Republic of South Sudan
Ministry of Agriculture and Food Security
Ministry of Water Resources and Irrigation

First National Rice Development Strategy (NRDS 2024 – 2034)

Juba, South Sudan
February 2025

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Foreword

The Ministry of Agriculture and Food Security (MAFS) developed the "First National Rice Development Strategy 2024-2034 of the Republic of South Sudan" since December, 2023 and was technically validated in the month of February, 2025 in Juba during CARD 1st working week meeting through 50 participants includes; senior government officials, Development partners such as; IFAD, EU, JICA and Turkey embassy, National Rice Task Force Members, Focal persons from three states; Jonglei State (JS), Northern Bahar El Gazal State (NBGS) and Western Equatoria State (WES). In the month of June 9th-13th, 2025 during CARD 2nd working week meeting organized by CARD secretariat in Nairobi, Kenya where the ten members of NRTF and three JICA South Sudan representatives and two CARD experts were developed four Concept Notes (CNs) and Resources Mobilization Roadmap (RMR) for the implementation of the NRDS 2024-2034.

In 22nd , August, 2025 the frist NRDS for the Republic of South Sudan was politically endorsed, through Ministerial meeting headed by; Hon. Lily Albino Akol, the Deputy Minister for the MAFS, including Undersecretaries from line Ministries of the Natural Resources Sector Working Group (NRSWG), ministries were; Ministry of Agriculture (MAFS), Ministry of Water Resources and Irrigation (MWRI), Ministry of Environment and Forestry (MEF), Ministry of Livestock and Fishiaries (MLF) and Ministry of Wildlife Conservation and Tourisim (MWCT) and Director Generals of Planning, Agriculture production and Extension, Research and Training, Representative from Ministry of Foreign Affairs and International Cooperation. While, the country's 1st NRDS was launched officially in Juba in the early week of October, 2025, leads to announcement of the Rpublic of South Sudan as CARD'S member by the General Coordinator for CARD during the tenth General Assembly (GM10) in Madagascar.

Agriculture remains a less taped economy of South Sudan; its contributing with about 30% of the country's GDP and employing about 80% of the rural population. South Sudan with a population is over 13 million people, 80% in rural much engaged in agriculture, and the country's had a land area of 658,842 square kilometers with the extensive area of grasslands which covers 37.8 percent which's potential for agricultural activities, as it offers fertile ground for cultivating crops and supporting livestock grazing, and 18.8% indicated as wetland which's good for low rice, while up land rice suitable for the mentioned grassland[1]. The Ministry of Agriculture and Food Security (MAFS), in line with the National Agriculture Investment Plan (NAIP) named Comprehensive Agriculture Development Master Plan (CAMP), the government selected rice as one of the prioritized commodities of the country's Food and Agriculture Delivery system (COMPACT).

During the last fifteen years rice consumption high in urban compare with rural always overtakes local production, and had been reported that an estimate cost of $76 million USD (176 million S. Sudanese Pounds or SSP) was spent for importation of milled rice and consumed all in the same period (NBS, 2009). This NRDS 2024-2034 aiming for increasing rice production and productivity at a target of 20% annually, at production target of 61,000 ton and 16,000 (ha) total acreage of land with at a yield target of 5 ton/ha and to lessen importation of rice from other countries by 50%, and also train 10,000 Small and Medium Holder Farmers (SMHF) on sustainable rice farming practices and climate resilient techniques by end of 2034.

02/10/25

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[1] South Sudan Land Cover Atlas, FAO Rome 2023.

Executive summary

Following application letter for membership of the Coalition for African Rice Development (CARD), South Sudan submitted its inten letter to CARD's General Coordinator in July, 2023 during the 9th General Assembly Meeting (GM9) in Cote d'Ivoire. Then, the country established its National Rice Task Force (NRTF) in November, 2023, which subsequently led the formulation of the first National Rice Development Strategy (NRDS 2024-2034).

The Coalition for African Rice Development (CARD) is an initiative for doubling rice production in sub–Saharan Africa within the 2nd phase of its ten years (2019-2030) of Coalition. CARD was launched/created at the 4th Tokyo International Conference on Africa Development (TICAD IV) in May 2008, and has already covered its first phase from (2008-2018). CARD was jointly formed by the Alliance for a Green Revolution in Africa (AGRA), Japan International Cooperation Agency (JICA) and New Partnership for Africa Development (NEPAD). The initiative is being implemented in full respect of African ownership and leadership embodied in the Comprehensive Africa Agriculture Development Program (CAADP), and with strong links to existing structures, programs, networks and initiatives such as African Rice Initiative (ARI). Under the CARD initiative the government of South Sudan provided with the technical support to develop the strategy (NRDS 2024-2034) with funding from JICA.

The vision of this NRDS is to produce rice to meet domestic demand, thus contribute to food security and poverty alleviation in South Sudan and further aimed to export rice to others. In order to strengthen the role of the agricultural sector in achieving the development objectives such as food security, poverty alleviation, export promotion, the government of South Sudan has adopted rice as an important and high-potential cash crop. The Ministry of Agriculture and Food Security (MAFS), in line with the National Agriculture Investment Plan (NAIP) named as the Comprehensive Agriculture Development Master Plan (CAMP), the government of South Sudan selected rice among its prioritized commodities of the country's Food and Agriculture Delivery system (COMPACT).

This strategy highlights key strategic goal, programs and plans for increasing rice production and productivity at a targets of 20% annually, at production target of 61,000 MT, and16,000 (ha) of acreage of land with a yield target of 5 MT/ha, including training of 10,000 Small and Medium Holder rice Farmers (SMHF) on sustainable rice farming practices and climate resilient techniques by end of 2034. The 1st NRDS covers; rice markets development, enhancing water and irrigation system for rice crop, and a guide to the policymakers, agricultural planners/programmers and development partners, markets and private sector players, government annual planning and budgeting, decisions and implementation for advancing rice production and national food security, inlining with rice sector policy & NIP.

This startegy also, outlined, the present status of Rice Production in lowland and upland (agroecological zones), the country's agriculture sector potentials available for developing rice across the nation. It explained the consumption and production of rice across urban & rural areas, market demand and supply characteristics, consumer preferences and trends in rice consumption as well as capacities, gaps, challenges and opportunities (SWOT) of the rice sector. It covers, the land tenure, including women and youth (Gender Issues), and the players in rice market value chain development. It's identified the priority intervention areas for the rice sector development Programs, in addition to M&E, implementation and coordination mechanisms.

South Sudan has an area of 658,842 square km with an estimated population of 13 million, where 70% are young people (under 29 years). The majority of country's population are living in the rural areas (83%), and about half of the total population live below the poverty line. Modern rice farming in South Sudan began since 1945-1973 in Aweil Rice Irrigation Scheme (ARIS), Northern Bahr el Ghazal State

(NBGS) as an oldest irrigation scheme, having been introduced by the British colonial administration through the Prison Service and picked up through the government of Sudan bythen. Notwithstanding the fact that rice consumption is high in South Sudan, with limited local production (unmet demand) leading to increases of the rice imports. The rice country's industry still in its early stages[2]. But as rice is becoming a crucial food diet in many of the population particularly the urban, as a result the consumers will be more sensitive to quality and taste attributes which might benefit local rice industry if it's scaled up by this NRDS.

During the last fifteen years (2009-2024), rice consumption was high in urban areas compare with rurals and it always overtakes the local production. Hence, it had been reported that an estimated cost of $76 million USD (176 million S. Sudanese Pounds or SSP) was spent for importation of milled rice and been consumed all in the same period (NBS, 2009). In this strategy (NRDS 2024-2034), the national rice demand projected in 2024/25 stood at about 115, 000 tons/ year vises a total production projected at about 11,843 tons/year. Also, the rapid increases on the national rice consumption shown when compared between the 2009 and 2021, the national per capita rice consumption rate increased from 2.9kg to 7.15kg. Out of the total national rice demanded, only 10% paddy rice produced locally, while the majority of rice met through the imported milled rice with high world market prices. Consumption continues to increase in urban areas, due to population increased, urbanization and more importantly the fact that a large number of South Sudanese have displaced or migrated to the major city and towns since 2013-2016 conflicts and others voluntarily returned from refuge during the South Sudan Revitalized Agreement in 2018 made between the Government and opposition. Whereby, most returnees were affected by new food habit which they adopted during their refuge.

Overall, there are perceived limiting factors which need to be overcome in order to achieve the objective of this strategy which mainly includes; lack of consumer and farmer-preferred high yielding rice seed varieties, inadequate rice farming inputs (machinery and fertilizers), limited capacities of breeders, agronomist, irrigation engineers, while rice farmers cultivating small land size only for home consumption, due to high cost of labour for the land preparation, planting, and lack of access to financial services, prevalence of pest and diseases, uneffective water management for the small, medium and large irrigation schames, poor post-harvest handling and market value chain.

In order to accelerate the production and productivity of rice and address the demand and supply gap, the National RiceTask Force (NRTF) developed four Concept Notes (CNs), for the execution of this NRDS, focuses on improving rice seeds system, promoting rice investment programs in South Sudan. Much attention will be devoted to financial mechanism in order to foster the implementation of projects that's developed by the TF. Therefore, availability and accessibility of credit through Small and Medium Holder Farmers (SMHF) and cooperatives is very crucial. Lending conditions to the rice producers should be sufficiently broad and flexible to allow investments related with on-farm development activities and agricultural seasons working capital. Big investment upgrading policies that encourage rice production and marketing will need to be formulated.

31st oct 2025

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[2] Green Publication (2024) "Evaluation of rice production in Aweil Rice Irrigation Scheme of Northern Bahr el Ghazal State in South Sudan", Volume-10 | Issue-1 | April, 2024

Abbreviation and acronyms

AfDB	African Development Bank
ARIS	Aweil Rice Irrigation Scheme
ARSRM	Annual Rice Sector Review Meeting
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CAMP	Comprehensive Agricultural Development Master Plan
CAADP	Comprehensive Africa Agriculture Development Program
CARD	Coalition for African Rice Development
COMESA	Common Market for Eastern and Southern Africa
CPA	Comprehensive Peace Agreement
CBOs	Community-based Organizations
DPs	Development Partners
EAC	East African Community
ECARRN	East and Central Africa Rice Research Network
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Development)
IDMP	Irrigation Development Master Plan
JGMU	John Garang Memorial University
IGAD	Inter-Governmental Authority on Development
JICA	Japan International Cooperation Agency
MAFS	Ministry of Agriculture & Food Security
MDGs	Millennium Development Goals
MWRI	Ministry of Water Resources and Irrigation
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental Organization
NRSWG	Natural Resources Sector Working Group
NRSWG TC	Natural Resources Sector Working Group Technical Committee
NRDS	National Rice Development Strategy
NRTF	National Rice Task Force
PFSP	Policy Framework and Strategic Plan
R-SSNDS	Revised South Sudan National Development Strategy 2021-2024
SDG	Sudanese Pounds
SDGs	Sustainable Development Goals
SIEM	Subsector/Intervention Elements Matrices
SSDI	South Sudan Development Initiative
SSDP	South Sudan Development Plan
SSNBS	South Sudan National Bureau of Standards
SSNDS	South Sudan National Development Strategy
SSASIP	South Sudan Agriculture Sector Investment Plan
SSP	South Sudanese Pound
WFP	World Food Programme of the United Nations
WTO	World Trade Organization

Chapter 1: Introduction

1.1 Background on the Formulation of National Rice Development Strategy (NRDS)

In 2023, recognising rice as an important and high-potential cash crop, the Ministry of Agriculture and Food Security (MAFS) selected rice as one of the prioritized commodities of the South Sudan Food and Agriculture Delivery Compact (Compact). This will directly contribute to increased production and productivity, and to improving food security and nutrition in line with the Government's strategy to transform the agricultural sector into a prosperous industry, and a driving force for inclusive growth and economic diversification.

In that regard, MAFS formed the National Rice Task Force (NRTF) to develop the first National Rice Development Strategy (NRDS). This strategy will provide the vision, goals, and objectives for the period 2024 to 2034 and beyond, to promote growth and development of the rice sector in South Sudan. This NRDS will also serve as a key resource mobilization instrument by the government, development partners, and the private sector.

1.2 General information on the Republic of South Sudan

The Republic of South Sudan (RSS) is a landlocked country in East Africa region. The countries bordering it are Sudan on the north, Ethiopia on the east, the Democratic Republic of Congo, Uganda and Kenya on the south, and the Central African Republic on the west. The diversified landscape of South Sudan includes vast plains and plateaus, dry and tropical savannahs, inland flood plains, forests and mountains. The Nile River comes from Lake Victoria, running through Nimule town from south to Renk in northern Upper Nile state crossing from the centre to Kosti in the White Nile of Sudan.

The signing of the Comprehensive Peace Agreement (CPA) in January, 2005 brought to an end the longest civil war in old Sudan. The CPA allowed the establishment of an Autonomous government of Southern Sudan where by-then the Ministry of Agriculture and Forestry (MAF) took the mandate of Agriculture and Food Security sectors and revived the national agricultural schemes including Aweil Irrigated Rice Scheme (AIRS) in Northern Bahar el- Gazal State (NBGS).

The country gained independence on the 9th July 2011 following years of struggle for liberation and successful referendum from Sudan. Unfortunately, just two years after independence, the country returned to civil war in 2013 and was later followed by a second breakout of fighting in 2016 which ended through the signing of the Revitalized Peace Agreement on the Resolution of the Conflict in the Republic of South Sudan (R-ARCSS), in September 2018. The peace agreement further encouraged and promoted relative stability under the Revitalized Government of National Unity (R-GoNU).

South Sudan has an area of **658,842 square km** with an estimated **population of 13 million**, where 70% are young people (under 29 years). Majority of the country's population are living in the rural areas (83%), and about half of the total population live below the poverty line. The country is known to have extensive unrealised agricultural potential, where over 95% of the country's total area is considered suitable for agriculture, of which 50% is prime agricultural land with favourable soil and climatic conditions suitable for crop and livestock production. However, only 4% of the arable land is cultivated whilst despite the abundant water resources, only 3% of the farmland is irrigated, whereas 97% of farmland depends on rainfed for agriculture.[3]

The South Sudan economy is highly vulnerable to external shocks due to its heavy dependence on crude oil production and exports, which accounts for nearly 60 % of the country's total gross domestic product (GDP), and conistitutes 95 % of the total share of the government revenues.

[3] Situation Analysis Report 2013/2015 of the Comprehensive Agricultural Development Master Plan

1.3 International, Regional and the Country Context of the Rice Sector

International Context of Rice Production;
Globally, rice is one of the most important food crops in the fight against hunger. The total annual world production of milled rice in 2024 increased to over **530 million metric** tonnes **compared with 525.6 million tonnes** produced in 2023 season, and with total utilization recorded at 525.3 million metric tons according to the world food outlook (Shirley Mustafa, June 2024). Despite sorghum and maize crops being widely consumed, rice remains the most favoured grain globally for human consumption (Mogga, 2014). Development of the rice sector presents an opportunity to reduce the number of gravely food insecure people that stand at 828 million in 2021 according to the UN Global hunger report, which has increased by 9.3% since 2020. Also, the United Nations (FAO), updated that the global rice trade in 2020 was projected at 757 million tons, following the easing of export restrictions imposed by several exporting countries in 2015. The preliminary global rice export forecasted in 2009 stood at 30.4 million tons. Rice importation globally is under the control of the private sector, which make it vulnerable to the risks of a global financial crisis.

Regional Context of Rice Production;
Regionally, in response to the growing importance of rice production in Sub-Saharan Africa (SSA) in late Nineteen-ninety, the Alliance for a Green Revolution in Africa (AGRA), Japan International Cooperation Agency (JICA) and the New Partnership for Africa's Development (NEPAD) launched the Coalition for African Rice Development (CARD) in 2008 as a new architecture to support the efforts of African countries to increase rice production in the continent. Thirty-two (32) countries are now CARD members, while the Government of South Sudan (GoSS) in July 2023 submitted its letter of intent to the CARD Secretariat to obtain its membership.

AFRICA – according to (UN-FAO's biennial "Food Outlook" report, June 13, 2024), the total milled rice production projected to reach **28.4 million tonnes** in the 2024/25 season, marking a 4% increase from the previous year's **27.3 million tonnes**. As a result, many African countries are expected to reduce imports and focus on local rice production. Recognising the importance of rice, development partners and Pan-African initiatives such as; FAO, the New Partnership for Africa's Development (NEPAD), the Comprehensive Africa Agriculture Development Programme (CAADP), the Forum for Agricultural Research in Africa (FARA), the East and Central Africa Rice Research Network (ECARRN), the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the East African Community (EAC) have shown interest in research and development for the benefit of the livelihoods of communities in SSA.

Rice Production in South Sudan:
Modern rice farming in South Sudan began in the 1945. Notwithstanding the fact that rice consumption is high in South Sudan, local production cannot meet the overall consumption demand leading to increased rice imports. The rice industry in the country is still in its early stages[4]. But as rice is becoming a crucial food staple for large portion of the country's population particularly the urban, where consumers are more sensitive to quality and taste attributes. Improving rice quality could particularly benefit local rice industry if it's scaled up.

The Aweil Rice Irrigation Scheme (ARIS) in Northern Bahr el Ghazal State (NBGS) is the oldest irrigation scheme in South Sudan, having been introduced by the British colonial administration through the Prison Service Department in Aweil from 1945-1955. The then Sudanese government took over from 1956-1972 and handed it initially to FAO in 1974-1979, and finally, to the European Development Fund from 1980-1987, when work stopped due to the Sudan civil war, see the mapped area of ARIS shown in Figure 1 bellow. Work resumed in ARIS by GoSS in 2008 -2012. The ARIS is well known by the State government and the people as a national project that is directly under the responsibility of the national Ministry of Agriculture and Food Security (MAFS) in Juba. The Scheme has seven (7)

[4] Green Publication (2024) "Evaluation of rice production in Aweil Rice Irrigation Scheme of Northern Bahr el Ghazal State in South Sudan", Volume-10 | Issue-1 | April, 2024

Departments and is headed by the Project Manager, with the Deputy directly reporting to the Under Secretary, Agriculture and Food Security in the national ministry without aligning with the technical directorates such as the Directorates of National Projects, Planning and Agricultural Economics, Agricultural Production and Mechanisation. Staffing capacities in the scheme are very low, with no agronomists, researchers, mechanisation, or irrigation experts[5].

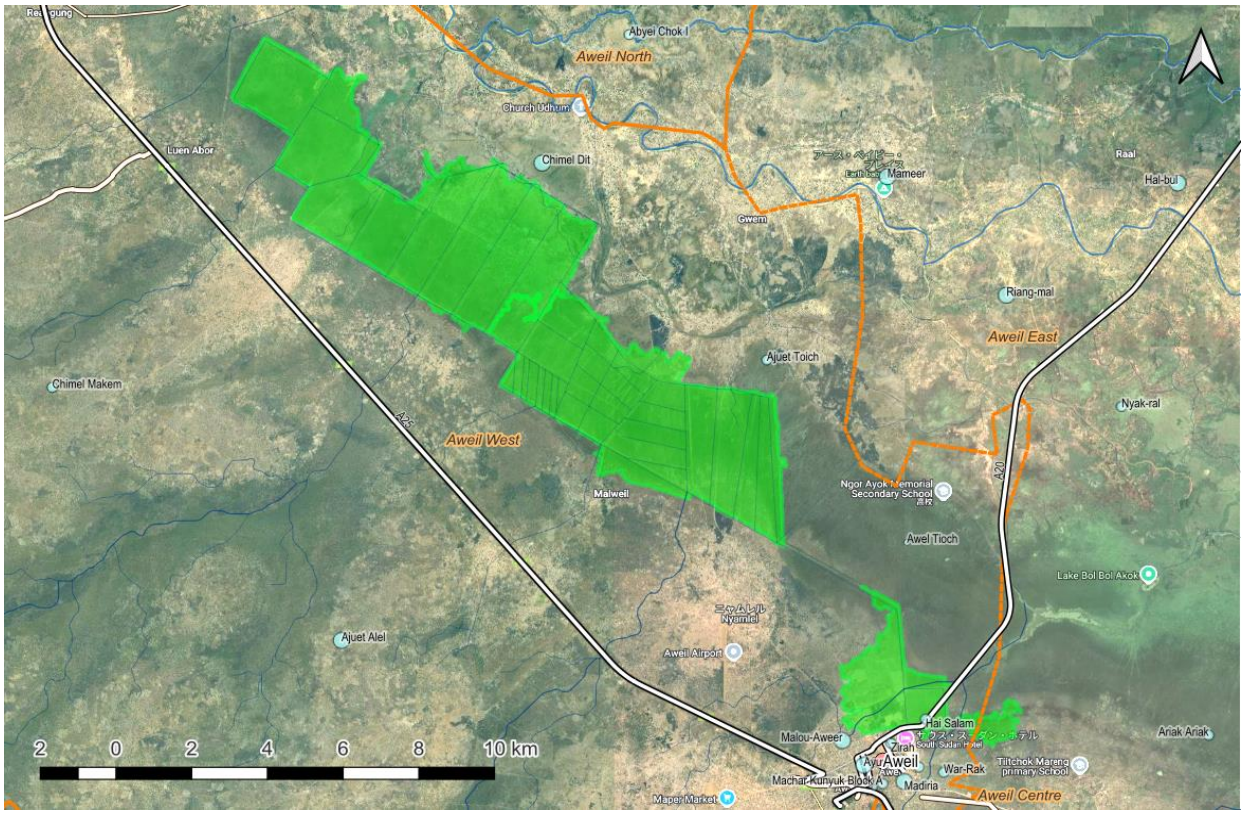


Figure 1. Map of Aweil Rice Irrigation Scheme in Northern Bahr el Ghazal State

[5] Overview of Aweil Rice Irrigation Schame, the management of ARIS and CAMP/IDMP field Assessment report 2023.

