

South Sudan

Agricultural value chain – challenges and opportunities

Summer 2020

DRAFT

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1 Introduction

1.1 Background

Nine years after independence, South Sudan remains one of the world's most conflict-affected and fragile countries. The conflicts disrupted the country's development and restricted the population's ability to engage in socioeconomic activities. Valuable resources and basic services have been difficult to access, the proportion of displaced persons increased, and the people's dependency on humanitarian assistance multiplied. In fact, the aggregate effects of years of conflict displaced approximately 4.2 million people from their homes – nearly 2 million displaced internally and 2.2 million outside of the country – and resulted in extreme levels of acute food insecurity with seven million people (more than half of the population) requiring humanitarian assistance in 2019 (UNOCHA, 2019).

On an economic level, South Sudan's economy is characterized by high levels of poverty, as well as low national GDP and household consumption and exports. This is in addition to an ongoing hyperinflation due to a rapid depreciation of the country's currency. In fact, South Sudan remains among the poorest countries in the world with more than 80% of South Sudanese living under the absolute poverty line (World Bank, 2020). Moreover, the conflict has had a devastating effect on the country's economic growth and particularly on the oil sector, which accounts for almost the totality of the country's exports and more than 40% of its Gross Domestic Product (GDP)¹. In fact, the country's GDP has decreased substantially in the past years, with the GDP per capita dropping from USD 1,111 in 2014 to less than USD 200 in 2017².

The country's fragility, weak health system, high population of internally displaced people, crowded living conditions, and food insecurity also increase the influence and risk of the COVID -19 pandemic. As the number of cases have exceeded 2000, the pandemic and the measures taken to contain it is expected to further augment the economic disparities

Yet, South Sudan has a remarkable potential for sustainable growth through agriculture. The agricultural sector plays a major role in South Sudan's economy, accounting for 36% of its non-oil gross domestic production with 80% of households depending on cultivation as their primary source of livelihood (FAO, 2015). Among the total 64.7 million hectares of land, around 75% of the area is suitable for agriculture and 50% of it is suitable for cultivation. Yet, only 4% of the land is currently cultivated by smallholder subsistence farmers (FAO, 2015).

However, the crux of the problem lies in the fact that, although the country has huge agricultural potential, it continues to be food insecure, import-dependent, and low in productivity. Despite conducive factors, yields remain low; crops and livestock activities are nowhere near meeting South Sudanese people food needs. Comparing South Sudan to its neighbors is very telling – despite the similar topography and temperature, South Sudan imports many of its foods, including staple cereal crops, and South Sudan's agricultural sector has mostly been subsistence-based. Smallholder farmers cultivate on small plots by hand, with family sizes of average 5.9 people³ from different family aggregations. Moreover, cultivation is usually limited by size of a household and its ensuing labor force, and whether or not traditional working

¹ The World Bank, South Sudan Overview – World Bank data base.

² *Ibid.*

³ 2017 UN households survey

groups can be mobilized by the family's provision of in-kind payment. In all states, Large-scale farmers and commercial farmers, although growing over the past couple of years, still remain limited.

Agricultural production is the key determinant of the level of household income and food security. Land is usually communally owned and total size of land cultivated per household ranges between 0.4 to 1.7 ha (AFDB, 2013), which is relatively small and in turn results in low productivity. The lack of capital is the main hindrance in land expansion. In terms of exports, agriculture plays a very minimal role. Yet, the past three years have positively shown the potential of exporting a number of products - including vegetables (particularly sesame), staple crops (maize, sorghum), and honey. Locally, a variety of crops are cultivated in South Sudan from fruits, such as pineapples and citruses, to vegetables including okra and cowpeas, and staple crops including maize, sorghum, and groundnut. The land is also fit for the production of tea, shea nuts, gum Arabic, coffee, and honey, which have potential for export.

Indeed, multiple studies have reported that the country's agriculture sector continues to operate on significantly high levels of low-input and output subsistence farming. The African Development Bank (2013) cites a number of reason for the following, which include:

- The need to improve agriculture input and techniques, including storage facilities and development of irrigation
- The difficulty farmers face when accessing markets due to weak infrastructure, unnecessary taxes, and bribes
- The absence of farmer and rural producer associations

1.2 Research objectives

In response to the aforementioned, the UNDP is implementing a project, under the name of the Youth Employment and Empowerment through Private Sector and Value Chain Development Project (YEPP), and funded by the Kingdom of the Netherland. One of its main aims is "to increase the productivity and labor-absorptive capacities of agricultural and natural resource-linked value chains and private sector enterprises with a focus on young men and women." One of the project's dimensions, relevant to this study, is training youth in horticultural, agricultural and natural resource management training, with the aim of increasing productivity and enabling them to adopt better agricultural practices.

Within that context, the objectives of this research are to:

- Understand current status and future potential of different agricultural commodities
- Inform project planning and implementation in the agricultural and natural resource sectors.

1.3 Methodology: a value chain approach

1.3.1 Research design

The research methodology relies on a qualitative approach, with an extensive desk review; in-depth interviews and focus groups with value chain actors, institutional actors, local and international non-governmental organizations, cooperatives and community leaders; and focus group discussions with farmers and agricultural workers held across the five different areas of Yambio, Torit, Jubek, Rumbek, and Bor.

A total of 25 interviews and 10 focus groups were carried out. The interviewees were selected based on a rapid mapping of key development interventions in South Sudan, as well as referrals from UNDP field coordinators and partners. A rapid description of the mapped and interviewed initiatives and interventions can be found in Annex 1, the list of interviewees and focus group can be found in annex 2, and the interviews and focus groups guidelines in annex 3.

The aims of the tools were to:

1. Identify Key Value Chains:

- Starting with the following value chains with high productive potential (identified based on the 2019 World Bank Report)
 - Staples: sorghum, maize, cassava, pulses and groundnuts
 - Nuts and seeds: sesame and sunflower
 - Horticulture: Bananas, mangoes, lemons, pineapples, as well as other vegetable production (such as onions, okra, tomatoes, eggplants, sweet potatoes and cabbage).
 - Herding activities, animal husbandry (not in the scope of the world bank 2019 report)
 - Forestry (not in the scope of the world bank 2019 report)
- Each of the above value chains will be qualitatively assessed in every area based on the following comparative advantages:
 - What is the production volume? (if available)
 - What is the capacity for employment?
 - What is the potential for impact and food security at the local level?
 - What is the potential for substitution of import at the national level?
 - Is there potential for exports?
- Selection of value chains per region to be considered for upgrade strategies

2. Assess Value Chain Competitiveness

- For each selected value chains:
 - What are challenges and opportunities of each of the value chains nodes (inputs supply, production, post-harvest services, processing, market)
 - What are support functions (policies and regulations, informal rules and norms, access to finance, market information and extension services).
 - What are existing or potential associated interventions risks including social and environment risks.
 - The following issues were discussed with interviewees:
 - Infrastructure and transport
 - Input supply and services availability and affordability
 - Production challenges,
 - Post-harvest (availability, technology)
 - Processing (availability, technology, competitiveness)
 - Market access (local / export) quality standards, segmentation
 - Access to finance
 - Knowledge, skills and extension services Associated risks and violence
 - Policies and regulations
 - Informal rules and norms, including associated risks, violence and gender dynamics

1.3.2 The value chain approach

Studies illustrate the importance of a value chain approach for understanding how to contribute to the sector's growth and expansion. The value chain approach illustrates the various actors playing a role as a primary agriculture product moves along a chain, in addition to the relationship between these actors, from inputs to production, post-production, processing, and distribution/marketing. Indeed, a World Bank (2019) report, looking at the linkages between agriculture and job creation, argues that "applying a value chain lens to investments in the sector can contribute to creating direct, indirect, and induced labor in the larger food system." Indeed, one of the main paradigm shifts in agricultural knowledge building and implementation has been the inclusion of the value chain approach. Given the growing consensus amongst development practitioners that agriculture is key for lifting rural populations out of poverty and improving livelihoods, it is important that the conversation around agriculture moves from one simply being about cultivation and harvest to one that focuses on the entire value chain approach.

