Resilience for Social System Assessment (R4S): NTFPs in South Sudan

Final report

Agora Global

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EXECUTIVE SUMMARY

This assessment explores two key market systems—**gum arabic** and **fruits and horticulture**—in the Greater Upper Nile (GUN) region of South Sudan. Initially with a broader scope on different non-timber forest products (NTFPs), the analysis focus on these two market systems as the ones with largest potential for market-based interventions. The Resilience for Social Systems (R4S) analysis examined how these market systems can support vulnerable communities amid significant social, economic, and environmental stressors, and identified interventions to strengthen resilience and reduce household vulnerability. The GUN has been severely disrupted by the ongoing conflict. The situation has led to massive displacement, breakdown of trade networks, limited government services, and environmental shocks like recurrent flooding. These intersecting crises have weakened already fragile market systems and exacerbated food insecurity and poverty.

Gum arabic is the dominant NTFP in the Great Upper Nile, and in particular in the Renk county, involving a significant portion of the population in collection and trade. However, the value chain remains largely informal and underdeveloped. Processing infrastructure is absent, certification and quality control mechanisms are non-existent, and the region's heavy dependence on Sudan for exports creates vulnerability to external shocks. Furthermore, there are very few companies active in the sector and limited professional engagement across the chain. To address these challenges, the assessment proposes interventions aimed at professionalising and strengthening the gum arabic value chain. These include:

- Cost-sharing mechanisms for establishing basic cleaning and storage facilities
- Implementing a lead-agent extension model to ensure product grading and quality checks
- Developing a traceable supply chain in partnership with international buyers
- Diversifying trade routes
- Promoting structured agreements among market actors
- Introducing tree planting practices to enhance long-term supply and ecological resilience

With respect to the **fruits and horticulture** market system, production of vegetables used to be present at commercial scale in Renk including as an intercrop with sorghum. However, based on data from the Agriculture Director of Renk the ongoing conflict has severely reduced productivity to about 15% of pre-conflict levels. Demand now far outpaces supply, yet farmers lack access to essential inputs, irrigation, and support services to meet market needs. The absence of a local processing industry further limits value addition and income diversification opportunities. Key interventions proposed for this market system include:

- Developing a small-scale leasing model for solar-powered water pumps
- Supporting input distribution networks, including partnerships with sorghum input suppliers
- Establishing digital extension services to close information gaps and build adaptive capacity

By identifying targeted, market-based interventions, this assessment highlights how strategic investment in gum arabic and fruit and vegetable value chains can reduce vulnerability and create more resilient livelihoods.

1 INTRODUCTION

1.1 Objective of the consultancy

The purpose of the consultancy is to undertake a Resilience for Social Systems (R4S) assessment of the non-timber forestry product market in selected areas of the GUN region in South Sudan. GOAL South Sudan is currently moving towards the implementation phase of THRIVE and findings from this R4S assessment should guide the intervention design and related strategic decisions.

Based on the ToR and discussions with GOAL, the assessment is focused on understanding the social, economic, and environmental vulnerabilities in these areas and developing market-based and sustainable interventions that lead to improved livelihood and environmental outcomes.

1.2 Methodology

The assessment adopted a mixed methods approach combining desk review, secondary data collection, and in-country primary data collection. The Market System Development approach and the R4S approach have guided this research.

In the first phase, secondary data was collected on South Sudan's context and general social, economic and environmental risks vulnerabilities. To the extent possible, a first mapping of NTFPs throughout the country was performed based on information available online and the recently published Market System Analysis.

In the subsequent phase, primary data was collected in three different counties, Fashoda and Rubkona, and then Renk. Ulang and Akobo were excluded due to security concerns. Data collection at county level was complemented with interviews with key private sector market actors and government representatives in Juba. Some challenges were encountered in this process, mostly due to the absence of large scale commercial activities in the Great Upper Nile in the NTFPs value chains analysed, with few exceptions. These challenges are further dicussed in Section 2.4.

The activities performed included:

- Field data collection in Fashoda
- Field data collection in Rubkona
- Field data collection in Renk
- Interviews with market actors located in Juba
- Interviews with government representatives

2 BACKGROUND ABOUT THE PROGRAMME

2.1 Context of the programme

THRIVE stands for Transforming Household Resilience through inclusiVe Economic Development and aims to bolster resilience in conflict and climate affected communities in GUN. Combining market systems development with locally led participatory approaches and gender equality and social inclusion approaches, THRIVE aims to address root causes of systemic challenges within target pastoral and agro-pastoral value chains. More specifically, the value chains addressed by THRIVE include fisheries, livestock and sustainable non-timber/agro-forestry. This assignment focusses on this latter.

2.2 Objectives of the programme

Key outcomes envisioned as a result of THRIVE include

- Increased incomes among individuals and micro/small-scale businesses engaged in the fishing, livestock and agro/non-timber forestry sectors.
- Improved food security among households targeted with livelihoods and women/youth empowerment activities.
- Strengthened disaster preparedness & coping capacities to climate and conflict shocks and stresses.
- Improved social cohesion and conflict resolution capacities among target communities.
- Women and youth economic empowerment, including financial inclusion and improved gender equality.

2.3 Implementation arrangements

THRIVE is implemented by a consortium of partners including GOAL South Sudan (lead partner), Mercy Corps, Veteriniaire Sans Frontieres Suisse (VSF), The Catholic Agency For Overseas Development (CAFOD). Each partner is responsible for implementation in different geographies: GOAL oversees implementation in Ulang and Renk, Akobo and Nasir are covered by VSF Suisse, Fashoda and Panyikang by CAFOD, and Rubkona and Panyijar by Mercy Corps.

Beyond the geographical structure, each partner provides technical leadership in their thematic areas of expertise.

GOAL will provide technical leadership on resilience tools, SBCC, and women's empowerment (Output 4). Mercy Corps will lead on MSD (Output 1), CAFOD on social cohesion/climate/DRR (Output 2 & Output 3); and VSF Suisse will provide expertise on livestock/animal value chains.

2.4 Challenges with programme design and with the R4S

The GrUN region includes three states (Upper Nile, Unity, Jonglei), further divided in 29 counties. **THRIVE targets 120,000 beneficiaries** in pastoral and agro-pastoral value chains, **in eight priority counties in the Greater Upper Nile: Ulang, Renk, Akobo, Nasir, Fashoda, Panyikang, Rubkona and Panyijar.**

The objective of this R4S study was primarily to scope out potential interventions that THRIVE can implement adopting an MSD approach around Non-Timber Forestry Products in specific counties in the Great Upper Nile region. **More specifically, THRIVE aims to implement MSD approaches to develop gum arabic, Bamboo, Honey, Shea, Fruit/Vegetables value chains in any of the following counties in the GUN region: Rubkona, Fashoda, Renk, Ulang, Akobo, Nasir, Panyikang and Panyijiar.**

MSD is characterised by identifying opportunities for interventions which achieve:

- Sustainability: Temporary programme support is used to foster innovation which is aligned with the incentives of market actors to continue to deliver the benefits after the support has ended.
- Scale: Interventions have to benefit a significantly large number of people that they could not better be served with direct interventions.
- Impact: interventions must align with a defined impact for a defined group of people, usually associated with resilience and poverty reduction.

This study has shown that is it challenging to align the three core pillars of intervention design i) and MSD approach ii) NTFPs iii) and the Greater Upper Nile region;

- MSD – these counties are remote, inaccessible, poor, and sparely populated. As such, they are unattractive as a supplier base or a source of demand for other actors in the value chains. The economies are underdeveloped with very few SMEs present in the market. From an impact perspective, there are obviously needs in this very poor region. But the degree to which these needs can be met sustainably is limited in the short-to-medium term by the size and potential of the market and major insurmountable infrastructural barriers in most cases.
- NTFPs – by and large, these regions are not major producers of the stated NTFPs. The products have viability elsewhere in South Sudan but due to immovable obstacles such as infrastructure and logistics and growing conditions, these regions are not competitively connected to trade routes. Within each county, where logistical constraints are less of an issue, markets are very small and so supply side interventions would only lead to a price crash.
- Greater Upper Nile Region – the region is, and these counties are, poor and disconnected. Other regions of South Sudan present viable market opportunities in NTFPs using an MSD approach where the access frontier could be expanded towards GUN but, for now, this aspect of the intersection is challenging.

In most cases, and with adapted timelines, it is possible to achieve at least two (and in some cases all three) of these pillars. As such, THRIVE must align expectations for this programme. Targets are high – **the highest of any MSD**

programme we have seen. The programme intends to benefit 15% of the total population of very hard to reach counties. In NTFPs, the proportion of the population involved in these industries (individually or combined) is a fraction of the population, the highest being subsistence fruits and vegetables but not on any commercial scale. And viability is low given the nature of the private sector.

3 CONTEXT ANALYSIS

3.1 Country context

Agro-ecological characterstics

South Sudan's territory is characterised by six agro-ecological zones and a hot semi-arid and tropical savannah climate.[1] The entire central and northern part of the country, are flood plains that extend around the White Nile river, the Sobat river and their tributaries. Beyond the large flood plains, South Sudan's territory includes an extensive plateau in the south-west ('*the Ironstone plateau*'), a Greenbelt in the southern border with Uganda, a mountainy area around the capital city Juba and an arid zone in the south-east of the country. Despite a very fertile soil highly suitable for agriculture - land that is currently under crop cultivation accounts for less than 4 % of total land. Conversely, the largest part of the country is under trees and shrubs (62.6 %).[2] According to South Sudan's ministry of agriculture, the six agro-ecological zones are suitable for the following cultivations.

- Greenbelt, suitable for oil palm, tea & coffee, fruits, irish potatoes, maize, vegetables, and tropical forestry
- Ironstone Plateau, suitable for sorghum, groundnuts sesame sunflower and livestock
- Nile and Sobat River alluvial soils, suitable conditions for sugar cane, rice and sorghum
- Flood plains, suitable for sorghum, rice sugar cane, sesame and groundnuts
- Hills and Mountains, suitable for tea, coffee, temperate fruits, (apples, grapes), forest plantations and wheat
- Arid zone, suitable for gum acacia

South Sudan has a tropical climate characterized by a distinct wet and dry season. The wet season runs from May to October bringing heavy rainfall, particularly in the southern and central regions. Conversely, the dry season, spanning November to April, sees significantly reduced precipitation and high temperatures.

Social context about South Sudan

The history of conflict of South Sudan dates back to 1956, as the Republic of Sudan became independent from the British-Egyptian control. The internal divisions between a wealthier north and a less-developed south, compounded by ethnic and religious tensions led to decades of violent conflict with two lengthy civil wars (1955–72), and (1983–2005). In 2005, a Comprehensive Peace Agreement was signed and six years later, in 2011, South Sudan officially

[1] https://climateknowledgeportal.worldbank.org/country/south-sudan

[2] Xinshen Diao, Liangzhi You, Vida Alpuerto and Renato Folledo, 2012, Assessing Agricultural Potential in South Sudan – A Spatial Analysis Method DOI: 10.5772/47938

gained independence, becoming the world's youngest nation. However, the optimism for post-independence development gains never materialised, due to the outbreaks of a civil war between President Salva Kiir and Vice President Riek Machar in 2013. The civil war, involved soldiers from two major ethnic groups (the Dinka and the Nuer), fueling violence throughout the country. Despite a "Revitalised Agreement on the Resolution of the Conflict in South Sudan" (R-ARCSS) drawn in 2018, violence persists still today. In 2020 a Transitional Government of National Unity was established, which still stands today. As the fighting erupted in neighboring Sudan in 2023, refugees started fleeing to South Sudan. The humanitarian crisis has been further worsened by heavy rains and extreme flooding in May 2024.[3]

Economic context about South Sudan

South Sudan is among the world's least developed countries, with a GDP per capita of 334 US$ at current prices.[4] The evolution over time shows a significant drop in GDP per capita during the civil war in 2013, which has since then remained stagnant, oscillating between 200 and 600 US$ since then. The sequence of the COVID-19 pandemic, historic floods, the conflict in Sudan, and challenges in public financial management has made it impossible for the South Sudanese economy to stabilise and grow.

Oil extraction is South Sudan's most important economic activity, as it contributes more than 80% of the country's GDP, about 90% of the country's export trade value and most of the country's foreign exchange. The oil fields are located in the north of the country, on the border with Sudan. Despite its large oil reserves, there are no working refineries in the country, nor port infrastructure for trade. The oil pumped from South Sudan must be refined in Sudan, after which it is exported internationally to China, Japan, Singapore, and Italy.[5]

For most of the population, agriculture remains the only economic activity. The very fertile territory located in the White Nile valley has high potential for a more prosperous agriculture development - but insecurity and limited access to seeds, mechanization and markets hinder productivity. Food crops include cereals like sorghum and maize, cassava and to a smaller extent millet and rice. Groundnuts and sesame are important cash crops. While the country has large potential for agriculture, only about 15% of the produce sold on the main market in Juba is domestic –largely produced in the states nearby such as Eastern, Central and Western Equatoria.[6]

The manufacturing sector is limited. South Sudan produces beer (e.g. Southern Sudan Beverages Limited), soft drinks, sugar, and other food products. **In terms of trade, South Sudan's chief export is crude petroleum, accounting for about 90% of the total trade value.** Other exports include gum arabic. Because of food insecurity and the limited manufacturing sector, the country must import most items, including many food, motor vehicles and machinery, and manufactured goods.

[3] Center for Preventive Action (2025), Instability in South Sudan. (https://www.cfr.org/global-conflict-tracker/conflict/civil-war-south-sudan)

[4] https://www.imf.org/external/datamapper/

[5] https://oec.world/en/profile/country/ssd

[6] UNDP report on agri value chains 2022 (https://www.undp.org/sites/g/files/zskgke326/files/2022-12/South%20Sudan%20Agriculture%20Value%20Chain%20Study_UNDP_Print.pdf)

In the specific case of the Great Upper nile region, two out of the seven major oil reserves of South Sudan are in the Upper Nile state, namely the Adar oilfield, located in the Melut Basin and the Paloch Oilfield, situated in the northeastern part of Upper Nile State. These are operated largely by the Dar Petroleum Operating Company (DPOC), whose main shareholders are the China National Petroleum Corporation (CNPC), Petronas (Malaysia) and the Nile Petroleum Corporation (Nilepet) – South Sudan's national oil company. While these provide revenues at the national level, they are a significant source of environmental degradation affecting soil, water sources and biodiversity.[7]

Beyond the crude oil extraction, a relevant economic activity in the Upper Nile state used to be cultivation of sorghum. In fact, Renk - the only large-scale mechanised farm in South Sudan used to be the main domestic source of sorghum. After 2011 the production decreased because of the departure of the Sudanese who made up three quarters of the workforce. [8]

3.2 Counties context

Renk

Renk County, located in the northernmost part of Upper Nile State, South Sudan, encompasses an area of approximately 32,000 km² divided in five administrative payams. The county comprises several payams, including Renk, Gieger, Shemedi and Wantow . As of 2025, the estimated population is estimated at over 300,000, a significant increase from the 2008 census figure of 137,751.[9] This growth is attributed to a high birth rate and a substantial influx of internally displaced persons (IDPs) and returnees, particularly from Sudan. The population density varies across the county, with urban areas like Renk town being more densely populated compared to the rural payams.

Geographically, Renk County is characterized by flat terrain with elevations around 380 meters above sea level. The area experiences a bimodal climate, with a rainy season from June to October and a dry season from November to May. Increasingly erratic rainfall has led to challenges in agriculture and water resource management. Flooding is a recurrent issue, exacerbated by heavy rains and the seasonal overflow of the White Nile.

Infrastructure in Renk County remains underdeveloped. The road network is limited, with poor connectivity between towns and to other parts of South Sudan. This isolation hampers trade, access to services, and emergency response efforts. Renk town has an airport, but transportation options are scarce, and flights are infrequent . Basic services such as healthcare, education, and sanitation are inadequate, particularly in rural areas.

Economically, Renk County is primarily agrarian. **Renk County stands out from other counties in the Greater Upper Nile region primarily due to its more developed large-scale agricultural activities.** Unlike many

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[7] https://lakeregionbulletin.co.ke/2024/10/18/south-sudan-oil-an-environmental-curse-to-upper-nile-region/

[8] https://land.igad.int/index.php/documents-1/countries/south-sudan/investment-5/1010-markets-in-crises-south-sudan-case-study/file

[9] SaveTheChildren; ReliefWeb: https://reliefweb.int/report/sudan/sudan-emergency-regional-refugee-response-plan-january-december-2025

neighboring counties where subsistence farming dominates, Renk benefits from extensive mechanised farming operations that cultivate significant quantities of crops such as sorghum, sesame, and, to a smaller extent vegetables. This agricultural scale is supported by the county's flat terrain, fertile soils, and access to the White Nile, which provides irrigation potential that is less available in other areas. Additionally, **Renk's proximity to the Sudanese border historically facilitated access to markets and agricultural inputs, further encouraging commercial farming ventures.** While other counties in the region largely rely on rain-fed smallholder farming and pastoralism, Renk's comparatively advanced mechanized agriculture makes it a critical breadbasket within Upper Nile State, contributing substantially to both local livelihoods and regional food supply. However, recent conflicts have disrupted cross-border commerce, leading to a shift towards markets within South Sudan, though challenges like insecurity and inflation have impacted productivity and access to markets.