Chapter 2: Review of the National Rice Sector

Rice is currently the third most important cereal crop in the RSS, after sorghum and maize. It is mainly grown by subsistence and small-holder farmers, or cooperativs primarily for household consumption. Only small quantities are supplied to the county level markets.

2. Agroecological zones of South Sudan suitable for rice;

South Sudan is ecologically divided into seven (7) agro-ecological zones as shown in Figure 2 {map}, which include: the Greenbelt, Ironstone Plateau, Hills and Mountains, Eastern Flood Plains, Western Flood Plains, the Pastoral zone (Arid zone) and the Nile-Sobat zone which forms one of the world's largest wetlands and the largest freshwater wetland in the Nile Basin, known as the Sudd.

The agro-ecological zones suitable for rice production include the Greenbelt and Hills & Mountains zones, with rainfall patterns, ranging from 800 mm to 2,000 mm per Anum and a temperature range of 25 to 40°C. Approximately 60% of the locally grown rice is in the Greenbelt zone of rainfed uplands, due to the existing two cropping seasons that starts from late March to June and again from August to December annually.

Owing to this, the growing season of rice differs in most parts of the country, in Eastern and Western Flood Plains zones, the rainfed lowland rice grown between May and October. About 40% of the locally grown rice is in irrigated schemes (ARIS), which should have greater opportunities for more production of rice if the irrigation facilities are improved. Table 1 shows Agro-ecological zones that are suitable for rice production in South Sudan.

Table 1. Agro-ecological Zones Suitable for Rice Production

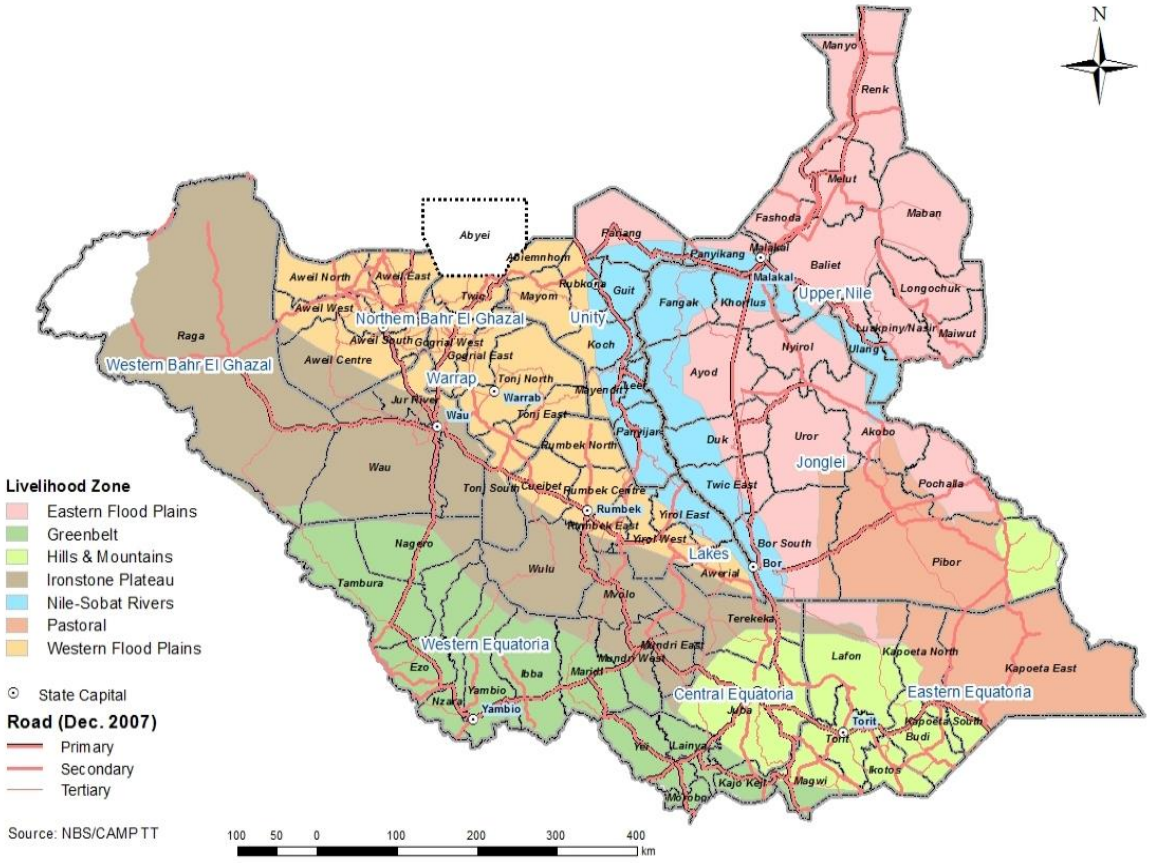
S/N	Agro-ecological zone	Rice cultivation types	States
1	Greenbelt	Upland rice, Irrigated	Western Equatoria State (WES), Central Equatoria State (CES), Eastern Equatoria State (EES)
2	Hills & Mountain	Upland rice	CES, EES, Jonglei State
3	Ironstone Plateau	Upland rice, lowland Irrigated rice	Western Bahr el Ghazal State, Lakes State, WES, CES.
4	Western flood Plains	Upland rice, Irrigated, Flooding	NBGS, Lakes State, Warrap State
5	Eastern Flood Plains	Lowland rice & Upland, Irrigated, Flooding	Jonglei State, Upper Nile State

Source: NRTF in the MAFS 2023/2024

The ARIS was partially rehabilitated and managed by the Government in partnership with Development Partners (DPs); including the African Development Bank (AfDB), GIZ and FAO. The total designated land for ARIS is 4,600 hectares, yet only about 6.8% has been under cultivation (315 hectares) in previous years. In the 2023/24 rice planting season, land under rice cultivation increased by 7% (324.24 hectares), through the support of FAO /MAFS along with the establishment of adaptive rice trial field at ARIS. The trial results suggested high potential yield of 4.2 t/h following improved rice Good Agronomic Practices (GAPs), including soil fertility and water management, compared to poorly managed rice fields, with lower yield, at about 2.5 t/h[6].

[6] Field survey report of Aweil Rice Irrigation Scheme, by NRTF to Northern Bahr el Ghazal State conducted in September 2024.

Figure 2. Map of Livelihood Zones (Agro-ecological Zones) of South Sudan



Source: Prepared by NBS/CAMP Task Team based on data from NBS. 2012 (National Baseline Household Survey 2009)

2.0. Analytical Framework of the Review and Information Employed

In this chapter, various aspects of the national rice sector's performance in South Sudan are reviewed to establish a reference point for discussing and determining NRDS targets and baseline strategies.

Rice Products, Consumers, and the Producing Farmers

The National Rice Development Strategy (NRDS) is a commodity-based strategy to increase rice production and consequent improvement of food security through rice-producing households. It aims to enhance rice transactions through market mechanisms to improve welfare, resilience, and food security of both rice consumers and producers. The overall target of the NRDS is to increase value added across rice value chain, with participation of inputs suppliers, financers, farmers, processors, wholesalers, retailers and consumers. However, among the value chain participants, the NRDS pays attention to the consumers and their consumption portfolios, together with farmers and their rice production characteristics. The selection of these two particular value chain players was based on the assumption that increased consumer demand for rice products, and an increased rice production by farmers to match this demand, are the core drivers of added value generation across the rice value chain in South Sudan. They were also selected based on the availability of data for both consumers and producers, which despite being relatively old, remains readily available for the development of the NRDS.

Spatial, Temporal, Technical, and Financial Elements of Public Sector Intervention

For the formulation of this National Rice Development Strategy (NRDS) document, the consumer consumption portfolios and farming households' production characteristics, along with expected temporal and spatial dynamics are discussed. The expected increase in households' rice consumption and corresponding increase in production of unhusked (paddy) rice as raw material, should be understood in relation to their consumption and production of the other food products and grains, given the challenging conditions of political and socioeconomic instability, communal conflicts, food insecurity and environmental impact. Understanding the spatial arrangements of such consumption portfolios and production characteristics is instrumental in understanding the expected dynamics of the rice markets during the NRDS implementation period. Based upon this understanding, spatial, temporal, technical, and financial elements of public sector interventions are proposed in the NRDS.

Data Used to Understand the Consumption Portfolios and Production Characteristics

The dataset used to propose intervention strategies is based on the 2009 National Baseline Household Survey (2009 NBHS) dataset of National Bureau of Statistics. The National Rice Task Force (NRTF) for the development of NRDS document, recognises that the information needs to reflect the current realities and has therefore derived data and information from various sources, including the regional/state field survey reports carried out by the NRTF in October 2024 and January 2025. These reports are very insightful and useful in determining the overall goal, targets, and quantified objectives with temporal and spatial implications.

The 2009 NBHS dataset was derived from a sampled household survey conducted from April to May of that year, to assess the living standards of the population and provide detailed information on household welfare dimensions, including consumption-poverty. The sampling design was based on a stratified two-stage sample design. The total sample size was 528 households per state, or 5,280 households countrywide. Given that only 15.2 percent of the households in South Sudan were classified as urban, a higher first stage sampling rate was used for the urban stratum of each state in order to improve the precision of the urban estimates at the national level. For the gap analysis of NRDS, several sections of secondary survey data were collected, but data from the Western Bahr el Ghazal State was missing.

2.1 Rice Market Characteristics in Terms of Consumer Preference, Demand, and Supply

2.1.1 Milled Rice Consumer Preference Trends in Food Consumption Portfolios

In South Sudan, rice consumers prefer the aromatic basmati rice, which also has superior cooking qualities compared to the other local and imported varieties. Table 2 shows the national, state, rural and urban area-wise annual per capita food consumption in kilograms. The table indicates average food consumption portfolios of households in 2009, categorized by national, state, urban, and rural households. For the development of the NRDS, these food consumption portfolios are considered the reference portfolios to which expected changes in households' consumption behaviours, consistent with the NRDS objective of enhancing domestic rice demand, can be compared. Since the improvement of households' food security and nutrition status, and therefore increase in their welfare, can be achieved through availability of food items in appropriate combinations in the categories indicated in Table 2, strategies to increase domestic rice consumption should be considered in the context of expected changes in consumer preference and resulting food consumption portfolio dynamics.

In order to define the NRDS targets, the nexuses between the expected changes in the food consumption portfolios, the supply of imported and domestically produced rice, and volume of food aid entering the markets are analysed based on summaries from the 2009 NBHS dataset shown in Table 3, Table 4, and Table 7. These tables indicate national, state, rural, and urban area-wide annual consumptions of grain and flours in tonnes, annual productions of grain crops in tonnes, and food self-sufficiency rates in percentage (%) of consumed grain and flour based on the production of related crops. The development

of NRDS targets considers the comparative positions of rice consumption, production, and self-sufficiency rates as shown in the tables.

National Milled Rice Consumer Preference Trend

Rice was the preferred food grain in urban areas as compared to the rural areas of South Sudan. The estimated national average per capita (milled) rice consumption in urban areas was 8.6 kg/person/year in 2009, whereas the consumption in rural areas in the same year was 1.6 kg/person/year (Table 2). The percentage of rice consumption against the total grain/flour food category in the urban and rural areas are, 3.7% and 0.6%, respectively. The urban rice consumption ratio was, therefore, six times higher than the rural consumption ratio. This indicates that, although the absolute quantity of rice consumed was relatively small, rice was the more preferred grain food in the urban areas than in the rural areas, nationally speaking. This rice consumption pattern in South Sudan matches the recent rice consumption patterns of the neighbouring countries such as Uganda, Kenya, and Tanzania, where urban dwellers have a higher dietary preference for rice than rural dwellers.

The temporal consequence of this pattern was observed to be the increasing trend of rice consumption against the other grain food items, both in percentage (%) and absolute terms in the country. This can be observed when comparing the national per capita rice consumption data of 2009 and 2021, which shows an increase in the per capita rice consumption from 2.9kg in 2009 to 7.15kg in 2021. From the point of view of the food consumption portfolios, the rising per capita rice consumption trend means the substitution of other grain/flour food items in a food secure situation where household's dietary requirements are met. On the other hand, in a food insecure situation, the increasing trend of rice consumption may not affect the consumption of other grain/flour food items, but it should add to the dietary diversity of a household. Therefore, in a food insecure situation, the increase in rice consumption should be resolved to meet dietary requirements of individuals and households.

Table 2. Annual per Capita Food Consumption as Food Consumption Portfolio [7]

(Kg/person/year)

Modified CODEX Food Category System (M CODEX FCS)	National			Upper Nile			Jonglei			Unity			Warrap			N. B.-El-Ghazal		
	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average
Fluid milk and milk products	8.9	11.7	11.2	13.5	26.4	23.1	20.0	15.1	15.5	10.4	22.9	20.3	12.8	6.9	7.4	5.1	3.9	4.0
Fermented milk products	0.3	1.3	1.2	0.4	0.9	0.8	0.0	1.1	1.0	0.9	0.9	0.9	0.1		0.0	0.5	0.0	0.1
Milk powder and cream powder	1.2	0.3	0.5	1.5	0.9	1.0	0.6	0.1	0.2	1.1	0.3	0.5	1.9	0.4	0.5	0.5	0.2	0.2
Fats and oils free from water	15.0	9.9	10.7	14.8	12.5	13.1	16.7	10.6	11.2	10.3	5.0	6.1	41.5	5.0	8.2	8.2	3.9	4.2
Fruit (fresh and processed)	47.2	41.0	42.0	36.9	18.6	23.3	3.6	7.2	6.9	6.4	23.9	20.3	7.7	9.9	9.8	3.7	0.4	0.6
Vegetables (fresh and processed)	48.1	18.3	23.1	41.2	25.9	29.7	37.7	11.1	13.7	14.7	6.3	8.0	168.2	12.0	25.6	19.3	6.1	7.2
Cocoa and chocolate products	0.4	0.0	0.1	0.0		0.0	3.5		0.3									
Confectionery	0.2	0.4	0.4	0.3	3.0	2.3	0.0	0.2	0.2	0.1		0.0	0.2	0.1	0.1		0.0	0.0
Grain/Flour	232.1	315.8	302.5	230.7	160.3	178.1	245.0	198.0	202.5	105.2	117.8	115.2	287.3	693.0	657.6	211.2	203.7	204.3
Sorghum	89.3	152.2	142.1	76.5	93.3	89.1	187.6	148.8	152.5	86.9	74.7	77.2	131.6	184.8	180.2	153.9	177.1	175.3
Maize	79.8	66.4	68.5	123.2	46.9	66.2	40.7	38.3	38.6	6.2	36.6	30.4	66.8	195.5	184.2	28.5	17.0	17.9
Millet	2.1	33.9	28.8	3.2	4.8	4.4		0.7	0.6	0.1	1.9	1.6	0.3	203.2	185.5	0.6	2.4	2.3
Groundnut	13.7	26.9	24.8	6.1	5.5	5.6	0.7	2.2	2.1	0.4	0.5	0.5	64.8	92.0	89.6	3.8	5.1	5.0
Cassava	22.5	23.6	23.4		0.2	0.1		1.3	1.2	0.3	0.1	0.2	1.7		0.1			
Wheat	6.5	3.4	3.9	5.8	5.1	5.3	4.5	2.0	2.2	4.6	1.4	2.1	12.8	11.0	11.2	18.0	0.6	1.9
Rice (milled)	8.6	1.8	2.9	6.2	2.2	3.2	10.7	3.5	4.2	3.5	0.8	1.4	6.3	0.3	0.8	2.6	0.8	1.0
% to Grain/Flour category total	3.7%	0.6%	1.0%	2.7%	1.4%	1.8%	4.4%	1.8%	2.1%	3.4%	0.7%	1.2%	2.2%	0.0%	0.1%	1.3%	0.4%	0.5%
Sweet potato	1.8	0.8	0.9	2.4	0.8	1.2	0.0	0.1	0.1	0.2	0.0	0.1	0.2		0.0	0.8		0.1
Irish potato	1.5	0.1	0.3	2.1	0.2	0.7	0.1	0.0	0.0	0.6	0.1	0.2	0.1		0.0	1.2		0.1
Soya bean	1.2	0.1	0.3	1.6	0.1	0.5	0.4	0.1	0.1	0.0	0.0	0.0	0.1		0.0			
Yam	0.1	0.3	0.2	0.1		0.0								0.2	0.2			
Other	5.0	6.5	6.3	3.5	1.3	1.9	0.2	0.9	0.9	2.5	1.5	1.7	2.7	5.9	5.6	1.8	0.7	0.8
Breakfast cereals	3.1	4.0	3.8	0.3		0.1	14.0	0.0	1.4	6.4	3.4	4.1	9.2	27.8	26.2	0.3		0.0
Pastas and noodles	2.3	0.3	0.6	4.9	1.9	2.7	1.3	0.0	0.1	1.6	0.1	0.4	2.3	0.0	0.2	6.4	0.2	0.6
Bread and ordinary bakery wares	22.8	5.0	7.8	35.6	10.8	17.1	19.2	1.2	2.9	24.2	10.7	13.5	3.7	2.3	2.4	15.3	4.2	5.0
Fresh meat, poultry, and game	38.5	26.9	28.7	46.2	19.5	26.3	76.2	17.8	23.3	12.5	9.7	10.3	10.8	5.3	5.8	19.1	17.9	17.9
Processed meat, poultry, and game	0.1	2.0	1.7	0.1		0.0	0.2		0.0									
Fresh fish and fish products	7.6	7.4	7.4	21.7	38.3	34.1	8.5	5.2	5.5	5.1	7.0	6.6	3.5	2.2	2.3	3.6	6.4	6.2
Processed fish and fish products	3.3	3.1	3.1	3.1	8.1	6.8	1.6	1.7	1.7	1.3	1.9	1.8	2.0	0.6	0.7	2.6	2.1	2.1
Fully preserved fish products	0.3	0.0	0.1	0.0	0.0	0.0				0.0		0.0		0.0	0.0	0.0		0.0
Fresh eggs	2.4	0.0	0.4	0.0	0.0	0.0								0.1	0.1	1.9		0.1
Refined and raw sugars	27.0	11.1	13.6	26.6	13.7	17.0	13.8	6.3	7.0	20.0	10.1	12.1	48.4	8.3	11.8	14.9	7.3	7.9
Honey	1.7	1.5	1.5	0.7	0.3	0.4	1.4	0.0	0.2	0.0	0.2	0.1	2.5	0.3	0.5	1.1	0.7	0.7
Infant formulae	0.7	0.2	0.3	0.3	0.7	0.6	0.0	0.1	0.1	1.6	0.2	0.5	2.2	0.1	0.2	1.5	0.1	0.2

[7] The estimated annual per capita consumption of the food items presented in the table was calculated from the reported quantities of consumption perceived to be occurred in the past 7 days from the date of the household survey implemented during April and May 2009. Since a reported quantity of a food item concerned was multiplied by the factor of 365(days)/7(days) to calculate an annual consumption value of a household without considering seasonality and/or lean period the calculated value, and therefore, the values in the table may be generally overestimated as a result of the seasonality bias. However, in this analysis it is assumed that the relative magnitudes of consumption values and therefore, food consumption portfolios are less affected by such seasonality bias.

Table 2. Annual per Capita Food Consumption as Food Consumption Portfolio (cont.)

