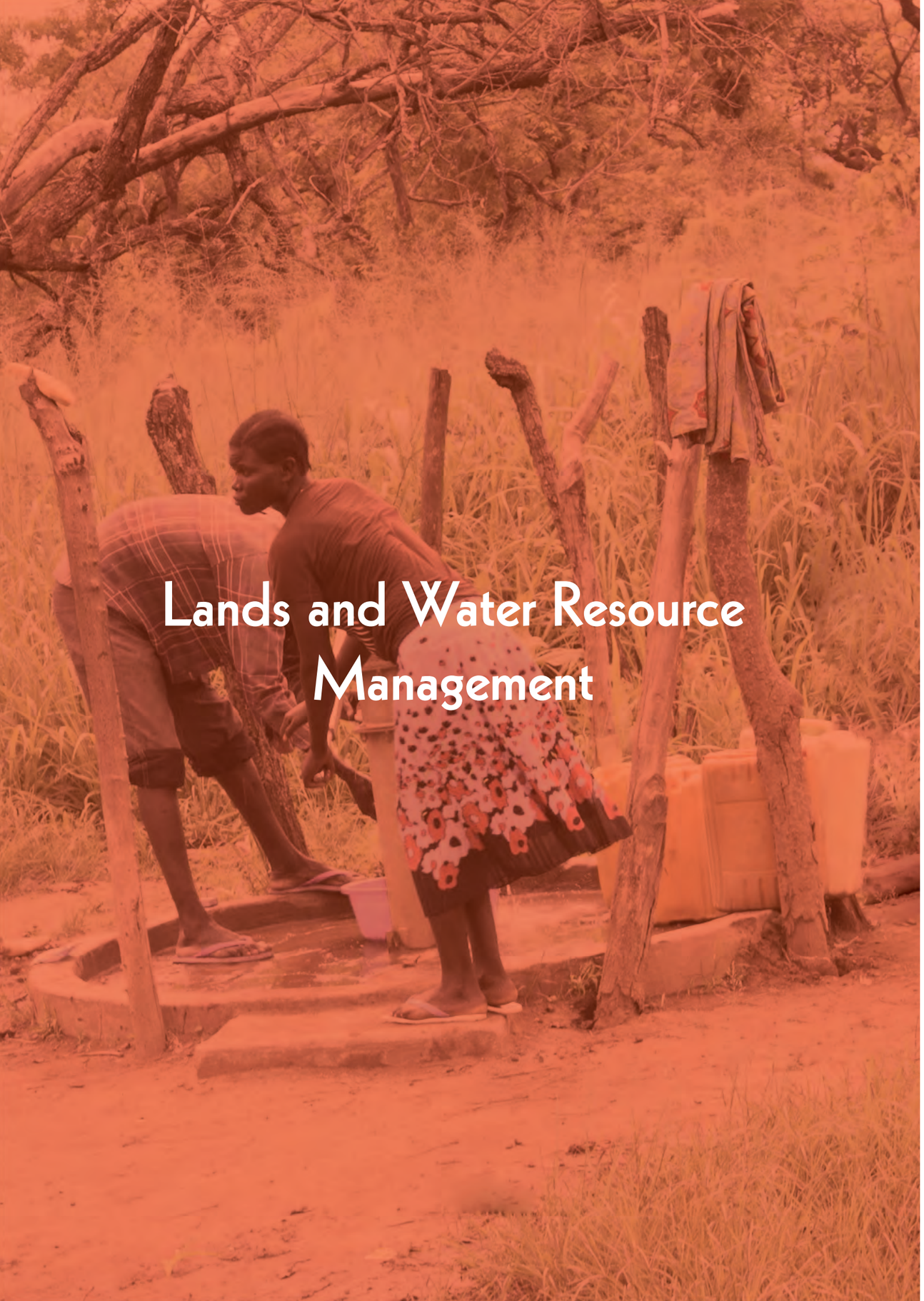


Lands and Water Resource Management

5 Lands and Water Resource Management

5.1 The Setting

It is clear that sustained development in South Sudan, including reduction in poverty and improved food security, depends on secure access to the substantial land and water resources of the country. Moreover, successful implementation of an ambitious infrastructure program along the lines outlined in this Report to support this growth depends on sustained progress in dealing with these basic issues related to land and water rights and access. Continued conflict over and or uncertainty about these rights will result in delays in infrastructure investment decisions and implementation and lower overall economic growth.

At the time that the CPA was signed, the Government of National Unity (GNU) and the Government of Southern Sudan (GOSS) recognized the need for development of land policy, and related legislation, institutions, and supporting services. In the subsequent period, rights of access to agricultural land for cultivation of crops and livestock production, water for irrigation, forest products, and petroleum reserves for export revenues have been contested at national, regional and local levels. Conflicts among competing groups for access to and control over land and water are common in South Sudan. The decades of war, prevalence of weapons, and numbers of people with combat experience have increased the likelihood of disputes turning violent. Establishment of an effective, integrated, socially legitimate system for resolution of disputes over land, water and other natural resources is critical to South Sudan's future. While progress has been made in addressing these problems, the reality is that issues of access to land and natural resources and security for the population continue to demand urgent and sustained attention.

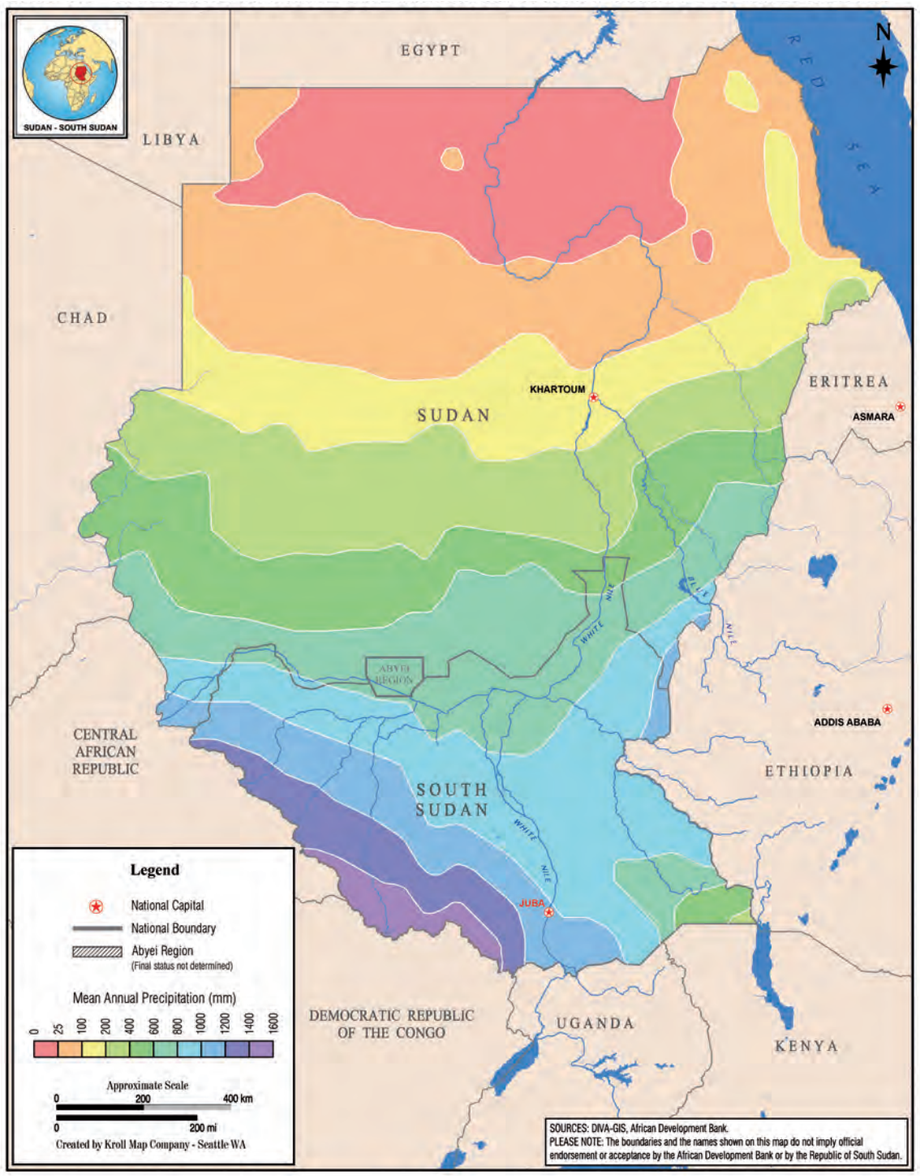
5.2 Climate and Ecological Zones

Altitudes in South Sudan range from 600 to 3,000 meters above sea level. Most of the geographical parts of the country have a sub-humid climate. Rainfall is favorable, with Western Equatoria and the highland parts of Eastern Equatoria receiving 1,200 to 2,200 mm of rainfall annually. The lowland areas of Eastern Equatoria, Jonglei, Upper Nile and Bahr el Ghazal receive between 700 and 1,300 mm of rainfall annually. The south-eastern tip of Eastern Equatoria receives the least rainfall, about 200 mm annually. Map 5.1 indicates the rainfall patterns for Sudan and South Sudan.

For Sudan as a whole, Harrison and Jackson (1958) described five major ecological zones based on floristic composition, rainfall and soil types.[28] The ecological classification now most commonly used is a modified version of the classification by Harrison and Jackson. It delineates six major divisions and a number of subdivisions. South Sudan is classified as savannah woodland (high and low rainfall), flood region, montane zone, and semi-desert. The savannah woodland is sub-divided into low rainfall savannah and high rainfall savannah. Low rainfall savannah occurs mainly in the north and is only represented in the south by a small area in the northern parts of Upper Nile State. High rainfall savannah covers most of the country with the exception of the floodplain around the Nile and the montane region of Didinga and Imatong Mountains. High rainfall savannah woodland is further divided into two sub-zones – savannah woodland and savannah woodland recently derived from rainforest.

28 Harrison, M. N. and J. K. Jackson (1958), Ecological Classification of Vegetation of Sudan. Bulletin No.2.1-45 Forest Department, Khartoum.

MAP 5.1: Average Annual Rainfall in South Sudan and Sudan



Temperatures are typically above 25°C and can rise above 35°C, particularly during the dry season, which lasts from January to April. For pastoralists, the hot, dry conditions trigger seasonal human and livestock migration to more permanent water sources, which serve as dry season grazing pasture. It also reflects on the escalation of conflicts among the pastoralists in search for water. For some ethnic groups, such as the Dinka, they also serve as fishing grounds. At the onset of the main rains (April to June), people and cattle return to upland wet areas. Seasonal movements are less pronounced in the more agricultural areas such as the Hills and Mountains Zone and are almost non-existent in the exclusively agricultural Greenbelt Zone. These two zones have two rainy seasons, April to July and August to December. However, there is evidence that points to a decline in rainfall as a result of climate change. [29]

29 This brief outline of climatic conditions draws on information provided in Southern Sudan Livelihood Profile of 2006. See Southern Sudan Centre for Census, Statistics, and Evaluation (2006), "Southern Sudan Livelihood Profiles." Written in collaboration with Save the Children UK and USAID Famine Early Warning Systems Network, draft, January 2006.

5.3 Land Resources of South Sudan

South Sudan is in the midst of a transition from decades of civil war to a peaceful country. Land tenure and property rights issues could undermine that transition by hampering a productive agricultural sector and long-term economic growth. In 2010, USAID reported that rural people contest the right of the GOSS to hold and manage land in trust on their behalf, claiming that land "belongs to the people."[30] Ongoing conflicts, many violent, erupt among pastoralists and between pastoralists and farmers. Customary claims to land in peri-urban areas are routinely ignored, fueling conflict. Laws and state institutions for land administration and conflict mediation are weak, and there is confusion over which laws take precedent – statutory or customary?

5.3.1 Land Tenure and Ownership

Customary law has governed the use of land in the country for centuries, with each ethnic group applying its own laws relating to land and land rights within its own geographical setting.[31] With the imposition of foreign rule over Sudan more than a century ago, various attempts were made to change this regime. The first serious attempt to control customary land was by the Anglo-Egyptian regime through the Land Ordinance of 1906. This made all land in Sudan the property of the government. In practice, however, land in South Sudan remained under the control of communities through the practices of customary laws and principles. In the post-independence period, the Unregistered Land Act of 1970 provided that any land not registered in accordance with the 1925 Land Settlement and Registration Ordinance was considered to belong to the Government of Sudan. Although the law was opposed and challenged by most communities in Southern Sudan, the government used it for the diversion of water through the construction of the Jonglei Canal and oil prospecting projects. This unilateral decision to exploit the natural resources of the South, with scant attention to human security, land rights and livelihoods, contributed to the outbreak of conflict in 1983. On the whole, land laws enacted by governments in Khartoum throughout the colonial and post-colonial periods have not seriously affected the customary land tenure system in South Sudan. During peace negotiations in Machakos and Naivasha, land was the main point of contention between the Government of Sudan and the SPLM. The result was the insertion of the concept of "Land belongs to the people" in the CPA and inclusion in the Interim Constitution of Sudan and Interim Constitution of Southern Sudan.

The CPA provided for the creation of the Southern Sudan Land Commission (SSLC), which came into existence in 2006. Its first major responsibility was the drafting of a new land law for Southern Sudan. The Land Act was promulgated in 2009; its main features are as follows:

- All land is owned by the people of South Sudan, and the Government of South Sudan is responsible for regulating use of the land.
- The Act provides for registration of land in South Sudan; all land, whether held individually or collectively, shall be registered and title granted.
- Public land is land owned collectively by the people of South Sudan and held in trust by the Government of South Sudan. Public land includes land used by government offices, roads, rivers and lakes for which no customary ownership is established, and land acquired for public use or investment.
- Community land is land held, managed, or used by communities based on ethnicity, residence, or interest. Community land can include land registered in the name of a community, land transferred to a specific community, and land held, managed, or used by a community.
- Private land includes registered freehold land, leasehold land, and any other land declared by law as private land. Freehold land can be held in perpetuity and includes the right to transfer and dispose of the land. Leaseholds can be obtained for customary and freehold land. Leases can be granted for periods of 99 years or less. Leases of more than 105 hectares of customary land must be approved by two local government bodies.
- The Land Act outlines a decentralized plan for land administration with County Land Authorities and Payam Land Councils.
- Foreigners cannot own land in South Sudan, but can lease land for periods up to 99 years. For agricultural investments, leases are up to 30 years and are renewable; for forestry purposes, land can be leased for up to 60 years and are renewable. Prior to the grant of a lease, a consultation with affected communities is required as is an environmental impact assessment.

30 USAID (2010), "Land Tenure and Property Rights: Sudan." www.usaid.com, USAID Program Brief, January 2010.
31 See Bior et al. (2006), Land Tenure Study in Southern Sudan. Summary Report, Nairobi. February 2006; and USAID (2010), Scoping Paper: Land Tenure and Property Rights in Southern Sudan. United States Agency for International Development, Washington DC, December 2010.

5.3.2 Institutional Responsibilities for Land Resources

The SSLC is responsible for establishing land policy within South Sudan, enforcing land law, resolving land disputes, assessing compensation for land acquisitions, studying and recording land-use practices in areas where natural resources development occurs, and conducting hearings and formulating rules of procedure. A land registry has been established in the Ministry of Housing and Physical Planning with coordinated registries maintained at the state level. Other institutions developing new land administration systems and laws include the Ministry of Legal Affairs and Constitutional Development and the Land Policy Steering Committee, which includes representatives from 13 ministries, commissions and boards. The Ministry of Agriculture and Forestry (MAF), which was formed in October 2005, is responsible for policy guidance, planning, assessment, resource allocation, regulation, and oversight of agricultural and forest land. At the state level, the Ministries of Agriculture, Animal Resources, and Irrigation (MAARIs) were instituted with a wide sectoral mandate and with the counties holding responsibility for implementation. These newly formed institutions have been slow to develop. In many cases, the new institutions lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity to operate effectively.

The SSLC is now working on implementation of the Land Act, as the Government of South Sudan aims to develop, distribute and implement a land policy and related legislation and regulations by 2013. One of the major challenges is to develop policies that would resolve differences among various interests in land at both the horizontal and vertical levels of governments and communities in South Sudan. This involves development of a land policy and the central and local institutions necessary to govern and administer land rights. Consultations were undertaken during 2010 in all 10 states of Southern Sudan.[32] A draft land policy was then prepared and has been available since February 2011. Key elements of the draft land policy are as follows:

- Resettlement of returning refugees and IDPs.
- Measures required strengthening the rights of women to land and property.
- Opportunities for potential commercial investment in land, including development of oil and other natural resources.
- The need to set aside land for the development of infrastructure, public projects, and urban areas.
- The need to address conflicts over competing claims to land and other natural resources.

Once these land policy issues are finalized and adopted, the Government expects to revise the Land Act to ensure consistency with the land policy.

5.3.3 Land Use in South Sudan

The total area of the country is reported by the National Bureau of Statistics (NBS) to be 644,330 km^2. The waters of the White Nile and its tributaries flow down from the highlands of Uganda, DRC, the Central African Republic and Ethiopia into the low clay basin that constitutes much of South Sudan, forming the world's largest contiguous swamp.

The FAO is currently updating estimates of land use in the country.[33] This assessment gives a picture of land use patterns in the latter part of the previous decade. The results of the assessment are summarized in Table 5.1. Key findings in this update of land use are as follows:

- Only 4.3% of the land area is cultivated for production of food and agricultural raw materials. Much of this area is cultivated periodically rather than continuously. Many of the large number of subsistence farmers of the country practice some form of shifting cultivation in the absence of use of fertilizers, pesticides and herbicides. According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged from a minimum of 1% to a maximum of 2% of the total land area – that is, from 0.65 million to 1.3 million hectares.[34]
- Forest areas cover about one-third of the country with Western Bahr el Ghazal and Western Equatoria accounting for about 56% of the forest cover. Areas covered with shrubs account for about 39% of the land area, with Jonglei, Eastern Equatoria and Upper Nile accounting for about 58% of this form of land cover.
- Grasslands account for about 23% of the land cover, with Upper Nile, Jonglei, Eastern Equatoria and Unity states accounting for about two-thirds of the grasslands in the country.
- The survey finds that urban/industrial areas account for only 34,188 hectares (or 341.88 km2.). With an urban population of 1.29 million in 2008 (Annex Table 1.1), this suggests an average urban population density of 3,770 person per km2. – a density that is only found in the megacities of Sub-Saharan Africa.[35] A portion of the low density urban areas may have been included under grassland and or land covered with shrubs.

Table 5.1: Land Use in South Sudan, circa 2007-2008
(Distribution in % by type of land cover or use)

State	Agriculture	Trees	Shrubs	Grasslands	Urban & industrial	Bare rock & soil	Water bodies	Total
Upper Nile	17.6	4.8	12.2	22.4	23.0	8.3	7.4	12.3
Jonglei	11.5	7.6	30.4	21.2	2.8	0.5	21.9	19.9
Unity	4.6	0.9	7.7	10.2	18.7	1.5	7.4	6.0
Warrap	15.7	3.0	5.6	6.4	4.1	0.7	1.7	5.3
Northern Bahr el Ghazal	8.8	7.6	2.0	3.9	3.5	1.1	19.8	4.7
Western Bahr el Ghazal	4.8	34.7	4.5	4.3	10.3	18.8	24.0	14.5
Lakes	6.7	7.5	6.8	6.3	5.2	11.5	4.3	6.9
Western Equatoria	12.4	21.1	8.3	7.0	5.1	49.5	3.8	12.4
Central Equatoria	13.8	7.6	7.2	4.2	24.6	6.4	2.6	6.9
Eastern Equatoria	4.1	5.1	15.4	14.0	2.8	1.8	7.0	11.1
South Sudan	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo item:								
Total area (hectares ('000)	2 760	20 742	25 032	14 522	34	159	462	63 712
Share of total (%)	4.3	32.6	39.3	22.8	0.1	0.2	0.7	100.0

Source: Annex Table 6.1.

5.3.4 Land Classification by Livelihoods in South Sudan[36]

Livelihood patterns are determined by the agro-ecological conditions as well as the culture and traditions of the various tribes. The Livelihood Profile prepared by SSCCSE in 2006 states that Southern Sudan's traditional livelihood systems are a combination of cattle rearing, crop production, fishing, wild food collection, hunting and trade. For most households in South Sudan, cattle-keeping is the fundamental basis for wealth and social status. Crop production plays an important complementary role, but is generally perceived as a less important activity more for cultural than agro-ecological reasons, especially among the Nilotic tribes (Dinka and Nuer). Access to food is highly seasonal and location-specific and in some parts of the country a majority of households move around to exploit seasonal patterns of rainfall. Mobility is crucial and food insecurity often arises where inter-tribal clashes and other conflicts constrain this mobility. The Livelihoods Profile (2006) defines seven distinct livelihood zones in Southern Sudan (see Map 5.2).

Greenbelt Zone. This zone includes Western Equatoria and parts of Central and Eastern Equatoria. It benefits from a bi-modal rainfall pattern which enables two planting seasons. The main livelihood is subsistence agriculture with the potential for surplus production. The main crops cultivated are root crops (cassava, sweet potatoes), maize, millet, groundnuts and finger millet. Poor infrastructure and related lack of access to markets are a major disincentive for farming households to increase their outputs. Despite the fact that there has been a reduction in new displacements, fear of attacks of the Lord Resistance Army continue to interrupt agricultural production in parts of Western Equatoria, in particular in Ezo, Tambura and Nagero counties and selected payams in Nzara and Yambio counties.

Hills and Mountains Zone. This zone covers parts of Jonglei, Central and Eastern Equatoria. It is characterized by reliance on agriculture and pastoralism. Reliance on casual labor and selling of charcoal, firewood, bamboos, poles and grass are common coping strategies in times of distress; for example, this was one of the areas worst affected by the 2009 drought. Most vulnerable

32 See, for example, USAID (2010), Land Policy State Consultation –Bor, Jonglei State. Washington DC. Workshop Report prepared under the USAID Sudan Property Rights Program, February 2010.
33 FAO et al (2011), Land Cover Atlas of South Sudan. Food and Agriculture Organization, Rome, draft, 2011.
34 World Bank (2007), Final Proposal for a Multi-Donor Trust Fund Grant to the Government of Southern Sudan for the Support to Agriculture and Forestry Development Project (SAFDP), Washington DC, August 2007.
35 According to World Bank data, the megacities of Sub-Saharan countries have about 3,600 persons per sq. km., about 1,280 per sq. km in secondary urban areas, and about 90 persons per sq. km. in periurban areas. See Foster and Briceño-Garmendia (2010).
36 The discussion in this Section draws heavily on the reports of USAID (2007) and FAO/WFP (2010).

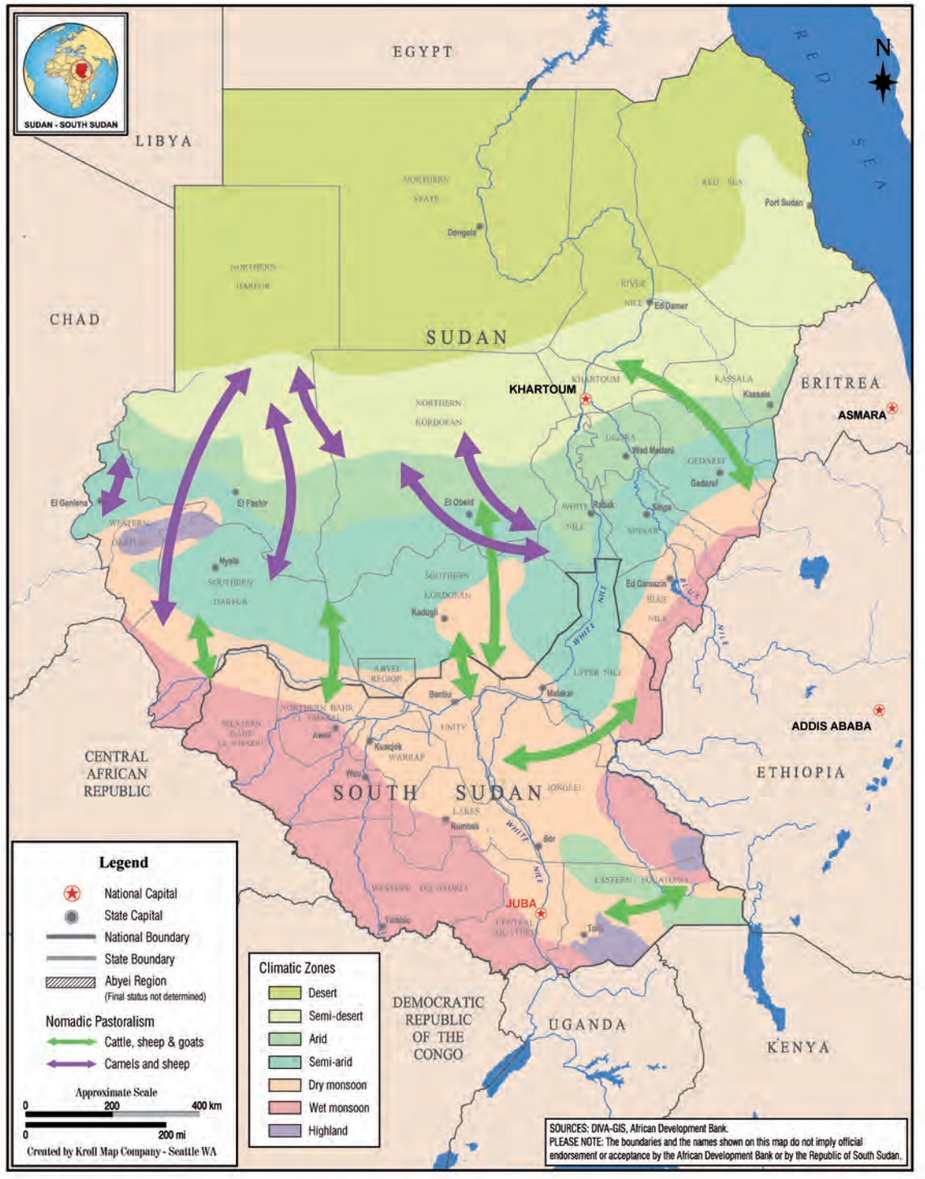
were communities in the lowlands who engage in the production of short- and long-term sorghum, while communities in the mountains who cultivate cereals, pulses and vegetables were less affected because of more favorable rain conditions at these higher altitudes. The high reliance in 2009 on the production of firewood and charcoal contributed to a further decline in woodland and forest resources around towns and in more populated areas, forcing households (mainly women) to walk longer distances to fetch firewood.