Rubkona

Rubkona County, situated in Unity State within the Greater Upper Nile region of South Sudan, spans approximately **3,569 km²** and supports a rapidly expanding population estimated between **309,000 and 342,000** (2021–2022).[10] The county comprises **11 payams—***Bentiu Town, Rubkona, Budaang, Dhorbor, Kaljak, Ngop, Nhialdiu, Panhiany, Wathjaak, Norlam-wuel and Roria*—with its administrative seat in Rubkona and the major urban center being Bentiu, the state capital. Rubkona is home to one of **South Sudan's largest concentrations of IDPs**, particularly within the Bentiu IDP Camp which hosts over 100,000 people.

The terrain alternates between **flood-prone wetlands** and drier **savannah woodlands**, resulting in a **uneven population density**: high concentrations around Bentiu and the adjacent Protection of Civilians (PoC) site, and far more dispersed settlements across seasonal floodplains and remote rural zones. This spatial pattern, along with the environmental and infrastructural challenges it presents, plays a critical role in shaping the county's development dynamics and humanitarian priorities. Flooding in **Rubkona County**, has had **devastating and recurrent impacts** on nearly every aspect of life, especially since the intensified flood events of **2019 to 2023**. The county's **flat topography**, **seasonal wetlands**, and proximity to the **White Nile and Bahr el Ghazal river systems** make it one of the most flood-prone regions in South Sudan. Since the flood of 2021, Rubkona is surrounded by the river Nile over a radius of 50 km.

Rubkona County's **infrastructure**—particularly in **transport, health, water, electricity and communications—**is severely limited, largely due to decades of conflict, chronic underinvestment, and recurring **flooding**. What infrastructure exists is mostly concentrated around **Bentiu town** and the **IDP camp**, with rural areas receiving minimal coverage.

Economic activities in **Rubkona County** are largely **subsistence-based**, shaped by a combination of environmental constraints and protracted displacement. The local economy is driven by **small-scale trade**, **livestock herding**, **fishing**, and **limited vegetable cultivation**, primarily concentrated around accessible areas such as **Bentiu town**, the **IDP camp**, and surrounding payams. Households engage in seasonal production of **okra (often processed into**

[10] Csrf-Southsudan.org, Save the Children's Resource Centre

powder), **tomatoes**, **kudra (local greens)**, **sorghum**, **beans**, **onions**, **maize**, and **groundnuts**, though yields are generally low due to **poor soil conditions**, **flooding**, and **lack of farming inputs**.

Despite these activities, Rubkona remains a **net food importer**, heavily reliant on **external markets** to meet local demand. This dependence is particularly evident during the rainy season, when **floods disrupt local food production and transport networks**. Staple food items—including **onions, maize, groundnuts, and okra powder—**are frequently imported not only from other counties within Unity State and beyond, but also **cross-border from Sudan**, especially from agricultural hubs like **El-Gedarif**. Suppliers from East Sudan, takes about 10-20 days to reach Rubkona. These imports play a critical role in stabilizing food availability in urban centers like **Bentiu**, although prices fluctuate significantly due to logistical challenges and border dynamics. Traders moving goods between **Sudan and Rubkona** face significant challenges, including the demand for **illegal bribes** at checkpoints along the route and frequent **delays** that result in the **spoilage of perishable commodities** during transit. These obstacles not only increase transport costs but also reduce the availability and affordability of goods in local markets.

Livestock trading—mainly involving cattle, goats, and sheep—remains a key livelihood for many rural households, though it is increasingly vulnerable to disease outbreaks, insecurity, and environmental stress. **Fishing** in flooded areas and rivers offers a supplemental source of food and income, particularly during the wet season. However, the overall economic landscape remains **fragile and aid-dependent**, with limited access to formal markets, financial services, and infrastructure to support sustainable growth.

In terms of **non-timber forest products (NTFPs)**, **gum arabic** is found on the local market for **household use as incense**. However, it is **not produced within Rubkona County**; instead, it is **transported by truck from other regions**, such as **Renk**, to meet local demand. Additionally, **small quantities of honey** are sold in the local markets. In past years, some **development projects** have attempted to promote **honey production as a livelihood activity** through the introduction of **top-bar hives**. For example, **Welthungerhilfe (WHH)** provided training and tools to approximately **150 beekeepers in Roria Payam**. However, there is **limited evidence of sustained impact**, as adoption and continuity of these practices remain low at the community level.

Other NGO activities in Rubkona seem to be limited to food and seed distribution; for instance WFP currently distributes sorghum cooking oil.

Fashoda

The Fashoda county is located in the Upper Nile state, along the White Nile. Three payams of the Fashoda county were visited during the field work: Kodok, Dethwok and Lulu, hosting overall about 95,000 people (Kodok 30,670 people, Dethwok 40,350, Lulu 24,360 people[11]). The county hosts the local Shilluk community, as well as returnees, and Sudanese displaced by ongoing war in Sudan.

[11] IRNA Report: Kodok, Lul, Dethwok Fashoda County Flood assessment, Upper Nile State (28 September 2022) - South Sudan | ReliefWeb

The Fashoda county is reached through boat transfer from Malakal, or from Juba. However, recent fighting between the SPLM and SPLM-io in Juba has severely affected delivery of critical supplies to Kodok from Juba by boats. Boats from Juba are no longer coming due to insecurity along the waterways.

Within the county, the different payams are reached through canoes, meaning that movement of people and goods between locations is challenging and unreliable. River logistics is further impeded by the presence of water hyacinth along the river course. The commercial boats from Malakal to Kodok only travel when the boats are full, which takes 5 hours and can be as rarely as once a week. Commodities carried by the boats are taxed (both legal and illegal taxes) by government officials along the water ways.

Flooding is a major problem during the rainy season (July – September/October); with water overflowing of river Nile bank, and further complicating logistics. Mobile telephone network is also scarce, with only two operators (MTN and Zain) providing intermittent internet connection. In terms of social infrastructure, hospitals are not present in the Fashoda county, with the exception of sparse small health facility.

Water is readily and constantly available for agriculture. The main economic activities are fishing, sorghum, groundnuts production, vegetable crop production (onion, okra, tomato). The market context in Fashoda is basic; the central market in Kodok lacks basic infrastructure such as water supply and waste disposal system). The market is largely open air, with stalls made of local available materials, some bamboo poles, and in some cases covered with grass-thatched roofs. Traders in the market pay market tax of SSP 75,000/annum.

In terms of NTFPs, none of the NTFPs (bamboo, shea, gum arabic, honey) are found on the local market, with a small exception for small scale honey production.

Only small scale and informal private sector actors are present in Fashoda, with NGOs such as Caritas, World Vision, Cordaid, Redcross distributing food and seeds to support the local population. To date NGOs' interventions in Fashoda have been largely focused on crop production and distribution of (non-food) items, with few exceptions, such as a training by Cordaid that targeted honey traders.

4 VULNERABILITIES AND RISKS

This section presents the vulnerabilities and risks characterising South Sudan, and the Great Upper Nile region in particular. In terms of resilience, environmental, social, political and economic vulnerabilities in South Sudan are strongly interlinked. **This interconnection means that environmental challenges—such as floods, droughts, extreme heat, and land degradation—exacerbate social fragility, while social issues such as poverty, displacement, and weak governance limit the country's ability to adapt to environmental stressors.** The cyclical nature of these vulnerabilities creates a feedback loop where each crisis deepens the impact of the next.

In fact, key shocks affecting the country are conflict, floods and droughts. Conflict, which has plagued South Sudan since its independence, displaces communities, destroys infrastructure, and hampers access to essential services such as healthcare, education, and markets. At the same time, flooding—now intensified by climate change—regularly damages crops, and in some cases forces people from their homes. These types of shocks often overlap geographically and temporally, compounding humanitarian crises. For example, areas already suffering from ethnic tensions and insecurity may simultaneously face catastrophic floods, leading to further displacement, resource competition, and instability.

Table 1 Overview of shocks and stresses relevant to the GUN region South Sudan

Key Shocks		Brief description
Natural		
Flood	High	Flooding in the Great Upper Nile typically **occurs annually** during the rainy season, with impacts varying in scale but often including widespread disruption to agriculture, transport, and local livelihoods
Drought	Medium	Drought in the Greater Upper Nile occurs roughly every 5 to 10 years—about a **10–20% chance** of a severe episode in any given year—leading to noticeable declines in crop yields and consequent impact on food insecurity
Political		
Conflict/violence outbreak	High	The Greater Upper Nile region has experienced, and still experiences, repeated outbreaks of conflict and violence, particularly **since 2013**, driven by political power struggles, ethnic divisions, and competition over land and resources.
Key Stresses		
Environmental or biological		
Negative effects of climate change	High	Climate change has increasingly severe impacts in South Sudan, particularly in the Greater Upper Nile region, where rising temperatures and erratic rainfall patterns have intensified floods, droughts, and resource-related tensions.
Public health concerns	High	Public health concerns range from malaria (endemic and worsened by stagnant floodwaters) and waterborne disease due to limited access to clean water and sanitation. Malnutrition, respiratory infections and maternal and child health issues are also common, associated with food insecurity, overcrowded living conditions, especially in displacement camps, limited access to skilled birth attendants.
Social		
Food insecurity	High	Reliance of rain-fed agriculture and economic instability lead to a strong food insecurity throughout the entire regio. Approximately 66% of Upper Nile's population (more than 1 million people) faced crisis or emergency-level hunger (IPC Phase 3+), with some 32,500 in catastrophic famine-like conditions[12]
Displacement of people	High	Due to its position at the border with Sudan, the Great Upper Nile serves as a refuge for displaced populations fleeing conflict. The area hosts a significant number of refugees, exacerbating pressures on limited resources and infrastructure.
Political		
Protracted conflict	High	The Greater Upper Nile region has experienced, and still experiences, repeated outbreaks of conflict and violence, particularly since 2013, driven by political power struggles, ethnic divisions, and competition over land and resources.

[12] https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_South_Sudan_Acute_Food_Insecurity_Malnutrition_April_July2025_Report.pdf

4.1 Shocks

Flooding

Flooding in the Greater Upper Nile region of South Sudan **is a frequent and escalating hazard**, **occurring annually** with particularly **severe impacts during the rainy season** between June and October. Since 2020, more frequent extreme flooding events have affected the northern states of Unity, Upper Nile and Jonglei due to the combined effect of heavy rains and the overflow of the upstream Lake Victoria [13] [14]. The intensity and unpredictability of flooding have increased, attributed to changing rainfall patterns and climate variability. Counties such as Fangak, Pigi, Ayod, Akobo, and parts of Upper Nile including Renk and Malakal are regularly inundated. These floods submerge homes, farmlands, and roads, displacing tens of thousands of people each year and leaving entire communities isolated for weeks or months.

The humanitarian and economic impacts are profound. **Floodwaters often destroy food stocks** and prevent planting or harvesting, contributing to widespread food insecurity. **Livestock losses are common**, and waterborne diseases like cholera, malaria, and diarrhea spike during and after floods due to stagnant water and poor sanitation. **Access to healthcare and humanitarian aid is severely hindered**, as many areas become reachable only by boat or air. In some cases, **people are displaced** multiple times in a single year, compounding vulnerability and reducing the capacity of families to recover. With each flooding cycle, the erosion of livelihoods and infrastructure grows, making long-term recovery increasingly difficult for affected communities. Beyond the severe damage to crop, livestock and roads – the stagnant water leads to a rise of water-born (e.g. cholera) and vector-born infections (e.g. malaria).

Droughts

Drought is a recurrent hazard in South Sudan, posing significant risks to food security, water resources, and livelihoods—particularly in the Greater Upper Nile region. The region experiences periodic droughts approximately every 5 to 10 years, with some areas facing more frequent dry spells due to shifting climate patterns. These droughts are often marked by delayed or below-average rainfall during the main rainy season (May to October), leading to reduced crop yields, poor pasture conditions, and water scarcity for both human and livestock use. In combination with ongoing conflict and displacement, drought exacerbates vulnerability by limiting communities' ability to recover and prepare for future shocks. Climate change is expected to increase the variability of rainfall in the region, potentially intensifying the severity and unpredictability of drought events in the coming decades.

[13] https://reliefweb.int/report/south-sudan/south-sudan-nasir-upper-nile-state-humanitarian-needs-assessment-due-flooding-22-september-2021

[14] https://www.theeastafrican.co.ke/tea/news/east-africa/in-south-sudan-floods-drown-hopes-4760598

Conflict and violence outbreak

The ongoing conflict in Sudan, which began in April 2023 between the Sudanese Armed Forces (SAF) and the paramilitary Rapid Support Forces (RSF), has now spilled across its southern border, deeply affecting South Sudan. Since late 2024, the turmoil has disrupted cross-border oil infrastructure—especially pipelines through Sudan—with an impact on **South Sudan's oil revenues which decreased by around two-thirds** generating widespread economic instability.

Beyond the impacts on oil revenues, the conflict also causes mass displacements. **Thousands of Sudanese refugees and returning South Sudanese are entering via border points like Joda and Renk,** overwhelming local services; in December alone, **up to 5,000 arrivals per day** strained health, shelter, and aid delivery systems. The influx has also stirred social tensions, with anti-Sudanese riots erupting in towns such as Renk and Malakal, fueled by economic stress and ethnic resentment. Moreover, South Sudan faces militarization and recruitment pressures: weapons, fighters, and alliances—such as RSF's ties with SPLM-N—are penetrating into South Sudan's Upper Nile region, threatening its fragile peace and risking a dreaded merging of both nations' conflicts. Sudan's civil war has become a major destabilizing force for South Sudan—crippling its economy, overwhelming social services, inflaming communal tensions, and directly testing its already tenuous peace agreements. Furthermore, longstanding ethnic tensions among the Shilluk, Nuer, and Dinka communities fuel cycles of violence, deepening divisions and undermining prospects for peace. It is evident that as the current conflict which affects the GUN region program this shall be factored in program design and implementation.

4.2 Stresses

Land degradation and deforestation

Extensive deforestation for charcoal, firewood, and agricultural expansion has stripped protective tree cover, accelerating soil erosion and reducing land fertility. Over-grazing by the country's large livestock herds further depletes vegetation, compacting soils and making them more susceptible to erosion, especially during heavy rains . In Upper Nile, decades of oil exploration have added another layer of degradation: contaminated soil and waterborne pollutants have damaged ecosystems and diminished land productivity around drilling sites.[15] The region's flat, silt-rich pediplains and swampy floodplains exacerbate erosion and sedimentation, particularly when seasonal flooding expands—each flood not only erodes topsoil but also leaves behind nutrient-poor layers that hinder regeneration . Compounding this, the annual floods in the Sudd wetland are becoming more frequent and persistent due to climate change and upstream hydrological changes, prolonging waterlogging and preventing recovery of agricultural lands. Collectively, these processes weaken food security and livelihoods, increase vulnerability to shocks, and heighten competition over increasingly degraded resources—often entangling environmental stress with social tensions.

Non-Timber Forest Products (NTFPs) play a dual role in shaping the dynamics of deforestation in South Sudan. On one hand, products like gum arabic provide important income opportunities for rural households without requiring trees to be cut down, thereby offering a sustainable alternative to timber harvesting or agricultural expansion. The

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[15] article.sapub.org+15lakeregionbulletin.co.ke+15msf.ie+15

acacia trees that produce gum arabic are particularly valuable, as they can be tapped season after season while remaining intact, which creates incentives for communities to conserve rather than clear them. On the other hand, weak regulation and poverty-driven overexploitation can shift this balance negatively. In some areas, acacia trees are still cut for fuelwood or charcoal despite their gum-producing potential, undermining both livelihoods and forest cover. Thus, gum arabic illustrates the complex relationship between NTFPs and deforestation in South Sudan: when managed sustainably it can reduce pressure on forests, but without proper governance and alternative energy options, its conservation potential is often compromised.

Public health concerns

In the Greater Upper Nile region, public health is under considerable strain: malaria remains endemic, exacerbated by extensive flooding and stagnant water which create ideal breeding conditions. A severe cholera outbreak between September 2024 and March 2025 resulted in 36,728 suspected cases and 624 deaths (a 1.7% case-fatality rate), with Unity and Jonglei states among the most affected.[16] Acute malnutrition is also high: approximately 2.3 million children under five are at risk nationwide, with 64% of the Greater Upper Nile population (some 3.1 million people) classified in IPC Phase 3 (crisis) or worse for food insecurity, including nearly 44,000 in IPC Phase 5 (catastrophe) (ipcinfo.org). Additionally, overcrowded displacement camps and limited healthcare services contribute to outbreaks of respiratory infections, vaccine-preventable diseases, and mental health challenges, while maternal mortality remains one of the highest globally—still estimated at around 2,053 per 100,000 live births.

Displacement of people

The combined impact of regional conflict and recurrent flooding in South Sudan has resulted in a massive and complex displacement crisis, affecting refugees, returnees, and internally displaced persons (IDPs). **As of mid-2025, there are approximately 1.9 million people internally displaced due to conflict and climate-related disasters—including about 665,000 displaced by floods alone**.[17] Across the border, over 1 million refugees and returnees—from both Sudanese fleeing war and South Sudanese returning—have arrived since April 2023; conflict-related entries number roughly 873,000 while broader refugee/returnee counts exceed 1.1 million . The 2024 floods displaced 65,000 people across 38 counties and affected over 735,000 residents, further swelling IDP numbers and disrupting basic services.