(Kg/person/year)

Modified CODEX Food Category System	National			W. B.-El-Ghazal[*1]			Lakes			Western Equatoria			Central Equatoria			Eastern Equatoria		
	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average	Urban	Rural	Average
Fluid milk and milk products	8.9	11.7	11.2				2.2	10.3	9.5	0.8	1.4	1.3	5.4	2.3	3.4	4.9	14.8	14.0
Fermented milk products	0.3	1.3	1.2				0.5	0.2	0.2				0.2	0.0	0.1	0.2	7.7	7.0
Milk powder and cream powder	1.2	0.3	0.5				1.1	0.3	0.4	0.4	0.2	0.2	1.2	0.1	0.5	2.5	0.6	0.8
Fats and oils free from water	15.0	9.9	10.7				6.0	3.5	3.7	7.3	10.3	9.8	12.7	7.5	9.3	23.7	26.5	26.3
Fruit (fresh and processed)	47.2	41.0	42.0				5.9	18.5	17.3	240.4	275.1	269.5	53.6	80.4	71.1	45.3	22.2	24.3
Vegetables (fresh and processed)	48.1	18.3	23.1				42.9	14.4	17.0	16.5	38.4	34.9	48.0	37.6	41.2	72.5	19.6	24.3
Cocoa and chocolate products	0.4	0.0	0.1					0.1	0.1		0.0	0.0				0.0		0.0
Confectionery	0.2	0.4	0.4							0.2	0.0	0.0	0.3		0.1	0.2		0.0
Grain/Flour	232.1	315.8	302.5				381.0	561.1	544.3	389.3	386.1	386.6	195.0	211.6	205.9	222.4	283.0	277.6
Sorghum	89.3	152.2	142.1				177.8	292.1	281.4	50.4	78.2	73.7	42.1	82.9	68.8	85.8	197.2	187.3
Maize	79.8	66.4	68.5				91.6	146.5	141.4	154.8	13.7	36.5	76.7	36.8	50.6	82.3	40.4	44.1
Millet	2.1	33.9	28.8				3.0	8.1	7.7	9.3	26.0	23.3	1.2	1.0	1.0	2.8	23.4	21.6
Groundnut	13.7	26.9	24.8				54.1	83.7	81.0	26.4	55.4	50.7	9.2	6.3	7.3	3.9	1.6	1.8
Cassava	22.5	23.6	23.4				3.2	13.4	12.5	125.3	177.3	168.9	36.6	64.5	54.8	19.1	10.2	11.0
Wheat	6.5	3.4	3.9				25.3	1.1	3.4	1.7	1.5	1.5	4.3	0.8	2.0	1.3	4.4	4.1
Rice (milled)	8.6	1.8	2.9				9.7	1.7	2.5	12.3	4.9	6.1	10.1	1.6	4.5	13.3	0.5	1.6
% to Grain/Flour category total	3.7%	0.6%	1.0%				2.6%	0.3%	0.5%	3.2%	1.3%	1.6%	5.2%	0.8%	2.2%	6.0%	0.2%	0.6%
Sweet potato	1.8	0.8	0.9				0.6	1.2	1.2	1.7	4.1	3.7	1.9	0.4	1.0	7.9	1.4	2.0
Irish potato	1.5	0.1	0.3				0.7		0.1				2.4		0.8	3.9	0.3	0.6
Soya bean	1.2	0.1	0.3				14.0		1.3		0.4	0.3	0.2		0.1	1.7	0.3	0.4
Yam	0.1	0.3	0.2					0.2	0.2	0.5	0.8	0.8		1.0	0.7		0.3	0.3
Other	5.0	6.5	6.3				1.0	13.0	11.9	6.9	23.6	20.9	10.4	16.3	14.3	0.4	3.2	2.9
Breakfast cereals	3.1	4.0	3.8					0.2	0.2	0.0	0.1	0.1	0.8		0.3	1.5	0.1	0.2
Pastas and noodles	2.3	0.3	0.6				4.9	0.4	0.8	0.6	0.3	0.4	0.7	0.3	0.4	1.3	0.0	0.1
Bread and ordinary bakery wares	22.8	5.0	7.8				33.3	13.1	15.0	7.1	3.7	4.3	20.3	3.4	9.3	35.9	2.0	5.0
Fresh meat, poultry, and game	38.5	26.9	28.7				45.7	8.8	12.3	31.4	67.8	61.9	24.5	29.9	28.0	106.4	72.4	75.4
Processed meat, poultry, and game	0.1	2.0	1.7							0.1	25.7	21.5				0.1	0.1	0.1
Fresh fish and fish products	7.6	7.4	7.4				1.2	4.5	4.2	1.6	4.7	4.2	3.4	0.7	1.6	7.3	0.2	0.9
Processed fish and fish products	3.3	3.1	3.1				0.6	3.3	3.1	3.1	6.0	5.5	3.8	2.6	3.0	11.4	3.1	3.8
Fully preserved fish products	0.3	0.0	0.1							3.0		0.5		0.4	0.2	0.5	0.1	0.1
Fresh eggs	2.4	0.0	0.4				0.4		0.0	28.4		4.6	0.0		0.0	0.9		0.1
Refined and raw sugars	27.0	11.1	13.6				42.5	18.4	20.7	15.6	9.9	10.8	31.9	7.9	16.2	24.8	20.7	21.0
Honey	1.7	1.5	1.5				1.9	1.9	1.9	0.8	4.7	4.0	2.8	5.3	4.4	2.3	1.7	1.7
Infant formulae	0.7	0.2	0.3				0.0	0.1	0.1	0.2	0.5	0.5	0.7	0.1	0.3	1.3	0.1	0.2

Note: 1) Consumption data in Western Bahr el Ghazal State is missing.

State-wise Characteristics of Milled Rice Consumer Preference Trends

Spatial characteristics of rice consumption in the context of food consumption portfolios can be derived from the information presented in Table 2 and *Figure*. Figure x indicates the enumeration area-wise spatial distribution of annual rice consumption in tonnes/year, while Figure x shows the enumeration area-wise spatial distribution of rice prices in Sudanese Pounds (SDG)/kg in 2009 SDG.

Due to the fact that rice consumption was mainly observed in the urban areas in the country, the average annual state-wise per capita rice consumption values in the urban areas and associated percentage (%) values to the total values of grain/flour food category shown in Table 2 were compared. However, the per capita rice consumption values and associated % values show a positive correlation (i.e. the higher the consumption values, the higher the % values), only the comparisons of the rice consumption values are performed.

As shown in Table 2, the centre of rice consumption with stronger preference for rice over the other grain crops, was the urban areas in the southern part of South Sudan, while the least rice consumption was observed in the urban areas in the northern part of the country. The highest rice consumption was

observed in the urban areas in Eastern Equatoria State where, on average, 13.3 kg/person/year was estimated. This is followed by the urban areas of Western Equatoria State (12.3 kg/person/year), Jonglei State (10.7 kg/person/year), and Central Equatoria State (10.1 kg/person/year), and Lakes State (9.7 kg/person/year). The least per capita rice consumption was estimated in Northern Bahr el Ghazal State (2.6 kg/person/year), followed by Unity State (3.5 kg/person/year), Upper Nile State (6.2 kg/person/year), and Warrap State (6.3 kg/person/year)[8].

2.1.2 Market Demand Characteristics of Milled Rice

Import is the Major Source of Milled Rice

Rice is among the top four staple cereals in South Sudan and serves as both a food and cash crop. Findings from the 2009 NBHS suggest that more than 75% of rural households consume cereals. Further, in the last two decades, South Sudan, was a net exporter of agricultural products to regional markets, highlighting the agricultural sector's potential in stimulating economic growth.

However, due to civil 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 food needs, including 40% of its cereals from neighbouring countries, particularly Uganda and Kenya. It is also reported that South Sudan receives all of its rice imports through Uganda (Nzomoi and Anderson, 2013), which acts as an important transit corridor for rice shipment of both locally produced and imported rice. Total food imports were estimated to be in the range of US$ 200-300 million a year (AfDB, 2013). As estimated in the later section, 22,433 MT/year of imports were consumed at a weighted average consumer price of 3.4 South Sudanese Pound (SSP)/kg. Therefore, it is estimated that 176 million SSP, which is equivalent to $76 million USD at the 2009 exchange rate of 2.32 SSP/USD, worth of milled rice was imported and consumed in that year.

Annual Consumption of Milled Rice with Respect to other Grain Food Items

In order to determine the rice production targets, attention needs to be given to the consumption of milled rice shown in Table 3, the production of unhusked rice shown in Table 4, and the self-sufficiency rates of rice shown in Table 7, in relation to the selected consumed food items belonging to the grain/flour category in the food consumption portfolios indicated in Table 2. The selected food items are sorghum, maize, millet, groundnut, cassava, wheat, rice, sweet potato, Irish potato, soyabeans, and yams.

State-wise Rice Consumption

As shown in Table 3, the national annual rice consumption in 2009 is estimated at 23,080 tonnes/year which is 1.0 % of the total consumption of food items belonging to the grain/flour category. In terms of state-wise consumption, Jonglei State exhibits the highest annual consumption estimated at 5,740 ton/year (2.1% of the category), followed by Central Equatoria State, at 5,010 ton/year (2.4% of the category), then Western Equatoria State at 3,790 ton/year (1.7% of the category). The Upper Nile State follows at 3,110 ton/year (1.8% of the category), then Lakes State at 1,710 ton/year (0.5% of the category), followed by Eastern Equatoria State 1,450 ton/year (0.6% of the category), then Unity State at 800 ton/year (1.2% of the category), followed by Warrap State at 770 MT/year (0.1% of the category), and Northern Bahr el Ghazal State[9] at 710 MT/year (0.5% of the category).

Spatial Characteristics of Milled Rice Prices and Markets

Figure illustrates the area-wide distribution of rice market process in enumeration areas. In 2009, 24% of urban households and 6% of rural households consumed milled rice in South Sudan. These relatively

[8] Data of Western Bahr el Ghazal is missing.
[9] Rice consumption data in Western Bahr el Ghazal is missing.

small numbers of rice consuming households were widely distributed in the country along the major transportation networks of roads and waterways. *Figure* also indicates significantly small variations in prices across the country, with increasing trends towards the northern regions, where the urban and rural areas in Malakal showed the highest set of rice prices.

The observations can be interpreted as reflecting the relatively well-organized rice markets and trading practices along major transportation networks. The increasing trend of market prices and the decreasing consumption trend towards the northern part of the country, indicates market scarcity of rice in that region. This can be understood as that the consumed rice was, generally speaking, traded from the southern part to the northern part of the country in 2009. However, it can be assumed that the civil unrest which occurred in 2013 and 2017, and the subsequent insecurity situation across the country, must have contributed to the deterioration of not only rice markets, but also markets of other food commodities.

Table 3. Annual Consumption of Grain and Flours

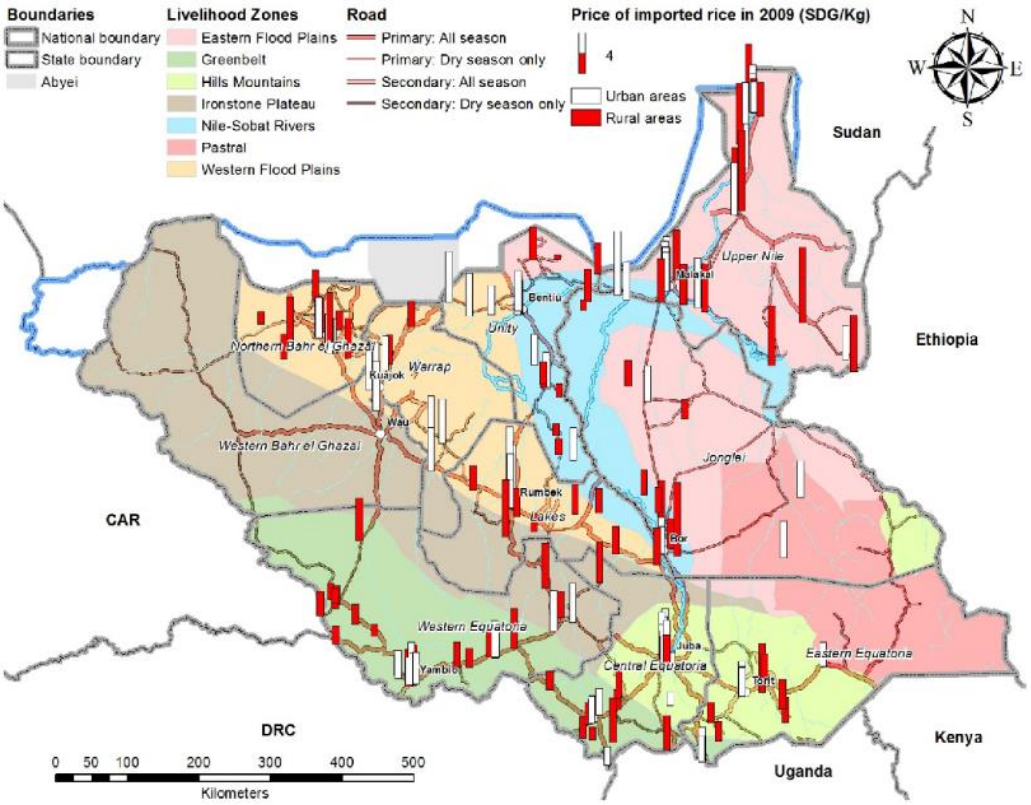
('000 ton/year)

M CODEX FCS[*1]	National			Upper Nile			Jonglei			Unity			Warrap			N. B.-El-Ghazal		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain/Flour	286.68	2,061.86	2,348.54	55.43	114.49	169.92	31.67	242.28	273.95	12.42	54.17	66.59	24.16	610.14	634.31	11.60	135.10	146.70
Sorghum	112.74	1,014.24	1,126.98	18.65	67.22	85.88	24.27	182.89	207.15	10.52	34.80	45.32	11.17	164.11	175.28	8.53	117.85	126.38
Maize	100.70	442.29	542.99	30.06	33.78	63.85	5.27	47.13	52.40	0.74	17.07	17.82	5.67	173.57	179.24	1.58	11.31	12.89
Millet	2.64	225.93	228.57	0.77	3.42	4.20		0.87	0.87	0.01	0.90	0.91	0.02	180.49	180.51	0.03	1.63	1.66
Groundnut	17.36	179.41	196.77	1.50	3.93	5.43	0.09	2.71	2.80	0.04	0.23	0.28	5.50	81.71	87.22	0.21	3.39	3.60
Cassava	28.43	157.20	185.63		0.11	0.11		1.60	1.60	0.03	0.06	0.09	0.14		0.14			
Wheat	8.21	22.58	30.79	1.42	3.66	5.08	0.59	2.41	3.00	0.55	0.67	1.22	1.09	9.81	10.90	1.00	0.37	1.37
Rice (milled)	10.80	12.27	23.08	1.52	1.59	3.11	1.39	4.35	5.74	0.43	0.37	0.80	0.54	0.23	0.77	0.15	0.56	0.71
% to G/F total	3.8%	0.6%	1.0%	2.7%	1.4%	1.8%	4.4%	1.8%	2.1%	3.5%	0.7%	1.2%	2.2%	0.0%	0.1%	1.3%	0.4%	0.5%
Sweet potato	2.24	5.10	7.34	0.57	0.56	1.13	0.00	0.17	0.17	0.02	0.01	0.03	0.02		0.02	0.04		0.04
Irish potato	1.93	0.44	2.37	0.51	0.15	0.66	0.02	0.03	0.04	0.07	0.04	0.11	0.01		0.01	0.06		0.06
Soya bean	1.56	0.60	2.15	0.39	0.05	0.44	0.05	0.13	0.18	0.00	0.01	0.01	0.01		0.01			
Yam	0.08	1.79	1.87	0.03		0.03								0.22	0.22			

('000 ton/year)

M CODEX FCS[*1]	National			W. B.-El-Ghazal[*2]			Lakes			Western Equatoria			Central Equatoria			Eastern Equatoria		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain/Flour	286.68	2,061.86	2,348.54				24.71	345.67	370.38	38.25	188.10	226.36	70.58	140.85	211.43	17.86	231.04	248.90
Sorghum	112.74	1,014.24	1,126.98				11.56	184.21	195.77	5.04	40.59	45.64	16.10	59.78	75.88	6.90	162.79	169.69
Maize	100.70	442.29	542.99				5.96	92.39	98.35	15.48	7.14	22.62	29.31	26.54	55.85	6.62	33.37	39.99
Millet	2.64	225.93	228.57				0.20	5.13	5.32	0.93	13.47	14.40	0.45	0.70	1.15	0.23	19.31	19.54
Groundnut	17.36	179.41	196.77				3.52	52.81	56.33	2.64	28.77	31.41	3.54	4.55	8.08	0.32	1.31	1.62
Cassava	28.43	157.20	185.63				0.21	8.48	8.69	12.53	92.04	104.57	13.98	46.50	60.48	1.54	8.41	9.95
Wheat	8.21	22.58	30.79				1.64	0.70	2.35	0.17	0.77	0.95	1.64	0.59	2.23	0.10	3.60	3.71
Rice (milled)	10.80	12.27	23.08				0.63	1.07	1.71	1.23	2.56	3.79	3.85	1.16	5.01	1.07	0.38	1.45
% to G/F total	3.8%	0.6%	1.0%				2.6%	0.3%	0.5%	3.2%	1.4%	1.7%	5.5%	0.8%	2.4%	6.0%	0.2%	0.6%
Sweet potato	2.24	5.10	7.34				0.04	0.77	0.81	0.17	2.13	2.30	0.74	0.32	1.06	0.63	1.15	1.78
Irish potato	1.93	0.44	2.37				0.04		0.04				0.91		0.91	0.31	0.22	0.54
Soya bean	1.56	0.60	2.15				0.91		0.91		0.20	0.20	0.06		0.06	0.14	0.21	0.35
Yam	0.08	1.79	1.87					0.11	0.11	0.05	0.44	0.49		0.73	0.73		0.29	0.29

Note: 1) M CODEX FCS means "Modified CODEX Food Classification System." 2) Consumption data in Western Bahr el Ghazal State is missing.



Source: CAMP 2016

Figure 3. Enumeration Area-wise Spatial Distribution of Milled Rice Prices

2.1.3 Market Supply Characteristics of Locally Produced Unhusked Rice

Advantages of Domestic Rice Production

The reality on the ground, and following the NRTF's maiden field trip to Yambio, Western Equatoria State, which falls within the Greenbelt Agro-ecological zone of the country (30th September to 5th October 2024), is that locally produced rice is of lower quality due to lack of pure quality rice seed varieties and milling equipment as compared to imported milled rice. Yet, farmers and consumers alike, prefer consuming local rice as a result of the following specific attributes: similarity in price, aroma, grain size, colour, gluten content, and tendency to expand/swell in the process of boiling/cooking. However, this can only be supported through the demand driven research, which encourage participatory testing and selection of rice varieties that meet farmer/consumer preferences.
Furthermore, in terms of rice seed access, farmers find the local rice verities are the only option available, accessible and stocked locally as seeds for planting.

Therefore, advancement of rice sector in South Sudan requires collective efforts of both public and private sectors, while importation of rice perhaps tailored to meet the deficit of local rice consumption. Subsequently, given the agricultural potential the country endowed with, local rice production, processing, and marketing, if focused on, would be of paramount importance to both the rural and urban population, providing employment as well as attracting investments and contributing to food security improvement opportunities.

Rice Production in 2023/2024

Despite the importance of rice in South Sudan, local production is still low. In 2023, the area cultivated with sorghum and maize was estimated at 70.0 percent and 20.5 percent, respectively, while millet and rice accounted for 6.0 and 3.5 percent, respectively (CFSAM, 2023). Through the field surveys and

information collected by the NRTF, it is estimated that around 6,300 ha of land is utilized for rice cultivation, which is by far not sufficient to meet the local demand, thus encouraging increased rice imports.

The rising demand offers a better opportunity for South Sudan to reduce rice imports by increasing the allocated cultivation area for local rice, e.g.; in Northern Bahr el Ghazal State (Aweil centre and east counties as of 2024 reported that, the rice cultivation area is 956 ha to 1,000 ha), Jonglei (reported a cultivated area of 3 ha to 41 ha), Western Equatoria State (reported cultivated area of about 4800 ha). In addition, other states reported includes Warrap and the Lakes, the area cultivated for rice is 451 ha and 20 ha respectively. The cultivated area, therefore, needs to be increased to improve rice production, with the execution of the NRDS.

Two environments appropriate for rice cultivation exist in South Sudan, the Greenbelt Agro-ecology for upland rice and the Flood Plain Agro-ecology for lowland rice in flood recession areas. However, the main constraints to rice production are: lack of quality seeds, lack of consumer and farmer-preferred high yielding rice varieties, inadequate rice farming inputs such as machinery and fertilisers, limited capacities of the local farmers due to farm size, high cost of labour for land preparation and planting, limited access to financial services, prevelance of pest and diseases, and lack of effective water management, post-harvest processing and marketing practices, among others[10].

Rice Cultivation Ecologies in South Sudan:

In South Sudan, rice is cultivated under two production systems, namely, rainfed upland (in the Greenbelt Agro-ecological zone) and irrigated lowland (in the both Western and Eastern Flood Plains Agro-ecological zones), where the Aweil Rice Irrigation Scheme (ARIS) in NBGS is the most predominant, including Unity, Jonglei and Upper Nile States.

Rain-fed upland rice cultivation is predominant in WES counties including; Yambio, Nzara, Maridi, Mundri while in CES, it is found in Yei and Morobo counties. In EES, it includes part of mountains (Imotong and Lpoit mountains), then low land in Lafon and Magwi County located along rain-forest belt within the Greenbelt agro-ecological zone of South Sudan situated at an elevation of 650 metres. These areas receive a bimodal rainfall pattern with annual mean total rainfall of about 1,443 mm. The soils are characterised as ferrous with heavy deposits of fertile clay soils (Hoffmann et al., 2012).

The ARIS, located in Aweil North County of Northern Bahr el Ghazal State, is naturally covered with shrub and sparse trees with an open deciduous woodland in the south. The area receives a unimodal rainfall pattern with 800 to 1000 mm rainfall annually. The rice scheme lies within the Flood Plains agro-ecological zone and provides the greatest potential for lowland rice cultivation in South Sudan. It is geographically positioned at 8° 46’ 48” N and 27° 24’ E at an elevation of 425 m above sea level (ASL) with an extensive irrigated lowland rice area of 4,600 hectares. The soil is predominantly black cotton soil, while the average monthly maximum temperatures vary slightly from 33.8ºC in March to 36.0 ºC in September, and average monthly minimums of 17.6 ºC in September to 10.5 ºC in December. The land along the river floods annually, though the floods are of variable volume and duration.

