain communities and urban centers, creating a new demand for labor and thus a new source of jobs. While the impact of these improvements has been relatively localized, it is likely (with the continuance of peace) that the reach of these activities will expand and the benefits will be felt far beyond these immediate urban centers. As infrastructure improves and as economic opportunities increase, significant improvements in health and food security are likely to follow.

3.1 Agricultural sector

While there are no official statistics on what share of GDP is attributed to agriculture in southern Sudan, it is widely considered the most important sector. Agriculture is largely traditional, relying primarily on hand power with very limited use of animals (which have only been introduced recently). Pesticides and herbicides are not common either. The most fertile areas of southern Sudan (termed the “greenbelt”) are in the regions of Western and Central Equatoria. This area receives rain throughout the year and crop surpluses here are often used to supplement food stocks in surrounding states during times of shortage. In much of the rest of southern Sudan (outside of the greenbelt), households rely on a mix of crop production and livestock rearing, supplemented by the gathering of wild foods, hunting wild game or fishing. Within these areas, the importance of crop production (as a share of total households livelihoods) largely depends on the amount of rainfall, flooding etc. Livestock is

[2] Source: Southern Sudan, Comprehensive Food Security and Vulnerability Analysis, World Food Program, December 2007

increasingly important, however. In fact, recent statistics indicate that the exportation of beef has surpassed cash crops as the largest non oil export of Sudan.

Throughout southern Sudan, sorghum, millet and maize are the most important crops, though in certain regions cassava, sweet potatoes, pumpkins, beans, sesame and a variety of other crops are also cultivated. Agricultural production and yield is traditionally determined by several factors:

1. Amount and timing of rain
2. Area planted
3. Availability of agricultural inputs
4. Weeds, pests, diseases and natural disasters
5. Localized insecurity

The cropping season in 2006 was no exception. Insecurity, in the greenbelt regions, militia activity in Jongolei and Upper Nile, and tribal clashes in Lakes, Warrap and Central Equatoria were cited specifically as reasons for reduced crop yields. Likewise, the lack of rain in June and July in parts of Central and Western Equatoria, Unity, Jongolei and Upper Nile states and severe flooding in Upper Nile, Jongolei, Unity, Lakes, Warrap, and Northern Bahr el Ghazal also reportedly caused substantial crop damage.

3.2 Obstacles and hurdles

Despite anecdotal improvements in the well-being of households throughout southern Sudan, there are many obstacles that must be overcome to ensure the economic growth and development necessary for sustainable, long-term improvement in health, nutrition and food security. First, and most importantly, it is crucial to maintain the peace. This requires that all parties meet the benchmarks established by the CPA and previously agreed upon by all signatories. This is certainly recognized as a very difficult step. In maintaining the peace, however, investment in southern Sudan will likely continue to increase and assistance from international agencies will continue without disruption, maximizing the beneficial impact on food security and livelihoods.

Another major obstacle to progress remains poor transportation infrastructure. This poses a major problem for the movement of both people and commodities throughout the south, particularly during the rainy season. It also serves as a disincentive to produce surplus crops, as farmers find it expensive and very difficult to transport surpluses to markets. Thus, farmers in fertile areas often do not produce to capacity, even when there are food shortages in surrounding states. Rehabilitating this infrastructure would not only open up markets (improving livelihoods and food security), but it would also improve access to health care, which could have a dramatic impact on both morbidity and malnutrition rates.

3.3 Livelihood strategies of households

Much is already known about the livelihoods of household throughout southern Sudan. A joint assessment, conducted by the international donors[3] has identified seven main livelihood zones in the region. These livelihood zones are:

- Greenbelt,
- Ironstone Plateau,
- Hills and Mountains,
- Arid/Pastoral,
- Nile/Sobat Rivers,
- Western Flood Plains, and
- Easter Flood Plains

The project is located in the Maiwut County which is situated in the Eastern Flood Plains, which is one of these seven livelihood zones in Southern South. Below are the key characteristics of this particular zone.

Summary Features of the Project Area and Its Vicinity

Characteristics	Features
Zone	Eastern Flood Plains
Geography	Upper Nile and Jonglei
Climate	Savannah grassland, and one rainy season (700- 1300 mms of rain)
Agriculture	sorghum, maize, cassava, sesame, pumpkin, beans, millet and root crops
Livestock	cattle, goats
Wild foods	lalop, water lilly seeds and reeds, tamarind, gum from acacia trees, fruits, roots, grains, leaves, and wild game
Fish	Negligible

In terms of livelihood profiles, approximately one-fifth of households in South Sudan rely on either “agriculture”, “agriculture, fishing and hunting”, “agriculture and livestock” or “livestock”. Agriculture alone was most commonly reported (by approximately 50 percent) of households in Lakes and Central and West Equatoria (the “greenbelt”). “Agriculture, hunting and fishing” was commonly reported in Jonglei, Warab, and North and West Bahr el Ghazal, corresponding to the agro-pastoral zones of the “western flood plains” and “eastern flood plains”. In these states, roughly a third of the households reported this activity. “Agriculture and livestock” were reported by 50 percent of households in Unity and 25 percent of households in East

[3] United States Agency for International Development (USAID), the Famine Early Warning Systems Network (FEWS NET), Save the Children UK, and the South Sudan Centre for Census, Statistics and Evaluation (SSCCSE)

Equatoria, North Bahr el Ghazal, and Upper Nile. Again this roughly corresponded to the agro-pastoral zones of the western and eastern flood plains, though is also picking up some households from Eastern Equatoria, living in the “hills and mountain” zone. Deviating from expectations, reliance on “livestock” only was most common in Jongelei and Warab, not in the arid, typically pastoral areas in Eastern Equatoria (referred to as the “arid” zone). Instead, households in Eastern Equatoria were most likely to report a combination of “livestock and agriculture” or “collection” (15 percent). “Collection” as a main livelihood was reported much less frequently elsewhere. Table 3 discusses these livelihood groups and their geographic distribution in more detail.

3.4 Priority Interventions

3.4.1 Facilitate crop production among recently resettled households

The project should collaborate with other agencies to facilitate crop production by recently resettled households. Recent data show that fewer households farmed in the last year than expected. This is likely driven by resettled households having missed the window for planting, given the resettlement schedule. Consequently, the data also shows that these households have more difficulty accessing food. To improve this situation, the project should encourage these households to produce crops through seed and tool distributions with to support to those resettled households that arrived too late for planting.

3.4.2 Encourage production and improve market access

The project should encourage farmers in productive areas to produce to capacity. There are numerous reports that farming households in the “greenbelt” region of southern Sudan do not routinely farm to capacity. The reasons for this are both structural and security related. First, post conflict military units have been active in the area, disrupting crop yields and discouraging farming to far away from the homestead. Secondly, these farmers see no benefit in farming to capacity as they do not need the food and they have no means of getting the surplus to markets. As many of the surrounding states could benefit from surpluses in these productive areas, the project and other agencies should encourage farming to capacity while working in the longer term to improve access to markets. This is a longer term solution though successful connecting these marketplaces could have a substantial impact on food security status of households throughout southern Sudan.

3.4.3 Priorities for Post-Recovery Development

According to FAO GIEWS in 2008[4], community priorities elicited from community interviews indicate security (reported in 43 percent of the assessed villages) and the provision of basic needs such as shelter/housing (19 percent), drinking water (12 percent), education services (5 percent), tools (4.2 percent), agricultural extension (4 percent), and road repairs (4 percent) as the main priorities, which need to be incorporated in the post-conflict recovery and development priorities. For seeds and tools, where at present there is no private sector involvement because of high transportation costs, there is a need for a deliberate and concerted effort by GoSS to develop mechanisms to make these inputs available at the state level. Increased availability of tools will allow for timely land preparation, effective utilization of household labour and increased household production.

[4] FAO GIEWS Report, 2008, page 37

4 Project Specific Notes and Observations

4.1 Visit to the Ministry of Agriculture

A visit was made to the Ministry of Agriculture, Malakal Office, Upper Nile State Government, on February 28, 2008. Discussions held with John Pakwan Huyong, Director (0121992384), Acting Director General, and Albino Simon Wanh, Director of Administration and Finance, have resulted in the following observations.

4.2 Observations and Notes on Infrastructural Needs

The MINAGRI has offices only in 2 out of the 12 counties that are under the Ministry's area of jurisdiction. Maiwut County has no representation of any of the Government offices, including agriculture. One of the reasons was that Maiwut is a newly created county. It was created 2 years ago by subdividing the neighboring counties. For any viable project activity in the area, the key Ministry offices need to be established in the area. The top priority would go the Ministries of Agriculture, Infrastructure, Education and Health.

MINAGRI has no email connection and has access to a very insufficient number of office equipment. They have a few desk top computers but no lap tops.

Key Staff Appointments to the Maiwut County

Ministry of Agriculture Staff	Ministry of Infrastructure Staff
• Forestry Engineer • Agriculturist • Livestock Specialist/Veterinarian • Fisheries Specialist	• Surveying and Land Registration Specialist • Housing Specialist • Rural Engineer/Rural Water • Rural Engineer/Roads and Bridges
Ministry of Education Staff	**Ministry of Health Staff**
• TBD	• TBD

Office Premises, Living Quarters and Other Needs

Description	Possible Quantity
Office Buildings	To accommodate 4 staff members for each of the four key ministries: Agriculture, Infrastructure, Health and Education, plus PCU Quarters
Reliable water supply and power	Perhaps one generator for the 4 GOVT

	offices, plus PIU quarters
Furniture and equipment	Sufficient for four GOVT offices and PCU
Guest House	For 6 persons

Some support to the State Government in Malakal would also be warranted. This support would largely consist of:

- Limited travel allowance and per diem
- O&M for basic work equipment, expendable and office supplies
- Fuel for cars
- IT equipment
- Training in computer use and basic/remedial English language
- Up to US$ 50,000 for each of the four key ministries may be appropriate

Access is either wholly or partly restricted during the rainy season from May through November. During this period, only river access is possible for which adequate equipment and tools (boats, fuel etc) must be supplied in order to allow for adequate interaction, liaison and cooperation between the project field office and the State Government in Malakal.

4.3 Markets and Marketing

The project area is a moderately food deficit area, and it imports food and grains from other states in Southern Sudan. The two principal crops are sorghum (dura in local parlance) and maize. Sesame and pumpkins are also important crops for the area, but the amount of marketable surplus is quite limited. Prices creep up during the rainy season, and decline after harvest in November, and remain rather stable during the dry season from November through June. Malakal links with Maiwut via Renk. The distance between Malakal and Maiwut is estimated to be only XXX kilometers, but would take no less than 2 days to travel. The dirt road is accessible during the dry season, but becomes inaccessible during the rainy season. The below table captures the limited information available at the Ministry of Agriculture.