Typically, agriculture research organizations focus on issues of production and productivity, whereas NGOs and other local organizations focus on marketing and, more broadly, the value chain approach. However, as noted in Devaux et al. (2018), what is needed is a holistic approach that takes into account the entire agriculture chain, looking at the challenges and opportunities of the input suppliers all the way to the consumption of a final product itself and, in fact, an evaluation of the final product following its consumption. "For agricultural research to benefit the rural poor, it needs to complement other efforts that improve the policy environment, alleviate resource constraints, and build local capacity for responding to changing technological and economic challenges and opportunities (Devaux *et al*, 2018)

The value chain approach, although used and applied differently across different sectors, signifies thinking of the relationships, transactions, and interdependent dynamics amongst different stakeholders as well. This, then, includes farmers, traders, processors, consumers, evaluators, and actors in between. As such, investing in programs that engage with the different value chains is critical for achieving resilience and improved food security. An important distinction must be made between primary and secondary actors within the value chain.

Primary actors are usually more actively involved in input supply, production, storage, retain, and consumption - with farmers usually being associated as primary actors. On the other hand, secondary actors are involved in the value chain more indirectly through provision of services and functions to primary actors, such as transportation and credit provision, without working in the actual crop production (World Bank, 2019). The value chain approach considers how different actors - such as energy service providers, technicians, researchers, traders - can interact with the agriculture sector and, in fact, become key value chain actors themselves.

There are also support activities that help enable the success of more primary activity. The value chain approach looks at activities such as infrastructure, technology, social capital, and other resources (Porter, 2001) .

The supporting activities and the surrounding atmosphere are key in the value chain approach. As such, it is worth asking how the environment surrounding stakeholders can be improved. The value chain approach also necessitates that understanding the market looks at both the domestic and export-oriented, international scale. Moreover, a constructive and amenable policy environment that prioritizes

rural populations and agricultural development is necessary. Technology that enables higher productivity and up-scaling of crops to make them more likely to be exported is also included in this.

This paper, hence, seeks to incorporate this approach in its analysis of South Sudan’s agriculture sector, through using the approach as a framework for understanding the country’s challenges and opportunities, as well as identifying various value chains for the five areas under study.

1.3.3 Value chain selection

As mentioned above the World Bank (2019) report that identified high potential value chain for South Sudan was used as an entry point for the value chain selection process. Interviewees were then requested to assess each value chain group based on predefined criteria. Most interviewees, stated that food security and potential for export should be the key factors that should be taken into consideration, stating that all agricultural value chains do have high potential for employment, while import substitution was mostly considered a secondary criterion.

Therefore, and based on initial feedback from interviewees, especially interviewees at national level, value chains were selected as per table 1 below:

Table 1: value chain selection based on employment, food security and export potential criteria

	Value chain	Group	Employment potential	Food security potential	Export potential
1	Sorghum	Cereals	High	High	Limited
2	Maize	Cereals	High	High	Limited
3	Sesame	Oil seeds	High	High	High
4	Groundnuts	Oil seeds	High	Medium low	High
5	Horticulture	Horticulture	High	High	Limited
6	Cattle	Livestock	High	High	Low
7	Poultry	Livestock	High	High	Limited
8	Honey	Livestock	High	Medium	High
9	River and Lake Fish	Fisheries	High	High	High

Interviewees with regional value chain actors enabled the setting regional priorities. Because of their importance in term of food security, sorghum and maize were selected in all regions. Following this, three other value chains were selected as interventions priority based on interviews with local key informants and included:

- Bor: groundnuts, fish, and Poultry (trial base)
- Jubek: poultry, honey, and horticulture
- Rumbek: cattle, fish, honey
- Torit: groundnuts, sesame, honey
- Yambio: poultry, sesame, honey

Throughout the text, quotes refer to citation from in interviewees and FDGs participants, except when otherwise indicated.

2 Structural challenges of the South Sudanese Agriculture.

The situation of the South Sudanese Agriculture is a paradox; on the one hand it has impressive potential, while on the other hand, food security remains a daily concern for many South Sudanese. The present section presents key structural – value chain cross-cutting – challenges that have hampered the capacity of agriculture to grow and prosper.

2.1 Note on the impact of COVID-19 on South Sudanese agriculture

The impact of COVID-19 on the agricultural sector in South Sudan, and the country's economy in general, is likely to have long-standing effects in addition to the immediate effects noticeable.

Due to the pandemic, the South Sudanese government imposed restrictions on cross-border and interstate movement, restricting access to supplies of goods and to markets, affecting market prices in the process. Similarly, trade-dependent livelihood activities were particularly affected. As such, agricultural activities linked to trade, particularly those reliant on foreign markets for exports, were heavily affected.

COVID-19 has further aggravated the economic crisis causing high inflation and devaluation of the SSP to USD exchange rate. This translates into ever-decreasing purchasing power, especially among the poorest who are trapped with lowering wages paid in SSP. The likely negative coping mechanisms include irreversible mechanisms such as selling of agricultural lands or livestock, or long-term mechanisms such as restriction of food intake (number and quality of meals) which is extremely serious in an economic context in which food insecurity and malnutrition are highly prevalent and constitute a significant public health concern. This reality is further aggravated by an exponential rise in COVID-19 cases which puts an extremely heavy strain on healthcare facilities in the context of almost non-existent infrastructure. South Sudan, a country with one of the weakest healthcare sectors in the world, is not equipped to face the threat of a global pandemic, leading the UN to term it "COVID-19: Potentially Greatest Threat to South Sudan's Already Fragile Health System"⁴. The already high mortality rates are expected to skyrocket, not only due to deaths from COVID-19 itself, but from a collapse of the healthcare sectors which entails disruptions to routine treatment of diseases such as pneumonia, malaria and diarrhoea in addition to the lack of vaccinations and maternal health services.

The factors mentioned so far, all-linked to lower purchasing power, also entail lower levels of consumption. As households rely less on markets to supply their food (in addition to the ban on large gatherings which also impacts access to markets), agriculture is also impacted as producers are unable to sell their produce. Furthermore, the agricultural sector in South Sudan is disproportionately reliant on manual labor, with very limited use of mechanization. However, with the pandemic and the lockdown it entails, large gatherings are impossible to hold, putting the workers either at risk of contracting the virus, or of losing income and livelihood. An apparent coping mechanism is reducing labor which will inevitably

⁴ Press release – UN security council 23 June 2020 – [link](#)

lead to decreased production. This reality has become apparent especially in the green belt and poses a serious risk of increased food insecurity over the long term, notably 2020/2021.

Moreover, the COVID-19 quarantine has spurred a rise in violent crime which can no longer be stereotyped as "intercommunal." Numerous properties were destroyed or stolen, women and children were kidnapped, hundreds of people were killed, and over 60,000 people were displaced⁵. The appearance of combatants in uniforms implies that organized factions could take part in the clash, jeopardizing the ceasefire that had been put in place. In addition to the political violence described, the dire economic situation has increased "intercommunal" violence as a result of competition over natural resources such as cattle raiding and theft of agricultural harvest⁶.