Pastoral Zone. This zone lies in the arid south-east corner of South Sudan and encompasses parts of Eastern Equatoria and Jonglei. A nearly pure form of pastoralism is common and there is almost exclusive reliance and livestock trade for food. In this zone, seasonal migration in search of water and pasture for livestock is the predominant livelihood activity. (See Map 5.3 below for the annual pastoral migration routes in South Sudan and Sudan.) The 2009 drought limited pastoralists' access to pasture and water resources, forcing them to migrate long distances. There are also reports of increased artisanal gold mining in some areas in 2010 in response to the poor livestock and harvest conditions the previous year.

Ironstone Plateau Zone. This zone covers parts of Lakes, Warrap, Northern and Western el Ghazal, Western and Central Equatoria. Households in this zone are heavily dependent on crop production, mainly sorghum, groundnuts, sesame and tobacco. In some areas, honey production is also an important supplementary activity. Households in this zone are usually well-placed to access food surpluses in the neighboring Greenbelt Zone. However, despite generally improving conditions for agricultural production in the past year, Western Bahr El Ghazal is affected by poor road conditions linking Wau and Juba due to several broken bridges, which has limited trading activities with the southern states.

MAP 5.2: Agro-Ecological Zones in South Sudan

MAP 5.3: Annual Pastoral Migration Routes in South Sudan and Sudan



Nile and Sobat Rivers Zone. The Western and Eastern Plains are separated by the Nile and Sobat River Zone. Apart from crops and livestock, wild foods and fish contribute significantly to household consumption in this zone. The latter items are collected in varying quantities depending on the season and household location.

Western and Eastern Flood Plain Zones. These two zones cover Upper Nile and parts of Unity, Jonglei, Warrap, Northern Bahr el Ghazal and Lakes. The primary livelihood activity is agro-pastoralism supplemented by fishing, wild food gathering and to some extent hunting in the Eastern Flood Plains. Livelihoods are highly dependent on changing water levels. Seasonal flooding increases the yield of pasture for livestock, fish and wild foods, but can affect agricultural production and cause displacements. Other economic activities in this region include the oil fields in Unity State and mechanized farms around Renk in Upper Nile, but benefits for the local population are generally limited to improvements of the local road infrastructure for which the 2% direct share of oil revenues is mainly used. In 2010, above normal rainfall and higher water

levels in rivers flowing from Ethiopia caused localized flooding in parts of Upper Nile, Unity, Jonglei and Northern Bahr El Ghazal resulting in destruction of crops and displacements of affected households. The situation was exacerbated by the often inadequate drainage in the newly constructed roads. Insecurity caused by inter-tribal/clan clashes prevented flood-affected households from accessing remote cropping areas on higher lands which remained flood free.

Given the current configuration of transportation infrastructure, Unity State, and to a slightly lesser degree, Upper Nile and the Northern parts of Jonglei, are almost exclusively dependent on Sudan for their market supply. Also Northern and Western Bahr el Ghazal depend largely on trade of cereals from the North.

5.4 Water Resources of South Sudan

According to the National Environmental Action Plan (NEAP), South Sudan has substantial water resources, but they are unevenly distributed across the region and vary considerably from year to year (Mohamed, 2007). The hydrologic variability, coupled with no investment in storage structures, has made South Sudan hostage to periodic floods and droughts. However, details about the supply of water available to South Sudan from internal and external sources and consumption of water by households and agricultural and industrial users, are not currently available from the FAO Aquastat database. Nonetheless, it is clear that domestic and commercial demand for water has been growing rapidly in recent years, and that trend is expected to continue, thereby placing increased pressure on water availability within the country.

5.4.1 Wetlands and Water Resources

The Nile is the world's longest river of some 6,800 km. The Nile Basin is estimated to be about 3.1 million km² and includes the following 11 riparian countries: Rwanda, Burundi, Democratic Republic of the Congo (DRC), Tanzania, Kenya, Uganda, Ethiopia, Eritrea, South Sudan, Sudan and Egypt. South Sudan is located entirely within the Basin, and accounts for approximately 20% of the total area of the Basin. While the Nile and its tributaries are vital sources of water throughout the Basin, dependence of these countries on the water resources of the Basin varies considerably. Egypt and Sudan are heavily dependent on the Nile system, whereas the Nile is a very minor part of the water resources of the DRC, which depends much more heavily on the drainage basin of the Congo River. Map 5.4 provides information on the main rivers of South Sudan.

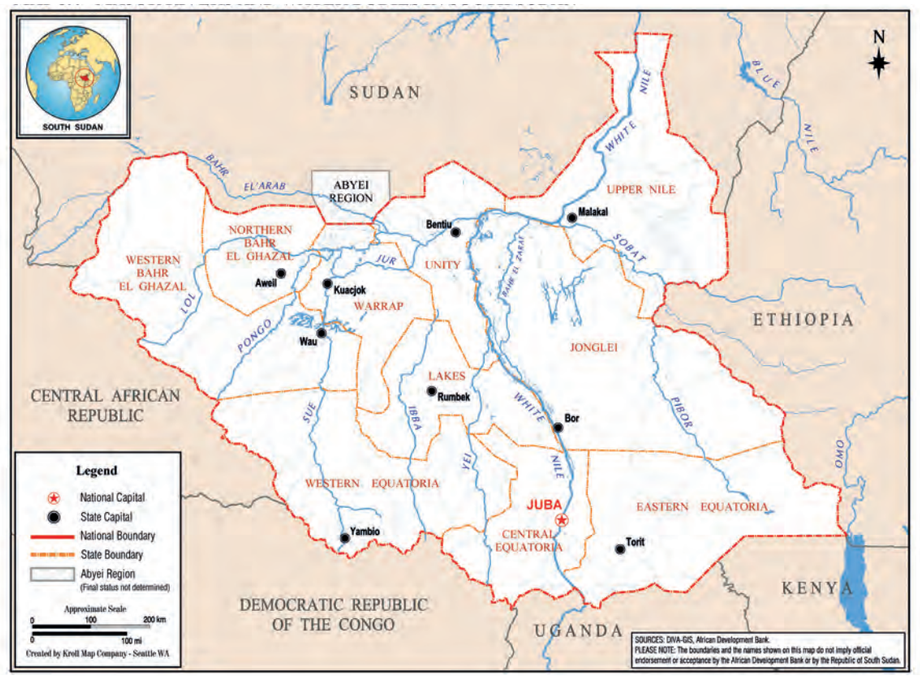
South Sudan's major water resources are the White Nile, its tributaries, and aquifers. An estimated 28 billion cubic meters, representing 30% of the flow of Nile water, passes through South Sudan to Sudan and on to Egypt. The country has three major river basins of Bahr el-Ghazal, Bahr el Jebel and the river Sobat (and 23 sub-basins). The river Sobat, which is formed by the confluence of the Baro and Pibor rivers, discharges about 14 billion m3 per annum into the White Nile. The Bahr el Jebel basin discharges about 30 billion m3 per annum, but only 14 billion m3 per annum passes into Lake No. The Bahr el Ghazal basin, which discharges about 12 billion m3 per annum looses 11.4 billion m3 per annum of its flow to the Sudd wetland leaving only 0.6 billion m3 to flow into Lake No. Hence the average discharge of the White Nile at Malakal is 28 billion m3 per annum. About 50% of the flow into the White Nile is lost in the wetlands of South Sudan, due primarily to evaporation and transpiration.

A large part of South Sudan is covered by wetlands as well, the most important of which is the Sudd. The Sudd is an inland delta of the White Nile and is made up of lakes, swamps, marshes, and extensive flood plains. It is also one of the largest wetlands in the world, averages in size at about 30.000 square kilometers and covers about 5% of the area of South Sudan. The Sudd has been declared a Ramsar site, which confers global recognition and importance to this wetland. There are many other wetland systems throughout South Sudan, some of which are quite extensive. However, wetlands in South Sudan are only protected if they are part of national parks, game reserves or forest reserves. As a result, many of the wetlands in South Sudan are at risk from exploitation.[37] Estimates show that wetlands comprise 7% of the total area of South Sudan. The location of the main surface water resources of South Sudan are shown in Map 5.5.

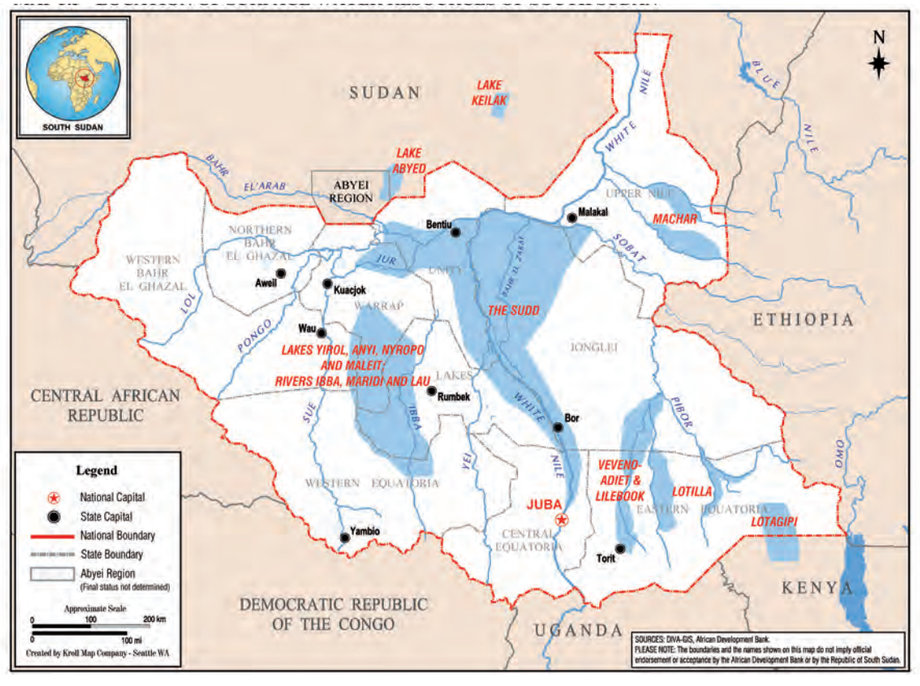
The bulk of South Sudan's groundwater resources are found in the Um Ruwaba Formation and basement complex which is characterized by unconsolidated clays and gravels with low to high permeability. The basement complex prevails in parts of Western Equatoria, Eastern Equatoria, Central Equatoria as well as in Western Bahr el-Ghazal states and is characterized by poor water bearing formation. However, fractures and weathered zones provide water of good quality and quantity. The Um Ruwaba formation is recharged by seasonal rainfall and river flooding. In South Sudan, ground water is the principal source of drinking water, but very little work has been undertaken to determine the distribution and extraction levels of these resources. Hence, the full extent of the aquifers and related characteristics is unknown at this time. There are compelling reasons to undertake ground water analytical studies as soon as possible.

37 For a more discussion of these risks, see USAID (2007).

MAP 5.4: Major Rivers and Water Bodies in South Sudan

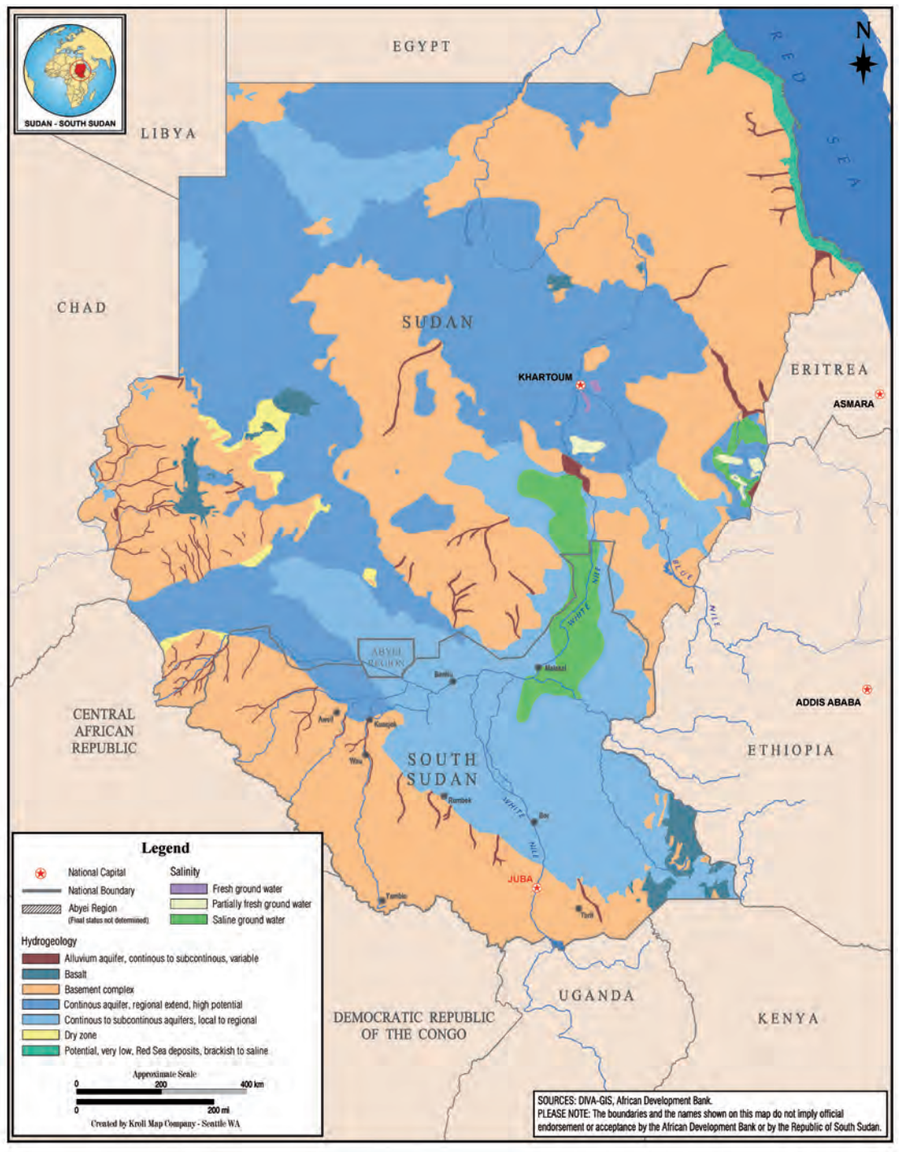


MAP 5.5: Location of Surface Water Resources of South Sudan



Map 5.6 provides an overview of the hydrogeological zones of South Sudan. Salinity levels exceeding allowable limits have been observed in Jonglei and Unity states making ground water unsafe in some areas of these states. While higher concentrations of fluoride, sulphate and nitrates have been observed in a few states, overgrazing and deforestation has also affected water resources quality increasing turbidity and siltation in water structures. Other issues include the need to monitor ground water quality around oil exploration sites in Unity State and undertake assessments of the impact of the effluent from the waste stabilization and oxidation ponds around Juba. The MWRI has developed a national water quality guideline, but the major concern will continue to be undertaking periodic monitoring and enforcement of regulations related to water use.

MAP 5.6: Hydrogeological Map of South Sudan and Sudan



5.4.2 Institutional Responsibilities for Water Resources

Institutional framework. The Ministry of Water Resources and Irrigation (MWRI) has overall leadership in the water sector. In the water resources sub-sector, the Ministry has responsibility for the following: (i) drafting and overseeing the implementation of policies, guidelines, master plans and regulations for water resources development, conservation, and management in South Sudan; (ii) encouraging scientific research into the development of water resources in South Sudan; (iii) overseeing the design, construction, and management of dams and other surface storage infrastructure for irrigation, human and animal consumption and hydroelectricity generation; (iv) setting tariffs for water use; (v) creating policy on rural and urban water resource development and management; (vi) initiating irrigation development and management schemes; (vii) protecting the Sudd and other wetlands from pollution; and (viii) advising and supporting the states and local governments in building their capacity to assume all functions vested by the Constitution and government policy. The three key directorates responsible for the sub-sector are Water Resources Management, Irrigation and Drainage, and the Hydrology and Survey.

Policy framework. The MWRI has adopted a water policy in 2007 and a strategic framework in 2011.[38] The overall goal of the water policy is to promote effective management of the quantity, quality and reliability of available water resources in order to maximize social and economic benefits while ensuring long-term environmental sustainability. Key guiding principles for water resources management are as follows: (i) water is a shared resource and appropriate legal frameworks shall be established to govern all aspects of water use; and (ii) water resources planning shall involve all relevant stakeholders and will be undertaken on the basis of natural hydrologic boundaries. The policy discusses aspects of water use in fisheries, navigation, livestock, forestry, industries, environment, wildlife and tourism development. However, it postpones the development of policies on irrigated agriculture to a future date, awaiting progress in the development and usage of water for irrigation uses and purposes. (Section 5.6.3 provides rough estimates of current and projected demand for water.)

The water sector strategic framework of 2011 discusses, among other things, South Sudan's challenges pertaining to water resources management, the complexities that arise from the transboundary nature of its water resources and the priority assigned to integrated water resources management. Underscoring the roles played by several institutions and appreciating the need to integrate the decision-making process, the strategic framework recommends establishment of a Water Council to act as the principal multi-stakeholder advisory body for the water sector. The Council would also provide relevant support services to the Presidency and the Cabinet on approval of new and amended legislation and policies pertaining to all water related issues. In addition, the strategic framework recommends establishment of a Water Resources Management Authority to enforce regulatory functions on the management and use of water resources.

In August 2011, the Government announced establishment of the Ministry of Electricity and Dams. At the time of drafting this Report, details on the ministry's duties, functions and inter linkages with the MWRI had not yet been clarified. In particular, institutional responsibilities on management of multipurpose dams and accompanied regulatory arrangements need to be worked out to minimize gaps and avoid duplication of efforts. While the scope of water resources touches most sectors and ministries, the Ministry of Electricity and Dams, Ministry of Agriculture and Forestry, Ministry of Animal Resources and Fishery as well as the Ministry of Local Government will continue to play major roles in the development and management of water resources activities in the country. In addition, due to the transboundary nature of the water resources and anticipated negotiations with other riparian states, the engagement of the Ministry of Foreign Affairs and International Cooperation will continue to be crucial.

At the state level, there are water resources management departments coordinated under the water and sanitation directorates. While these directorates are administratively accountable to their respective state ministries, they are technically accountable to the MWRI. The directorates lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity much needed to operate effectively. Limited skilled manpower, coupled with lack of capacity, has made some of these directorates dysfunctional. A majority of the states don't have designated staffs to coordinate water resources management programs. The experience of other sub-Saharan countries has been that development and adoption of a Water Act has helped to streamline institutional responsibilities and address overlaps and gaps in institutional responsibilities. So far, South Sudan has not developed a Water Act and as matter of high priority it needs to develop and adopt it. The proposed program of support outlined in this Report includes provision for such assistance.

38 See Government of Southern Sudan, water policy, MWRI, 2007 and Water, Sanitation and Hygiene Strategic Framework, MWRI 2011.

5.5 Major Challenges in Land and Water Resource Management

5.5.1 Land Tenure Arrangements

As noted earlier in this Chapter, most rural residents in the country rely on customary land tenure systems, but these are under pressure from violence, insecurity, refugees and IDP resettlement. According to the IS Academie (2011), implementation of the Land Act of 2009 is slow.[39] In the meantime, large-scale land acquisitions are ongoing, but lack transparency, and may lead to more conflict over water and land. There is a detailed agenda of concerns about the status of land tenure arrangements for the country. These are clearly articulated in a series of reports prepared under the auspices of the USAID-funded Sudan Property Rights Program.[40] The list of concerns includes the following:

- Relations between traditional authorities on the one hand, and national and state governments on the other, regarding land.
- Management of land in urban areas.
- Arrangements for resettlement of returnees and IDPs.
- Restitution of land and property to rightful owners.
- Facilitation of access to land and property among vulnerable groups in South Sudan society.
- Women's rights to access land and property.
- Domestic and international investors' access to land.
- Conflicts among rural communities over access to resources such as water and grazing lands.

In the case of land policy related to private investment – an issue of particular importance for the strategy for agriculture set out in Chapter 6 – a baseline survey of large-scale land-based investment in South Sudan has recently been prepared with support from Norwegian People's Aid.[41] The report presents data on 28 foreign and domestic investments planned or underway across the ten states of South Sudan. In the four year period 2007-2010, foreign interests sought or acquired a total of 2.64 million hectares of land (26,400 km^2) in the agriculture, forestry and bio fuel sectors alone – a land area that is equal to the entire cultivated area of South Sudan at the present time and an area that is larger than the entire country of Rwanda. After allowing for domestic investments, some of which date back to the pre-war period, and investments in tourism and conservation, the report estimates that these private investments would account for 5.74 million hectares (57,400 km^2), or 9% of South Sudan's total land area. The concern of the report is that this influx of investment could provide development opportunities for rural communities, but without the appropriate procedures in place there is a danger that it will serve to undermine livelihoods and create further internal tensions.

Resolution of these issues is central to the on-going efforts of the National Government to ensure that South Sudan is able to use its mineral wealth and agricultural potential to promote an extended period of sustained strong economic growth that is broad-based and creates income and employment opportunities for a majority of the population. Continued substantial support from the international donor community will be required to build capacities at the national, state and local levels for effective administration and management of land-related issues. However, the outline of a detailed strategy for provision of such support over the medium-term is beyond the scope of this Report.

5.5.2 Riparian Rights and Use of Water in the Nile Basin

One of the most important challenges for the country is to strengthen capacities for effective management of its water resources. Authority over water resources needs to be clarified at national and local levels and governance of water resources needs to be coordinated among public and private entities and communities.

The Nile River represents the country's biggest water management challenge, as well as its biggest opportunity. As noted earlier, the country is both an upstream country vis-a-vis Sudan and Egypt and a downstream country with respect to the rest of the riparian countries. The country is at the heart of the complexities associated with the Nile Basin Initiative (NBI), and the related transboundary water management of the River presents an extraordinary challenge. South Sudan's independence adds to these issues by raising questions about the use and allocation of the Nile waters between Sudan and South Sudan.

The proposed program for development of commercial agriculture outlined in Chapter 6 includes a substantial increase in the use of irrigation to expand crop production. The longer-term development of the electric power sector is also built around the utilization of the Nile's hydropower potential. But these interventions will raise questions among other riparian states about ownership and origin of the waters. At the present time, there is no clarity on how the water rights will be allocated now that South Sudan is an independent country. There is a compelling case for joint management of these water resources to avoid political tensions over shared resources and sub-optimal use of the resources.

The history of hydro-politics in the Nile is complex and has significant ramifications for South Sudan and for development throughout the northeastern region of Africa. Over the years, states within the Nile Basin have put agreements and treaties in place to avoid conflict over access to these water resources[42]. At the present time, Egypt and Sudan have primary control over the Nile waters. The current arrangements stem primarily from the following treaties: (i) the 1929 Agreement between Egypt and Anglo-Egyptian Sudan, which gave Egypt complete control over the Nile during the dry season when water was most needed for agricultural production, put substantial limits on the amount of water allocated to Sudan, and provided no water rights to any of the other riparian states; and (ii) the 1959 Nile Agreement between Sudan and Egypt for full control and utilization of the Nile waters. This agreement allowed the entire average annual flow of the Nile (estimated to be about 84 billion cubic meters measured at the Aswan High Dam) to be shared between Egypt and Sudan at 55.5 and 18.5 billion m^3 respectively. Included in the agreement was an assumption that the remaining 10 billion m^3 is accounted for by losses due to evaporation and related factors. The Agreement granted Egypt the right to construct the Aswan High Dam (which can store the entire annual Nile River flow of a year) and granted Sudan the right to construct the Rosaries Dam on the Blue Nile and to develop irrigation and hydroelectric power generation until it fully utilizes its Nile share.

The contemporary challenge facing the Nile Basin countries is how to establish a legal framework for the utilization of its waters that is acceptable to all the riparian states. The basic issue has been that seven of these countries contribute to the waters of the Nile (Burundi, DRC, Ethiopia, Kenya, Rwanda, Tanzania and Uganda), but have no formal rights to the use of these waters. Several studies have shown that, the tributaries of Ethiopia supply an estimated 86% of the waters of the Nile.[43] In the case of Egypt, FAO data indicates that for 2009 about 97% of the actual renewable water available to Egypt comes from external sources (i.e., the Nile River). The current situation for South Sudan and Sudan is not clear as the FAO water resource data refer to pre-independence Sudan.[44]

There have been efforts deployed by some countries to bring about cooperation over the Nile waters. Negotiations for creation of a Cooperative Framework Agreement (CFA) started in 1997, but have not yet been concluded. The CFA seeks to establish a permanent Nile River Basin Commission through which member countries would act together to manage and develop the resources of the river. In February 1999, the Nile Basin Initiative (NBI), which is a partnership among the Nile Riparian states, was formally launched by the then nine countries that shared the resources of the River.[45] The NBI is led by a Council of Ministers from the member states in charge of Water Affairs (Nile-COM) with the support of a Technical Advisory Committee (Nile-TAC). It has been set to promote sustainable economic development and stability across the basin. The NBI "seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security." With support from the World Bank, African Development Bank and other donors, the NBI has launched a substantial program aimed at building capacities among member states and making investments in water resource development and management. The NBI provides an historic opportunity to manage the Nile for the good of the peoples of the basin and to use it as a vehicle for change for the better. Within the framework of the NBI, the Nile states are exploring major cooperative investments in: power generation, transmission and interconnection, irrigated agriculture, navigation; fisheries, and related investments in land management, watershed protection and environmental conservation. These projects are a first phase of a long-term investment program that will support economic development and integration in the sub-region. While South Sudan was not a major beneficiary of these programs, some activities have been undertaken in collaboration with the NBI.

