THE REPUBLIC OF SOUTH SUDAN

MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL RESEARCH POLICY

Juba, July 2012

PREFACE

The Republic of South Sudan (RSS) is introducing new policies in order to give meaning to our hard worn political independence and to demonstrate our resolve to achieve a high level of economic independence in the shortest time possible. The Government is emphasizing improvement on the agricultural sector because it is the backbone of our rural economy and directly affects the livelihoods of more than 90 % of our population; and it constitutes the foundation for the economic growth and poverty reduction in South Sudan.

Therefore, one of our most important priorities is to transform subsistence Agriculture into a market-led system of farming. The most important impediment to achieving this goal is the low productivity and profitability of South Sudanese Agriculture. In order to increase productivity we need to apply science and technology and this requires a well organised. This policy aims at establishing a national agricultural research system (NARS) with public research institutions which are demand driven and responsive to producer needs.

The Republic of South Sudan, through this policy paper, is proposing to establish an agricultural research network based on the six agro-ecological zones of this country and is also proposing to establish a semi-autonomous institution to be known as the South Sudan Agricultural Research Organisation (SSARO) to coordinate all agricultural research in our new country.

Hon. Dr. Betty Achan Ogwaro
Minister of Agriculture and Forestry

EXECUTIVE SUMMARY

Agricultural productivity in South Sudan, like in so many other Sub-Saharan countries, is very low despite the enormous agricultural potential of the country. The average yield of the major cereal crops such as maize, sorghum, millet and rice is less than one metric tonne per hectare, whereas the yield of maize in South Africa is 6 tonnes; Sorghum in USA is 8 tonnes; and rice in China may be up to 10 tonnes per hectare. The African hen in South Sudan lays on average 50 eggs per year, while an improved hen lays at least 200 eggs per year (Khalafalla and Hass, 1999). The local zebu cow produces less than 2 litres[1] a day while an exotic cow produces more than 30 litres of milk per day.

A number of factors such as low genetic potential, pressure of pests and diseases, declining soil fertility, use of unimproved tools such as the hand hoe, unfavourable climatic factors such as drought and floods, low human capacities of farmers, researchers and extension agents, poor physical infrastructure and poor institutional framework for both research and extension combine to constrain agricultural productivity in South Sudan. On the other hand, there are opportunities for increasing productivity which are yet to be exploited. These include abundant land which is grossly under-utilised. The substitution of imported agricultural products by local produce provides a niche and emerging markets for South Sudan. This will create a comparative and competitive advantage to the growing demand for agricultural products in East and Central Africa, Europe, the Middle East and in Asia.

To be able to meet these constraints and future challenges rationally, and to pro-actively seize available opportunities, MAF/RSS will introduce an agricultural research policy for generating and harnessing knowledge, science and technology necessary for sustainably increasing agricultural productivity. In line with the broad national agricultural policy, the Agricultural Research Policy seeks to promote the goal, vision, mission and objectives listed hereunder.

[1]Research Uses of Cattle Breeds at ILRI (1992). http://ilri.org/ilripubaware/Uploaded%20Files/20041061442590.BR_ISS_037_ResearchUsesOfCattleBreedsAtILRI.pdf

The main instrument for the implementation of this policy will be the South Sudan Agricultural Research Organisation (SSARO). Within a period of two years, and after due consultation with all stakeholders in the agricultural sector, RSS will introduce the necessary legislation for the establishment of SSARO. The legislation will define the mandate, functions, powers and duties of SSARO, its structures for governance, management and research as well as its linkages with local, national, regional and international stakeholders in agricultural research. SSARO will be supplemented by public and private universities as well as other public and private agricultural research institutions which may emerge in future.

The major objective of this policy is to promote the generation, acquisition, adaptation and dissemination of new knowledge and improved technologies and policies necessary for transforming farming in South Sudan from subsistence to commercial. The following are policy statements to enhance innovative and demand driven agricultural technology development system promoting commercial farming by small, medium and large scale producers.

Policy Statements No 1

Promote and encourage breeding, adaptation and adoption of new and improved crop varieties and animal breeds.

Policy Statements No 2

Ensure reduction of losses caused by pests and diseases in crops, livestock, fisheries and forestry.

Policy Statements No 3

Promote sustainable increased crop yields and preservation of the natural resource base.

Policy Statements No 4

Introduce and develop improved agricultural implements and machinery in South Sudan**.**

Policy Statements No 5

Facilitate improved knowledge, skills and competence of personnel in the national agricultural research system of South Sudan.

Policy Statements No 6

Create conducive environment to minimize the losses caused by droughts, floods and heat stresses.

Policy Statements No 7

Facilitate establishment of a physical and technical environment conducive to advanced productive research work

Policy Statements No 8

Enhanced collaboration with development partners and international institutions will build institutional capacity for a pluralistic and demand driven National Agricultural Research System, (NARS).

Policy Statements No 9

Facilitate provision of data and information for promoting efficient, rational and equitable utilisation of land by small, medium and large scale commercial farmers, planters and ranchers.

Policy Statements No 10

Create conducive business and trade environment to expand market opportunities for South Sudanese products at national, regional and global markets.

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LIST OF ABBREVIATION

RSS	-	Republic of South Sudan
NARS	-	National Agricultural Research System
SSARO	-	South Sudan Agricultural Research Organization
MAF	-	Ministry of Agriculture and Forestry
NGO	-	Non-Governmental Organization
CMV	-	Cassava Mosaic Virus
ARC	-	Agricultural Research Corporation
MARF	-	Ministry of Agricultural, Resources and Fisheries
MDTF	-	Mult-Donor Trust Fund
ECF	-	East Coast Fever
IFDC	-	International Fertilizer Development Centre
DRC	-	Democratic Republic of Congo
IARCs	-	International Agricultural Research Centres
AU-NEPAD	-	African Union New Partnership for Development
CAADP	-	Comprehensive African Agricultural Development Program
ASARECA	-	Association for Strengthening Agricultural Research In Eastern and Central Africa.
CMT	-	Change Management Team
ARIS	-	Agricultural Research Institutes
NARF	-	The National Agricultural Research Forum
USDA	-	United States Department of Agriculture
ARTF	-	Agricultural Research Trust Fund
M & E	-	Monitoring and Evaluation

1.0 BACKGROUND

Most of the research work in South Sudan has been on cotton, sorghum and groundnuts in the irrigated sector, but very little in the rain fed sector of the country. Yambio Research Station was opened in 1948, with the mandate to pursue the work on the rain fed cotton "Acala variety" designated for the resettlement of the Azande people under the Zande Scheme. The mandate of Yambio Research Station was later expanded to include other crops such as maize, sorghum, finger millet, pearl millet, cassava, sweet potatoes, groundnuts, sesame and, fruits and vegetables to support local communities. Yambio Research Station operated until it was closed in 1965 due to war. Following the Addis Ababa Peace Agreement of March, 1972 adaptive research was initiated at Yambio and other places by the semi-autonomous Republic of South Sudan and by a large number of NGO's especially on sorghum, groundnut, maize, cassava, sesame, cow peas, millets, sweet potato, yams, coffee, pineapples, cashew nuts, cocoa, cowpeas, pigeon peas, beans and a number of vegetable crops and fruits. But in 1990 research activities came to a halt when research personnel fled the war.

In contrast, the agricultural research network in North Sudan, during the same period, was expanding rapidly with more than 20 research stations and more than 700 scientists in the Agricultural Research Corporation (ARC) of Sudan. The number of South Sudanese scientists in ARC was less than twenty and they all were working for ARC in the north. Following the Comprehensive Peace Agreement in 2005, the new Republic of South Sudan (RSS) created Directorates of Research, Training and Extension services under the Ministries of Agriculture and Forestry (MAF) and Animal Resources and Fisheries (MARF). Several attempts by RSS and development partners were made to create a new institutional framework for agricultural research and these have culminated in the proposal to establish a pluralistic and demand driven national agricultural research system (NARS) which is responsive to producer needs and involves producers in programme planning, implementation and monitoring.

2.0 RATIONALE FOR AN AGRICULTURAL RESEARCH POLICY

Since the independence of the Old Sudan in 1956, there has been very little research conducted within the geographical area now covered by the new state of South Sudan because of the protracted war between the North and South Sudan. The little agricultural research infrastructure that was developed during the British colonial era was either destroyed or damaged during the liberation struggle and research personnel either perished or fled. In order to avoid haphazard and uncoordinated actions it is necessary for the government to have an agricultural research policy for the country.

Following the CPA the RSS Parliament passed a number of bills including the *South Sudan Research Council Bill (2007)* which provides for the establishment of Specialised Research Councils and Committees. Section 3 of Article 14 of this bill makes provision for the establishment of an "*Agricultural Research Council* (ARC) as the dedicated Council for research activities within the agricultural sector". This policy document is intended to operationalise these provisions.

The Multi-donor Trust Fund (MDTF) of RSS and development partners provide for setting up an effective networked research system, whose activities are targeted, demand-driven and geared towards generating significant impact on agricultural, forestry, animal resources and fisheries' productivity. The creation of this system necessitate an enabling policy framework.