2.2 Infrastructure

2.2.1 Roads, electricity and ITC

The need for infrastructure is an intrinsic part of improving agricultural value chains. Investment in infrastructure, such as irrigation, roads, electricity, ITC, among others have positive effect on agricultural productivity in developing countries (Llanto, 2012). In fact, Pinstруп-Andersen and Shimokawa (2007) found out that infrastructure promotes agricultural development with a rate of return (ROR) in Africa (18 countries) of 22%, with Ethiopia and Uganda having one of the highest annual ROR (40% – 50%) .

Farmers, importers, and traders are highly dependent on good road infrastructure in order to be able to access markets. Llanto (2012) found out that the investments in road have a multiplier effect on agriculture GDP, ranging between 1.6 and 2.12, across different countries. Road rehabilitation and infrastructure development are extremely critical for the agriculture sector in South Sudan, as it significantly impact access to markets – and thus access to food, particularly in Juba and in surrounding counties, where develop infrastructure could potentially play a role in expanding trade.

Similarly, the lack of access to electricity is a key constraint to growth– South Sudan is ranked as the 187th country out of 189 ones when considering access to electricity. In fact, only around 9% of the country has access to electricity⁷. Also, Information and Communications Technology (ICT) is crucial for creating linkages between the different value chains; in fact, with the large growth of ICTs, data and information can be successfully generated, collected, analyzed, disseminated and utilized to assist farmers and farming communities to upgrade agriculture productivity and sustainability (Gakuru et al (2009); and Zhang et al (2016). Yet, ICTs are not that accessible within rural communities in South Sudan, making market information dissemination limited and affecting value chain development negatively.

Lack of roads and poor road infrastructure do not only impact food availability, but also food affordability. Food prices are largely affected by the poor infrastructure, because fuel prices and transportation costs lead to differing market prices and market volatility. For example, roads connecting Juba to Rumbek are significantly affected during the rainy season from May to October. Additionally, transportation costs are quite high, with different taxations that are both official and unofficial. The latter can be in the form of

⁵ Ibid

⁶ Ibid

⁷ Access to electricity (% of urban population) in South Sudan was reported at 22.03 % in 2016, according to the World Bank collection of development indicators, compiled from officially recognized sources.

illegal payment in order to pass through on a certain road, leading to high operation costs. In terms of the quality and division of roads, a substantial amount of time is spent at customs, checkpoints and roadblocks leading to an increase in risks of theft and looting happening especially during late hours. Driving as an activity by itself can be extremely daunting causing a lot of inconvenience – interviewees noted that many of the main roads lack roads signs, traffic lights, or proper orientation. In Yambio, for instance, roads and infrastructure are extremely poor and it is highly difficult for smallholder farmers with high yield to access markets in Central Equatoria/Baher el Ghazal. Farmers noted that even within Yambio itself, transportation from villages into town is a huge challenge.

Nonetheless, several initiatives are aiming to address the serious transportation challenge. Some of which are local endogenous initiatives, such as people’s transport association (i.e. sharing resources and means to ensure transport of people and goods), others are supported by international organizations, e.g. the United Nations Mission in South Sudan is working on the rehabilitation of roads, as is United Nations Office for Project Services which has constructed a road in the Lakes Region. Similarly, over the last year, WFP constructed a road from Yambio to Nzara allowing farmers to sale their produce.

2.2.2 Water and irrigation infrastructure

South Sudan has a significant problem with regards to access to clean drinking water; over 80% of South Sudanese do not have a stable or steady supply (Trew, 2019)⁸. These water shortages, in large part, contribute to increased conflict between different ethnic groups, and in certain instance may led to death from dehydration. Conflict over water point access for livestock is also frequent. Yet, South Sudan does not lack water supply per se – several rivers, including the White Nile, supply an abundance of water. However, as noted by a KII interviewee, “there is no adequate infrastructure in place to ensure that the water supply is used and distributed properly and fairly.” The lack of infrastructure led to an overall water mismanagement and dependency on waterfall cycles “with low-lying areas being highly susceptible to flooding while other areas, such as those on the northern border with Sudan, being prone to long dry periods”.

“We are constantly [timing] ourselves depending on the rain. It will be better if we have wells all year or better irrigation in general.” Farmer participant in a FGD

Flooding is a serious issue for many farmers. Upon the writing of this paper, flooding happened in Bor, disrupting many farmers’ work and killing a number of residents. The heavy floods led to thousands fleeing their homes and has made it extremely difficult for humanitarian aid to be delivered to people. In fact, unexpected flooding has impacted around one million people across different states in South Sudan since July 2019, especially states such as Northern Bahr El Ghazal, Jonglei, Warrap and Upper Nile. Its overall effect on crop and livestock production has been significant, 74,157 hectares of cultivated land has been harmed and 72,611 tons of grain have been lost (gross crop production lost) according to estimates from FAO (Rosati and Poueme, 2019)

Overall, irrigation water issues are exacerbated by the limited irrigation infrastructure. Although there is growing technology for on-farm irrigations, they are still quite limited. FAO and WFP (2019) reported that,

⁸ Trew, Bel. (2019). South Sudan, where a water crisis is leading to child kidnappings and rape. The Independent.

“The poor performance of the 2018 cropping season was mainly due to below-average and erratic rains constraining yields and persisting and protracted insecurity disrupting agricultural activities.” There is heavy dependence on rainfall, and as such, fluctuating rainfall affects crop production.

Interviewees noted that an often-overlooked factor is the ways in which water shortage is an obstacle for farmers and agricultural production in the country. Indeed, installing public wells and ensuring better rainwater harvesting structures is one keyway to help ensure more productivity (Qureshi et al. 2018). Furthermore, training is highly needed in using water more efficiently and building the capacity of farmers, particularly those involved in horticulture, to use more modern irrigation approaches such as drip and sprinkler systems.

2.3 Production challenges

2.3.1 Input supply: shortage and inconsistent quality of seeds

The provision of quality, local seeds in South Sudan is significant challenge. International organizations, including FAO, continue to buy seeds from outside South Sudan instead of investing in local seed production that can thrive in South Sudan’s local conditions. Instead, according to interviewees, seeds brought in from Kenya and Uganda do not germinate well. In fact, it has been reported by interviewees, that shortage and inconsistency of seeds quality is a major impediment to agricultural production.

According to interviewees, the FAO and the South Sudanese Government are to upscale their current seeds program and support access to imported high yielding seeds varieties. However, interviewed farmers have said they prefer local varieties and are still reluctant to adopted imported one, especially that hybrid seeds come at a higher cost and cannot be used for more than a season. Several initiatives have been undertaken by international organizations, private businesses, and community-based groups to support seed programs, including seeds multiplication and local seed banks. Private seed companies⁹, are promoting local seeds production, mostly for sorghum and maize; Cordaid began a project with the Ministry of agriculture to support seeds multiplication (foundation seeds from Uganda and Kenya), but this plan was disrupted due to the COVID-19 pandemic. AGRA is also actively in seed production in Rumbek and other areas across South Sudan . Overall, interviewees agreed that stimulating community-based seed production is needed, especially through farmer associations and cooperatives

“Continuing to import seeds into South Sudan will weaken the existing system and will create an unsustainable dependence on imported seeds”. Key informant interviewee.

“Farmers in Torit are very affected by seeds sold in the market, it’s almost a gamble. They go to the market, buy plants, and then nothing comes out. Unless you are a farmer directly supported by FAO, you cannot afford high quality seeds. However, FAO does not have the capacity to support all farmers in Torit.”. Key informant interviewee.