- Technical staff from the MWRI have received training through the Applied Training Program (ATP) component of the shared vision program.
- Lau and Aswa integrated watershed management projects are under implementation.
- Baro-Akobo-Sobat multipurpose water resources study project is under preparation

39 IS Academie (2011), South Sudan: Food Security and Land Governance Factsheet. Maastricht University, The Netherlands, 2011.
40 See USAID (2010), Land Tenure Issues in Southern Sudan: Key Findings and Recommendations for Southern Sudan Land Policy. Report prepared by Tetra Tech ARD for the USAID, December 2010.
41 See Deng, David K. (2011), The New Frontier: A Baseline Survey of Large-scale Land-based Investment in Southern Sudan. Based on research by GADET-Pentagon and the South Sudan Law society. Norwegian People's Aid, March 1, 2011.
42 See, for example, Waterbury, John (1979), Hydropolitics of the Nile Valley. University of Syracuse Press, 1979; Tvedt, Terje (2004), The Nile: An Annotated Bibliography. I.B. Taurus, 2nd edition, January 17, 2004; Chatteri et al. (2002), Conflict Management of Water Resources. Hampshire, Ashgate Publishing Ltd. 2002.
43 See International Peace Institute (2010), Issue Brief: A Political Storm Over the Nile. New York, December 2010.
44 In the case of Sudan, the FAO reports that about 54% of the actual renewable water resources came from external sources in 2009.
45 At the time the NBI was launched there were nine member countries: Burundi, DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan Tanzania, and Uganda. Eritrea, which also lies within the river basin, is not an official member of the NBI, but it does hold observer status. Prior to independence in July 2011, Southern Sudan had observer status in the NBI. Shortly after independence, the Republic of South Sudan applied for full membership of the NBI.

Notwithstanding these developments, there has been continuing tension among NBI countries over what constitutes an equitable utilization of water. These tensions stem from an increased need of water for various purposes such as irrigation and other multi-purposes uses of water resources. While the NBI, which is a transitional arrangement, has succeeded in bringing the riparian states together for a common purpose, engaged in capacity building and led the implementation of some investment programs, establishment of a permanent institutional arrangement is still work-in-progress. In the past two years, seven upper riparian states launched the Nile Basin Cooperative Framework Agreement (CFA) in a bid to establish a permanent organizational structure and ensure an equitable utilization among all the riparian states of the Nile. The CFA was opened for signature on May 14, 2010 for a period of one year until May 13, 2011. Article 42 of the draft Cooperative Framework Agreement provides for its coming into force upon ratification by at least six members. So far six riparian states have signed the Agreement. (DRC, Sudan and Egypt have not yet signed the agreement.) The tenth riparian country, Eritrea was an observer and didn't participate directly in the negotiations. The lack of agreement among all the riparian states indicates that the utilization of Nile waters will continue to pose a challenge at least for a foreseeable future. In the mean time, South Sudan should endeavor to meet the needs of its population by addressing the pressing water management and resource issues facing this new country.

5.6 Development Programs for Land and Water Resources

The major thrust of the proposed program for development of land and water resources in the decade ahead centers on three sets of interventions: (i) building human and institutional capacities for the management of the land resources of the country, with particular attention to the agenda spelled out above in Section 5.5.1; (ii) strengthen the institutional framework for water resource management at national and state levels within South Sudan and support the design and implementation of a policy framework for equitable water use on a regional basis by the riparian states of the Nile basin; and (iii) improve substantially the infrastructure required for effective management of water resources within the country, including regular monitoring of water resources and withdrawal of these resources for agricultural, commercial and domestic use and investment in additional capacities for surface storage of water to meet growing demand. The proposed program also calls for a series of strategic and analytical studies that will streamline mandates and responsibilities and attract much needed private investment into the sector.

5.6.1 Building Institutional Capacities for Water Resource Management

Strengthening the institutional framework. Since 2004, and with the support of the international donor community, South Sudan has made some progress in creating an institutional framework for water resource management and has initiated essential sector strategic assessments and feasibility studies to rehabilitate dilapidated infrastructure and improve management of its water resources. A new National Water Policy was endorsed by the government in 2007, and the Ministry of Water Resources and Irrigation was established in 2008 with defined mandates and responsibilities. Building on these initiatives, action is now required on two fronts:

- Development of a Water Act: South Sudan doesn't have a legal framework for the management of its water resources. As a result, delineation of institutional responsibilities in regulations as well as in service delivery has been masked with gaps and sometimes with overlaps. In addition, responsibilities for setting pricing policy for domestic as well as non-domestic uses has not been clearly defined creating confusions among responsible institutions. Thus, there are compelling reasons to develop and adopt a Water Act as a matter of high priority.

- Training program: South Sudan needs to build capacity of its' sectoral institutions in development and management of water resources. The country has applied for membership with the Nile Basin Initiative (NBI) and its capacity in negotiations and conflict resolution needs to be enhanced to the fullest extent. A series of short-, medium- and long-term training programs are necessary to build the capacities of key government institutions, civil society and other entities.

Improving basic information about the water resources of the country. The lack of data on physical and natural resources has constrained the country's ability to harness its rich ground and surface water resources potential. There are no major studies about the water resources in South Sudan. A three-pronged program is proposed for this component of the Action Plan outlined in this Report:

- Rehabilitation and expansion of the water resource data collection network in the country: Most of the meteorological and hydrological data collection network was destroyed during the civil wars, and only minimal capacities for these activities are now in place. Surveys indicate that out of 29 meteorological stations in the country, only five are currently operational. In addition, of the estimated 113 hydrological stations installed several years ago, about 10 are currently operational leaving the country with paucity of data much needed in water resources management and early warning forecast systems.[46] The technical and institutional capacities for these activities are also quite limited. A substantial effort is required as soon as possible to build these technical and institutional capacities for water resources management.

- Integrated river basin master plan studies: Given the country's urgency to implement large-scale infrastructure projects for irrigated agriculture, hydropower and other multi-purpose use projects, there are compelling reasons to undertake integrated river basin master plan studies as a matter of priority. This Report recommends undertaking integrated river basin master plan studies on Bahr el Jebel as well as Bahr el Ghazal basins. These studies will help in the following ways:

    - Preparation of water allocation and utilization plan with different scenarios and to generate data, information and knowledge on ground and surface water resources in the country.

    - Development of the resources in the basins with respect to occurrence, distribution, quality and quantity of water resources for the next 20-40 years.

    - Identification and prioritization of a list of development projects and preparation of physical plan for the basins.

    - Formulation of policy framework for the development of the basins in line with the government's policies in planning and managing natural resources in hydrologic boundaries.

- Water quality and soil testing laboratories: Apart from a small water quality laboratory within the MWRI, there are no other laboratories for the sector. Given the expected large investment in the water sector, there is a need to undertake water quality monitoring activities in both ground and surface water resources sources of the country. In particular, the increased use of ground water resources for domestic and non-domestic uses pose water quality problems and such laboratories will help in analyzing the problems. Further, the design and construction of storage structures such as dams and irrigation structures necessitate conducting soil tests and analysis. The Report thus recommends constructing and equipping of water quality as well as soil testing laboratories. These facilities will also support much needed regulatory activities in the decade ahead.

Building capacities for construction and maintenance of facilities. The MWRI, through its directorates, carries out dyke construction as well as river cleaning works using its own staff. This Report recommends use of independent construction entities outside of the MWRI to undertake periodic and routine maintenance works on the water resources infrastructure. As the discussion Chapter 4 indicates, there is substantial scope and need for concerted efforts to build the capacities of local companies to undertake construction and maintenance of these types of facilities. The proposed program therefore makes provision for initiatives that can be taken by the Government to build these capacities in the private sector.

46 Annex Table shows the location of all hydrological stations in South Sudan along with the required costs needed to upgrade the systems.

Table 5.2: Ongoing and Proposed Program of Capacity Building and Technical Support for the Water Resources Sector (In $ '000 at 2010 constant prices and exchange rate)

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Capacity building & technical support								
Ongoing								
Develop legal and institutional framework	678	83	167	83				333
Training programs and capacity building	2 035	1 908	1 858	750				4 516
Proposed								
Technical advisers for MWRI			150	500	500			1 150
Training programs and capacity building			100	100	150	150	150	1 250
Establish water quality & testing laboritory					200	200		1 400
Upgrade hydrological stations				500	500	500	1 000	6 000
Strengthen water information management system				100	100	100		300
Establish water resources management institute					200	200		1 400
Total	2 713	1 991	2 275	2 033	1 650	1 150	1 150	16 349
Technical studies								
Ongoing								
Mapping assessment & water management		1 633	1 470	876				3 979
Proposed								
Development of the Water Act			50	150	150	50		400
Integrated rive basin studies								-
Bahr el Ghazal				500	1 500	1 500		5 000
Bahr el Jebel				500	1 500	1 500		5 000
Sudy of regulatory and institutional linkages			50	100	100			250
Water pricing & tariff studies				100	100	100		300
Total	-	1 633	1 570	2 226	3 350	3 150	-	14 929
Grand total	2 713	3 624	3 845	4 259	5 000	4 300	1 150	31 278

Source: Date for ongoing programs from SSDP and MWRI. Projections are those of authors.

Proposed program of capacity building and technical support. The program proposes substantial support for institutional capacity building of sectoral institutions as well as undertaking various technical studies to streamline institutional responsibilities and attract much needed investment into the sector. The proposed program includes training activities, upgrading and rehabilitation of hydrological stations, construction of water quality and soil testing laboratory and establishment of a water resources management institute. In addition various technical studies including highly prioritized integrated river basin master plan studies and development/adoption of a water Act will be undertaken. Institutional studies, including regulatory and service delivery functions as well as linkages with other line ministries, will be undertaken to ensure efficient sectoral performance. Development of an irrigation policy will also be carried out as a priority.

Table 5.2 provides a summary of ongoing and proposed new capacity building programs and technical studies for the water resources sector. Almost $9 million of support is ongoing at the present time, including $4.8 million for capacity building, mainly related to mapping and water resource management, and $4 million for mapping and water resource assessments. Table 5.2 provides a detailed list of the proposed programs for the decade ahead, which includes $11.5 million for further capacity building, and about $11 million for technical studies.

5.6.3 Expansion of Water Supply Capacities to Meet Anticipated Demand

As noted earlier, the FAO Aquastat database does not provide separate estimates for water resource supply and consumption for South Sudan. As a result, there is no complete baseline data from which projections of demand can be developed. For the purposes of this Report, an indicative estimate has therefore been made for water consumption for 2010 from which demand projections have then been developed. These estimates are no more than indicative of possible trends, given the uncertainties about the base level of consumption for 2010.

Table 5.3: Estimation of Household Demand for Water (Billion liters per year)

Indicator	2010	2011	2012	2013	2014	2015	2020
Consumption of improved water							
Urban population	1.9	3.1	4.6	6.5	8.8	12.6	74.7
Rural population	19.3	22.9	26.9	31.3	36.1	41.3	74.2
Total	21.2	26.0	31.5	37.9	44.9	53.9	148.9
Consumption of unimproved water							
Urban population	5.4	6.6	7.9	9.1	10.3	11.1	8.0
Rural population	18.7	18.6	18.3	18.1	17.7	17.2	13.3
Total	24.1	25.2	26.2	27.2	28.0	28.3	21.3
Total consumption							
Urban population	7.3	9.7	12.5	15.7	19.1	23.7	82.7
Rural population	37.9	41.4	45.2	49.4	53.8	58.5	87.5
Total	45.2	51.1	57.7	65.1	72.9	82.2	170.2

Annex Table 6.2.

Household demand for water. As Table 5.3 indicates, total household consumption of water in 2010 is estimated at 45.2 billion liters per year (equivalent to 45.2 million m^3 per year). About 47% of this total household water use is improved water. Based on the targets for expanding access to improved water in the decade ahead that are outlined in Chapter 9, total household consumption of water is projected to increase to about 140 million m^3 by 2020, 88% of which would be improved water. (See Annex 6 for an explanation of the basis for these estimates.) If these targets for household access to improved water are realized, the implication is that there will be a fivefold increase in demand for improved water in the decade ahead.

Table 5.4: Agricultural Water Use in Selected Comparator Countries, 1998-2002

Country	Area cultivated (ha '000)	Cultivated area irrigated (% of total)	Agriculture water use (bill m^3 p.a.)	Agriculture share of total (%)	Water use per hectare (m^3 p.a.)
Burkina Faso	4 700	0.50	0.69	70.1	147
Burundi	1 351	1.58	0.22	77.1	164
Ethiopia	10 604	2.70	5.20	93.6	491
Kenya	5 518	1.80	1.01	79.2	183
Malawi	2 970	1.90	0.81	83.6	273
Rwanda	1 385	0.61	0.10	68.0	74
Sudan & South Sudan	16 644	11.20	36.07	97.1	2167
Uganda	7 700	0.12	0.12	36.4	16
Memo item:					
South Sudan	1 000	3.21	0.62	92.5	620

Source: Authors estimates for South Sudan; FAO Aquastat database for comparator countries.

Agriculture sector water demand. In the absence of data for South Sudan, a highly indicative estimate of agricultural demand for 2010. Table 5.4 compares the results of this baseline estimate with FAO data for selected comparator countries. As the Table indicates, total water use by agriculture is closely linked to the total area cultivated and in particular to the cultivated area that is irrigated. As noted in Chapter 6, the actual area cultivated in South Sudan in any one year varies from 650,000 to 1.3 million hectares, with only 32,100 hectares that is irrigated, which implies that somewhere between 2.5% and 5% of the actual cultivated area is irrigated. Given the relatively small area that is cultivated, the share of irrigated land is somewhat higher than that for comparator countries, except for Sudan. For the purposes of this Report, it is assumed that the amount of land actually cultivated in 2010 was 1 million hectares, equivalent to the average of the range reported by the World Bank for recent years. The other issue related to agricultural demand for water concerns the livestock sector. As Chapter 6 indicates, South Sudan has almost 40 million cattle, goats and sheep. These animals are an important source of livelihood for large number of rural families. Based on data for comparable countries it is assumed that this livestock population consumed about 0.23 billion m^3 in 2010. Total agricultural demand for water was estimated to be about 0.62 billion m^3 in 2010, equivalent to consumption of about 390 m^2 per hectare (not including livestock consumption).

Annex 6 provides a detailed description of the basis on which the demand for water was projected to 2020. The scenario for expansion of cultivation and irrigation outlined in Chapter 6, proposes a total cropped area of 2,500 ha by 2020, 400,000 ha of which would be irrigated mainly for production of high value fruits and vegetables and other cash crops. As Table 5.5 indicates, agricultural demand for water increases to about 5 billion m^3 by 2020 – an eightfold increase over the estimated level of use in 2010.

Information on the ***industrial use of water*** in South Sudan is not available at this time. Currently, the primary source of industrial water use would be the petroleum sector. A notional amount of 0.01 billion m^3 was assumed for industrial use in 2010.

Aggregate demand for water. The resulting very rough estimate for water withdrawal in South Sudan is about 0.67 billion m^3 in 2010. As Table 5.5 indicates, demand for water is projected to increase to about 5.3 billion m^3 by 2020. Agriculture accounts for about 96% of total water use, households account for about 3%, with industrial use accounting for the balance. The agricultural sector would continue to be the dominant source of demand for water for the entire decade, driven by the large investment in commercial agriculture and irrigation. Particular attention will also have to be given to meeting the needs of the livestock industry. Lack of water at critical times in the year can be an important cause of conflict among local communities. Additional water facilities will be needed to meet the needs of the industry.

Table 5.5: Estimation of Total Demand for Water (Billion m^3 per year)

Indicator	2010	2011	2012	2013	2014	2015	2020
Agriculture							
Cropland	0.38	0.42	0.48	0.72	1.20	1.80	4.80
Livestock	0.23	0.23	0.24	0.25	0.25	0.26	0.30
Sub-total	0.61	0.65	0.72	0.97	1.45	2.06	5.10
Households							
Improved water	0.02	0.03	0.03	0.04	0.04	0.05	0.15
Unimproved water	0.02	0.03	0.03	0.03	0.03	0.03	0.02
Sub-total	0.05	0.05	0.06	0.07	0.07	0.08	0.17
Industry	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Total	0.66	0.71	0.79	1.04	1.54	2.16	5.30
Memo items:							
Harvested area ('000 ha)	1 000	580	1 020	1 070	1 160	1 320	2 500
Irrigated area (% of total)	3.2	3.3	3.6	5.0	7.4	10.0	16.0
Water use per ha (m^3 p.a.)	610	1 126	706	904	1 254	1 562	2 042

Source: Authors estimates for South Sudan; FAO Aquastat database for comparator countries.

The issue then is the extent to which this demand can be met in a sustainable manner from aquifers and river flows and the extent to which this source of supply must be met from stored surface water. South Sudan's substantial lack of water storage capacity has made it vulnerable to periodic drought and flooding problems. In the case of agriculture, uncertainties about rainfall in some parts of the country have a detrimental effect on farmers' willingness to expand production to meet local market requirements. A substantial amount of additional work is required to assess the supply possibilities for various parts of the country to determine whether urban water and agricultural demand can be met in part from additional stored surface water. A start has been made on building stored water capacities in South Sudan. In 2008, the MWRI awarded five contracts worth $38 million for feasibility studies for the construction of three medium-sized dams in Wau and the rehabilitation of the Maridi Dam and Water Station. Rehabilitation of the Maridi dam was completed in 2010 and it currently provides about 3,000 m3 of water per day to the inhabitants of Maridi town. However, it is the only dam of any size in the country.

For the purposes of this Report, it is assumed that the Sue Dam would go ahead as proposed in the SSDP with design and construction completed during 2013-2015. It is assumed that a second large dam will be constructed during 2018-2020 to meet further growth in urban demand in the following decade. The cost of these facilities is notionally put at $400 million and $250 million respectively. At a capital cost of $400 per thousand m3, these facilities will provide about 1.6 million m3 of stored water capacity. Assuming both are multipurpose dams, they would meet growth in household and industrial demand for water and depending on their location, provide some water for irrigation of high value fruits and vegetables as proposed in Chapter 6.

5.7 Expenditure Programs for Water and Land Resource Management

5.7.1 Expenditure Programs of Government and Donors

Ongoing programs. Table 5.6 provides a summary of the on-going development programs related to water resource management. Through the support of MDTF and other NGOs, construction of water storage structures such as hafirs and ponds are underway in a few states. In addition, the GOSS allocates budget for rehabilitation of water conveyance structures such as canals and irrigation structures. The Egyptian Government supports studies on Wau multipurpose dam project as well as rehabilitation of hydrological stations. These ongoing programs amount to about $34 million.

Table 5.6: Ongoing and Proposed Program of Capital Works for the Water Resources Sector (In $ '000 at 2010 constant prices and exchange rate)

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Ongoing								
Increase supply of water	709	4 839	6 865	1 383				13 087
Open rives and dykes		3 267	6 367	4 367				14 001
Mapping assessment & water management		1 588	2 497	3 147				7 232
Proposed								
Construction of haffirs			4 000	4 000	6 000	5 000	5 000	44 000
Construction of microdams			3 000	3 000	3 000	3 000	3 000	27 000
Construction of multipurpose dams				50 000	150 000	200 000	100 000	650 000
Equipment for flood control works				1 000	1 000	2 000	2 000	14 000
Flood and dyke protection works			3 000	3 000	3 000	3 000	6 000	42 000
Clearing of blocked waterways				5 000	5 000	5 000	5 000	40 000
Total	709	9 694	25 729	74 897	168 000	218 000	121 000	851 320

Source: Date for ongoing programs from SSDP and MWRI. Projections are those of authors.

Proposed new programs. The South Sudan Development Plan (SSDP) calls for new expenditures of some $453 million on programs related to water resource management during 2011-2013. The bulk of the funds are proposed for investment in additional capacities to supply fresh water, including $400 million for construction of the proposed Sue multipurpose dam. Only $5 million is proposed for capacity building and technical studies in this period.

The Action Plan for water resource management set out in this Report calls for new capital outlays of about $820 million, in addition to the ongoing program of $34 million. The bulk of the funds would be used to finance the construction of two more multipurpose dams that would provide water for household and industrial use, and depending on further analysis and site investigations, also provide additional water for agricultural use. An amount of $650 million is included for these two dams. Preliminary information obtained from the MWRI indicates that the proposed dam will store about 1-2 billion m^3. It would supply water for electricity generation and meet the water demand of the Wau town. In addition, it would be used as a source of supplemental irrigation during the dry periods sufficient to cultivate about 40,000 feddan (16,800 hectares). The SSDP made a notional allocation of $400 million for this project, which implies a capital cost of $200-$400 per thousand m^3. A feasibility study on the Wau multi-purpose water resources project is currently underway. Given the size of the scheme, the MWRI, along with other line ministries and stakeholders, will need to establish a panel of experts to review the results of the assessment and evaluate economic costs and benefits.

Because the country is prone to flooding, the Report also recommends procurement of earth moving machineries to support dyke construction works much needed for flood protection works or contracting to the private sector for such work. Another important component of the program is the construction of water harvesting structures such as hafirs, ponds and cisterns. These structures are critical for the livelihood of the population in the arid zones, as well as for the large number of livestock in South Sudan.

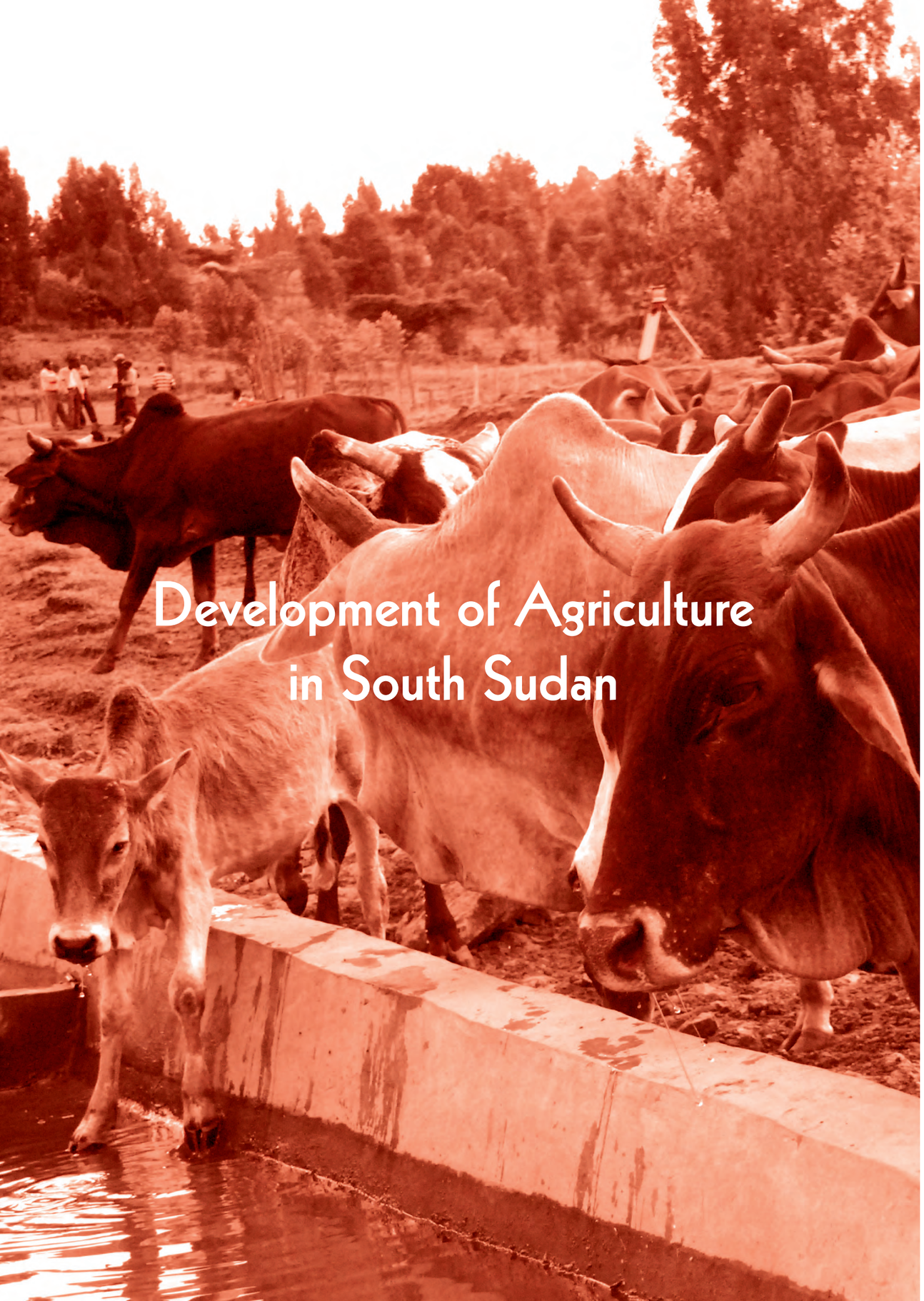
Table 5.7: Sources of Funding for the Water Resources Program
(In $ '000 at 2010 constant prices and exchange rate)

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Capacity building & techncial studies								
Government								
Ongoing								-
Proposed	-	-	35	255	500	430	115	2 245
Donors								
Ongoing	2 713	3 625	3 495	1 709	-	-	-	8 828
Proposed		-	315	2 296	4 500	3 870	1 035	20 205
Total	2 713	3 625	3 845	4 260	5 000	4 300	1 150	31 278
Capital expenditures								
Government								
Ongoing	709	4 839	6 865	1 383	-	-	-	13 087
Proposed	-	(0)	2 500	49 813	111 950	144 065	79 283	571 900
Donors								
Ongoing	-	4 855	8 864	7 514	-	-	-	21 233
Proposed	-	-	2 500	16 186	56 050	73 935	41 718	245 100
Total	709	9 694	20 728	74 897	168 000	218 000	121 000	851 320
Total program								
Government								
Ongoing	709	4 839	6 865	1 383	-	-	-	13 087
Proposed	-	(0)	2 535	50 068	112 450	144 495	79 398	574 145
Donors								
Ongoing	2 713	8 480	12 359	9 223	-	-	-	30 061
Proposed	-	-	2 815	18 482	60 550	77 805	42 753	265 305
Total	3 422	13 319	24 573	79 156	173 000	222 300	122 150	877 598

Source: Annex tables 6.7 and 6.8 and estimates by authors.