3.0 CONSTRAINTS, CHALLENGES AND OPPORTUNITIES

The major problem of the agricultural sector in South Sudan, like in most African countries, is ***low productivity.*** For example maize yield levels in the country are estimated at 0.6 mt per hectare, while the potential under good management is at least 5mt per hectare. The potential production for improved breeds of dairy animals is 20 litres per day, compared to the current productivity of one to two litres per day from local cattle in South Sudan.

In summary, major causes for low agricultural productivity include low genetic potential, pests and diseases, low or declining soil fertility, unimproved tools, climatic variability. These constraints and challenges could not, in the past, be addressed because of the absence of a functional research and extension system and the requisite physical and human infrastructure. Additionally, South Sudan's unique historical, geographical and political position offer opportunities such as niche markets e.g., gum acacia and the growing demand of certain agricultural products such as cereals, in the national, regional and global markets. To-date, these opportunities remain unexploited because of the lack of suitable production technologies, information and a conducive policy environment.

3.1 CONSTRAINTS

3.1.1 Low Genetic Potential

South Sudan has been dependent on low yielding crop varieties and local landraces for over 25 years. For example in sorghum, farmers have been using local cultivars such as *dyeri, agono, kigo, merese, nyarango and Bari*. Yields of these cultivars are around 0.4 mt/ha. There have been no crop breeding programmes in the country since 1983. Furthermore, crop management and decline in soil fertility have contributed to this phenomenon in many areas of South Sudan.

In the of forestry sector, the country has not exploited the potential of indigenous tree species to improve the wood industry due to lack of research capacity in this sector. Some of the exotic tree species introduced in recent years are teak, pine and eucalyptus. However, management and location of plantations were not in accordance with the environmental suitability of some of the tree species.

South Sudan has predominantly relied on indigenous and unimproved animal breeds. Most of the breeds in the animal industry, especially cattle are of dual purpose. The major breeds in South Sudan comprise the zebu and borans which are a source of beef and dairy. Currently, South Sudan has no improved breeds such as Friesians, Jersey, Guernsey, Sahiwal and Redpoll. Like in crops and forestry, there have been no improvement programmes in livestock.

The country has great potential in the fish industry especially Tilapia and Nile perch. The management system of fisheries is underdeveloped, as such there are numerous constraints affecting fish productivity which include infestation of water hyacinths, water pollution and unregulated fish catching including poisoning (affecting breeding stock). Aquaculture has not taken off in the country, hence precluding the development of hatcheries and making the fisher-folk and consumers to predominantly depend on natural fisheries. In spite of these problems, there has been no fisheries research to improve the industry.

3.1.2 Plant and Animal Pests and Diseases

Pests and diseases are wide spread in the South Sudan and they are the major factors for low yield levels especially in crops and livestock. For example, cassava is affected by more than five major diseases and pests including cassava mosaic virus (CMV) and cassava green mite, each of which can cause losses of up to 90 %. Sorghum shoot fly, stalk borers, smut, head moulds, various virus diseases and bird (quelea quelea) damage cause heavy losses on cereals annually. Beans are affected by at least ten diseases and groundnut is severely affected by groundnut rosette virus. Insect pests and fungi can cause losses of up to 40 % during storage. Infection by storage fungi such as *Aspergilus flavus* may introduce aflatoxins which harm both humans and farm animals.

In cattle, East Coast Fever (ECF) is the major limiting factor in production especially among exotic breeds. Trypanosomosis, Foot-and-Mouth disease and Brucellosis are also important factors in limiting ruminant animal production in South Sudan. African swine fever in pigs and Newcastle disease, Gumboro disease in poultry can wipe out entire stocks. Internal parasites are debilitating diseases in all livestock production systems. Water hyacinth and other invasive weeds in the Nile river system, including the Sudd, infest fish breeding grounds and directly reduce fish stocks.

3.1.3 Low and Declining Soil Fertility

Soil fertility is a fundamental factor in agricultural production. Most soils of South Sudan are moderately fertile but can lose fertility when cultivated, which calls for appropriate measures to maintain its fertility for sustainable agricultural production

and productivity. Based on empirical studies by FAO[2], maize yield levels in the country have been less than 800 kg/ha for the past ten years. Furthermore, FAO observes that low yields obtained in the traditional sector in South Sudan are mainly attributed to low soil fertility particularly nitrogen and phosphorous, moisture content and poor management. This is in spite of peoples' perception that land in South Sudan is fertile and does not need any fertilizer application. In virtually all maize producing areas in the world, inorganic fertilizers are relied upon to improve crop yields and maintain soil fertility. Soils of the South Sudan are known to be heterogeneous and poor in nitrogen. Low soil fertility is also attributed to nutrient mining of agricultural land. According to the International Fertilizer Development Centre (IFDC) nutrient mining in South Sudan falls within the range of 30kg to 60kg[3] per hectare per annum which is quite significant. Estimates from IFDC demonstrate that the yield of one metric tonne of maize per feddan removes 30kg of Nitrogen from the soil (IFDC Field Handbook 1982).

Apart from nutrient mining, decline of soil fertility is contributed by poor soil and land management, for example cultivating on steep slopes, burning of crop residues, lack of rotation, bush fires and wanton destruction of tree cover. Shifting cultivation which is commonly practiced among subsistence farmers in South Sudan also contributes to land degradation and loss of nutrients. Loss of soil cover reduces organic matter and reduces moisture holding capacity which promotes nutrient uptake. Although inorganic fertilizer application in agriculture enhances productivity, inappropriate use can negatively affect nutrient balance and soil health. In this country, soil analysis was done in the early 80's. However, the results produced from this analysis did not provide a basis for soil fertility mapping and land use classification in terms crop production potential, partly due to inadequate technical and scientific capacity in the country

3.1.4 Low Land and Labour Productivity

Agricultural operations including bush clearing, weeding, harvesting, processing and animal husbandry are highly labour intensive. The hand hoe and the *maloda* are the dominant cultivation implements in South Sudan. Primary processing at the farm level is done manually. Dependence on manual operations in agriculture limits labour productivity and therefore competitiveness in local, regional and international markets. There is no local manufacturing of improved farm tools and implements in South Sudan. Introduction of agricultural tools and implements from foreign countries are done mostly without prior and careful planning, study, or thorough testing.

[2] FAO (2011). Annual Needs and Livelihood Analysis Report.

[3] IFDC 2002-2004.

3.1.5 Low Capacity of Research Personnel

South Sudan lacks fully-functional agricultural research institutions and universities whether public or private. One of the major constraints in building national research capacity in this country is lack of critical mass of qualified, motivated and committed professionals to promote the national development agenda. Some scientists and technicians were displaced during the war, some died and others migrated to distant lands. While five national consultants have been hired from North Sudan to initiate adaptive research activities in this vast country, there is no plan to recruit new research staff.

The quality of science-based outputs and outcomes is dependent on the skills and competences of scientific and technical staff. At the present moment there is no long-term human resource development plan and strategy for building a critical mass of professionals in various disciplines to develop strategies for enhancing and managing agricultural research. Granted that there are scientists and technicians in North Sudan who may wish to return to South Sudan, but their numbers do not exceed 20. Furthermore, a significant proportion of these have already retired or are approaching retirement age. Hence the human resource base for agricultural research in South Sudan will have to be built almost from scratch.

3.2 CHALLENGES

3.2.1 Negative Impacts of Climatic Factors

The climate in South Sudan is characterized by intermittent periods of drought and floods, many times resulting in total loss of crops, widespread death of livestock especially cattle, displacement of human populations as well as famine and disease. Despite the presence of many rivers and streams and probably underground water reservoirs, there have never been serious efforts to develop irrigation and flood management systems in this country.

3.2.2 Poor Physical Research Infrastructure

For the research system to effectively implement its programmes there is need for adequate and quality physical resources such as land, offices, housing, laboratories, equipment and machinery. Land for agricultural research is abundant but in most cases it is not officially gazetted and in some cases it is occupied by squatters. During the colonial period and the liberation wars, some of the infrastructure were damaged or left unattended, or as in actual fact damaged. The colonial administration constructed staff houses as well as research buildings and developed laboratories and field research facilities at Yambio during the 1940s and 1950s. Following the Addis Ababa Accord,

research facilities were developed at Halima and Yei. However, most of these facilities were destroyed or fell into disuse during the war. Laboratory facilities are almost non-existent and so is water and electricity supply. Consequently, the available physical facilities are not adequate or suitable for scientific research. Currently budgetary allocation to the ministry of agriculture and forestry, especially in the Directorate of Research, Training and Extension services is inadequate to invest in physical resources and operations.

3.2.3 Poor Institutional Framework

Institutional arrangements refer to combinations of policies, legislation and regulations, guidelines and administrative structures in the agricultural research system. Agricultural research in South Sudan began in 1904 with investigations into the possibilities of growing vegetables, fruit and timber trees in Kagelu (Tothill, 1940) and cotton under rain-fed conditions at Rumbek and Wau (Ageeb, Hamdoun and El-Hassan 1999). Yambio Research Station was established in 1948 under the then Department of Agriculture and Forests with the mandate of testing crops suitable for growing in the forest and savannah zones of Equatoria Province. But there were no efforts to establish a research network in South Sudan as Yambio remained the only research station in the whole country. Efforts to establish a research network in South Sudan were hampered by the liberation war.