2.3.2 Pest management

For the majority of farmers, the main obstacle affecting crop yield and livestock activities are the prevalence of pests and diseases. This is exacerbated by the fact that they do not have the tools, means, or know-how to be able to address these pesticides or diseases. Some of the most common plant diseases

⁹ Such as KSC, Oryem Cosmas O’Lonam, Pioneer, Syngenetta, Pannar

include the head smut on sorghum. Moreover, there is a problem of weed build-up, due to continued cultivation without proper weeding. The latter particularly affects sorghum cultivation, as striga weed becomes quite common. This can be tackled through either crop rotation, using manure, intercropping, and proper training of extension workers on adequate preventative measures.

In Torit, for example, farmers were highly affected by a locust invasion, which according to a farmer, “affected crop production a lot, and made us lose a significant portion of our yield.” In the absence of proper measures, farmers tend to address the pesticides and diseases with more traditional methods. For instance, farmers in Bor said they used ashes and peppers mixed with lime to tackle crop infestations; however, they added that this do not always succeed. Bird scaring is also usually practiced.

The fall armyworm is a critical issue, feeding on many varieties of plants – including staple grains such as maize, rice, and sorghum, and vegetables. The fall armyworm, which appeared in 2017, spread across different cropping areas and quickly infested maize crops, spreading through Jonglei, Western and Central Equatoria, Upper Nile States, and Western Bahr el Ghazal. By 2018, it had spread all throughout the country and affected maize crops largely (especially those late-planted crops). It also attacked sorghum but was less severe than maize. Farmers noted that they lost over 50% of their yield from the fall armyworm, especially farmers in Bor. Indeed, the FAO and WFP report (2019) estimates that one of the reasons behind the mean gross cereal yield in the smallholder sector decreasing by 4.07% from 2017 is because of the losses incurred by the infestation of the fall armyworm. Striga also infests and threatens food security and affects cereals.

Poultry is also infested by many diseases and parasites, such as the Newcastle disease. Some of the main non-migratory pests in South Sudan include local birds, wild pigs, aphids, termites, green grasshoppers, sorghum cinch bug, and sorghum midge. However, there are still no proper control measures for migratory pests, including the QQU birds which are often a significant threat to sorghum harvests in the winter.

Commercial pesticides or herbicides are rarely used by small farmers. However, there has been an increase in herbicides in large scale mechanized farms, especially in the Upper Nile. Majority of pests and diseases are not treated, and farmers tend to approach the losses yielded from them as unavoidable or predestined. It is important to promote proper pest management and ensure that the control of pests and diseases is in line with the communities’ culture. Additionally, safe use of agro-pesticides and chemicals should be mainstreamed through the agriculture ministry, and stakeholders need to identify and coordinate with organizations and communities working directly on developing or distributing these chemicals or agro-pesticides.

2.3.3 Skills and know-how

Farmers interviewed have low levels of education. SSADP 11 (2019) reported that in Bor, Torit and Yambio 73%, 38% and 19% of farmers respectively mentioned that they are uneducated. Similarly, 20%, 41% and 70% of farmers respectively said that they acquired primary education level; nonetheless, 7%, 22% and 12% of farmers respectively have a secondary education level. However, none of the interviewed farmers stated that they had tertiary education level, i.e. diploma or degree education level. While farmers possess the knowledge and experience of production, the low levels of education might affect their capacity to enter the market. According to interviewed cooperative leaders, it also affects managerial and

administrative issues, and this makes the management of farmers cooperatives, or association and informal groups, more difficult.

In Yambio, Mekese University provided basic and limited agriculture courses with a very low number of students enrolled. Yambio used to host an agriculture services center but it has not been operational in recent years. There is also a lack of vocational institutes in Bor teaching practical agriculture courses. For instance, there were promises of Hanbit agriculture center in Bor, yet interviewees noted that there has not been significant coverage of their graduates or programs. According to interviewees, the available training programs benefiting farmers are short term courses and training provided by donor funded project.

Until today, the public sector's extension services remain very minimal, with weak inspection services and inconsistent enforcing standards, among others. A proper extension program, put in place, is capable to disseminate information on soil, water and salinity management practices among farmers. Moreover, connecting farmers with intervention programs of national research and extension organizations, can result in benefitting farmers in several areas such as improving land and water management, hence, expanding their agricultural productivity. (Qureshi et al., 2018). It is important to disseminate information as well as vulgarization of good agricultural practices using means that are accessible and easily transferable – including schools, ICT, radio, and community sources of information. Furthermore, there are yet to be adequate research centres in South Sudan focusing on understanding the agriculture sector from a scientific lens. Connecting farmers to research centers benefits the farmers in several aspects such as water management, improving land, and increasing agricultural productivity. (Qureshi et al., 2018)

2.3.4 Lack of financing and entrepreneurship

Agriculture is still approached, especially amongst youth, as a traditional sector that is not worth investing in. Farmers and interviewees noted that for many youths, working in agriculture in South Sudan is perceived as unchallenging and conventional, therefore, many youths decide to invest in other sectors upon graduation. In large part, this is because agriculture has not been yet recognized as a sector that can inspire entrepreneurship and innovation, but rather as a traditional sector. On the other hand, youth in other neighboring countries view agriculture as an opportunity to develop agribusiness ideas, particularly in terms of rural tourism and organic agriculture. In South Sudan, however, there is a scarcity of farm labor because of the subsistence nature of farming, which is also a challenge in terms of production. Youth from rural areas migrate to cities, as they perceive agriculture as a sector that is not befitting. There are, indeed, not enough incentives for labor.

Access to finance remains very weak and minimal with the exception of Juba where the situation is relatively better. Traders and farmers are usually unable to access loans or foreign exchange, with the availability of only few financial institutions. This is coupled with high production costs and high cost of labor. Lack of capital is cited as an obstacle to agricultural investments, in term of both intensification and extensification of production. Hiring tractors is highly expensive and makes mechanization services inaccessible to a large number of farmers and rural households.

The lack of financing has significant impact on the ability of South Sudanese agriculture to grow, instead production practices have remained highly traditional. The SERA project experimented with traditional farming by conducting different types of trials with farmers, including both the traditional and modern

approaches, whereby farmers would then decide, following the trial, the type of farming that was more productive. Before the project, many farmers mentioned that line-planting is tedious and wastes time, but after trying it in the farming school, they concluded that line planting was more efficient because they compared the quantity of seeds used using each method. Additionally, farmers continue to use manual tools such as the maloda. Therefore, there is a strong need for advanced manufacturing equipment. For instance, irrigation systems need advanced methods to increase the application efficiencies. Because farmers in South Sudan do not have access to modern irrigation technologies, they mainly rely on traditional basin or flooding methods leading to irrigation application efficiencies of 30% to 35%. Indeed, studies showed that adequate irrigation systems have high potential in expanding and boosting agricultural productivity. On the other hand, poor irrigation infrastructure (at both farm and water network level) as well as farm machinery are identified as the main reasons for low productivity.

Most of the residents of Juba (although to a lesser extent), Rumbek, Bor, Yambio and Torit are unbanked, which makes the access to finance extremely difficult, and the economy denoted as a cash economy; this is because residents of these counties prefer to keep their money at home rather than opening current and saving accounts in existing banks. There are several challenges that financial institutions face and that discourage people from putting their trust in banks, and thus, accessing their services. These challenges include high and volatile inflation rates, shutting down of Kenya Commercial Bank (KCB) and Equity Bank in 2016 in both Torit and Yambio due to conflicts, lack of variety and quality of bank products, and lack of financial capacity. For instance, the Women and Youth Empowerment (WOYE) microfinance institution had a lot of defaulters in the past (conflict period), resulting in offering a small range of financial products which are deemed to be unattractive to the residents of Yambio. Another example on perception of banks from the perspective of residents is that when KCB and Equity banks closed their branches, as mentioned earlier, the branch managers asked the customers to claim their money from the branch in Juba; however, a flight to Juba would cost the clients more than the money they had in their accounts, hence, they refrained from claiming it again. Moreover, an example of difficult access to finance in the agriculture sector is that banks do not give loans for farmers because the latter are only able to put their livestock as a guarantee, given that they don't own the land; the banks' clientele, therefore, is constituted mostly of NGOs and small business and their activities are limited to savings and cash transfer. Sometimes, the banks have to physically take the cash (i.e. for WFP the grain buying centers) to farmers who live far and do not have bank accounts.