5.7.2 Financing Arrangements for the Program

Table 5.7 provides a summary of the proposed funding arrangements for the land and water resources program. Total funding requirements for the decade ahead amount to about $880 million (at 2010 constant prices and exchange rate). The program would be funded by the National and state governments and by the donor community. South Sudan would fund two-thirds of the cost of the program, with the donor community meeting the rest. One important qualification to the foregoing financing arrangement is that it may be possible to attract private funding from international investors who are attracted to business opportunities in the agricultural sector for one or both of the large scale dams proposed for the decade ahead. This would involve the mobilization of about $200 million of private equity and $450 million of debt financing from commercial sources. Once the detailed feasibility study for the Wau project is completed, a transaction advisory team can be retained to assess the prospects for mobilizing such funding.



6 Development of Agriculture in South Sudan

6.1 Current Status of Agriculture, Fisheries and Forestry

6.1.1 The Setting

Agriculture is the backbone of the economy of South Sudan. Estimates on value addition by agriculture, forestry and fisheries accounted for 36% of non-oil GDP in 2010 (see Annex Table 2.4). It is evident that about 80% of the population lives in rural areas, with agriculture, forestry and fisheries providing the primary livelihood for a majority of the households in each state (Map 6.1). Much of the rural sector activity is currently focused on low-input low-output subsistence agriculture instead of production for markets. Among the significant reasons for this are: (i) the need for improved agricultural inputs and techniques such as seeds and fertilizers, storage facilities and advisory services, and irrigation development; (ii) the difficulties faced by farmers in accessing markets due to the poor road network, lack of other transport modes and nuisance taxes and charges, including bribes; (iii) the lack of a critical mass of farmer and rural producer associations as a means of entering the market place with the aim of minimizing the cost of inputs, accessing loan finance at affordable rates and influencing farm-gate prices; and (iv) uncertainties pertaining to property rights and access to land.

Two and a half decades ago, the country was net exporter of agricultural product to regional markets; due to war-related destruction, poor infrastructure and lack of investment in the agriculture sector, South Sudan is now a net importer of food. It currently imports as much as 50% of its needs, including 40% of its cereals from neighboring countries, particularly Uganda and Kenya. Total food imports are estimated to be in the range of $200-300 million a year.

While the country produces and consumes a wide range of agricultural commodities, with the passage of time some commodities have become prominent in the national pattern of consumption. Cereals, primarily sorghum and maize, millet and rice are the dominant staple crops in South Sudan. According to the 2009 National Baseline Household Survey (NBHS) more than 75% of rural households consume cereals. At the state level, the percentage ranges from a low of 28% in Upper Nile state to 62% in Western Bahr el Ghazal and to as much as 95% in Northern Bahr el Ghazal. For the country as a whole, cereal consumption accounts for about 48% of total basic food consumption in term of value. Livestock accounts for approximately 30%, fish 4%, roots 2%, seeds about 3.8% and other non-cereal crops combined, 12.7%.

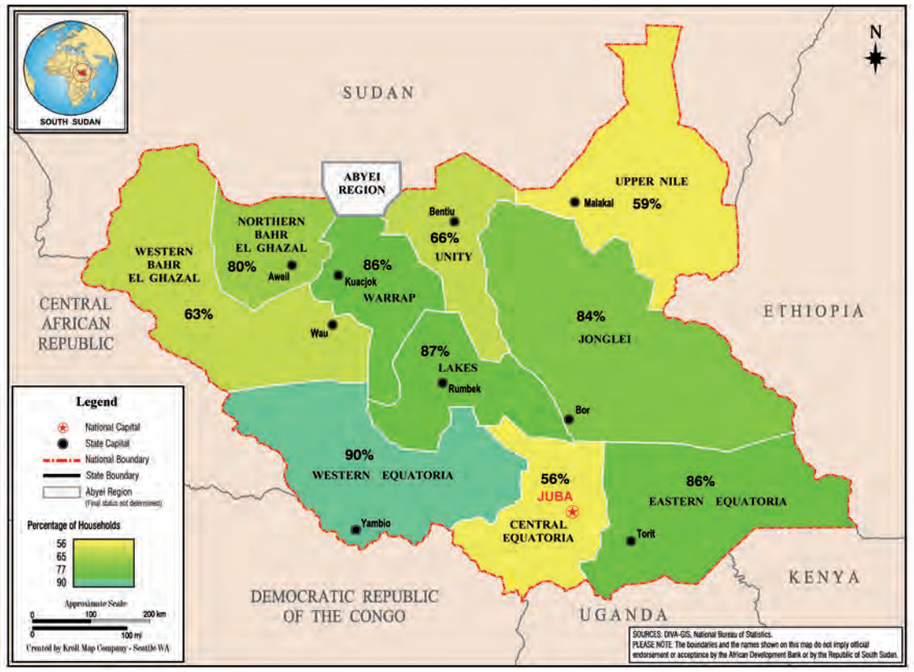
Sorghum is the main crop cultivated with a wide range of local landraces. It is the main staple food in all states, except for the three Equatorias where the local diet is also based on maize flour (largely imported from Uganda) and cassava (mainly in the Green Belt). In Northern and Western Bahr el Ghazal, Warrap and Lakes, sorghum is often intercropped with sesame and millet. Maize is normally cultivated in limited areas, close to homesteads and often used for green consumption. In some locations such as Upper Nile, maize is cultivated in larger plots, instead of sorghum, provided the soil is suitable. Minor cereal crops such as bulrush millet, finger millet and upland rice are also cultivated in certain locations. Groundnut is cultivated on sandy soils in most locations and makes an important contribution to the household diet. It is the main cash crop which contributes to farming household income at certain periods of the year. In parts of Central and Western Equatoria, sweet potato, yam, coffee, mango and papaya are commonly grown. Okra, cowpea, green-gram, pumpkin and tobacco are also widely grown around homesteads. Vegetables such as onions or tomatoes are not commonly grown in rural areas, but are increasingly cultivated near cities to supply urban markets.

Livestock provides the main source of livelihood for a substantial portion of the population, with herds (mostly cattle) concentrated primarily in western parts of Upper Nile state, and in East Equatoria, Jonglei and Bahr El-Ghazal states. Livestock are raised by nomads and semi-nomads and are entirely dependent on access to grazing land and watering points. However, the increasing number of sedentary farmers is reducing the amount of grazing land available, and as noted in Chapter 5, that is a source of internal conflict in the country.

With over 95% of agricultural production being rain-fed, weather variability is a major factor in determining crop performance. In lowland areas, flooding is a normal occurrence, but variability of the water levels affects harvested area and yields. Agriculture is, for the most

part, based on small, hand-cultivated units often farmed by women-headed households. Despite land availability for farming, manual land preparation limits the area households can cultivate. Making use of animal traction would allow household to cultivate larger plots and plant in line to ease weeding. The GoSS, FAO and NGO-based extension agents make efforts to promote animal traction on a small-scale in Central Equatoria, Western Equatoria, Lakes, Warrap and Bahr el Ghazal States. In addition to social and cultural barriers, lack of spare parts and skills to maintain moult-board ploughs and adaptability of ploughs model to local soil conditions are the main constraints. Mechanized farming is practiced mainly in the Upper Nile counties of Renk, Melut and Wadakona and to a limited extent in Malakal and Bentiu in Unity State.

MAP 6.1: Share of Households Depending Primarily on Agriculture and Livestock



6.1.2 Institutional Arrangements for the Sector

At the national level, primary responsibility for agriculture, forestry and fisheries rests with two ministries: the Ministry of Agriculture and Forestry (MAF), and the Ministry of Animal Resources and Fisheries (MARF). In addition, the Ministry of Cooperatives and Rural Development and the Ministry of Water Resources and Irrigation have significant responsibilities for particular aspects of agricultural development.

The mandate of the Ministry of Agriculture and Forestry is to transform agriculture from traditional subsistence farming to achieve food security through scientific, market oriented, competitive and profitable agriculture without compromising the sustainability of natural resources for future generations. The mandate of the Ministry of Animal Resources and Fisheries is to promote, regulate and facilitate animal production and fisheries, value-added addition and access to credit and regional and international markets for food security, poverty alleviation and socio-economic development.

A series of policy papers were prepared during 2006-2007 for food and agriculture, forestry, animal resources, and fisheries.[47] In 2010, the FAO sponsored a review of these various policy papers that, in turn, has led to the drafting of a comprehensive food and agricultural development policy framework for the country.[48] A major ongoing concern for policy makers is that most of the food sold in the market in South Sudan is imported and a significant proportion of food insecure people rely on imported food aid. An important focus of the ongoing review of the food security policy and related framework has been the following:

- Development of production support services, with particular emphasis on how the private sector can be harnessed to provide various services including input delivery and mechanization.
- Expansion of agricultural markets, value chain development and finance, with special emphasis on agribusiness development.
- Inter-relationships between food security, social development and climate change.

The draft policy statement is to be presented to the Council of Minister of South Sudan and if approved, it will become the official policy document for guiding agricultural development in the country.

6.2 Agricultural Land Use in South Sudan

6.2.1 Estimates of the Cropped Area

The country lies entirely within the River Nile Basin and is covered by grassland, swamps and tropical forests. As noted in Chapter 5, 75% of the country's land area is suitable for agriculture while, approximately 330,000 square kilometers, or about half of the total land space, is estimated to be suitable for culivation. With its high potential for agricultural production, some expert observers have said that, with the development of appropriate and adequate infrastructure, South Sudan could become the bread basket of Africa.[49]

Table 6.1: Land Use in South Sudan (In hectares)

Category	Area	Share (%)
Cultivated	2 760 131	4.3
Trees	20 742 243	32.6
Shrubs	25 032 308	39.3
Herbaceous	14 522 385	22.8
Urban/industrial	34 188	0.1
Bare rock & soil	159 106	0.2
Water bodies	462 105	0.7
Total	63 712 466	100.0

Source: Annex Table 6.1.

In spite of having 50% of its arable land mass as prime agricultural land only 4% of this area is cultivated continuously or periodically. The very low ratio of cultivated to total land compares with 28% in Kenya and 8% in Uganda. Most of this land use in South Sudan is accounted for by smallholder subsistence farmers that, in the absence of fertilizers, pesticides and herbicides, practice some form of shifting cultivation. As Table 6.1 indicates, the total area that is cultivated on a shifting basis is estimated at about 2.8 million hectares. Areas covered with trees and shrubs account for 72% of land use, with grasslands accounting for about 23% of the total area.

The Western Flood Plains livelihood zone has the most cropland (34% of national cropland). Greenbelt and Eastern Flood Plains zones are the other two important crop production regions, accounting for, respectively, 18% and 26% of national cropland. Altogether, these three livelihood zones account for 78% of national cropland. Five states account for 70% of the national cropland (and 56% of the national territory): Upper Nile, with 19% of total cropland; Warrap, 15%; Jonglei, 14%; Western Equatoria, 11%, and Central Equatoria with 11%. Almost all irrigated crops (mainly rice) are in Upper Nile; rice on flood land is all in Northern Bahr el Ghazal while fruit trees

47 See the following papers prepared by the Ministry of Agriculture and Forestry: Food and Agriculture Policy Framework (FAPR), November 2006; MAF Strategic Plan 2007-2011, June 2007; MAF Forest Policy Framework (2007) and Strategic Plan 2007-2011. In the case of the MARF, the following papers were prepared: Animal Resources Sector Policy and Strategic Plan (2006-2011) and Fisheries Sector Policy and Strategic Plan (2006-2011).

48 See Mengistu, Diress (2010), "A Review of Selected Sector Policies of the Government of Southern Sudan to Identify Gaps in Food Security Policy." Report submitted to the Food and Agriculture Organization of the United Nations/Sudan Institutional Capacity Programme: Food Security Information for Action, Southern Sudan, Subprogramme, June 2010.

49 Source: Several assessments by FAO; Huliq "US envoy on South Sudan's economic potential" February 2007; and, BBC "Sudan, one country or two?" May 27 2011

and tree plantations are exclusively in Green Belt Zone encompassing Western, Central, and Eastern Equatoria which have the longest LGP in South Sudan.

According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged between a minimum of 1% and a maximum of 2% of the total land area – that is, from about 650,000 to 1.3 million hectares.[50] According to FAO-WFP reports, about 1 million hectares were put under cultivation in 2008. Cereals typically account for 80% or more of the cultivated area each year; for example, the area under cereals that was harvested in 2008 was about 850,000 hectares. Sorghum is the main cereal, followed by millet and maize. The average area culivated by these household is typically in the range of 1-4 feddans (0.4-1.7 hectares).

6.2.2 Rainfall, Land Use and Population Densities

Agriculture is predominantly rainfed with the level of annual rainfall rising from north to south and from east to west. As noted in Chapter 5, it ranges from less than 500 mm/year in the semi-arid lands of Eastern Equatoria to about 1,800 mm/year in the Green Belt zone. South Sudan experiences unimodal and bimodal rainfall regimes, the bimodal areas covering much of Greater Equatoria (Western, Central and Eastern Equatoria) while the unimodal areas characterize the rest of the country. Agricultural performance consequently varies considerably from place to place and from year to year, ranging from the possibility of two harvests per annum in Greater Equatoria between Tambura and Kejo-Keji, to one harvest in the unimodal areas further north.

The length of growing period (LGP) ranges from 280-300 days per annum in the southern parts of South Sudan to 130-150 days in the northern parts.[51] More than 70% of South Sudan has a LGP longer than 180 days and is, therefore, suitable for crop production, but as noted earlier, only a very small percentage of this area is actually cultivated each year. Classifying the aggregated land use by LGP shows that 27% of cropland in South Sudan is located in areas where agricultural potential is high (an LGP more than 220 days) and another 42% in areas with medium agricultural potential (an LGP between 180 and 220 days). The implication is that there is tremendeous potential to expand and scale up agricultural production by bringing more of the arable land into cultivation by smallholder and commercial farmers, introduction of appropriate modern farming technology and the use of higher yielding seeds.

As discussed in Chapter 1, the vast majority of the population lives in rural areas with low population densities. Even though the density varies widely, the average population density for South Sudan is estimated at 13 people per km^2 compared to 166 in Uganda, 70 in Kenya, 83 in Ethiopia, and 36 people per km^2 for Sub-Saharan Africa in 2009. Two states have a population density of less than 10 people per km^2: Western Bahr el Ghazal (3 per km^2) and Western Equatoria (8 per km^2), while five states have a density that lies between 10 per km^2 and 20 per km^2. Of these, Upper Nile has the largest cropland area nationally, but a population density of 13 per km^2. Three other states – Warrap, Northern Bahr el Ghazal and Central Equatoria – also have relatively high shares of the national cropland, but they have population densities of more than 20 persons per km^2.

A recent World Bank study finds that areas in South Sudan that have "high" and "medium" production potential based on the LGP have the highest population density.[52] According to Boserup (1965 and 1981), 50 people per km^2 is a threshold population that indicates the possibility of promoting agricultural intensification.[53] Map 6.2 sets out the spatial distribution of areas with high, medium and low agricultural potential and high, medium and low population densities. In South Sudan, there are high to medium population densities in areas of high and medium agricultural potential: the high agricultural potential areas have a population density of about 66 persons per km^2 while areas with medium agricultural potential have a population density of 54 persons per km^2. Although these areas presently have low per capita cropland values, they are likely to generate quick wins in terms returns from new public and private investments leading to expansion of cropland and increased agricultural production.

With assistance from USAID and World Bank, the National Government has formulated strategies for expansion of the areas under cultivation that takes into account the assessments of the agricultural potential in various parts of the country.[54] The objective of these assessments is to identify geographic areas in the country that can have a high payoff in terms of their development impact. Typically, the criteria used in identifying such areas include agricultural potential, access to markets, and density of population. For the purposes of this Report, this ongoing analysis has provided the basis for an indicative estimate of the prospects for expansion in cultivated areas in all 10 states. The results are set out in Table 6.2 below. The analysis suggests that the livelihood zones with large potential are the Green Belt, Ironstone Plateau and Hills and Mountains; the relevant states are Western Bahr el Ghazal, the three Equatoria states, Warrap, Upper Nile and Jonglei. As Table 6.2 indicates, the Western, Central and Eastern Equatoria states would account for almost 60% of the proposed increase in cultivated areas. Large amounts of additional land (26% of the proposed increase) would also be brought under cultivation in Jonglei, Warrap, and Western Bahr el Ghazal.

Table 6.2: Current and Proposed Additional Cropland for the Medium and Longer-Term
(In hectares '000)

State	Cropland			Share (%) of additional cropland	Cropland as % of state total	
	Current cropland	Additional cropland	Total cropland		Current cropland	Total cropland
Upper Nile	504.9	178.8	683.7	5.0	6.6	8.9
Jonglei	373.6	262.5	636.1	7.3	3.1	5.3
Unity	119.5	48.4	167.9	1.3	3.2	4.5
Warrap	405.4	318.2	723.6	8.9	9.4	16.7
Northern Bahr Ghazal	247.6	146.5	394.1	4.1	8.4	13.4
Western Bahr Ghazal	73.1	373.9	447.0	10.4	0.7	4.4
Lakes	248.2	183.0	431.2	5.1	5.7	9.9
Western Equatoria	317.0	977.7	1 294.7	27.3	4.1	16.6
Central Equatoria	313.9	878.4	1 192.3	24.5	7.3	27.6
Eastern Equatoria	77.6	219.1	296.7	6.1	1.1	4.1
Total	2 680.8	3 586.5	6 267.3	100.0	4.1	9.7

Source: Annex Table 7.1 and estimates by authors. Note: current cropland includes 10% of «grass with crops» and «trees with crops.»

An important unresolved practical issue at this juncture is the pace at which this land can be developed. The answer depends to a considerable extent on the extent to which the Government, with assistance from the donor community and private investors, address the existing constraints to agricultural expansion in South Sudan.

6.3 Key Challenges for the Sector

There are a number of major constraints to agricultural and rural development in South Sudan, in addition to those discussed in Chapter 1. In order to achieve sustained and broad-based economic development, these challenges/constraints must be addressed. Infrastructure improvement, provision of public goods and access to extension and veterinary services will be a crucial aspect of the Government's strategic response to these challenges. Notwithstanding the range of crops produced, agricultural production in South Sudan remains largely traditional with low yields. In the cereal subsector, for example, it is widely acknowledged that the vast majority of farmers do not use high yielding seeds nor do they use any synthetic fertilizer or herbicide. As Table 6.3 indicates, South Sudan's avergage yield is low relative to most other countries in the region, averaging only 0.97 tonnes per hectare during 2005-2009; it is far below the average of 7.64 tons per hectare in Egypt where the bulk of the cereals are grown under irrigation. These low cereal yields in South Sudan stem from a range of problems faced by smallhold farmers. A survey undertaken in 2006 by Ministry of Agriculture and Forestry, with support from FAO and the WFP, asked

Table 6.3: Cereal Yields (Tons per hectare)

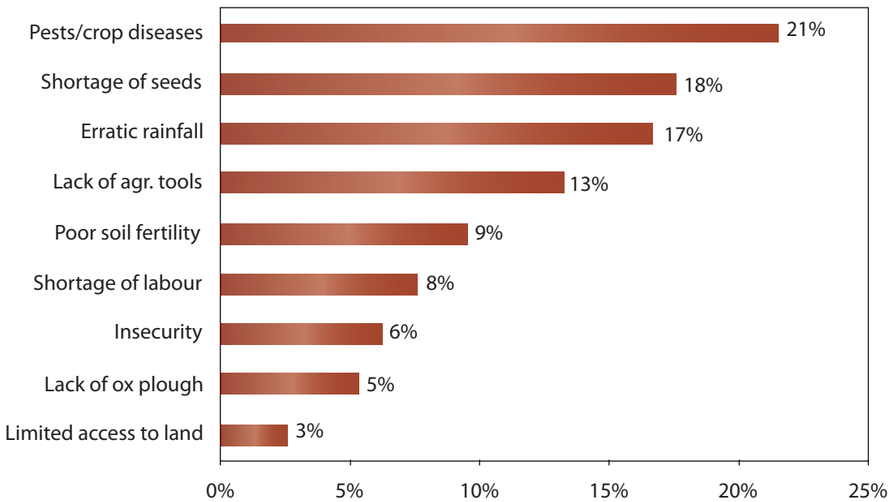
Country	Average 2005-2009
Burundi	1.31
Chad	0.78
DRC	0.78
Djibouti	1.64
Egypt	7.53
Ethiopia	1.49
Kenya	1.54
Malawi	1.58
Rwanda	1.11
South Sudan	0.94
Uganda	1.53
Tanzania	1.19

Source: FAO database and Table 6.5.

50 World Bank (2007), Final Proposal for a Multi-Donor Trust Fund Grant to the Government of Southern Sudan for the Support to Agriculture and Forestry Development Project (SAFDP), Washington DC, August 2007.
51 The length of growing period (LGP), defined as the number of days when both moisture and temperature conditions permit crop growth, is often used as a proxy for an area's suitability for farming. For example, an area with LGP 120 days per year (a dry or semi-arid area) may allow for no crops or for only one crop per year while an area with a LPG between 180 and 220 days per, (e.g., Green Belt Zone) may have multiple crops grown sequentially within one year.
52 World Bank (2011), "Strategic Choices of Realizing South Sudan's Agricultural Potential." World Bank, Washington DC, October 2011.
53 Rural population density varies positively with land productivity but only up to the point where overcrowding leads to land degradation.
54 See World Bank (2011) and USAID (2011), "Achieving Agricultural Growth and Food Security in South Sudan." Report prepared for USAID by McKinsey & Company, Discussion document, September 2011.

farmers what were their primary constraints to improving crop production. As Figure 6.1 indicates, pests and crop diseases, shortage of seeds and erratic rainfall were the three most important concerns.

Figure 6.1: Constraints for Crop Cultivation in South Sudan



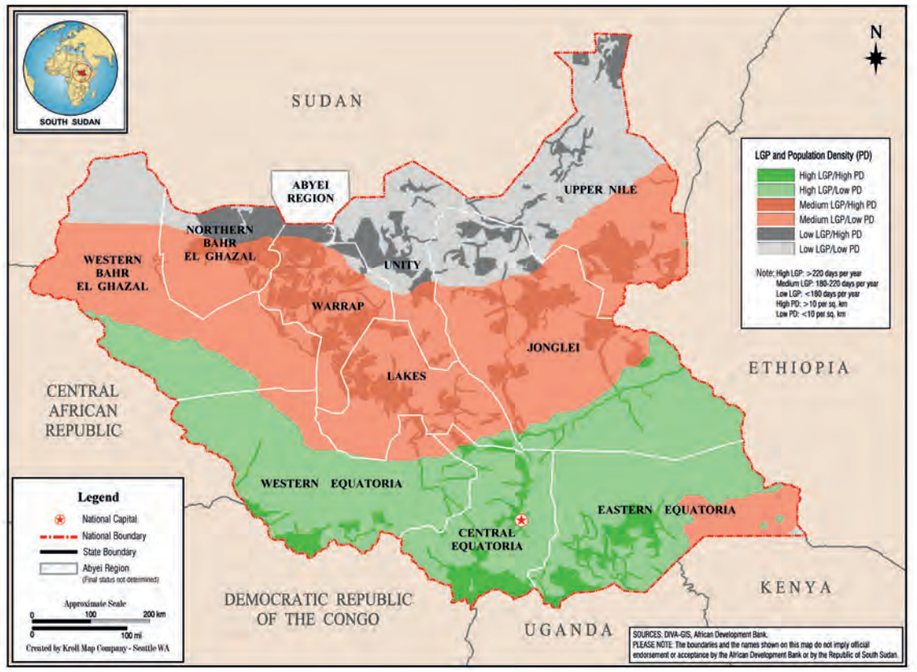
Source WFP-FAO-MAF (2006).

The wide range of challenges that face the sector today can be conveniently grouped around the following nine sets of concerns.

Weak entrepreneurship base and absence of commercial farming. Agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is in the range of 0.4-1.7 hectares. Intensive farming with little fertilizer application has progressively lowered yields and depleted soils. There are very few cooperatives and little commercial farming and/or the adoption of modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, livestock farming is dominated by culture and tradition that lack business orientation (cattle, for instance, are still raised for prestige and for dowry payments rather than for meat, milk, hides and other by-products). The private sector is nascent and has weak business management skills.

Weak or non-existent capacity to provide farm and off-farm extension services to farmers. A recent joint GOSS/FAO baseline survey report on agriculture and animal resources found that weak extension service support to agricultural and livestock farmers is a major concern for farmers throughout South Sudan. The public sector extension and veterinary/animal care services are extremely limited. Inspection services are weak in enforcing standards and lack equipment and training. There is lack of critical mass in the number of Community Animal Health Workers.

MAP 6.2: Spatial Patterns of Agricultural Potential and Population Density



Lack of agricultural productivity-enhancing technologies. There is little use of improved varieties of seed or breeds of livestock. Crop farmers save their seed for planting in the next season, and there is little selection for improved varieties. There is a need for improved varieties that are resistant to common diseases and which are more productive. The traditional livestock breeds could increase productivity by upgrading the genetic base, but market incentives to improve quality are lacking.

Poor and inadequate infrastructure. Lack of developed trunk and feeder roads (and, other types of infrastructure – railway/rolling stock, electricity and transport systems as well as ICT) inhibit movement of goods and services into and out of rural areas, increases the cost of transportation and dampen producers' incentives to generate surplus. The absence of rural and feeder roads and, therefore, access to domestic, regional and international markets is a key bottleneck to increased agricultural production. Similarly, the near complete absence of rural electrification limits the choice of farm implements and the adoption of modern farming techniques. These concerns are addressed at some length in the various sectoral chapters in Part B of this Report.