These groups now live in overcrowded camps and transit sites—often lacking shelter, sanitation, healthcare or schooling—which heightens risks of disease outbreaks, food insecurity, gender-based violence, and land conflicts.[18] In essence, South Sudan is contending with a layered humanitarian catastrophe: millions uprooted internally, tens of thousands displaced by environmental shocks, and refugees and returnees still seeking safety.

[16] afro.who.int

[17] https://www.unhcr.org/us/emergencies/south-sudan-emergency

[18] https://www.unrefugees.org/news/south-sudan-s-hostages-of-the-climate-emergency/

Within the broadly fragile country context, the Upper Nile state stands out as a hotspot of instability and humanitarian challenges. The Greater Upper Nile is one of the most affected regions.[19] Due to its position at the border with Sudan, it serves as a refuge for displaced populations fleeing conflict. The area hosts a significant number of refugees, exacerbating pressures on limited resources and infrastructure. In 2025 it is estimated that Renk's population increased

Food insecurity

South Sudan's is also affectedy by food insecurity. First, reliance on rain-fed agriculture makes communities exceptionally vulnerable: prolonged dry seasons bring drought that severely impact crop yields and water availability, while erratic wet seasons unleash floods that inundate farmlands, destroy crops, disrupt markets, and contaminate drinking water—this has displaced hundreds of thousands, especially along the Jonglei Canal where over 379,000 were uprooted earlier this year.[20]

Second, conflict—particularly in Upper Nile counties such as Nasir, Ulang, Akobo, and Rubkona—further wrecks agricultural cycles, displaces families, and blocks humanitarian aid; as of April–July 2025, approximately 66% of Upper Nile's population (more than 1 million people) faced crisis or emergency-level hunger (IPC Phase 3+), with some 32,500 in catastrophic famine-like conditions.[21] Overall, an estimated 7.7 million South Sudanese (57% of the population) are acutely food insecure, including 83,000 in famine-like Phase 5, with conflict, floods, droughts, skyrocketing food prices, and economic collapse—exacerbated by the Sudan war spillover—identified as core drivers.

In the Upper Nile, pre-existing vulnerabilities are amplified: humanitarian access is limited by insecurity and seasonal floods, while macroeconomic pressures and trade disruptions—especially of oil revenues—raise the price of food beyond reach.

4.3 Key risks and impacts relevant to NTFPs

All the vulnerabilities described above makes the Great Upper Nile region a highly fragile context – where livelihoods depend on few economic activities. In some cases, NTFPs (in particular, gum arabic) are the major source of income for farmers. Therefore, any shock to these value chains can have significant ripple effects on the livelihoods of thousands of South Sudanese farmers, as well as refugees, IDPs and returnees who are involved in this value chain. Key hazards identified as material for the production of NTFPs are:

- **Droughts and erratic rainfall**, which affects the regeneration of forests and availability of NTFPs,

[19] https://land.igad.int/index.php/documents-1/countries/south-sudan/investment-5/1010-markets-in-crises-south-sudan-case-study/file

[20] https://apnews.com/article/south-sudan-flooding-dde718e68427f931d08eb0fb35f3927d

[21] https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_South_Sudan_Acute_Food_Insecurity_Malnutrition_April_July2025_Report.pdf

- Increased frequency of **flooding** (destroys forested areas and changes ecological dynamics, affecting the growth cycles of key NTFPs.
- Invasive species, often exacerbated by changing rainfall patterns and weakened ecosystems, threaten native forest species.
- Pest outbreaks (e.g., locusts or crop pests affecting trees) can also degrade tree cover and reduce NTFP yields.
- **Charcoal production and firewood collection** are major drivers of deforestation, especially near urban areas and IDP (internally displaced persons) settlements.

5 DESK REVIEW NON-TIMBER FORESTRY PRODUCTS

According to the FAO Forestry Assessment report, about 11% of total land of South Sudan is covered with forest, with an additional 52% corresponding to '*other wooded land*'.[22] For local communities, forests are primary sources of food, energy and construction materials. In addition, they provide employment opportunities in the logging industry (machine operators, vehicle drivers, loaders, etc). Timber production is a key economic activity especially in the southern and eastern states (such as Central Equatoria, West Equatoria, Western Bahr el Ghazal) where most of the forest area is located. For the most part, the timber is transported south towards Kampala, where it reaches the formal market and is then exported internationally to India and the UAE.[23] **Given the smaller forest area in the northeast of the country, the Upper Nile state remains largely out of traditional logging activities and trading routes.**

The country's forests are endowed with rich and diverse concentrations of biodiversity, which include valuable species that command high market prices. There are plantation forests of teak, as well as of non-timber forest products (NTFP). Considerable potential exists for the expansion of forest plantations of both indigenous and exotic species.

Beyond the production of timber, NTFPs can be important products at both the local and national levels. NTFPs include any product or service other than timber that is produced in forests, such as fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences and a range of barks and fibres, palms and grasses. **In South Sudan, most relevant NTFPs are shea nut, fruits, fibres, grasses, honey, oils, resins and gums -harvested for local consumption as well as trade.**

A study conducted in rural areas around Melut County, North Upper Nile State investigated the non-timber forest products for local people reported that NTFPs play an important role in meeting subsistence needs,

[22] Global Forest Resources Assessment 2020

[23] https://www.csrf-southsudan.org/wp-content/uploads/2021/06/2020-10-The-impact-of-logging-on-local-communities-Final-Report.pdf

especially in a remote area of the Upper Nile State of South Sudan.[24] Similarly, research in Sudan has shown that NTFPs contribute significantly to the diet and income of the rural inhabitants – recommending that NTFP-producing trees and shrubs should be conserved and integrated in the local farming systems in order to maintain biodiversity and sustain productivity.[25]

Throughout the continent, the contribution of NTFPs to household income varies from location to location, and the comparison of NTFPs between places often is difficult due to lack of consistency in definitions and measures of forest income and household. Nevertheless, research shows that in Sudan the contribution of non-timber forest product was found more than 50% to rural households' income compared to those with other countries; such as Cameroon (39%), Tunisia (32%), Iran (21%) and northern Thailand (6%)[26].

Some key challenges with NTFPs value chain were researched by a study carried out in Sudan that highlights how beyond the Gum Acacia and the Baobab fruits, other NTFPs value chains remain small and unstructured.[27] Some of the key reasons identified are the limited exchange of information between the upstream and downstream actors, the fact that wholesalers have the highest monetary benefits followed by small traders and the least by the collectors, the lack of any market structure/infrastructure, as well as of any government support to the development of NTFPs. The study also finds that the majority of the upstream actors are the women, and their role is restricted to the collection of NTFPs. In particular the gum arabic sector is dominated by women, which underlines its value as an entry point in efforts to improve the livelihoods of women.

A World Bank thematic evaluation on forestry in South Sudan published in 2024 has presented the strengths and weaknesses of NTFPs value chains.[28] The review highlightst that Non-Timber Forest Products (NTFPs) play a vital role in the livelihoods of rural communities in South Sudan, particularly in forest-adjacent and conflict-affected regions. Products such as honey, shea butter, wild fruits, resins, and medicinal plants are essential for food, income, and coping strategies during periods of crisis. Despite their importance, NTFPs remain largely informal and under-commercialized, with weak or nonexistent value chains—especially for products like gum arabic and shea butter that could have regional trade potential. The current forest policy framework barely acknowledges NTFPs, offering little in terms of legal recognition, tenure security, or benefit-sharing mechanisms for communities that harvest them. According to the study, women are central to NTFP collection and trade, especially for food, fuelwood, and medicinal

[24] Worja, S.W.L. (2023). Role of Non-Timber Forest Products to Local People Livelihoods in Melut Area, Upper Nile State, South Sudan, Eregli Journal of Agricıultural Science, 3(1), 1-7.)

[25] Opportunities and Constraints for Poverty Reduction in the Nuba Mountains, South Kordofan, Sudan - Bashir Awad El Tahir1 and Jens Gebauer (2004) https://www.tropentag.de/2004/abstracts/full/93.pdf

[26] Faisal I. Musa, Uttam K. Sahoo, Muneer E.S. Eltahir, Talaat D. Abdel Magid, Osman E. Adlan, Hamdon A. Abdelrhman, Ahmed A. Abdelkarim, Contribution of non-wood forest products for household income in rural area of Sudan – A review, Journal of Agriculture and Food Research, Volume 14, 2023, 100801, ISSN 2666-1543, https://doi.org/10.1016/j.jafr.2023.10080

[27] https://www.sciencedirect.com/science/article/pii/S2666154323003083

[28] https://induforgroup.com/wp-content/uploads/2024/08/WB-South-Sudan-Thematic-Review-Final-Report-4-June-2024-ID-153089-compressed.pdf

plants, yet their contributions are undervalued and they often lack access to training, markets, and finance. Promoting sustainable NTFP harvesting offers an opportunity to strengthen both conservation and livelihoods, particularly through community forestry models that align with biodiversity and climate resilience goals. The review recommends formalizing NTFPs in forest policies, supporting value chain development, enhancing women's participation, and integrating NTFPs into pilot initiatives under the proposed Community Forestry Roadmap. When it comes to the specific NTFPs in scope of this report, the table below reports their main production locations,

	Production locations
gum arabic	Eastern Equatoria, Central Equatoria, North Bahrel Ghazal, Warrap, Unity, Jonglei, **Upper Nile**
Fruit and Vegetables	Vegetable commercial scale production in Equatoria, and throughout the country at smaller scale for subsistence and county level trade.
Shea	Central Equatoria (Kajo Keji, Tindilo, Tari Counties), Eastern Equatoria (Magwi, Pageri Counties), Western Equatoria (Mundri East & West Counties), Lake State (Wulu County)
Honey	Eastern Equatoria (Magwi county: Badinglo National Park, Imatong mountain), Central Equatoria (Yei, Lanya, and Morobo counties), Western Equatoria (Mundri, Yambio, Mavolo counties), Lake State (Wulu County) and Western Barl El-Ghazal (Raja County)
Bamboo	Magwi county in Eastern Equatoria and Lanya County in Central Equatoria state

6 PRIORITISATION OF NTFPS

Based on the analysis from this study, it is recommended to **THRIVE to focus on the development of the gum arabic and Fruits and Vegetable value chains in Renk and Rubkona.** In a nutshell, gum arabic and Fruits and Vegetables are in fact the only two value chains that are, to some extent, already somewhat developed in the GUN region's counties in scope for THRIVE. Other NTFPs are not present at sufficient scale and therefore show limited potential for market-based approaches, unless the geographical constraint is relaxed. Beyond the simple fact of where the largest scale production takes place, the focus on gum arabic and Fruits and Vegetables is further supported by the table below, where the relevance, opportunity and feasibility of market systems interventions for different NTFPs are assessed.

Beyond the overall better opportunity related to gum arabic and Fruits and Vegetables, it should be noted that no NTFPs scores "*high"* on all three dimensions - relevance, opportunity and feasibility,. This means that while some interventions are possible, there are some systemic barriers that remain that go beyond what THRIVE can possibly do.

Table 2:

	Relevance	Opportunity	Feasibility	Recommendation
Gum arabic	***High****;* marginalised and vulnerable population (in Renk) largely dependent on gum arabic – as first (and in some case unique) source of cash livelihood – e.g. farmers in harvesting, refugees in cleaning	***Medium/Low****;* there is high international demand and export potential of gum Arabic, however there is little presence of commercial scale, formal private sector actors in South Sudan	***Medium/Low****; ultimate* dependency on Sudan as export infrastructure not possible to change	Focus areas could include the development of a more traceable supply chain, including through a lead agents' extension model; the diversification of trade routes; and the facilitation of longer-term agreements leading to more sustainable planting and harvesting practices.
Fruits and Vegetables	***High*****;** vegetable production takes place throughout the entire country, including the GUN region. Large scale irrigated fields in Renk – and smaller scale rain-fed production in other counties.	***Medium;*** opportunities vary from county to county, enhancing production capacity to substitute imports is relevant - at different scales - in Rubkona and Renk	***High*** **–** because production is practiced widely and households engage in some degree of commerciality, the population represent a potential consumer market for producers and distributors of	Focus areas shall include enhancing production capacity by enabling an improved market for water pumps (e.g. through leasing), as well as better access to inputs such as better quality of seeds and pesticides.

			productivity-enhancing inputs.	
Honey and Shea	***Medium***; farmers in South Sudan are engaged with honey production, but not at scale in the GUN region. Supporting the development of the honey value chain would only benefit the target group in the GUN region indirectly, and/or in the long-term	***Medium/Low;*** there are private sector actors in the country (e.g. Hagana, Lulu Works), but these do not currently procure from the GUN region	***Low;*** systemic infrastructure and logistics challenges (e.g. very poor transport infrastructure)	Not directly relevant for the counties in scope, MSD approach would be relevant to extend outreach of private sector actors – but no direct impact on GUN region.
Bamboo	***Medium;*** no natural growth / production in the GUN region, but high level of consumption (construction sector)	***Low;*** no presence of private sector actors	***Low;*** no intrinsic systemic barrier, but absence of private sector actors in the counties in scope	No opportunities identified for the counties in scope.

Gum arabic and Fruits and Vegetable value chains offer the largest potential for MSD interventions in the GUN region

gum arabic plays a significant role in the local economy of Renk County, with an estimate 80% of the population—including farmers, refugees, and internally displaced people—engaged in harvesting, cleaning, sorting, and trading the product. Given South Sudan's important role in the global supply of this commodity, gum arabic presents an opportunity to develop a non-timber forest product (NTFP) value chain. Remarkably, despite its potential, this value chain has received limited attention from development programs so far. Although gum Arabic commands a high consumer price, the current structure of the value chain generates little added value for the smallholders who harvest the raw product.

Production of vegetables, and to a smaller extent fruits, takes place throughout the country, with scale of production varying from county to county. In most cases, production is small scale, and is often unable to meet local - county-level demand. In these cases, a rationale for engaging in this value chain is import substitution. In fact, in some of the GUN counties in scope, it appears that these are products for which local (county level) demand is higher than its supply. Supporting (small-scale) market actors with enhancing their production levels to prevent imports is a relevant approach for counties such as Rubkona or Fashoda. While this would not result in a wider connection of these remote counties to a broader market system, it could still bring benefits to both consumers (who would access cheaper products) and local producers (who could generate additional incomes). This scenario applies, for instance to the case of Rubkona, which is currently a net food importer - with food items (e.g. onion, maize, groundnut, okra powder) currently being transported from outside the county (e.g. from El-Gedarif, Sudan). The case is different for Renk, where large scale commercial production is present – even though facing significant challenges (e.g. disrupted input supply chains, change in offtaker markets, etc.) due to the ongoing conflict.

An important remark is that vegetables do not fall into a strict NTFPs definition, as being farmed in open land.

Interventions in the shea and honey value chains would need to focus on private sector actors that are outside the GUN region to extend the access frontier to eventually reach the target counties

Products such as honey and shea nuts are very relevant from the perspective of the **overall country development**. However, these are only produced at very small scale (if at all) in the counties in scope, and traded on local markets for local consumption. There would be potential for MSD approaches around these products, but the focus would lie outside of the counties in scope for THRIVE.

In the GUN region, production and trade of products such as honey and shea nuts are informal and there is no connection with the more formal private sector actor operating on commercial scale in South Sudan. Despite being produced at scale in some regions of South Sudan, that scale is not reached in the Great Upper Nile region, and commercial processors are mostly procuring from regions that are closer and better connected to Juba.

For instance, areas suitable for honey production include the Bahr el Ghazal, Lakes, Western Equatoria, Eastern Equatoria, Upper Nile and Unity states. Some counties in these states are especially suitable due to the presence of natural forests as well as adequate rainfall which makes their natural habitats for bee colonies.

These areas are not equally developed in terms of honey production: currently most production takes place in Eastern Equatoria (Magwi county: Badinglo National Park, Imatong mountain), Central Equatoria (Yei, Lanya, and Morobo counties), Western Equatoria (Mundri, Yambio, Mavolo counties), Lake State (Wulu County) and Western Barl El-Ghazal (Raja County). In contrast, production in the Upper Nile and Unity states is much less developed. In the Fashoda county for instance, wild honey is harvested in the forest of the Orinyo and Aburic bomas. Production is on a small scale, based on traditional methods.

Hagana, a company processing honey procures raw honey from farmers in Eastern Equatoria in Mawgi county, which is located at 150 km distance from Juba along a main road (as opposed to the 700+ km that separate Juba from Fashoda). The weak transport infrastructure between Juba and the counties in scope for THRIVE means that logistics are too costly for companies to procure goods from these counties. Local markets in the Great Upper Nile are often largely disconnected among themselves, and most importantly strongly disconnected from the main market in Juba.

Working structurally to enhance and extend the honey value chain would entail engaging with the existing private sector companies that process NTFPs (e.g. honey processors) to support the extension of their reach throughout the country. For instance, if 95% of the raw honey is currently procured within a radius of 200 km from Juba, THRIVE could consider designing an intervention to lower the risk for the company to procure additional goods from locations that are further away, but still reachable.