Finally, the high and volatile exchange rates affect the products that the bank introduces, especially loans they are offering. For instance, in 2019, 3 million SSP is worth \$19,000 as opposed to 2013 when it was worth \$1 million, resulting in a high cost of living and limiting the lending activities of the bank. The major loan sources remain informal loans from friends, family and individuals, and most crucially the existing mismatch between the borrowing sources and uses. Interviewees noted that reasons for borrowing are first and foremost to purchase food or other basic needs; secondary reasons are business-related. As for sources of loans, they mostly comprise of individuals such as friends, family, others. Other channels include Village Savings and Loan Association (VSLAs).

Table 2: Main financial institutions in Bor, Torit, Juba, Rumbek, and Yambio

County	Main Financial Institutions
Bor	Kush bank, Liberty bank, Kenya Commercial Bank, Nile Commercial Bank
Yambio	Kush bank, Ivory bank, Women and Youth Empowerment (WOYE) microfinance institution, Kenya Commercial Bank, Equity Bank, rural finance initiative (RUFII)
Torit	Ivory Bank, Eden Bank, Nile Commercial Bank, Kenya Commercial Bank, Equity Bank, Nile Commercial Bank
Rumbek	Kenya Commercial Bank, Nile Commercial Bank, Sudan Microfinance Institution, and Diar for Rehabilitation and Development Association (which provides some financial support to women's groups)
Juba	Kenya Commercial Bank, Equity Bank, Nile Commercial Bank, Eden Commercial Bank, Liberty Commercial Bank, Cooperative Bank of South Sudan, Sudan Microfinance Institution

2.3.5 Dependence on donor funded projects

Because South Sudan is a newly established and fragile state, there has long active efforts by the international humanitarian community to intervene and provide both relief and development support. However, if the question of sustainable funding and local grassroots mobilization is not addressed, the dependence might become difficult to undo. This can be seen in the agriculture sector, whereby the FAO and WFP, among other international organizations, are the key providers of certain support functions. Local organizations interviewed reported that most of these interventions are highly positive for the agriculture sector, but the problem lies when smaller associations and community groups avoid taking initiative because of their reliance on external and international entities.

The major agricultural inputs used were seeds and tools such as machetes. These were granted by FAO and other NGOs. This has resulted in an overdependence and affected the market of seed production negatively as well as the agro-dealer sector. There were times when the farmers were influenced by delays in the seeds and were forced to plant low quality saved seeds. Based on the ministry of agriculture, the government banned the usage of fertilizers and pesticides in the counties where there is fertile land. However, traditional solutions (like spraying ash) to the fall army worm problem were not successful amongst the farmers and needed immediate actions. Additionally, there are several actors in counties with the government being the main extension service provider, and other actors such as SSAPU in Yambio, and farmer field schools in Bor and Torit. In Yambio, FFSs ended once the program that supported them was suspended.

2.3.6 Unclear land laws

Largescale farming necessitates access to land with clear rights in order to profitably grow the land. Under the 2009 Land Act, foreigners are banned to own land, but can lease land for a maximum of 99 years.

Additionally, if community lands are to be assigned for investment reasons, these investments should ensure that there is a substantial benefit for the community and result partially in its economic and social development. Land ownership of 250 Fedans or more (104 Hectares) must be approved by state authorities. Moreover, having a consistent national land law and transparent ownership rights as well as obligations will ease and enable foreign investments in agriculture sector in South Sudan. Furthermore, given the major role that women have in farming, laws must be gender sensitive and give women the right for land ownership (AFD, 2013).

2.3.7 Conflict violence and displacement

To this day, the main challenge to the majority of farmers in conflict-ridden areas such as Bor remains to be security related. Armed violence in Jonglei State, and particularly in Bor town, has led to renewed displacement. This has exacerbated aid delivery, particularly given increased floods and the COVID-19 pandemic. The cyclical violence in South Sudan prevents farmers from moving freely and hampers their ability to cultivate and harvest. There are many abandoned farms in South Sudan and continuous disruption of the flow of the value chain, agricultural infrastructure, and farming activities. Importantly, many areas in South Sudan have witnessed relative calm during the past year, such as Yambio and Torit.

“One of the biggest challenges is insecurity, because even right from the inception [when we began our project intervention] we were highly affected because of cattle raiding and political insecurity between different ethnic groups.” Key informant interviewee.

The 2018 June peace talks have improved trade and reduced market volatility; for instance, because of improved security on the Nimule-Juba road – a very important trade route with Uganda, there has been more maize imports. The border with Sudan has also been open to trade, although there are still a lot of checkpoints in those trade routes.

South Sudan’s conflict has had a significant cost on the livelihoods, with people suffering for years from lack of access to resources. The massive destruction and displacement caused due to the war has affected people’s resilience and ability to improve their livelihoods without depending on humanitarian assistance, which is still lacking. Because of security challenges, over 7.5 million people in South Sudan require emergency assistance, with 3.7 million South Sudanese displaced (OCHA, 2019).

2.4 Downstream value chain challenges

2.4.1 Lack of post-harvest and processing facilities

The lack of adequate storage facilities is also a significant contributor to post-harvest losses. Traditional huts, made of clay or straw, that are near farms usually serve as the main storage facilities. However, there are other types of government-built or commercial storage facilities, which are usually concrete. Mobile humanitarian storages are also increasing.

The lack of post-harvest systems leads to loss of crops and yields, particularly because pests and molds may infest crops, and otherwise because of the traditional methods that farmers use in storage, which result in the loss of the crop’s nutritional value (Asenso-Okyere & Jemaneh, 2012). Furthermore, lack of adequate storage facilities drives farmers to sell their crop early on – immediately after harvesting, which

leads to brokers capitalizing on the situation and farmers compromising on the price of their products. (Qureshi, Abdallah, & Tombe, 2018)

Furthermore, farmers would highly benefit from being connected to value chain actors involved in processing, for instance, connecting maize farmers with flours producers and pineapple and oranges farmers with juices producers. Such opportunities have added value with regards to job creation and increased earnings, therefore, result in undeniably expanded agricultural production (AFDB, 2013). For example, a significant investment would be “growing sugar cane by smallholders and processing it by a central facility operated by a large-scale commercial operation” (AFDB, 2013). However, processing businesses are not expanding in South Sudan because many of them have a problem with accessing finance.

2.4.2 Regional markets

Most of the commodities that are being traded in the markets of South Sudan counties are food items obtained locally. Table 3 shows the main markets in each county.