State-wise Annual Unhusked Rice Production and Identification of the Production Centres

The estimated annual production of unshelled rice in tonnes is shown in Table 4. The national annual rice production in 2009 was estimated at **890 MT/year** which represents 0.1 % of the total production of crops under grain category. In terms of state-wide production, only Western Equatoria State showed the most significant and highest annual rice production, with 730 MT/year (1.3% of the category), followed by Central Equatoria State with 70 MT/year (less than 0.1% of the category), Warrap State followed with 40 MT/year (0.1% of the category), then Jonglei State with 20 MT/year (0.1% of the category), then Eastern Equatoria State with 20 MT/year (less than 0.1% of the category), and Unity

[10] NRTF team survey report September-October 2024

State with 10 MT/year (0.1% of the category). Notably, no rice production was estimated in Upper Nile State, Northern Bahr el Ghazal State, and Lakes State[11].

Table 4. Annual Production of Grain Crops (2009)

('000 ton/year)

Crops[*1]	National			Upper Nile			Jonglei			Unity			Warrap			N. B.-El-Ghazal		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain	35.26	578.64	613.90	4.57	38.55	43.13	2.12	44.09	46.21	0.68	9.66	10.34	2.43	28.34	30.77	0.25	25.21	25.46
Sorghum	13.03	260.36	273.39	2.27	15.38	17.65	1.36	29.19	30.55	0.21	2.10	2.30	1.86	14.89	16.75	0.23	23.18	23.41
Maize	4.20	111.65	115.86	0.90	21.87	22.77	0.69	13.57	14.26	0.46	7.39	7.85	0.06	4.85	4.91		0.32	0.32
Millet	0.67	27.74	28.42	0.28	0.13	0.41		0.32	0.32		0.02	0.02	0.02	0.80	0.81		0.29	0.29
Groundnut	9.88	104.25	114.14	1.12	1.17	2.29	0.06	0.51	0.57		0.14	0.14	0.48	7.68	8.16	0.02	1.42	1.44
Cassava	6.62	62.26	68.88					0.25	0.25		0.00	0.00		0.01	0.01			
Wheat	0.07	0.23	0.29											0.04	0.04			
Rice (unhulled)	0.30	0.59	0.89				0.00	0.02	0.02	0.01		0.01	0.02	0.02	0.04			
% to G total	0.8%	0.1%	0.1%				0.0%	0.1%	0.1%	1.9%		0.1%	0.7%	0.1%	0.1%			
Sweet potato	0.33	10.60	10.93					0.00	0.00					0.00	0.00			
Irish potato		0.08	0.08															
Soya bean	0.01	0.29	0.30		0.00	0.00	0.00	0.23	0.23	0.00		0.00		0.02	0.02			
Yam	0.15	0.57	0.72								0.01	0.01		0.02	0.02			

('000 ton/year)

Crops[*1]	National			W. B.-El-Ghazal			Lakes			Western Equatoria			Central Equatoria			Eastern Equatoria		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain	35.26	578.64	613.90	4.73	5.30	10.02	0.57	66.98	67.55	7.93	49.00	56.93	1.48	146.78	148.26	10.50	164.74	175.24
Sorghum	13.03	260.36	273.39	0.75	2.98	3.72	0.12	25.95	26.07	0.21	4.71	4.92	0.13	56.73	56.86	5.89	85.26	91.15
Maize	4.20	111.65	115.86	0.48	0.06	0.54	0.04	3.38	3.43	0.94	11.20	12.14	0.23	8.09	8.32	0.41	40.92	41.33
Millet	0.67	27.74	28.42	0.04		0.04	0.01	4.32	4.33	0.33	3.30	3.63	0.00	2.52	2.52		16.04	16.04
Groundnut	9.88	104.25	114.14	1.68	1.58	3.25	0.40	31.22	31.61	2.06	14.45	16.51	0.28	31.59	31.87	3.79	14.49	18.28
Cassava	6.62	62.26	68.88	1.67	0.65	2.32		1.92	1.92	4.03	13.29	17.32	0.63	45.15	45.78	0.29	1.00	1.28
Wheat	0.07	0.23	0.29							0.04	0.02	0.06	0.03		0.03		0.17	0.17
Rice (unhulled)	0.30	0.59	0.89							0.27	0.46	0.73		0.07	0.07		0.02	0.02
% to G total	0.8%	0.1%	0.1%							3.4%	0.9%	1.3%		0.0%	0.0%		0.0%	0.0%
Sweet potato	0.33	10.60	10.93	0.11	0.03	0.15		0.11	0.11	0.06	1.43	1.49	0.04	2.49	2.52	0.12	6.54	6.66
Irish potato		0.08	0.08								0.08	0.08						
Soya bean	0.01	0.29	0.30								0.00	0.00	0.00	0.04	0.04			
Yam	0.15	0.57	0.72					0.08	0.08	0.00	0.04	0.05	0.14	0.11	0.25		0.31	0.31

Note: 1) Crop production data in the table should be understood weights of unhusked grain or unprocessed products data.

Unhusked Rice Production in the Aweil Rice Irrigation Scheme Inferred from the Dataset

The lack of rice production estimation in Northern Bahr el Ghazal state, as shown in Table 4, seemingly contradicts the fact that the Aweil Rice Irrigation Scheme (ARIS) has existed since the 1950's. The detailed examination of the sampling scheme revealed that within the 2 km radius from the boundary of the ARIS, 102 urban households (i.e. households with any types of livelihoods in the enumeration areas (EAs) classified as "urban EAs") and 2 rural households (i.e. households with any types of livelihoods in the enumerations areas (EAs) classified as "rural EAs") were sampled. These numbers increase to 115 urban and 12 rural households within the radius of 4 km, and to 115 urban and 23 rural households within a 6 km radius. Since the survey results indicate that none of these households engaged in rice production, it can be interpreted that either the spatial density of the sampling scheme was too coarse to sample households engaged in the wet paddy rice production within the Scheme, or that the actual engagement of paddy rice production in the Scheme by surrounding communities was limited. In any case, the engagement of the production in the Scheme was reported to be low, hence government intervention to promote paddy production in the Scheme should be carefully considered. At the same time, strengthening of alternative research, provenance testing, and technical experiment functions of the Scheme should be considered, to help building on the past and current benefits of investments to the Scheme by the government supported by the German Agency for International Development (GIZ), AfDB, FAO, and other development partners.

[11] Rice consumption data in Western Bahr el Ghazal is missing.

According to the survey conducted by the NRTF for the development of South Sudan NRDS, ARIS reported rice production of about 532 MT/year in 2024. Out of the total, the fertilized rice trial field reported a better yield of 4 MT per hectare, as compared to non-fertilized rice field that yielded 2.5 MT per hectare.

Unhusked Rice Market Characteristics of Western Equatoria State as Main Hill Rice Producing State

The detailed data of the milled rice consumption and unhusked rice production, including the weighted average purchase prices of milled and unshelled rice estimated for Western Equatoria State, are shown in Table 5. It is reported that all of the unhusked rice was produced by the cultivation of hill rice and not by the cultivation of paddy rice. The consumption and production data shown in the table are consistent with the data indicated in Table 3 and Table 4. Eighty-two percent (82%) of the unhusked rice produced in South Sudan in 2009 (890 MT/year shown in Table 4) was estimated to be produced in Western Equatoria State (733 MT/year shown in Table 5). In the state, it was estimated that 268 MT/year (37% of the state total) was produced by 2,183 urban households (14.3% of the total households in the urban areas in the state), whereas 460 MT/year (63% of the state total) was produced by 9,544 rural households (9.4% of total households in the rural areas in the state). Within this produced unhusked rice, 91 MT/year or 34.9% of produced unhusked rice were sold to the unhusked rice market by 637 producer households at a weighted average price of 1.6 SSP/kg in the urban areas, whereas 65 MT/year or 13.9% of produced unhulled rice were sold to the unhulled rice market by 1,684 producer households at weighted average price of 5.3 SSP/kg in the rural areas. This supply of unhulled rice is far smaller than the milled rice consumption of 1,228 MT/year in the urban areas with a self-sufficiency rate of 16% (Table 7), and consumption rate of 2,562 MT/year in the rural areas with a self-sufficiency rate of 13% (Table 7).

Since the yield of milled rice from unhulled rice is assumed to be 72%, without considering milling cost, these unhusked rice market supply prices in the urban and rural areas in Western Equatoria State are converted to hypothetical milled rice supply prices for purposes of comparison with the weighted average purchase/demand prices of milled rice perceived by the rice consuming households in the state. The conversion yielded a set of hypothetical milled rice supply prices of 2.3 SSP/kg and 7.4 SSP/kg, assumed to be seen in the milled rice markets in urban and rural areas in the state, respectively. As shown in Table 5, these prices are compared with the weighted average consumer purchase/demand prices of 2.9 SSP/kg in the urban market and 2.4 SSP/kg in the rural market.

The comparison of the hypothetical milled rice supply price of 2.3 SSP/kg and the average purchase/demand price of 2.9 SSP/kg in the milled rice market in urban areas can be interpreted as a linked and closed local value chain of unhusked rice production, milling, and milled rice consumption by urban households in the state. On the other hand, the large discrepancy between hypothetical milled rice supply price of 7.4 SSP/kg and the average purchase/demand price of 2.4 SSP/kg in the rural milled rice market can be interpreted to mean that the unhusked and milled rice markets in the areas are segmented and not linked in the same value chain. The interpretation is consistent with the reported characteristics of the unhusked rice market in the Western Equatoria State, particularly that in the Yambio areas, where most of the produced unhusked rice was purchased at higher prices and exported to Democratic Republic of the Congo (DRC) in bulk by agents of a brewery firm in DRC.

Yield of Unhusked Upland Rain-fed Rice Production in Yambio in 2022

Based on the information on the upland rainfed rice production in three (3) out of six (6) payams in Yambio County, the per hectare yield of unhusked rice shown in Table 6 was estimated. Western Equatoria State consists of 10 Counties with suitable ecological system for rice production, which is predominantly upland and marshland areas. The average yield of 1.0 ton/ha/year is considered to be low, and probable reasons for the low yield could be lack of high yielding varieties, none/limited use of improved agronomic practices, absence of fertilisers, and acidic soils.

Table 5. Milled Rice Consumption and Unhusked Rice Production in Western Equatoria State

Location		Estimated annual consumption of milled rice				Estimated annual production and sales of unhulled rice by production HHs							
State	Rural/ Urban area	Production of rice						Sales of produced rice					
		Consumer HHs		Consu-mption quantity (ton/yr)	Average purchase price (SSP/kg)	Production HHs		Produc-tion quantity (ton/yr)	Selling HHs		Sales quantity (ton/yr)	% to harves-ted qtty (%)	Average price
		(no.)	% to all HHs (%)			(no.)	% to all HHs (%)		(no.)	% to all HHs (%)			Unhulled rice (SSP/kg)	As milled rice (SSP/kg)
Western Equtoria	Urban	6,003	39.3%	1,228	**2.9**	2,183	14.3%	268	637	4.2%	94	34.9%	1.6	**2.3**
	Rural	17,404	17.2%	2,562	**2.4**	9,544	9.4%	465	1,684	1.7%	65	13.9%	5.3	**7.4**
State	All	23,407	20.1%	3,791	**2.5**	11,727	11.0%	733	2,321	2.5%	158	21.6%	3.3	**4.6**

Source: NRDS Task Force

Figure 4. Harvesting of Rice in Yambio

Source: NRDS Task Force

Figure 5. Threshing and Drying of Harvested Rice in Yambio

However, it must be understood that the sustained production practices observed in these payams are the optimal practices chosen by the producing households under the knowledge, human resources, technical, financial, and uncertain market and climatic condition constraints. If the practice was not assumed to be optimal, it would not be chosen by households for their livelihood. Therefore, rice production extension and promotion strategies should be developed based on careful examination of the existing production and value chain systems and underling constraints, and expected impacts on production behaviour under the status of shifted, lightened, or removed constraints.

Table 6. Estimated Yield of Unhusked Upland Rainfed Rice Production in Yambio in 2022

Payam name	Rice production area (ha)	Annual yield of unhusked rice (tons/year)	Per ha annual yield of unhusked rice (tons/ha/year)
Gangura	33	34	1.0
Rirangu	26	28	1.1
Bazungua	28	26	0.9
Total/average	87	88	1.0

Source: World Vision International 2022

Post-Harvest Loss

Rice production in South Sudan is also affected by high post-harvest losses, due to poor access to improved rice processing machines such as rice threshers, cleaning, grading and milling machines. The only service provided by ARIS to farmers on cost recovery is land opening and the use of the combine

harvesters during the harvesting and cleaning of rice. Traditional practices for rice hulling (i.e. use of mortar and pestle) is the main option for rice processing for most rice farmers in major rice growing areas in the country. In addition, traditionally processed rice is of lower quality standards and cannot compete favourably with imported rice.

Therefore, to reduce rice post-harvest losses, mechanised rice production is critical. Value-added products, like rice-based ready to eat food, ready-made mixes, noodles and flours may enhance the market value of the rice and consequently reduce losses. Rice value addition enhances its market competitiveness and increases export market opportunities for rice products in South Sudan.

Access to External Market: Trends in Rice Import and Export Markets

Rice farming in South Sudan is characterised by small, fragmented rice fields, low yielding varieties, poor rice agronomic practices, limited access to labour saving farm machineries, and low value addition, making local rice less competitive, in terms of quality and price, to imported rice. Therefore, rice production in South Sudan is by far insufficient to meet the local demand, further encouraging increased rice imports. It is also estimated that South Sudan receives all its rice imports through Uganda (Nzomoi and Anderson, 2013), which acts as an important transit corridor for rice shipment of both locally produced and imported rice. South Sudan faces a daunting task on how to produce sufficient and affordable high-quality rice that not only meets the preferences of its fast-growing and increasingly urbanized population, but also competes favourably with imported rice (Mogga et al, 2018).

Very often, aromatic or fragrant rice commands a higher price in the rice market than the non-aromatic rice varieties (Khush, 2000) because of their pleasant aroma, flavour and texture. Aromatic cultivars commonly sold in world trade include the Basmati rice from India and Pakistan, and the Jasmine rice from Thailand. Aromatic rice is highly valued throughout Asia with wider acceptance in Europe, Australia, USA, the Middle East and Africa (Suwannaporn and Linnemann, 2008; Sakthivel et al., 2009). A study by Lamo (2010) in Uganda reported that overall, high yield potential, high market value and aroma were the most important factors in determining farmers' preferences in rice variety. Further, in another study by Mzengeza (2010) in Malawi, farmers identified large grain size, aroma and rice grain that tends to remain separate after cooking as most preferred traits in a rice variety. In Tanzania, a study by Kashenge (2010) reported that yield potential, aroma and early maturity were the most preferred traits in a rice variety. Further, Tanzania, the second largest producer of rice in East Africa, has not only sustained its domestic market for rice but also export substantial quantities of high-quality fragrant rice to its neighbouring countries at a considerable premium over imported rice (Demont, 2013).

2.1.4 Self-Sufficiency Rates of Milled Rice and Other Grain Food Items

Table 7 shows that the estimated nation-wide self-sufficiency rate of the grain/flour food category in 2009 was 26% (i.e. 613,940 MT/year of produced and unprocessed grains shown in Table 4 against 2,348,5400 MT/year of processed and consumed grains shown in Table 3. The estimated rate for the urban areas was 12% (i.e. 35,260 MT/year of produced and unprocessed grains shown in Table 4 against 286,680 MT/year of processed and consumed grains shown in Table 3), while the estimated rate for the rural areas was 28% (i.e. 578,640 MT/year of produced and unprocessed grains shown in Table 4 against 2,061,860 MT/year of processed and consumed grains shown in Table 3). Since the urban economy was assumed to be dominated by the non-agricultural sector, particularly by the service sector in South Sudan, it is reasonable to expect a low self-sufficiency rate of the category in the areas. On the other hand, the self-sufficiency rate of 28% in the rural areas can be interpreted as a significantly low performance of the agricultural sector.

The national-level macroeconomic interpretation of this situation is that a large grain/flour food supply deficit of 72%, was met by imports and the free supply of the food aid. A consequence of the imports must be the drainage of oil revenues and precious added value from the service sector to foreign countries for consumption. The economic cost of this situation must be the lost opportunity for capital accumulation in the rural areas, which is necessary for productivity improvement of the agricultural

sector's value chains. In addition, the sector must be facing the negative consequences of food aid, which likely suppressed the market prices of grain/flour food items and diminished farmers' incentives to produce these items.

Among the grain/food items, the rice was found in the lowest group, with a national self-sufficiency rate of 3%, that is, 2% and 3% in the urban and rural areas, respectively. In terms of state-wise self-sufficiency rates, Western Equatoria State showed the highest rates of 16% and 13% in its urban and rural areas, respectively, as a consequence of its highest rice production in the country. Other rice producing states such as Jonglei State, Warrap State, Central Equatoria State, and Eastern Equatoria State show positive but very small self-sufficiency rates. Since milled rice was not introduced in the rice market through food aid in 2009, the national self-sufficiency rate can be translated to 22,433 MT/year of imports consumed at the weighted average consumer price of 3.4 SSP/kg. Therefore, it is estimated that 76 million SSP, which is equivalent to 76 million USD at the 2009 exchange rate of 1SSP/USD, worth of milled rice was imported and consumed in 2009.

Table 7. Food Self-Sufficiency Rates of Grain and Flour

Crops/M	National			Upper Nile			Jonglei			Unity			Warrap			N. B.-El-Ghazal		
CODEX FCS[*1]	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain/Flour	12%	28%	26%	8%	34%	25%	7%	18%	17%	5%	18%	16%	10%	5%	5%	2%	19%	17%
Sorghum	12%	26%	24%	12%	23%	21%	6%	16%	15%	2%	6%	5%	17%	9%	10%	3%	20%	19%
Maize	4%	25%	21%	3%	65%	36%	13%	29%	27%	62%	43%	44%	1%	3%	3%		3%	2%
Millet	25%	12%	12%	36%	4%	10%		36%	36%		2%	2%	79%	0%	0%		18%	18%
Groundnut	57%	58%	58%	75%	30%	42%	64%	19%	20%		62%	52%	9%	9%	9%	10%	42%	40%
Cassava	23%	40%	37%					16%	16%		1%	1%		NC	4%			
Wheat	1%	1%	1%												0%			
Rice (milled)[*3]	2%	3%	3%				0%	0%	0%	2%		1%	2%	6%	3%			
Sweet potato	15%	208%	149%					1%	1%					NC	12%			
Irish potato		19%	4%															
Soya bean	1%	49%	14%		2%	0%	10%	173%	130%	48%		11%		NC	219%			
Yam	190%	32%	38%								NC	NC		10%	10%			

Crops/M	National			W. B.-El-Ghazal[*2]			Lakes			Western Equatoria			Central Equatoria			Eastern Equatoria		
CODEX FCS[*1]	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Grain/Flour	12%	28%	26%				2%	19%	18%	21%	26%	25%	2%	104%	70%	59%	71%	70%
Sorghum	12%	26%	24%				1%	14%	13%	4%	12%	11%	1%	95%	75%	85%	52%	54%
Maize	4%	25%	21%				1%	4%	3%	6%	157%	54%	1%	30%	15%	6%	123%	103%
Millet	25%	12%	12%				5%	84%	81%	35%	25%	25%	0%	361%	220%		83%	82%
Groundnut	57%	58%	58%				11%	59%	56%	78%	50%	53%	8%	695%	394%	1203%	1110%	1128%
Cassava	23%	40%	37%					23%	22%	32%	14%	17%	4%	97%	76%	19%	12%	13%
Wheat	1%	1%	1%							21%	3%	6%	2%		1%		5%	4%
Rice (milled)[*3]	2%	3%	3%							16%	13%	14%		4%	1%		3%	1%
Sweet potato	15%	208%	149%					14%	13%	33%	67%	65%	5%	778%	239%	19%	569%	374%
Irish potato		19%	4%								NC	NC						
Soya bean	1%	49%	14%								1%	1%	6%	NC	71%			
Yam	190%	32%	38%					75%	75%	10%	10%	10%	NC	15%	34%		107%	107%

Note: 1) M CODEX FCS means "Modified CODEX Food Classification System." 2) Percentage (%) data in Western Bahr el Ghazal is missing due to its missing consumption data. 3) "NC" means grain estimated to be produced but not estimated to be consumed due to small magnitudes of production and consumption not properly captured by the limited sampling framework of the 2009 NBHS.

Note: 3) Self-sufficiency rates of rice were calculated using weight of milled rice equivalent of unhulled rice production data multiplied by the factor of 72%. Other grain crops were calculated simply by dividing production data by consumption data.

As mentioned *supra*, most of the consumed rice was imported in 2009.The situation still largely remains the same in 2024. The NRTF, from collected data and information in consultation with major rice stakeholders, estimates that the self-sufficiency rate as of 2024 has slightly improved and stands at around 9%, as rice production takes a growing trend.

2.2 Supply and Demand of Land, Labour, Technology, and Financial Inputs

2.2.1 Agricultural Land

The land tenure system in rice-growing schemes is favourable to farmers, only that they do not own land titles making it impossible to access credit. Women are key players in rice production, but are yet to own land. For sustainable rice production, the land tenure system needs to be addressed to provide for ownership and to allow women access to land. The equitable, organised, and risk-free markets of land ownership, usufruct rights, and tenancy rights are still in early stages of development.