Following the signing of the CPA in 2005, the civil administration established the Ministry of Agriculture and Forestry (MAF) and the Ministry of Animal Resources and Fisheries (MARF). Under each of these ministries there is a Directorate of Research, Training and Extension, but there are no operational research stations. Currently, the agricultural research system is embedded within RSS, as is the case in Malawi, Tanzania and Zambia. However, the system in South Sudan is under the jurisdiction of two Ministries, Agriculture and Forestry, and Animal Resources and Fisheries. This dichotomy brings problems of planning, implementation, administration, coordination and financing. In terms of planning, the two Ministries have different policies, strategic plans and budgetary allocation. In addition, the framework for implementing, coordinating and financing policy interventions and programmes are different. Therefore the relationship between the Ministries and the research system in terms of implementing research vision, mission and strategies becomes problematic.

Experiences of agricultural research systems directly embedded within a government ministry in some countries have created significant constraints and challenges to effectively and efficiently implement research programmes and activities. Some of these include inadequate flow of financial resources to support human and physical capacity development, lack of incentives to attract and motivate productive scientists

and stringent bureaucratic procedures in procurement and management of resources. In South Sudan, the 2009 total budget for the Directorate of Research, Training and Extension was only SDG3.5 Million[4] of which SDG1.1 Million was for salaries and a mere SDG75,720 was for operations. This budgetary allocation was meant to cater for three departments within the Directorate. Considering the functions and programmes to be implemented by the three departments, budgetary allocation of two percent for operations within the directorate could not permit accomplishment of the work-plans for the fiscal year. Furthermore, the placement of three very important departments under one Directorate again creates problems of coordination, administration and management.

This arrangement only provides for the administrative management of officers at MAF headquarters without considering research activities on the ground. As of 2012 South Sudan had no organizational structure to plan, implement and manage agricultural research programmes in the country. Because of the problems associated with Government-embedded research organization structures, some countries such as Kenya, South Africa and India have opted for establishment of semi-autonomous research institutions. In this context, the research system is governed through research policies, strategies, legislation and regulations. In addition, such systems have created opportunities of independently mobilising financial resources through development partners and international institutions.

3.3 OPPORTUNITIES

3.3.1 Abundant Land Suitable for Agriculture

South Sudan covers an area of 640,000 square kilometres and 70 percent of this land is used for unorganised and unplanned randomly scattered small scale subsistence farm holdings or nomadic pastoralism. It would seem that in order to achieve economies of scale, a system of collectivisation of small holder farms would be a more efficient way of utilising agricultural land. Further, the availability of large tracts of land creates opportunities for large scale farming, plantation forestry and ranching by local and foreign entrepreneurs.

The country is blessed with an extensive system of large and small rivers which can be harnessed for irrigation to provide water for livestock and fisheries. There are also underground water reservoirs of undetermined capacity. These land and water resources constitute a rich resource which can be rationally exploited for small, medium and large scale agricultural projects.

[4] Ministry of Finance and Economic Planning (2010). Republic of South Sudan Approved Budget.

The country has wide range of natural forest types, albeit under varying degrees of degradation, ranging from woodland savanna in the north to the highland montane forests in the south. Forest-based industries (sawmilling, wood-based panels, furniture, and joinery manufacture) are a significant source of off-farm employment. For example, South Sudan forestry sector can support a significant wealth creating export industry on a sustainable basis if well managed. Rural communities derive consumptive benefits by trading in non-timber forest products such as gum, honey, palm oil, lulu (shea oil and butter), etc. This forest resource could constitute an alternative source of revenue to the Republic of South Sudan apart from depending entirely on oil revenues.

3.3.2 Substitution of Imported Agricultural Products

Currently a large volume of agricultural produce and products used in urban areas such as vegetables, fruits, roots and tubers, fish, meat, beans (janjaro), maize flour, rice, dairy products, to mention but a few are imported from Uganda, Kenya, North Sudan, Democratic Republic of Congo (DRC), or even from the Middle East and South East Asia, yet these can be produced in South Sudan. Therefore, there are opportunities for the South Sudanese farmers and processors to capture this market potential.

3.3.3 Niche and New Markets

a. South Sudan already produces and exports Gum Acacia and Shear butter nut. The country has tremendous potential for expanding the production of these two commodities and their demand on the international market is quite high. However these products are still collected from wild Acacia and shear butternut plants. Yet, with current technology these plant species can be domesticated and grown in plantations. Additionally, there may be many plant species with medicinal properties such as *Prunus africana* or of industrial importance which have yet to be exploited or even identified.

b. The global demand for bio-fuels is growing exponentially. There are tremendous opportunities for South Sudan, with a suitable climate and land, to competitively and profitably engage in the production of bio-fuels.

c. This country has vast areas suitable for growing cotton. But cotton production is currently very low and yet AGOA provides a window of opportunities for expanding this product. Furthermore, opportunities for the cotton and textile industries exist through the substitution of the large volumes of old clothing (mivumba / aliwara) imported from rich countries; with the additional benefit of creating new jobs.

3.3.4 National, Regional and International Markets

Although the population of South Sudan is relatively small it is growing at a rate of 3%. Furthermore, urbanisation is growing rapidly, creating a market for food stuffs. This becomes an opportunity for the rural farmers to take advantage of increasing food demand. The demand for non-food agricultural products such as cotton products and bio-fuels is also expected to grow rapidly creating new avenues for increasing farmers' incomes. The five countries of the East African community (Burundi, Kenya, Rwanda, Tanzania, and Uganda) have a combined human population of about 140 million which is growing at 3% per annum. Land for expansion of agriculture in those countries is progressively decreasing. Therefore, they will increasingly depend on imported food and other agricultural products from South Sudan, which has relatively abundant agricultural land.

The demand for agricultural products in the emerging economic giants of the Middle East, East Asia (China) and West Asia (India) is growing exponentially. These regions will be importing meat, grain for food and animal feed, bio-fuels, fibres and a host of niche products. South Sudan can provide all these materials.

4.0 VISION, MISSION, GOAL AND POLICY STATEMENT

The strategic plans of the Ministries of Agriculture and Forestry and of Animal Resources and Fisheries contain a broad policy statement on sustainable agricultural transformation and modernisation and the protection of the environment for the sake of posterity of future generations of South Sudanese people. In line with that broad policy, the Agricultural Research Policy seeks to promote the following vision, mission, goal, guiding principles and objectives described hereunder.

4.1 VISION, MISSION AND GOAL

4.1.1 VISION

An enhanced, innovative and demand driven agricultural technology development system promoting commercial farming by small, medium and large scale producers; leading to household and national food and income security in South Sudan.

4.1.2 MISSION

The mission of this policy is to promote the transformation of agriculture in South Sudan from subsistence to a science-based, socially and environmentally sustainable market-driven system of farming.

4.1.3 GOAL

To facilitate increased agricultural productivity, food security, economic growth, sustained competitiveness and poverty reduction.

4.2 CORE VALUES

The core values include adherence to national goals, vision and mission; creating and responding to market opportunities, promoting excellence in research work; accountability; transparency; integrity; inclusivity; and main-streaming gender and environmental concerns.

4.3 MAJOR OBJECTIVE

The major objective of this policy is to promote the generation, acquisition, adaptation and dissemination of new knowledge and improved technologies and policies necessary for transforming farming in South Sudan from subsistence to commercial.

4.3.1 Policy Statement on Promotion of New Improved varieties and Breeds

Problem Statement No. 1
Inadequate promotion of new improved crop varieties and animal breeds.
Policy Statement No. 1
Continuous promotion and encouragement of breeding, adaptation and adoption of new and improved crop varieties and animal breeds

Implementation Strategies for Policy no. 1

i. Baseline survey to identify existing varieties and breeds and establish an inventory;
ii. Establishment of germplasm collection and conservation system;
iii. Breed and select for superior characteristics in plants and livestock using conventional and novel tools;
iv. Performance for adoption f improved crop varieties and animal breeds.
v. Introduce and adapt improved crop varieties and animal breeds;
vi. Develop Breeder's and Basic Seed for the seed industry; and
vii. Develop market driven breeding programmes.

Flagship project for policy no.1

Germplasm Collection and Conservation system.

4.3.2 Policy Statement on Control of Pest and diseases

Problem Statement No. 2
Reduction of yields caused by pests and diseases in crops, livestock, fisheries and forestry.
Policy Statement No. 2
Ensure reduction of losses caused by pests and diseases in crops, livestock, fisheries and forestry.

Implementation Strategies for Policy No. 2

i. Programmes for the Introduction breeding, developing and promoting pest and disease resistant varieties and strains;
ii. Promotion of utilization of biological control agents;
iii. Development and promotion of the use of safe chemical pesticides;
iv. Promotion of good cultural husbandry practices;
v. Promotion of integrated pest and disease management methods and practices; and
vi. Research and promote effective and safe traditional pest and disease control methods.