Major Crops and Market Prices

Crop	Season	Malakal	Maiwut	Comment
Dura	Rainy	100 SD	150 SD	Bag of 90 kgs, there is some inter-state trade related to dura. Malakal market lower in 2008 than it was in 2007.
	Dry	75 SD	100 SD	

Maize	Rainy	N/A	N/A	Maize is only grown for local consumption in Maiwut. There is no reported inter-state trade with maize.
	Dry	N/A	N/A	

The crop calendar for the major crops is presented in the following chart.

Crop Calendar **S= sow; H = harvest**

CROP	J	F	M	A	M	J	J	A	S	O	N	D
SORGHUM												
lewalding					S	X	X	H	H			
agono						S	X	X	X	X	H	H
OTHER CROPS												
maize	X	X	H				S	X	X	H	S	X
sesame						S	X	X	X	H		
pumpkin			H	H	H			S				

Source: GIEWS FAO Report – Annex I

4.4 Localizing Maiwut County in the Upper Nile State[5]

Upper Nile State is located in Nile-Sobat Corridor and is comprised of Melut, Renk, Maban, Tonga, Fashoda, Malakal, Sobat, Ulang, **Maiwut**, Luakpiny, Longechuk and Guornyang counties. The Nile and Sobat Rivers livelihood zone encompasses the land surrounding three main rivers, namely the Nile, Sobat and Pibor rivers. Most of the land surrounding the rivers is low lying and contains soils with high clay content, making it susceptible to flooding. The zone receives between 700-1300 mm of rainfall annually. Hence, in this respect, the project area in maiwut and the rest of the Upper Nile State terrotory share comparable characteristics. This zone is distinct from the Eastern and Western Flood Plains zones in that local livelihoods are far more dependent on the rivers, which harbour the most productive fishing and water lily harvesting areas in southern Sudan.

Continued insecurity, related to the disarmament process and presence of armed militia, has persisted in the State since the beginning of 2006. The conflict was mainly concentrated in the south of the State, but has now spread towards the northeast in the form of inter-ethnic conflict. In the south, the conflict exacerbated tensions over

[5] 2007 FAO GIEWS Report

available pasture and severely constrained access to food gathering and farming activities. Thousands of households were reported to have been displaced.

In the State, there are large mechanized rainfed sorghum production areas around Malakal. In Renk there are mechanized irrigated and rainfed sorghum production areas. The expected yield for sorghum is about 2 sacks of 90 kgs per feddan (about 0.43 tonnes/ha).

4.5 Cereal Production in the Traditional Sector

Cereal production estimates for Upper Nile State from the traditional sector in 2007 are shown in the below table. For Southern Sudan as a whole, gross cereal production is expected to be 859,000 tons from 849,000 ha similar to last year's estimates but from a reduced area due to the flooding. The average yield estimate of traditional cereal production this year, at 1.01 tons per hectare is higher than any estimate in recent years, but this estimate masks a range from 0.75 t/ha in Northern Bahr el Ghazal to 1.5 t/ha in Yambio. It should be noted that at the higher end cereal yields may go up to 3 tons per ha in Upper Nile, Lakes, Warrap and Equatoria.

In the Upper Nile State, cereal production is about 35,000 tons, corresponding to about 4% of the total production in Southern Sudan. Due to geographical proximity, the Latjor/Nasir area would typically exemplify the project area in Maiwut County. As will be seen from the below table, the total cereal crop area (19,000 ha) corresponds to half of the cereal area in the Upper Nile State, highlight the fact that cereals are of vital economic and social importance for the project area. Despite this large production, the Latjor/Nassir area still exhibits an important cereal deficit due to the heavy population pressure.

Upper Nile - Areas, Yields and Production of Cereals

County	Area-harvested (ha)	Yield (t/ha)	2007 cereal production (tons)	2007 net cereals (tons)	Popul-ation mid-2008	Consump-tion (t/year)24	surplus (+)/ deficit (-) (tons)
Renk	2,611	1	2,872	2,585	21,151	1,269	1,316
Fashoda	5,389	1	5,928	5,335	52,947	3,177	2,158
Tonga	3,779	1	3,401	3,061	34,619	2,077	984
Sobat	3,199	1	2,879	2,591	44,649	2,679	(88)
Latjor/Nasir	**23,940**	**1**	**19,152**	**17,237**	**430,456**	**25,827**	**(8,590)**
Malakal	1 459	1	1,167	1,051	105,678	12,681	(11,630)
TOTAL	**38,918**	1	**35,399**	**31,860**	**689,500**	**47,710**	**(15,850)**

5 Project Costs and Economic Analysis

5.1 Reminder on the Costing Methodology

Efforts are underway to develop the project costs. When fully developed, as much as possible, project costs will try to distinguish between Investment Costs and Recurrent (Operational Costs). The following guidelines will be adhered to:

Detailed Design: Detailed design would be needed for the first 18 months or roughly for the first two years. For the remaining years a less detailed approach may be pertinent.

Project interventions will be presented such that answers would be furnished to the following questions:

Component: Under which project component and sub-component does this intervention fit?

Dollar Estimate: How should one measure these costs: options are (a) lump-sum (or straight dollar figures), or (b) unit cost multiplied by quantities.

Expenditure Type: What type of expenditure does this investment represent: options are (a) technical assistance (TA), (b) training (TR), (c) civil works (CW), (d) goods and materials for agriculture and forestry (G), (e) grants (GR), (f) recurrent or operating costs (OC). See also below recap on Expenditure Accounts.

Phasing: How are these project costs distributed over the years. This would be done on the basis of a five year project assumption. Here we can use: percentage based phasing for lump sum costs or quantities can be spread over the years.

Physical Contingency (PC): What is the percentage for physical contingency? Usually 10 to 30 % on civil works and up to 15% on other items. If and when we are confident about the quantity of the estimate, then PC would be set at zero.

Operation and Maintenance (O&M) Costs and Who Pays for them: One may like to specify the dollar amount of the OC or link it to the investment using a percentage.

Recap on Expenditure Accounts

Type of Expenditure	Abbreviation	Usual Units	Comments
Technical Assistance	**TA**	person month	Distinguish between national and foreign consultants
Training	**TR**	Persons, study	Training and capacity

		tours, etc	building
Civil Works	**CW**	Ha, m2, etc	Buildings or infrastructure
Goods	**G**	State what it is: car, computer etc	Any physical commodity
Grants	**GR**	US$ or other	Perhaps credit or revolving fund or any other grant – including cash giveaways to very poor families
Recurrent or Operating Costs	**OC**	US$ or other	Travel cost, equipment and car maintenance

The analyst will avoid using expenditure accounts to name the components. For instance, component names such as Technical Assistance and Training will be avoided. Such a component would be called, say, Capacity Building for Ministry of Irrigation etc. Capacity building may comprise many things, including equipment.

5.2 Project Components and Financing

The project would consist of four principal components:

- Capacity Building and Institutional Strengthening
- Support to Livelihoods
- Provision of Basic Services
- Project Management

Total foreign funding for the project is expected to reach US$ 15.00 million, possibly with contributions from several donors. In addition, it is expected that users, beneficiaries and local Government would contribute up to 10% of this cost, hence yielding a total cost estimate of about US$ 16.5 million over a period of five years.

In terms of expenditure accounts, a preliminary and cursory analysis shows the reveals features.

Expected Financing Arrangements

Component	Dominant Expenditure Type, and Expected Percent	Comments
Capacity Building and Institutional Strengthening	Technical Assistance and Training, 20%	Primary source of funding would be donor funds
Support to Livelihoods	Technical Assistance, Training and Goods 20%	Primary source of funding would be donor funds
Provision of Basic	Civil Works, Goods 50%	Some O&M and

Services		Investment Cost Sharing
Project Management	Technical Assistance, 10%	Primary source of funding would be donor funds

5.3 Economic Analysis

Development of an economic analysis framework is still underway. The analysis will rely heavily on projections of incremental production, and stability of production and reduction in poverty, as well as improvement in the environmental concerns, as would be typical in any watershed project. The bulk of the economic analysis will be descriptive, and will rely on some of the information already supplied ion this report.

SWECO

Eastern Nile Technical regional Office (ENTRO)

WATERSHED MANAGEMENT FAST TRACK IN SUDAN
DETAIL PROJECT PREPARATION STUDY

Lau Watershed, Maiwut County, Southern Sudan.

LIVELIHOOD INTERVENTIONS WORKING PAPER

Working Paper
Stockholm May 2008
SWECO International AB
SWECO International

Project No. 1989151000

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SWECO

List of Content

1 Background

Guided by the IWRM/Watershed Management Concept, the Consultant have undertaken assessment of feasibility and acceptability of the proposed measures and how intervention options need to be tailored to the Lau Project Area, taking into account local bio-physical conditions, previous experiences, and community priorities and needs voiced during consultations.

Based on the proposed water interventions, which is a prerequisite for any intensified livelihood intervention, the preparatory team has analyzed various options in consultations with project beneficiaries and potential supporting agencies. These activities together with multidisciplinary screening of the proposed interventions has enabled the preparatory team to propose a menu of possible livelihood interventions, which are deemed to be socially accepted and economically viable and that could be undertaken within the lifetime of the FTWMP in Lau project area.

The proposed measures and interventions are aimed at improving the quality of life of the target groups, underpin economic development of the area and achieve fair land use allocation and management of natural resources and resulting in local and regional benefits.

The resource base is good to sustain intensified and diversified livelihoods. The challenge for the FTWMP in Lau Watershed would be to tap these resources in a socially and environmentally acceptable manner and to organise the communities to engage in productive activities as a way to assist them to go from relief dependency to subsistence to making a surplus for the market. This surplus could then be used during times of household emergencies at times of harvest failure etc or for schooling, health care expenses etc.

To this end, an important activity of the preparation has been to identify current and potential income earning opportunities, both on farm and off farm, and current constraints on their realization and extension. Some early observations on potential improved livelihood opportunities as well as on-going activities to build on are listed below. The below listed livelihood interventions are recommended to be coupled with specific activities to increase community long term capability to partake in and manage local sustainable development and reduce community dependency on relief.