2.2.2 Labour and Gender Considerations in the Rural Labour Markets

Labour Costs and Scarcity due to Urban Migration

The migration of young energetic people to the urban centres has rendered labour unavailable and expensive. Traditionally, most farming families are dependant on family labour to carry out various farming activities, partly to reduce production costs and partly because it has been available on demand during labour peaks. The type of labour identified by the NRTF across the surveyed rice producing states were: family and communal labour, hired labour and tractor services. In Yambio and Nzara counties of Western Equatoria State (WES) the hired labour for rice production registered very high-cost records right from land preparation, planting, pests and weed control and up to post harvest stages, as compared to other states of Northern Bahar El Gazal State (NBGS) and Jonglei State (JS), due to the density of tree cover within the farming land. While, tractor hired services were reported to be very limited due to high cost of fuel and incentives for the tractor operators as a result of market inflation. This is due to the high dollar exchange rate as compared to the South Sudanese Pound as shown in the below labour costing Table 8. Therefore, the NRDS strategy shall promote modern agricultural technologies suitable for the local farmers as well as mechanisation services to increase rice production and productivity.

Furthermore, this NRDS document shall promote investment in the Market Value Chain (MVC) such as, drying, processing, branding, market information and marketing activities in the rural rice growing areas, and that should create employment opportunities to curb the rural to urban migration by the youth.

Gender and Youth Inclusion in the Agricultural Sector of South Sudan

Women are involved in small-scale production, processing and value addition of mainly oil commodities including sesame, ground nuts, etc., producing oil and peanut butter. Men, women and children are involved in rice production at various levels. Men are mainly involved in land preparation and transportation whereas women and children do planting, weeding, bird scaring, harvesting, threshing and drying. Rice marketing is done by both men and women though women dominate the local retail rice businesses. For instance, men in Yambio and Nzara counties of WES are dealing with heavy work, such as bush clearance and selective cutting of big trees within the farmland (Figure and Figure). The youth transport paddy rice from the farm sites to homes and local markets by boda-boda and pickup Tri-wheel motorcycles (“rickshaw” or “tuktuk”).

Low adoption of agricultural technologies has been associated with gender-related issues. Despite being the central players in rice production, women are reported to hardly attend trainings and workshops. This is likely to have adverse effects on the adoption and upscaling of rice technologies. Deliberate targeting of women and children for capacity building and technology transfer will enhance production and productivity.

For instance, the first established active rice producer group (Cooperative) in Bor County of Jonglei State, is headed by a female, where the majority (70%) of the members are women, reported no female members being trained on rice production technology available at the John Garang Memorial University (JGMU), in Bor.

Table 8. Labour/Production Cost, Office and Storage Hiring (in SSP)

Stages	Activity	Average Cost of ha in pounds (SSP) per Agric-stage activity			
		Western Equatoria	Northern Bahar-El-Gazal	Jonglei	Total average
Land preparation	Bush clearance (hands)	650,000	120,000	240,000	340,000
	Bush clearance (machine)	0	450,000	0	450,000
	Plow by tractor	0	550,000	150,000	350,000
	Digging by hoe	260,000	300,000	220,000	260,000
Planting	Direct seed planting	350,000	300,000	300,000	315,000
	Transplanting	0	450,000	0	450,000
Control	1st weeding	300,000	47,000	300,000	160,000
	2nd weeding	250,000	25,000	250,000	250,000
	Pest/diseases/birds	350,000	0	0	350,000
Harvest	Hand harvesting	450,000	350,000	250,000	350,000
	Machine	0	250,000	0	250,000
Post-harvest	Drying	350,000	250,000	0	300,000
	Trashing	650,000	850,000	0	750,000
	Packaging	25,000	28,000	0	26,500
Marketing	Transporting	150,000	350,000	0	250,000
	Loading	25, 000	35,000	0	30,500
	Offloading	25,000	35,000	0	30,500
Stocking	Monthly Store hiring	0	125,000	0	125,000
	Shope rent	125,000	250,000	0	200,000
	Office rent	750,000	250,000	0	500,000
Others	Buying rice seed (kg)	18,500	22,000	22,000	22, 000
	Buying hoe or hand tool	30,000	20,000	25000	50,000
	Fertiliser	0	0	0	0
	Irrigation Facility (fuel 20lt)	0	0	560,000	560,000
	Average total production cost per (ha)				**6, 369, 500**

Source; MAFS, *South Sudan National Rice Task Force (NRTF) grassroot consultative report Sept-Oct, 2024 & Jan. 2025*

Further, while the youth comprise 74% of the population in South Sudan (UNDP, 2021), they face many challenges including unemployment, lack of education, limited participation in decision making, limited access to resource and financial services, among others, causing frustration and contributing to their engagement in violent acts such as armed conflicts. A detailed gender analysis of prioritised value chains would inform the development and implementation of tailored responses to specific challenges and needs of both women and youth in agriculture.

Source: NRDS Task Force

Figure 6. Selective Tree Cutting for the Rice Farm in Nzara County, September 30, 2024

Source: NRDS Task Force

Figure 7. Farm Ready for Planting in Nzara County, September 30, 2024

2.2.3 Rice Seeds

Breeding varieties that meet Farmers and End-Users Quality requirements

Despite the importance of rice in South Sudan, production is low, while the introduced varieties do not meet the standards of imported rice in terms of physical, cooking and eating qualities, and consequently they do not offer competitive prices in the market. The country's major challenge in the rice sector is, therefore, how to produce sufficient and affordable high-quality rice that not only meets the preferences of its fast-growing and increasingly urbanized population, but also competes favourably with imported rice.

Unfortunately, most of the introduced rice varieties do not go through testing for quality, adaptation, and other agronomic traits. Thus, farmers take considerable risk by planting varieties of unknown performance that are largely low yielding and susceptible to diseases besides other biotic/abiotic stresses. These varieties may satisfy the farmers' preferences but not the market and end-user qualities, thus the locally produced rice is unable to compete with imported rice that has improved cooking and eating qualities.

The results of a ranking study on rice farmer and consumer preferences (Mogga et al, 2018) identified yield, early maturity, cooking and eating quality, nutritional importance and drought tolerance as the most desirable traits of rice varieties. Further, imported rice varieties were best ranked for their sweet and appealing taste, rich aroma, grain shape and size, swelling capacity and non-stickiness during cooking (Mogga et al, 2018). Major constraints for rice production were unreliable rainfall, poor access to credit facilities, poor soil and water management practices, poor rice storage facilities, inadequate and poor processing machines as well as limited technical skills in rice production. The results suggested a need for integration of farmers' and consumer preferences in variety development processes, and the desirability of releasing site-specific rice cultivars, given the differences in bio-physical, socio-cultural and farmers' preferences across major rice growing areas of South Sudan. A combination of both farmer and end-user qualities in one genetic background is desirable but remains a major challenge in the rice breeding programme. Therefore, breeding for enhanced yield and end-user preferred quality would be an important key strategy for South Sudan's rice breeding programme (Mogga et al, 2018) to further accelerate rice growth and development in the country.

New Rice for Africa (NERICA) Varieties

Between 2011 and 2015, the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) supported researchers from South Sudan and Uganda to enhance productivity, value addition, and competitiveness of smallholder NERICA rice production systems in the post conflict areas of South Sudan, including locations such as Morobo and Yei counties. The project established innovation platforms for upscaling NERICA innovations through a participatory approach. The Multi-stakeholder Platforms (MPs) comprised members from the Ministry of Agriculture, Forestry, Cooperatives and Rural Development (MAFCRD); Agricultural Extension Department (AED); Millers; non-governmental organizations (NGOs); Farmers; Traders; Community Leaders (CL); Commissioners for Agriculture (CfA); Seed Companies (SCs) and the Japan International Corporation Agency (JICA), among others.

The project established commercial supply and distribution systems in which farmers were contracted to produce the seeds. An analysis of both seed and grain production and supply chains was conducted and priority constraints identified and addressed. A total of 1,200 value chain actors were trained on production, processing and marketing of the new technologies. Demonstration sites were established in Yei and Morobo to train potential seed growers and rice farmers on best agronomic practices.

One station for upland rice trials of twenty (20) varieties, including NERICA 1, 4 and 10, alongside preferred local varieties showed that NERICA flowers much earlier and yields higher than the local varieties. Subsequently, by leveraging the Alliance for Green Revolution in Africa (AGRA), 4 upland

rice varieties (NERICA 1, 4, 10 and DKA-P27) were released by the Ministry of Agriculture and Food Security (MAFS) in 2015. Farmers embarked on the production of NERICA rice seeds, wherein a total of 10.6 metric MT (MT) of rice Quality Declared Seeds (QDS) were produced and marketed through UNHCR for distribution to returnees and refugees in 2015.

Production and Distribution of Quality Seeds

Despite the 2013/2016 conflicts, farmers continued to produce rice (both seeds and grains). It is estimated that close to 35 MT of combined rice seed and grain is produced annually across Yei and Morobo Counties. In Aweil, FAO has supported the rice scheme by providing access to improved seeds (WITA 9) over the last couple of years. There has been less effort at ARIS to promote production initiatives of quality local rice seeds.

Other farmers continue to recycle a mixture of old varieties, along with the continuous introduction of improved rice varieties, such as BR4 and BG-400, without proper measures. There are more than 10 rice landraces whose genetic erosion is threatened by the introduction of new rice varieties. It's imperative that measures for rice biodiversity, such as community in addition, as the absence of a functional rice breeding program that enhances access to rice Early Generation Seeds (EGS) is a limiting factor.

Current efforts and support to the Directorate of Research of MAFS through the African Development Bank (AfDB) focuses on production, maintenance and multiplication of EGS (pre-basic and basic seed) through public-private-partnerships in collaboration with local private seed companies to encourage sustainable business models in promoting the rice seed value chain.

For instance, the NRTF conducted a survey in September to October 2024 and January 2025, in the three states (WES, NBGS and Jonglei State) and five counties (Yambio, Nzara, Bor, Aweil Centre and Aweil East), to collect the necessary data and information for development of NRDS. They found that in the rice producing counties such as Yambio, Nzara and Aweil, the local farmers were, for more than five (5) decades, growing an old recycled mixed seeds of varieties that yielded very low paddy rice. Moving forward, MAFS, FAO and the public Universities should initiate seed purification, breeding of new varieties and quality seed multiplication. A Rice Seed Research Centre that can produce pure high quality seed for the local farmers, meet consumers interests and compete with the imported rice in the market is deemed necessary (report by the NRTF-MAFS October, 2024).

Uncontrolled Trans-Border Trade of Seeds

South Sudan is a member of both the Eastern African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) regional trading blocs. It is therefore bound by the common tariffs that apply to the member states of these trading blocs. However, there is a lot of informal cross-border trade with Uganda and Democratic Republic of Congo. There is also rice seed movement across the borders to counties such as Nzara in Western Equatoria State, which may not have undergone formal certification that could be detrimental to rice sub-sector development and leads to spreading of diseases and pests.

These trading blocs present major trading opportunities and sharing of germplasm. There is therefore need to speed up the ongoing harmonization process of trade tariffs, as well as the seed law and regulations by the partner states.

2.2.4 Fertiliser

Rice production relies on the use of synthetic fertilisers, especially nitrogen, to meet the rising demand for the commodity driven by population growth. However, nutrient needs of rice crops are not constant and may vary with fields, seasons, and years due to differences in crop-growing conditions and management. Further, proper management of nutrients for rice production should be adjusted to the

specific soil, yield targets and crop requirements. In addition, the application of external nutrients is the second most expensive rice production input, after labour. Therefore, nutrient management is an important component for sustainable rice production and sustaining soil health, while protecting the environment.

The absence of a functional fertiliser policy and regulatory framework limits access to quality and judicious use of fertilisers. Further, lack of an accredited soil and water laboratory predisposes farmers to the risk of wrong choice of fertiliser amendments and amounts, creating potential soil nutrient imbalances. Thus, application of fertiliser is limited to vegetables and watermelon grown around river side areas using irrigation, especially for market purposes.

Many cultivated soils particularly in the major cereal growing areas have poor soil fertility and do not supply the nutrients required by the crops grown, thus productivity is low as the use of fertilisers is not widespread. Further, considerable yield increases can only be achieved when improved soil fertility management practices are used, including appropriate application of organic and inorganic fertilisers based on soil tests. For instance, in ARIS, the survey by the NRTF found that the use of fertilizers in the trial rice field yielded more than 4 MT per hectare, as compared to 2.5 MT per hectare in the non-fertilized rice field as of 2024.

A study on the availability and access to fertilisers in South Sudan (FAO/MAFS Rapid Seed Security Assessment, 2023) interviewed at least 20 agro-input dealers; in Western Equatoria State (3), Western Bahr el Ghazal State (4), Northern Bahr el Ghazal State (1), Upper Nile State (3) and Central Equatoria State (9). Within these locations, fertilisers are mostly sold through retail shops (15 traders), wholesale and retail shop (3) and in wholesale (2) or bulk quantities.

At retail shops, fertilisers are repackaged in smaller bags to enhance fertiliser access and affordability by smallholder farmers. The retail shops stock small quantities of fertilisers (100-300 Kg) and only import larger quantities upon request or receipt of a purchase order. In general, fertilisers are mainly imported through Kenya, Uganda and Sudan from countries such as Turkey, Saudi Arabia, Qatar and Russia. Major buyers of fertilisers are smallholder farmers and commercial farmers. Other buyers of fertilisers included NGOs, private companies, and government institutions. Major fertilisers sold in the market in 2021/2022 were Urea (46%), Di-ammonium phosphate (DAP; 25%), Nitrogen, Phosphorus and Potassium (NPK; 17%), Calcium Ammonium Nitrate (CAN; 11%), and Foliar spray (1%). In the last two years, the largest quantity of fertiliser was sold in Central Equatoria State (38,000 kgs), followed by Upper Nile State (33 418 Kgs), Western Bahr el Ghazal State (5,260 kgs), Western Equatoria State (2,250 Kgs) and Northern Bahr el Ghazal State (125 Kgs). Further, there was limited knowledge on fertiliser types, their application and utilization among the fertiliser vendors and hence no provision of after sales service and extension advisories to farmers. Therefore, the main constraint to expansion of fertiliser utilization can be attributed to lack of access (unavailability in the local markets), high costs, inadequate extension and lack of clear policy and support from the government.

2.2.5 Pest and Disease Control Technologies

The primary constraint to rice production systems are insect pests and disease infestations, where the rice stem borer and brown plant hopper have the largest share (Shah et al., 2015). It is also reported that the most destructive insects to rice are the lepidopteran stem borers (*Tryporyza incertulas and T. innotata*) and the rice leaf folder (*Cnaphalocrocis medinalis*), causing annual losses in the order of 10 million tonnes (Shah et al., 2015). Unfortunately, incidences of pests have increased with increased investments in the use of insecticides due to the intensification of rice production systems. Indiscriminate use of pesticides can easily disrupt the natural balance between insect pests and their natural enemies. Although insecticides may be needed in some cases, they must be used judiciously in order to maximize their effects on natural control agents. In recent years, great progress has been made in implementing integrated pest management programs in rice crops, although additional data on the potential of natural enemies, microbial insecticides, and cultural practices is still needed. The reduction of chemical pesticide use associated with biological control methods is increasing the abundance of

some beneficial insects, and improving the natural control of specific pests. Evidence suggests that the Integrated Pest Management (IPM) adoption increases profits for rice farmers, since pesticide costs are reduced with no countervailing reduction in output (Shah et al., 2015). However, more knowledge of the natural enemies of pests is needed if appropriate biological control methods can be designed for South Sudan. Increased investment in agricultural research is critical in addressing knowledge gaps on pests and diseases in rice, and other staple crops in the country.

2.2.6 Machineries for Mechanised Production

Agricultural mechanisation is an essential factor in increasing labour and land productivity while reducing drudgery cost of production and maximing profits. Mechanisation can also be used to add value to primary products, create employment and subsequent income along the commodity value chain, enabling the growth of commercial agricultural systems. This, together with improving efficiency in postharvest handling, processing, and marketing options, should translate to food security. Mechanised large and mid-size farms can be found in the irrigated Aweil Rice Irrigation Scheme (ARIS) in Northern Bahr el Ghazal State. The rice scheme has a capacity of 4600 hectares, out of which, around 3750 hectares have been rehabilitated and 750 hectares are being used for rice cultivation, as of 2024. In March 2013, Aweil Rice Farmers Cooperative Society Limited was officially established and comprises about 250 farmers. The cooperation between the Scheme management and the Cooperative is expected to improve rice production and marketing. The only available rice mill at ARIS, with a capacity of 10 MT per hour, is faulty and non-functional. Services provided to farmers by the ARIS management include land-opening and the use of combine harvesters during harvesting and cleaning of rice on cost-sharing basis. Traditional practices for rice hulling (i.e., use of mortar and pestle) is the only available option for rice processing by most farmers (for rainfed upland and irrigated/rainfed lowland), which reduces the quality and grade of rice, making it less acceptable in the market. Further, the limited access to labour-saving technologies such as power tillers, tractors, rice planters, weeders, threshers, dryers and rice milling machines makes rice production a rather tedious and labour consuming work. In addition, spare parts are either unavailable or costly, making repair and servicing of farm machines difficult. More recently, MAFS, through World Bank support, conducted a comprehensive assessment of agricultural mechanisation in the country to inform State and County-specific agricultural mechanisation plans. Through this effort, MAFS will procure and manage appropriate mechanisation equipment and their sustainable utilization through rural agricultural mechanisation centres.

2.2.7 Financial Services

Absence of, or inadequate access to credit facilities, in the rice sector is an important constraint to enhancing rice production and productivity. Agriculture is generally viewed as a risky business by most financial institutions in South Sudan. Indeed, there are very few of these institutions in the country that support agricultural investment. Most of these are in major towns that are not easily accessible to rice growers. Other factors impeding access to finance by small holder farmers include credit history, collateral, and high interest rates by the banks. FAO and partners' support to farmer groups has encouraged the formation of village savings and loan associations (VSLAs), to enhance capacities on financial literacy while promoting savings by farmers and linkages with financial credit institutions. In fiscal year, 2023-2024 a budget of 3 billion South Sudanese Pounds (about USD 1.5 Million) was approved for the Agricultural Bank of South Sudan, to support farmers across the country with access to inputs, including tractor service and fuel for agricultural machinery to boost production. Over the years, the Aweil Rice Irrigation Scheme (ARIS) has provided tractor service, rice seeds and fertilisers to rice growers through a credit system with the costs recovered through a percentage of an agreed volume of rice harvest. To further encourage improved rice production and productivity, there is a great need to support rural farmers with access to affordable inputs through input credit schemes.

2.3 Players of Rice Inputs and Outputs Markets, and Rural Infrastructure

2.3.1 Rice Farmers, Processors, and Traders

In South Sudan, value addition in the agricultural sector is minimal, with most produce traded and consumed either raw or in a pre-processed form. There are few primary processors involved in agro-processing of small quantities of mainly cereals and oil crop products, most of which are sold in the local markets. Due to the insecurity that followed the outbreak of conflicts in 2013 and 2016, and the continued low-level instability, value addition initiatives were brought to a halt. Rice is mainly produced by small-scale farmers in Eastern Equatoria State (Magwi and Madi Corridor), Central Equatoria State (Yei, Morobo and part of Kaji Keji), and Western Equatoria State (Maridi, Yambio and Nzara). Approximately 11,700 rice producing households in the state were estimated to provide labour and to earn their livelihood through rice production.

2.3.2 Cooperatives, Firms, and Associations

The NRTF for the development of NRDS 2024-2034 found that very few cooperatives engaged in rice production were found in Yambio and Nzara WES, and in Aweil, NBGS. However, new rural groups of rice farmers initiated by FAO and WFP implementing partners in the flood-affected states such as Jonglei, Warrap, Lakes, Unity and Upper Nile, had voluntarily started up formation and registration of their local rice groups. These groups were to be certified by the County Agriculture Department and State Cooperative Department as the rice producer groups in the counties, following effective engagement in practical trainings organized by the government extension officers in collaboration with the NGOs partners at the established rice demonstration fields. This training introduced agronomic practices knowledge to the local communities in the flood-affected areas.

2.3.3 Rural Infrastructure Necessary for Rice Sector Development

Infrastructure development in the form of roads, feeder roads, market infrastructure, dams, irrigation and drainage systems, rice processing facilities, and power supply by public and private sector investment is needed. However, the investment in this infrastructure has been very limited, and due to the existing insecurity situation, infrastructure has deteriorated.

2.4 Government Interventions for Promotion of Rice Inputs and Output Markets

2.4.1 Rice Policy and Investment Plans

Policy Position of Rice

The Ministry of Agriculture and Food Security (MAFS) has over the years limitedly invested in rice research and value chain. However, it included in its 2023 Compact, rice as one of the commodities to be invested in, tallying with the country's Vision 2040 that was mainly geared towards ensuring food security, food self-sufficiency and poverty reduction for the people of South Sudan. Following these reforms, the Ministry developed a twenty-five-year strategic plan known as the Comprehensive Agriculture Master Plan (CAMP) and Irrigation Development Master Plan (IDMP) (2015- 2040) which focuses on improved service delivery and interventions that could trigger commercialization of the sector.