A similar case scenario applies to shea nuts. These grow across the three Equatoria States, through Lakes and Warrup, and into Western and Northern Bahr el Ghazal, forming a zone (estimated at 100,000 km2) referred to as the shea belt. There is also a much smaller zone that spreads from Eastern Equatoria into Jonglei and on into Gambela, across the foothills of western Ethiopia. More specifically production of shea nut take place in the following counties Central Equatoria (Kajo Keji, Tindilo, Tari Counties), Eastern Equatoria (Magwi, Pageri Counties), Western Equatoria (Mundri East & West Counties), Lake State (Wulu County).The distance between Torit in Eastern Equatoria to Juba by road is 217km, with relatively easy access. Remarkably, Shea nut produced in Western and Northern Bahr el Gahzal – despite its distance from Juba (about 650 km between Aweil North and Juba).

In general terms the shea value chain throughout the continent is organised with local collectors, selling to local traders (90%) or village-based processors (10%). Traders in turn sell the product to mechanical processors, after which the product is fractioned to separate the oil from the butter. Only 15% of the total volume is fully processed in the continent.[29] Final consumption from food, cosmetic and pharmaceutical brands is in Europe. There is little to no commercial scale processing of shea which is therefore exported raw for low value added to the country's economy. However, the potential shea nut production in South Sudan is estimated at 500,000 tonnes per year with about 30,000 consumed at the domestic level. The average price range for South Sudan shea nuts ranges between USD 4.6 to 7.2 per kilogram. Average annual exports of 100,000 tonnes could generate an average between USD 460 to 720 million per year.

The main constraints affecting the shea sector include poor road infrastructure, security, lack of market linkages and access to finance. Relevant private sector actor in this sector are **Aramweer Limited and Lulu Work Trust Limited.** Aramweer is a pioneer shea processing company started in 2019 to produce organic skin care products from shea nuts. Lulu Works Trust Ltd operates under a cooperative business model, The Lulu Oil Women's Empowerment Group has developed into a successful business over a decade. They work with four levels of production: Shea nut collection from rural women's groups who are trained in the production of high-quality shea kernels, centralized processing groups with facilities and staff for consolidation, storage, and oil extraction, Juba-based operation centre that receives bulk product, then processes and produces the butter, and then packages and distributes the finished products to Kenya, Kenyan-based distribution centre for regional and international sales. Lulu Works Trust products include lip balms, 100% lulu oil (with and without fragrance), and exfoliating soaps.[30]

As in the case of honey, developing the shea value chain would entail engaging with the existing private sector companies that process NTFPs (e.g. shea nut processors) to support the extension of their reach throughout the country – embracing that this would mean NOT reaching farmers in the GUN counties in scope.

Bamboo is a product in high demand throughout the country, but not produced at scale in the Great Upper nile region

Despite being a significant product for some of South Sudan's neighboring countries this value chain appears to be the least developed and researched among the abovementioned NTFPs. **Bamboo is mainly produced in Magwi county in Eastern Equatoria and Lanya County in Central Equatoria state.** These are shipped to Juba which is a commercial/ distribution hub, after which bamboo is then shipped to other locations. Bamboo is a fast-growing

[29] Global Shea Alliance

[30] Strengthening Agricultural Value Chain AfCFTA Linkages in South Sudan: Opportunities and Challenges | United Nations Development Programme

product which is widely used in construction and for traditional housing across the GUN region. Thatched bamboo is also a widely used humanitarian product for emergency shelter for POC and IDP congregating areas within the region.

Demand for bamboo is high, also in counties where there is no or little production. This means that despite the difficult transport, bamboo is transported to remote locations from Juba and Maban counties, South Kordofan, Nuba mountains. This makes bamboo expensive; when products are transported by boat in the White Nile they are often heavily taxed along the waterway. The retail price of bamboo in locations such as Kodok can reach SSP 35,000 for a bundle of 10, which is more than double than its price in Juba, where a bundle of 10 is sold for SSP 15,000/ bundle of 10 (Juba).

Given the high level of vulnerabilities in the GUN region, complementary 'pre-MSD' approaches could also be considered

Many NGOs are present in these counties delivering traditional development approaches including the free distribution of seed, cash, training, and other inputs. There is also some small element of government support available in some cases. THRIVE has often, when working at the boundaries of economic feasibility, employed more direct approaches including the graduation approach. This is relevant for counties that are largely disconnected from the most formal private sector actors in the country – including characteristics such as micro economies, low levels of production and consumption, and subsistence agriculture. When considering some of the above, it is possible that THRIVE may consider combining the building of markets in some NTFPs at a regional or even national level with some more direct activities in the target counties so that, at some point, they might meet in the middle. The core aspect determining whether an MSD approach makes sense is the scale and relevance of that sector in a given county. This considers factors such as population density (and therefore market opportunities for sourcing, sales of goods and services by private actors, and production potential) and the presence of and attractiveness to private actors.

Regarding 'direct delivery' intervention, there are ways of implementing these interventions that make sustainability more or less likely in future. In consultation with farmers in Rubkona, for example, seeds had been distributed by an NGO freely during one season and then did not arrive the next. In another case, they arrived but too late to deliver proper yields. In such cases, the viability of and the incentive for the private sector is actually reduced by the intervention.

In such cases, where THRIVE is trying to build a pathway towards a market, or at least not to inhibit this pathway through their activities, there are opportunities for intervention. Utilising the local service sector, for example, at least increases awareness and develops buying, rather than receiving habits for both sellers of services and consumers. For example, rather than distributing improved vegetable seeds to improve yield and food security, to give vouchers to the farmers to spend at the nearest vendor from a large town may incentivise that vendor to increase their mobile seed distribution so that they can actually receive these sales.

7 GUM ARABIC

7.1 Status of the Market System

Gum arabic, or Gum Acacia is a gum extracted from *Acacia Senegal* – a drought-resistant tree that grows in arid, subtropical and semi-arid climatic zones.[31] It is used for a range of applications, mostly in the food, pharmaceuticals and cosmetics industry. For an estimated global market size of 1 billion USD, gum arabic is high value commodity with significant potential to drive development.

The gum arabic belt in South Sudan runs across from Eastern Equatoria, Central Equatoria, North Bahrel Ghazal, Warrap, Unity, Jonglei to Upper Nile States.

Until recently, gum arabic has mainly been traded through Sudan, which accounts for 80% of the global supply. In 2020 the South Sudan government launched the export of gum arabic to the international market. At the inaugural event the Vice President for Economic Cluster, Dr. James Wani Igga had stated that *"If we put our energy in the production of gum arabic, we can easily forget about the oil. Oil is what makes us lazy. Let us encourage farmers to plant gum arabic in organized plantations"* highlighting the potential of this cash crop as a source of non-oil revenues.[32] Yet, the connection to markets remains largely dependent on Sudan. As a result, the current conflict in Sudan has impacted production and prices are generally set by Sudanese wholesalers, controlling both collectors and local traders.

Based on analysis by Indufor there is potential to further develop gum arabic production in South Sudan.[33] The three key gum arabic production states in South Sudan (Upper Nile, Northern Bahr el Gazal and Eastern Equatoria) have about 4 million ha of Gum Acacia resources, with an estimated annual gum production potential of 25 721.9 MT. This is about 32.2% of the potential production in the whole of Sudan (80 000 MT).

Remarkably, there is no major recent development project that has focused on this value chain in South Sudan. Possibly this is due to a difference in timeframes. gum arabic is a perennial crop taking 3 - 5 years to reach maturity, depending on the variety. It is therefore challenging to report results within projects of 24-36 months.

One relevant exception is a project by the International Trade Center (ITC) funded by the EU (MARKUP II) has shown interest in the gum arabic value chains.[34] MARKUP II plans to build capacity of local institutions through

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[31] Niranjan Prasad, Nandkishore Thombare, S.C. Sharma, Shravan Kumar,Gum arabic – A versatile natural gum: A review on production, processing, properties and applications, Industrial Crops and Products, Volume 187, Part A, 2022, 115304, ISSN 0926-6690, https://doi.org/10.1016/j.indcrop.2022.115304.

[32] South sudan launches export of gum arabic. Available at: https://www.radiotamazuj.org/en/news/article/south-sudan-launches-export-of-gum-arabic

[33] https://induforgroup.com/wp-content/uploads/2024/08/WB-South-Sudan-Thematic-Review-Final-Report-4-June-2024-ID-153089-compressed.pdf)

[34] https://www.eacmarkup.org/partner-states/south-sudan

coaches who collaborate with BSOs and technical experts. The program aims at establishing and operationalising a National Trade Facilitation Portal that provides product-specific step-by-step description of import, export and transit formalities, providing assistance to the metrology and national testing laboratories for accreditation, **supporting South Sudan National Bureau of Standards for the accreditation of its certification services,** supporting capacity building on value addition, technology transfer and postharvest processing, providing special institutional trade and investment promotion support at the national level and establishing and reinforce existing packaging centers and provide capacity building in packaging.

A study by White Peak Consulting for the MARKUP II project,[35] identified four key priority actions to support the development of the gum arabic value chain in South Sudan. The first two relate to production - namely **increasing production capacity** and **strengthening post-harvest management mechanisms**. The third consists of establishing South Sudan gum arabic Corporation as an institutional body aimed at strengthening the coordination in the value chain – in particular between the gum arabic Federal Union, the state-level associations and the producers. Finally, the study identified the need for establishing **efficient pricing mechanism** to price gum arabic according to its quality. If a new pricing mechanism is established with active involvement of the Central Bank this is expected to encourage financial institutions such as commercial banks to provide loans and improve access to finance for actors in the sector.

The figure below showcases a System Map of the gum arabic value chain in South Sudan. Within South Sudan, gum arabic is majorly produced in the Northern Upper Nile State bordering Sudan, specifically in the following counties: Renk, Maban, Melut, Manya, Udekone, Kaka and Magenis. **The information presented focusses on Renk county.**

Gum arabic *agents*

Gum arabic harvest is a widespread activity in Renk, with an approximate 80% of the county population, involved with some aspect of this value chain. The overall general structure of the value chain revolves around **individual gum arabic agents.** Remarkably, agents do not possess neither the control over the land, nor the labour force to collect gum arabic from it. Yet, they are the only ones who purchase licenses from the Ministry of Industry and Trade to trade the gum arabic. As owner of these licenses, they then hire local labourers and pay a fee to community chiefs who own the land - to be able to harvest the gum arabic and resell it.

[35] Uncovering opportunities in South Sudan (Avaialble at: https://whitepeakconsulting.org/blogs/f/uncovering-opportunities-in-south-sudan%E2%80%99s-gum-arabic-sector)

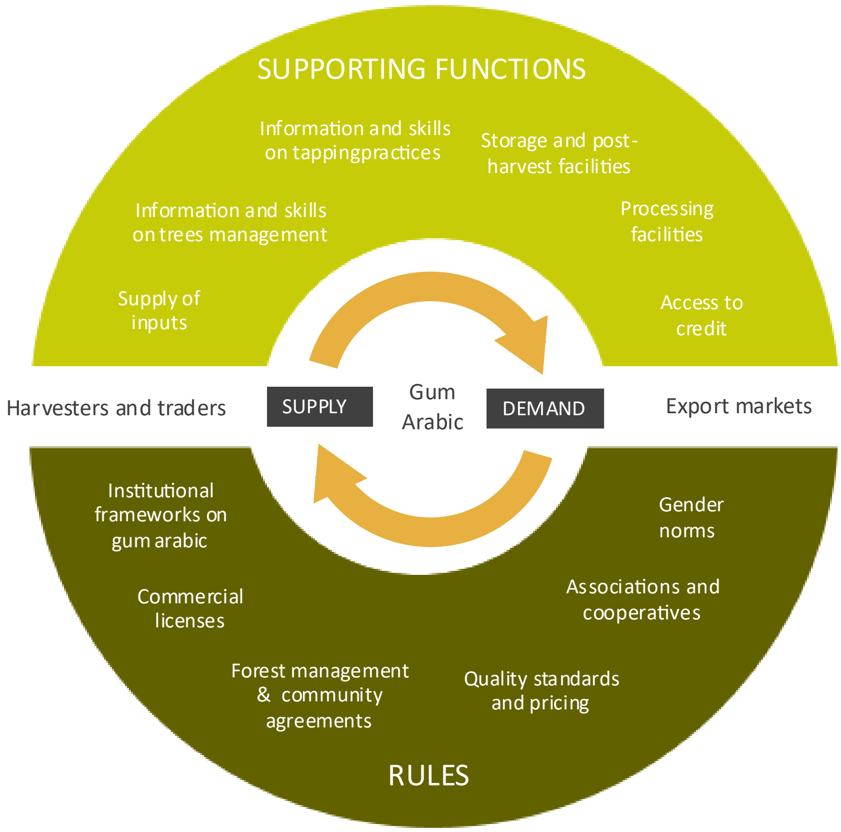

Figure 1

Core market actors

Core market actors within the borders of South Sudan range from harvesters, aggregators, gum arabic agents, traders and local consumers. Outside of the borders of South Sudan, further market actors are processors and export markets where most of the product is absorbed.

Harvesters

Harvesters work either independently or hired by traders to collect the gum arabic. When hired by agents, harvesters are paid with a share of the product harvested.

Gum arabic is currently harvested **exclusively from wild trees**. The harvest season lasts on average three months between December and March, with an average harvesting capacity per farmer up to 15-20 bags (Gumthaar) for one season. The harvest takes place in two or three rounds; in a best-case scenario, harvesters can expect up to 10 bags of produce within the first week, a similar amount after 15 days, and a smaller harvest round thereafter. It is noted that these amounts are subject to significant fluctuations, with production capacity can significantly decrease due to flooding, dry spelt, wildfires, or pests.

A major risk for gum Arabic harvesting is flooding, as it prevents gum Arabic to be harvested for a full year after the flood event. As coping mechanisms, harvesters eventually have other economic activities, such as farming, livestock rearing, fishing or charcoal-making. Droughts are reportedly less impactful but can still lead to halved production. Farmers are adapting to long dry seasons by anticipating the gum Arabic farming season.

Cleaners and aggregators

Post-harvest activities include (1) cleaning the product from sand, dust and other impurities, (2) sorting (3) packaging the gum in bags, also referred to as Gumthaar (about 90-100 kg capacity). gum arabic agents buy the raw gum arabic from collectors, and hire labourers for cleaning, sorting and packaging the product. Labourers include Sudanese refugees or local communities, who provide cheap labour for gum arabic production.

The gum arabic is stored at different locations: the main storage location is in Soma (Renk), that hosts a public government-owned storage facility. Other storage locations are located at county headquarters, or at individuals' stores in the market.

Gum arabic agents

Agents, at the center of these operations, keep an approximate 35% of the gum arabic, while the rest is utilised to pay labour, feeding, land rental, storage and other costs. For example, local traders will have to pay one Gumthaar to the village chief for each labourer they hire to work on the community's land. To be able to operate local traders must purchase an annual license from the Ministry of Industry and Trade for 500,000 SSP. The remaining 35% is sold to larger traders, middlemen or private companies (e.g. Ramciel) for a margin.

Depending on the stage of the trading chain, within Renk, one bag of gum arabic is sold between 150,000 – 600,000 SSP (approx. $ 30-120 USD). Given that no processing takes place in South Sudan, the gum arabic is exclusively traded in its raw form. As such, trading gum arabic is often the most lucrative activity over the year, even though the season only lasts three months. Outside of the gum arabic season, gum arabic agents are usually farmers.

The price of one **bag (90-100 kg) of gum arabic reaches up to $ 150 USD when exported.** On average, prices of raw, non-processed gum arabic range between $0.50 – $1.50/kg for *Acacia senegal* (Kordofan grade), and $0.30 – $1.00/kg for *Acacia seyal* (Hashab grade). **Acacia senegal, on average commands higher prices** than *Acacia seyal* due to superior solubility and food safety. That is because **Acacia seyal gum arabic comes with some limitations such as the** darker color and higher viscosity which restrict use to **non-food applications**.

Companies and export brokers

Middlemen, or export brokers purchase the product to resell it across the border, towards processing facilities in Sudan. Only to a small extent the harvested gum arabic is transported to Juba, which is the main commercial hub for most commodities.

Ramciel company is a national private sector player operating under SUDD Services and Investment Co. Ltd, the only one operating in the Renk county in the gum arabic sector next to a large number of individual traders. Ramciel is an agro-dealer trading sorghum (60%) and gum arabic (40%). The company buys the gum arabic from the local agents to aggregate and export it to China and UAE, as well as to Sudanese traders. The product is transported to Juba by barge. Ramciel estimates that in a typical season it trades 1,000-2,000 bags of gum arabic. With the ongoing conflict, the production capacity of the region decreased – disrupting cashflows and capital availability for Ramciel.

Other private sector actors somewhat involved with the gum arabic value chain are Elaag, B&S Group, Ramciel, Sufta Company Ltd, Hub Logistic, Nile agriculture cooperative society or Guardian Angel. While it was not possible to interview all of them, it is clear that none possess the processing facilities required to add value to the raw gum arabic harvested throughout the country. All of them trade or transport gum arabic as a part of their business, but do not operate only in gum arabic.

For instance, Elaag is an agro-trader, based out of Juba, trading gum arabic among other products. Remarkably, Elaag trades gum arabic which is harvested in Renk, then processed in Sudan, transported back to South Sudan and then exported. Elaag has exported to the UAE and to France. However these sales are one-off deals rather than long-term agreements.

Another relveant actor, is the B&S group, a Juba-based company with its core business in transport services and logistics, and some minor operations in gum arabic. The company buys raw gum arabic from agents and collectors in the Aweil and Renk counties. The gum arabic is then sold on the local market in Juba (e.g. Konyokonyo, Customs, Jebel) for incense as well as to exporters. For their export business, B&S group acts as aggregator. The scale of their business remains unclear, but it was reported anecdotally that they exported gum arabic through Uganda.