The project should encourage farmers in productive areas to produce to capacity. There are numerous reports that farming households in the "greenbelt" region of southern Sudan do not routinely farm to capacity, which was also confirm during field visits. The reasons for this are both structural and security related. First, post conflict military units have been active in the area, disrupting crop yields and discouraging farming too far away from the homestead. Secondly, these farmers see no benefit in farming to capacity as they do not need the food and they have no means of getting the surplus to markets. As many of the surrounding states could benefit from surpluses in these productive areas, the project and other agencies should encourage farming to capacity while working in the longer term to improve access to markets. This is a longer term solution though successful connecting these marketplaces could have a substantial impact on food security status of households throughout southern Sudan.

Among the perceived needs of Maiwut communities are improved cattle management, and modernized agriculture. The natural resource base is also good to sustain well-planned intensified and diversified livelihoods. In addition, communities have requested establishment of more reliable access to water for domestic, livestock, and to allow shifting to more intensive agriculture using small scale agricultural ploughs, hand tools, agricultural inputs, and fishing gears etc. Agriculturally, among the best prospects in terms of soil and water conditions in the flood-plains are sugar-cane and rice growing. Agro-forestry can only be promoted in the intermediate and high lands. Productions of vegetable and tobacco can be up-scaled in the intermediate and high lands.

Based on the ToR and detailed assessments of feasibility the Fast Track project is proposed to include the following components:
Component 1: Community Empowerment and Institutional Strengthening
Component 2: Basic Services
Component 3: Livelihood Interventions
Component 4: Project Management

This report describes in detail Component 3: Livelihood interventions. The proposed measures to be assessed by the assignment have been divided in several intervention areas as listed below:

1. Agriculture
2. Fishery
3. Livestock and transhumance activities
4. Forestry and Agro-Forestry
5. Alternative Energy
6. Alternative incomes

2 Resources use for livelihood

The minor differences in relief, the considerable rainfall that occurs in the summer, combined with a number of permanent streams and small rivers habit of overflowing their banks, all combined causes various degrees of flooding. It is the degree and extent of flooding which determines the type of natural vegetation, the utility of land for grazing or cultivation, and indeed the whole nature of the region as a field for human occupation. The main ecosystems resulting from above interactions are:

- Marches or (Nuer toich) in the flood plain which is inundated for a period of four to six months every year. The flood plain has been built up by the deposition of the alluvial material. Selective erosion has played its part in removing finer particles in suspension after rainstorms.
- The intermediate land which is crossed by numerous streams and rivers and for sometimes flooded because of the impeded drainage.
- High lands normally escape flooding and have sufficiently permeable soils to drain quickly after rain.

Throughout the region the sources of livelihood of the population are cattle-rearing, crop production, fishing, hunting and collection of wild foods. These vary in their relative importance according to the areas of grazing and cultivable land available. Crop production is much less important in the clay plains than animal husbandry. Clay plains are very difficult to work with. Soils are very sticky when wet and very hard when dry. In addition, pests, diseases, droughts, and floods all take their toll of growing crops in the field.

The principal areas of cultivation are the ridges of high lands, the higher parts of the intermediate land, and the flat-lying plains between the foothills of the Ethiopian Highlands. The vegetation varies from poor to rich savannah. About 1.15 billion m^3 of rain water fall on Lau watershed. About 0.531 billion m^3 fall on the Lower watershed (Maiwut County), and about 0.616 billion m^3 fall on the Upper Watershed (Ethiopia). About 25% (about 0.153 billion m^3) of the rainfall in the Upper Watershed come to the Lower Watershed as runoff in the form of rivers and streams (calculated from Tables 4 and 5, Lau Watershed Water Resources Potential, Development and Management, Interim Report). The area, therefore, receives annual rainfall and runoff enough to sustain agricultural practices.

Pastoralists who live near the rivers cultivate the banks of the river when the flood recedes exposing alluvial terraces along the rivers. The farming system is shifting cultivation. Double cropping of maize and beans and single cropping of sorghum are practiced. Land preparation is carried out using hand-hoes as tsetse precludes the existence of oxen.

Agriculture is essentially for subsistence in a more sedentary form with some element of shifting and fallowing. A wide range of crops including maize, sorghum, groundnuts, cassava, sesame, sweet potato, cowpea, finger millet is grown in the area.

Livelihoods in the high lands, are composed of crop production, fishing, gathering of wild foods, hunting, keeping of small ruminants and small-scale trade (honey, tobacco).

The relative abundance of land for cultivation means that access to land is not really a problem; especially within the higher more settled areas away from the dry season river bank settlements. At present, there are little conflicts related to agricultural land.

Rearing of cattle is strongly linked with the practice of seasonal migration between the high land and the flood-plains. During drought years, the Nuer communities stay for longer periods of time in the marshy areas. This has serious implication on their agricultural activities and food security, since land preparation is often delayed and not properly prepared ahead of the rains. Tree growth is prevented in low lands by the effect of excessive water and poor drainage in the summer, combined with fierce grass fires in the winter. The inhabitants of the area, in general, have been little affected with outside trade or modern advances in technology. Their economic isolation is to a large extent the result of difficulties of communication in the region. Lorry transportation is of increasing importance, but lorries can be used only during the dry season.

The Sudan enjoys a vast expanse of clay plain of Vertisols types (black cotton soil) which are considered the most important of its soils. Vertisols total an area of about 70 million ha and cover about 28% of the country's total area. These soils stretch in four continuum patches: central, eastern, western, and southern Vertisols. The central Vertisols stretch from south of Khartoum in-between the Blue and White Niles southwards to Sobat river at the fringe of southern Sudan. They cover an area of about 21 million ha. The eastern Vertisols are found between the Blue Nile and Atbara river towards the borders with Ethiopia and cover an area of about 16 million ha. The western Vertisols are found west of the White Nile in Southern Kordofan state in an area of about 12 million ha. The southern Vertisols form a large triangle with their apices at Lake Turkana in

Kenya, Renk on the White Nile, and Aweil in northern Bahr el Ghazal, and cover an area of about 21 million ha. Vertisols in the north are more fertile and easily workable than those in the south. The parent material of the central Vertisols is the Blue Nile alluvium from basaltic rocks in Ethiopia laid down when the area was a lake 50,000 B. C. to 10,000 B. C. Those of the eastern and western Vertisols are of basaltic origin weathered *in situ*, and the southern Vertisols are believed to have been deposited by the White Nile. Vertisols in most cases are on flat terrain and this reduces the chances of sheet and gully erosion, but increases the chances of water logging. However, the major soil degradation types confronting the Sudan Vertisols under the current cropping systems of both irrigated and rain-fed areas are soil compaction due to heavy machinery use, nutrient depletion due to lack of fertilizers use, and loss of soil organic matter. 15 to 20 million hectares of the Vertisols are currently cultivated under rain, 40% under large-scale mechanized agriculture and the remainder under small-scale traditional cultivation The Gezira and its Managil extention, New Halfa, Rahad, the Blue and the White Nile schemes and the five sugar plantations grown mostly on the Suleimi, Laota, and the Dinder Vertisols series are the main irrigated areas of the Sudan Vertisols comprising an area of about 1.5 million hectares.

2.1 Status of food security

Despite the extreme attachment of the Nuer to their cattle, the greater part of their diet comes from grain. Grain production in the area rarely suffices for subsistence even in good years. Grain stocks fall at the end of the dry season, and during the rains there is a hungry period until the new crops are harvested. In this case grain is imported from central Sudan, paid for by the sale of cattle. Even if there is grain surplus, the high humidity prevailing throughout the year prevents the storage of grain for more than one season. The relative humidity ranges between 25 to 80% throughout the year. It is highest (between 50 to 80%) during May to November, with an annual mean of 54%. Other food crops include maize, eaten early before the main sorghum crop ripens at a season of distinct food shortage. Various pests attach crops in the area aggravating food insecurity situation. The voracious migratory locust is occasionally reported. Damage to crops is also caused by various birds. Particularly severe crop losses are caused to the sorghum crop by the parasitic witch weed, *Striga spp* due to the cultivating the same land year after year by sorghum (mono-cropping). During the dry season, the Nuer and Burun do fishing, hunt, and gather wild plant foods. Some grains and vegetables supplement this diet. None of the food commodities are solemnly produced for market purposes.

2.2 Current agricultural activities

2.2.1 Crop production

As regards resource use, apart from the semi-mechanized crop production in Renk in the Upper Nile, crop production in the State, in general, remains at the subsistence level. This traditional farming system is characterized by shifting cultivation, mixed cropping (two to three varieties of sorghum are mixed with millet, beans and sesame), intercropping (cassava is inter-planted with groundnut maize and pumpkin). Only tobacco and rice are planted in pure stands. Modern technology such as crop husbandry, use of fertilizers and pesticides is not adopted. Constraints include lack of adopting modern agricultural technology and practices, moisture deficits in the uplands, marginalization of the traditional sector in general, low level of technological inputs, wide spread of weeds, pests and diseases, lack of extension and research services.

The Gajaak-Nuer apart from grazing their animals on the lush grass in the Toich (seasonal floodplains), they plant and grow some crops (especially maize) in the moist soils left by the receding flooding. This is not common for the rest of Nuers. Under normal circumstances the community could achieve subsistence in food, unless natural hazards occur like birds (locusts) attack to crops.

The Burun community is sedentary or shifting cultivators. Agricultural practices are very much feminized in the Burun society. The lack of adequate and timely provision of seeds and tools affects the lives of these women and their families.

They mainly occupy higher grounds to the north and northeast where drainage is good for cultivation and grazing. The yields are generally very low and there is inherent risk of food insecurity. Thus, there is need to address the limitations of the traditional farming system by integrating both sustainable features of the traditional and modern farming systems to enhance sustainable agriculture and promote the overall economic development.

2.2.2 Animal rearing

The Nuer economy and social life in general revolve around cattle, which graze on the marshy areas during the dry season and in the hills as well as close to the Lau stream during the wet season. The

Gajaak-Nuer people of the study area remain strongly transhumant. The grazing lands are accessed in common. Pastoralism is the leading preoccupation of the people that are almost wholly dependent on livestock.

The Burun, on the other hand, keep few cattle received through inter-tribe marriage, raise sheep, goats and fowls for domestic use and for trade with the neighbours. The Burun do not drink milk.

2.2.3 Fishing

Fishing is the third main source of livelihood. It is widely practiced by men, women, and children of most members of the community and especially by poorer households. Some individuals who lack other resources have come to specialize in fishing. The numerous shallow streams, lagoons, and lakes make it easy to catch the fish with primitive methods. Fishing takes place at varying times of the year in different sites, but in most areas fishing is a key dry season activity while livestock are at the toich.