Table 3: Physical markets across counties

County	Markets in each county
Yambio	<ul style="list-style-type: none"> • Yambio market • Nabiapai market (located at the borders with Congo) • Masia market (located 1.5 kilometers away from Yambio market)
Bor	<ul style="list-style-type: none"> • Merol market (four hours’ drive from Juba through main roads) • Langbaar • Hai-Machuor • Baidit payam market • Smaller riverside markets
Torit	<ul style="list-style-type: none"> • Torit market • Melekia market • Other small markets include Kudo Payam market and Imadong Payam market
Juba	<ul style="list-style-type: none"> • Konyokonyo market • Custom market • Jebel market • Munuki market • Gudele market
Rumbek	<ul style="list-style-type: none"> • Rumbek Centre : Malith Market • Rumbek East: Aduel, Pachong & Akot • Rumbek North: Maper Market • Wulu: Wulu Centre Market

Juba. Regarding Juba, there are many economic opportunities making this county the center of South Sudan’s economic, political and social changes. In fact, the rising number of private businesses drives many people to move to Juba in search of employment, resulting in a growth in business and trade

activities. Additionally, the construction of roads such as the Juba-Nimule road led to many foreigners moving to Juba as well, leading also to an increase in trade especially in the agricultural items. Therefore, the markets in Juba are the biggest in South Sudan, including Konyokonyo, Custom, Jebel, Munuki and Gudele markets. The role they play is substantial as an East African regional market representing a long value chain with international value transfer in the region; for instance, the majority of products coming from Uganda pass through Juba even if they are traded in areas other than Juba, hence, emphasizing the role of Juba as an intermediary in the East African regional market. Juba also plays a role as a South Sudan domestic market representing a medium value chain with local value transfer within South Sudan. Naturally, this county's markets offer a range of agricultural and non-agricultural items with some of its items being obtained from all over East Africa. It is worth noting that the volume of commodities in one of Juba's major markets (Konyokonyo market) is bigger than that in other markets, and the supply of commodities in Juba is more stable than that in other markets in South Sudan. Moreover, the Juba market is well regulated, and traders must register at the Payam in order to be able to sell their commodities in the market. For instance, in the Konyokonyo market, traders, porters, and retailers have started a committee to organize the market, and they pay fees for the county in return of using the market. Large-scale traders sell agricultural produce including staple food and vegetables from various regions. For instance, the turnover of vegetable wholesalers ranges between SSP300 and SSP2,000 every day. This is because large-scale wholesalers have specific producers that they buy from and they can buy commodities on credit, while medium to small scale wholesalers buy their commodities from large scale wholesalers themselves, and often sell limited quantities of commodities. Medium to small scale wholesalers are more prone to price volatility because they do not have enough capital to absorb small revenue reductions. Commodities include maize, flour, beans, rice and vegetables. For instance, in Konyokonyo market, there are around 40 traders who sell vegetables. Additionally, the payment for transactions, including agricultural trading, is mostly done in cash whether it is for traders, wholesalers or retailers.

The cross-border trader between South Sudan and Uganda plays a significant role in providing a regular supply of major items. Because many agricultural products are perishable, the volume and type of the border trade on the South Sudan side is not that equipped and ready; nevertheless, substantial amounts of maize and cassava flour are imported from Uganda whereas fresh vegetables, some crops and livestock are locally grown. In fact, the Juba market heavily relies on imports including the bulk of maize flour, wheat flour, sorghum, rice, Irish potatoes and onions. This stream of commodities from Kampala to Juba is only a small share of a bigger volume of cross – border trade that is well managed because of its scale, and hence, affects the regional economic development.

Bor. In Bor, the main trade of non-agricultural and agricultural products take place in Merol market; sorghum and vegetables are obtained locally, whereas wheat flower, sugar, maize, and beans usually arrive from Juba. It is also worth noting that there are both wholesale trade, linked to foreign traders to a certain extent, and retail trade, largely linked to local traders. Moreover, Juba and Uganda are the major sources of commodities, with sorghum being locally produced, and sometimes obtained from Malakal. Regarding Baidit Payam in Bor, basic commodities could be found, including salt, sugar, soap, vegetables and cereals, and locals found the market to be easily reachable. Riverside markets in Bor sell fresh fish and smoked dried fish and other basic commodities.

Yambio. Yambio and Masia markets are the main daily market, and there is an other market in Nabiapai, active mostly on Saturdays, and with lower volume and varieties of products.. In Yambio, there are agricultural products including maize, cassava, groundnuts, sesame, cassava leaves, meat, bush meat, honey and fruits, which are all obtained locally; as for non-agricultural products, these include, for instance, electronics, shoes, clothes, farming equipment and inputs, and they are mostly obtained from Uganda through the Congo border because Juba is inaccessible from there. Market information in Yambio

is vastly transmitted among traders especially non-agricultural traders, in which the most information being shared is related to prices and exchange rate changes between SSP and USD. The latter allows traders to adjust their prices accordingly, specifically imported items.

Torit. In terms of Torit, most of the items found in the markets are agricultural including domestic food obtained locally. Demand for food in Torit is high because the local produce is not enough to sustain the community for one complete season, thereby resulting in outsourcing from sources, such as imported produce from Uganda¹⁰. It seems that, in this case, the potential for agribusinesses would be large; however, substantial changes need to happen especially in the attitudes and mentality of the locals. Two payam markets open once a week and a modern market was constructed but it witnessed low numbers of buyers because it was distant and the community preferred the older market that has closer proximity; hence, the new market was not functional although the structures are present. Nevertheless, there is potential for more trade given that the county is witnessing lack of conflict, growing hotel industry, and new colleges and schools that are being built.

Rumbek. Rumbek's main market stretches over a number of blocks, and is divided into crops, cereals, and other goods (such as electronics). Rumbek's town also has a relatively active livestock market for the sale and exchange of cattle and other livestock. The market is vibrant during the harvesting months of November and December, but throughout the rest of the year it struggles a lot with market linkages and tends to import products at high costs. One interviewee noted, "Rumbek's market is weaker than that of Juba, Yambio, Torit, and even Bor." Moreover, Rumbek's market has a significant number of foreign shop owners, usually from Kenya and Uganda. Rumbek's location is rather strategic, with Rumbek town situated on the main road from Juba to Wau. Two smaller roads connect out of town – Yirol and Durbouni. Moreover, the recent UNOPS-built road constructed in the Lakes region, 60 km from Rumbek, connects Mapordit to Aluakluak towns, and has also amped up arrival of goods. Staple crops are both produced locally and imported either from Uganda or other areas of South Sudan (mainly Juba). Vegetables too, with some imported from Uganda and Tanzania.

2.4.3 Disturbed access to market

Counties understudy all tend to have a main market in the main town center, coupled with small markets in the payams¹¹. Markets have multiple stalls sectioned into ones for grains, vegetables, livestock, clothes, and other consumables such as sugar, oil, tea leaves, etc. There are also grain millers within main market centres.

The South Sudan-Uganda trading pattern is important to capture; however, it is in favor of Uganda. Uganda's agricultural export to South Sudan continues to soar. Moreover, the trading pattern is highly informal and unsystematized, with South Sudan importing maize flour, maize grain, sugar, rice, wheat flour, and cassava chips among others. These products usually pass through the Nimule border. Indeed, many interviewees note that traders continue to buy their commodities from transporters and brokers outside of South Sudan, specifically Kenya and Uganda.

"There is no problem selling to nearby residents; but the challenge is when, for example, a group of fishermen cooperatives have large quantities of fish left that they would benefit from transporting to Juba but they are unable to - meanwhile, there is a surplus of fish in Bor and hence no one will buy the fish. The problem arises when you train farmers on effective and efficient fishing only for them to be unable to sell because they cannot access the markets." Key informant interviewee.

¹⁰ In several instances, vegetable supply was low because of delay or low supply of vegetables from Uganda.

¹¹ A payam is an administrative division lower than the county

For farmers cooperatives, the issue of access to markets constitute an impediment. The main market in the Jubek region, for instance, is in Juba but many of the farmers outside of Juba are unable to afford the cost of transportation needed to deliver their products there. Even middlemen face this issue. This is in large part a consequence of cyclical insecurity and weakened infrastructure, which feed into one another and make addressing each challenge connected to addressing the other challenges.