Flagship project for policy no.2

Research on Integrated Pest Management (IPM)

4.3.3 Policy Statement on Increased Yields and Natural Resources Base Conservation

Problem Statement No. 3

Low crop yields and inadequate preservation of the natural resource base.

Policy Statement No. 3

Sustainably promote increased crop yields and preservation of the natural resource base.

Implementation for Policy No 2.

i. Research and Development on improved methods for using inorganic fertilizers without compromising environmental health;
ii. Research and Development on methods for increasing efficiency of biological nitrogen fixation in leguminous plants;
iii. Research and Development on practical methods for using mycorrhizae in improving soil fertility;
iv. Research and Development on rotations which improve soil fertility and soil conservation;
v. Develop and disseminate appropriate soil erosion control measurers; and
vi. Research and Development to improve and adapt methods for cost effective use of:
    a. organic fertilisers;
    b. mulching to improve water retention;
    c. minimum tillage; and
    d. cultural practices.

Flagship project for policy no. 3
Research on Minimum Tillage and Organic fertilizers

4.3.4 Policy Statement on Development of Farm Mechanization Tools

Problem Statement No. 4

Lack of strategies to develop improved agricultural implements and machinery in South Sudan.

Policy Statement No. 4

Introduction and Development of improved agricultural implements and machinery in South Sudan.

Implementation Strategies for policy no. 4

Research and Development programme to:

i. Introduce appropriate improved farm tools, implements, equipment and machinery;
ii. Adapt introduced farm tools, implements, equipment and machinery to local conditions; and
iii. Design farm tools implements, equipment and machinery appropriate for local conditions.

Flagship project for policy no. 4

Design of appropriate agricultural implements

4.3.5 Policy Statement on Human Resource Development for Agricultural Research System

Problem Statement No. 5

Low facilitation of knowledge, skills and competence of personnel in the national agricultural research system of South Sudan.

Policy Statement No. 5

Continuously facilitate improved knowledge, skills and competence of personnel in the national agricultural research system of South Sudan.

Implementation Strategies for policy no. 5

i. Develop a long term human resource plan for scientists, technicians and support staff;
ii. Attract from the Diaspora back suitably qualified South Sudanese personnel
iii. Recruit, as a short term measure, suitable personnel from the East and Central Africa region to kick-start priority research programmes; and
iv. Mobilise financial resources for:
    a. training young South Sudanese graduates to Masters level within the ECA region;
    b. training South Sudanese Masters graduates to PhD level within the Africa Region and overseas Universities;
    c. short attachments of South Sudanese scientists to International Agricultural Research Centres (IARCs) of the CG system and at advanced research centres globally; and
    d. Training in soft skills[5].

Flagship project for policy no. 5

Research and Development Human Resource Development Plan

4.3.6 Policy Statement on Technological Mitigation of Climate Change Effects

Problem Statement No. 6

Lack comprehensive Environmental Management Strategy creative conducive environment to minimize the losses by droughts, floods and heat stresses.

Policy Statement No. 6

Create conducive environment to minimize the losses caused by droughts, floods and heat stresses.

[5] Soft skills are the nontechnical skills, abilities, and traits that workers need to function in a specific employment environment. They include four sets of workplace competencies: problem-solving and other cognitive skills, oral communication skills, personal qualities and work ethic, and interpersonal and teamwork skills (Leigh, et al., 1999).

Implementation Strategies for policy no. 6

i. develop drought and heat tolerant varieties and breeds;
ii. develop and disseminate improved water management technologies;
iii. develop a database for agro climatic data for all agro-ecological zones;
iv. develop predictive models for drought and flood episodes;
v. develop household, community and national schemes for water harvesting; and
vi. explore the potential of underground water reservoirs for use in agricultural production.

Flagship project for policy no. 6

Climate change Mitigation Research Programme.

4.3.7 Policy Statement on Improved Research and Development Infrastructure

Problem Statement No. 7

Inadequate facilitation of productive research work enhancement for physical and technical environment.

Policy Statement No. 7

MAF/RSS will facilitate establishment of a physical and technical environment conducive to advanced productive research work.

Implementation Strategies for policy no. 7

i. Rehabilitate the existing physical infrastructure;
ii. Construct required additional infrastructure;
iii. Provide modern scientific laboratory and field equipment; and
iv. Develop culture of maintenance;

Flagship project for policy no. 7

Modernization of Research Infrastructure

4.3.8 Policy Statement on Pluralistic Institutional Capacity Building

Problem Statement No. 8

Inadequate collaboration with development partners and international institution to build institutional capacity for pluralistic and demand driven.

Policy Statement No. 8

MAF/RSS in collaboration with development partners and international institutions will build institutional capacity for a pluralistic and demand driven National Agricultural Research System, (NARS).

Implementation Strategies for Policy no. 8

i. Develop a national agricultural research system (NARS) which enables the participation of a variety of actors in agricultural research and development;
ii. Establish a semi-autonomous research body to be known as the South Sudan Agricultural Research Organization (SSARO);
iii. Establish integrated public sector agricultural research stations;
iv. Promote private sector agricultural research;
v. Foster linkages and networking between and among agricultural research and development institutions within South Sudan, the African region and internationally;
vi. Develop an agricultural research management information system; and
vii. Develop intellectual property rights management capability

Flagship project for policy no. 8

Establishment of South Sudan Agricultural Research Organization

4.3.9 Policy Statement on Efficient use of Land Resources

Problem Statement No. 9

Unavailability of data and information for promoting efficient, rational and equitable utilization of land.

Policy Statement No. 9

Facilitate provision of data and information for promoting efficient, rational and equitable utilisation of land by small, medium and large scale commercial farmers, planters and ranchers.

Implementation strategies for policy no. 9

i. Carry out studies for collective/group farming in Africa, Asia and Latin America and document lessons for South Sudan;
ii. Carry out studies on large scale farming, forest plantations and ranching in the tropics and document lessons for South Sudan;
iii. Carry out ex-ante environmental and social impact assessment of large scale farming, tree plantations and ranching in the six agro-ecological zones of South Sudan;
iv. Document and forecast the necessary conditions for promoting large scale farming, forest plantations and ranching in South Sudan; and
v. Forecast the probable impact of large scale farming, forest plantations and ranching on agricultural and economic growth of South Sudan.

Flagship project for policy no. 9

Promotion of technologies for Large Scale Crop Farming and Ranching

4.3.10 Policy Statement on Development of Regional and International Markets

Problem Statement No. 10

Lack of conducive business and trade environment to expand market.

Policy Statement No. 10

Creation a conducive business and trade environment to expand market opportunities for South Sudanese products at national, regional and global markets.

Implementation Strategies for policy no. 10

i. Marketing Policy Implementation
ii. Carry out local, regional and global value chain analysis on commodities with comparative and competitive advantages.
iii. Identify and increase the quality and quantity of agricultural commodities for which South Sudan has a comparative and competitive advantage;
iv. Develop and release technologies for growing *acacia senegal, acacia seyal* and shear butter nut tree (*vitellaria paradoxa*) in plantations;
v. Explore the prospect of producing bio-fuels in South Sudan; and
vi. Prospect and identify plants of potential medicinal and industrial importance

Flagship project for policy no. 10

Value –Chain Analysis for comparative and competitive commodities in the Regional Market

5.0 INSTITUTIONAL AND IMPLEMENTATION FRAMEWORK

Implementation of the South Sudan Agricultural Research Policy (SSAR) will require innovative strong political will, leadership, direction and financial support. Throughout all stages of implementation, there will be need for trust, ownership, flexibility, and tolerance in managing the reform process. In addition, adequate time is required to create an environment conducive for positive change, achieve full consensus and buy in, establish functional governance structures, and manage the transition. The primary test for the new agricultural research system emanating from this policy will be to demonstrate its added value and cost effectiveness in agricultural development in the short, medium and long term.

In the wider context, South Sudan is a member of the African Union, COMESA and ASARECA by virtue of her previous relationship in the One Sudan. Therefore this Agricultural Research Policy will inform the African Union New Partnership for Development (AU-NEPAD) and particularly by the Comprehensive African Agricultural Development Programme (CAADP) Pillar IV - Agricultural Research – which lays emphasis on the adoption of a truly integrated agricultural research approach ensuring that researchers work together with small holders and pastoralists, extension agencies, the private sector and NGOs to have positive impact on agricultural productivity. This policy will also be guided by research protocols of COMESA, ASARECA, FARA and FAAP. Nevertheless, following guidelines and protocols of relevant international and African bodies and initiatives will be done without compromising the stated government objective of transforming agriculture in South Sudan from subsistence to commercial, which is the desired impact end point. Below is the envisaged implementation framework of this policy:

5.1 ESTABLISHMENT OF A CHANGE MANAGEMENT TEAM (CMT)

Changing from the known to the unknown is always a challenging and often a sensitive experience. It requires good planning and careful implementation. Therefore, this policy is providing for a Change Management Team (CMT) consisting of five persons who will be appointed, by the Minister of Agriculture and Forestry in consultation with the Minister of Animal Resources and Fisheries, and others as necessary, on a part time and/or consultancy basis for initially two years and renewable once. The team will be provided with secretarial support from SSARO. The composition of the team shall include individuals with proven financial and administrative experience, science and research management expertise as well as public policy development. The team will also be expected to be outstanding in managing change with experience in dealing with public and private sector actors.