Many kinds of fish are caught, and most are eaten. The most famous one is the Nile perch, which is an essential part of their economy. The mud fish or king fish, in famine time, can be taken from stream beds where it spends the dry season. Fresh fish is sold in the nearby towns. There is also some production of sun-dried fish, which is sold in the rapidly growing demands in western Sudan, and to seasonal workers in the mechanized rain fed agricultural areas.

3 Agricultural interventions

The main objective of such interventions is to raise the sustainable level of production of the land, water and vegetation from subsistence level to market oriented production through the application of sustainable resources use systems. The strategy should be based on research findings of similar situations in the Sudan and elsewhere. The Sudan has accumulated a respectable record of information on the agricultural production technology and management of both irrigated and rain-fed Vertisols. Such knowledge has been acquired through the long-standing research and management in the irrigated Gezira for about one century, and the mechanized rain-fed agriculture for about half a century. The author of this note had reviewed the research work carried out in the Sudan during the period between 1919 and 1996 on the sustainable management of Vertisols under irrigated and rain fed agriculture. This review is published in a book by the International Board for Soil Research and Management (IBSRAM) under the title “Sustainable Management of Vertisols, 2001”.

The Gezira and the rain-fed schemes set very good economic and management examples as models for Sudan social and economic development on Vertisols. However, lack of appropriate infrastructure, poor economy, political instability and a massive brain drain which started in 1975 frustrated all planned development. The sustainability of the rain-fed agriculture should follow some strategic approaches which would maintain soil fertility and conserve moisture.

All sectors, such as research, extension, crop rotation etc., are expected to play effective roles in the promotion of peace and development. Thus, the development of the capabilities of these sectors including their infrastructure, technical facilities, and human resources is essential.

3.1 Priority intervention themes

Before progress can be made in all aspects of agriculture, the major problem of human attitudes should be overcome. The possibility of adapting the population to agricultural innovations would need great efforts. Similarly, of the limitations on improved animal production, none is more significant than the reluctance of the people to part with their cattle or to be content to maintain a smaller herd of the optimum size in relation to the available grazing resources. The capacities of

available resources and technologies to satisfy the demands of the retaining returning refugees and IDPs after the CPA, and of the growing population for food and other agricultural commodities remains uncertain. To increase food production in a sustainable way and enhance food security should involve:

- Promotion of greater public awareness of the role of the people's participation and people's organizations, especially local communities, small farmers, women's groups, and the youth in sustainable agriculture and rural development;
- Strengthening and developing the management and the internal capacities of the local people's organizations and extension services and to decentralize decision-making to the lowest community level;
- Dissemination to farming households simple integrated farm management technologies, such as crop rotation, organic manuring, prevention of pre- and post-harvest crop losses;
- Initiation and maintenance of locality and community agricultural land-resource planning, management and conservation groups to assist in problem identification, development of technical and management solutions, and project implementation.

Among the perceived needs of Maiwut communities are improved cattle management, and modernized agriculture. The natural resource base is also good to sustain well-planned intensified and diversified livelihoods. In addition, communities have requested establishment of more reliable access to water for domestic, livestock, and to allow shifting to more intensive agriculture using small scale agricultural ploughs, hand tools, agricultural inputs, and fishing gears etc. Agriculturally, among the best prospects in terms of soil and water conditions in the flood-plains are sugar-cane and rice growing. Agro-forestry can only be promoted in the intermediate and high lands. Productions of vegetable and tobacco can be up-scaled in the intermediate and high lands. Various uses of *papyrus*, which is abundant in the area, could be considered, and further investigation into the conversion of *papyrus* into power alcohol has been recommended before.

3.1.1 Improvement of traditional rain-fed farming, and introduction of irrigated farming system

Traditional farming in Maiwut County has a great potential for improvement and thereby increase its productivity if full use is made from its agricultural resources and some features of modern technology which could be transferred from similar climate and soil environments. Technology packages could be adapted from research

stations in central Sudan such as Damazeen Agricultural Research Station, Agady Research Farm, Abu Naama Research Station etc.

Introduction of sustainable irrigated agriculture involving the transfer of modern knowledge and technology will maximize the productivity of the land, ensure food security and overall sustainable development, and thereby promote resettlement, peace and tranquility. The irrigated farming system should be introduced, particularly in the high lands and along the rivers/streams banks, where adequate surface or underground water is available. Technological package for growing food crops, cash crops, and some strategic crops such as sugar-cane etc. can be provided from research stations in central Sudan working on these crops on similar soils. Following information could be extracted from such research stations:

- Identification of basic agronomic practices (land preparation, sowing dates, spacing and seed rates, fertilizers use, pests and disease control, weed control etc.) for specific crops, including field crops and horticultural crops.
- Identification of appropriate irrigation systems and irrigation scheduling i.e. identifying how much and when water is applied.
- Introduction of high yielding crop varieties (hybrid sorghum, hybrid maize) and varieties resistant to pests and diseases.

The above interventions will meet the perceived needs of Maiwut communities in modernizing agricultural practices through provision of technology transfer packages for raising crops yields. Project area should be linked with agricultural research centres of the White Nile University at Malakal and its local demonstration plots for training trainers at the communities' levels. The Agricultural College at the White Nile University may be invited to establish demonstration plots within the project area for agricultural extension purposes. Such demonstration plots can show:

- The use of modern technology in modernizing both traditional rain fed and irrigated agriculture in aspects such as application of fertilizers and pesticides, and the use of ploughs and hand tools.
- Promotion of popular participation and extension components.
- The constraints of traditional farming and the prospects of integrating some of the modern technology in traditional farming.

3.1.2 Improvement of fishing facilities

Fishing undoubtedly offers one of the best prospects for economic development in the area. Greater quantities of commercial fish can be produced through introduction of appropriate technologies, proper control of water levels, regular drainage of isolated lakes, and improvement of transport and marketing arrangements. The development of fish-ponds and commercial fisheries is recognized to hold out very great prospects. There are defined shortages of animal and fish protein in many parts of the Sudan, so it may be that further investigation and investment could be warranted. Salted-sun-dried fish should also be encouraged as cottage industry.

3.1.3 Soil moisture conservation

Rainfall distribution may vary greatly within Maiwut locality. In the northern and eastern parts moisture deficiency is often experienced, while in the southern and western parts and in the relatively low areas water logging becomes a frequent problem. Therefore, appropriate soil moisture conservation in the former and ways to dispose of excess water in the latter should be worked out. The Farm Water Management (3.1), Broad Bed and Farrow System (3.1.1), and Surface Drainage (3.1.2), and Recommended Approaches to Water Harvesting and Land Drainage (3.2) reported in (the Lau Watershed Water Resources Potential, Development and Management, Draft Report), showed ICRISAT's experiences in the soil moisture conservation and management of Indian and Ethiopian Vertisols. As the soils and environmental conditions in Maiwut County are almost similar to those where ICRISAT conducted the reported experiments on soil conservation and management, these experiences can be tested under the Maiwut County Vertisols in improving crop production under rain and irrigated farming systems. As far as surface water storage is concerned, the Sudan has a long standing experience in livestock watering, fish production, and irrigating crops. All these experiences are housed in the Ministry of Irrigation and Water Resources, and should be made use of.

Below is a summary of agricultural research findings which had been done in the Sudan (during 1917 through 1986) to improve agricultural management of the Vertisols with the aim of putting emphasis on some aspects of cultural practices that may serve as guidelines for the sustainable management of these soils. Research strategies were to change from low-input and wide course rotation to more intensified and diversified cropping systems.

1) The indispensable role of nitrogen fertilizer in the crop production economy of the irrigated and rain-fed Vertisols was recognized from

the start. Urea is now used extensively to grow cotton, wheat, sorghum and some horticultural crops on the irrigated Vertisols. In later years, phosphorus and some trace elements were found to be essential to the growth of some crops in the irrigated sector. Ammonia volatilization from surface-applied urea was found to be an important mechanism of nitrogen loss that might reduce nitrogen fertilizer efficiency, and hence crops yields, in these cracking soils under hot conditions. The uptake and utilization of urea-N by several crops in the Vertisols depended to a large extent on the depth and time of fertilizer application. High yields of these crops require the maintenance of an adequate supply of nitrogen at relatively early stages of growth.

2) Water-use management was found to be of great importance in both irrigated and rain-fed agriculture. In these slowly permeable soils cracks are important avenues for water penetration into the subsoil. Enhancements of soil cracking should, therefore, be integral parts of the Vertisols management. A period of 4-6 months of soil desiccation (fallow period) would be enough to form necessary cracks. Maintenance of chemical soil fertility and a friable physical structure are the main indicators of sustainable management of Vertisols in the Sudan.

3) A shallow (10 cm) weeding operation was all that was necessary to prepare an adequate seedbed for rain-fed agriculture when sufficient rain had fallen to replenish soil moisture through the cracks, and partially closed the deep cracks. This would be done rapidly and economically by a high speed-shallow cultivator. There is always pressure to sow the crop as quickly as possible before the build-up of soil moisture in August - September when tractors are easily bogged down in the wet clay and prevented from working efficiently. Deep tillage was found very costly, relatively slow, and produced a cloddy tilth which required further energy to break down the soil to an acceptable seedbed. The use of the disc harrow year after year produced a hard soil layer.

4) Most of the field crops and horticultural crops are grown on ridges 60 cm apart and in-row spacing of 10 cm or 20 cm depending on the crop. Three seeds per hole are sown and after two weeks thinned to two plants. Seeds are sown on top of the ridges. A fixed interval of 14 days between watering coupled with 100 mm rate of application per irrigation was the optimum irrigation for most of the crops all over the irrigated Sudan Vertisols.

5) Crop rotations including a legume give better yields than those without legumes. For social and economic purposes the four-course rotation sesame/sorghum/legume (beans or groundnuts)/fallow could be chosen for the project area.

6) Rice and sugar-cane could be promising crops in the flood plains. There is a lot of research work on these crops on Vertisols.

3.2 Proposed Agricultural Activities

There are two major ecological groups for agricultural interventions. These are the high lands and the flood plains or the toic.

The high lands: They escape flooding from the rivers and have sufficiently permeable soils to drain quite quickly after rain. The soils are of medium fertility and would need frequent application of fertilizers, particularly nitrogen fertilizers, for sustainable crop production. Estimated fertilizers use for optimum production would be about 50 to 100 kg urea per feddan depending on the crop. These riverian soils have good structure and are easily worked. On these soils we can expect expanding production of vegetables and fruits crops besides some grain crops (sorghum, maize, millet).