Even though there are multiple local markets in rural areas, they are immobile, disorganized, and not well connected to supply chains. Indeed, one of the biggest challenges for this study was the lack of clarity on market channels from sellers to buyers. For instance, Cargo aircraft from Juba has become more common, however it is mostly informal trading channels that operate. Similarly, the Kampala-Nimule-Juba trading route is also key. Moreover, markets in Juba, which are connected to Uganda through a tarmac road, have high potential. Additionally, the western trade corridor (Nimule-Torit-Juba-Rumbek-Wau-Aweil) are improving. On the other hand, Rumbek's markets, although unaffected by conflict, are affected by weak infrastructure (roads) especially during the rainy seasons. Overall, the devaluation of the local currency has had huge effects on the market and the capacity of traders to conduct business. The sourcing of goods is highly costly, consequently markets are having to operate below their capacity. Furthermore, there is extensive borrowing from informal financial markets, given that the formal banking institutions offer credit at high interest rates. Otherwise, farmers borrow from friends and family.

2.4.4 Asymmetric market information

A major obstacle that agribusinesses face in South Sudan is the information asymmetry, defined by suppliers and consumers lacking the necessary information about the market. In another way, the consumers do not have access to information about the prices offered of services and products; simultaneously, suppliers are not able to estimate the demand for the services and products they are offering, which results in situations that could exploit either party. These situations tend to give the powerful more power, and do not serve the poor communities.

In fact, according to SSADP II's baseline, only 56% of people have access to information related to the market. This percentage is highest in Bor at 62%, and lowest in Yambio at 48%, while in Torit, it's at 58%. The type of information being accessed includes prices of the products at 68%, demand for agricultural produce at 17% only, and whether there are new consumers at 13%.

2.5 The government's actions

In addition to the FAO, WFP, and local and international NGOs, the other main institutional stakeholders in the agriculture sector are the relevant ministries (under MACFRD) and the South Sudan Relief and Rehabilitation Commission. The relevant ministries include the Ministry of Agriculture and Forestry, along with the Ministry of Animal Resources and Fisheries, the Ministry of Cooperative and Rural Development, and the Ministry of Water Resources and Irrigation. The government's predominant role is provision of extension services, while the RRC coordinates between NGOs and other humanitarian aid provision.

"What I can say is the ministry is not as strong as it once was, but what we do is to provide extension services - external agents to advise farmers about pesticides and diseases but we are being helped by partners because they have access to proper transport" Key informant interviewee.

Interviewees, however, noted that the government personnel severely lack resources and need capacity building. “Most of the staff are not equipped, as there are technological, infrastructural and knowledge gaps. The government might have the will, but they lack the capacity. The government does not finance the agricultural sector properly and they are not able to support the small farmers. The ministry’s officials can hardly put fuel in their vehicles to go and monitor the production of agricultural lands. They rely on the support of NGOs.” Nonetheless, interviewees noted that the ministries tend to be very supportive within the limit of their capacities. For instance, in Yambio, “because of funding limitations, their role has been mainly supportive rather than direct involvement in terms of supervision or undertaking projects directly.”

However, proper inspection and extension support visits are rarely implemented although agencies such as Agricultural Input Inspectorate Department (AIID) and Agro-Pesticide Control Board (APCB) exist. This is reportedly due to capacity challenges, and it means that agricultural inputs are not properly verified and may not be useful.

Generally, all agricultural projects have to go through the Ministry of Agriculture for approvals. Interestingly, a KII pointed out, resources drain from public institutions is a major issue. “International agencies give the MoA training, but usually those who attend the training end up looking for jobs outside the ministries because it is more profitable for them to work in an agency where they get better paid”.

In terms of policy development, The Ministry of Agriculture and Food Security (MAFS) is the main entity responsible for agriculture and ensuring food self-sufficiency in South Sudan. In addition to focusing on poverty reduction, MAFS’s strategy emphasizes the need to transform the agriculture sector from subsistence-oriented to one that is more market-facing. MAFS also drafted a key **Seed Policy in 2012 and a Seed Bill in 2013** aiming to establish a Seed Council and ensure adequate seed testing and certification to ensure improved quality of seeds and monitor seeds used.

Since the establishment of South Sudan as a state, significant process has been done to ensure necessary legal frameworks for land and natural resources, agriculture, forestry, and fisheries. However, as most interviewees indicated, the government remains unable to implement many of these policies or establish mechanisms of monitoring and accountability. One KII noted, “If you look at existing agricultural policies, they are actually quite comprehensive. But the problem is the severe lack of funding within ministries, as well as the need for capacity development of public sector [employees] as well.” Another interviewee noted, “It is important to put into context that South Sudan is a very new country that has been involved in civil wars. The focus has been on humanitarian need, and less efforts have been put into policy implementation or developing enabling regulations. However, now, with the relative peace this is where focus should shift to.”

South Sudan, notably, is highly decentralized. The **Local Government Act of 2009** delegated a significant amount of power and functions to local governments, including land administration and management of agriculture. Traditional authority councils and chiefs, as per the act, are also involved in community resolution. It is worth mentioning that the Local Government Act is in accordance with the **Community Land Act** and sets the framework for the government administration’s decentralized nature. This Land Act gives local authorities significant functions related to agriculture livelihoods. Indeed, most rural lands are administered informally, mostly by chiefs and other traditional institutions. The act aims to resolve land disputes, recognize customary law, facilitate resettlement and integration of returnees and internally

displaced, establish a land administrative system, promote land management, that preserves the environment and ecology, and guarantees fair compensation to peoples who have lost occupancy rights. However, the act has not been enforced. The Act aims to strengthen communal land rights, establishing County Land Authorities and Payam Land Councils who hold primary responsibility over matters related.

Meanwhile, a draft **National Land Policy** was approved by the Council of Ministers in 2013 but parliament is yet to pass it. The policy pushes for statutory protection for land that is under customary laws through a Community Land Act. As is noted in World Bank (2019), “Finalizing and implementing the policy, especially the proposed Community Land and Land Registration Acts, is critical to addressing existing policy and implementation gaps. Settling land reform policies and regulations will be a long-term goal that will be critical to achieving transformation of the agriculture sector.” Article 169 of the constitution states that land is owned by the people and regulated by the government and the constitution also addresses equal rights for men and women. However, as indicated in the section on gender, women’s right to access land is often dictated by male relatives. Therefore, the National Land Policy is crucial, as it recognizes that women do not have the same access to land as men, and recommends legal reforms emphasizing women’s access to land.

Moreover, the **National Agriculture and Livestock Extension Policy (NALEP)** encourages agricultural extension services that aim at introducing sustainable production amongst households. It calls for research and extension services to be aligned to the needs of rural communities, while advocating for a cross-cutting approach. The NALEP also calls for inclusion of private sector in provision of extension services and developing human resource capacities. Key objectives include the empowerment of rural households and creating effective partnerships (between research and extension user) that are attuned to the needs of farmers. In 2012, **the Agricultural Research Policy** was also put forth, with the aim of disseminating new information and improved policies centered on transforming agriculture in South Sudan. However, this policy has also not yet been approved by the government. With regards to animal husbandry, the previous Ministry of Animal Resources and Fisheries had developed a strategic framework that had advocated increased investment in training capacity for best practices. It had also promoted livestock research, wildlife management, criminalization of cattle rustling, and resources management. The same ministry had also put forth a fisheries policy focused on improved production and minimized destruction of wetlands and overfishing.

A more recent agenda has been that of the **Agriculture Sector Policy Framework (2012-2017)**, which importantly prioritized gender mainstreaming in gender, in addition to an irrigation and drainage policy. This framework involved collaboration with the Ministry of Environment to develop a climate change strategy and the National Adaptation Programme of Action under the United Nations Framework Convention on Climate Change. **The National Environment Policy and Environment Protection**, which was passed in 2016, also focuses on sustainable development in relation to the environment. Indeed, South Sudan is a signatory to the Paris Climate Change agreement and aims to prepare for the Intended Nationally Determined Contribution.