While difficult to quantify, a large share of the South Sudanese production is absorbed and smuggled by trade networks of Sudanese middlemen directly to Sudan or Ethiopia via informal trade channels.

Gum arabic **export price was about $1.5 USD per kg**, which has increased to $1.7-2.0 USD per kg over 2024. Strong price fluctuations are common, due tosupply, demand, purity, and geopolitical factors - especially as conflict affects production. Most importantly, South Sudan export price refers to the raw, unprocessed product. For reference, the refined market price of gum arabic when sold internationally can reach up to $3 – 4 USD per kg for the cleaned product; up to $5-8 USD for fully processed food-grade, and up to $12 USD per kg for pharma-grade product.

Processing (outside of South Sudan)

Gum arabic is processed into powder through a process which can be shortly summarised as follows. It is important to remark that the largest share of gum arabic is exported in its raw format, given the lack of availability of facilities and machineries. For information purposes, below the processing steps are described.

Cleaning and Screening Machines: automated cleaning machines remove external contaminants using vibration, sieving, and airflow techniques, ensuring the raw gum is free of large impurities.

- Dehumidifiers and Dryers: prevent spoilage during storage and improve the efficiency of downstream processes.
- Crushing and Grinding: crushed into smaller particles or ground into powder form. This stage is critical for achieving consistency in texture and maximizing the gum’s surface area for solubility. The equipment for crushing and grinding is composed of jaw crushers, hammer mills and pulverizers).

- Dissolution and Filtration: To ensure purity and remove water-insoluble impurities, gum arabic is dissolved in water and then filtered. This process requires advanced dissolution and filtration systems.
- Dissolution Tanks: dissolve gum arabic efficiently and uniformly.
- Filtration Units:, ensure high purity and removal of unwanted particles.
- Pasteurization: a critical step for ensuring microbial safety in gum arabic, particularly for food-grade and pharmaceutical applications.
- Spray Drying: Spray drying is the cornerstone of gum arabic processing. It converts the liquid solution into a fine powder, making it easier to store, transport, and integrate into various applications.
- Agglomeration and Granulation: For some applications, gum arabic is required in granulated or agglomerated forms to enhance solubility and handling properties. Agglomeration unit is composed of fluid bed agglomerator that creates free-flowing, dust- free granules with improved rehydration properties, and granulator that is precision- engineered to produce uniform granules, ideal for use in the food and pharmaceutical industries

Figure 2: Processed gum arabic at Elaag company

Impact of conflict on trade routes

Given that some supply routes to Sudan have been destroyed by the war, a recent report indicates, that alternative export routes have emerged including Mombasa port on the Kenyan coast, implying that some exporters are currently using Kenya's port of Mombasa as export gateway. A recent report by Reuters has implicated Kenya in the illegal export of gum arabic from the RSF- controlled territory. The Kenyan government is increasingly being accused by SAF of siding with the RSF. Kenya is also an export route for Gold from the RSF-controlled region. The scale of business partnership and volume of business between Kenyan-Government (Ruto) and the RSF leadership (Hemedti) is unknown. According to data from Eurostat, Kenya's exports of gum arabic have jumped from 16,000 kilogrammes in 2014 to 170,678 kg in 2023, indicating external supply sources, possibly the RSF controlled regions.

Supporting functions

Supply of inputs

Gum arabic is harvested from special trees of different varieties, such as Anguat (Acacia Senegal), Biy (Vachellia Seyal / Acacia Seyal), Aluiy (Acacia nilotica). The first two, as discussed above, produce gum arabic for international trade, while the third and fourth ones two are only relevant for local consumption of gum. Currently all gum arabic is harvested from wild trees for more than 95% of its production in South Sudan. While it is acknowledged that these trees could in principle also be planted, there are only very small-scale efforts; for instance, in 2018 the South Sudan Gum Arabic Company proposed a plantation in Northern Bahr el Ghazal, but the project was delayed and then halted because of insecurity in the region. Other pilots by FAO and UNDP did not result in successful outcomes due to drought and poor management. Therefore, wild harvesting dominates as gum collection remains a seasonal livelihood for pastoralists population, and it is cheaper to harvest wild trees than to wait for plantation (average growth time for a tree 4-7 years).

At the level of production, inputs such as tapping, collection and drying equipment are very basic and reported to be currently available on the local market. Harvesting gum arabic only requires very basic inputs, such as harvest and tapping tools. The traditional version of this tapping tool is named *Sonki* (Figure A). There are also new gum arabic Harvesting tools, made up of stainless metal and composed of a harvesting tool and a harvesting *assistant* as represented in Figure B. Tools are available on the local market and cost around 10,000-15,000 SSP.

A: *Tapping tool*

B: *Modern Tapping tool and harvesting assistant*

Figure 3

Information and skills on trees management

Trees are affected by pests (locust and animals) that destroy trees at night, which are very difficult to control given that the trees are in an open natural forest. Other threats to trees are competing economic activities such as bush burning and charcoal production. There are efforts to restrict production of charcoal to trees that are not relevant to gum arabic production.

Information and skills on tapping practices

To a large extent, knowledge and awareness of sustainable tapping practices is not available for farmers in Renk. The practices used for gum arabic harvest can have a large impact in the long-term on trees' production capacity. In fact, wild trees can produce gum for 20+ years if tapped sustainably; but over-tapping kills trees within 3–5 years, reducing future yields (FAO). FAO has developed a 'Tapping and not killing method' that describes sustainable tapping practices, that includes, for instance:

- Selecting the right trees (e.g. tap only mature trees (more than 5 years old, with more than 10 cm trunk diameter).

- Proper tapping technique (e.g. using a sharp, clean knife or *maktaa* (traditional curved blade), with cuts depths of less than 3 mm (only pierce the bark, not the cambium layer). Also cut direction, spacing, peeling techniques are relevant. Ring-Tapping (circling the trunk kills the tree) shall be avoided.
- Seasonal timing (e.g. tap trees in the dry season (December–April) when trees are dormant,and consider time for trees recovery (e.g. 1-2 years) without tapping.
- Avoid overharvesting (e.g. avoid tapping more than 30% of a tree's surface).

Storage and post-harvest facilities

In Renk, the lack of adequate knowledge on quality standards and post-harvesting techniques leads to the production of lower quality gum and post-harvest losses. In fact, storage facilities are scarce, and the know-how to handle the gum when it comes to sorting, cleaning, grading and packaging is only available to a limited extent. Storage facilities are government-owned, and are often in poor condition (e.g. leaking roof and wet floor), therefore impacting the quality of the produce which is strongly affected by humidity. Moreover, the lack of modern machinery can lead to challenges such as mixing of different gum varieties and residues, which lowers the quality of the gum produced.

Most importantly as the gum arabic is sold to middlemen traders in small batches and fully unprocessed implementing opportunities for improved cleaning and storage facilities would require first the set-up of cooperative structures for collectors.

Access to credit

There is very limited supply of financial services in the current gum arabic market system in the context of Renk. Local traders are the ones who at times need access to financing to be able to hire labourers or rent community land. The only provider of credit in Renk is Ramciel company. Loans are paid back in the form of bags of gum arabic after harvest.

Rules and norms

Institutional gum arabic framework

At the national level, there is no formal legal framework that regulate the production, pricing, quality standards and export of gum arabic. Responsibilities are spread among various actors resulting in a lack formal linkages to the international market, fair market prices and international recognition. Within the government, the ministry of agriculture and food security (MAFS) oversees forestry and agroforestry policies, while the ministry of trade and industry regulate export licenses for gum arabic, and attempts to attract foreign investment in gum processing.

Beyond governmental bodies, the set up of a South Sudan gum arabic Association has been discussed since 2022 but does not seem to be operational yet. Its role would be to advocate for harvester rights and link farmers to international buyers, so to bypass Sudanese middlemen.

The South Sudan National Bureau of Standards (SSNBS), theoretically sets quality standards for exports (including gum arabic); but has no testing labs to certify gum arabic for food/pharma grades which means that South Sudan keeps relying on Kenyan/Sudanese labs for compliance checks.

Commercial licenses

Local traders in Renk buy commercial licences to be able to operate in Renk. The local government sells the licences for one season at 500,000 SSP, which is approximately the value of one Gumthaar of gum arabic**.** These are personal licenses, associated to a specific trader rather than to a specific land plot.

Forest management, community agreements and land disputes

The management of forests where gum arabic is collected involves a mix of traditional and governmental systems, but oversight is often weak due to conflict, limited state capacity, and unclear land tenure. Formally, the Ministry of Environment and Forestry owns all forests, but enforcement is weak, with almost no dedicated gum arabic management policies. Local chiefs (*Boma* and *Payam* leaders) and clan elders regulate access to forests, with harvesting rights often being allocated based on family or communal land claims. Wild gum arabic trees are treated as common property resources, with specific rules varying by tribe (e.g., Dinka, Nuer, Bari).

Land disputes are common, due to overlapping claims generating inter-communal conflicts. Competition between harvesters and charcoal producers also generate conflicts. Conflicts cases are settled by community leaders, or, in some cases handled in the court of law.

Quality standards and pricing

Gum arabic prices depend on the grade and quality of the product. In Sudan and South Sudan different qualities of gum arabic are divided in a Kordofan Grade and a Hashab Grade. The Kordofan Grade (Gold Standard), harvested from *Acacia Senegal* mostly in Kordofan/Darfur regions. This is further divided in subgrades: namely a *superior grade* (white/transparent) with highest price and adequate for utilisation in the food industry, a *first grade* (light amber colour) – for general food use; and a *second grade* (dark amber colour), for industrial applications. The Hashab Grade, harvested from *Acacia Seyal* has darker, higher viscosity, and is used for industrial applications in paints and inks. The global benchmark for quality gum arabic for utilisation in the food industry is **Kordofan HPS** (Hand-Picked Selected).

Beyond the tree species, other factors that affect the gum arabic quality are the harvesting method, the climate conditions (as drought-stressed trees produce inferior gum), the processing (mechanical cleaning vs. manual sorting) and the storage (as moisture exposure degrades quality). Currently, while South Sudan's gum is naturally suited for Kordofan grade, it remains undervalued due to a lack of cleaning infrastructure, certification and market linkages. In Sudan, for instance, the Gum arabic Board (GAC) issues Kordofan HPS certificates for premium gum while a certification body in South Sudan currently does not exist. **The MARKUP II project by the ITC and the EU aims to enable South Sudan National Bureau of Standards for the accreditation of its certification services.**

Fair trade and ethical certiciations

Beyond the ongoing work on quality standards, there are global organisations such as FairWild and Fair for Life that certify gum arabic on social and environmental principles. FairWild offers certifications with a focus of sustainability and certifies that wild-collected gum meets ecological and fair-wage standards. It's structured around three themes (ecological, socio-cultural and business) and seven key principles including considerations on nature conservation, workers rights, local communities' customary rights, and compliance with local regulations. Similarly, the Fair For Life label guarantees a fair purchase price higher than market prices, purchase commitments over 3 years minimum, a protection mechanism for producers in the event of a crisis, decent and safe working conditions throughout the sector, strengthening the autonomy of producers, environmentally friendly agricultural practices. These principles apply throughout the whole supply chain covering producers, traders, manufacturers and brand holders. To the best of our knowledge FairWild and Fair for Life have not been implemented to date in South Sudan.

Cooperatives

There are no cooperatives, and the whole value chain remains very much based on the individual work of local trader, who hire labour as needed, to work on land that they do not own.

Gender norms

Men and women are formally allowed to participate in gum arabic activities, but as a matter of fact the value chain is dominated by men at harvest, cleaning, packaging and trading activities.

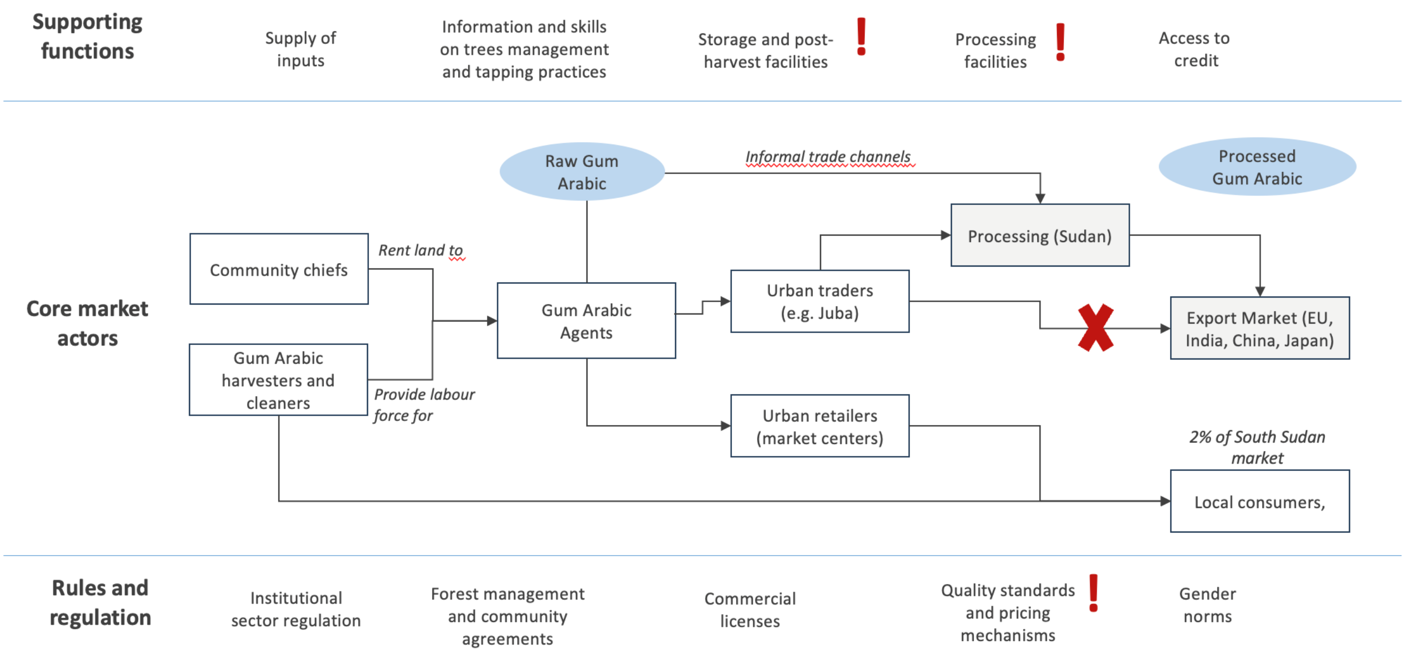

Figure 4: Gum arabic Market System Map (Transaction Chain)

7.2 Proposed intervention areas

Based on the analysis of the gum arabic value chain in Renk, it emerges how challenging it is to intervene meaningfully in this market system. Inputs like tapping tools are basic, and locally accessible, and disease management for naturally grown trees offers little room for improvement. Processing - the key value-adding step - happens entirely in Sudan, where THRIVE lacks operational reach. Meanwhile, deep-rooted issues like land politics, regulatory gaps, and export monopolies require long-term structural reforms beyond the scope of an NGO's mandate. Another core challenge identified, strictly linked to how the value chain is structured is the complete lack of cooperation between farmers. However, while some NGOs are working in that direction – especially in other value chains - building social structures where they don't exist has a bad track record in development, . Nevertheless, there are intervention areas that THRIVE can consider, as discussed below . **The main issues are the complete lack of**

professionalisation of the value chain, with very few large-scale structured private sector actors within South Sudan and many agents and middlemen. To enable systemic change THRIVE can start from different angles.

INTERVENTION AREA #1: Cost-sharing of basic cleaning and storage facilities in Renk

A key issue in the gum arabic value chain in South Sudan is the **complete absence of any value addition process, which means that the gum arabic is exported in its raw form for a low price.** Given the market size for gum arabic, and the role that South Sudan has in the global supply of this prodcut, this is a significant **missed opportunity to generate incomes within the borders of South Sudan**. While processing gum arabic all the way to food or pharmaceutical grades requires complex machinery, including testing laboratories – there are intermediate steps that can be undertaken to enhance the grade and quality of the product. As discussed in previous sections, factors such as the harvesting method, the climate conditions, the cleaning method and the storage condition affect prices. In particular, when it comes to storage, it is key that the gum arabic is kept away from water and humidity. Making cleaning machinery and dry storage facilties available within the South Sudan borders is a first step towards a better functioning gum arabic sector. As the main large-scale private sector actor with physical presence in Renk, Ramciel company appears to be a realistic partner for THRIVE to collaborate with on this issue. Ramciel currently buys the gum arabic from the local agents, it aggregates and exports directly to international market or resellls it to other companies in Juba in bulk. Further partners with whom THRIVE could explore a partnership are Elaag, or the B&S group – both Juba-based companies who buy the gum arabic in Renk, even if at smaller scale than Ramciel.