The flood plains: Currently, cropping is less important in the flood plains than in the high lands. The flood plains are Vertisols, which are markedly heavy and high in clay contents. These require hard physical labour in clearing the weeds and cultivating the land. Here we must stress the importance of drainage as a factor that could affect crop performance and soil fertility. But these soils (Vertisols) have already proved their worth, whether irrigated or under rain for growing of grain, sesame, cotton, peanuts, sugar-cane, vegetables and fruits. In these cracking clays, the Sudan enjoys its best prospects of greater prosperity for generations to come. Soils of the flood plains are potentially fertile, but it is doubtful if this fertility will be maintained, without fertilizers application, if the land is brought under relatively intensive and diverse cultivation. To sustain good production, perhaps about 50 kg of urea per crop per feddan would be needed. Leguminous crops like groundnuts and beans in general would not require nitrogen fertilizers, unless otherwise proven by research.

Poor farmers operating at the edge of survival in the project area can not afford to take the risks of adopting new approaches. Yet, a farmer-centred approach is the key to the attainment of sustainability. Therefore, it is advisable to introduce to them agricultural packages to improve their livelihoods in two phases.

Activity 1: Establishment of agricultural demonstration plots

The first phase (Phase One) will be the establishment of agricultural demonstration plots in selected sites for adapting the population to the role of agricultural innovations in boosting agricultural production. This is an area of intervention for long-term gain and is justified by its high payoff. Agriculture in this area, and elsewhere, needs scientific and technological underpinning if it is to have sustained productivity. We need to accelerate adoption of the most promising available agricultural technologies to avert food insecurity and reduce poverty. Demonstration plots are technology delivery systems that quickly bring innovations to farmers. The College of Agriculture at the Upper Nile University at Malakal should be a very close partner in this project. County and Payam officials, local and international NGOs with experience in the field, community leaders, and farmers' organizations should be key stakeholders. All above key stakeholder should be involved in the planning and governing of the demonstration plots. This will improve efficiency of delivery and accountability of extension agents.

Four demonstration plots are suggested, pending availability of funds. Three demonstration plots in the flood plains Vertisols area in Maiwut, Jotome, and Turu, and one demonstration plot in the high lands light soil area in Kigili. Maiwut, Jotone and Tutu demonstration plots will be for rain fed crops, while that of Kigili will be for rain fed and irrigated crops. Irrigation water will be pumped from Lau River or from shallow wells adjacent to the river. The size of each plot will be about 50 feddans, laid down in about 350x600 meters. The objective of establishing these demonstration plots is to show the local communities the optimum way of land preparation, planting, weed control, pest control, watering, crop harvest, processing (grinding) and marketing.

Within 2-3 years from the commencement, the Demonstration Plots should have shown clearly the benefits of the technological packages, and many farmers and traditional leaders should have seen and felt the differences.

Activity 2: Support to pioneer farmers

Phase Two will then commence after farmers and local leaders have got convinced of the benefits of the technological packages in boosting agricultural production. Phase Two will provide assistance to selected promising farmers with agricultural inputs to improve their productions and livelihoods. 100 farmers will be selected as pioneer farmers in each of the four areas. The selection of these pioneer farmers will be crucial and will involve consideration of many factors. The experiences of the local and international NGOs in the agricultural and developmental sectors such as Nile Interdevelopment Program (NIP), Agency for Corporation on Research and Development (ACORD), Norwegian Peoples Aid (NPA), Care International etc. should be made use of.

4 LIVESTOCK AND TRANSHUMAN INTERVENTIONS

4.1 Situational Analysis

Livestock remain of vital importance to almost all Nuer, both as a source of livelihood and as a form of social wealth. Hutchinson describes a gradual decline in the cultural significance of livestock with the onset of the cash economy. One indication of this is a greater willingness to slaughter cattle for meat and to sell animals for cash. These gradual changes in attitudes towards livestock seem to be continuing despite the current lack of market opportunities.

All the same, cattle continue to be important for bride wealth and marriage, for settlement of feuds, and as a way of holding wealth. Even when people engage in other activities such as crop production, fishing or trade, any surplus obtained from these are used to buy livestock. Bride wealth rates of 25 cattle are still widely quoted (for a Nuer bride, fewer, apparently, for a Burun bride) although with the increasing frequency of elopement this may be more of an ideal than a reality.

All respondents argued that actual livestock numbers per household had declined due to insecurity and displacements during the current civil war. The concept of 'livestock per household' is itself a complex one. Among the Nuer, families rather than individuals own livestock with the sons normally claiming their share when they are ready to marry. Individual ownership is always complicated by obligations to other family members and herds may be pooled or dispersed for convenience and to reduce risks of losses. Wealthy people would naturally try to conceal their true livestock numbers. Livestock are owned by men. Where a widow remains with livestock a brother or older son would be appointed as the owner or a 'new husband' would be 'found for her'. She could not buy cattle without 'discussing with her men folk'.

The Nuer Agro pastoral system is based upon the acquirement of livestock, through inheritance, bride wealth gifts, purchases, loans, etc. and the management of these stocks as production assets. Nuers pursue subsistence form of life aimed mainly at producing the goods they need to survive and to reproduce their institutions. The subsistence system also includes transactions of any sort (market, and non market), but gives more consideration to the primordial value of cattle. It is also the only form of investment available, and the capital essential to their social life.

The movement of Nuer is based on change of season; wet and dry season. Pasture and water shortage, crop production and flood dictate mobility. The green pasture, which grows thanks to the flood that occupies the largest portion of the dry season settlement land, provides sufficient feed reserve enough to keep livestock up to January. From Oct. - January agro pastoralist exploit the flood fed green land, which was abandoned in July for wet season settlement area. At the end of January the grass gets dry and looses its palatability. To get rid of it and facilitate the growth of new grass, Nuers burn the whole grazing field.

Animal health problem is the main constraint to livestock production in the project areas. Stock movements over considerable distance especially during the dry season, mixing up of different herds in the dry season (March, April, May), and free movement of animals from the Sudan are some of the factors favoring disease transmission.

Currently Contagious Bovine Pleuro-pneumonia (CBPP) is common on the Maiwut side and is the disease most feared by the Nuer pastoralists. Pasteurellosis, which is also a common disease during early rain season (mid May - July) and during drought, stands next to CBPP. A number of outbreaks reported before the intervention of ACORD Gambella pastoralist livelihood support program, were CBPP and Pateurellosis diseases. Through planned and prophylactic vaccination although both disease are effectively controlled in the Ethiopian side of the Nuer agro pastoral area, unless the same measure is taken in villages across the border these diseases continue threatening the livelihood of pastoralists. Previously Foot & Mouth Disease - FMD outbreak was occurring once in three or four years. However our community participatory assessment and passive disease surveillance shows the prevalence of the disease in the last three years. Other diseases common in both sides of the agro pastoral community and which affects the livelihood of the people are annexed in this project proposal.

Livestock raiding is mostly practiced by youth and younger who violate the customary and official laws and lose control by elders and local leaders
The main causes for raiding are:-

- Poverty and unemployment.
- Literacy.
- Payment of bride wealth (dowry).
- Recognition.
- Revenge.

The capacity for small-scale dairy processing and marketing to generate jobs in rural communities, as well as in peri-urban and urban

areas, is demonstrated in this project. However, employment generation is shown to be affected by the structure of the market, particularly the distances in market channels and the types of products demanded by consumers. Greater distances generally require more intermediaries and more labour, as do additional processing and handling for derived products. Seasonality also plays a role in affecting the stability of employment through the year. The policy environment, however, interacts with all of these factors and can either ameliorate or exaggerate their effects. Helpful policies can potentially enhance the employment opportunities and stability.

It is evident from this field investigation that traditional knowledge plays a major role in smallholder dairy processing. Ways to enhance this traditional knowledge, including training in modern dairy technology and entrepreneurship need to be considered to improve the efficiency of dairy processing. Training should however be practical and tailored to the particular needs of the small-scale sector.

Conclusions about the relative value of dairying versus beef production cannot be reached without a longer-term, more comprehensive study of the economic costs and returns to each. However, the data available from this the field investigation, which was limited both in time and scope, suggest some reasons why most pastoralists not depend heavily on milk production.

Dairy production and sales provide pastoralists women with a means of adjusting their diets and income sources to the vicissitudes imposed by the climate and local economy. Milk therefore has a dynamic role in relation to the changing exchange values of grain versus slaughter cattle. This dynamic function may be disguised in a quantitative assessment of the value of milk at any one point in time.

Women's dairy income, either in kind (bartered grain) or in cash which allows them to buy grain, therefore permits pastoral families to produce less grain than they consume, and to sell fewer animals than would otherwise be necessary. Dairy income thus underpins the maintenance of a pastoral production system, since it bridges the ‘grain gap’ that pastoralists can only otherwise overcome by compromising the efficiency of their livestock operation and possibly jeopardizing their whole pastoral enterprise.

The existence of seasonally surplus milk at low prices has prompted several entrepreneurial merchants to set up small-scale rural cheese-making plants which offer women higher prices for whole milk than they could otherwise obtain for buttermilk. The potential for expanding the number of such dairying plants is present in the form of an ample supply of milk in the rainy season and a demand for cheese among local urban residents. Impediments to the development of cheese-making in this area are undoubtedly the lack of good transport facilities, lack of capital and absence of critical inputs to assist private entrepreneurs in developing cheese production.

4.2 Proposed Activities

In the light of the above short situational analysis, the following Key interventions have been recommended:

Activity 1: Appropriate technology for milk processing

Traditional manual milk separation, still widely used in the area, is a problem for women because it is hard work and time consuming. It is also inefficient as the separation is usually not complete. A cost effective and labor saving technology has been developed locally in Sudan by the Agricultural Research Station in El Obeid. It will be appropriate for the Project to introduce it in Area. The device, though manual to suit the nomadic communities without access to electricity, is much more efficient and easy to propel even for younger members of the family. Women will be trained in their use. These will be made available to poorer women with some livestock according to the same principles of matching grant used throughout the community fund.

Gybna beyda is a hard white cheese made in Sudan. The experiences of Sudan in rural areas such as Kordofan the storage life of the cheese may be more than one year and about one kilogram of cheese will be obtained from seven liters of milk.

The method of process Cheese is very simple as follow:
1. Heat fresh milk to 35oC and add salt to give a 7–10% salt solution in the milk.
2. Add rennet or rennet extract to obtain a firm coagulum in four to six hours.
3. Transfer the coagulum to wooden moulds lined with muslin and allow the whey to drain overnight.
4. Cut the curd into 10 cm cubes. Put the cubes into tins or other suitable airtight containers.
5. Fill the tin or container with whey and seal.