Terms of reference for the CMT shall be prepared by SSRC in consultation with MAF and MARF. Some of their responsibilities will include engaging broad consultations with all stakeholders and partners to raise greater awareness, enhance buy-in, and build consensus on the implementation pathway. The consultation process shall target, among others:

- all the implementing institutions listed within the structure of SSARO;
- a sample of senior civil servants and members of the parliament involved in agricultural research and allied sciences; and
- Representatives of key stakeholders and partners listed under section the SSAR policy document.

5.2 CREATING A NATIONAL AGRICULTURAL RESEARCH SYSTEM (NARS)

The Ministry of Agriculture and Forestry and the Multi-Donor Trust Fund (MDTF) with the support of the World Bank provide for the establishment of a National Agricultural Research System (NARS) which is pluralistic and whose activities are targeted and demand-driven. This will contribute towards sustainable economic growth and development through improved agricultural technology which will lead to increased agricultural productivity. According to SADC (2008), the concept of a National Agricultural Research and Development System (NARS) emerged in a number of developing and intermediate countries in the early 90's in order to adapt the prevailing paradigms and institutional set ups in agricultural research, to the emerging needs for a more efficient dissemination and adoption of research findings. A National Agricultural Research and Development System is an organized system mobilizing the contribution of stakeholders in agriculture that include; Research institutions (public, private and professional); Universities and Professional Training institutions; Extension organizations; Farmers' organizations; Private companies and their organizations; and Non-Governmental Organisations (NGOs) and Civil Society Organisations (CSOs).

A NARS has the following characteristics:

i. it operates for the development and the use of research by the stakeholders;
ii. it is governed by participatory bodies;
iii. it is funded by governments and stakeholders;
iv. it plans research and development programs, and evaluates the outputs of those programs; and
v. it supervises the development of international cooperation.

As presented in Figure 1, the National Agriculture Research System in South Sudan will constitute the following actors in a pluralistic research manner:

- The South Sudan Agricultural
- Governmental, non-

Research Organisation (SSARO) as the coordinating body;

- Public and Private universities;
- Private research institutions;

- Policy makers;
- Marketing intermediaries;
- Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA);

governmental and private extension agencies;

- Development partners;
- Farmers; and Input Dealers
- Media
- Credit institutions;
- International Agricultural Research Institutes of the CGIAR system operating in South Sudan;
- Consumers

These various actors will interact with each other in carrying out research, promoting research or assisting the farmers in adopting technology for commercial farming based on the principle of subsidiary. The farmer will be the principal target.

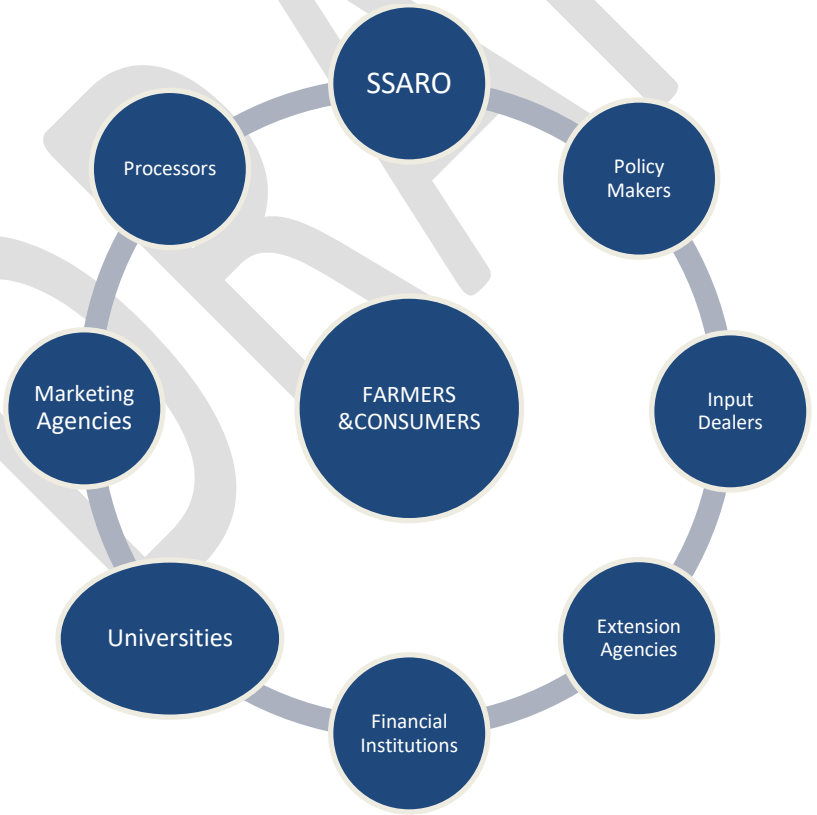


Figure 1: The NARS Family Concept

5.3 ESTABLISHING THE SOUTH SUDAN AGRICULTURAL RESEARCH ORGANISATION (SSARO)

The Republic of South Sudan will enact a law establishing a semi-autonomous research body to be known as the South Sudan Agricultural Research Organisation (SSARO) in accordance with the *South Sudan Research Council Bill (2007).*This bill provides for the establishment of an *Agricultural Research Council* dedicated to research activities concerned with the agricultural, forestry, animal resources and fisheries sectors. This policy wishes to establish an "organisation" rather than a "council" to distinguish the agricultural research body from the South Sudan Research Council. The SSARO shall operate under the supervision and guidance of the SSRC. It will be the principal government body for implementing agricultural research in South Sudan through its research stations. The SSARO will also be the coordinating agency for all agricultural research implanted with government funding. SSARO will be structured as follows:

a. ***SSARO Governing Board*** appointed by the Minister responsible for SSARO (see Figure 2), in accordance with the SSARO Act, whose membership will reflect the major players in the NARS. The Chairperson of the Board will be an eminent scientist. The Board will have at least four standing committees:
    i. Finance and Audit;
    ii. Programmes;
    iii. Partnerships; and
    iv. Administration and Personnel.

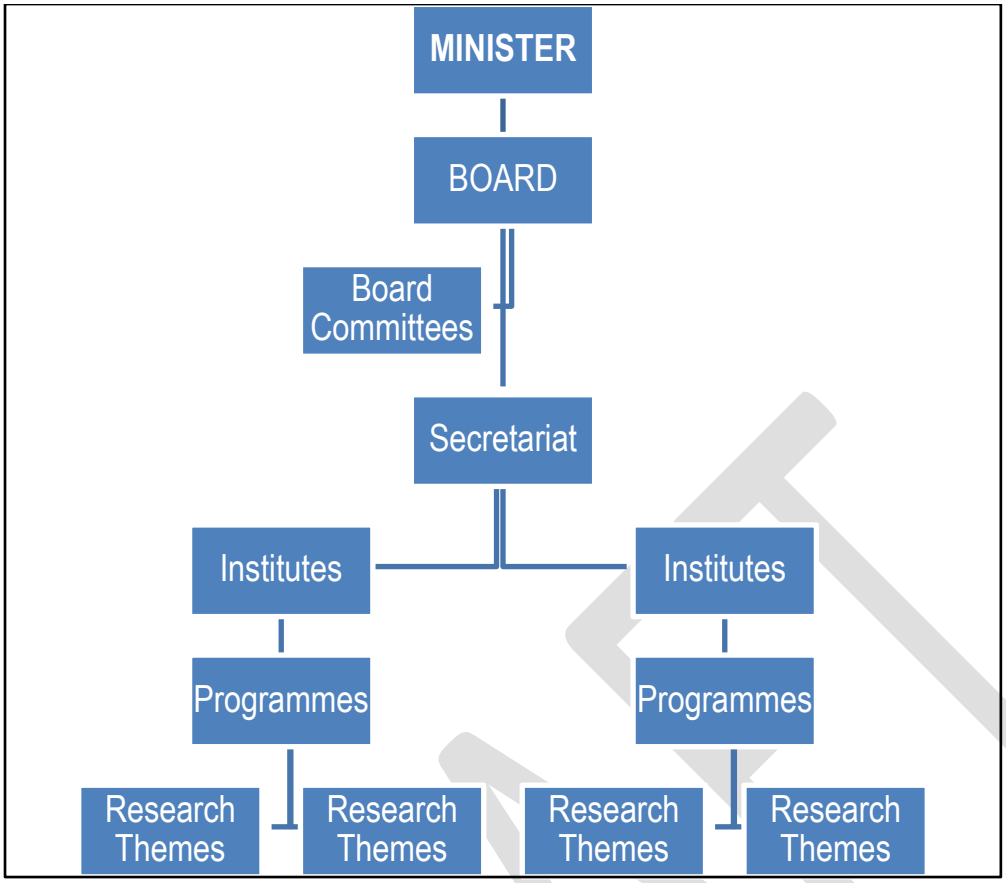


Figure 2: Organogram of the South Sudan Agricultural Research Organisation (SSARO)

b. ***SSARO Secretariat***, whose staff members will be appointed on a competitive basis by the Board, will provide oversight and direction of all operations of SSARO. The secretariat will be headed by the Director General who will be the Chief Executive Officer of the organisation and s/he will be assisted by the following units:

i. Administration and Finance;
ii. Agricultural Policy Analysis;
iii. Planning, Monitoring and Evaluation;
iv. Agricultural Research Information Systems;
v. Human Resource Development;
vi. Research-Extension Linkages; and
vii. Legal Affairs.