In cognizance of Vision 2040, MAFS' Undersecretary constituted the National Rice Task Force (NRTF) to strategize and align rice commodity focus with the country's agricultural trajectory. Thus, this NRDS has been developed. The strategy will guide the course of rice production and development for the next ten (10) years. The Strategy will also guide present and future efforts of the Ministry and its development partners, in providing technologies for improving the livelihoods of the millions of poor rice farmers and consumers in terms of food and income.

Rice Policy Options and Investment Plans

The Government of South Sudan has made efforts to improve the agricultural sector through the Comprehensive Africa Agriculture Development Programme (CAADP), which identifies several opportunities including:

(i) Compact as a shared commitment by all stakeholders;
(ii) adhering to the commitments in the Maputo and Malabo declarations, such as the allocation of 10% of budget to agriculture [currently only 2% is allocated] and
(iii) the National Agriculture Investment Plan as a major building block for agricultural transformation.

The South Sudan Compact identifies rice as one of the prioritized value chains of investment, in line with the South Sudan Comprehensive Agricultural Master Plan (CAMP) and the country's Vision 2040, which prioritises building a prosperous, productive and innovative nation to be achieved through increasing agricultural productivity to enhance food and nutritional security. The Plan targets to reduce rice imports by increasing rice production to 100,000 tonnes by 2027 over an acreage of 16,000 hectares, while improving productivity from the current 0.7 MT/ha to 6 MT/ha[12]. It also targets the rehabilitation of rice irrigation canals under the Aweil Rice Irrigation Scheme (ARIS) (4,600 ha) through the support from AfDB. Increased rice productivity will be achieved through improved soil and water management practices; improved farmer preferred and adapted rice varieties with matching good agronomic practices, promoting input credit schemes, supportive policies, among other interventions.

Rice Breeding Policy

A study by M. Mogga, et al. (2018) revealed important considerations for the rice breeding programme in South Sudan, including policy interventions that are essential for boosting the rice industry in the country. The study noted that majority of the rice farmers in the country were relatively young, within the economically active age group but were less exposed to specialised formal training in rice production and management. The study highlighted that rice farming was largely dominated by traditional rice farming methods, including broadcasting and use of farmer-saved seed or recycling of old rice varieties despite efforts to introduce new rice varieties. Low uptake of new rice varieties largely emanates from the lack of incorporation of farmer and consumer preferences in these varieties, hence farmers are rarely exposed to rice varieties that provide acceptable alternatives to their landraces. The farmers' criteria for selecting rice varieties were influenced by locations and gender differences. For example, the men preferred rice varieties that are long and slender and fetch high market prices, while women select varieties that are aromatic and swell when cooked. The study emphasized the importance of participatory approaches in variety development processes, to integrate farmer and end-user qualities and preferences in the choice of varieties. The study further encouraged increased investments in rice value-addition to make domestic rice competitive to imported rice and to enable African rice farmers to access urban markets. Further, policy options that encourage increased access to farm inputs through agro-dealer networks, input credit systems and judicious use of fertilisers will help enhance rice production per unit hectare. The study also suggested generating site-specific rice cultivars for South Sudan given the differences in bio-physical, socio-cultural and farmer preferred traits across rice production sites. The study further recognised the important role of research in generating appropriate rice technologies while advocating for policy measures that encourage quality rice seed production and distribution in the country.

2.4.2 Research

Overview of Rice Research

The long period of Civil War derailed the establishment of rice research, and efforts by NGOs have been largely centred on the introduction of improved varieties for use by farmers. Previously, the Government of Sudan exerted its efforts by establishing the Aweil Rice Irrigation Scheme (ARIS) in the 1950s for

[12] https://www.afdb.org/en/documents/south-sudan-country-food-and-agriculture-delivery-compact

paddy production. However, the operations of this scheme were adversely affected by the resurgence of the Civil War in 1985. Similarly, efforts by the Government of South Sudan through GIZ in rehabilitating the scheme, did not realise full potential in rice production. The then Ministry of Agriculture and Forestry, Republic of South Sudan, through the Department of Research, has conducted rice trials within the Greenbelt. This further led to the introduction and recommendation of elite rice cultivars such as upland rice varieties (NERICA 1, NERICA 4, and NERICA 10), and lowland rice variety (WITA 9).

Unfortunately, such initiatives have not significantly contributed to increased rice production or in addressing rice production constraints in the country. More recently through the support of AfDB, rice adaptive trials were established through the support of FAO and MAFS to promote the uptake of improved technologies including superior rice varieties. However, the absence of NRDS as key driver towards improving self-sufficiency by increasing productivity and market competitiveness of the locally produced rice remains critical in unlocking rice potential in the country.

Further, to consolidate the gains so far made within the rice sector in South Sudan, NRDS is of paramount importance in laying the foundation for sustained growth and transformation that will accelerate the move towards improving rice self-sufficiency, private sector led economic growth and increased rice productivity.

Progress in Rice Research and Dissemination of Best-Bet Technologies.

MAFS, through the Department of Research, has conducted rice trials within the Greenbelt. This further led to the introduction and recommendation of elite rice cultivars such as NERICA 1, NERICA 4, NERICA 10 and DKA-P27. Unfortunately, such initiatives have not significantly contributed to an increase in rice production and in addressing the constraints related to this production in the country. The lack of a functional farmers and market responsive rice breeding program in the country further exacerbates efforts to boost rice production and productivity in the country. Farmers therefore largely cultivate traditional low yielding varieties; most of which are susceptible to diseases and other biotic/abiotic stresses, and have been generally unresponsive to improved crop management practices.

In June 2022, FAO and MAFS with the support of AfDB established on-station adaptive rice variety trials to promote participatory selection and uptake of superior rice cultivars at ARIS. The trial comprised of 30 rice cultivars (lowland/rainfed) with 28 elite rice varieties and 2 checks. The 28 elite rice varieties were acquired from the National Crops Resources Research Institute, Uganda (17 cultivars), Sierra Leone (3 cultivars), and Bangladesh (8 cultivars), while a popular landrace variety (BR4) as well as a recently introduced and adopted variety (Wita 9) were used as comparative controls. The preliminary trial identified 13 superior varieties that were selected for their good agronomic traits such as yield, early maturity, tallness/tolerance to floods and resistance to lodging. In June 2023, the selected 13 best performing varieties were planted in advance trials at ARIS to further identify candidate rice varieties through participatory selection, to be proposed for national release and commercialization. State extension officers and two MAFS scientists were engaged in the design and establishment of the trial experiment. Further, the intervention established rice fertiliser trials and constructed a rice research centre and seed storage facility to further enhance capacities for rice production at the ARIS.

Breeding Perspectives on Improving Rice Grain Quality

Grain quality is usually based on certain objective or subjective criteria that are of relative importance to the end-user. In general, the most important grain quality traits that are common to all end-users include appearance, milling quality, cooking and processing quality and nutritional quality (Lou et al., 2009). Thus, knowledge on end-user tastes and preferences for rice grain quality traits is important for enhancing rice breeding strategies. This will ensure competitiveness of locally produced rice and thus serve as a mechanism to return more of the benefits associated with improved quality rice to farmers. For most African countries, the focus on rice breeding programmes has been on increasing yields and enhancing stress tolerance with little emphasis on grain eating and cooking qualities (Manful, 2010).

High yielding varieties are often released after field-testing without taking into account their quality attributes such as milling potential, amylose content, gelatinization temperature, gel consistency, chalkiness, pasting characteristics, cooked rice texture and aroma. Further, consumer tastes and preferences are rarely incorporated in the selection of new rice varieties. These varieties may satisfy the farmers' preferences but not the end-user qualities, thus the locally produced rice is unable to compete with imported rice that has improved cooking and eating qualities. Therefore, there is an increasing importance for enhanced yield and end-user quality in the local rice varieties. A combination of both farmer and end-user qualities in one genetic background is desirable but remains a major challenge in a rice breeding programme. Thus, breeding for enhanced yield and end-user quality requirements would be an important key strategy for South Sudan's rice breeding programme to further accelerate rice growth and development in the country. Consequently, increased rice production and market competitiveness of locally produced rice would contribute to food, income and nutrition security for South Sudan. Moreover, partnership with international organizations such as the International Rice Research Institute (IRRI) and AfricaRice will help maintain a stream of new elite breeding lines selected based on local needs. This material can be regularly assessed in multiple sites in the county with the objective of releasing and commercializing varieties that meet local farmers' and market needs.

2.4.3 Aweil Rice Irrigation Scheme: Limited Capacities for Irrigation Management

The Aweil Rice Irrigation Scheme (ARIS), located to the north of the town of Aweil in Northern Bahr el Ghazal State, is the largest mechanised rice scheme in South Sudan. The area experiences floods and inter-communal conflict (insecurity) associated with pasture and water sources. Paddy production in ARIS was initiated in 1945 by the British Colonial Government District Commissioner as a prison farm with the size of four feddan (1.68 hectares) in the flood plains of river Lol (known locally as Toich).

In 1953, the scheme was taken over by the Sudanese Government Ministry of Agriculture and Forestry and expanded to cover an area of 210 hectares. Flood control dikes to enclose the irrigable areas have been built since 1961 covering a total area of 4,600 hectares. After the Comprehensive Peace Agreement (CPA) in 2005 under the Sudan Productive Capacity Recovery Programme (SPCRP) funded by the EU, the then Ministry of Agriculture and Forestry (MAF) signed an agreement with GIZ-IS to implement the Aweil Irrigation Rehabilitation Project (AIRP) from 2007. This involved provision of machinery and rehabilitation of three (3) basins totalling 1,150 hectares. In March 2013, The Aweil Rice Farmers Cooperative Society Limited was officially established. Rice production in ARIS has been affected by rampant floods and inability to control water levels in the rice fields. This has discouraged most farmers from expanding rice production areas. A feasibility study on the irrigation scheme reported some of the challenges faced by the farmers at the rice scheme such as lack of farm machinery, farm inputs, storage facilities, water availability for irrigation and drinking, lack of health centres and market access, flood hazards, lack of quality seeds, and poor private sector interest. Further, the lack of capacity in the government Ministries and farmers' experiences in irrigation development has been identified as a serious constraint in the implementation of the Aweil Rice Scheme project.

2.4.4 Provision of Healthcare and Conflict Mitigation Services

In the irrigation schemes, high prevalence of waterborne diseases such as malaria and bilharzia has been noted to affect the productivity of farmers. In addition, inter-communal conflict has greatly affected the productive work force of the rural farming communities. Currently, limited services are available to address such healthcare and social conflict issues.

2.4.5 Institutional Capacity Building: Capacity and System Needs Assessment for MAFS

The prolonged civil war in South Sudan destroyed much of the country's infrastructure and seriously eroded human capacity needed for development. Based on the FAO Capacity Needs Assessment Study

in 2008, although a good number of officials at the national level are qualified, few at the state level are academically qualified to support the implementation of agricultural interventions. Similarly, in terms of gender, a greater number of women employees in the Ministry of Agriculture and Forestry (MAF) and the Ministry of Animal Resources and Fisheries (MARF) are in the unclassified job category[13]. Further, weak linkages within and between the National, State and County Agricultural Departments, weak corporate governance as well as lack of transparency, accountability and improved monitoring systems are some of the major constraints limiting the functions of the institutions, including the development and implementation of appropriate policies.

Currently, agricultural productivity in South Sudan is extremely low due to the low performance of the public sector and the farming community, which is attributed to poor attitude and low capacity in skills and knowledge. Inadequate institutional capacity to support implementation of knowledge and skills development is one of the major factors contributing to low performance in agriculture. However, low civil service performance is also exacerbated by lack of operational human resource systems and procedures for staff recruitment, selection, appointment, appraisal, motivation, staff development and training. In other words, management, administration, planning and supervisory ("soft") skills are weak and there is limited capacity among existing institutions to improve these skills. Enhancement of competencies through improved knowledge, skills and behaviour modification is a necessary condition to effectively formulate, implement, monitor, and evaluate development policies, programmes and projects across public and private sector institutions throughout the country.

Considering the need for both national and state levels to improve agricultural productivity and food security in the country, it is imperative to assess MAFS institutional capacity and system needs requirements, and to develop a comprehensive and effective strategic plan for improved service delivery in both the public and private agricultural sectors. Its against this background that MAFS, through FAO and with funding from the World Bank, procured the services of a consulting firm (2023-2024) to undertake MAFS capacity and systems needs assessment, and to develop a comprehensive capacity development plan to be implemented in the short-medium and long-term plan in line with MAFS development goals. Subsequently, investment by the World Bank and the AfDB emphasizes capacity enhancement and technical support to the Ministry of Agriculture and Food Security (MAFS) to strengthen its policy, planning, managerial and technical roles and functions.

[13] Final draft training and capacity development policy, 2011

Chapter 3: Challenges and Strategic Approaches to Capture Opportunities

Despite the abundant natural resources, including arable and grazing land, water resources, oil and timber, yet the country remains among the poorest and the least-developed countries in the world.
The key challenges include; insecurity, political instability, climate related disasters, food shortages and localized armed conflict among the crop farming and cattle keeping communities. Moreover, influx of refugees and returnees from Sudan due to armed fights between the warring factions (SAF and RSF). For instance, in April 2024, about 640,688 returnees, refugees, and asylum seekers arrived in South Sudan[14].

Constraints and challenges vary with production, cropping and farming systems across the country. Like the rest of the world, the trend of rice cultivation is going towards upland rice production, where water use efficiency and conservation is emphasised. The kind of infrastructure which goes with large scale paddy rice production is expensive to most smallholder farmers, and therefore the introduction, testing, and extension of cost-effective small-scale irrigation paddy rice production should be considered.

The economic performance in the past 15 years was severely affected by the unstable and shrinking economy, due to civil unrest and erratic extraction of the finite oil reserves. As the reserves will eventually be exhausted, the economic diversification through agricultural development together with other sectors is imperative. Wise use of renewable natural resources for sustainable agriculture should also be well considered by capturing opportunities of agricultural development. This is following the fact that the agricultural sector is considered rural sector, and service and industry sectors are considered urban sectors.
Based on the above understandings, a SWOT analysis was performed in order to select strategic approaches to capture the opportunities. Figure presents the results of the SWOT analysis.

Strength	Weaknesses
• Plenty of water for irrigation • Suitable land for growing rice • Growing Population • Market for rice (consumer preference) • Suitable Climate (Agro-ecological zones) • Enough rainwater • Established national projects • Availability of labour • Political will for developing the sector	• Insufficient production • Lack of/Inadequate storage facilities • Lack of rice specific policies • Lack of quality inputs (seeds, fertilisers, etc.) • Low quality mills • Poor extension services • Small and fragmented farm size • Poor access to financial resources (subsidies, credits, etc.) • Poor farming practices • Inadequate research system • Inadequate funding from government • Poor infrastructures (feeder roads, etc.)
Opportunities	Threats
1) Increase in domestic rice demands and supply 2) Availability of expertise and high-end technologies, inputs, and machinery in the region 3) Existing rice supply chain and market 4) Government policy and capacity to support rice sector development	• Pest and diseases • Climate change (flood, drought, uneven rainfall) • Insecurity • Macro-economic shocks • Cheap and competitive imported rice

Figure 8. Results of the SWOT Analysis

[14] World Bank (2024), Report on South Sudan situation April, 2024

As a result of the SWOT analysis, four key opportunities were identified:

1) Increasing domestic demand and supply of rice
2) Availability of expertise, advanced technologies, inputs, and machinery in the region
3) Existing rice supply chain and market infrastructure
4) Government policies and institutional capacity to support rice sector development

Based on the identified opportunities the following sections in this chapter 3 were established:

3.1 Rice consumption and supply
3.2 Rice production technologies and inputs
3.3 Rice value chain and market infrastructure development
3.4 Government's public service delivery capacity

3.1 Rice Consumption and Supply

In South Sudan, although consumption quantity has been relatively small, the major rice consumption areas has been in the urban areas, and demand in these areas has been met by imported milled rice. Since the service sector in the areas has shown growing value addition, domestic rice production in the rural areas should be promoted to meet the rice demand of urban dwellers to capture the value addition by the rural rice producers. This will also result in the substitution of imports through domestic supply of rice.

3.1.1 Challenges

The examination of the rice market in terms of consumer preference, rice consumption, supply, and self-sufficiency rates resulted in the identification of the following challenges:

- Although rice was widely consumed across the country along the major roads and water-way networks, absolute quantity of the consumption was low compared with other major grain and tuber food items such as sorghum, maize, groundnut, and cassava;
- Worsened and continuing insecurity situation, as well as economic instability have hindered increase in the urban dwellers' disposal income that likely resulted in loss of opportunities for increase in rice consumption;
- Rice consumption was dominated by imported milled rice which was preferred by consumers, particularly in the urban areas, reflecting low competitiveness of the locally produced and processed rice;
- Consumption of milled and traded rice was less preferred in the rural areas where the livelihoods of a large part of the cash-constrained population largely relies on subsistence farming of non-rice crops;
- Supply of domestic milled rice is limited to West Equatoria State where traditional production of upland rice is estimated meet about 5% (approximately 5,000 MT/year) of the national rice consumption (approximately 100,000 MT/year) in 2024; and
- Adoption of irrigated rice production around the area of Aweil Center in the NBGS by the local communities is limited, and supply of milled rice from the area is limited.

3.1.2 Approaches to Capture Opportunities

Import Substitution by 2034

The self-sufficiency rates for grain and flour food items including rice, were estimated to be low in the Survey of 2009, and the situation has persisted. There was a large discrepancy between production and consumption of rice in 2009, which estimated production of 890 MT/year of unhulled rice, whereas, estimated consumption stood at 23,080 MT/year of milled rice. The NRTF estimates that by 2024, the production increased to around 10,000 MT/year and consumption to around 100,000 MT/year. The self-sufficiency rate, therefore, is around 10%. This results in the need to promote domestic production through modern and efficient farming and post-harvest practices, and make domestically produced rice

competitive with the imported rice. A competitive local rice value chain involving existing input suppliers, farmers, millers, traders, retailers, and consumers should be improved with targeted interventions to improve self-sufficiency by 2034.

Target Urban Areas for Domestic Rice Supply and Consumption Promotion

Farmers and pastoralists in the states performed relatively well around 2014 despite being severely affected by the security, weather, and economic shocks. Since 2018, they have been under the slow process of recovery, which will be prioritized for public support in the long run. On the other hand, the size of the GDP from the industry and services sector (urban sector) was 6.4 times larger than the size of the agricultural sector in 2019. Therefore, large rice demand in the urban areas must be met from domestic rice supply in order to capture value addition (GDP) generated by the urban sector.

3.2 Rice Production Technologies and Inputs

The rice sector is in its early stages of development in South Sudan. Therefore, the opportunity to apply existing expertise and high-end technologies, inputs, and machinery available in the region will be captured through enhancing the technical and financial capacity of rice producers.

3.2.1 Challenges

The identified challenges preventing the availability of production technologies and inputs for rice sector development are as follows:

- Limited rice production, marketing knowledge and skills of the farmers and farm labourers;
- Limited supply and demand of rice production inputs and machinery resulted in their high cost;
- Limited supply and demand of financial services;
- Insecure land ownership preventing access to credit;
- Limited or no land ownership of women, preventing women's access to land;
- Labour scarcity due to urban migration, limited availability of on demand family labour, resulted in high labour cost;
- Low unit area production usually between 2.5 - 4.0 t/ha;
- Low input, especially fertilisers;
- Poor quality of inputs;
- Poor market linkage to the input supply;
- Traditional planting system (broadcasting); and
- Low financial capacity of farmers to increase farmland and purchase the required inputs (seeds, fertiliser, pesticides, herbicides, tools, and many others).

3.2.2 Approaches to Capture Opportunities

Target Western Equatoria State to Explore its High Potential for Rice Sector Development

Since the centre of the traditional hill rice production is observed to be West Equatoria State, the state must be selected for the prioritised public intervention in the early stages of NRDS implementation to explore the state's high potential for rice sector development. It is reported that the traditional hill rice production was predominantly practiced in the Yambio area of the state. Therefore, the government's intervention to promote a competitive rice value chain, with emphasis on small-scale-commercial-landowner-household hill and paddy rice production with less than one (1) ha cultivation area, will be initiated in the state in collaboration with the state government.

In ranking the promotion of hill and paddy rice production systems, hill rice production with advanced rice varieties will be prioritised, followed by paddy rice production with appropriate technologies adopted from technologies introduced form other African countries and CGIAR centers. Since cost effective and high productivity rice production is an essential element of the competitive rice value chain,

the hilly topography of the state is an advantage to the introduction of gravity irrigation to save on water management costs.

Promotion of Paddy Rice Production, Research and Training in Aweil Rice Irrigation Scheme Areas

The other priority government intervention is the continuous promotion of the small- to medium-size (1 to 5 ha) tenant-based and owner-based paddy rice production model in the areas of Aweil Rice Irrigation Scheme (ARIS). This is meant to benefit the established paddy rice production research and extension experiences. According to the survey results, the participation of the neighbouring communities in the production model was inferred to be low. This is consistent with anecdotal reports that perceived high costs of inputs, erratic water supply, land-based conflict, underdeveloped rice value chain, and weak government support prevented active participation of the local communities in the production model to be implemented in the scheme. Therefore, prior to promoting the paddy rice production model of the scheme, technical, financial, economic, and market analysis on the performance of the current participants in the production model and associated rice value chain will be conducted, to consider necessary adjustments and improvements on the production model.