Activity 2: Establish Market Mechanism: Formation of Cooperative to handle the marketing (sub Chiefs women)

Due to market inaccessibility in the Sudan side of the Nuer habitat and the relative strong value of birr, in the past twenty years Sudanese Nuer cattle owners have been increasingly trekking cattle to Gambella market. Other reason for cattle flow includes seasonal mobility. In the face of the prevailing high risk of acquiring new disease and the spread of outbreaks from the neighboring Sudan, so far adequate measure has not been taken by the regional and federal government to tackle the problem.

Nuers suffer from chronic problems of access to markets. They should walk long distances (some of them up to three days) to sell

livestock and purchase necessities. There is no formal livestock market in Nuer agro pastoral areas of both sides. Cattle, mainly culled cows and bulls are taken from all districts to Gambella.

The creation of marketing mechanism from women sub chiefs will help in facilitation of the whole process from collection points at time of rainy season, awareness campaigns and marketing,

The milk churns will be complemented with rationalizing milk collection and sale. The group could also access the lactoperoxidase to conserve larger quantities to be collected by milk intermediaries. A share of the profits will be paid to the CIF to purchase additional milk processing activities to service more women in the community in the same activity or diversification of this, for example ghee (samen) manufacture and cheese making.

Also ways to promote associations among small traders would allow some economies of scale and more efficient transportation of milk. Easier access to micro credit facilities was considered in each country as one option to address the need for more investments by individual traders.

In the end the project will develop sustainable community managed systems for delivering micro credit and input/output supply services to groups of very poor milk producers and also setting up community owned and managed small-scale dairy enterprises.

Activity 3: Poultry

Among the Nuer cattle remain by far the most important livestock followed by goats and sheep. Chickens are more widely kept now than in the past. The Burun mainly keep goats, sheep and chickens, with smaller numbers of cattle. Burun communities further to the north also keep pigs.

Activity 4: Intertribal and cross boarder Dialogue

- Support annual inter-tribal conferences and methods for inter-tribal negotiation and conflict-resolution related to annual transhumance movements. (capital).
- Review and report on the options for coordination of transhumance movements crossing the north-south Sudan divide, and support methods to effectively manage and coordinate such movements.

- Organizing experience sharing visit b/n Gambella and Maiwut CAHWs , neighbouring state and the associations abroad including Ethiopia and Kenya

Activity 5: Heath Services

This can be undertaken in partnership with ACORD and all has been widely covered but it can provide support to what is going on with ACORD and other actors.

- Provision of veterinary drug for Maiwut Community Based Animal health programme
- Organizing prophylactic vaccination campaign against Pasteurellosis and CBPP in Maiwut and organizing disease reporting training for cattle owners

Activity	In puts	Targets
1.Mobile Cheese and Ghee processing during the rainy season (collection points)	Training in milk and cheese processing Raw materials	500 No of HHS
2. Formation of market committees	Market Institutions (group of sub chiefs)	10-20 Committees
3. Poultry	Chickens, 50 per house hold, fodder, etc	200 No of HHS
4. Support 3 Intertribal conferences, and networking, and two exchange visits (internal and eternal)	Support Creation of Pastoralist and Farmers Unions by nat. consultant + 3 conferences + 2 Exchange Visits to Kenya and Ethiopia	Support given to approx 10 meetings. 2 exchange visits undertaken. Plans for transhumant movement drafted and discussed.

5 Forestry and Agro-Forestry Interventions

5.1 Situation analysis

Ecologically, Lau Watershed can be classified as Sudanian Savanna Ecoregion. The vegetation is dominated by *Acacia seyal*, *Adansonia digitata*, *Anogeissus leiocarpus*, *Balanites aegyptiaca*, *Ceiba pentandra*, *Kigelia africana*, *Sclerocarya birrea* and *Tamarindus indica*, which are typical trees of the ecoregion (White, 1983). The dominant trees have been reported to have a very high economic value in the ecoregion. Some of them also occur worldwide where they are highly valued by local communities and their products traded internationally.

Acacia seyal/Red Acacia, locally known as Talh, is a thorny nitrogen fixing tree up to 10 m high with a greenish or reddish bark with major roles in fuel and fodder production throughout Africa. It is a source of gum talha and a proportion enters international trade. Both varieties of *A. seyal* are viewed favourable as forage. Dry matter net energy contents are high: 6-8 MJ kg^{-1} (foliage) and 4-7 MJ kg^{-1} (fruits). The associated digestible protein levels are also high: 100-150 g kg^{-1} in the foliage, and higher in the fruits (NFTA, 1994; Forest & Landscape, 2000).

*Adansonia digitata/*Baobab, locally known as Dhuony in Nuer, is a multipurpose tree best known for its swollen trunk. The most important benefit of baobab is derived from its fruits. Seeds are eaten fresh, dried or roasted. The pod contains a very nutritious pulp, which is rich in vitamin C, calcium, potassium, phosperous, iron and protein. It is mixed with water to produce beverages. Dried pulp is processed as a powder to enhance food nutrition and marketed locally and internationally. Oil is extracted from the seeds which is often used in traditional ceremonies and for cooking. Bath oil, lotions and creams have also been developed from the oil for the cosmetic industries. Fresh and dried leaves, which are rich in vitamin A, are cooked and eaten as a type of spinach (Teklehaimanot, 2007).

Anogeissus leiocarpus/African Birch, locally known as Riek in Nuer, is a tree of up to 30 m in height. The wood is well appreciated as a carving wood and is used for construction and tool handles because it is fairly insect and termite resistant. The ashes are used for tanning leathers and the leaves and bark are used as yellow dyes for fabric and leather. The gum is used to make ink more viscous or to glue leather and is used occasionally as arabic gum replacement. The roots are used as chew sticks for cleaning teeth (Forest & Landscape, 2007).

Balanites aegyptiaca/The Desert Date, locally known as Thaue in Nuer, produces an African dryland fruit with edible pulp and a hard woody endocarp enclosing an edible oil-rich seed. The fruits develop even in unusually dry years, thus, local communities heavily rely on this resource as emergency food and are regular rural market commodities. The seeds are rich in protein and energy. Oil is extracted from the kernels that are used for cooking and medicine. Commercially, it is a potential diosgenin and yamogenin source for the manufacture of cortisone and corticosteroid drugs. The edible leaves are the only vegetable available in many areas during the dry season (Teklehaimanot, 2007).

Ceiba pentandra/Kapok Tree, locally known as Lath in Nuer, is a tall, deciduous tree. The fruit or seedpod about six inches long is filled with brown seeds and cotton-like, woolly floss. The fruits, when mature, burst open exposing the cotton-like substance, which is the kapok of commerce. The kapok fibre, which is eight times lighter than cotton and five times more buoyant than cork is used for stuffing pillows, mattresses and cushions. It is light, water repellent and buoyant, making it ideal for life jackets, lifeboats and other naval safety apparatus. It is an excellent material for insulating iceboxes, refrigerators, cold-storage plants, offices, theatres and aeroplanes. The tree is also an important honey source, the foliage is used for fodder, and oil is extracted from its seeds and used industrially (Forest & Landscape, 2005).

*Kigelia africana/*Sausage Tree, locally known as Luael in Nuer, draws its name from its unique sausage-shaped fruit, suspended from long stalks, sometimes over a metre in length and weighing as much as 10 kg. Kigelia has a long history of use by rural African communities, particularly for treatment of a wide range of skin ailments, from fungal infections, boils, psoriasis and eczema, through to the more serious diseases, such as leprosy, syphilis and skin cancer. A significant body of scientific literature and patents confirm the validity of many of the traditional uses of Kigelia. The fruit extract for treating skin cancer has now found a market in Europe and the Far East (Grace et al., 2002; Eldeen and Van Staden, 2008).

Sclerocarya birrea/Marula, locally known as Camel in Nuer, plays a very significant role in the diet and culture of people in many countries where it occurs. Both the pulp and kernel are nutritious. Local people consume the fruits and some are sold on local and regional markets. In South Africa the fruits are used to produce the very popular 'Amarula' liquor, which is traded internationally. Butter is also extracted from the kernels, which is used for cooking and for the production of cosmetics by cosmetic industries in Europe and USA (Teklehaimanot, 2007).

Tamarindus indica/Tamarind, is thought to have originated from Eastern Africa, from where it spread to Asia and Central and South America. Thus, tamarind has become an economically important species not only in Africa but also in Asia and the American continent. The edible fruit pulp is consumed fresh and used to make syrup, juice concentrates and exotic food specialities like chutney, curries, pickles and meat sauces. The fruit pulp contains high amount of vitamin C and sugar and is a much-valued food ingredient in many Asian and Latin American recipes. Pharmaceutical industries use the pulp as an ingredient in cardiac and blood sugar reducing medicines (Teklehaimanot, 2007).

5.1.1 Findings and recommendations

During the consultancy mission in Maiwut county between 14th and 19th April, the four payams that fall within the Lau watershed, namely Maiwut, Jekou (Turu), Jotome and Kigili payams were visited. It was observed that in all the four payams there was very dense forest cover dominated by the above listed tree species namely *Acacia seyal*, *Adansonia digitata*, *Anogeissus leiocarpus*, *Balanites aegyptiaca*, *Ceiba pentandra*, *Kigelia Africana*, *Sclerocarya birrea* and *Tamarindus indica*. Local people rely heavily on these forests to collect wild foods to supplement cereals and proteins as a local strategy for food security. Like elsewhere, in all the four villages visited, local people harvest fruits from the above tree species namely *Adansonia digitata*, *Balanites aegyptiaca*, *Sclerocarya birrea*, *Tamarindus indica* to either eat fresh or process the fruits to produce juice. The forests are also the main source of energy and provide poles for construction of tukuls and wood for carving and furniture making. Other benefits derived from these forests also include grazing, hunting, and non-wood products such as honey. Wild honey collection is practised widely in all the areas visited. Quite a large herd of roan antelope (*Hippotragus equinus*) was observed in some of the forests and this could be one of the major sources of income to the local people if managed properly. Since there are well established regional and international markets for some of the products of the above mentioned trees, there is also good opportunity for the local people to trade these products that can contribute to diversification of their income and enhancement of their livelihoods.

Shifting cultivation by clearing forests is the main farming system practised in the area. According to some of the interviewees, the forest cover has depleted by approximately 25% between 2005 and 2008 as a result of clearing for crop cultivation in addition to cutting for fuel wood and construction. There is large influx of returnees from refugee camps in neighbouring countries and IDPs needing new farmlands that can only be obtained by clearing the remaining forests.