Weak markets and non-existent market information systems. As Chapter 10 indicates, South Sudan has yet to achieve the level of mobile voice and data telecommunication that is now commonly available in many rural communities in Africa. In addition, the absence of ICT in rural communities limits market information generation and dissemination. This also restricts market size, outreach and agricultural value chains development. Consequently the economic benefits of modern telecommunication still elude rural communities in South Sudan.

Paucity of microfinance facilities. Formal banking services are still extremely limited.[9] The Southern Sudan Microfinance Facility is a government sponsored private micro-finance umbrella agency that is attempting to foster micro-finance market development. Presently, only a few microfinance institutions provide minimal financial services in some market towns, but there are no financial services for the agricultural sector – for producers or for agribusinesses.

Weak farmer/producer organizations. Years of war and displacement of population have weakened or destroyed whatever farm cooperatives existed before. Some donor

55 Some commercial from banks in Kenya (e.g. Kenya Commercial bank and Equity bank) have opened branches in Juba and a few other towns in Southern Sudan. The portfolio is still narrow with no lending to the agriculture sector at the moment.

projects have worked with smallholders to organize themselves into groups, cooperatives or associations.[56] However, many of the producer members do not farm as a business, and decisions are not made based on cost/benefit basis. There is little ability to calculate costs of production and to use market information to determine if products will be competitive and profitable in markets. Extremely weak literacy and numeracy skills, particularly among women, are constraints to smallholders becoming commercialized.

Shortage of farm labor. Even though 90% of the population of South Sudan lives in rural areas, close to 80% of farm labor is provided by women who combine this activity with their other domestic chores. Farming is not viewed favorably (as a befitting profession) by young men and women, who often migrate to cities. In addition, farm labor, when available, is expensive and often lacks appropriate skills and the incentive to work. The expectation that many of the South Sudanese returning from Sudan would swell the ranks of farm works may not materialize in the absence of incentives for the returnees to settle and farm in rural communities. Besides, it is instructive to note that most returnees were not farmers previously; most were city dwellers and may, in the absence of incentives, have little inclination to move to rural communities and engage in farming activities.

Unclear land tenure and demarcation. The concerns about land tenure are discussed at length in Chapter 5. Large-scale farming requires access to land with unambiguous rights to profitably develop the land.[57] Under the 2009 Land Act foreigners are not permitted to own land, but can lease land for a maximum of 99 years; community lands may be allocated for investment purposes, but that investment must reflect an important interest for the community and contribute to economic and social development of the local community; and land acquisition of 250 fedans or more (104 hectares) must be approved by state authorities. Having a uniform national land law and transparent ownership rights and obligations will facilitate the decision of foreign investment in agriculture in South Sudan. In addition, given the predominant role that women play in farming, the laws must be gender sensitive and accord women the right to land ownership.

6.4 Strategy for Development of the Agricultural Potential

Developing the country's agricultural and livestock potential has been identified in the SSDP as the most feasible way to enable broad-based economic growth and food security in the short- to medium-term. South Sudan soils and ecological characteristics make the country suitable for the supply of wide range of agricultural products. Furthermore, the strategy envisages a South Sudan that would exploit opportunities to process food products and raw materials for value addition, job creation and increased earnings. The key drivers in the strategy for expansion of agricultural production are threefold: (i) expand substantially the area under cultivation; (ii) increase yields in areas that are already under cultivation along with ensuring high productivity on newly farmed lands; and (iii) expand opportunities substantially for production of marketable surpluses of livestock and fish products.

6.4.1 Strategy for Expansion of Cultivated Agriculture in South Sudan

There is, of course, a range of possible scenarios for the development of very large potential for exp ansion of cropland agriculture in South Sudan. For the purposes of this Report, one possible scenario for expansion of cropland has been considered. The total cultivated area would be increased from 2.7 million ha in 2010 to 4 million ha by 2020 and based on Table 6.2 above, perhaps 6-7 million hectares by say 2030 (Table 6.4). These increases in the cultivated area would come from bringing areas currently covered by forest, shrubs and grass under cultivation.

A two-pronged approach would be used in the decade ahead to develop this large potential for crop production:

- A larger share of the existing 2.7 million hectares of land that is cultivated periodically by smallholder farmers would be brought under continuous cultivation with improved access to markets, lower transport costs that reduce the cost of and access to inputs such as fertilizer and herbicides, use of out-grower models, and so on.

- A substantial investment would also be made in cultivation of new land by medium- and large-scale commercial farming operations, many of which would operate with out-grower models that would allow nearby existing or new smallholder farms to supply fresh foods and agricultural raw materials for processing by the commercial operation. (For example, sugar cane grown by smallholders, and processed by a central facility operated by a large-scale commercial operation.)

56 FAO through its Sudan Productive Capacity Program and GIZ have been actively helping farmers to form groups and associations.
57 In early 2009 USAID started up a new, 2-year land tenure program, which is helping to develop a new land policy for Southern Sudan.

Table 6.4: Indicative Plan for Cropland Development (In hectares '000)

Indicator	Estimate	Indicative	
	2010	2020	2030
Harvested area			
Cereals	921	1 880	2 800
Other crops	79	620	1 900
Total	1 000	2 500	4 700
Cultivated land under rotation	1 681	1 500	1 570
Cultivated area	2 681	4 000	6 270
Memo items:			
Irrigated area (ha '000)	32	400	1 000
Cultivated as % total land area	4.2	6.2	9.7
Harvested as % of cultivated	37.3	62.5	75.0
Irrigated area as % total harvested	3.2	16.0	21.3

Source: Table 2.7.

As discussed below, much more work is needed on the details of a possible strategy for cropland development for the next one to two decades. Therefore, the scenario presented here is largely indicative at this stage. In this scenario the total area of cropland harvested annually would increase from about 1 million hectares at the present time to 2.5 million hectares by 2020. A large part of the increase would be accounted for by increased cultivation of cereals, initially for the domestic market to address the ongoing food security problem, but later in the decade for export of surpluses to regional markets as well. The remaining cultivated areas would be used to expand substantially the production of high value fruits and vegetables for local and export markets, and other cash crops such as sugar, groundnuts and tree crops such as oil palm, tea and coffee. In this indicative scenario, the cultivated area would increase from 4.2% of the total land area at present to about 6.3% by 2020; however, the cultivated area that is harvested annually would increase from about 37% at present to 63% by 2020. This expansion in cultivated cropland would be supported with a substantial investment in irrigation in the decade ahead. The irrigated area would increase from a negligible 32 thousand ha at present (3% of the harvested area) to 400 thousand ha by 2020 (equal to 16% of the harvested area). Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area to about 6.3 million hectares by 2030.

Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area perhaps to about 6.3 million hectares by 2030 as in Table 6.4 above. In this scenario, the harvested area increases to 4.7 million ha, or 10% of the land area, with 75% of the total cultivated area being harvested annually. About 20% of the harvested area would be irrigated. This level of irrigation in the longer-term would almost certainly raise important issues for Nile Basin riparian countries regarding the use of water within the Basin.

More work is needed on the proposed strategy for the decade ahead (2011-2020) to determine: (i) the likely cost of bringing this additional land under cultivation in particular parts of the country; and (ii) the off-farm costs for roads, electric power and other infrastructure, and for off-farm storage and processing of products. The discussion below on infrastructure requirements for agriculture and the related discussions in other chapters of this Report provide insights into the off-farm development costs associated with these programs. In the case of on-farm costs, these may range from the equivalent of a few hundred US dollars per hectare for modest improvements to as much as $3,000 per hectare for the water distribution costs of large-scale irrigation projects. At an average of $500 per hectare, for example, the on-farm cost of bringing the additional 1.3 million ha of land under cultivation and improving capacities of the areas already cultivated could be in the range of $1 billion. At an average of $1,000 per hectare the on-farm development cost rises to $2 billion. Most of these on-farm costs would have to be borne by the private sector, either by smallholders or large-scale commercial investment, much of which would have to come from offshore investors. The mobilization of these levels of investment for agriculture represents another major challenge for the decade ahead.

6.4.2 Choice of Models for the Transformation of Agriculture

To achieve these objectives, given the small size of the South Sudan market, the strategy must be both domestic and export-oriented, contributing to food security, facilitating agriculture-supported domestic industrialization and maximizing exports. A high priority would be accorded to scaling up production of high value crops using adaptive technology and cost effective means of production. And, in order to achieve technical efficiency, resource allocation should be rationalized and output maximized. In addition, binding transport and other trade logistic constraints to market access must also be addressed.

Like Ethiopia, Ghana, Kenya, Uganda, Tanzania and Rwanda, South Sudan can enhance agricultural production and increase productivity by creating a conducive policy environment as well as making new and sustained investments in agricultural production and related supporting services including off-farm processing and infrastructure services. For a country such as South Sudan, which is seeking to transform its rich but barely exploited agricultural endowments, knowing what model of agricultural development approaches has or has not worked in other countries is advantageous. Box 6.1 summarizes the approaches taken by Ethiopia and Ghana. While every country is unique, with different ecological characteristics and agricultural practices, a key lesson from the experience of these two countries is that the Government of South Sudan will need to play an important role in fostering agricultural development.

Under the AU/NEPAD CAADP framework, it is the role of government, with assistance from its development partners, to articulate the sector development strategy, create an enabling policy environment, demonstrate commitment to promote the attainment of key targets and increase public and private investment to levels that will result in sustained growth in agriculture of 6% a year.[58] An integral part of an enabling environment is the provision of basic infrastructure and extension services. These investments would take the form of budget allocations by the government, as well incentive-driven private domestic and foreign direct investment.

Box 6.1: Models for Promoting Agricultural Growth: Experience of Ethiopia and Ghana

Ethiopian Model. Ethiopia is considered a leader in the use of strategic international (foreign) partner to promote agricultural development. Agriculture is the backbone of the Ethiopian economy, accounting for 85% of employment and nearly 50% of GDP. Since 1991, the Agricultural Development Led Industrialization Program (ADLI) has served as the vehicle for promoting agricultural modernization, national growth and poverty reduction. Through ADLI, agricultural development has resulted in significant commercialization and entrenchment of value addition in the agricultural sector, expansion of capital base and accumulation of investment and technology. At the federal level, the Agricultural Investment Support Directive (AISD), under the Ministry of Agriculture and Rural Development serves as a central office to facilitate land leases of 5,000 hectares (ha) or larger for investment purposes. AISD is the central depository of these plots and expedites the issuance of licenses, permits, and approval of all land leases. At the state and local levels, the relevant authorities provide extension services and facilitate access to micro-finance and technical assistance services and training for smallholder farmers and farmer cooperatives. The aim of AISD is to lease three million hectares of land for large-scale commercial farming. Since 2004, the agency has allocated 607,760 ha to investors (of which 157 projects are over 1,000 ha), realizing total investment commitment of approximately US$ 78.6 million. Foreign direct investors include a German bio fuel project; an investor in a livestock project (leasing 150,000 ha), and a Saudi Arabian government-backed company investing in rice and palm oil projects.

Ghana Model. In 2005 the Government of Ghana launched the Northern Ghana agricultural development program aimed at raising agricultural GDP, promoting national food sufficiency and raising smallholder income. The region was targeted because of its relative high poverty, large agricultural potential due to the existence of abundant uncultivated arable land, good water supply and yet low output yields. The region has agricultural high potential for import substitution in rice, maize and soy. The key targets of the program are: (i) double the per capita income of 250,000 farmer per year; (ii) increase cultivated land by 20% by end of program; (iii) achieve 70% food sufficiency in rice; and increase: agricultural GDP by $500 million/year, earmark $100 million public investment through the program and, attract $600 million private (domestic and foreign). The Government, with support from AGRA, mobilized financial and technical support from the World Bank, the African Development Bank, bilateral donors and domestic and foreign private investors. The program aims to upgrade all segments of the agriculture sector value chain by mobilizing private sector contractors to organize and empower smallholder farmers, produce aggregators and marketing agents. The Ghana program is built on five key principles: (i) The AU/NEPAD Comprehensive African Agriculture Development Program (CAADP) provides framework and the Northern Ghana Program the vehicle for national implementation of CAADP; (ii) agricultural transformation using pilot schemes in high potential areas and subsequently replicating and scaling up in other regions (Volta Region and Accra Plains); (iii) holistic and participatory, involving all stakeholders: government, local authorities, resourced smallholder farmers and farmer cooperatives; (iv) scaling up using private sector operatives, national and international; and (v) work with blueprints comprising detailed designs and execution modules, and delivery units.

Key components of the value chain for the Ghana model were as follows: (i) 200 warehouse entrepreneurs to operate as aggregators of smallholders; (ii) 25-35 private sector-led commercial farms using idle arable land- government facilitates land aggregation and allocation ensuring social equity; (iii) a nucleus farm/out-grower system for high-value crops; (iv) a transversal support system that included farm inputs, credit, infrastructure, and off-farm logistics; and (v) a credibly manned delivery unit under the Ministry of Agriculture to drive implementation.

As has been stated above, only 4% of South Sudan's estimated 320,000 km^2 or more of arable land is being cultivated mainly by smallholder subsistence farmers. The transformation of the agriculture sector will, of course, require that more cropland be brought under cultivation; it will also entail a holistic approach that encompasses recognition of the role of smallholder farmers and their associations as the nucleus that must be nurtured and strengthened. Above all, the strategy will be export-oriented and driven by foreign direct investors who will undertake the development of modern large scale farms with capacity to scale up farming as business units as well as train the small scale farmers; the establishment of holistic farm systems based on rain-fed cropping as well as irrigation systems that can prudently and profitably harness land and water resources to expand agricultural production, process and market value chain products in national, regional and global markets; enhanced market access by rural communities to urban centers, regional and global markets; and, transversal provision of extension and research services. Rising global demand for agricultural products and cereals, in particular, suggests that, if ever there was an opportune time for a strategic transition to a more efficient farming system in South Sudan, it is now.

6.4.3 Other Key Elements of the Strategy

Leadership and Alignment. To be successful, a lead agency must assume overall responsibility for the implementation of the strategy. As noted earlier, responsibility for promoting agricultural and rural development lies with four ministries. Effective implementation of the agricultural development strategy will require the establishment of a Joint Board or Steering Committee comprising the four ministries and the Ministry of Industry and Investment, with the later serving the Chair of the Steering Committee. Other relevant stakeholders must also be co-opted into the Committee.

Supportive policy environment. A conducive policy environment with incentive mechanism for domestic and foreign investment in agriculture value chain activities is a prerequisite for transforming the sector. Hence, the government should strive to enact policies and adopt regulations that promote and protect equitable private investment in arable land development, encourage market-driven seed production and distribution system, adopt a national investment codes and actively promote domestic and foreign trade in agricultural commodities.

Strategic International Partners in Agriculture. South Sudan's private sector is still nascent and domestic private investment in agriculture and livestock is hampered by traditional practices that lack market orientation. Successful implementation of the agriculture development strategy will, necessarily, require the stimulation of local investment in agriculture, which will take time to realize. At this point in time, South Sudan requires robust investment of capital in land and technology; this can only be realized through the attraction of strategic international partners, individual, institutions and even foreign governments willing to invest in agricultural land development, production of high value crops and the development of associated infrastructure.

Infrastructure. Years of war and benign neglect has left South Sudan with destroyed or neglected transport, power, water/sanitation, ICT and other infrastructure and support facilities. The need to rebuild the country's infrastructure is the subject of South Sudan Infrastructure Action Plan. The implementation of the recommendations of the Plan and agriculture transformation strategy will be key determinants of whether or not the country can transit from the present low production low productivity mode to a virile, diversified modern economic base that is driven by a transformed agricultural sector.

Delivery mechanisms. This will entail use of market driven organizations with policy and regulatory support from

58 Other African countries that have managed similar high agricultural growth rates for a decade or more include Morocco and Togo in the 1980s, and Benin, Cameroon, Malawi and Chad in the 1990s. Burkina Faso and Nigeria also had similar high growth rates during 2000-2005. See World Bank country database at www.WorldBank.org.

government. To this end, the attraction of the right type of FDI will bring with it efficient delivery structures such capital investment in off farm infrastructure (collection, processing and storage systems) and out-grower farmer organizations that ensures that smallholder farmers are integrated into the production and delivery mechanisms.

6.4.4 Expansion of Crop Production

Current status of crop production. As noted earlier, a wide range of food and cash crops is grown in South Sudan depending on the agro-econological zone. The Green Belt zone with the highest level of annual rainfall is the area with high potential for sustained crop production. The crops include casava, sorghum, groundnuts, sesame, maize, finger millet, cow peas, beans, pigeon peas, vegetables (onions, okra, tomatoes, cabbage, egg plant, cucumber and pumkins). Rice production was expanded under the Awei Rice Scheme which collapsed during the war. At the present time some rice production is continuing by farmers who adopted rice production outside the scheme. Coffee is also grown commercially and, there are a handful of tobacco farmers. Fruit trees include banana, plantain, pineapple, mangoes and citrus. Other crops include sweet potatoes, yams, and papayas which are grown for home consumption and sale in local markets. The proposed strategy would aim to encourage expansion in most of these activities, subject to access to profitable marketing opportunities.

Strategy for cereals production. The sub-sector is critical to the prosperity of South Sudan, given its importance in the livelihood of a vast majority of the population. The need to revamp the sector and significantly increase production is compelling for the following reasons:

- At the domestic level, South Sudan has the potential to be both self-sufficient and to become a major exporter of cereals. The main constraints to realizing this potential are largely internal and therefore, within the control of the policy makers: marginal use of available arable land, low and declining productivity due to poor farming methods, high marketing margins caused by poor infrastructure, and, proliferation of taxes. The removal of these constraints is not only feasible and within reach but will be transformative and beneficial to the country;

- The opportunity cost of not developing the sector is huge. Cereals, encompassing wheat, maize, sorghum and rice, among other grains, is a US$80 billion a year global industry and the average prices have risen steadily in recent years due to increasing demand from larger and more affluent societies, particularly China, the ever increasing demand for bio-fuels and rising demand for animal feed. These demand-pull forces, aided by erratic weather patterns, have outstripped impressive global technological advances, resulting in ever increasing food prices for rich and poor countries alike. With its agricultural potential, the country should be able to beneficially fill some of the huge global cereal supply gap.

Net production of cereal (i.e. less post harvest loss of 20%) stood at approximately 695 thousand tons while consumption was about 885 thousand tons, resulting in the importation of about 200 thousand tons (see Table 6.5). Not only does the shortfall constitute a serious food security challenge, but it also raises the risk of eroding external and fiscal balances, increasing food aid dependency and impeding development of the sector. Against this backdrop, the Ministry of Commerce, Industry and Investment, in collaboration with the Ministry of Agriculture and Forestry, proposed the following targets for the development of the cereals sub-sector by 2016: (i) increase the volume of cereals produced to 1 million tons; (ii) increase yields for cereals from 0.97 tons per hectare to 1.1 tons per hectare; (iii) increase the volume of cereal exports from the current level of 148 thousand tons to 1.5 million tons; and (iv) mobilize $350 million of FDI for commercial production of cereals for the domestic and international markets.

As noted earlier, production of cereals (and other crops) in South Sudan can be expanded by (i) increasing the area of cropped land; and (ii) raising productivity, that is, increasing the amount of production per unit area. The scenario outlined in Table 6.4 above is elaborated on in Table 6.5 below, which incorporates both of these strategies. This Report proposes a doubling of the harvested area of cereals in the decade ahead to about 1.88 million hectares and through improved farm productivity and reduction in the current high level of post harvest losses, raise yields from the current average of about 0.94 tons per hectare to 1.3 tons per hectare by 2020. These strategies, if successfully implemented, would increase cereal production (net of post harvest losses) from about 700,000 tons in 2010 to 2.4 million tons by 2020. Assuming a steady increase in cereal consumption per capita with improved supply conditions and livelihoods from about 100 kg per person at the present time to 130 kg per person by the latter part of the decade, South Sudan would meet domestic consumption requirements by 2016-2017 and then have an exportable surplus of cereals in the range of 600,000 tons a year by 2020. At recent international prices of about $300 per ton for maize and wheat, the value of cereal production would increase from about $200 million in 2010 to about $700 million a year by 2020, with an exportable surplus of a little under $200 million a year at that time.

Table 6.5: Projected Production and Consumption of Cereals in South Sudan

Indicator	Estimates		Projected					Growth (% p.a)
	2010	2011	2012	2013	2014	2015	2020	2011-20
Production								
Total available cultivated area ('000 ha)	2 681	2 694	2 746	2 754	2 835	2 991	4 000	4.1
Cereal area harvested ('000 ha)	921	500	939	986	1 060	1 166	1 880	7.4
Cereal area as % total cultivated	34	19	34	36	37	39	47	
Production ('000 tons)								
Gross								
Net	695	475	916	971	1 060	1 225	2 444	13.4
Imports/Exports ('000 tons)	(190)	(480)	(250)	(307)	(330)	(277)	614	
Consumption								
Cereal consumption ('000 tons)	885	955	1 165	1 278	1 391	1 501	1 830	7.6
Memo items:								
Net yield (tons/ha)	0.75	0.95	0.98	0.99	1.00	1.05	1.30	3.2
Per capita cereal consumption (kg)	93	95	110	115	120	125	130	3.4
Population ('000)	9 494	10 048	10 594	11 116	11 589	12 012	14 079	4.0

Source: Estimates by authors.

Strategy for production of high value fruits and vegetables. With its rich soil and favorable climate, several parts of South Sudan have enormous potential for competitive production of high value fruits and vegetable for the domestic and external markets. South Sudan smallholder farmers cultivate pineapples, mangoes, onions, tomatoes and yams. At the present time, the contribution of these fruits and vegetables to agricultural output is negligible; production has fallen dramatically and so has the export values of these products. Furthermore, the industry has only minimal commercial orientation. In general, due to infrastructure constraints producers have limited access to consumers beyond their local markets. As a result, decisions about area to be cultivated are often made on the basis of own household consumption needs, not market demand. Any surplus produced is usually sold or bartered for other goods in the local market. At the present time, the country is a net importer of these products, primarily from Kenya and Uganda, notwithstanding South Sudan's potential for producing high value fruits and vegetables, rising global prices for these items and an unmet regional demand.

Driven by globalization, technology and logistics, the market for high value fruits and vegetables has become global. Currently, trade in horticulture accounts for more than a fifth of global trade in agricultural commodities. The value of horticulture exports has risen from $ 82.5 billion in 2005 to over $ 122 billion in 2010.[59] Horticulture exports of Sub-Saharan Africa now exceed $2.3 billion, with Kenya, Uganda and Tanzania accounting for a sizeable share of this trade.

With its vast unexploited arable land and a favorable climate, South Sudan has high potential to prosper from participation in the global market for fruits and vegetables provided it is able to create the necessary transport logistics and associated cold chains and adopt a market-oriented system for commercial production. A successful transition from subsistence to a commercial model in these products would yield high returns for the country. However, having fertile soil and good climate are necessary, but not sufficient conditions for competitive entry into regional or global markets for fruits and vegetables. Fruits and vegetables are highly perishable and subject to high post-harvest losses if not preserved under ideal temperature conditions. As a result, competiveness in the sector is determined by the availability of adequate logistics, including cold chains, to move products to markets. Furthermore, a sustainable entry into the terminal market, mostly in Europe, Asia and the Middle East, requires fast, dependable and adequate transport arrangements that can move the products to the markets consistently and on a timely basis. Ever more demanding customers in these terminal markets require products that arrive consistently on time and are of the highest quality. In order to meet these conditions, it has become necessary for many fruits and vegetable suppliers to own or control the entire value chain from production through marketing as this allows the supplier to control the logistics without having to rely on third

59 UNCTAD Trade Statistics, 2010.

parties. Consequently, the industry is characterized by the dominance of large commercial firms with the capability and capacity to move products through the entire value chain, supplying high quality products to end markets consistently and on a timely basis.

In 2011, the Ministry of Commerce and Investment proposed the following key objectives for the industry: (i) increase exports from current levels of about $800,000 a year to $10 million a year by 2016; and (ii) attract FDI of $100 million to spearhead the development of the industry.

A three-pronged strategy has therefore been formulated for expansion of production of high value fruits and vegetables in South Sudan:

- Identification and attraction of the right kind of strategic foreign direct investment;
- Establishment and support of farmer cooperatives that can be linked to larger commercial farms; and
- Linking these commercial farms to regional and international transport and logistics networks.

Box 6.2: Expanding Horticulture Production: a Kenyan Example Company Profile: Homegrown Company Ltd.

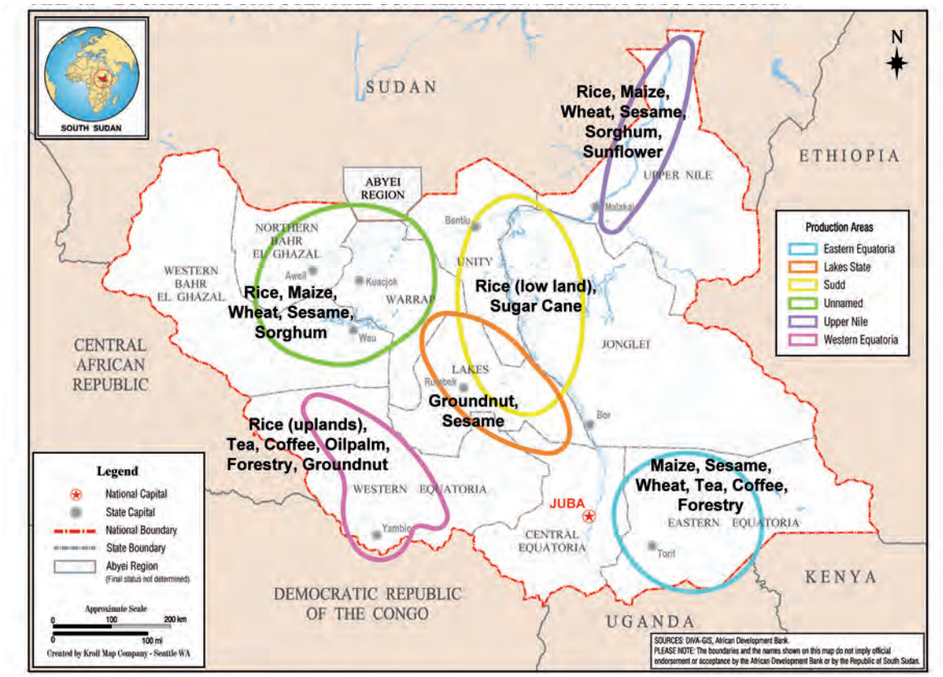
Homegrown is the largest vegetable exporter in Kenya. It is a success story of packaged horticulture produce. The company ventured into Kenya in 1982 and focused on processing and exporting vegetables to the United Kingdom. The firm's strategy has been the production and packaging of produce at the source for export directly to market without further packaging abroad. The firm operates its own nucleus of farm production units to meet a given level of demand, plus a network of farmers contracted to provide the balance. It is an out-grower model.