Promotion of Production Investment

High costs of labour, technology, and financial constraints faced by the traditional rice producers indicate a fundamental issue, which is the low productivity of traditional rice production practices, which do not require significant investment. In other words, investment in modern technologies is too expensive to be adopted. Therefore, the shift from traditional low-input and low-yield rice production technologies to modern high-input and high-yield production technologies must be achieved through the promotion of commercially oriented rice production and capital accumulation of farmers. It is expected that the capital accumulation should result in the shift to capital-intensive, input-oriented, high-yield, and high labour productivity rice production. This approach is consistent with the government's target of economic diversification through agricultural development.

3.3 Rice Value Chain and Market Infrastructure Development

Historically imported milled rice, though relatively small in quantity, is consumed widely in South Sudan with an existing supply chain of imported rice. Therefore, further expansion of the existing supply chain to a fully functional rice value chain to market domestically produced rice will be supported by the government.

3.3.1 Challenges

- Limited rice marketing efforts from rice market players in rural and urban areas;
- Rice market players are dominated by farmers that have limited capacities;
- NGOs are not cost effective;
- Weak incentive and capacity of the rice market players to form farmer, processor, trader, and consumer organizations to collectively address rice value chain development market issues;
- Public financial and technical instruments to enhance the functions of the rice value chain are limited or non-functional;
- Slow public investment in rural infrastructure.

3.3.2 Approaches to Capture Opportunities

Since the financial capacity of rice market players, particularly in rural areas is limited, and incentives of self-employed businesses to perform collective action are low, the government will provide regulatory services and implement incentive schemes to encourage the rice value chain players to improve production and business practices.

3.4 Government's Public Service Delivery Capacity

It is expected that the government will play an important role in delivering regulatory and faciliting roles and services, and in implementing various incentive schemes including subsidies, concessional loans, and tax breaks. Therefore, the improvement of public service delivery and policy implementation capacity of the Ministry of Agriculture and Food Security (MAFS) and Ministry of Water Resources and Irrigation (MWRI) is essential to achieve NRDS goals.

3.4.1 Challenges

- Limited policy formulation and implementation capacity;
- Limited legal framework development and enforcement capacity;
- Poor coordination between MAFS, MWRI, and other ministries concerned;
- Insufficient technical and financial capacity to support the introduction of advanced rice production technologies;
- Limited research capacity in terms of human and financial resources;
- Inadequate research collaboration with international and regional research and academic institutions and platforms; and
- Inadequate extension services.

3.4.2 Approaches to Capture Opportunities

Policy Development and Implementation

The Ministry of Agriculture and Food Security (MAFS) and the Ministry of Water Resources and Irrigation (MWRI) , in collaboration with the development partners, and capacity to mobilise them, are mandated to develop and implement relevant policies and legal frameworks to develop the rice sector in South Sudan.

Emerging socio-economic and climate issues affecting cereal production and productivity, alongside the changes in political stability and policy environment are governing agricultural development. More emphasis is being placed on the rice sector within the Revised Agriculture Sector Framework Strategy (ASFS 2022-2026) and Compact program to increase food staples in order to improve food security and rural livelihoods.

The National Rice Development Strategy (NRDS) is aligned with Government Plans and Programmes, such as the Country's Vision 2040, the Revised National Development Strategy (R-NDS 2021-2024), the Comprehensive Agricultural Master Plan/ Irrigation Development Master Plan (CAMP/IDMP 2015-2030), which is the National Agricultural Investment Plan (NAIP) for South Sudan geared towards the Comprehensive Africa Agriculture Development Programme (CAADP).

The NRDS is thus a policy strategic framework that is intended to address the challenges affecting the rice industry and guide its development process over the next five-year period. This informs the government of the Republic of South Sudan's decision to include rice as one of the five selected food commodities, where other commodities including sorghum, maize, fisheries and livestock are under the COMPAC program.

Research and Extension Services

The Ministry of Agriculture and Food Security (MAFS) and the Ministry of Water Resources and Irrigation (MWRI) have limited capacity to provide extension services. MAFS, Juba University, and other universities, although limited in resources, have a long history of research and technical development capacity. These remaining opportunities for the enhancement of research, technical development and technical backstopping capabilities should be enhanced for better sector development.

Opportunities to Shift Consumption, Cultural, and Social Norms

Opportunities to shift the preference for domestically produced rice, perceptions on gender, divisions of labour and their application, and socio-cultural norms should be explored through the provision of facilitative public services by the government. In this context, rice consumption, production and promotion campaigns aiming for change in cultural and social norms targeting the urban and rural dwellers will be implemented.

Chapter 4: Vision and Scope of the Strategic Intervention Approaches

4.1 Vision, Objective, and Targets

4.1.1 National Vision

To transform the South Sudan rice sector into a thriving sustainable and competitive industry that meets the national needs of the nation, drive economic growth and empower local farmers through innovative agricultural practices.

4.1.2 Objective

To increase rice production in South Sudan annually by 20% over the next 10 years by improving access to quality seeds, modern farming equipment and irrigation systems.

4.1.3 Rice Sector Development Targets

To achieve the vision and objective of NRDS, the following targets are selected:

- The target is **to increase annual unhusked rice production by 20% every year,** aiming to **reach an annual production of 61,000 MT** by 2034 or **317, 000 MT** over the ten-year period of the NRDS.

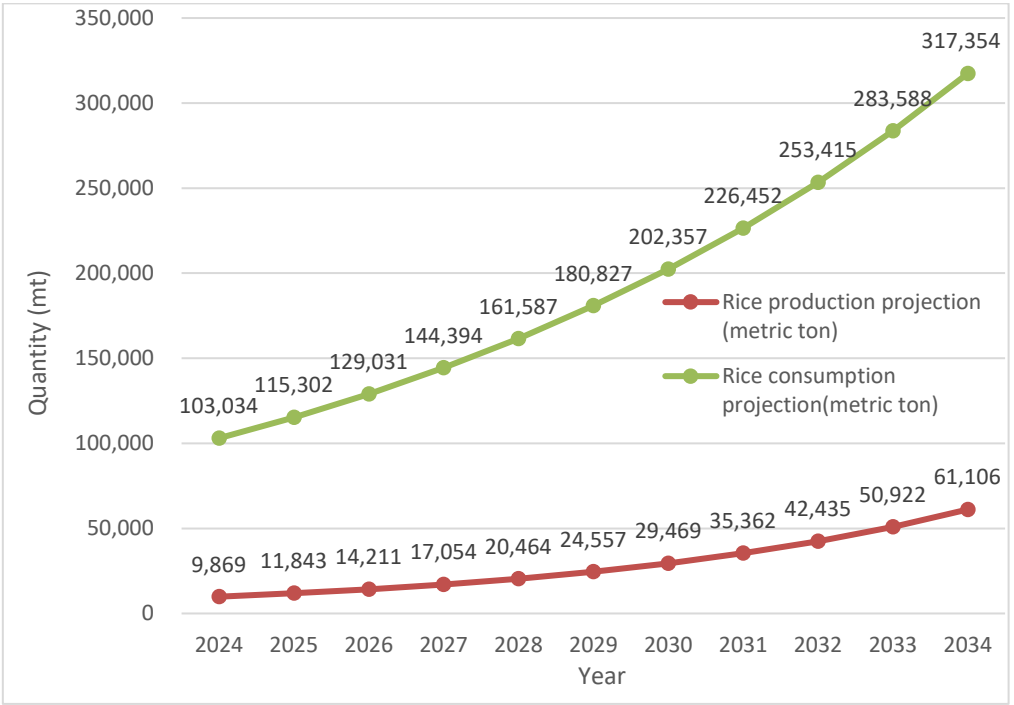


Figure 9: Projection of Rice Consumption and Production Done by NRTF for the NRDS Implementation Period

- Train **10,000 rice farmers** in sustainable rice farming practices and climate resilient techniques by 2034 to improve yields and reduce environmental impact.
- **16,000 hectares** of target acreage of land to be cultivated by the end of this first NRDS (see Table 9 below).

Table 9. Rice Production Target Between 2024 to 2034

Production type	Area/Yield/Quantity	2024	2029	2034
Rainfed Upland	Area (ha)	4,800	5,880	10,543
	Yield (t/ha)	1.50	2.50	3.50
	Production (MT)	7,200	14,700	36,900
Rainfed Lowland	Area (ha)	750	1,960	4,613
	Yield (t/ha)	3.50	3.75	4.00
	Production (MT)	2,625	7,350	18,450
Irrigated	Area (ha)	9	467	1,118
	Yield (t/ha)	4.75	5.25	5.50
	Production (MT)	44	2,450	6,150
Total	Area (ha)	5,559	8,307	16,274
	Yield (t/ha)	-	-	-
	Production (MT)	9,869	24,500	61,500

Source: NRTF in the MAFS 2023/2024

- Initial priority intervention areas are in **Western Equatoria State**, which includes seven counties: Yambio, Nzara, Ezo, Tombura, Mardi, Iba and Mundri West. Then NBGS including two locations; **Aweil center** where Aweil Rice Irrigation Scheme (ARIS) is used for Research infrastructure to enable local farmers and extension workers acquire knowledge and skills for agronomic practices. This applies to both rainfed hill/upland rice production and paddy/lowland rice production, while the community around **Aweil East County** will be engaged in lowland rice cultivation. Lowland rice cultivation intervention will also be prioritized in Jonglei states, then other appropriate flood plain areas.

- Training and demonstration functions of zonal and sub-zonal research, including that of ARIS, strengthened community-based demo sites and public universities.

- Policy formulation and implementation, and resource mobilization by the National Government will be strengthened to realize intensified public service delivery in Western and Eastern Equatoria States, Jonglei State, Warrap State, Lakes State and Northern Bahr el Ghazal State.

- The extension and facilitation capacity of the National Government, states and counties of rice producing areas in the country will be strengthened to support rice producer households, cooperatives and rice market players to capture and promote value addition in the urban sector.

- Applied research, technical development, and training capacity of the national research system and ARIS will be strengthened in support of rice producing households and rice market players to capture and accumulate value addition in the urban sector.

4.2 Strategic Intervention Approaches to Capture Opportunities

4.2.1 Increase in Unhusked Rice Production as Import Substitution

Targeting rice production states and counties to achieve production of sixty-one thousand (61,000) MT/year unhusked domestic rice production by 2034

The target production value of 61,000 MT/year will be achieved to improve the self-sufficiency rate of around 9% in 2024 to around 20% in 2034. To this end, Western Equatoria State and Aweil Rice Irrigation Scheme (ARIS), and the rural communities within the vicinity, have been selected to provide prioritized and targeted public services. This aims for the extension of proven technologies, production and market facilitation services, as well as subsidies in the early stage of NRDS implementation. Based on the success and outcomes of the initial intervention, Greenbelt agro-ecological Zone counties including Yei and Magwi will be selected in the middle of NRDS implementation. Once the floodplain

or lowland rice production technologies has been tested and established at ARIS, the technologies can be extended to other selected institutions and make interventions in other flood plain areas such as Jonglei and Upper Nile. Collaboration between the national and concerned state governments, as well as international research and development institutions will be essential for the success of these interventions.

Collaboration with Western Equatoria State and other Greenbelt Areas to promote Hill Rice Paddy Rice Production

Since the centre of the traditional hill rice production is observed to be Western Equatoria State, parts of both CES and EES, the areas in the Greenbelt zone must be selected for prioritized public intervention in both the early and middle stages of NRDS implementation, to explore the state's high rice sector development potential. The national and Western Equatoria State Governments, including other parts of Greenbelt areas, will establish a strategic collaboration arrangement. In the arrangement, the national government will be responsible for external and internal resource mobilization, improvement of regulatory framework and services, and M&E of the rice project implementation. On the other hand, the state government will be responsible for the delivery of frontline of extension, facilitation, and technical services to support subsistence rice producers, promote cooperatives and small-scale-commercial-land owner-household hill and paddy rice producers with less than one (1) ha to a maximum of (4) ha, of the average cultivation area per farmer and cooperatives, respectively. In this case, hill rice production with advanced rice varieties will be promoted first, followed by the paddy rice production, adopting the appropriate technologies at the Aweil Rice Irrigation Scheme.

Collaboration with the Northern Bahr el Ghazal State Government and other Flood Plain areas to promote Rice Production in Aweil Rice Scheme and its Vicinity

The other priority government intervention is the continuous promotion of the small- to medium-size (1 to 5 ha) tenant-based paddy rice production model in the Aweil Rice Irrigation Scheme (ARIS), in order to benefit its established paddy rice production and extension experiences. To this end, the national government and the state government of Northern Bahr el Ghazal State will work collaboratively to analyse the root causes of limited success to extend the tenant-based paddy production to Jonglei, Upper Nile, Lakes and Warrap States. The Scheme will also be used as a demonstration centre for various rice varieties, paddy and upland rice production systems for extension workers, trainers and rice farmers visiting from other targeted states across the country.

4.2.2 Supply and Demand of Land, Labour, Technology, and Financial Inputs

Support rice producing households, Cooperatives and rice value chain players to capture and accumulate value addition of the urban sector to increase their purchasing power

In order to promote a shift in household production technology choices, the present perceived constraining circumstances must be changed. The common and well recognised constraining factors preventing the shift towards input intensive production technology are; scarce variability of environmentally, monetary and/or physical capital necessary for the technology choice. On the other hand, the observed and reported (findings) /perceptions of scarce and costly availability of land, labour, technology, and financial inputs are the concurrent phenomena of scarce demand, resulting from household capital constraints (as the field assessment findings shows in Table. (8) in this starategy. The proposed strategy is adapted to cut the vicious cycle of the scarcities and high cost of production input burdening the rice farmer in the country. Once demand and supply of the factors increases, availability and affordability should be improved concurrently.

4.2.3 Players of Rice Inputs and Outputs Markets, and Rural Infrastructure

Since the capital accumulation of the rice market players particularly in rural areas is limited, and incentives of self-employed businesses to perform collective action is low, in close collaboration with

the state government's intensive provision, pubic services will be given priority at the initial stage of NRDS implementation. In order to encourage rice market players to improve their production and business environment through their own efforts, the government will provide regulatory services to secure conducive production and business environment.

4.2.4 Government Strategy for Development of Rice Inputs and Output Markets

Although limited, the Ministry of Agriculture and Food Security and the Ministry of Water Resources and Irrigation have the capacity to develop and implement strategies and implementation plans, in collaboration with the development partners. This capacity can be strengthened and mobilised to develop and implement relevant policies and legal frameworks for rice sector development. The major areas to be addressed by policies, as well as delivery of extension and research services intended for the promotion of the rice sector initially, are the priority states of Western Equatoria, Northern Bahr el Ghazal and other selected flood prone areas, as follows:

- **Agriculture extension services**: Agriculture extension for the rice sub-sector in South Sudan is neglected, due to limited knowledge and lack of proper annual training programs, low attention to studies regarding rice production strategy, planning, budget and implementation of the rice sub-sector activities as a key priority. Therefore, to disseminate the agricultural technologies knowledge, skills and techniques on rice production, the agriculture extension services should be prioritized to promote rice cultivation and production in the country. This can be done through trained extension teams done by both public and private sectors. The partnership between public and private sector extension services on the rice sub-sector must be considered as one of the extension approaches in the rice sub-sector. This includes Farmers Field School (FFS) approach and market driving extension systems, while considering the needs of the communities and zonal ecology. However, harmonising the country's rice extension system with CARD advanced countries should promote the production of high quality rice in the region.

- **Seed production and certification, and other regulatory systems**: There is a critical need to establish a seed production and certification system in South Sudan. Without it, rice seed producers cannot ensure a reliable supply of high-quality seeds to rice famers across the country. More importantly, rice varieties released by breeders through the South Sudan Variety Release Committee serve as the foundation for certifying improved rice varieties.

- **Inter-ministerial coordination**: In the irrigation schemes, for example, the high prevalence of waterborne diseases such as malaria and bilharzia, affect the productive ability of farmers. Additionally, inter-communal conflict has greatly affected the productive work force of the rural farming communities. There is need to provide dispute mitigation, social amenities, and improved health care services, and to improve economic and market infrastructure based on the intra-ministerial coordination for collaboration.

- **Intervention priority area sequencing:** The broad vision of MAFS envisions a sustainable transformation of the agriculture sector into a vibrant and productive economic driver that contributes to the country's GDP for economic growth, social -wellbeing, national food security, nutrition and poverty alleviation. Therefore, rice production policies, strategies and program planning, should translate the vision into reality. However, most MAFS programs fail due to misaligned planning with the country's vision and goals, which often ends up in a repetition of the same activities, loss of effort, resources and time. Therefore, there is need for rice-specific policies, for harmonization between regional and other existing agricultural thematic policies. The rice varieties in RSS are grouped based on priority, and the potential of agro-ecological zones shown in Table 10. In the table, this NRDS prioritized Western Equatoria State and Aweil Rice Irrigation Scheme (ARIS) as initial locations for intervention.

Table 10. Priority and Potentials of Agro-ecological Zones for Interventions

S/N	Agro-ecological zone	Rice varieties	States	Prioritization status
1	Greenbelt	Upland, Irrigated	Western Bahr el Ghazal Western Equatoria Central Equatoria Eastern Equatoria	Short-term priority (Western Equatoria first)
2	Hills & Mountain	Upland	Central Equatoria Eastern Equatoria Jonglei	Medium-term priority
3	Ironstone Plateau	Upland, Irrigated	Northern Bahr el Ghazal Western Bahr el Ghazal Warrap Lakes Western Equatoria Central Equatoria Eastern Equatoria	Long-term priority
4	Western flood Plaines	Upland, Irrigated, Flooding	Northern Bahr el Ghazal Lakes Warrap	Short-term priority
5	Eastern Flood Plaines	Upland, Irrigated, Flooding	Jonglei Upper Nile	Short-term priority

- **Coordination and collaboration with the regional institutions**: Given the need for collaboration with other stakeholders, international research institutions and Development Partners (DPs), South Sudan should coordinate with the region in human and institutional capacity building on rice technologies, knowledge sharing, training and expertise movement and exchange. There is a need for coordination and collaboration to avoid duplication, in order to maximize the effort and utilisation of resources. The government should mobilise international communities and regions to support its efforts towards the promotion and development of the rice sector in South Sudan.

- **Trading blocs**: As noted *supra*, South Sudan is a member of both the Eastern African Community (EAC) and COMESA regional trading blocs. It is therefore bound by the common tariffs that apply to the member states of these trading blocs. However, there is a lot of informal cross-border trade with Uganda and the Democratic Republic of Congo. There is also rice seed movement across the borders to counties such as Nzara in Western Equatoria State, which may not have undergone formal certification, and this could be detrimental to rice sub-sector development. However, the trading blocs present major opportunities for trading and sharing of germplasm. There is therefore need to speed up the ongoing harmonization process of trade tariffs and seed industry rules and regulations by the partner states.

- **Rice production inputs**: South Sudan rice producers, in both public and private sectors, have very limited access to quality seed. Only specialised rice seed growers have access to seeds from pure assorted grain products. Other farmers acquire seeds from neighbours, or their local stock which is kept assorted for the purpose of planting. To improve rice production and productivity, it is fundamental to have clear rice seed production, which can be achieved through training of rice producers on agronomic practices for rainfed or irrigated lowland and upland rice. Equally important is the promotion of a community seeds system for quality seed stocking, distribution and planting. Since the majority are small scale or subsistence farmers, they use hand tools and plant their crop without fertilisers. The only government large scale farm in ARIS uses heavy machinery farm tools, canal irrigation and introduces trail plots with fertilisers.

- **Pests and disease intervention**: Across South Sudan, farmers are faced with challenges such as dealing with pests and diseases related to rice production, e.g.: open mono- cropping farming and

lack of knowledge of agriculture best practices, limited resources and the absence of agriculture extension services. Therefore, the national rice development strategy should address pest and disease management and control, with support from regional and international bodies to mitigate and reduce their impact on the rice sub-sector.

- **Soil fertility management**: In South Sudan, soil is generally perceived as fertile and not needing extensive use of inorganic fertilisers. However, the use of inorganic fertilisers is one of the major factors that catalysed the rice green revolution in Sub-Sharan Africa and Asia. Therefore, South Sudan should learn from the CARD countries that produce rice by recognizing their challenges and how they were addressed. Additionally, the use of organic fertilisers should be aligned with recommended fertiliser application practices, with research supervision and experimental test results.

- **Water management for quality rice**: The limited rainwater poses real challenge for rice production in the country, because 80 percent of the population support themselves through farming, and the lack of sufficient water systems can result in food insecurity in the nation. However, most of the water in South Sudan comes from rainfall, along with water from the River Nile and its tributaries, which is primarily used for domestic activities and only minimally for irrigating field crops. The River Nile's water in South Sudan has the potential to support the development of the rice sector, particularly for irrigated and lowland rice varieties.