Although it may seem that there is adequate forest cover in the area at present, at the current rate of conversion to farmlands, the existing forests could be totally destroyed within a short period of time. The consultant strongly feels that there is an urgent need to tackle the problem. The mechanism by which shifting cultivation can be controlled or forest destruction can be reduced is through setting aside part of the forests as reserves. Therefore, it is recommended that **joint sustainable reserve forest management** be applied to parts of these forests in order to ensure that the forests continue to provide the goods and services to the local people sustainably and arrest their further degradation. This is not designed to create forest reserves that are meant to prevent the local communities from access (see later).

Traditionally, farmers in drylands of Africa, in general, retain indigenous trees on their farm fields after converting original forest to cropland because they know that trees modify microclimates for improved agricultural crop production and that they protect farm fields susceptible to water and wind erosion. This type of land use practice is referred to as **agroforestry parkland systems**. In particular, the above mentioned tree species are highly valued and retained on parklands in many drylands of Africa because there are known to play a crucial role in tempering the effects of climate, while also providing shade and nutrients to facilitate and enhance the growth of crop on farms and pasture on rangelands in addition to providing a wide range of products. It is, therefore, recommended that, when converting certain parts of the forests to croplands, **the practice of retaining some of the above fruit bearing trees on farm in the form of agroforestry parkland systems be introduced s**o that the trees can play their ecological roles on the farms and at the same time continue to provide food and income to the local people.

It is recommended that the forest area in each village is divided into two zones: **agriculture production areas** and **reserve forest areas** based on land use capability study. The agriculture production areas are then allocated to farming households, both residents and returnees, using a village-managed land distribution system for **conversion to agroforestry parklands.** Certificate of tenure entitlement of the land allocated should then be issued to the households. This is required because management of agroforestry parklands requires long-term commitment of farmers. This approach has proved to be a good mechanism for reducing shifting cultivation and preserving forests in some countries. Security of tenure is recognised as a prerequisite for farmers' willingness and commitment to undertake long-term management and improvements of their land.

5.2 Proposed Forestry and Agro-forestry Interventions

It is recommended that the following forestry and agroforestry interventions are implemented in one village in each of the four payams per year so that all villages (bomas) within the watershed are covered in 5 years (20 villages). The proposed interventions are to be implemented by the line Ministry of Agriculture and Forestry (MAF) of GOSS, in close collaboration with the Southern Sudan Land Commission, at payam level. Currently, there is only one representative of MAF at the county level (Maiwut) with a diploma in agricultural extension. It is recommended that the MAF staffing is strengthened by employing one forester (BSc degree) at the county level as project coordinator and four extension agents (Diploma) for the four payams to facilitate the implementation of the proposed interventions.

Component 1: Land use planning, land allocation and conversion of part of the forest to agroforestry parkland systems

Objective: to reduce shifting cultivation, preserve trees of economic value on farm and promote sustainable dryland agriculture
Output 1: Community awareness and support
Activities:
1.1. Formation of Village Land Use Planning and Land Allocation Committee (LUP/LA) and selection of chairperson
1.2. Awareness of local community members by MAF and Project Team about the need for land allocation and entitlement and the significance of retaining trees of economic value on farms
1.3. Assigning roles and responsibilities of the chairperson and Committee members
1.4. Training of extension agents (training of trainers) in land use planning, land allocation, methods of forest conversion to agroforestry parkland and management and maintenance of retained trees on parklands
1.5. Training of Committee members on methods of land use planning and land allocation to households needing new farmland
1.6. Training of community members by MAF and project Team in the management and maintenance of retained trees on agroforestry parklands

Output 2: Land use planning, land allocation, conversion of part of the forest to agroforestry parkland and management and maintenance of retained trees
Activities:
2.1. Land use zoning and establishment of physical boundary and demarcation of land for agriculture production and forest reserve by LUP/LA Committee with MAF with support from mobile project team.

2.2. Producing land use map of the village by LUP/LA Committee with MAF with support from mobile project team.
2.3. Land allocation in the agriculture production zone to households needing new farmland by LUP/LA Committee with MAF and in close collaboration with the Southern Sudan Land Commission.
2.4. Issuing certificate of land tenure entitlement to households by LUP/LA Committee with MAF and in close collaboration with the Southern Sudan Land Commission.
2.5. Establishing the number of trees and species to be retained when converting the allocated forest land to agroforestry parkland by LUP/LA Committee with MAF and mobile project team (roughly 50 trees per hectare).
2.6. Conversion of the allocated forest land to agroforestry parkland by individual households
2.7. Management and maintenance of retained trees on agroforestry parklands by individual households
2.8. Assessment of land allocation, management of retained trees and review of progress by LUP/LA Committee with MAF

Component 2: Joint village reserve forest management
Objective: to preserve and sustainably manage the natural forest in the village

Output 1: Community awareness and support
Activities:
1.1. Formation of Village Reserve Forest Management Committee (VFMC) and selection of chairperson
1.2. Environmental awareness of the Committee members by MAF and mobile project team to facilitate participatory joint management of the village forest
1.3. Assigning roles and responsibilities of the chairperson and Committee members
1.4. Training of extension agents (training of trainers) in forest inventory, management and maintenance.
1.5. Production of legal document on regulations and restrictions by the Committee with MAF with support from project mobile team
1.6. Training of Committee members in forest management and maintenance by MAF and project team

Output 2: Management and maintenance of village reserve forest
Activities:
2.1. Inventory and mapping of the village forest by the Committee with MAF
2.2. Fire control and prevention by the Committee with MAF
2.3. Grazing control and prevention by the Committee with MAF
2.4. Managing and controlling harvesting of products by local communities from the village forest by the Committee with MAF

2.5. Confiscation of illegal cuttings, arresting offenders and court proceedings by the Committee with MAF
2.6. Village reserve forest management assessment and review of progress by the Committee with MAF

6 Alternative Energy

The fuel mainly used for cooking in homes and public institutions of South Sudan is firewood. Firewood is collected from the forests and bushes by women and children, sometimes as far as 6 km away. Large tracts of unutilized bush land resulting from displaced populations are a common feature in South Sudan. As a result, availability of firewood is not a constraint today. This however may change in future as more trees are cut down.
The disadvantages of firewood and kerosene as fuels include:

- Excessive smoke pollution causing respiratory and eye problems
- High cost of imported kerosene further straining of scarce cash resources
- Dangers of fire outbreak and risk of explosions from tin kerosene lamps

Introduction of alternative technology

The project area is a remote rural area and will probably not benefit from any rural electrification programme in the near future. Presently, the population uses a significant amount of firewood for cooking. It would therefore be appropriate to support the communities to revert from cutting down the local forest resources from which the communities could benefit from in other ways.

Improved cooking stoves - Efficiencies of at least 20% can be achieved with most improved stoves, implying an energy saving of around 25% compared with open fires. Improved stoves can also reduce smoke in the kitchen and its negative impacts upon health by enabling the fuel to be burned more efficiently. Introduction of improved stoves would thus have multiple positive effects, the stoves use less wood putting less pressure on women workload and local forestry resources, reduce smoke and its negative impacts upon health and if locally produced by women it could be a supplementary household income.

Biogas - Considering the prevalence of animal wastes in abundance in the project area there is a great potential to promote construction household and community biogas units. Anaerobic digesters producing biogas (methane) offer a sustainable alternative fuel for cooking, and lighting that is appropriate and economic in rural areas. Promoting use of animal waste and agricultural residue for biogas

production is a socially acceptable solution in the area since the communities already dry manure for cooking. Biogas technology was introduced to Sudan in mid 1970s when GTZ designed a unit as part of a project for water hyacinth control in central Sudan. In Sudan, there are currently over 200 installed biogas units, covering a wide range of scales appropriate to family, community, or industrial uses. Tubular Plastic Biodigestor (TPB) technology was introduced in South Sudan during the year 2001 through a UNICEF/OLS-supported Biogas Pilot Project at the Rumbek Secondary School.
In the neighbouring Ethiopia, biogas production at community level has also been successful.

Solar PV systems for lights etc are proposed to be installed at staff offices and lodges at administrative level. An important driving force to the wide-scale use of PV technology in Eastern and Southern Africa has been a dramatic drop in production costs experienced over the last 20 years. PV costs are expected to fall to US $ 2.00 per Wp by the year 2000.

Biogas technology

The technology of the fixed dome biogas digester is described by the African Initiative called ”Biogas for Life”. www.biogasafrica.org

The operation of a biodigester mainly consists of feeding the installation with a mixture of dung and water. Biogas digesters convert animal dung, human excrement and other organic materials into combustible biogas. Biogas can be used in simple gas stoves for cooking and in lamps for lighting. The bio-slurry left over from this process is easily collected and can be used as a potent organic fertiliser to improve crop yields.

Various types of biogas digesters have been developed including the floating drum, fixed dome and plastic bag design. Depending on the context, any type may be used. Most of the plants built so far are of the fixed dome type. They are constructed from bricks and/or concrete and are usually installed underground in the yard. To operate, they must be fed daily with a mixture of dung and water. For farmers with livestock on site and access to water, this job will take no more then 20 to 30 minutes a day.

The fermented material is removed automatically; the bio-slurry is discharged into a compost pit or channel. The robust design of this type of biogas plant (fixed dome) ensures a lifetime of over 15 years. Maintenance is restricted to occasional inspections and where necessary – repairs to pipes and fittings. The installation itself – if

operated properly – needs little maintenance. Investment costs 450 Euro in Africa.

Farmers with at least 2 cows or 7 pigs (or a flock of 170 chickens) can generate sufficient gas to meet their daily basic cooking and lighting needs. Within the same design, different plant sizes can be constructed to allow for actual numbers of livestock and the family's biogas requirement.
Clearly, the obvious advantage of domestic biogas is in providing energy for cooking and lighting. Replacing conventional cooking materials – often wood, briquettes or dung cakes – the installation not only saves money, but also reduces the workload of the women and girls usually responsible for collecting and preparing these traditional energy sources.
Equally important, the indoor air pollution caused by cooking on inefficient wood stoves is virtually eliminated.
The same Africa Bigas Initiative has also through the International Resources Group (IRG) performed a financial and economic analysis of biogas digesters for this initiative. The outcome was positive, but strongly
depended on the price of firewood. Biogas is a very attractive option for the economy but less so for households.
At macro economic level, biogas programmes are profitable even when overall programme costs are taken into account. For Rwanda, the EIRR is estimated at more than 20%. Additional benefits accrue from better health. With no more time and effort going into fuel gathering, and with the extra income from emission credits, women in particular find they have a lighter workload. A biogas installation also increases agricultural production.

This implies that the investment cost of even the smallest of the biogas units is prohibitive for most rural households. If introduced at household level, the biogas units have to be heavliy sibsidised.