In order to ensure quality, and supply of fresh produce, Homegrown enters into partnership with local farmers to complement its own production. Through this partnership, the company is able to source about 25 % of total requirements and in some cases, such as French Beans, 100 % of the total requirement from independent farmers (as opposed to employees farming company land). Farmers are supplied with the latest farming technology, such as crop varieties and husbandry techniques. The provision of technical extension by the contractor has played a key role in ensuring that farmers are able to optimize production in both quality and quantity. Homegrown also supplies fertilizers, and agro-chemicals on credit to those farmers who need it, as many small farmers still find it difficult to obtain credit despite the importance of the sector. Kenya's financial market remains somewhat biased against agricultural production.

All farmers supplying to Homegrown must have a supply contract. The contract stipulates the specific commodity, the supply period, the desired quality and quantity, and the price. The system implies that farmers manage production schedules and the necessary inputs to meet the contracts. Farmers also agree to follow recommended crop husbandry practices to maintain required quality. Contracts allow Homegrown an assurance of production. The major constraint faced by the company is ensuring that farmers follow technical instructions so as to produce the required quality and quantity standards. This is especially important for those commodities in which the company is entirely supplied by contracted farmers. The EU market has exceptionally stringent standards for agricultural products; so there is very little room for error.

There are both benefits and constraints to Homegrown out-grower model. Farmers enjoy the benefits of an assured market for their produce, and an assured price for various grades of produce. Homegrown can assure farmers of a market for their produce because of its extensive knowledge of, and connection with, global buyers. Homegrown will also look after the logistics of the sale. The "just in time" nature of the business makes this a critical activity. However, Homegrown requires strict adherence to delivery schedules, agreed quantities and quality standards. The contract terms can be very demanding with little flexibility. Furthermore, farmers sometimes feel that the market price offered by the company is low compared to the prices for the final product, a tension that needs careful management to ensure all parties feel fairly treated.

MAP 6.3: Locations for Potential Commercial Investment in South Sudan



The MAF has recently outlined a more detailed program for private investment in high value fruits and vegetables (as well as for cereals and tree crops such as oil palm, tea and coffee). Map 6.3 highlights the locations where these investment opportunities may be pursued.[60]

The foregoing strategy is informed by the characteristics of the market as well as lessons drawn from the experience of Kenya and other Sub-Saharan countries. Kenya is a successful exporter of fruits and vegetables, and is presently the leading all-season supplier of high quality horticultural products to brand name supermarket chains in the EU and several other countries in Europe. The sector has had phenomenal growth rates averaging over 15% a year with consistently rising annual sales, which reached $330 million in 2010.[61] As of June 2011, as many as 22,000 smallholder Kenyan farmers were engaged in export-oriented horticulture, with over 17,000 persons employed by firms across the horticulture value chain. The industry has made a transition from the dominance of an amalgam of smaller farmer/local exporter selling their produce to independent importers in Europe to a fully integrated sector controlled by a few large farms controlling the value chain and selling directly to large supermarkets in the importing countries. These firms are able to: (i) provide the logistics at a level that ensures economies scale in operations; (ii) meet the demand preferences of supermarkets who prefer to deal with a small, but well organized and integrated suppliers; and (iii) adhere to the stringent quality assurance (phytosanitary standards) requirements of importing the countries.

The Kenyan model for development of a high value fruits and vegetables market is built on the following seven key elements.

- *Policy of openness to FDI:* The government has enacted laws and adopted legal frameworks such as the abolition of export and import taxes, allowing residents to open foreign currency denominated accounts and liberalizing borrowing regulations for domestic and foreign companies. In response to these incentives, new investments have been attracted from India, China, United Kingdom, Italy and Germany. Due to its openness, Kenya, as a member of the East African Community and COMESA, now serves as the business hub for investors in Eastern Africa.
- *Upgrade of human capital:* Kenya has moved from low cost labor force to one with critical mass in the

60 See Hon. Betty Achan Ogwaro, Minister of Agriculture, "South Sudan: The World's Newest Investment Destination." Presentation to the AgriBusiness Forum, Johannesburg, South Africa, 19th October 2011.
61 USAID DIA report, 2011

number of workers with skills and technical expertise, capable of meeting the human resource needs of the firms in the sector. Investors point to a competent and motivated and productive labor force,

- *Build key infrastructures:* Kenya has a good network of roads (trunk and feeder) that leads to ports (Mombasa) and Jomo Kenyatta International airport with modern cold storage and freight handling facilities. Kenya's export processing zones (EPZ) boast of good supply water, electricity and ICT.

- *Decrease investment risk:* Although Kenya is still experiencing high level of corruption, there have been improvements as reflected in Kenya's ranking in the World Bank Doing Business Index. Kenya laws recognize and protect property rights and the enforcement of contracts. Furthermore, the level of communal violence has decreased in the aftermath of the 2007 election crises.

- *Create business friendly institutions and support industry:* In order to diversify its economic base Kenya created the Industrial and Commercial Development Corporation (ICDC) and the Development Finance Company of Kenya (DFCK). Both organizations provide loan and equity financing. Furthermore, while providing facilitating leadership, the government has allowed firms to operate without undue government intervention or bureaucracy.

- *Improve on natural resources:* Although Kenyan horticulture firms engage in crop production, they have engaged in value adding production system and product transformation such as increase fertilizer use, all season cropping through irrigation farming, and product upgrading through packaging and processing such as canning, drying and freezing.

- *Expand extension services and encourage private sector and civil society organizations:* Kenya farms enjoy a high level of extension services from the Ministry of Agriculture and Rural Development and Kenya Export Development Support (KEDS) and Kenya External Trade Authority, which is responsible for the overall policy direction. The government also provides support to the Kenya Agricultural Research Institute (KARI), the Fresh Produce Exporters Association of Kenya among others.

6.4.5 Development of the Livestock Industry

Current status of the industry. Livestock production represents a significant proportion of agricultural activity in South Sudan. The main populations of livestock are cattle, goats, sheep and poultry: the main products are meat, dairy products, hides and skin and eggs. Livestock production, especially cattle, is undertaken in the more arid and semi-arid zones such as East Equatoria. Livestock systems are either normadic pastoralist or mixed crop-livestock systems and are a major source of livelihoods, especially in the floodplains and the semi-arid pastoral areas. Table 6.6 shows the estimated livestock population by state. According to these estimates there are almost 12 million cattle, 14 million goats and 13 million sheep in the country. This population is equivalent to about 2.6 animals per hectare of grassland in South Sudan as a whole and 1 animal per hectare of grassland and savannah. These population densities per hectare are relatively high.

Table 6.6: State Distribution of Livestock in South Sudan (In thousands)

State	Cattle	Goats	Sheep	Total	
				Number	Share (%)
Upper Nile	990	651	447	2 088	5.4
Unity	1 189	1 511	1 784	4 484	11.7
Jonglei	1 475	1 423	1 227	4 126	10.7
Northern Bahr el Ghazal	1 590	1 306	1 658	4 554	11.9
Western Bahr el Ghazal	1 256	1 184	1 139	3 579	9.3
Lakes	1 320	1 252	1 489	4 061	10.6
Warrap	1 539	3 131	1 392	6 061	15.8
Central Equatoria	883	1 286	1 173	3 342	8.7
Eastern Equatoria	895	1 042	1 152	3 088	8.0
Western Equatoria	680	1 189	1 152	3 020	7.9
Total	11 816	13 974	12 612	38 402	100.0

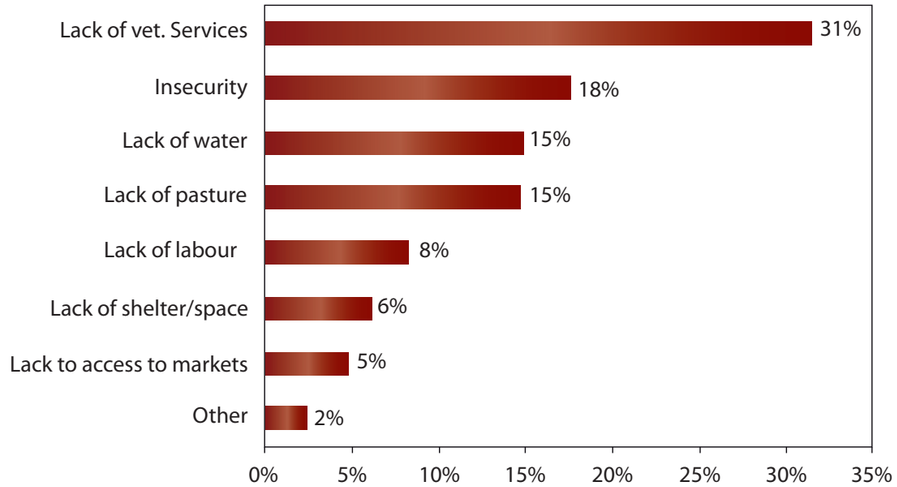
Source: FAO, South Sudan, 2010.

Livestock is an important economic asset, in addition to having a huge cultural value. Ownership of cattle is also a risk mitigation tool for pastoralists and farmers, the latter continually facing uncertainty caused by crop failure. Data from the Ministry of Animal Resources and Fisheries as well as the Food and Agricultural Organization (FAO) indicate that about 85% of South Sudanese households own one or more animal. This suggests that South Sudan has approximately 1.1 million livestock farmers.

Even though livestock is ubiquitous across South Sudan, from the southern equatorial forests to the arid and savannah north, the commercial value of livestock remains negligible. The estimated value of livestock production and products suggest that the income generated currently stands at about SDG 1.4 billion annually, equivalent to only 20% of the sector's potential. Market value is limited to the sale of red meat, mostly within the immediate local rural market and adjacent urban centers, particularly Juba, Yei and Malakal; some livestock is also sold to Sudan. Several years back South Sudan exported cattle to Uganda and Kenya and through the Port Sudan to Saudi Arabia and other regional markets. Paradoxically, South Sudan currently imports meat from Uganda in spite of having the largest number of livestock per capita in Africa.

Major challenges facing the livestock industry. Perhaps, the single most important challenge to the transformation of the industry is social model, which circumscribes market orientation and limts value chain exploitation. Currently, livestock in South Sudan is not viewed as an industry as much as it is a deeply rooted cultural phenomenon that represents the very fabric of South Sudanese society. The livestock ownership is not measured by the market value of the animals; instead, it represents a status symbol that commands respect of the community and provides the owner with a source of nutrition and the ability to settle marriage dowry. Occasionally, cattle owners sell some stock, usually from his/her very old (oxen) stock to generate supplementary income. Consequently, only a small fraction of the commercial value is currently being realized.

Figure 6.2: Constraints to Livestock Production in South Sudan



Source: WFP-FAO-MAF 2006

The prevailing social model is not only a hindrance to growth and poverty reduction in the country, but represents a significant opportunity cost, in terms of lost growth and income. It is also a risk to food security and sustainable development of the country's natural resources. Projections of South Sudan population growth and domestic and external demand for livestock and livestock products highlight the urgency to transform the current social model into one with a commercial orientation. Furthermore, as the livestock population increases, there will be more pressures on grazing land and water resources, heightening the prospects of more conflicts

among pastoralist and between pastoralists and farmers as they compete for limited fodder and water resources. Transforming and commercializing the sector is, therefore, an urgent necessity. Achieving this transformation will require, in addition to a mindset change, the alleviation of other constraints facing the sector.

The above-mentioned 2006 survey undertaken with the support of FAO and WFP identified a number of concerns among livestock producers, the most important of which was the lack of veterinary services. As Figure 6.2 indicates, 31% of producers cited lack of these services as their main concern.

Even though changing from the social model is the paramount obstacle to transforming South Sudan's livestock sector into a commercial orientation, several other constraints must be addressed if the sector objective is to be realized. Looming among these other constraints are the following:

- *Weak off-farm infrastructure.* In addition to generalized paucity of basic infrastructure such as roads (trunk and rural/feeder), South Sudan suffers from inadequacy of livestock markets where farmers trade their livestock. Given the size of the country and the dispersion of farmers over a wide area, there is need to create several more markets with the necessary facilities.

- *Insecurity and cattle rustling.* Even though the war with Sudan has formally ended, South Sudan is still faced with pockets of internal insecurity from ethnic conflicts and the existence of factional militia. In addition, cattle raids are still pervasive. Both factors combine to impede trade and limit investment, circumscribing the development of the livestock sector.

- *Lack of trust.* Inter-communal strife and low level of trust among South Sudanese constitute a hidden tax on transactions. In the livestock sector, the absence of trusts can hinder the formation of farmer cooperatives and the establishment of partnership in value chain exploitation.

- *Poor breeds.* The prevalence of domestic genotype livestock breeds limits the productivity and yield of the sector. Almost all livestock in South Sudan comprises of the Toposa and Ingessana indigenous breeds, which have not been upgraded for many generations.

- *Poor animal health.* The prevalence of animal diseases limits the market value of livestock and represents a binding constraint on exports of South Sudan livestock. Rampant existence of tse-tse fly and recurrent outbreaks of Rift Valley Fever effectively quarantine livestock to local markets. Low availability and access to adequately qualified animal health service providers and poor animal husbandry practices among farmers lead to low births and high mortality rates for both young and mature herds, resulting in low yields

- *Inadequacy of animal feeds.* South Sudan livestock suffer productivity losses due to poor animal nutrition doe to poor or inadequate grazing practices, poor pasture and water management and lack of supplement in animal diet.

- *Nascent private sector and low level of entrepreneurship.* The private sector in South Sudan is under developed and lack entrepreneurship, stifling the formation and management of agric-business in general and livestock operations, in particular.

- *Challenging economic policy environment.* Several policy factors inhibit growth of the livestock sector. These include: (i) inadequate and high cost of labor; (ii) high transportation costs; (iii) unclear land tenure; and (iv) high and multiple taxation.

Box 6.3: Insights from the Development of the Livestock Industry in Ethiopia

In 2006 Ethiopia had close to 45 million head of cattle, which is continuing to expand rapidly in number. Ethiopia is currently the largest livestock exporter in the Eastern Africa representing about 10% of the country's export earnings, which amounted to US$165 million in 2007 with strong showing in live animal sales, meat and hides and skin exports. Export destinations are diversified and include regional markets, Kenya, Somalia, Egypt and Sudan and global destination, primarily: Saudi Arabia, UAE for live animals and meat and, UK and China for hides and skin.

Ethiopia's exports are driven by small-scale pastoralists and livestock cooperatives that work closely with private sector value chain operators – all with a strong trading mindset; the country has very few large-scale livestock farmers. The government has played a support role in the industry, including: (i) enforcement of animal health and product quality standards, deregulation of domestic prices, liberalizing foreign trade; providing institutional support for the export sector; (ii) promoting a liberal investment climate; and (iii) with the support of state governments, providing access to grazing pastures. With support from the central and state government, support institutions have been created such as high quality SPS labs, an extensive research and development platform that includes several veterinary faculties, and colleges for the training of farmers, health workers and service providers.

Strategy for expansion of the livestock industry. The livestock industry in the country has a very substantial potential to emerge as a major food product industry in the decade ahead. The Government has identified the industry as a principal axis for making agriculture the engine of growth and poverty reduction in the country. Under the medium-term industrial strategy (2011-2016) outlined by the Ministry of Commerce, Industry and Investment in 2011 the key objectives for the livestock sector are: (i) increase domestic sales of red meat from the current level of about $200 million to $250 million a year by 2015; (ii) expand the number of primary markets for livestock from 117 at present to 380 by 2015; and (iii) develop an export market for red meat, with sales of $50 million a year by 2015.

As with programs for cereals production, South Sudan can draw on the experience of Ethiopia for the design of its livestock program (see Box 6.3 above). However, the design of the program must also address the unique constraints facing the sector in South Sudan, particularly with respect to the imperative for a paradigm shift from the social to a market mindset model. A three-tier approach is proposed for attaining the objective: (i) changing mind-set using a versatile and context relevant information communications campaign; (ii) the creation of a market-based platform; and (iii) with government support, creation of a private sector driven value chain system that focuses on production.

- *Launching a national campaign to change mind-sets in local communities.* Changing to market and commercially oriented mindset is the single most important factor for the development of the country's livestock sector. Unlocking the enormous commercial potential of the industry will entail a transformational cultural change from the current social model of acquisition and conservation to a commercial market model that monetizes stock through market-based transactions. It will entail the use of a detailed focus group that does the following:

    - Identifies the target audience which is all citizens, particularly livestock farmers.

    - Conveys a clear message that development of a commercial livestock industry will enhance economic welfare.
    - Identifies change agents. These will include commercially oriented farmers, key government advocates, committed community leaders, logistic providers, and niche markets that can benefit livestock producers.

    - Highlights successful cross-border livestock examples, including Ethiopia, Kenya and Uganda.

    - Establishes and disseminates information on structures to help farmers, including for example, extension services and transport logistics.

- *Creating a market-driven commercial platform.* This will entail establishment of several primary markets for the sale of animals, the exchange of information between farmers, traders, agents and slaughterhouses. The objective here is to bring market players together in an integrated system to improve the value chain for meat production. The system should be built around the existing commercial trading market centers, including industry working groups in Greater Kapoeta region in Eastern Equatoria, Nyrol and Pibor Counties in Jonglei, Nasir, Baliet and Renk in Upper Nile; Panyinjar, Mayon and Leer in Unity; and Terekeka in Central Equatoria. With support from the Ministry of Animal Resources and Fisheries, the working groups should include all segments of the meat production value chain, including operators of slaughter houses, traders and market agents. The Chamber of Commerce could play a key role in facilitating the working group. Such a market-driven system will value and price animals according to their potential for high meat and hides quality, sending a tacit message to farmers about the value that the market places on the intrinsic quality animals.

- *Creating a sustainable value chain, emphasizing production of high quality livestock.* The low quality of breeds, poor animal health practices and low quality of animal product safeguards constitute the main technical challenge because of the impact they exert throughout the value chain. In addition, the government should rein in cattle rustling and improve infrastructure logistics. A key imperative for creating a strong value chain hinges on the production of high quality market-bound animals. Hence emphasis should be placed on:

    - The enactment of policies and regulatory initiatives to raise the quality of cattle and meat. This will entail the adoption of international SPS standards.

    - Improvement of animal husbandry, including technical assistance through the provision of a critical mass of experts who are paired with community animal health workers, and extension service officers that cover all aspects of animal husbandry – from training of farmers to ensure proper feeding and breeding of animals to the establishment of modern slaughter houses and cold storage.

    - An overt effort to produce high quality animals. Government could initiate a time-bound price

subsidy program with a minimum price offer for animals that meet international quality standards. This may entail entering into sales contracts with guaranteed prices. The subsidy should be phased out as soon as market agents are entrenched and equipped to handle grade classification and pricing animals based on quality.

- Create quality and reliable infrastructure to enhance timely market access of farmers. The access should include both backbone infrastructure and feeder roads that reduce transport costs and ensure timely arrival of products to the market as well as cold storage and other facilities.

- Launch a robust survey of regional and international markets to determine demand requirements and develop an action plan to meet the needs of these markets. Given the limited size of the domestic market, a central thrust of the marketing strategy will entail the development of external niche demand markets mimicking relevant elements of the Ethiopian market diversification model.

For the purpose of estimating the water requirements of the livestock industry for the water demand analysis in Chapter 5, Annex Table 6.4 assumes that the livestock population will grow at 3% a year in the decade ahead, with the total population of cattle, sheep and goats exceeding 50 million by 2020. It is by no means certain that the livestock population will grow in this manner, but if it did, livestock densities in South Sudan would rise in the decade ahead, also driven in part by the proposed expansion in cultivated areas. These potential land pressures will require close attention to the manner in which the commercial livestock industry is developed. With a major expansion in commercial farming, it may be that an increasing large share of the livestock population does not migrate but becomes more fully integrated into farming operations that combine cultivation and sale of animals for meat production and into the development of grazing reserves that combine forest reserve management with livestock farming, or integration of livestock farming with tree crop agriculture, including for example, oil palm, cashews, coffee, citrus and mango. In addition to forage found under these plantation crops, products from the tree crops can also be used to increase feed supply for livestock.[62]

6.4.6 Fisheries and Forestry Development

Fishery development. According to a 2010 baseline survey report on agriculture and animal resources in South Sudan, about 14% of households in South Sudan, particularly those in the Sudd area along the River Nile and its tributaries, engage in fishery as a means of livelihood.[63] Detailed statistical data for the industry does not exist because no field assessments have been undertaken; however, the fisheries production potential is believed to be in the rage of 100,000 to 300,000 metric tons per year. This is based on combined water surface area of 90,000 square kilometers of the River Nile. According to an FAO (2008) report, aquaculture development may have vast potential in the Central, Eastern and Western Equatoria states, in the Northern and Western Bahr El Gazal states, as well as in Warrap state. In addition to river and lake fishing, there is significant potential for fish farming in South Sudan that remains to be exploited.

The main constraints to fisheries development in South Sudan are the absence of policy incentives, lack of storage facilities due to weak or total absence of power supply and the absence of effective processing technologies. In addition, inadequate transport infrastructure which limits producers access to markets, is a deterent to fisheries development in South Sudan.

Table 6.7: Forest Land in South Sudan (Hectares '000)

Land use category	Area	Share (% of total)
Forest reserves	640	3.1
Forest plantations	23	0.1
Other forested areas	20 079	96.8
Total	20 742	100.0

Source: Table 6.1 and government sources.

62 The integration of livestock into tree crop farming has been studied in some detail in Asia and the Americas, for example, but there has been very little done on these possibilities in Africa. See, for example, FAO, "Integrating Crops and Livestock in West Africa." Chapter IV. FAO Corporate document Repository. www.fao.org/DOCREP/004/X6543E/X6543E04.htm.

63 The Joint Baseline Survey Report of the Agriculture and Animal Resources in South Sudan by GOSS/FAO with financial assistance for the European Union. A table summarizing the key agriculture baseline survey indicators as attached as Annex 1.

Forestry. South Sudan has diverse natural forests and woodlands, making it one of the richest areas of concentrations of biodiversity in Africa. It is estimated that natural forests and woodlands of South Sudan cover a total area of about 207,422 km2 or about 33% of the total land area. These moist forests contain valuable commercial products, including cabinet grade timber trees such as mahogany, ebony and teak, among others. In addition to the direct benefits in the form of income, food and fodder for wildlife and domesticated animals, the forests provide many vital indirect benefits in forms of environmental protection (shade, wind belts), improved agricultural production (from increased soil fertility through mulching and nitrogen fixation) and food (Shea butter and wild fruits and fodder for wildlife). As Table 6.7 indicates, forest reserves account for only 3% of the total forested area of the country and commercial plantations are negligible accounting for about 0.1% of the total forested area.

The main challenges to the existing natural forests and woodlands in Southern Sudan include: forest base degradation from wild fires; overgrazing and over cutting of trees during successive wars. According to a MAF-GOSS 2006 report, the productivity of South Sudan natural forests and woodlands is low and declining due to shallow soils found in many areas and intermittent droughts, which limit tree growth. The absence of a strong forestry management, policy and regulations, has also contributed to degradation and inefficiency in forestry development and exploitation.

6.4.7 Infrastructure Requirements for Agriculture

The availability of arable land and favorable climate is a necessary, but not sufficient condition for successful development of the sector. A critical requirement is the availability of logistics, including key off-farm infrastructure, to facilitate timely and cost-effective movement of products to domestic and international markets. The required infrastructure includes, for example, trunk and feeder roads, airports with regular fights to market destinations, cold chain facilities that include cold storage at airports and other destinations, reliable road transport services at competitive freight rates, prompt customs clearance for exports and key agricultural inputs that must be imported,. To compete effectively in regional and international markets and against imports of agricultural products from neighboring countries, and attract the large amounts of FDI that will be required, South Sudan must have the ability to facilitate the provision of essential off-farm infrastructure. The key requirements include the following:

- A network of market access roads: trunk roads as well as rural/feeder roads.

- Off-farm storage and processing facilities.

- Cold chain facilities, including cold storage at airports and other locations throughout the country.

- Reliable supplies of electricity and water

- Airfreight processing stations key airports that can operate 24 hours a day.

- Reliable and economically affordable road and air freight to the main consumer centers in the region and overseas.

- Access to low cost communications networks.

- Adequate supplies of skilled labor.

Some of these facilities would be provided by the national or state governments and some by the private sector. As the discussion in the next Section indicates, where appropriate the latter should be integral parts of the proposed SIAP agreements with potential investors.

Transport requirements for agricultural development. The transport requirements of the country and proposed action plan for addressing these requirements is discussed at some length in Chapter 7. In sum, the current road network is fragmented with many roads unusable during the rainy season. Transport typically entails long travel time and high prices. These shortcomings impede access to rural and agricultural production areas, leaving them isolated from markets for more than half of the year. There is substantial evidence that investments in roads and improved road connectivity positively affect agricultural productivity and output. Experience from other countries in Sub-Saharan countries indicates that a relatively low level of road infrastructure and long average travel times result in high transaction costs for sales of agricultural inputs and output that, in turn, limits agricultural productivity and growth.[64] However, remoteness and demand constraints may not be the only factor limiting production. Improved roads will not reduce transport and marketing costs significantly in the short-term if transport and trade services are not competitive or volumes of marketed products are small. Similarly, production increases may not be forthcoming in the absence of availability of credit, land tenure arrangements that encourage investment and government policies that increase risk.