c. ***Agricultural Research Institutes (ARIS)*** as shown in Figure 2 will be the operational units for research activities and will be the core of Public Agricultural Research Institutes (PARIs, see Figure 3). In the short to medium term there will be one Public Agricultural Research Institute (PARI) for each of the six agro-ecological zones of South Sudan. These institutes will be structured

as indicated in Fig 3 and shall have internal autonomy in managing priority

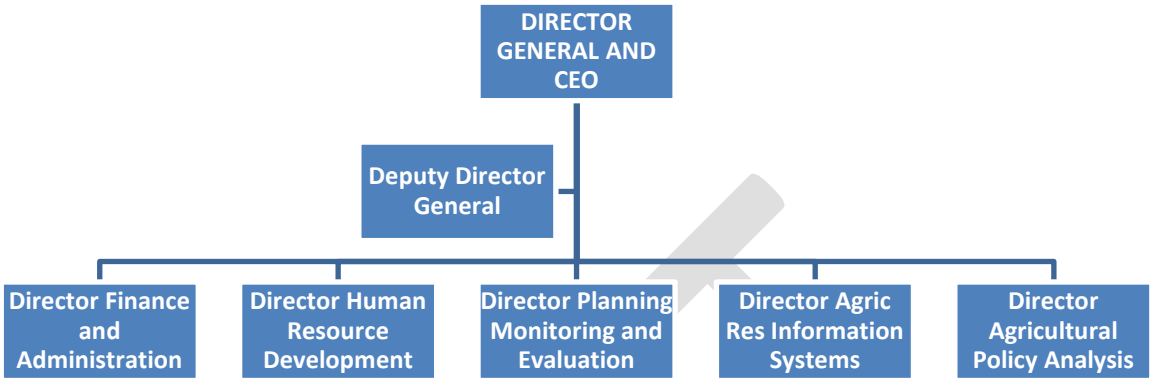


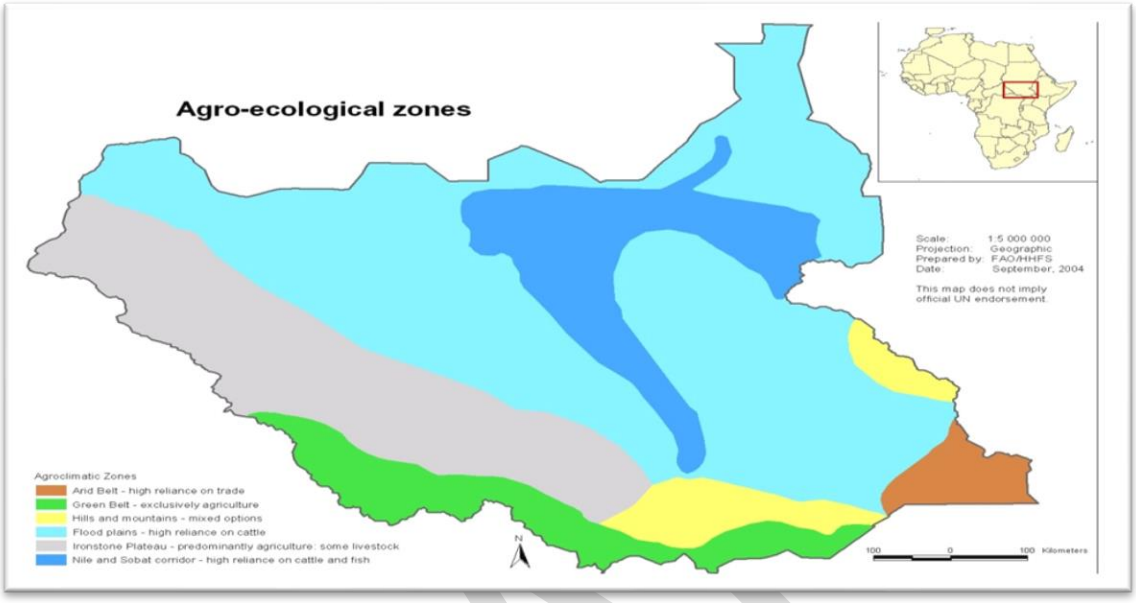
Fig 3: The SSARO Secretariat

research programmes and resources at their levels. ***An Advisory Board*** in Figure 4 will be appointed by the Chairperson of the SSARO Board in consultation with the Minister responsible. The other members of the Advisory will be appointed in such a way as to represent the various agricultural stakeholders in the particular zone. The Advisory Board will have two standing committees one for Administration and Finance and the other for Programmes.

i. ***A Directorate*** comprising of staff appointed by the SSARO Board on a competitive basis. The directorate will be headed by a Director who will be assisted by three units: Administration and Finance, Agribusiness and Training and Outreach. There will be an Executive Committee composed of representatives of the various categories of staff in the station to ensure transparency in the management of station affairs.

ii. ***Research Programmes*** will be based on broad commodities areas i.e., Crops, Livestock, Forestry and Fisheries. Actual research mandate and activities will concentrate on priority commodity chains for the particular agro-ecological zone. Supportive non-commodity research will be on technology that reduce drudgery or mitigate effects of natural hazards such as drought and floods. All programmes of an ARI need not be in one location. For example, if the headquarters of the Green Belt ARI is Yambio, the forestry programme could be located at Kagelu and the Horticulture programme at Yei. The Flood Plains AEZ zone covers more than half the country (see Map 1). This AEZ could

have as many sub-stations as are necessary and affordable. Major activities in this zone will revolve around soil water management, irrigation, rice culture and fisheries.



Map 1. Agro-ecological Zones of South Sudan

iii. ***Specialised Laboratories/Centres of Excellence:*** A research institute may establish specialised laboratories such as for Plant Pathology, Biological Control, Brucellosis, Flood Management or Biotechnology, etc. Similarly some research programmes may develop into Centres of Excellence for a scientific discipline e.g. Dairy Science or Sorghum Science.

d. The National Agricultural Research Forum, NARF: A forum to be known as the South Sudan Agricultural Research Forum (SSARF) shall be established under the South Sudan Agricultural Research Act which shall bring together representatives of all public agricultural research institutions, national universities, their clients and their major funders. It shall be chaired by the Minister responsible for SSARO and will be serviced by the SSARO secretariat. Representatives of private sector research institutions may attend meetings of the Forum as observers. The Forum shall meet once every two years but may meet more often as the responsible minister may decide from time to time. Its main function will be to review research programmes of public institutions and to

ensure that those programmes are contributing to the advancement of national strategic objectives.