On the other hand, the larger combined septic tank/biogas units that are run by institutions such as hospitals and schools have proved viable. In Rumbeck in South Sudan, a Tubular Plastic Biodigestor (TPB) size 12.7 m3 feed with cow dung is used to cook for 400 students. In Rwanda, for example, a 25m^3-Fixed Dome digester connected to 6 bio-latrines is used to cook for 400 students.

6.1 Proposed activities

It is proposed that improved cooking stoves are promoted at household level and biogas at public and/or communal places.

Improved stoves are proposed to be promoted by the FTWMP in Lau Watershed and supported by training women promoters and by making available community investment funds for any individual investment cost.

Biogas energy should be introduced in the Lau project area with the aim to i) demonstrate the potential of biogas technology systems and ii) reduce firewood use for cooking in the schools, health clinics, market places and project demonstration plots by up to 80%. Currently, a typical school uses about 50 tonnes of firewood per year to cook for 400 students.

The schools/health clinics may establish at least a ¼ acre vegetable garden next to the biogas plant where they can grow popular local vegetables by using the rich natural fertilizer from the biogas plant to improve the soil on this plot.

Activity	**In puts**	**Targets**
1.Promotion of improved stoves at households	Provision of raw materials Training of promoters (women) in use Training of promoters (women groups) in making of the stove for sale.	2000 No of Promoters (20 bomas à 100 women) 20000 No of Secondary beneficiaries (buyers of stoves)
2. Promotion of biogas units at public places and for communal share	Training on the theory and use of biogas. Training of promoters in construction Installation of the unit 400 Euro	40 Units
3. Strengthening of supporting institutions		Maiwut County, Private Sector, NGOs

7 Off-farm employment: Make individuals employable

The population of Maiwut is composed of agro-pastoralist and farmers currently practicing very traditional livelihood practices. These will be supported by the project with the aim of intensifying their agricultural and animal rearing practices. IDPs and returnees are coming back to settle in the area. Many of them have not practiced the localized traditional livelihood practices for many years. Others are born in refugee camps. A large proportion of the population in Maiwut is young. Within these groups are found individuals who are interested in off-farm employment, especially among the young men. Some have gained experience in metal works, carpeting etc.

A lot of construction work and infrastructure development is currently on-going in the area. The proposed intervention aims at making local people employable within this growing construction sector currently dominated by Ethiopian and Kenyan entrepreneurs. To this end, the project will provide – in phase one - training to interested and able community members in off-farm skills such as basic masonry, carpeting and metal works and car mechanics. In face two, the most promising participants will be selected and supported in order to start their own business. To this end the project could support the establishment of two manufacturing workshops which could be run on cooperative basis.

Diversification of income: Make individuals employable		
Proposed Activities	**Proposed Outputs**	**Target beneficiaries**
Youth, young men, IDPs and Returnees on-the -job trained in basic masonry, carpeting, etc	Youth, young men, IDPs and Returnees on-the -job trained in basic masonry, carpeting, etc	100 selected youth and individuals
2 local manufacturing workshops established in Maiwut and run by local entrepreneurs	2 local manufacturing workshops established in Maiwut and run by local entrepreneurs	100 selected youth and individuals
Initiate micro-lending / saving activities (20 groups)	Initiate micro-lending / saving activities (20 groups)	Target 300 families supported

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ANNEX 7

Fast Track Wtershed Management Project, Sudan Lau Watershed Project Area, Maiwut Count, Southern Sudan		
Proposed Activities	**Proposed Outputs**	**Target beneficiaries**
Component 1: Community empowerment and institutional strengthening		
Maiwut County supported in integrated watershed development including environment management, pro-poor development & conflict resolution		
support integrated County planning and support formulation of strategies to address emerging issues		
	County plans reviewed or formulated to reflect emerging issues in watershed and environment management, pro-poor development & conflict resolution	Maiwut County
	Produce updated maps of N.R., basic services & livelihoods survey and support their use in planning	Maiwut County
	Annual N.R. and livelihoods assessments (3 in total) undertaken	Maiwut County
Introduce improved financial systems	Improved Accountability: new financial system on revenue and resources mobilization and utilization introduced	Maiwut County
Capacity building of Maiwut County departments	Capacity built for improved extension services within county departments i.e. agriculture, fishery, animal health and forestry (equipped & trained)	Approx. 10 senior staff and 40 extension workers in county departments
Speeding up local development for the empowerment of the citizens in the county and its payams. (possibly to be paid by GOSS/COUNTY)		
Construction of offices and staff lodges	10 payam offices/ staff lodging houses and 4 guest houses (with room for 5 people) in Maiwut and Payams	Maiwut County and payams
Purchase of necessary materials and equipments	2 land cruisers pick-up cars, 1 tractor with a disk plough, 1 lorry tipper, 5 5KV Generator, 2 Refrigerators, 5 copier machine, 5 long range radio, 5 thurayas, 10 bicycles, 5 motor cycles, 5 computers, 5 fax machine; 1 VSAT	Maiwut County and payams
Community Empowerment (empowered to chart their own development future in partnership with the local government)		
Establish Land Use Planning and Allocation Committees (LUPAC) Support communities in land use planning and to identify, prioritize and plan towards meeting their development goals through harnessing capacities within their own communities & external using FTWMP funding	20 Land use planning and allocation committees (LUPAC) formed and in operation. Initiation and maintenance of county and community agricultural/land-resource planning, management and conservation groups to assist in problem identification, development of technical and management solutions, and project implementation	Community, traditional leaders and local government staff trained and mobilised
Training of chiefs and women representatives in the payams & bomas to cope up with CPA and Project Objectives	40 community chiefs and sub-chiefs trained and mobilised	Traditional leadership and communities

Component 2: Basic Services		
Water: Improved access to clean water for at least 25 000 individuals at the end of the project period		
Improve access to water (construction, rehabilitation & maintenance)	Carry out technical design assessments	Communities (25 000 individuals) with limited / no access to safe water
	Construct 56 number of pond schemes (PSs); Construct 56 number of subsurface dam schemes (SSDSs)& protecting water sources	
	Train pump technicians & establish water committees (56)	
Sanitation: At least 16000 people using improved sanitation methods by end of project period (using latrines, burying stools)		
Improve sanitation in target communities & institutions	Provide 112 latrines to households and institutions	16000 individuals with improved sanitation facilities and hygiene awareness
	Carry out training in sanitation in target communities / institutions. Improve health and hygiene knowledge, attitude and practices through clubs, schools and house-to-house visits	
Education: School attendance in communities with schools increases to 50% by the end of project period & Reduction in drop out rate of girls by 25% by the end of the project period. Increased access to adult literacy		
Improve school attendance through household awareness & school feeding programmes	Promotion for school attendance as part of the community mobilisation activities	Target: 300 households
	Support/Initiate school feeding in 3 schools	Target: 1200 pupils (300 in each school)
Establish / support adult literacy activities	Establish adult literacy in three payams (300 persons; 50% women)	Individuals (IDPs and returnees) aspiring to be teachers within project area

Component 3: Livelihoods Interventions: Communities supported to develop key economic and social infrastructure		
Agriculture: Improvement of traditional rain-fed farming, and introduction of irrigated farming system; ; Make the people of the county producers instead of consumers.		
Mobilisation of Land Use and Allocation Committees	20 LUPAC mobilised and informed of intervention approach, process and conditions	Communities and supporting agencies
Establishment of agricultural demonstration plots	Establishment of 4 demonstration plots in Maiwut, Turu, Jotome and Kigile. New technologies adopted, such as crop rotation, organic manuring,	Communities and individual households
Support to pioneer farmers	Assistance to 400 farmers provided (100 in each payam)	Selected farmers
Support agricultural extension system in Maiwut County	At least 3 persons trained in agricultural extension, farmer field schools & extension work commenced	Maiwut County
Fisheries: Improvement of fishing facilities		
Mobilisation of Land Use and Allocation Committees	20 LUPAC mobilised and informed of intervention approach, process and conditions	Communities and supporting agencies
Undertake demonstration and training activities	Undertake 40 training session (2 in each boma) in water management, net repair and fish	Communities and individual households
Support fishery extension system in Maiwut County	At least 3 persons trained in fishery extension & extension work commenced	Maiwut County
Livestock and transhumance interventions		
Mobilisation of Land Use and Allocation Committees	20 LUPAC mobilised and informed of intervention approach, process and conditions	Communities and supporting agencies
Appropriate technology for milk and cheese processing	500 households using modernised milk processing practices. 10-20 Marketing Cooperative formed (sub Chiefs women)	500-1000 women
Support Poultry	200 households provided with chicken under revolving fund approach	200-400 Women
Intertribal and cross border dialogue	Support given to approx 10 meetings. 2 exchange visits undertaken. Plans for transhumant movement drafted and discussed.	20 LUPACs
Support animal production extension system in Maiwut County	At least 3 persons trained in animal production extension & extension work commenced	Maiwut County
Off-farm employment: Make individuals employable		
On-the -job training of youth, young men, IDPs and Returnees in basic masonry, carpeting, etc	Youth, young men, IDPs and Returnees on-the -job trained in basic masonry, carpeting, etc	100 selected youth and individuals
Establishment of local manufacturing workshops	2 local manufacturing workshops established in Maiwut and run by local entrepreneurs	100 selected youth and individuals
Initiate micro-lending / saving activities	20 micro-lending / saving groups established	Target 300 families supported
Forestry and Agroforestry:		
Introduction of Agro-forestry parkland systems	Agro-forestry parkland approached practiced for clearing of new agricultural plots	20 Communities
Joint community reserve forest management	Reserve community forests established in each Boma	20 Communities

Alternative Energy		
Mobilisation of Land Use and Allocation Committees	20 LUPAC mobilised and informed of intervention approach, process and conditions	Communities and supporting agencies
Promotion of improved stoves at households	Promoters trained in use and making of the stove.	20 women groups as Promoters (20 bomas à 100 women = 2000
Promotion biogas production at public and communal places	40 units installed and in operation (approx 400 Euro per unit). Users trained the biogas theory and use.	4 Schools, 4 Clinics, 4 training centres, 2 at market place and 20 units in bomas/communities
Strengthening of supporting institutions	Training undertaken in installation of units and business support given to biogas promoters	County, NGOs, young entrepreneurs
Component 4: Project Management: Project activities implemented smoothly and with technical and financial efficienc		
Establishment of LIU and reqruitment of Development Team	LIU established and operational	
Establishment of PSC and LSCs	PSC and LSCs established	
Project management and coordination of activities in conformity	Project activities implemented as scheduled and within budget.	