- **Mechanisation intervention**: Commercialised agriculture in South Sudan remains very limited due to lack of the required resources, knowledge, and skills to manage large-scale schemes such as ARIS in NBGS. Additionally, the high cost of acquiring inputs is a major barrier to agricultural mechanisation. Therefore, South Sudan should allocate sufficient funding to promote mechanisation by supporting progressive small-scale farmers, subsistence farmer groups, and cooperatives. This would enable them to efficiently manage production activities, including ploughing, planting, irrigation, pest control, harvesting, and marketing. Further, the mechanisation of the rice sector should be aligned with the availability of spare parts to ensure sustainable and effective maintenance and long-term use.

- **Access to credit and finance**: In South Sudan, 95% of famers in rural areas practice subsistence agriculture. Majority of them lack resources and practice traditional farming methods where most activities depend on hand tools and intensive labour, in addition to support from NGOs in accessing farming input (seeds and tools, extension messages and basics training). Farmers do not have special funds allocated by government to support their farming activities. It is also very difficult for farmers to maintain their farming groups due to displacement caused by conflicts. Additionally, rice farmers have had almost no access to agricultural financing from the government or commercial banks since South Sudan's independence. Therefore, there is a critical need to organize and strengthen rice producers' groups to enhance support, access to resources, and financial opportunities.

- **Access to market and marketing**: Most of the rice producers and processers have complaints over lack of market. This can be attributed to the fact that local rice is not competing with imported rice, due to poor processing quality, inadequate rice millers, poor transports, poor post-harvest handling and limited access to market and marketing knowledge. The rice stakeholders should consider and address all these challenges to establish a vibrant market for local rice to be able to compete with imported rice.

- **Farmer organizations**: The current extension efforts in the country have been unable to deliver substantial impact in creation of bodies such as Common Interest Groups (CIGs). Poor market organisation has allowed cartels to dominate the market and has led to the adulteration of rice, compromising quality and fair trade. In order to mitigate such unfair market conditions, farmer organisations are needed to represent the stakeholders and to entrench their bargaining power for a better deal in development along the commodity value chain. There is a need for strong farmers'

cooperative societies to complement the CIGs in accessing technology, credit, bulk purchases of farm inputs and marketing of farm produce at reasonable prices, thereby eliminating exploitative tendencies of the middlemen.

Research and Extension Services

South Sudan Agricultural Research Organization (SSARO) should be focused on rice research, while MAFS primarily engages in extension. SSARO and its partners have the capacity to conduct rice adaptability trials. The scientists based at research institutions are experienced in rice breeding, agronomy, crop protection and socioeconomics.

ARIS, Yambio Agriculture Training Centre, and Yei Agriculture Research Centre can be the centres of applied rice research and development, the University of Juba and John Gararng Memorial University could act as the centres of basic rice research and development. These institutions in addition to the regional research institutions can provide technical backstopping and training services to the extension systems of the concerned ministries of the national, state, and county governments.

Priority is given to the ARIS to mobilise and benefit from its research and training capabilities strengthened by the ongoing technical and financial support from FAO and AfDB. The scheme's functional research, training, and experiment facilities of paddy rice production are important assets to enhance promotion and extension of rice production in South Sudan. Currently, various research and experimental activities concerning the medium-size paddy rice production are ongoing. The activities include provenance tests of the introduced rice varieties, studies on fertiliser application as well as pest and disease control, and economic and financial analysis of the rice production models.

In addition to these research and experimental tasks, the development and training tasks of technologies concerning hill rice production and small-scale gravity irrigation will be given to Aweil Rice Irrigation Scheme (ARIS). The developed technologies and training capabilities will be applied in the extension activities in Western Equatoria State, selected for the prioritized intervention for the promotion of small-scale hill and paddy rice production. It is also expected that the development and introduction of flood adapted rice varieties and production systems to address food security issues of the flood affected population. Nation-wide rice products and consumer markets and value chain analyses will be carried out by the ARIS.

Since Western Equatoria State is part of the Greenbelt agro-ecological zone, the rehabilitation and enhancement of rice research, training, and extension capabilities of the Yambio Agriculture Training Centre and the Yei Agriculture Research Centre, located within the same zone, will be carried out once the functions of the ARIS are well established. The focus of research and training capability development will be the same as those of the ARIS, with additional consideration to adapt technologies to the hilly topography and high precipitation characteristics of the Greenbelt agro-ecological zone.

In correspondence to the major policy areas, the priority research areas approached by natural science and social science disciplines are selected based on the currently available research capabilities within the government and universities in South Sudan. The selected research areas are listed below based on their priority setting.

High priority areas:

- Water management for quality rice (water management study);
- Seed production and certification (quality standard establishment study);
- Pests and disease intervention (identification and chemical application analysis);
- Mechanisation intervention (agricultural machinery development study);
- Soil fertility management (soil analysis);
- Rice production and input (production management analysis);
- Agriculture extension services (organizational analysis); and
- Farmer organizations (organizational analysis).

Low priority areas:

- Access to credit and finance (economics and financial analysis);
- Intervention on priority area sequencing (economics and sociology);
- Access to market and marketing (market analysis);
- Trading blocs (economics analysis and institutional design);
- Inter-ministerial coordination (institutional design study); and
- Coordination and collaboration with region and CGIAR centers for technical matters (institutional design study).

Chapter 5: Implementation Coordination Arrangement, and Resource Requirement and Mobilization

5.1 Coordination and Implementation Arrangement

5.1.1 National Rice Task Force, the CAMP & IDMP Implementation Coordination Structure

South Sudan's vision 2040 prioritizes building a prosperous, productive and innovative nation; to be achieved through increasing agricultural productivity to enhance food and nutrition security. In response to the vision, the Government of South Sudan developed the Compact in 2023, which is an investment plan under the CAMP and IDMP Investment Plan priority framework aiming to transform agriculture and livestock into a thriving sector and a driving force for inclusive growth and economic diversification. It proposes four strategic value chains as the government high priority area: sorghum, sesame, fisheries and rice.

Following the submission of the letter of intent to become a member of Coalition for Africa Rice Development (CARD) by the Government of South Sudan in July 2023 to the Director General of the CARD, the Government established the National Rice Task Force for the development of its first National Rice Development Strategy (NRDS), and for facilitation of resource mobilization to implement NRDS. NRDS will set the strategic approaches to promote the growth and development of the rice sector, which contributes to the food security improvement, household wealth creation and national economic growth. The terms of reference of the National Rice Task Force (NRTF) are shown in Appendix 1, and its members are shown in Appendix 2.

NRTF is hosted by the Directorate of Agriculture Production and Extension Services of the Ministry of Agriculture and Food Security, and therefore NRTF is a part of CAMP and IDMP Implementation Coordination Structure which is shown in Figure . NRTF and the directorate are placed in the Implementing Directorates and Authorities indicated by the red square in the figure.

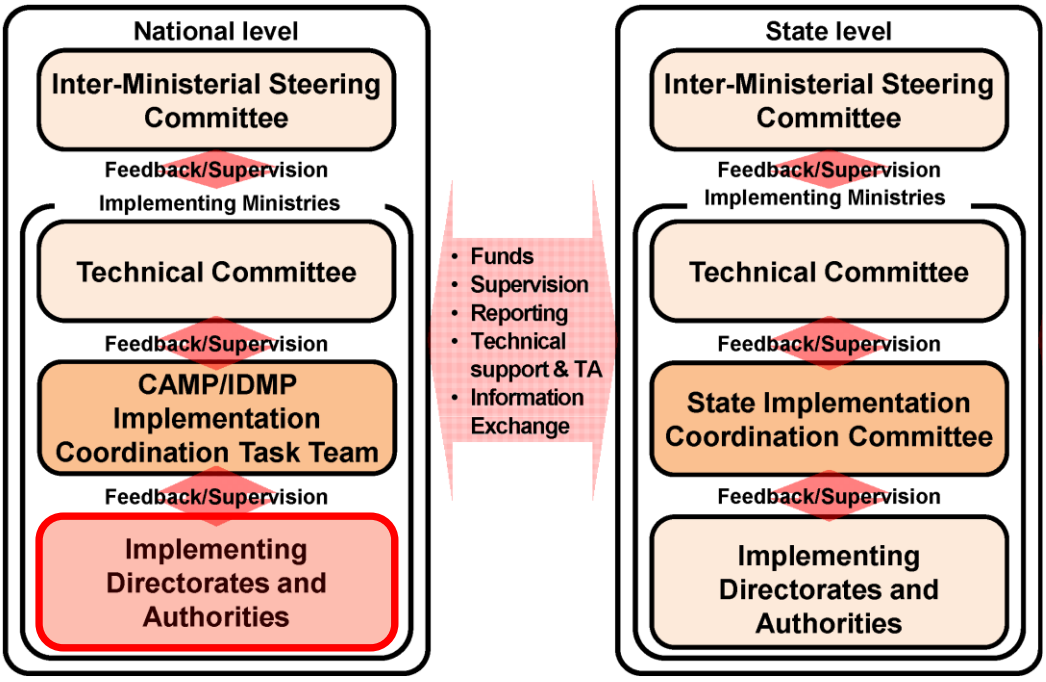


Figure 10. CAMP & IDMP Implementation Coordination Structure at National and State Levels

All processes of internal and external resource mobilization, planning, budgeting, and project implementation to achieve NRDS objectives will be conducted following the operational modalities of the Climate Adaptation and Mitigation Program (CAMP) and the Integrated Drought Management Program (IDMP) Implementation Coordination Structure (CAMP & IDMP ICS). Therefore, NRTF and the Directorate of Agriculture Production and Extension Services report to and obtain guidance from the CAMP & IDMP Implementation Task Team (CAMP & IDMP ICTT), the National Technical Committee, and the Inter-Ministerial Steering Committee. Inter-ministerial coordination, and national and state government coordination and internal resource mobilization activities for NRDS implementation will also be performed through the CAMP & IDMP ICS. Since CAMP & IDMP define that state and county governments are responsible for providing frontline public services to farmers and producers, collaboration with state governments through the CAMP & IDMP ICS is essential for the effective implementation of the NRDS.

5.1.2 External Linkages

As shown in Figure , CAMP & IDMP ICS has the external coordination mechanism of Natural Resources Sector Working Group (NRSWG), NRSWG Secretariat, and NRSWG Technical Committee comprised of the six (6) Natural Resources Sector Spending Agencies. NRSWG is a platform for policy dialogue, resource mobilization, and project information sharing participated by the spending agencies, development partners, and the civil society. All external coordination, policy dialogue, resource mobilization, joint implementation and M&E activities for the implementation with CARD will be performed through this NRSWG arrangement.

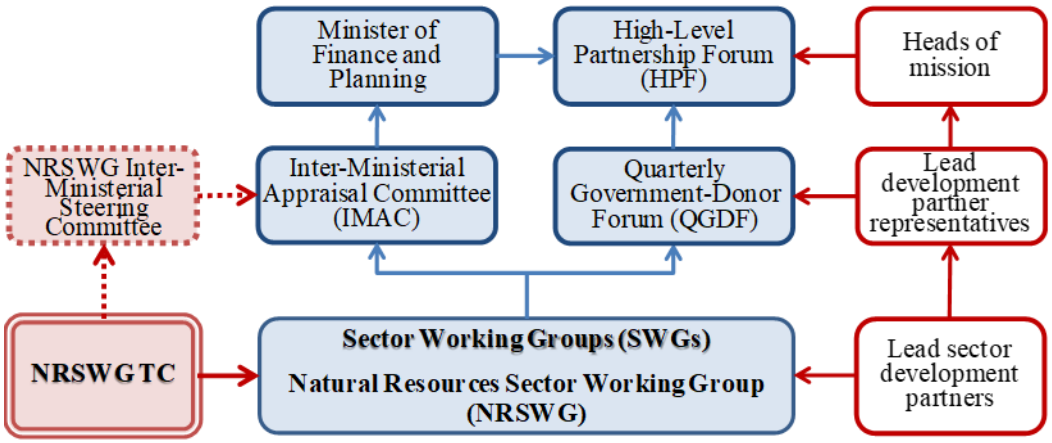


Figure 11. Natural Resources Sector Working Group and NRSWG Technical Committee

5.2 Resource Mobilization Strategy

Resource mobilization efforts for NRDS implementation will be performed through CAMP & IDMP ICS and NRSWG arrangement described in the section 5.1. Coordination, resource mobilization, and technical support functions of CARD will also be utilized to achieve targeted project marketing and resource mobilization.

5.3 Monitoring and Evaluation

M&E of NRDS implementation will be performed based on the M&E modality of CAMP & IDMP ICS. It monitors the progress of project implementation each month, quarter and year to determine whether targets have been achieved, identify bottlenecks and other implementation issues etc., so that corrective measures can be taken.

NRTF and the Directorate of Agriculture Production and Extension Services are responsible for implementing the planned activities and monitoring their implementation on a monthly and quarterly basis. The identified M&E coordinators at national and state levels provide technical assistance to the project teams on the conduct of M&E activities, including periodical assessment intervention impacts, dynamics of production areas, output quantities, and market prices. The M&E units at the various concerned ministries or directorates assist in monitoring the implementation of NRDS, especially in the analysis of the collected data. Regular monitoring at national, state and county levels is monthly, quarterly, and cumulative. However, in the last quarter, an annual review replaces quarterly monitoring. The annual review assesses the whole year to determine the cumulative achievement of planned outputs and outcomes.

Tool of the CARD M&E Framework

The tool of the CARD M&E framework will be used for the monitoring, which provides the standard set of 13 indicators as shown in Table 11. The set of 13 indicators consists of 4 overall indicators to monitor the production-related outputs, 8 indicators based on the RICE approach and 1 price indicator to monitor the process of rice sector development. NRTF will determine the indicators according to the country's situation and available information, and set up the baseline and target figures for the selected indicators, then conduct a survey to collect the primary data.

Table 11. Standard Set of 13 Indicators Under the CARD M&E Framework

S/N	Category	Code	Indicator
1	Overall (O)	O1	Quantity of paddy produced
2		O2	Harvested area
3		O3	Yield per hectare of land
4		O4	Self-sufficient ratio
5	Resilience (R)	R1	Area under irrigation (Ha)
6		R2	Quantity of certified stress resilient variety seeds (MT)
7	Industrialization (I)	I1	Level of Industrial Milling Capacity (%)
8		I2	Level of mechanization in production (unit)
9	Competitiveness (C)	C1	Share of local rice in the market (%)
10		C2	Quantity of high-yielding variety seeds (MT)
11	Empowerment (E)	E1	Smallholder farmers' accessibility to financial services (%)
12		E2	Smallholder farmers accessibility to technical training and services (%)
13	Price	-	Retail price of locally produced and imported rice

As a CARD member, NRTF will conduct the Annual Rice Sector Review Meeting (ARSRM): (i) preparation of basic documents including Annual Summary Report, updated M&E indicators, updated Subsector/Intervention Elements Matrices (SIEM)[15], and updated Concept Notes, (ii) convening ARSRM, and (iii) resource mobilisation.

[15] Subsector/Intervention Elements Matrices (SIEM) is another tool recommended by CARD for Concept Notes formulation and M&E of NRDS implementation. SIEM consists of 9 sub-sectors and 5 interventions.

Appendix 1: Terms of Reference of National Rice Task Force, Republic of South Sudan

1. Background

South Sudan's Vision 2040 prioritises building a prosperous, productive and innovative nation; to be achieved through increasing agricultural productivity to enhance food and nutrition security. In response to the vision, the Government of South Sudan developed the Food and Agriculture Delivery Compact (Compact) in 2023, which is an investment plan under the *CAMP and IDMP Investment Plan priority framework* aiming to transform agriculture and livestock into a thriving sector and a driving force for inclusive growth and economic diversification. It proposes four strategic value chains as the government high priority area: sorghum, sesame, fisheries and rice.

Following the submission of the letter of intent to become a CARD member by the Government of South Sudan in July 2023 to the General Coordinator of the Coalition for Africa Rice Development (CARD), the Government established the National Rice Task Force for the development of its first National Rice Development Strategy (NRDS), and facilitation of resource mobilization to implement NRDS. NRDS will set the strategic approaches to promote the growth and development of the rice sector, which contributes to food security, household wealth creation and national economic growth.

2. Terms of Reference of the National Rice Task Force

Overall Goal

The overall goal of the National Rice Task Force is to strengthen coordinated, efficient, and effective government led NRDS formulation, and facilitation of resource mobilization for the implementation of NRDS.

Key Activities

(1) To facilitate identification of issues related to input supply, production, post-harvest management, processing, trading, marketing, and consumption of rice through stakeholder consultations;
(2) To establish close communication with the CARD Secretariat to access information on rice development experiences in other countries, and to obtain guidance to facilitate development and implementation of NRDS;
(3) To draft NRDS and finalise NRDS though stakeholder consultations for approval of the relevant authorities of the Government of South Sudan; and
(4) To facilitate implementation of NRDS through development of project concept notes and facilitation of resource mobilization.

Membership

The National Rice Task Force comprised of the following membership arrangement:

(1) Core Members

If Core Members are government officials they are appointed by the Government, and if Core Members are not government officials they are appointed by their organizations and adopted by the Government.

(2) Chair, Deputy Chair, Secretary, and Deputy Secretary

1) One person of Core Members is appointed as the Chair by the Government
2) One person of Core Members is appointed as Deputy Chair by the Chair

3) One person of Core Members is appointed as Secretary by the Chair
4) One person of Core Members is appointed as Deputy Secretary by the Chair

(3) Supporting Members

Supporting Members are nominated by the Chair and appointed by the relevant authorities where Supporting Members belong.

Functions of Core and Supporting Members

The function of the Core Members is to lead the coordination and facilitation activities necessary to draft and finalise NRDS and project concept notes, and to mobilise resources for their implementation.

The functions of the Supporting Members are to provide comments, suggestions, and guidance for the development and implementation of NRDS, and project concept notes.

Supervision

Activities of the National Rice Task Force are supervised by the CAMP and IDMP Implementing Ministries comprised of the following:

(1) Ministry of Agriculture and Food Security
(2) Ministry of Livestock and Fisheries Industry
(3) Ministry of Water Resources and Irrigation
(4) Ministry of Environment and Forestry

Meeting Calendar, Agenda Setting and Announcement

The Chair organises bi-weekly meetings (i.e. organises the meeting twice a month) attended by the Core Members of the National Rice Task Force. Prior to each meeting, the Chair sets agendas and circulates them widely not only to the Core and Supporting Members of the Taskforce, but also to identified stakeholders.

The Chair also invites Supporting Members of the National Rice Task Force to attend the meetings when their inputs are considered crucial for NRDS development and implementation.

Reporting

The National Rice Task Force reports to the CAMP and IDMP Technical Committee, the Natural Resources Sector Spending Agencies, and Natural Resources Sector Working Group.

Amendment of the Terms of Reference or Termination of the National Rice Task Force

Whenever required, the Government and/or the National Rice Task Force will propose the amendment of the Terms of Reference or termination of the National Rice Task Force for approval by the Government.

Appendix 2: List of Members of the National Rice Task Force, Republic of South Sudan

S/N	Name	Membership and designation	Organization	E-mail	Tel
Core Members					
1	Alfred Wani	Core Member (Chair)	Director of Agriculture Field Crops Production/ MAF	wanialfred1@gmail.com	+211 928763280
2	Dr. Tony Ngalamu	Core Member (Deputy Chair)	Professor, University of Juba	lingaringwa@yahoo.co.uk	+211 926626675
3	Mr. Angelo Lemor Joseph	Core Member (Secretary)	CAMP/IDMP-DP Desk & Directorate of Planning & Programming/ MAFS	angelolemor@gmail.com	+211 928528463
4	Dr. Maurice Mogga	Core Member (Deputy Secretary)	South Sudan Country Office/ FAO	Mauricemogga1@gmail.com	+211 924547171
5	Rev. Jimmy Kato Towe	Core Member	South Sudan Agricultural Producers' Union	Jimmyaturu@gmail.com	+211 924349820
6	Mr. Christopher Ismail	Core Member	Eden Multipurpose Cooperative Society – Yambio	Chris.ismail@gmail.com	+211 921611601
7	Innocent Kitara	Core Member	CAMP&IDMP ICTT, Directorate of Research/ MAFS	Ilitara72@gmail.com	+211 928811302
8	Obaj Mayik *(Participant in Rice training in Uganda)*	Core Member	Senior Inspector, Department of Extension/ MAFS	Obajmayik19@gmail.com	+211 925561819
9	Esther Yeno David *(Participant in Rice training in Egypt)*	Core Member	CAMP & IDMP ICTT, NRSWG Secretariat, Inspector for irrigation/ MIWRI	estheryeno@gmail.com	+211 925941452
Supporting Members					
10	Vincent Kiwanuka	Supporting Member	Head of smallholder agriculture market support / WFP	Vincent.kiwanuka@wfp.org	+211922948636
11	Miyuki Yamashita	Supporting member	Head of Food System and resilience unit / WFP	Miyuki.yamashita@wfp.org	+211922470395
12	Coroline Mwongera	Supporting Member	Country Director, East and Southern Africa Division / IFAD	c.mwongera@ifad.org	++25193021812
13	Esther Kenyi	Supporting member	Program officer, South Sudan office / IFAD	e.kenyi@ifad.org	+211925240509
14	Peter Lomude Lo-Severio	Supporting Member	GIZ Coordinator, South Sudan office / Juba	peter.lo-severio@giz.de lomudepeter@gmail.com	+211925731055
15	Toshifumi Serizawa	Supporting Member	Leader, JICA Advisor Team	serizawa.toshifumi@jincorp.jp	+211923609742

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