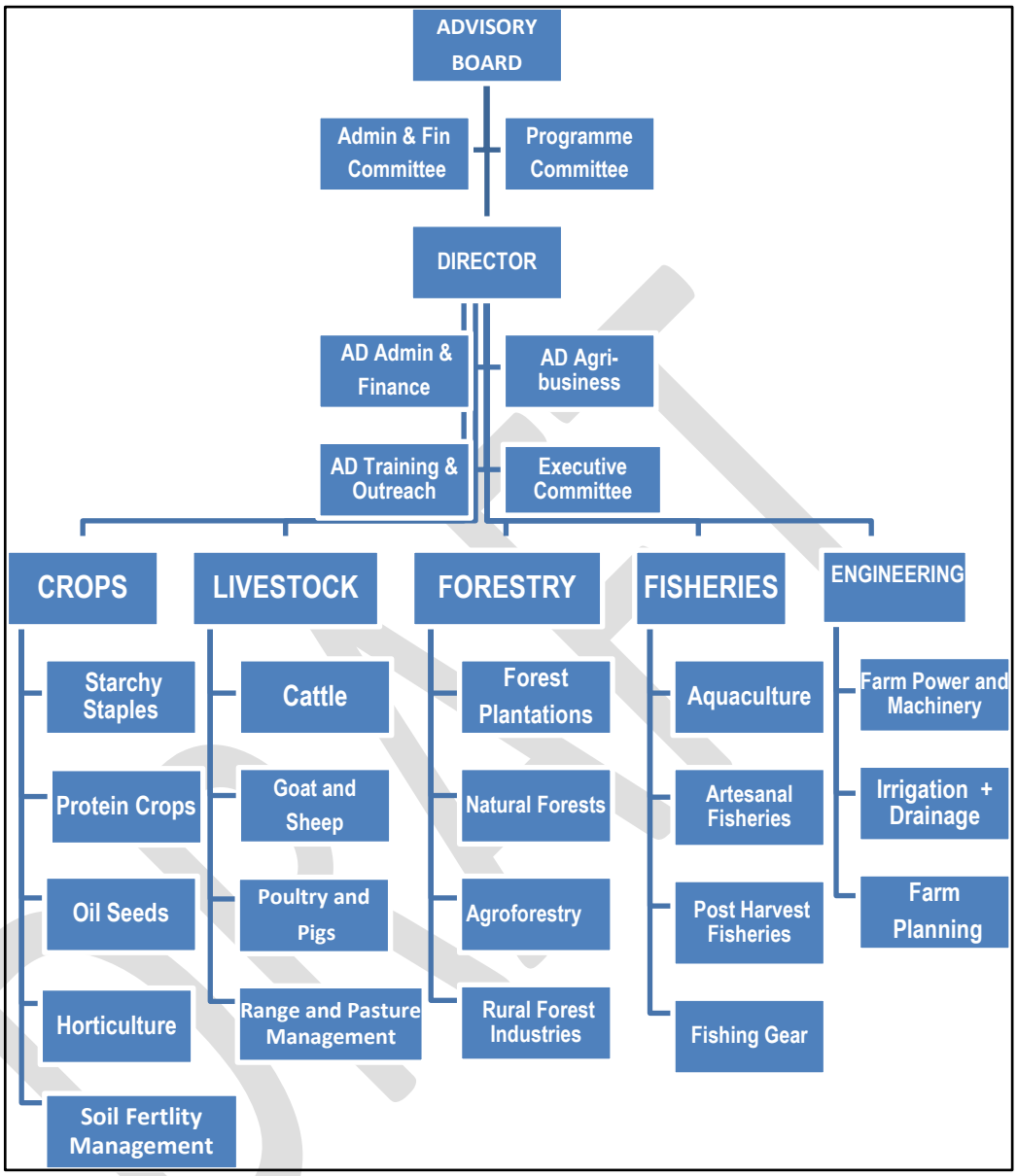


Figure 4: Organogram of Agricultural Research Institutes (ARIS)

5.4 FUNDING

Funding is the blood of all research systems. The funding of agricultural research is the responsibility of governments globally because food and agriculture are strategic for national well-being, development and politics. In China, government funds agricultural research through several academies and government departments. In India agricultural research is funded through the Indian Council for Agricultural

Research (ICAR), through more than twenty agricultural universities and State Governments. In the USA each state has at least one land grant university dedicated to agricultural education, research and extension. These universities are amply supplemented by the US Department of Agriculture (USDA), Agricultural Research Service (ARS) operating in every state. Further, there are several US government (and state governments'), agencies, such as the National Science Foundation and the National Academy of Science, which provide funding for agricultural research on a competitive basis. In Britain, where Agriculture is no longer a strategic factor, the government funds world class research in agricultural sciences through the government-owned Biological and Biotechnological Science Research Council (BBSRC). Some of this research is about African problems.

5.4.1 Sources of Funding

Likewise the onus of funding agricultural research in South Sudan rests primarily on RSS and the Government will fund agricultural research through a combination of the following:

a. Making Parliamentary budgetary provisions;
b. A levy/cess on income from the sale of fossil fuels channelled into a trust fund for research especially on renewable energy e.g. bio-fuels and sustainable agriculture. Current fossil fuel deposits are non-renewable. So it will make sense to invest in research on future sources of renewable energy
c. A levy/cess on agricultural exports for research that can ensure the continued availability of products for export; and
d. Mobilising loans and grants from donors and philanthropic organisations.

5.4.2 Establishing a National Agricultural Research Trust Fund (NARTF)

An Agricultural Research Trust Fund (ARTF) shall be established by the SSRC and registered as a Trust Fund, with a distinct jurisdiction and management structure. The Fund is expected to:

- provide strategic and predictable funding to support for the implementation of National Agricultural Research Strategy and Plan; and
- foster collaboration and synergy between SSARO's various research implementing institutions, and enhance the quality, relevance, and impact of science and research partnership in South Sudan.

It is thus anticipated that the Fund's research activities shall be governed by performance contract arrangements. The Council shall identify and appoint a Trustee for the Fund. It is expected that RSS, aid agencies, and private sector

investors will be the main contributors to the Fund. The Fund shall be administered by an executive team. The Manager of the Fund shall be appointed by the SSRC. S/he shall be a non-voting member of the Council. A Fund management committee shall be established and chaired by the Chairperson of the South Sudan Research Council's Finance committee. To ensure full integration between SSARO's planning, priority setting, resource allocation and M&E processes, the DG/CEO of SSARO's Secretariat and the Chair of the SSARO Board's Finance Committee shall be members of the Fund management Committee. Fiduciary responsibilities of the Fund shall reside with the Fund Management Committee. There shall be a Fund Secretariat which shall be lean, but staffed with highly qualified professionals.

6.0 IMPLEMENTATION SCHEDULE

The policy calls for a smooth, progressive and decisive process for the reform of the NARS and the establishment of the South Sudan Agriculture Research Organization (SSARO) through the stewardship of the South Sudan Research Council (SSRC). Sufficient time will be allowed for consensus and confidence building among all key stakeholders. The following schedule is proposed to accomplish some of the most critical interventions needed to implement this policy.

Actions	Responsible	Timing
1. Seeking and consolidating consensus on this policy document;	MAF Senior Executive	2012
2. Appointing Change Management Team (CMT)	MAF and MARF Senior Executives	2012
3. Drafting SSARO Ten Year Strategic Plan	Research Management Team and CMT	2012
4. Drafting the SSARO Act	Legal experts	2012
5. Presenting Draft SSARO Act to Ministers Council and Parliament	Minister	2012
6. Developing Terms and conditions of service of SSARO staff	Research management Team	2012
7. Constituting SSARO Board	Minister	2012
8. Constituting the National Agricultural Research Forum (NARF)	Minister	2012
9. Establish Research Centres in the six Agro-ecological Zones, Renk / Malaka (flood plain/Nile Sobat Corridor), Halima (ironstone), Yei/Yambio (Greenbelt), Kapoeta (Semi-arid zone), Gilo / Nagishot (Hills and mountains)	NARF	2012
10. Approval of SSARO Ten Year Development Plan	SSARO Board	2012
11. Appointing staff of the Secretariat	MAF Executive and CMT	2012
12. Constituting Advisory Boards for Halima (Ironstone AEZ) and Yambio (Green belt AEZ)	CMT	2012
13. Appointing core staff for Halima and Yambio ZARS	CMT	2012
14. Drafting protocols for the National Agricultural Research Trust Fund (NARTF)	CMT	2012
15. Presenting NARTF protocols to Council of Ministers and Parliament	Minister	2012
16. Developing manuals for: Financial	CMT	2013

management, Human Resource management, Assets management and Research management		
17. Establishing the ZARS for the Flood Plains and the Nile / Sobat Corridor AEZs	SSARO Board	2014
18. Establishing ZARS for the Arid Belt and Highlands AEZs	SSARO Board	2016
19. General Review of the progress in establishing a National Agricultural System (NARS) of South Sudan	Minister	2017

A full matrix of implementation plan and expected budgets for the period until 2017 based will have to be developed by the Directorate of Research in collaboration with other departments and key stakeholders outside MAF.

6.1 EFFECTIVE DATE

This National Agricultural Research Policy shall come into effect as soon as it is passed by the Parliament. The tenets of the policy shall have long-term application, and shall continue in force indefinitely, until specifically modified by law. Any such modifications shall not change the intent or philosophy of this South Sudan National Agricultural Research Policy.

6.2 APPLICABILITY

All public and private stakeholders in the Agricultural sector shall be required to comply with the content and spirit of this National Agricultural Research policy. Legislative proposals and regulations shall be introduced in due course to establish the South Sudan Agricultural Research Organization (SSARO).
Relevant legal provisions that may be enacted are:

a. The South Sudan Agricultural Research Council Bill to give legal backing to this policy;
b. Establishment of agricultural research stations to service all agro-ecological zones
c. Intellectual property Rights Law.

6.3 POLICY AND ADVISORY UPDATING

To keep the South Sudan National Agricultural Research Policy current and applicable to changing conditions, the SSARO will from time to time, make recommendations to the Government on relevant issues of importance to agricultural research. The responsible Ministers shall consider such recommendations; discuss them with State Ministers responsible for Agricultural Sector and all other stakeholders, and, in accordance with applicable laws, issue modifications in the South Sudan National Agricultural Research Policy to improve its suitability and applicability to current conditions without changing its long-term intent or legitimacy. Plans of action shall be prepared and updated from time to time to serve as guides to both public and private stakeholders in the implementation of actionable components of this policy. The plans of action shall be based on the goals, objectives and strategies outlined in this policy and shall specify the expected outputs and activities expected of the recommended interventions, the time frames, the responsible and/or implementing institutions as well as costs, budgets and other resources. The SSARO shall oversee the preparation of the plans of action but all participating institutions will be required to propose the specifics relating to the components for which they are responsible.