<u>Intervention modality:</u> THRIVE could **partner with private sector companies (e.g. Ramciel, B&S group, Elaag) and agree on a cost sharing model to establishing cleaning and dry storage facilities for gum arabic in Renk.**

The conflict has caused capital access issues and supply issues in gum arabic for Ramciel in Renk. Displaced people has reduced harvest of raw products, while the reduced availability of capital has reduced Ramciel's ability to buy stock or potential to invest in innovation. These innovations should be aligned with the incentives of all actors:

- Ramciel can increase the prices they receive and the total revenue from increased volumes. Particularly with the global supply disruption from the war in Sudan, there is a global supply gap from which they can benefit if production and quality can be increased.
- Harvesters can increase their revenues and reduce value lost by harvesting more and getting better prices for their yield.

Supporting Ramciel to either increase purchasing power or to invest in value added facilities in the Renk can contribute to THRIVE's objectives in several respects:

- Increase in processing within Renk can add to the value captured by harvesters
- Additional processing within South Sudan can increase jobs available in gum arabic
- Improved storage facilities can reduce post-harvest (value) loss and increase resilience

The most appropriate intervention model and modality must be developed through further conversations with potential partners including Ramciel. Based on other contexts, models might include:

- Larger scale finance-focused interventions such as credit guarantees for Ramciel which would enable them to borrow in order to purchase more to meet international market demand.
- Investment finance for Ramciel to set up storage and cleaning facilities in Renk. This would increase loyalty of sales from farmers and increase the quality of product purchases and therefore sales price.

- Alternatively, THRIVE might wish to pilot a subscription-based storage and cleaning facility in Renk. This is problematic without a pre-existing organisation and governance structure, but has worked in other contexts including the storage of ginger and for feedlots in livestock.

INTERVENTION AREA #2: Implementation of lead agents extension model

The overall sector currently **lacks harmonised standards on quality and pricing for gum arabic**. The MARKUP-II project of the International Trade Centre is working at the institutional level to support the South Sudan National Bureau of Standards while providing trainings. As a national standard for gum arabic will start to come into place and be implemented, it will become crucial for companies such as Ramciel to be able to differentiate systematically and trace how gum arabic is harvested, from what type of trees, and similar factors. Collecting this information requires capillary work in the field.

Intervention modality: Intervention area one focuses on attainable and small increases in value captured locally for what is, on a global scale, a very high value commodity. It is also possible to be more ambitious in terms of capturing value locally, for which there are many options. One such option is an improvement in the raw materials that are provided to processing companies. One factor undermining quality is the harvesting and post-harvesting treatment practices of harvesters, in this fragmented and informal value chain.

As one small and realistic option to overcome this challenge, THRIVE could support the **development of an extension model to be implemented through Ramciel -** to train "*lead agents*", whom beyond their usual responsibility for coordinating labour and harvest and selling it to the company – will also be **in charge of reporting on gum arabic quality, and overall practices adopted, to Ramciel**. Such *lead agents*, once trained by the company, could provide this as a service, for a fee, to Ramciel. They would be able to report information on their own product as well as on the product quality of the gum arabic harvested by others. The main benefit for Ramciel will be to have more reliable and direct information on the quality of the gum arabic and a guaranteed higher quality supply, while on their end, the *lead agents* would have access to another source of income. For harvesters, incrementally, they will learn improved harvesting practices which should increase their revenue. Finally, for the agents, they will receive an additional fee from Ramciel as the company is able to obtain higher prices from the higher quality products.

As this change in practice represents a risk to Ramciel, THRIVE could seek to share this risk but cost-sharing some of the necessary investments – such as training materials and logistics – or to provide technical assistance to Ramciel to support curriculum development or other aspects of the model.

INTERVENTION AREA #3: Development of a traceable supply chain

Similarly to the point above, due to the lack of formal organisation and oversight within the gum arabic value chain in South Sudan, there is no enforcement of social or environmental practices. Most of the harvesting and trading is carried out informally, often without basic safeguards in place to ensure decent working conditions, fair wages, or protections against child labor. The absence of traceability mechanisms means that buyers have little visibility into the social and environmental conditions under which gum arabic is sourced, further disincentivising any efforts toward ethical sourcing or value chain accountability. As global markets increasingly demand compliance with fair trade and sustainability standards, there is potential to leverage responsible sourcing as a driver for improving labor conditions in South Sudan's gum arabic sector.

Intervention Modality: While in a similar broad area to interventions 1 and 2, this intervention is far more ambitious and represents an opportunity to capture a far greater proportion of value by accessing premium markets for gum arabic. **THRIVE could initiate partnerships with international buyers committed to ethical and sustainable sourcing—such as Alland & Robert (France) —to co-develop a traceable supply model.** This would involve identifying key gum arabic agents, to introduce basic documentation and monitoring systems that can track the origin, the labor conditions of gum arabic as well as the tapping practices adopted. Buyers could be invited to share the upfront costs of establishing these traceable supply arrangements, including training agents and harvesters on fair labor standards, implementing internal control systems, and developing certification pathways over time. Such collaboration could also incentivise agents associations that adhere to agreed-upon social and environmental standards. In the long run, this model would improve labor conditions and transparency but also open access to premium markets that reward ethical sourcing—creating a virtuous cycle of higher income, better labor practices, and more resilient supply chains.

THRIVE's facilitation role in this area could be as simple as researching and making introductions to these major buyers, or could include more investment-heavy roles in providing purchase price guarantees on pilot consignments.

INTERVENTION AREA #4: Diversification of trade routes

One of the intrinsic structural challenges of the South Sudanese gum arabic value chain is **its heavy dependency on Sudan for trade and export**. Currently, the vast majority of gum arabic produced in South Sudan is transported and sold through Sudanese channels, leveraging established logistics, market networks, and export infrastructure that South Sudan lacks. However, this dependency places South Sudanese producers and traders in a highly vulnerable position. Political instability in Sudan—including border closures, conflict, or regulatory changes—can lead to sudden trade disruptions, reduced prices, delayed payments, or even the complete halt of exports. These risks are compounded by the lack of alternative trade infrastructure or viable export markets within South Sudan itself. Diversifying trade routes is therefore a critical aspect for increasing the resilience and sustainability of the gum arabic sector.

Intervention modality: THRIVE could **work together with South Sudanese traders and private companies to explore and establish alternative export corridors**, particularly through neighboring countries such as Kenya and Ethiopia. This may involve conducting feasibility assessments of logistical routes (e.g., through Nadapal to Kenya or Pagak to Ethiopia), identifying bottlenecks in infrastructure or regulation, and facilitating cross-border trade agreements with relevant authorities. In parallel, cost-sharing with private sector companies for basic trade infrastructure—such as storage, transport, and processing facilities near alternative border points—could be supported. By helping South Sudanese actors reduce their reliance on Sudan, such interventions would not only mitigate political risk but also strengthen the country's autonomy and bargaining power in the global gum arabic market.

While underexplored, as with any emerging logistics market, coordination is a problem and could be an area in which THRIVE could support. In other contexts, for example, shared procurement platforms to buy space on transport (in this case barges) could allow aggregators to predictably book space on transport header to Kenya or elsewhere without the unpredictability of constantly transporting products to and from waiting for a space. It also provides some stability of pricing which can be passed on to customers.

THRIVE's investment here could be directed towards supporting trade missions to neighbouring countries, facilitating policy dialogue with government on easing trade frictions, or supporting pilot consignments for new supply routes as above.

INTERVENTION AREA #5: Introduction of tree planting practices

A peculiar factor emerging from the analysis of the gum arabic value chain in South Sudan is the fact that it is **fully harvested from** Acacia senegal and Acacia seyal **trees in natural forests**, and that – despite local stakeholders generally recognise that these trees could in principle be planted, this has never been done at scale until now. This leaves long-term productivity and sustainability vulnerable to environmental pressures, overharvesting, and land-use changes.There are different options to introduce tree planting. There is clear potential to introduce more proactive cultivation strategies. In many contexts, such interventions begin with the establishment of tree nurseries that provide seedlings for sale to individual farmers. However, in the case of gum arabic in Renk, individual harvesters have limited authority or incentive to plant and manage trees on their own. Instead, community chiefs—who hold influence over land use—emerge as critical actors in any effort to enhance the gum arabic tree population. Further, the timeline to results from this practice for THRIVE would be very long and likely well beyond the life of the programme.

Intervention modality: THRIVE could **collaborate with local financial institutions and forestry experts to design a community-based afforestation model** tailored to the local governance structure. This approach would involve supporting community chiefs in the allocation of suitable communal land for increasng the population of Acacia Senegal trees – those able to produce the higher gum arabic grade. Financial incentives or access to microcredit could be provided to communities to invest in nursery development, planting, and long-term tree care. While it is true that results from tree planting are medium/long-term (4-7 years before a tree reaches maturity), by positioning community leaders at the center of such initiatives, this approach could strengthen local ownership, enhance resilience of the gum arabic value chain, and promote the regeneration of a key natural resource in a way that aligns with cultural norms and land governance practices.

INTERVENTION AREA #6: Promotion of more structured agreements among market actors

In line with the overall lack of professionalisation in the gum arabic value chain in South Sudan, commercial relationships among market actors are largely informal. Transactions are typically based on verbal agreements and short-term arrangements between harvesters, agents, middlemen, and traders. This informality contributes to a climate of uncertainty and risk aversion, where neither side is willing to make long-term commitments or invest in practices that yield benefits over time—such as sustainable harvesting, replanting of trees, or the maintenance of land and trees. Without contracts or predictable market arrangements, harvesters have little incentive to manage trees responsibly. In fact, short-termism often drives unsustainable behaviors such as over-tapping or neglecting fallow cycles, which can degrade tree health and reduce productivity over time. Similarly, community leaders have few reasons to allocate land for tree regeneration or invest in preserving communal tree stocks, since there is no guaranteed return or stable market linkage to justify the effort.

Intervention modality: THRIVE could work to introduce and support basic formalisation within the value chain through the development of written agreements—such as seasonal or multi-year contracts—between community chiefs, gum harvesters (laborers), and intermediary agents or local traders. These contracts would outline roles, responsibilities, and shared commitments to sustainable harvesting practices. For example, a contract could include provisions on: respecting tree resting periods to avoid overexploitation, allowing replanting, providing harvesters with guaranteed minimum purchase prices, etc. Over time, formalising these relationships can reduce risk, build trust, and encourage a shift from exploitative short-term transactions to more stable, sustainable value chain engagement. By anchoring contracts within traditional leadership structures and aligning incentives across actors, this approach would lay the groundwork for a more resilient and environmentally responsible gum arabic economy.

As above, **gum arabic agents** are the critical actor in the way that the value chain currently operates – securing harvesting rights, labour, and customers. They are currently incredibly informal and depend on recurrent relationships. In other similar contexts, such as domestic labour markets in Ethiopia, MSD programmes have had success in seeking to grow and formalise the most effective and ambitious of these informal actors. There, supporting the growth of those exhibiting better practices in terms of securing work, labour standards etc, were supported to grow and overcome some of the challenges of weaker informal markets above; essentially introducing a market mechanism in the selection of agents where they previously did not exist. This strategy by THRIVE could be linked with some of the above interventions, most notably intervention 2, but also potentially interventions which involve identifying new products and new customers.

8 FRUIT AND HORTICULTURE MARKET SYSTEM

8.1 Status of the market system

Vegetable production, and to a smaller extent fruit production, are important sub-sectors that have a potential to boost South Sudan's economy and household nutrition security. These can be grown extensively in all states of South Sudan because of the suitable climate.

It should be noted that while some fruits (grown on trees) can be considered NTFPs, this is not always the case such as for vegetables that are farmed in open lands. Yet for the purpose of this assessment, a broad definition is adopted, and all fruits and vegetables are included in the discussion.

Potentially, fruits and vegetables production in South Sudan may provide significant yields and are easy to grow in various soil conditions.[36] However **the extent to which fruits trees and vegetable crops are developed varies widely throughout the country and by product.**

Some of the main fruits produced throughout the country include bananas, pineapples, lemon and oranges, whereas the main vegetables produced include sweet potatoes, okra, tomatoes, cassava leaves, and increasingly onions. Fruit trees and vegetables are mainly small-scale or backyard-level.[37] National strategies are underway to boost commercial horticulture—including a five-year fruit and vegetable roadmap—but production remains limited and heavily reliant on imports from Uganda and Kenya[38].

For vegetable crops, the GUN region maintain mostly subsistence-level vegetable production, often limited to household gardens or floodplain plots, with less commercial scale[39] **Renk county is an exception to that, as – despite being located in the Upper Nile - it has a significant amount of land utilised for medium-scale vegetables crops.** Renk has **some of the largest irrigated plots per farmer**, especially near Abu Khazera and the White Nile floodplains. Renk County hosts medium-scale vegetable cultivation, particularly along the Nile floodplains. There are approximately 125,000 hectares of irrigated farmland in the county growing a variety of crops, including vegetables in large-scale schemes, although vegetables account for a small fraction of this.[40] On the other hand, **fruit trees** are far less common and mostly limited to home gardens or pilot agroforestry programs.

36 https://erc.undp.org/evaluation/managementresponses/keyaction/documents/download/6539

[37] erc.undp.org

[38] foodsystemsdashboard.org+15intracen.org+15erc.undp.org+15

[39] csrf-southsudan.org+15climis-southsudan.org+15microdata.worldbank.org+15

[40] openknowledge.fao.org+12afrikansarvi.fi+12eyeradio.org+12

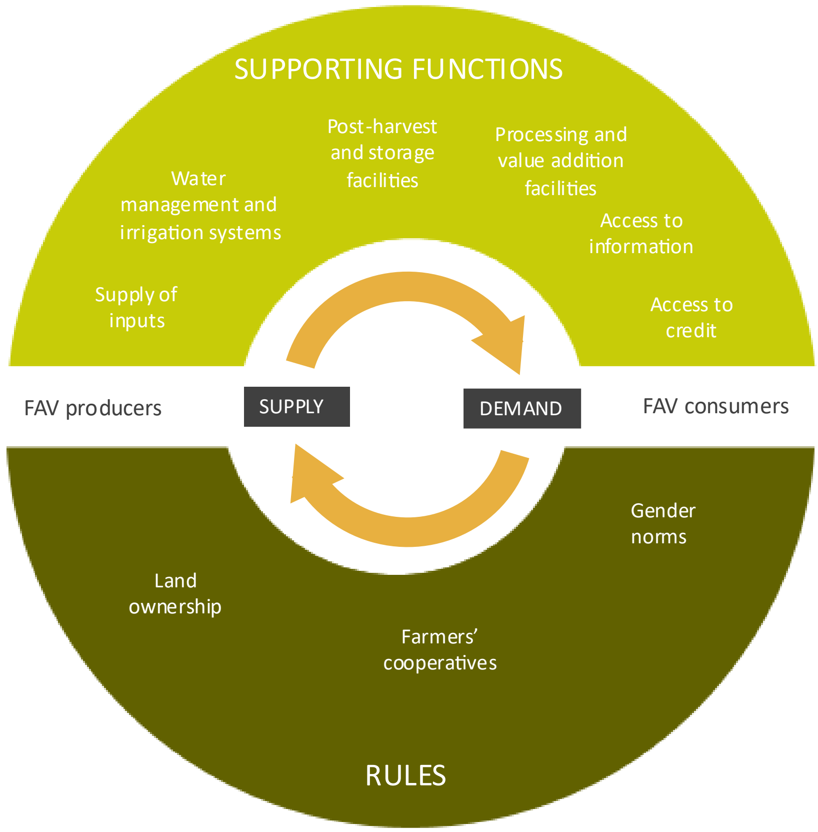

Figure 5

There are three possible pathways from THRIVE to potentially achieve its goals through intervention in the fruits and vegetables market system.

1. Support the **growth of commercial scale vegetable** (and fruit) **production in Renk** to support livelihood improvement through waged labour on farms and to support nutrition security through increased availability and reduced price of vegetables on the local market.
2. Support the commercialisation and **improve the resilience of smallholder vegetable production in Renk and Rubkona** to improve livelihoods through increased incomes reduced losses.
3. Support **improved yields for smallholder vegetable producers** for improved nutrition security.

The supporting functions and rules of which underlie these different theories of change are similar, but differ in nuanced ways and present different degrees of feasibility for intervention, as detailed below.

Core market actors

Commercial scale farmers

The irrigated land **in Renk County** is used for **diverse crop production**. Overall, the irrigation land is utilised across multiple layers: broad areas dedicated to cereals and oilseeds, and subsections within these zones designated for higher-value vegetables by smaller independent farmers.

- Staple cereals: Large schemes along the Nile floodplains—such as Gaiger, Magara, and Abu Khadra—grow mixed crops encompassing, rice, maize, and sorghum[41]
- Cash crops: Specialised plots (approx. 2,000 ha across the main schemes) cultivate cotton and sunflower under organised irrigation systems.
- Small-plot horticulture: Within the larger irrigated zones, hundreds of farmers operate 2–10 ha plots for okra, tomatoes, eggplant, onions, and pumpkins—some individual holdings reach up to 4.5 ha.

Based on data from Renk County Agriculture Department there are between 5,000 and 10,000 feddans (2,000 – 4,000 ha) allocated commercial farmland for fruits and vegetables. Out of this it is estimated that about less than 1,000 ha is currently in use for vegetable and fruit. Individual farmers' properties range between 50 and 150 feddans. Historically a large number of commercial farmers were from Sudan, while now ownership is mixed between Sudanese and South Sudanese.

There is commercial vegetable production of okra, tomato, eggplant, sweet potato, onion, pumpkins, water cress, pepper, and cucumber - but there are only few fruit producing farmers on very small scale focusing on guava, lemon, mango and watermelon.