The Government is keenly aware of the poor state of the road network and of the fact that lack of rural connectivity

64 See Dorosh, Paul et al. (2009), Crop Production and Road Connectivity in Sub-Saharan Africa: A Spatial Analysis. Africa Infrastructure Country Diagnostic, World Bank, Washington DC, Working Paper 19, February 2009; and Doroash, Paul et al. (2012), "Road Connectivity, Population, and Crop Production in Sub-Saharan Africa." Agricultural Economics 43 (2012), pp.89-103.

(trunk and feeder roads) is the binding constraint to agricultural transformation and growth in South Sudan. It is the inability to connect rural communities to urban, regional and global markets that severely constrains economic growth and poverty reduction, particularly in the rural areas.

Rural connectivity measures the access to means of transport, particularly roads by rural communities. Rural connectivity is measured in the following conceptual ways:

- *Rural Accessibility Index (RAI):* A social-oriented measure that is computed as the share of the rural population living within two km of an all-season passable road.
- *Market Accessibility:* An approach used by the African Infrastructure Country Diagnostic studies (2009) focuses on market accessibility of agricultural production zones.
- *High Population-High Agriculture Potential Measure:* Advocated by the World Bank in its recent report on the agricultural sector of South Sudan, this is a composite measure of accessibility to the road network by areas with both high population density and high agricultural potential.

Table 6.8: Distribution of Road Network by Zones of Agricultural Potential (kilometers)

Agricultural potential zone	Interstate roads	Other primary	Secondary roads	Tertiary roads	Total roads
HH	389	1 249	1 004	887	3 529
HL	485	641	1 570	1 416	4 112
MH	582	874	1 121		2 577
ML	276	939	1 193		2 408
LH	443	373	535		1 351
LL	522	400	862		1 784
Total	2 697	4 476	6 285	2 303	15 761

Source: World Bank (2011).

The development and rehabilitation of roads in areas with the highest agricultural potential and population density would have a high development impact, allowing small scale farmers to expand production and compete with food imports in the short-run and commercial firms to penetrate and conquer cross-border market and compete effectively in global markets in the medium- to long-run. To facilitate an assessment of the actions needed to improve rural connectivity, the portion of the national road network that is located in each of the six zones of agricultural potential has been estimated. As Table 6.8 indicates, about 10,220 km of roads are located in the three zones with a high agricultural potential (HH, HL and MH) – equivalent to about 65% of the national network, using the World Bank estimates for the size of the national network, which are somewhat larger than the estimates used for this Report in Chapter 7.[65]

For the purposes of this Report, the High Population-High Agriculture Potential Measure has been used to formulate a strategy and action plan to improve rural connectivity in the decade ahead. The approach emphasizes the need to invest in roads in areas with high population density and high potential for agricultural production. Under this approach, priority access is given to regions or area with "high production potential and high population density" (HH), "high production potential and low population density" (HL), and "medium production potential and high population density" (MH). The objective is to achieve a high Cropland Connectivity (CLC).

Application of the RAI Index with a 2 km requirement for access to the interstate primary road network of South Sudan results in a CLC Index measure of 39%. About 18% of the rural population and 7% of the currently cultivated areas of high agricultural potential are within 2 km of the all season primary road network. This level of rural connectivity was judged to be too low. However, if the rural population and high potential agricultural land that is within 5 km of an all-season road is used, the CLC Index measures 64% for that part of the country that is classified as having high agricultural potential. About 51% of the total cropland and 71% of the rural population in these high potential areas would be within 5 km of all-season roads. This level of road access is judged to provide the basis for a strong agricultural supply response.

65 The road network data used in the recent World Bank study differ from that used in Chapter 7 of this Report. See Annex 8 for a discussion of these differences.

Table 6.9: Length of Road Required for Rural Connectivity Target (In kilometers)

Road category	Required all-season roads	Total roads	Required as % of total
Interstate primary roads	2 697	2 697	100.0
Other primary roads	2 764	4 476	61.8
Secondary roads	3 695	6 285	58.8
Tertiary roads	2 303	2 303	100.0
Total	11 459	15 761	72.7

Source: World Bank (2011)

To provide this level of access to an all-season network of roads, about 11,460 km of existing roads would need to be converted to all-weather status, either as paved roads or all-weather gravel roads. This includes the above-mentioned 10,220 km of roads in the zones with high potential and the balance of 1,240 km of the interstate road network. Such a program would convert about 73% of the existing road network in South Sudan to all-weather status. Analysis of the location of these roads relative to the land areas that are classified as having high potential for agriculture indicates that the bulk of the roads are in the three Equatoria states and Jonglei. These four states account for almost 80% of the all-weather road network required to meet the rural connectivity target. Most of this proposed all-weather network is located in the Greenbelt (34% of the proposed network), the Hills and Mountains agro-ecological zone (22%) and the Pastoral zone (21%). As Table 7.7 in Chapter 7 indicates, the proposed program put forward in this Report to improve road connectivity in the decade ahead calls for the upgrade of 14,560 km of road to paved and all-weather status, including a notional allocation for 2,180 km of tertiary roads pending the results of the ongoing inventory of the road network that will determine the actual length of the tertiary network in place today.

Additional road development targeting areas with high potential for irrigation-based commercial agriculture should also be prioritized and rehabilitated on the merit of the expected high pay-off in terms of agricultural expansion, employment creation and technology transfer. As Map 6.4 indicates, areas with high irrigation potential for possible development in the decade ahead include areas of Western Equatoria, Eastern Equatoria, and parts of the Western Flood Plain Zone, including Northern Bahr el Ghazel and Warrap

Table 6.10: Proposed Distribution of All-Season Roads for Enhanced Rural Connectivity (In kilometers)

State	Interstate roads	Other primary	Secondary roads	Tertiary roads	Total roads	Share of total
Upper Nile	-	9	17	-	26	0.2
Unity	-	72	15	-	87	0.8
Jonglei	84	553	660	590	1 886	16.8
Northern Bahr el Ghazal	200	72	126	-	397	3.5
Western Bahr el Ghazal	286	75	140	-	501	4.5
Lakes	575	69	232	2	878	7.8
Warrap	129	130	282	-	542	4.8
Western Equatoria	589	512	686	539	2 326	20.7
Central Equatoria	578	891	188	562	2 220	19.8
Eastern Equatoria	256	305	1 192	610	2 363	21.1
Total	2 697	2 687	3 539	2 303	11 226	100.0

Source: Ministry of Roads and Bridges.

Water resources and irrigation. Before the second war broke out in 1983, the overall plan for irrigation development in Southern Sudan was to irrigate about 270,000 ha of land.[66] Because of the ensuing conflict these plans were not realized and there has been no significant development of the country's irrigation potential. The current area of irrigated crop area is negligible occupying only 321 sq km (32,100 hectares) – less than a tenth of one percent of national land space. About 12,700 ha sq km of the irrigated cropland in South Sudan is in Upper Nile state; irrigated areas in Jonglei and Western Equatoria states are 300 and 500 ha respectively, with the remaining 18,600 ha in small parcels of land across the country. In addition, about 6,000 ha of flood land, confined primarily to Northern Bahr el Ghazal, is used for rice production. By livelihood zones, Eastern Flood Plains has most of the national irrigated cropland, followed by the Green Belt and Nile Sobat River Basin.

Given the country's rich land and water endowment, the potential for irrigated agriculture is large. With its substantial water resources, South Sudan can, though irrigation, increase agricultural production by converting into cropland, some parts of its land cover that is currently not under cultivation or is cultivated only periodically. The MWRI has identified irrigation as means for attaining food security and improvement of water management for agriculture and as a remedy to the dual problems of recurrent droughts and periodic floods. The locations for potential development include the following: (i) the lowlands, where farmers make use of flooding to supplement water for growing rice; (ii) areas adjacent to river floodplains, where farmers cultivate short-maturing varieties of sorghum; (iii) areas around swamps/marshes where extension of the growing season is possible by planting in moist soils left by receding floods; (iv) drought-prone eastern mountainous semiarid areas with low water storage and infiltration capacity; and (v) southwest and western (Green Belt zone) whose agricultural output usually exceeds subsistence level and where modern irrigation techniques can further increase agricultural production, enhance food security and supply agro-industries.

The choice of locations for irrigation development should be guided by the prospects and potential to increase cropland and cropping season (i.e. LGP) in areas where, due to low rainfall, unutilized arable can be converted to cropland using irrigation schemes to harness water resources for agricultural production. The analysis of the classification of aggregated land use in South Sudan shows that 27% of existing cropland is located in areas where agricultural potential is high (LGP > 220 days) while as much as 42% is located in areas with medium to low potential because of low LPG. Furthermore, as underscored earlier, the areas with medium to low LGP have high population densities. On this basis, the best opportunities for expanded smallholder and commercial irrigated-based agriculture appear to be in parts of the Eastern and Western Flood Plains, the Nile-Sobat Rivers area, and the Green Belt zone.

Nile-Sobat River Basin Irrigation Schemes. The potential area that can be irrigated in the Nile-Sobat River Basin is estimated to be about 654,700 ha. On average, the annual rainfall in the Basin area is between 200 to 400 mm. However, with the introduction of irrigation, the area acquires huge potential for increased agricultural production. Development of this potential would make a significant contribution to agricultural output, enhance food security and boost export earnings. It is anticipated that cereals (sorghum, rice, maize), oil seeds (groundnuts sesame, sunflower) and gum acacia would feature prominently in these programs because of the suitability of the soil as well as the large unmet domestic, regional and global demand for these commodities. Along with the introduction of large-scale commercial irrigation, there are opportunities for development of small- to medium-scale irrigation schemes (primarily for production of rice and possibly sugar cane) in the following areas of the Nile-Sobat Basin:

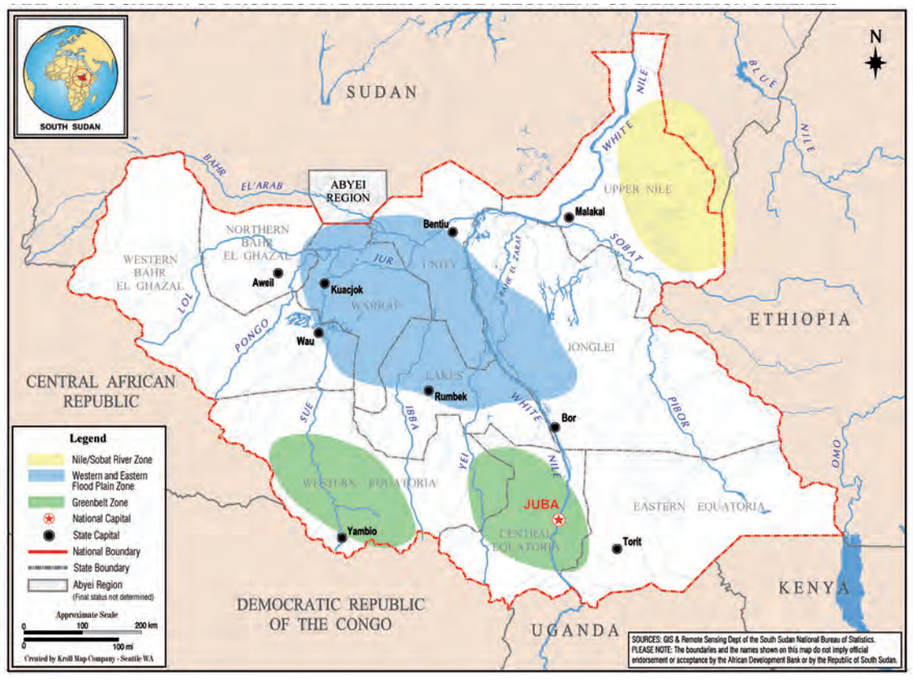
- Between Geigar and Gelhak the development of pump schemes for smallholder farmers is feasible. As much as 11,840 ha could be irrigated in this manner.
- Between Gelhak and Melut there is an estimated irrigable area of 27,890 ha.
- Between Melut and Malakal an area estimated at 17,000 ha could be irrigated.

Western and Eastern Flood Plains Irrigation Scheme. As with the Nile-Sobat River Basin, the Western and Eastern Flood Plains have a significant proportion of its land area is prone to floods. It is estimated that as much as 600,000 hectares of land could be converted into cropland in Warrap, Unity and Jonglei states. However, in these two zones a large amount of the total landmass is covered by trees, flood land and water with rocks. Before this potential can be developed, extensive due diligence and environmental assessments must be first undertaken to ensure that such development is sustainable and based on sound environmental and ecological principles. Moreover, construction of such schemes must also be in compliance with the evolving provisions of the Nile Basin Initiative on water resource management/utilization. Within these two zones, flood rice and sugar cane can be grown on a commercial scale to meet local demands and generate export earnings. Furthermore, alongside irrigation for crop farming, there are opportunities to construct water catchments for better management of floods and droughts and for provision of a year-round supply of water for livestock farmers. There are good prospects for commercial livestock farming in the medium term.[67] In addition to facilitating crop and livestock farming, the construction of catchments will contribute to a reduction of the incidence of cattle raiding and the attendant ethnic conflicts over control of water resources, which is prevalent in the zones.

Mangalla Irrigation Scheme. Mangalla is located at the confluence of the White Nile and one of its tributaries in Central Equatoria state. The area has considerable potential for large commercial farming using irrigation to produce sugar cane. The region has rich alluvial soil within a vast marshy plain from the overflow of rivers during the rainy season. It is estimated that approximately 250,000 hectares can be irrigated. Mangalla is only 45 km from Juba. It has good market access and power supply from bagasse and presents opportunities for operating a cane processing plant that could supply domestic and regional markets.

Irrigation schemes in the Green Belt Zone. As noted earlier, the Green Belt has a high LPG in addition to being densely populated. It is among the livelihood zones with the highest agricultural potential, having both a long growing period and relative high population density. The zone has approximately 500,000 ha of virgin land under tree cover, some of which can be converted into agricultural land. The introduction of irrigation schemes would provide significant opportunities for year-round cropping activities. The development of small- to medium-scale irrigation schemes in the Green Belt would increase agricultural production and income of smallholder farmers engaged in fruits and vegetables farming. The region's proximity to EAC and COMESA regional markets with sizable unmet demand for cereals and oilseeds provides good market opportunities for producers. In addition, the region has easy and fast access to international markets through the seaport of Mombasa and Juba and Nairobi international airports. Nairobi airport is known to have world-class produce handing logistics for exporters of fresh fruits and horticulture.

MAP 6.4: Location of Prospective Areas for Development of Irrigation Schemes



66 Among the schemes considered then were the Mangalla Sugarcane Scheme in Central Equatoria, Panko (Penykou) scheme for different varieties of crops in Jonglei and, with support from UNDP and FAO, the Aweil Rice Scheme in Northern Bahr el-Ghazal. The Aweil scheme was expected to irrigate an area approximately 2,440 ha.

67 The livestock population of Jonglei, Unity and Warrap accounts for 35% of total livestock in South Sudan.

Development of a national strategy for irrigation and related water management. The foregoing discussion about the potential for irrigation suggests that there may be as much as 1.5 million ha of land that could be brought under irrigation by smallholders and commercial farming. The World Bank has noted that experience in Sub-Saharan countries indicates that economic returns on small-scale schemes have averaged about 26% compared to 17% for large-scale schemes.[68] These results depend on keeping investment costs down to best-practice levels of $3,000 per hectare for the water distribution component of large-scale irrigation and $2,000 per hectare for small-scale irrigation. For each 100,000 hectares of smallholder and medium- and large-scale irrigation brought into production at these best practice costs, the investment costs would be $200 million and $300 million respectively. However, these World Bank studies of African experience indicate that the cost of public irrigation has been excessively high. Many schemes failed to capture higher yield levels and failed to transition to higher value crops. Another important consideration drawn from experience in Sub-Saharan Africa is that in most cases, irrigation is only viable for cash crops or high value food crops (such as horticulture). Experience has shown that the economic viability of irrigation for staple food crops in often doubtful. These concerns about economic viability, farm-level profitability and sustainability should guide investment decisions in the decade ahead.

The country's development and growth will also benefit from enhanced use of the Nile and its tributaries as sources of water for irrigation and as a means of transport. However, development of the country's large irrigation potential will need to be undertaken within the framework of a national strategy for agricultural water development. At this stage, it is not clear how much water may be available for irrigation programs from multipurpose dams that are under consideration for the decade ahead, how much water would come from run-of-the-river type schemes, and how much would come from tapping aquifers. More work is needed on the implications of the program for downstream riparian states.

A possible program for irrigation development. As a first step in the development of this potential, this Report proposes that as a matter of priority, a master plan for irrigation development be prepared for the decade ahead. The master plan will need to give particular attention to the amounts of existing or potential cropland to be brought under smallholder irrigation schemes and the amount to be developed under medium- and large-scale commercial farming and the likely investment cost per hectare. Construction costs in South Sudan are known to be high. In the event that water-related investment costs per hectare for large-scale commercial operations were say $6,000 per hectare, it is entirely possible that the viable area of irrigation land would decline substantially. Furthermore, the proposed program for irrigation development needs to be drawn up within the framework of a national water resources strategy that includes close attention to the domestic and regional institutional arrangements for development of these water resources, along the lines outlined in Chapter 5.

Subject to the completion of a master plan for irrigation that addresses these foregoing concerns, an indicative program for the development of 400,000 hectares of irrigated agriculture has been included in the program for agriculture. The underlying assumption is that 50% would be smallholder farm development and 50% would be large-scale commercial farming with links to the smallholder outgrowers. Assuming application of best practice investment costs, the water related component of the program would cost $1.0 billion (Table 6.11). The $600 million for commercial farm operations would have to be mobilized from private investment. The $400 million required for smallholder development would have to be funded from public sources using Government and donor resources. Assuming the program was successful in concentrating on the production of high value crops that yielded revenue of say $2,000 a hectare, gross revenues from the program would amount to about $1 billion a year. This would be a substantial contribution to the GDP of the country, to employment opportunities and to import replacement and or export revenues.

Table 6.11: Proposed Investment Program for Irrigation Development

Indicator	2010	2011	2012	2013	2014	2015	2020
Land under irrigation (hectares '000)							
Smallholder program	32.1	35.0	40.0	50.0	60.0	80.0	200.0
Large scale commercial	-	(15.7)	(2.9)	3.5	25.9	52.0	200.0
Total	32.1	19.3	37.1	53.5	85.9	132.0	400.0
Capital cost per hectare (US$)							
Smallholder program	2 000	2 000	2 000	2 000	2 000	2 000	2 000
Large scale commercial	3 000	3 000	3 000	3 000	3 000	3 000	3 000
Cumulative capital cost (US$ mill)							
Smallholder program	64	70	80	100	120	160	400
Large scale commercial	-	(47)	(9)	10	78	156	600
Total	64	23	71	110	198	316	1 000
Annual capital expenditure (US$ mill)							
Smallholder program	-	5.8	10.0	20.0	20.0	40.0	50.0
Large scale commercial	-	(47.0)	38.3	19.2	67.4	78.2	106.9
Total	-	(41.2)	48.3	39.2	87.4	118.2	156.9

Source: Estimates by authors.

Such a program would require mobilization of FDI from strategic international agriculture partners (SIAP) and expansion of cropland. The attraction of investors of the Hybrid model should aim to stimulate the development of a local outgrower schemes, farmer cooperatives and other farmer-based organization. The SIAP investor would also be expected to contribute to the provision of modern technology and agric-business management systems and facilitate the creation of the necessary logistics, including river and rural transport infrastructure. One of the side benefits of such a program may be its impact on complementary farming systems, including in particular livestock. These new investments in irrigated cropland farming may also bring investment opportunities in the livestock value chain activities and processes, focusing on market development and consolidation, processing of hides and skin (leather and leather goods) and the establishment of modern slaughterhouses and cold storage facilities.

An important concern related to this proposed program for irrigation is its implications for water demand. Section 5.6.3 in Chapter 5 includes a detailed discussion of the possible growth in demand for water by the agricultural sector. Driven by the proposed expansion in irrigation, water demand for cropland agriculture is projected to increase from an estimated 0.42 billion m^3 at present to 4.8 billion m^3 by 2020 (see Table 5.5).

6.4.8 Promoting Commercial Investment in Agriculture

Attracting high impact foreign direct investment. As a direct consequence of decades of war and abject neglect, there has been near complete depletion of the country's technical, institutional, financial, man-made and social capital, which has, in effect, circumscribed the country's ability to engineer and sustain development and growth without direct foreign assistance, particularly, foreign direct investment. The lack of financial and technical resources required for the country to achieve its development objectives is clearly evident in the agriculture sector. As discussed in the preceding sections of the Chapter, notwithstanding its natural land and water resource endowments, the agriculture sector is producing at substantially below capacity with yields that are far below those of less endowed neighboring countries. If the country is to achieve an export-led agricultural transformation and growth, it must attract high impact foreign direct investment and link it to the country's smallholder farmers and farmer cooperatives. Further, given the importance of cereals in the food basket of the population, the cereals industry should be at the center of efforts to strengthen the traditional sector and lay the foundations for a competitive performance in export markets.

The challenge is to identify and attract the right type of foreign direct investment in South Sudan: those with high impact on development and that contribute to building the capital base of the country. South Sudan can benefit from the experience of many other African countries in this regard. The recent experience of South Sudan's neighbors provides a valuable lesson on the type of Strategic International Agriculture Partners (SIAP) that South Sudan should seek to attract. Summarized below are a set of best practices and insights from Ethiopia, Ghana, Kenya, Uganda and other East African countries. Experience elsewhere in the region suggests that there are three widely used operating models for large-scale commercial agriculture:

- *Investor Controlled Model,* under which the investor manages the farm and is the sole entity that grows, harvests and markets crops.

- *The Out-grower Model:* Under this model, the investor does not directly engage in large-scale farming; instead the investor relies on local farms and a farmer groups and independent suppliers to produce crop, which the investor then purchases. A prerequisite for operational

68 See Foster and Briceño-Garmendia (2010), op cit., and Svendsen, Mark, Mandy Ewing and Siwa Msangi (2008), "Watermarks: Indicators of Irrigation Sector Performance in Sub-Saharan Africa." Africa Infrastructure Country Diagnostic, Summary of Background Paper 4, World Bank, Washington DC, April 2008.

effectiveness of this model is the existence of a well-organized and coordinated structure of local out-grower farmers, with sound agricultural knowledge and capacity to maintain standard and produce high quality crops with minimum supervision from the investor. Investors in bio-fuel schemes often use this model.

- *Hybrid Model:* This model combines elements of the investor controlled and out-grower models. Under the hybrid model, the investor maintains a large-scale farm and also buys crops from local out-grower farmer groups or cooperatives. A key advantage of this model, at least from South Sudan's standpoint, is that the investor plays a role in organizing and training local farms, thus the community benefits from employment, and knowledge and technology transfer. It is common for the investor to initiate this model. However, many African countries, including Ghana, Morocco, Kenya and Ethiopia have developed investment criteria that mandate the foreign investor to integrate traditional farmers and local out-grower producers in the firm's production and supply chain structure.

The position taken in this Report is that South Sudan should identify and attract a SAIP that falls with the Hybrid Model because the relevant local community will benefit from employment opportunities arising from scale operations of the investors as well as the technical transfer and managerial knowledge. The Government should aggressively seek out this type of investors using the resources of the country's investment promotion agency. The Government should also develop structured investment standards and codes that would ensure the inclusion of South Sudan's smallholder farmers and farmer cooperatives in the supply chain of the commercial investor. Prior to entering into SIAP agreements, the Government of South Sudan may want to draw on international experience with best practice SIAP models.

Design and implementation of SIAP agreements: The principal actors are usually the national host government and the international agricultural partner. The foreign partner can be a foreign government, a sovereign wealth fund, a private enterprise endorsed by its home country government. Depending on structure of the deal, other actors, such as multilateral financial institution such as the World Bank or the African Development Bank, or MIGA may be included. The need to involve the host country's government is pivotal because it is the authority best suited to: coordinate internally with state and local governments as well as civil society; structure a legally binding agreement; and, place the investment within the framework of the national development plan. The involvement of the national government also ensures a uniform approach and avoids the prospects of different localities offering competing concessions.

In order to maximize the mutual benefits of the investor and the host country its citizens, the following factors should be central to the agreement:

- *Duration of the agreement*. Land leases (not outright sale) range from 10-99 years. The actual duration will depend on the crop. For example, for annual crops, the duration typically does not exceed 30 years.

- *Labor force and technology transfer.* Most SIAPs agree to recruit and train the local labor force. Labor force is a subject of mutual interest of the country and the investor. SIAPs are concerned about the availability of dependable labor force from which they can draw from; the host country and involved communities are interest in employment creation and skill development. Some agreements do include provisions for temporary and time-bound importation of some labor force when the required skills are not yet available. Many SIAP agreements specifically require that the investor brings modern agricultural practices and technology to the host country, very often transforming the sector from dependence on traditional agricultural methods using simple instrument to the use of mechanized equipment (tractors) and other productivity-enhancing tools and equipment.

- *Compensation.* In addition to taxes, it is common for compensation to include the construction of community facilities such as rural roads, irrigation schemes, water treatment and supply systems, schools, clinics and as well as the training of local farmers or farmer groups on agricultural methods, raising their knowledge and productivity.

- *Land.* Property rights and enforceable land lease contracts are central in land deals as is the protection of the land rights of the community. The involvement of the host government and civil society is central to ensuring the safety of the SIAP investment as well as securing equitable compensation to the community. The central government is best suited to arbitrate and protect the rights of the investor as well as the communities involved in the host country. A good and transparent land deal will entail early involvement of civil society, creating a process where the voices of community members can be heard and their concerns addressed. The deal must be seen to be fair and seen to be equitable in terms of quantity, quality and price of the land involved. Some land deals also address water access issues, including annual water rents.

- *Yield.* One of the many advantages of large-scale farming is that it can contribute to national food security by increasing yields and supply of crops in the domestic market. Agreements usually specify the percentage of output of the investor that must be sold in the domestic market. The yield percentage must be clearly specified in the agreement.

- *Taxation.* When structuring agreements care must be taken to balance the tax revenue interests of the state and the profitability of the investment of the investor. Depending on the crop and complexity of the farming operation, investors would like to monetize their investments as soon as possible and often seek the granting on tax holidays in order to generate quick cash flows. Other provisions in the agreement deal with land transfer rights, land duties and transfer of profits to the investor's parent company in foreign countries.