Timeframe and Budget for the Strategy

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
1. Output 1: Promote and encourage breeding, adaptation and adoption of new and improved crop varieties and animal breeds.															
1.1 Conduct baseline survey to identify existing varieties and breeds and establish an inventory **Activities:**															
1.1.1															
1.1.2															
1.1.3															
1.1.4															
1.2 Establish germplasm collection and conservation system **Activities:**															
1.2.1															
1.2.2															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
1.2.3															
1.2.4															
1.3 Using conventional and novel tools. **Activities:**															
1.3.1															
1.3.2															
1.3.3															
1.3.4															
1.4 Introduce and adapt improved crop varieties and animal breed. **Activities:**															
1.4.1															
1.4.2															
1.4.3															
1.4.4															
1.5 Develop breeder's and Basic seed industry **Activities:**															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
1.5.1															
1.5.2															
1.5.3															
1.5.4															
2. Output 2: To ensure reduction of losses caused by pests and diseases in crops. Livestock, fisheries and forestry.															
2.1 Introduce, breed, develop and promote pest and disease resistant varieties and strains. **Activities:**															
2.1.1															
2.1.2															
2.1.3															
2.1.4															
2.2 Utilise biological control agents **Activities:**															
2.2.1															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
2.2.2															
2.2.3															
2.2.4															
2.3 Promote the use of safe chemical pesticides. **Activities:**															
2.3.1															
2.3.2															
2.3.3															
2.3.4															
2.4 Promote good cultural husbandry practices. **Activities:**															
2.4.1															
2.4.2															
2.4.3															
2.4.4															
2.5 Identify and promote effective and safe traditional pest and disease															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
control method. **Activities:**															
2.5.1															
2.5.2															
2.5.3															
2.5.4															
3. Output 3: Preservation of the Natural Resource base to promote increased crop yields															
3.1 Develop and adapt improved methods for using inorganic fertilizers **Activities:**															
3.1.1															
3.1.2															
3.1.3															
3.1.4															
3.2 Increase efficiency of biological nitrogen.															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
Activities:															
3.2.1															
3.2.2															
3.2.3															
3.2.4															
3.3 Develop practical method for using mycorrhizae in improving soil fertility. **Activities:**															
3.3.1															
3.3.2															
3.3.3															
3.3.4															
3.4 Develop rotations to improve soil fertility and soil conservations **Activities:**															
3.4.1															
3.4.2															
3.4.3															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
3.4.4															
3.5 Develop and disseminate soil erosion control measures **Activities:**															
3.5.1															
3.5.2															
3.5.3															
3.5.4															
3.6 Improve cost effective use of Organic fertilizers, mulching, minimum tillage and cultural practices. **Activities:**															
3.6.1															
3.6.2															
3.6.3															
3.6.4															
4. Output 4: Improve agricultural implements and machinery in South Sudan															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
4.1 Introduce appropriate improved farm tools, implements, equipment and machinery. **Activities:**															
4.1.1															
4.1.2															
4.1.3															
4.1.4															
4.2 Adapt introduced farm tools, implements, equipment and machinery to local conditions. **Activities:**															
4.2.1															
4.2.2															
4.2.3															
4.2.4															
4.3 Local design farm tools implements, equipment and machinery appropriate for South Sudan conditions.															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
Activities:															
4.3.1															
4.3.2															
4.3.3															
4.3.4															
5. Output 5: Facilitate improved knowledge, skills and competence of personnel in the national agricultural research system of South Sudan.															
5.1 Develop long term human resource plan **Activities:**															
5.1.1															
5.1.2															
5.1.3															
5.1.4															
5.2 Attract suitably qualified South Sudanese personnel from the Diaspora.															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
Activities:															
5.2.1															
5.2.2															
5.2.3															
5.2.4															
5.3 Recruit suitable personnel from the East and Central Africa to kick-start priority research programmes. **Activities:**															
5.3.1															
5.3.2															
5.3.3															
5.3.4															
5.4 Mobilize financial resource for training of different levels. **Activities:**															
5.4.1															
5.4.2															
5.4.3															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
5.4.4															
6. Output 6: Create conducive environment to minimize the losses caused by droughts, floods and heat stresses.															
6.1 To develop drought and heat tolerant varieties and breeds. **Activities:**															
6.1.1															
6.1.2															
6.1.3															
6.1.4															
6.2 Develop and disseminate improved water management technologies. **Activities:**															
6.2.1															
6.2.2															
6.2.3															
6.2.4															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
6.3 Develop database for agro climatic data for all agro-ecological zones. **Activities:**															
6.3.1															
6.3.2															
6.3.3															
6.3.4															
6.4 Develop household, community and national schemes for water harvesting **Activities:**															
6.4.1															
6.4.2															
6.4.3															
6.4.4															
6.5 Develop predictive model for drought and flood episodes. **Activities:**															
6.5.1															
6.5.2															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
6.5.3															
6.5.4															
6.6 Explore the potential of underground water reservoirs for use in agricultural production. **Activities:**															
6.6.1															
6.6.2															
6.6.3															
6.6.4															
7. Output 7: Facilitate establishment of a physical and technical environment conducive to advanced productive research work															
7.1 Rehabilitate the existing physical infrastructure. **Activities:**															
7.1.1															
7.1.2															
7.1.3															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
7.1.4															
7.2 Construct required additional infrastructure **Activities:**															
7.2.1															
7.2.2															
7.2.3															
7.2.4															
7.3 Provide modern scientific laboratory and field equipment. **Activities:**															
7.3.1															
7.3.2															
7.3.3															
7.3.4															
7.4 Develop culture of maintenance **Activities:**															
7.4.1															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
7.4.2															
7.4.3															
7.4.4															
8. Output 8: Development partners and International Institution will build institutional capacity for a pluralistic and demand driven National Agricultural Research System (NARS)															
8.1 Develop a National Agricultural Research system (NARS), **Activities:**															
8.1.1															
8.1.2															
8.1.3															
8.1.4															
8.2 Establish a semi-autonomous research body to be known as the South Sudan Agricultural Research Organization (SSARO). **Activities:**															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
8.2.1															
8.2.2															
8.2.3															
8.3.4															
8.3 Establish integrated public sector agricultural research stations. **Activities:**															
8.3.1															
8.3.2															
8.3.3															
8.3.4															
8.4 Promote private sector agricultural research. **Activities:**															
8.4.1															
8.4.2															
8.4.3															
8.4.4															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
8.5 Foster linkages and networking between and among agricultural research and development institutions within South Sudan, the African region and internationally. **Activities:**															
8.5.1															
8.5.2															
8.5.3															
8.5.4															
8.6 Develop an agricultural research management information system **Activities:**															
8.6.1															
8.6.2															
8.6.3															
8.6.4															
8.7 Develop intellectual property rights management capability. **Activities:**															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
8.7.1															
8.7.2															
8.7.3															
8.7.4															
9. Output 9: Facilitate provision of data and information for promoting efficient rational and equitable utilisation of land by small, medium and large scale commercial farmers, planters and ranchers.															
9.1 Carry studies for group farming in Africa, Asia and Latin America and document lessons for South Sudan. **Activities:**															
9.1.1															
9.1.2															
9.1.3															
9.1.4															
9.2 Carry out studies on large scale farming, forest plantations and ranching in the tropics and															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
document lessons for South Sudan. **Activities:**															
9.2.1															
9.2.2															
9.2.3															
9.2.4															
9.3 Carry out ex-ante environmental and social impact assessment of large scale farming, tree plantation and ranching. **Activities:**															
9.3.1															
9.3.2															
9.3.3															
9.3.4															
9.4 Document and forecast the necessary conditions for promoting large scale farming forest plantations and ranching in South Sudan,															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
Activities:															
9.4.1															
9.4.2															
9.4.3															
9.4.4															
9.5 Forecast the probable impact of large scale faming, forest plantations and ranching on agricultural and economic growth of South Sudan. **Activities**															
9.5.1															
9.5.2															
9.5.3															
9.5.4															
10. Output 10: Create conducive business and trade environment to expand market opportunities for South Sudanese products at national, regional and global markets.															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
10.1 Analyse the impact of agricultural imports and food aid **Activities:**															
10.1.1															
10.1.2															
10.1.3															
10.1.4															
10.2 Carry out comparative and competitive advantage studies on agricultural commodities produced in South Sudan. **Activities:**															
10.2.1															
10.2.2															
10.2.3															
10.2.4															
10.3 Cary out local regional and global value chain analysis on															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
commodities. **Activities:**															
10.3.1															
10.3.2															
10.3.3															
10.3.4															
10.4 Identify and increase the quality and quantity of agricultural commodities for which South Sudan has a comparative and competitive advantage. **Activities:**															
10.4.1															
10.4.2															
10.4.3															
10.4.4															
10.5 Develop and release technologies for growing acacia Senegal, acacia seyal and shear butter nut tree in plantations.															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
Activities:															
10.5.1															
10.5.2															
10.5.3															
10.5.4															
10.6 Explore the prospect of producing bio-fuels in South Sudan. **Activities:**															
10.6.1															
10.6.2															
10.6.3															
10.6.4															
10.7 Prospect and identify plants of potential medicinal and industrial importance. **Activities**															
10.7.1															
10.7.2															
10.7.3															

Output and Activities	Budget	PHASE I						PHASE II							
	US$	2012		2013				2014		2015		2016		2017	
		Q1	Q2	Q1	Q2	Q3	Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4
10.7.4															