Significant changes to Renk's ability to produce and sell fruits and vegetable have taken place since the war. It is estimated that production capacity as of today is at 10-15% than prior to the war. While the cultivated area used to expand until 2 km from the Nile, now the system is limited to a radius of 500 meters from the river banks – also due to a large-scale government-owned generator that has stopped functioning and has not been repaired. As a result, there is land which is currently not being used productively.

Prior to the conflict, fruits were exported to Sudan for further value addition and consumption. However, as the population that imported fruits from Renk to Sudan is displaced these opportunities for exports to Sudan no longer exist, and trade is actually reversed, with South Sudan importing fruits from Sudan.

In Rubkona and other areas of the Great Upper Nile the general picture is quite different. Vegetable production remains small-scale and largely subsistence-focused, with limited irrigated plots. It is estaimated that about 20% of households engage in crop cultivation – with plots ranging from 1-4 feddans (e.g. 0.4 to 1.7 ha per household).

Traders

Vegetables produced in Renk are marketed through a combination of local vendor networks, humanitarian procurement, and regional export channels, linking county producers to both domestic cities and neighbouring

[41] papers.ssrn.com+8afrikansarvi.fi+8content.unops.org+8content.unops.org+2openknowledge.fao.org+2papers.ssrn.com+2.

nations. Vegetables from irrigated farms—primarily in schemes like Abu Khazera, Magara, and Gaiger—are distributed through the following channels:

Local Market Traders: farmers sell to market vendors operating in Renk. Sales are managed by farmers individually; there is no joint marketing by an organised groups or cooperatives. Traders buy from individual farmers/produces in a common market place and transport the vegetables to other areas and markets for retail or selling to retailers. Traders then transport the products to areas such as: Renk, Paloch, Shumadi market, Ataham (refugee population from Sudan), Bibinis (refugees area), and in some cases to the neighbouring Maban County. Onion production is currently scaling up and has a good market in Juba.

WFP & Humanitarian Programs: While staple crops like sorghum dominate, there's growing interest in integrating vegetables into humanitarian food baskets. Formally organised farming groups, backed by CMD and FAO-WFP, supply vegetables to wholesale buyers and humanitarian agencies via rural aggregation centers.[42]

Consumers

In general terms, farmers' produce is sold to end consumers in open-air retail markets, kiosks, and agribusinesses and small supermarkets and grocers (such as Fresco Supermarket, Phenicia, Lily's, and Vamp Vegetables & Fruits). However, especially since the conflict has been affecting the Great Upper Nile and its local economy, **demand is higher than supply,** which means that produce very rarely is exported to other counties or countries.

In Rubkona and Fashoda, stockouts are common especially during offseason production period. Since markets (also those that are relatively close to each other) are not well integrated due to the complicated logistics, commodities are not exchanged easily between markets.

In Renk, despite the generally larger scale production capacity - the current local supply still does not meet the local demand, also due to an increased demographic pressure associated with refugees, returnees and internally displaced population.

This has led to slightly increased vegetable and fruit prices in Renk. Current market prices for main vegetables and fruits in Renk (different measuring units): 1 medium size 50K (tomato), 1 bag of okra 45k SSP ($7.7), 1 bag of sweet potato 350k, 1 bag of eggplant 250k, 1 watermelon 30k, 1 pc of mango fruit 5k SSP ($0.86), 4pieces of guava fruit - 5k SSP (($0.86), 4 pieces of lemon fruit - 5k SSP ($0.86), 1 sack of onion - 300k SSP ($52).

This means that in practice, most products are sold in the local markets, without any value addition and almost no exports. **Tomato is the only product that is still exported to Sudan in the current market system.**

Value addition processors

Fruits and vegetables are barely processed into higher-value products. There is currently no companies doing value addition in South Sudan. All fruits/vegetable are retailed in the local markets without value addition.

[42] eyeradio.org, projects.hpc.tools+6jubaechotv.com.ss+6marketsincrises.net+6

There are at times individual traders - mainly women, who blend fruits to make juice, which is normally served fresh in most market centres in South Sudan. The raw materials are sourced from abroad, with Uganda being the main source supplying Juba and other major towns.

Apart from a few pilot tomato processing trials—where tomatoes are made into paste, concentrates, soups, or ketchup—most vegetables are sold fresh with minimal processing [43]. There have been pilots to develop processing facilities for vegetables such as:

- **Small enterprise initiatives** in Bor, Torit, and Yambio integrate vegetable preservation—such as drying okra, producing tomato paste, and creating packaged snacks—though mainly at cottage or village-level scale.[44]
- **Value addition opportunities** like tomato pastes, vegetable oil, sweet potato chips, and dried okra are recognised but rarely realised in commercial volumes due to limited infrastructure, lack of packaging facilities, and weak cold chains.[45]

Sector strategies and training programs, led by partners like ITC, EWS-KT, and SPARK, aim to strengthen MSME capacities and introduce standardised processing techniques, but these remain in early stages.[46]

Supporting Functions

Farmers face challenges related to frequent seasonal flooding, as well as lack of access to capital to expand farm operations, or to buy irrigation pumps for production during dry season. Inputs seeds are low quality, and farmers struggle with crop pests and diseases, as they have little access to agro-chemical pesticides. Farmers also highlight the need for key materials, such as fencing materials to fence the farm for protection from livestock, or plastic sheets to dry the agricultural produce.

Supply of inputs

In Renk seeds and seedlings are available, some are locally sourced while others are imported from Sudan, White Nile state. Seeds are sold on the local market by different actors. There are both wholesalers and retailers engaged in seed market in Renk. Prices vary depending on type of seed/seedling.

This is different in Rubkona, where seeds are supplied by NGOs, and by one unique retailer "Quality Hotel" , a retailer in Juba who is also a major supplier to FAO.

In Renk and Rubkona, tools for agriculture are distributed by NGOs, are produced by local artisans, or are imported by traders. Farmers use pesticides available in the local market. Farmers who are well informed reach out to seek

[43] ijiset.com

[44] cordaid.org+1spark.ngo+1

[45] fxfoodmachine.com+15erc.undp.org+15farmersreviewafrica.com+15

[46] intracen.org+3intracen.org+3ews-kt.com+3

technical support from the County department of Agriculture. The department provides extension support on need basis, recommends pesticides for farmers and assist farmers to spray their farmers with farmers' own pesticide. There are a number of farmers who do not have the skills on pest management and rarely reach out to Agriculture Department for support.

Overall, the key challenges with input supplies include the poor quality of seed on the market, which are at time expired and the scarce availability of pesticides – as well as the high cost of fuel and transport services. In this already complex context, the input supply chain was affected and disrupted by the conflict in Sudan which was the major source of input supplies. Inputs are often smuggled from Sudan into Renk, in combination with inputs supplied by NGOs and small quantities transported from Juba.

Seed suppliers from Juba are discouraged by the high cost of transport to Renk, and logistical challenges such as delays on the river route with several checkpoints.

In Renk, there are local seed production initiatives started by a few (e.g. Aguer Nyok and sons, Ismael Thiel Company, Diing Ajang). However, these focus on different types of sorghum seeds (e.g. early maturing seeds, different varieties) ant not on vegetable seeds. For vegetables, individual farmers tend to save seeds from their own production.

Water management and irrigation systems

Managing the excess and lack of water is one of the key issues. In recent years, floods have become more frequent, affecting agricultural activities especially between November and January. Given that the vegetable production takes place mainly along the river bank, approximately 25% of the overall vegetable production is affected by the floods each year. In case of flood events, there are limited options for farmers, who tend to stop production and wait for the floods to recede before resuming the production activities. This affects livelihoods as it leads to reduced incomes and destroyed farm shelters. In case of floods, **farmers owning water pumps tend to move to higher-ground areas and use their pumps to generate water and sell to domestic water supplying tankers/carts.**

Dry spells also occur even though less consistently. In 2024, Renk experienced dry spells early into wet season and later followed by period of heavy rains. In 2024, nearly 40% of production was lost as a result of dry spells in parts of Renk including a Akon, Ataham areas. Although on a small scale, farmers are beginning to take up crop diversification as a measure to coping with unpredictable and changing climatic conditions. Planting drought resistent crops together with vegetables guarantees some gains even a climate disaster occurs. In case of droughts, farmers often turn to activities such as charcoal production and gum arabic. In event of a dry spell, the cost of re-planting the farms can take a toll on farmers who eventually resort to investing less in production.

For irrigation, farmers use watering cans for seedling irrigation in nurseries. Water pumps fueled with gasoline generators are used for watering vegetables and fruits in the main field after transplanting. The plan to install a large scale electricity generator to power large scale mechanised irrigation system was halted by the social and political instability.

There is a market for water pumps, with dedicated water pump suppliers in Renk market. These are individual traders who sells pumps and accessories to users. Water pump suppliers are mostly traders with linkages with companies from Sudan, as there is no South Sudanese water pumps company. There are also individual actors who provide maintenance services to water pump owners. However, farmers stress that the cost of fuel for vegetables irrigation is too high, and that water pump maintenance services are insufficient

Storage and post-harvest facilties

As discussed above, demand for fruits and vegetable is higher than its supply. This means that harvested products are directly transported to the local markets and sold off, without value addition. Farmers tend to sell fruits to fruit vendors who in turn retail the fruits for the consumer market. Post-harvest losses are caused by animals (e.g. birds, monkeys and insects), leading to about 20% losses throughout the season.

Access to information

Much of the support to farmers on best production practices, pest managmeent, sales channels/prices come from NGOs and UN agencies implementing projects on the ground. The County Agriculture Department also provides support to farmers on best production practices through extension workers/agents. Public extension workers part of the County Agriculture Department are deployed in the payams and provide techicnal suppor to fruit farmers. They help farmers improve their production through imparting knoweldge and best practices.

Access to credit

Farmers tend to take loans for the farming season, for instance to hire labourers to help in land preparation. Local financial institutions such as Agriculture Bank, Ivory Bank provides loans which they require to be repaid back within about three months. They require asset collateral such as cars, shops, or grantees from the local chiefs. Banks charge a very high interest rate. Sometime banks require farmers to settle their loans by giving some of their produces as loan repayment. Anecdotally, during the last farming season farmers got loans from Agriculture Bank for 5,000,000 SSP, which were requested to be paid back after the harvest season in cash, with a 20% interest rate. The increased cost of production due to the conflict and the ongoing economic crisis combined with a lack of access to financial resources is identified as one of the main constraints limiting the current production of vegetables at sufficient scale to meet the high market demand.

Access to weather and climate information

The weather information system is largely underdeveloped. There is no country-based digital service providing information on seasons, weather predictions or climate trends to farmers. The regional IGAD Climate Predictions and Application Centre (ICPAC) provides forecast for East African countries including South Sudan. However, climate information sharing mechanisms to the local farmers and grassroot populations remains a challenge as South Sudan meteorological department lacks the capacity and resources to implement information-based extension services

Rules and Norms

Insitutional frameworks relevant to fruits and vegetables

The Ministry of Agriculture and Food Security (MAFS) oversees agriculture, food security, forestry, rural development, and cooperatives in South Sudan. Within MAFS, the Directorate of Planning and Agricultural Economics leads policy development, data collection, and early-warning systems, while the Directorate of Food Security Policy and Stakeholder Coordination focuses on food and nutrition policy and inter-stakeholder alignment.

Regulation of inputs remains limited, as the country lacks a comprehensive seed framework. South Sudan lacks a fully implemented seed regulation framework, leading to a prevalence of low-quality imported seeds with minimal border checks ISSD Africa. Efforts are underway: in 2024, the Ministry of Agriculture convened stakeholders to revise a draft seed policy first drafted in 2012. Currently, a technical working group is reviewing and preparing the draft for parliamentary consideration.

Specific to horticulture, the government introduced the first national Fruits and Vegetables Strategy in 2022, with support from the International Trade Centre (ITC) through the EU-funded Jobs Creation and Trade Development project. This five-year plan seeks to expand GDP contribution, inclusivity, and employment, particularly for youth and women, and has been complemented since 2023 by monthly trade fairs in Juba that directly connect producers of crops such as tomatoes, cucumbers, okra, and lemons with urban markets.

Land ownership

Based on data from Renk County Agriculture Department there are between 5,000 and 10,000 feddans (2,000 – 4,000 ha) allocated commercial farmland for fruits and vegetables. Out of this it is estimated that about less than 1,000 ha is currently in use for vegetable and fruit. Individual farmers' properties range between 50 and 150 feddans. Historically a large number of commercial farmers were from Sudan, while now ownership is mixed between Sudanese and South Sudanese.

Significant changes to Renk's ability to produce and sell fruits and vegetable have taken place since the war. It is estimated that production capacity as of today is at 10-15% than prior to the war. While the cultivated area used to expand until 2 km from the Nile, now the system is limited to a radius of 500 meters from the river banks – also due to a large-scale government-owned generator that has stopped functioning and has not been repaired. As a result, there is land which is currently not being used productively.

Associations and Cooperatives

Initially, there were no cooperatives especially among small scale fruit farmers, but recently NGOs have started grouping farmers into cooperatives, so now there are newly established cooperatives in Renk.

Gender norms

One clear norm is that women are usually engaged in subsistence farming while men dominate commercial farming. That said, from a nutrition security perspective, many fruit and vegetable crops are produced at homesteads for domestic consumption by women. There are, therefore, issues in improving nutrition security in terms of their access to markets such as those for inputs to improve the quality and variety of what they can produce.

8.2 Proposed intervention areas

Fruits and vegetables are not a majorly commercial or commercialisable crop for the majority of people in the target counties. As such, the greatest potential to develop an intervention which achieves THRIVE's goals – sustainability and scale of improved livelihoods and resilience – is **through opportunities which see the target groups in fruits and vegetables as consumers; consumers of fruits and vegetables and of the inputs needed to create them.** The GUN region is for the most part not economically viable as a production hub which may be of interest to processors and off-takers and it is a place where there is limited potential for farmers to compete with producers in other regions. However, there is an opportunity for market actors involved in delivering supporting functions and setting and enforcing rules to see the large number of people in the region involved in subsistence production as a consumer market. Improving the distribution and marketing of support services has the potential to improve food and nutrition security in particular and cash-incomes to some degree in a way that is sustainable.

Given that the primary market in these intervention areas are subsistence farmers, a key screening criteria has to be cost; the investment in new technologies, knowledge, or services made by farmers likely won't be compensated by increased revenues and, so, likely has to offset cost of purchasing vegetables, reduce risks of losses, or represent a valued discretionary investment. This limits the range of possible interventions, as below.

INTERVENTION AREA #1: Market development for small scale leasing of solar water pumps

Water presents a problem for vegetables – both if there is too much or if there is too little. Both of these phenomena are common in GUN state. Investment in the production of vegetables is not cheap meaning that low-income farmers have come to avoid it through risk aversion. An important technology in mitigating these challenges is water pumps which can irrigate in times of shortage and remove water in times of flooding. Large-scale infrastructure is either absent or dysfunctional. The cost for privately owned small-scale infrastructure is prohibitive to farmers that have small plots and in many cases grow purely for subsistence. However, in many contexts, pumping water can be treated as a service so as to share the cost between a number of users. Given the poor quality of power infrastructure in the area, solar powered pumps are the most viable option. The advantage of this area for this model and in this subsector is that vegetable farming is intensive and not extensive, meaning small-scale pumping is viable in small land areas. Further, the need for water pumping in both directions provides a higher likelihood of a year round business model which extends the agricultural season and improves productivity.

Intervention modality: THRIVE could partner with a distributor of solar pumps to establish a service delivery network in GUN. The distributor will train, on-board, and support operators of pumps in the service and the marketing of the service. THRIVE will share the cost of the pilot to test the model and the willingness of farmers at different scales to pay. This has been successful in other contexts and is becoming more viable as the cost of technology decreases. In more mature markets such as tractors and mini-tillers, these models have been very successful in extended access to machinery to marginalised populations and increasing the land underproduction.

INTERVENTION AREA #2: Support to improved distribution of inputs

The Greater Upper Nile (GUN) region faces a severe shortage of agricultural input supplies, including quality seeds, tools, and pest control products. Limited market presence, high transportation costs, and disruptions from ongoing conflict have weakened supply chains, leaving farmers with few reliable options. As a result, many rely on low-quality or expired inputs, which hampers productivity and food security across the region.

Intervention modality: THRIVE can promote the adoption of improved seed varieties by increasing farmers' access to certified, high-yielding, and climate-resilient seeds, such as flood- or drought-tolerant types. Many smallholders currently express concerns about seed quality,yet lack reliable information or access to certified suppliers.

It should be noted that this market is embryonic. Even in the main cash crops such as sorghum, production, distribution, and widescale usage of improve inputs are low. As such, THRIVE's role here will be in market building, working with early adopters, and exploring the most viable options. For example, in seeds and seedlings, there are seed producers for sorghum. THRIVE could support these producers who at least have adjacent knowledge and networks and are selling to people who are at least familiar with the concept of paying for enhanced agricultural performance. THRIVE could subsidise the cost of pilots to help these sorghum seed producers to extend their model to fruits and vegetables. The project would become sustainable in time under the assumption that sorghum seed producers start selling the fruits and vegetable seeds to farmers.