- *Security.* Having a stable and political and economic environment that is devoid of conflict is the responsibility of the host government, but is crucial to the investor. If an investor perceives high political risk such as arms conflict, unstable policy environment with the prospects theft or government expatriation, then they will not enter into agreement. It is not unusual for investors to demand a stabilization clause to ensure that the regulatory framework governing investment is not threatened. Both the government and the investor are interested in and will ensure the inclusion of a fair arbitration process that will address disputes that may arise.

6.4.9 Linking Strategic Investors to Smallholder Farms and Cooperatives

In order to maximize the benefits from foreign direct investment local stakeholders must be mobilized and actively linked to the larger commercial farmers. Furthermore, in order to create effective farmer cooperatives that will supply the larger commercial farmers, the members of the cooperatives must be trained by the commercial farmer on modern farming approaches, including the application of fertilizer and pesticides and on methods of ensuring high standard of products.

In recognition of the importance of logistics and access to good arable land and favorable climate (mainly in the Green belt zone) and airfreight services and communities within a radius of one hundred miles to the Juba airport should be targeted. Farmer-based organizations and cooperatives, under the guidance of the Ministries of Agriculture and Forestry and Rural Development and Cooperatives, would enter into supply agreements with the commercial farmers. A technical assistance package for farmer-based organizations and out-growers would be designed and supported by the commercial farmers and the government. Key issues to be addressed in the technical assistance packages would include fertilizer availability and use, seed cultivation and multiplication, integrated pest control and management, and post-harvest management.

Government should facilitate the leveraging of the strategic partner basket of resources to support the traditional sector. It is well known and empirically documented that most international agricultural investors provide financing resources, technology, off-farm and some basic infrastructure. To galvanize the impact of these benefits, the government should support the creation of agro-business hubs and formation of community-based grower cooperatives and other farmer-based organizations that would be linked with the foreign commercial scale operations in their area. These integrated clusters of the traditional sector are the channeled through which the government, in partnership with commercial farm, could provide technical assistance packages, design some basic infrastructure as well as provide technical and managerial training in very cost ways.

The strategic partner can deliver technical assistance. Raising the productivity of the country's cereal subsector is imperative. The country cereal producers have the lowest yields in Africa. The presence and support of the strategic commercial farmer can reverse this phenomenon. GoSS, through the Ministry of Agriculture, the state level ministries and county departments of agriculture, in partnership with the scale farmer can provide technical training to extension officers and the establishing of farmer field schools.

Strategic farmers can assist seed production programs. With support from government, the strategic international farmer could facilitate the establishment of viable county seed production units. Within the framework of a supply chain that links the international scale farmer to traditional farmers organization, the international farmer will benefit from the establishment high yield seed production units. The government should provide a time-based subsidy to the seed units pending when farmers' operations become financially self-supporting.

Fertilizer production and distribution. At the present time, the vast majority of traditional farmers do not use any synthetic fertilizer, herbicide or pesticide, which, in part, accounts for the low yields relative to farmers in the broader region. GoSS, through the Ministry of Agriculture and Forestry, in close collaboration with the scale farmer, should earmark funds for financing the establishment of a fertilizer plant and a distribution system that enables farmers and farmer based organization to acquire fertilizer in a timely and cost effective manner.

Higher quality and more widely available extension services. Continuous training and development is an absolute necessity in order to upgrade the competitiveness

of the cereal industry. Specific and dovetailed training targeting agronomists should be institutionalized and administered though State and County government structures. Training/skills development is needed in:

- Production practices of the different grains
- Food science and practical skills in grain processing as business units
- General business skill (including farm management and financial, marketing and risk management
- Pesticide use and handling, market quality assurance and SPS requirements
- Collection, handling and interpretation of market and business information

Adaptive research. Sustainable competitiveness of the South Sudan cereal sub-sector will depend on its ability to adopt and adapt latest and relevant production and processing technologies. A research laboratory that aims at commercial application of such technologies will ensure that extension services provide and dovetailed to South Sudan circumstances.

Mechanized farming equipment. Currently approximately 80% of local production comes from small and traditional farmers. Only a tiny proportion is mechanized agriculture and limited to the Upper Nile region. The absence of mechanized tractors (or at the least, animal draught ploughs) has resulted in the absence of scale and yields on all of the main cereals in South Sudan. The Government has purchased various models of tractors and distributed to each of the ten states with the objective of encouraging the mechanization of land preparation and other field operations. The tractors are, in principle, available for hire by farmers, farmer groups and cooperatives, at a cost ranging from 50 to 240 SDG/feddan for land preparation. Over 400 tractors have been distributed to the states since 2005. Given the limited infrastructure on the ground, there are concerns regarding the capacity to maintain these tractors locally. The Ministry of Agriculture and Forestry should scale up the acquisition and distribution of tractors and ploughs along with the requisite comprehensive training program for operators. In this regard, selected farmers should be trained in basic tractor operations, including the mounting and setting of implements. Fully equipped workshops should also be established in the state centers along with trained mechanics to maintain, service and repair both government and privately owned tractors. The Government should also ensure that access to these tractors is equitable and that they are available to female farmers.

6.4.10 Capacity Building and Technical Support

A key component of the proposed strategy outlined in This Report for agricultural development in the decade ahead is to build capacities with the national government and the state governments for provision of basic services to smallholder farming communities. As noted earlier in this Chapter, farmers, pastoralists, and people that depend on fisheries for a livelihood, have cited lack of technical support services for a wide range of activities in the sector as a major obstacle to increased production. These include, for example, inadequate supplies of improved seeds and planting materials, inadequate support for the management of animal diseases and pests and diseases in crops, and issues relayed to land use.

A comprehensive list of ongoing donor-funded capacity building and technical support is not available for the Ministry of Agriculture and Forestry, the Ministry of Animal Resources and Fisheries, and the state government ministries responsible for the agriculture sector. Information from the AIMS database of the MoFEP identifies $11.5 million of technical support and capacity building in 2010, with actual disbursements of $6.8 million during the year – equivalent to 11.4% and 9.4% of planned and actual total disbursements in 2010. There is significant provision of technical support and capacity building in other ongoing programs supported of donors. For the purposes of this Report, it is assumed that the total amount of technical support and capacity building funded by donors in 2010 was 30% of their total disbursements. This puts the total amount of such support at about $27 million a year at the present time. The total operating budget (salaries plus operating expenses) of the MoAF and MoARF taken together for 2010 and 2011 was $19 million equivalent (Table 6.11). Donors and government are therefore spending about $50 million a year on agricultural services of various kinds (other than capital expenditures) – equivalent to about $35 a year for each rural household. It is not clear how much of these services provide reasonably direct benefits to the rural population of the country. The position taken in this Report is that for successful implementation of the proposed strategy for agriculture, there will have to be a major expansion in basic extension and other services to smallholder farmers, pastoral and fishing families. Some of the increase in services will come from commercial investors under the proposed out grower models; but there will also have to be a significant increase in public support services as well.

In the early stages of the program, build-up in these public service capacities would be undertaken by the government with strong support from the international donor community. In the latter part of the decade, large scale commercial investors would become important suppliers of services to smallholder farms that contract to supply agricultural, livestock and fisheries products on a regular basis. As Table 6.11 indicates, operating services funded by the government an donor community would need to increase to close to $100 million a year by 2020, with much of the $50 million increase going into extension, veterinary and other direct services to farm families.

6.5 Development Expenditure Requirements and Financing

The proposed program for agriculture, forestry and fisheries will require a significant build-up in recurrent and capital spending in the sector. The program for the decade ahead is built around three broad thrusts: (i) a major expansion in private investment in medium- and large-scale commercial farming to supply the domestic and international markets with a range of food products and agricultural raw materials; (ii) a substantial build-up in public spending on services provision, especially for smallholder farms, combined with efforts to improve access to working capital loans and agricultural inputs; and (iii) a substantial improvement in the quality of infrastructure in these areas, in the degree of access to markets and in the cost of the infrastructure services.

6.5.1 Private Investment in Agriculture

As discussed earlier, a key objective for the sector is to raise the growth in production and value added to about 6% a year in real terms by the latter part of the decade ahead. Achieving sustained strong growth of this kind will require a substantial increase in private investment in the sector in the decade ahead.

There is no up-to-date and complete information about current levels of private investment in the sector. There are two distinctly different components for the estimates of private investment. One is capital improvements on smallholder farms that are undertaken primarily with the use of farm labor with little or no use of outside capital. The other is investment undertaken on medium- and large-scale farms that are funded primarily with debt or equity financing by the private investors concerned. In kind capital expenditures by smallholders is assumed to be about $10 million a year during 2010-11, with a steady increase to about $65 million a year by 2010.[69] Investment outlays by commercial farmers are assumed to be in the range of $20 million a year at the present time. Commercial investment in agriculture is projected to increase sharply in the decade ahead to about $600 million a year by 2020 (at 2010 constant prices and exchange rate). A substantial part of this investment would come from offshore private investors, some of which would involve joint ventures with domestic partners. For the decade as a whole, the amount of private investment required to achieve a 6% growth rate is projected to be about $2.6 billion (at 2010 constant prices and exchange rate).

Table 6.12: Indicative Cost for Development of the Agriculture, Forestry and Fisheries Sector
($ millions at 2010 constant prices and exchange rate)

Category	Estimate		Projection					Total
	2010	2011	2012	2013	2014	2015	2020	2011-2020
Management and service provision								
National government	18.3	19.9	21.9	24.5	27.4	30.7	54.1	342.8
Capacity building & technical support								
Donor programs	21.9	27.1	28.5	30.0	31.5	33.0	36.8	326.3
Capital expenditures								
Donor programs	51.0	63.2	66.5	70.0	73.5	77.0	85.8	761.4
National government	4.1	16.1	32.3	48.1	65.6	84.6	172.9	964.0
Private sector	25.0	30.0	60.0	100.0	150.0	206.0	675.9	3 109.9
Sub-total	80.1	109.3	158.8	218.1	289.1	367.6	934.5	4 835.4
Total								
Government	22.4	36.0	54.2	72.6	93.0	115.3	227.0	1 306.8
Donor funding	72.9	90.3	95.0	100.0	105.0	110.0	122.5	1 087.8

69 See Annex 7 for a discussion of the basis for these estimates.

Category	Estimate		Projection					Total
	2010	2011	2012	2013	2014	2015	2020	2011-2020
Private sector								
Smallhold farmers	10.0	11.4	17.5	23.9	36.7	49.7	65.6	460.7
Commercial investment	15.0	18.6	42.5	76.1	113.3	156.3	610.3	2 649.2
Sub-total	25.0	30.0	60.0	100.0	150.0	206.0	675.9	3 109.9
Grand total	120.3	156.3	209.2	272.6	348.0	431.3	1 025.4	5 504.5
Memo items:								
Growth in basic services (% p.a)		8.5	10.0	12.0	12.0	12.0	12.0	
National budget allocation for sector (%)	1.0	1.5	2.0	2.5	3.0	3.5	5.0	
Total budget expenditures (US$ mill)	2 342.9	2 423.2	2 710.0	2 905.0	3 100.0	3 295.0	4 540.0	
Public investment in irrigation (US$ mill)	-	5.8	10.0	20.0	20.0	40.0	50.0	
Exchange rate	2.38	2.38	2.38	2.38	2.38	2.38	2.38	

Source: Estimates for 2010 and 2011 from 2011 National Budget and MoFEP AIMS database. Projections for 2012-2020 prepared by authors.

6.5.2 Public Expenditures on Agriculture, Forestry and Fisheries

In 2010, public spending on programs for agriculture, forestry and fisheries amounted to about $95 million, including donor support in the amount of $73 million and national budget expenditures of $22 million equivalent. Public expenditures on programs for which the Ministry of Animal Resources and Fisheries is responsible amounted to about $30 million equivalent in 2010; for Ministry of Agriculture and Forestry programs, total public spending was about $65 million. At the time this Report was prepared, total outlays in 2011 were estimated to be about $125 million.

Government support for the program. During 2006-2010, national government spending on programs for agriculture, forestry and fisheries accounted for about 1% of total expenditures in the national budget (Table 6.12). The 2011 budget allocation amounts to 1.8% of proposed total expenditures.

As Table 6.13 indicates, recurrent spending by the government on service provision to the farming community, pastoralists and those depending on fisheries for a livelihood is currently about $20 million a year. Under the proposed program this would increase to about $54 a year by 2020. As noted in the above discussion, this growth in capacities for service provision would be supported by the donor community with capacity building and technical support increasing to about $35 million a year by 2020. (Both expenditure programs are at 2010 constant prices and exchange rate.)

Table 6.13: National Government Expenditures on Agriculture, Forestry and Fisheries (In SDG millions)

Indicator	Realized expenditures					Budget
	2006	2007	2008	2009	2010	2011
Ministry of Agriculture & Forestry						
Recurrent expenditure					28.044	36.950
Capital expenditures					4.797	25.345
Sub-total	33.363	18.507	32.356	44.443	32.841	62.295
Ministry of Animal Resources & Fisheries						
Recurrent expenditure					15.527	21.656
Capital expenditures					4.899	22.176
Sub-total	13.484	12.129	26.354	14.080	20.426	43.832
Total for two ministries						
Recurrent expenditure	-	-	-	-	43.571	58.606
Capital expenditures	-	-	-	-	9.696	47.521
Total	46.847	30.636	58.710	58.523	53.267	106.127

Indicator	Realized expenditures					Budget
	2006	2007	2008	2009	2010	2011
Memo items:						
Total expenditures (US$ mill)						
Total	21.6	15.2	28.1	25.3	22.4	36.0
Capital	-	-	-	-	4.1	16.1
Total expenditures as % national budget	1.3	1.0	1.0	1.4	1.0	1.8

Source: Ministry of Finance & Economic Planning (2011), Approved Budget, 2011. March 14, 2011.

Capital outlays by the national government have averaged less than $10 million a year in the past two years. However, the strategy set forth in this Report calls for a substantial build-up in government capital spending on field service facilities, and extension and research services. As Table 6.12 indicates capital outlays by the government would build up to about $170 million a year by 2020, a level that would be substantially larger than the proposed donor program. These capital expenditures would, for example, include the $50 million a year being spent on expansion of public irrigation schemes for smallholder farms in 2020. In this scenario, donors would increasingly become cofinanciers with the government in these capital works programs, in contrast to the current situation where donors fund a substantial part of the capital works program independent of the government.

Role of the donor community. The agricultural sector (including crops, livestock, fisheries and forestry) currently receives support from 16 multilateral and bilateral donors. As of October 2011, total donor commitments for ongoing projects in 2010-2013 amounted to $192 million (Table 6.12). The commitment of $101 million in 2010 was equivalent to about 10% of the donor-funded development assistance program (excluding humanitarian assistance) for that year. Disbursements against these ongoing programs amounted to $73 million in 2010 (implying a disbursement ratio of 72% in 2010). The livestock, fisheries and forestry sub-sectors account for about 17% of the ongoing program, with support for cropping activities, capacity building and institutional development such as land tenure issues accounting for about 83% of the program.

Table 6.14: Ongoing Donor Funded Agriculture, Forestry and Fisheries Projects ($ thousands)

	Budget allocation					Disbursement				
	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total
Livestock	8 294	2 809	1 647	420	13 170	6 423	3 509	2 113	1 124	13 169
Fisheries	9 628	1 277	1 753	400	13 057	9 390	1 438	1 737	491	13 057
Forestry	5 984	400	800		7 184	4 197	2 187	800		7 184
Crops and other	77 056	61 738	13 708	6 334	158 836	52 872	58 427	41 203	6 334	158 836
Total	100 962	66 223	17 908	7 154	192 247	72 882	65 562	45 853	7 949	192 246

Source: Ministry of Finance and Economic Planning. AIMS database.

The United States of America and European Union have the largest ongoing programs with commitments of almost $70 million and $50 million respectively (Table 6.15). The MDTF, Canada, Common Humanitarian Fund and World Bank account for another $60 million of the ongoing commitments. The other 10 donors account for the balance of $19 million of ongoing commitments, six of whom have programs of less than $2 million. The fragmentation of the donor program is a matter of concern for the National Government. The proposed action plan for agriculture set forth in this Report calls for a carefully focused set of public and private interventions in selected geographic areas of the country, backed by programs of technical support and capacity building at the national and state levels. Successful implementation of this strategy will require a close attention to issues of donor coordination in the sector.

Table 6.15: Ongoing Donor Commitments (In $ millions)

Donor	Amount	Share (%)
USA	68.5	35.6
European Union	49.3	25.6
Multi-Donor Trust Fund	18.1	9.4
Canada	15.8	8.2
Common Humanitarian Fund	13.4	7.0
World Bank	8.5	4.4
Other donors (10)	18.6	9.7
Total	192.2	100.0

Source: MoFEP, AIMS database.

6.6 Managing Risks and Uncertainties

The main risks and uncertainties facing the strategy outlined in this strategy for attaining agricultural transformation and a sustainable agriculture – led growth of South Sudan include: (i) doubts about South Sudan's ability to effectively implement the strategy; (ii) continued insecurity in parts of the country; (iii) unclear land laws; (iv) acute infrastructure shortage, including the cost financing rural connectivity; and, (v) weak entrepreneurship and the high cost of labor in South Sudan. These risks must be managed if the strategy is to succeed. The following paragraphs highlight the risks as well as propose some remedial measures to attenuate the risks.

6.6.1 Ensuring Effective Implementation of the Strategy

Key implementation risks include organizational inertia and the lack of implementation and coordination capacity at the national and state levels. The social model, which has impeded development of the livestock sector, illustrates one of the core implementation risks that must be addressed.

To this end, there is a need to rebuild South Sudan's institutional and human/technical capacities, which were depleted as a result of decades of civil conflicts and wars. Agricultural institutions need to be rehabilitated or rebuilt from scratch. In addition, individuals and organizations must be trained and empowered with skills and knowledge needed to fulfill their roles. Farmers must be trained on modern farming methods, including the acquisition of productivity-enhancing knowledge and skills. Livestock farmers are in need of a transformational mindset change and must, therefore, be trained to see the advantages of and embrace the commercial model. It is also well recognized that South Sudan suffers from a deficit of trust among South Sudanese ethnic/tribal groups, which has been the source of ethnic/tribal tensions, which can very well obstruct the implementation of the strategy. To this end, the government must develop and implement an awareness campaign aimed at promoting peace and good neighborliness among the ethnic groups, particularly at the state and local levels where tolerance and amicable social interaction are desirable for the formation of cohesive cooperatives and other farmer groups.

There is also a need to harness and streamline the wide array of donor and NGO systems in South Sudan, transforming them into a nucleus for strategy implementation. The government should establish a national coordination task force. The task force, to be co-chaired by the Ministers for Commerce and Industry and Investment and the Minister for Agriculture and Forestry, should include representative of states, private sector, donors and NGOs. In addition, the government should convene sector-working groups to drive the implementation of the subsector strategies. Already, there exist working groups for Livestock, Cereals and High Value Fruits and Vegetable. Their knowledge and commitment should be harnessed to drive the implementation of the sector strategies.

Furthermore the government should strengthen the South Sudan Investment Authority (SSIA), enabling it play its role of identifying, attracting and supporting the type of foreign direct investors whose commercial interests are aligned with the strategies outlined in this Report. Such investors can enhance capacity building, bring managerial expertise and support infrastructure development in South Sudan.

6.6.2 Insecurity in South Sudan

Even though the war between Sudan and South Sudan was formally declared over by the signature of the CPA-Protocol on Security Arrangements, persistent episodes of violence and insecurity have continued to afflict various parts of the country and continues even after independence. The proliferation of opportunistic militia groups and violent activities by the Lords Resistance Army have made many communities throughout South Sudan vulnerable to effects of violent conflicts- deaths/injury, displacement and destruction of social and economic assets. As a result of the proliferation of small arms, too few productive opportunities for unemployed youth, distrust among many tribes and ethnic groups, and poor and inadequate physical infrastructure, especially in the rural areas, violence and insecurity remain and constitute a source of concern across South Sudan. Criminal cattle raids have become a frequent phenomenon, leading to loss of life and destruction of economic assets.

Insecurity is both a threat to personal safety as well as an impediment to economic transformation and development. The security of and confidence in large-scale and long-term projects are crucial decision variables for foreign investors, which can have far reaching consequences for investment and medium-term development and economic growth. If farms are threatened by violence, theft, or government expropriation then investors will pull their projects and funding from the country and new investors will be reticent to enter. Investors seek projects with low political risk and strong government support.

Security, peace and good governance are cornerstone pillars of the SSDP. In this regard, the Government is working towards providing a peaceful and stable political and economic environment. To assuage potential investors concern about security of investment, the government should be willing to provide stabilization clauses, ensuring that the regulatory framework governing investment in land are not threatened (i.e., investors do not want the project's original economic equilibrium to be in jeopardy). The Government should also establish dispute settlement mechanisms and arbitration processes that are transparent and viewed as fair and equitable by all potential parties in any dispute.

6.6.3 Unclear Land Tenure and Demarcation[70]

There is a risk that current land acquisition laws may hinder or complicate access to land by a SIAP. This is due to several provisions in the current South Sudan land law[71], which prohibits foreigners from owning land in South Sudan. Although a recent IDS Academie publication claims that, between 2007 and 2010, at least 10 large-scale investment in agricultural land and 4 in forestry/carbon credit have been concluded, it also states that some of the land acquisitions have been conducted under questionable conditions and are being reviewed, risking abrogation.[72]

Arguably, commercial/large scale farming, which is essential for FDI in agricultural development, requires assess to land with unambiguous right to develop the land. Under the 2009 Land Act (i) foreigner are not permitted to own land in South Sudan; they can, however, conditionally, lease land (for a maximum of 99 years); (ii) community lands may be allocated for investment purposes but that investment must reflect an "important interest of the community" and contribute to economic and social development of the local community; and (iii) land acquisition of 250 fedans (104 hectares must be approved by state authorities). If South Sudan is to transit from traditional farming to FDI-led commercial farming, then access to land must be equitably liberalized. Having a uniform national land law and a clearly defined and transparent ownership right and obligations will facilitate the decision of potential foreign investors in agricultural land in South Sudan. In addition, given the predominant role that women play in farming in South Sudan, the laws must be gender sensitive and accord women unfettered right to own and develop land. There is, therefore, a need for the government to adopt land development policies that allow potential investors to acquire, develop land and reap the benefits of their investment in commercial agricultural land.

6.6.4 Acute Shortage of Infrastructure

Poor and inadequate physical and soft infrastructure is a binding constraint to economic development in South Sudan. A central assumption of the agricultural transformation strategy outlined in this Report is that alongside investment in agriculture there will be a parallel development of rural infrastructure that will serve as an incentive for smallholder and commercial farmers to increase production knowing that markets are accessible. If rural connectivity is not improved, then the strategy will be in jeopardy. From the analysis undertaken in this Report it is obvious that government must increase its budgetary allocation for rural infrastructure in order to improve rural connectivity. One of the ways of through which allocation to rural roads can be increased is by adopting cost–saving material and technology measures that will reduce the cost and budget allocation to interstate

70 In early 2009 USAID funded 2-year land tenure program which is helping the government efforts to develop a new land policy for South Sudan.
71 See "Laws of Southern Sudan: "The Land Act, 2009"
72 See IDS Academie, "South Sudan –Food Security and Land Governance Fact Sheet", 2011 and D. Deng: "Land belongs to the community, Demystifying the 'global land grab' in Southern Sudan, a paper presented at IDS conference in April 2011

roads, thus channeling the savings towards the financing of more rural/feeder roads. Another plausible measure will entail shifting part of the cost of enhancing rural connectivity to the SIAP as an integral part of any SIAP agreement. As a general guiding principle, for all public investment in infrastructure, it is important to ensure that government expenditure is used to "crowd in" private investments rather than discourage them.

6.6.5 Weak Entrepreneurship and High Cost of Labor

Weak entrepreneurship. The agricultural sector in South Sudan is constrained by weak entrepreneurship base and the absence of commercial orientation: to date agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is small and in the range of 0.4-1.7 hectares. Intensive farming undertaken with little fertilizer application has progressively lowered yields and depleted soils. There are very few cooperatives and little commercial farming and/or the adoption of modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, livestock farming is dominated by culture and tradition that lack business orientation (cattle, for instance, is still raised for prestige and for dowry payments rather than for meat, milk, hides and other by-products). The private sector is nascent and has weak business management skills. These characteristics must begin to change and change at a fast pace if the transformation of the sector is to gain traction and drive change and foster economic growth. To maximize growth in the agriculture sector, the government should encourage the transition to a culture that values innovation, competition and commercial success and create a business environment that welcomes ideas, talent, and capital, regardless of its origin.

High cost of labor. The country suffers from an aberration of two twin risks: high labor cost and low labor productivity. Furthermore, given the high cost of living in South Sudan and the experience of other natural resource-dependent countries, it is unlikely that labor wages - the most significant component of total farm production cost - will decline in the short to medium term. Thus, reductions in farm production costs in South Sudan would have to accrue from a combination of increased cropland ushering in economies of scale and labor productivity gains through mechanization of some of the production processes. Sebit (2011) shows that when tractors are used, 16% less labor is used and higher output realized. Further expansion of such practices will have greater productivity impact and lower the unit cost of labor. Furthermore:

- South Sudan should accelerate the pace of formulating an agricultural mechanization policy that will help improve the use and efficiency tools, implements, and machinery in agricultural production and associated value chain operations. In this connection, the government has to recognize that the private sector is better placed to provide mechanization services and should strive to create conditions for self-sustaining development of mechanization with minimal direct government intervention. There is need to build on some of the already existing and successful private sector-driven models in Upper Nile, Unity, and Central Equatoria;

- In tandem with mechanization, South Sudan should pursue other productivity enhancing measures if it is to reduce farm production costs. Key to this will be the use of tradable inputs and the provision of advisory services on technology and other production related activities; and,

- The government should also realize that to achieve yield potentials for improved varieties will necessarily require significant increase in the level of fertilizer use in South Sudan.