Other options that have been successful in similar thin markets include work on the distribution and marketing of other inputs. Given the logistical challenges of reaching areas like Renk and Rubkona this would likely have to begin with focusing on existing distribution networks for any product rather than areas with relevant networks and knowledge. In similar areas in the past, utilising FMCG retailers and ensuring that, through their upstream distribution networks, they have some access to knowledge about how to use the products, has been successful. This is opposed to trying to create relationships and distribution networks where there aren't any or trying to create markets where they are not viable due to an inability to pay.

INTERVENTION AREA #3: Digital extension services

One of the challenges faced by all farmers in GUN is a lack of knowledge on good agricultural practices and on emerging threats. These threats include localised pest outbreaks but also the two main threats which impact upon farmers (and harvesters of gum arabic) in GUN – floods and locusts. The localised shocks can be averted with better information – of example with the prior treatment of crops integrated pest management solutions. In terms of the more major issues of flooding and locusts, while these cannot be prevented with information, farmers can minimize damage and increase resilience with better information by, for example, not planting spending on and planting seedlings which are set to be ravished or harvesting early to prevent total crop loss.

On the good agricultural practices side, there are many techniques which can, at low or zero cost, improve productivity for farmers. In functional agricultural systems, farmers obtain these skills from their families, friends and then importantly, from private networks specialized in agriculture such as input dealers and from effective government extension services.

As above, private input supply networks are all but non-existent. The state is underfunded, disjointed, and the logistical challenges make accessing farmers to disseminate knowledge unrealistic. As farmers have moved or deserted their farms because of conflict and new farmers have come in, social networks have become disrupted meaning almost every avenue for the dissemination of information has been closed.

Farmers in GUN do, however, have mobile phones and will access connection on a regular basis. If they were able to access either routine or occasional information related to improve productivity or resilience, this could have a significant impact on their livelihood. Pending an additional assessment on the field, distribution of information via radio could also be considered.

Intervention modality: THRIVE has options here for either publicly or privately led solutions to this problem. Given the local ability and willingness to pay, a publicly led option could be attractive if there is a realistic prospect of the local government having the capacity and incentive to support such an initiative on an ongoing basis. This would involve THRIVE paying a technology provider to develop a bespoke SSD solution to push out information to farmers. THRIVE's support would likely be used to develop the solution and support the initial collection of data such as contact information. The government's responsibility would be to pay for ongoing maintenance of the database, collation and input of relevant information and any ongoing subscription or maintenance costs, which are likely low and are the responsibility of the agricultural department.

A privately led solution likely has greater chance of sustainability if it can be proven viable. In such a scenario, a 'pay-as-you-go' information solution has been shown to work in other contexts where farmers might send pictures or questions as they have problems or pay a small subscription through airtime to receive relevant information. THRIVE's support would again be to develop the platform and to support the initial marketing push. It should be noted that the relevance of such a solution would be far broader than GUN and would likely find more viable entry points in other counties. It is perhaps more realistic to develop it within these other counties (maybe under THRIVE's forthcoming work in crops) and then extend the sustainable access frontier over time to GUN. In the meanwhile, THRIVE could cover costs within GUN for subscribers to build awareness and willingness to pay over time.

9 STAKEHOLDER ENGAGEMENT ANALYSIS

Actor type & name	Capacity	Incentive	Engagement strategy
1. Ramciel	Local gum arabic trader with significant presence in Renk county.	Purchases gum arabic from local agents and collectors and export it, or resells it to export brokers in Juba. Has interest in having better facilities for cleaning, storing and packaging the product to increase sales	Engage to assess actual needs, willingness to co-invest on gum arabic facilities in Renk and best suited intervention modality, as well as to test the potential of lead agents extension model
2. Elaag	Local agro-trader with some operations in gum arabic	Elaag trades gum arabic harvested in Renk, processed in Sudan, transported back to South Sudan and then exported. Could be interested in enhancing procurement in Renk or localising some of the processing.	Engage to assess actual needs, willingness to co-invest on gum arabic facilities in Renk and best suited intervention modality
3. B&S Group	Juba-based company with its core business in transport services and logistics, and some minor operations in gum arabic.	Trades gum arabic from Aweil and Renk counties, which is sold on the local market in Juba as well as to exporters. Could be interested in enhancing procurement in Renk.	Engage to assess actual needs, willingness to co-invest on gum arabic facilities in Renk and best suited intervention modality
4. Lead agents of gum arabic	Key value chain actors orchestrating the harvest of gum arabic by owning licenses, hiring workers, and land	Could be interested in having longer-term agreements with buyers, and could offer new services (e.g. quality control, grading) for additional income.	Engage to evaluate feasibility of a lead agents extension model

5. Alland & Robert (France)	International gum arabic buyer	Seeks opportunities to purchase certified gum arabic	Engage jointly with South Sudanese exporters to test interest in buying gum arabic from South Sudan while co-developing a traceable supply model.
6. FairWild / Fair for Life	International certification body	Certifies gum arabic on the basis of social and environmental criteria	Engage jointly with international buyers to assess feasibility of compliance for South Sudanese gum arabic
7. International Trade Center – project MARKUP II	International development actor active in the gum arabic sector in South Sudan	Involved at the institutional level to create a national quality standard for gum arabic in South Sudan	Not a direct partner but a key player in the ecosystem to exchange information with. Has contacts with relevant private sector and institutional actors.
8. Agriculture Bank / Ivory Bank	Local financial institution with little participation in the Gum Arabic value chain	Currently provides lending to farmers in other agriculture activities	Engage to explore feasibility to provide financial services to gum arabic lead agents and to provide financial incentives to communities to invest in nursery development, planting, and long-term tree care
9. Sorghum seeds companies Aguer Nyok and sons, Ismael Thiel Company, Diing Ajang	Input suppliers	Currently exploring different seed varieties with a focus on sorghum	Engage to explore feasibility and interest to supply quality vegetable seeds

10. Water pump distributors / retailers	Retails water pumps through linkages with companies from Sudan	Could be interested in a different business model shifting from the sales of water pumps to a leasing service	Engage to explore feasibility of establishing a service delivery network

10 RESULTS CHAIN FOR DESIRED SYSTEM CHANGE

The visual below represents the desired results chain for the gum arabic market system (Figure 6) and for the vegetable market system (Figure 7).

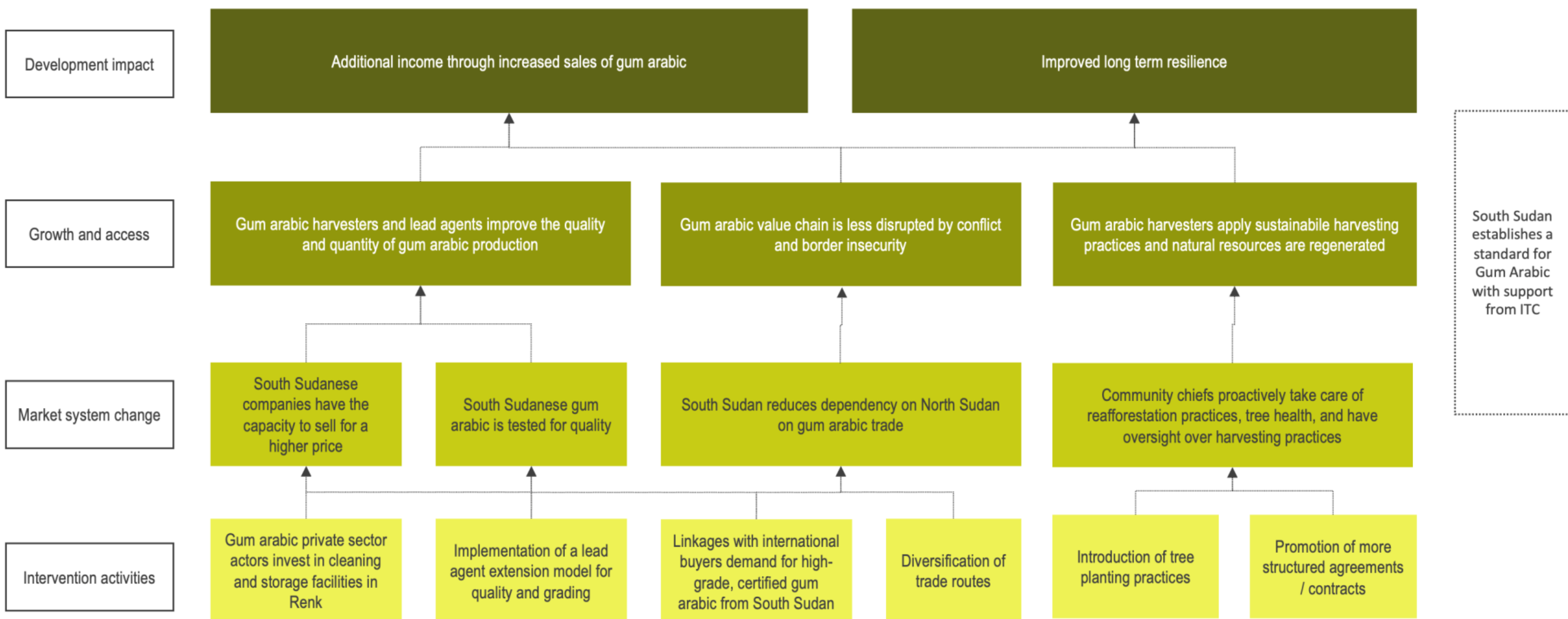

Figure 6

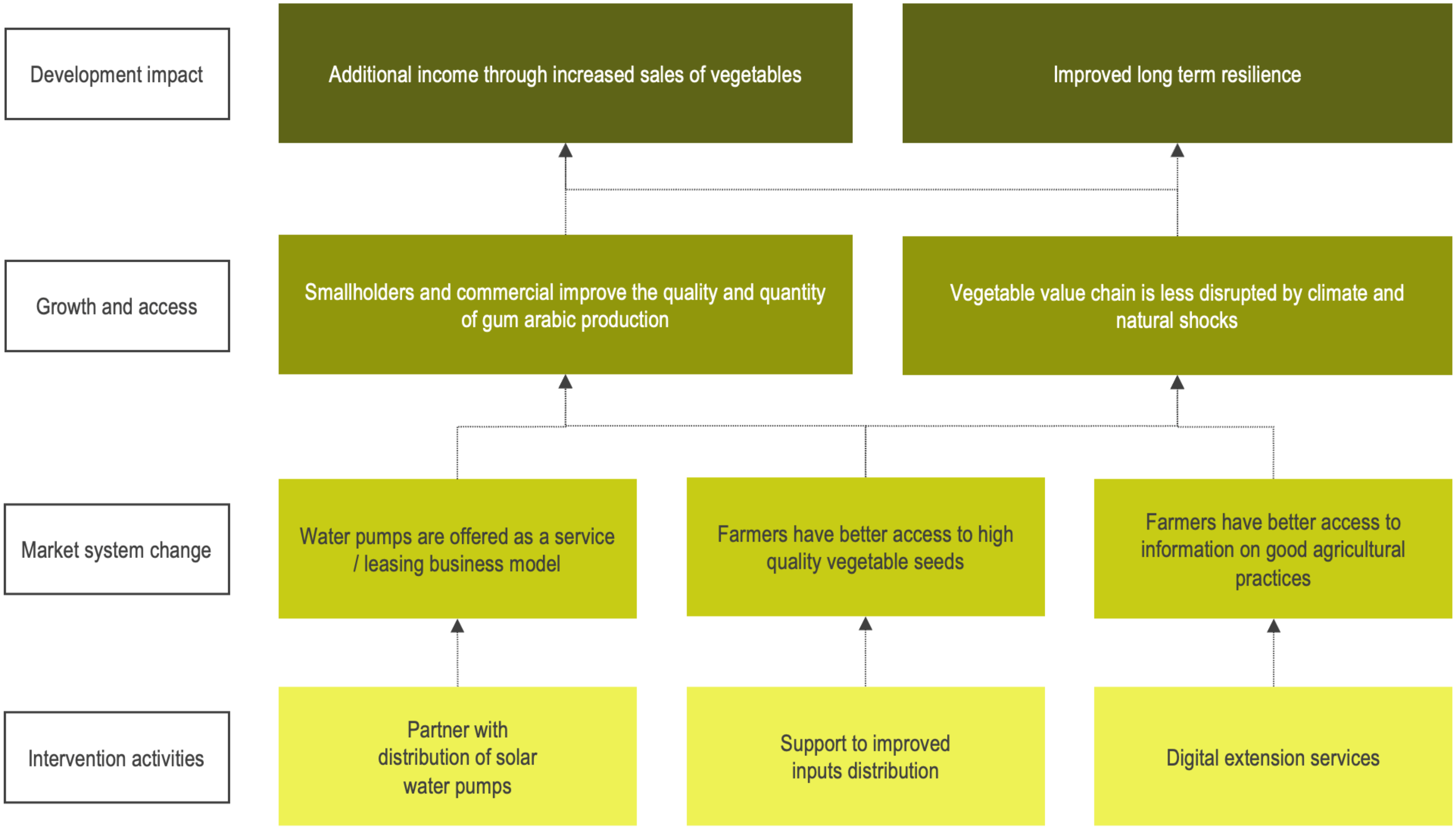
Development impact
Additional income through increased sales of vegetables
Improved long term resilience
Growth and access
Smallholders and commercial improve the quality and quantity of gum arabic production
Vegetable value chain is less disrupted by climate and natural shocks
Market system change
Water pumps are offered as a service / leasing business model
Farmers have better access to high quality vegetable seeds
Farmers have better access to information on good agricultural practices
Intervention activities
Partner with distribution of solar water pumps
Support to improved inputs distribution
Digital extension services

Figure 7

11 PMEAL PLAN

At this early-stage scoping for the NTFPs market in the GUN region, the Project Monitoring, Evaluation, Accountability, and Learning (PMEAL) needs are different from an ongoing program with definitive interventions. THRIVE's focus should be to select and validate the proposed intervention ideas with stakeholder consultation and collecting missing data and statistics to ensure the business models and ideas are viable, while setting realistic performance measures. Following that, depending on the outcome of the program design and the selected interventions, THRIVE can develop a specific PMEAL plan for the overall program portfolio. For illustrative purpose, indicators are suggested for selected interventions in both market systems.

For all indicators suggested ideally THRIVE could establish a baseline before the intervention through appropriate survey to then be able to monitor and track change on revenues, sales prices and volumes as the intervention implementation unfolds.

Result Area	Indicator
Development impact	
Additional income through increased sales of gum arabic	- Additional revenues from gum arabic
Improved long-term resilience	- Types of shocks and stresses experienced - Gum arabic incomes before and after the shocks
Growth and access	
Gum arabic harvesters and lead agents improve the quality and quantity of gum arabic production	- Volume of gum arabic harvested - Gum arabic sales price to local companies
Market system change	
South Sudanese companies have the capacity to sell for a higher price	- Sales price to foreign buyers
South Sudanese gum arabic is tested for quality	- Volumes of gum arabic tested for quality - Volumes of gum arabic certified as high quality
Intervention activities	
Private sector companies invest in cleaning and storage facilities in Renk	- Amount invested by private sector companies - Number of facilities set up in Renk
Implementation of a lead agent extension model for quality control and grading of gum arabic	- Number of lead agents trained and involved

Table 3: Illustrative example of indicator for two intervention areas in the gum arabic market system

Result Area	Indicator
Development impact	
Additional income through increased sales of vegetables	- Additional revenues from vegetable sales
Improved long-term resilience	- Types of shocks and stresses experienced - Vegetable incomes before and after the shocks

Growth and access	
Smallholders and commercial farmers improve the quantity of vegetable production	- Volumes of vegetable production - Sales price of vegetable
Market system change	
Water pumping is offered as a service / water pumps are offered through leasing business models	- Number of customers benefitting from the service - Additional income from leasing of water pumps for water pumps distributors
Intervention activities	
Partner with solar water pumps distributors	- Number of distributors involved

Table 4: Illustrative example of indicator for two intervention areas in the vegetable market system

Annex: Key informants

Public sector actors

- Ater John, Director, Ministry of Environment and Natural Resources
- Wani Nelson, Ministry of Environment and Natural Resources
- Renk County Agriculture Director
- Renk County Agricultural Engineer
- Rubkona Country – Agriculture Focal person
- Fashoda Country - Luciano, Agriculture Focal Person

NGO and Aid actors

- Lokujo Chaplain Duku Soma, GOAL Director Renk
- THRIVE consortium partner Mercy Corps
- THRIVE consortium partner CAFOD
- THRIVE consortium partner VSF Suisse
- THRIVE consortium partner SPARK
- James Wani, World Food Program
- Tabule Noah Silvester, Project Manager, FAO RAL program
- Levi Ahmed Bona, International Trade Centre, MARKUP II program

Private sector actors in NTFPs

- Estellah Malek, Aramweer Organics Limited
- Patrick Kyalo, The Hive Limited
- Matata Safi, Hagana Agro-Processing Limited
- Kennedy Lodiong, Association of South Sudan Manufacturers
- Kou Ajak, Managing Director, Elaag Agricultural Company Limited
- Peter Asheli, B&S Group
- Finance Officer, Ramciel Multi Purpose Co Operative Society

Local actors

- Renk - vegetable farmers
- Renk – vegetable traders
- Renk - gum arabic harvesters
- Renk – gum arabic local agents
- Renk - local storekeepers (including stores for gum arabic tools)
- Renk – gum arabic traders
- Fashoda – honey traders
- Fashoda – vegetable farmers
- Fashoda – vegetable traders
- Rubkona – vegetable farmers
- Rubkona – vegetable trader