Forest reserves, where a lot of honey production takes place, receive more detailed protection and management according to a KII. Broadly, there is significant focus on environmental protection, as stated in Article 41 of the constitution. The Ministry of Environment and Forestry was instituted in 2016, as part of the conflict resolution process in South Sudan. In 2016, as well, the National Legislative Assembly approved a national strategy focuses on managing environmental resources. The National Environment

Policy and Environment Protection Bill mentioned above is also based on good governance and sustainable development, giving the framework environment protection mainstreaming.

The “**South Sudan Vision 2040: Towards Freedom, Equality, Justice, Peace and Prosperity for All**” is a key document drafted in 2011 although it is yet to be officially adopted. A main tenet of the document is that the country’s economy should tap into the agriculture sector and not simply rely on oil.

2.6 South Sudan’s cooperative movement

Farmers have historically formed informal groups and cooperatives for purposes of land cultivation and harvesting. From as early as 1953, a Department of Cooperatives was set up in Juba. However, following the years of political and social instability, there was a break-down of social capital and the development of cooperatives was held back by decades of war and infrastructural damages. Farmers, since South Sudan’s official formation in 2011, are poorly organized. However, in the past three to four years, given the relative peace, more farmers are moving towards forming groups, associations, and formalized cooperatives – this can be seen particularly in Juba, Yambio, and Torit.

Cooperatives are established with the help of payam-level cooperative inspectors from the MAFCRD. Groups are required to put forth their principles and members (minimum of 20) prior to official registration by the state ministry. Cooperatives can open bank accounts with their registration certificates.

NGOs, in tandem with the Ministry of Agriculture, Forestry, Cooperatives, and Rural Development (MAFCRD), have also supported cooperatives particularly in terms of production and harvesting. The major source of funds for cooperatives is membership fees and service charges once the members’ aggregated produce is sold. However, interviewees point out that there is still a lot of work left to do with building cooperatives’ capacity to upgrade from subsistence farming to a more market-oriented approach.

Overall, there is a dire need for financial support in order to enhance and increase cooperatives’ operations. Another challenge that they face is the lack of competitive markets for cooperative members are able to sell their produce. Cooperative members, additionally, have high levels of illiteracy, leading to communication and organization problems as well as poor management styles, and ability to arrange for logistics. In fact, illiteracy is high among cooperatives’ board members as well. Moreover, cooperative members lack business development skills that might help cooperatives seize more opportunities to grow and advance more, especially that some members already suffer from lower business opportunities because of the striga weed infestation, fall armyworm and lack of mechanization. An additional challenge that cooperatives face is that there is no appropriate structure and accounting practices. This has caused the cooperative in Yambio, for instance, to lose their main market to sell their produce – WFP (SSADP II Baseline, 2019). When WFP was asked why they decided to support farmers directly instead of cooperatives, they mentioned that there were no accounting practices adopted and hence no transparency within the cooperative, which resulted in many farmers not getting their share of funds. Thus, they decided to support farmers directly even those who have very small amounts of produce.

Moreover, the main areas where cooperatives need the most support include:

1. Training on disease or pest management that affects maize, sorghum, and groundnut
2. Support with administrative, financial, and governance-related development. Support is needed on internal democracy and organization within the cooperatives
3. Prioritizing and advocating for modern farming practices and procurement of tractors
4. Focusing on storage after harvesting, as post-harvest losses are great

5. Understanding how to tap into the market and creating linkages between cooperatives across South Sudan
6. Opening bank accounts and liaising on issues related to access to finance
7. Working on transportation and facilitation of goods from one area to the other

A KII with a representative from South Sudan’s Agricultural Producer’s Unions noted, “Cooperatives in South Sudan do not have proper decentralization and they really need support with building governance structures and internal democracy. While cooperatives do focus on crop production, especially with cereals and horticulture, they do not have proper administrative units to create market linkages.” An interview with the Director of the Ministry of Cooperatives noted, “The managerial aspect is a bit challenging. It is the biggest obstacle to cooperatives; they need training with management and finance.”

Table 4: Main business activities of cooperatives across several counties

County	Main activity of the cooperative
Torit	Production of maize, groundnuts, sorghum, sesame and vegetables
Bor	Collective cultivation and marketing of sorghum, maize, ground nuts, sesame, fishing
Yambio	Production, primary processing and aggregation of grains and pulses including maize, groundnuts, cowpeas and sorghum; as well as beekeeping
Juba	Collective cultivation and marketing of sorghum, maize, ground nuts, sesame, fishing
Rumbek	Production of sorghum, groundnuts, processing of honey

3 Gender dynamics in South Sudanese agriculture

3.1 Customary Laws

The customary laws make addressing gender discrimination and violence very difficult. Customary laws, recognized in the transitional constitution, have many aspects that make it difficult to advocate for women's rights as they, ultimately, perpetuate gender injustice. As noted in Kircher (2013) "In customary law and culture, the focus is on social cohesion and the preservation of the family rather than on the safety and wellbeing of the individual. Reconciliation and compensation are favoured over retribution and punishment". If there is a contradiction between customary and statutory law, the latter should prevail, but in reality, this does not usually happen, and the two systems operate in parallel. Many tribes prioritize family and marital affairs over other issues - within these communities, it is shameful to discuss marital issues publicly as family cohesion is crucial.

Customary courts remain highly biased towards women, as social stability is the main status to be maintained - as such, even in cases of abuse, stories might be hushed in order to preserve social cohesion; "as the aim of customary courts is to preserve marriage, divorce is rarely granted and women are almost always ordered to reconcile and return to their abusive husbands" (Kircher, 2013). Moreover, for instance, as cattle are considered as bride price, divorce is discouraged because it will mean that the bride and her family will have to return the cattle.

The customary law is not limited to matters of social issues and the relationship of individuals between each other, or marital and familial relationship only. While it appears to be socially and culturally acceptable for women to work in agriculture, they face challenges concerning land ownership. Interviewed female farmers noted one of the challenges is that although legally, as per the transitional constitution, women have the right to own a property, they do not own assets or lack control over their assets, due to cultural obstacles. The majority of property is owned and controlled by men. An interviewee noted, "Many women are simply not allowed to own property or land". However, in some areas, women are more likely allowed to own and sell goats and poultry than cattle.. It has been a remarkable improvement and asset for them. Additionally, in many tribes, owning cows by women is not acceptable and is seen as a purely "man's thing".

Men usually make decisions, and there continues to be an expectation that women should provide and serve the family. Therefore, many women still depend on male family members - whether husbands, brothers, or fathers - before working in certain endeavors. There is still a prevalence of the discourse that men "bought" women and hence have control over them.

Cases of gender based violence, early marriage, and early school drop out remain the same across all five areas. There are very few formal mechanisms of accountability or redress in terms of gender equality. It is also good to mention another aspect of masculinity and gender discrimination is polygamy. Polygamy is legalized in South Sudan, as South Sudanese can marry as many women as they want as long as they can afford to pay the bride price. However, women can only have one husband.

In all five areas, particularly surrounding towns and rural areas, the local chiefs have a say in many affairs related to women. Local chiefs preside over customary courts, many of whom may have traditional

perspectives about family and women. Familial and land-related disputes, for instance, may also be taken to a land chief. In some cases, the land is provided to cooperatives via local chiefs. Such disputes - related to property, marriage, inheritance - are under the jurisdiction of customary laws. Until today, there is no proper harmonization with statutory laws.

The different ethnic groups have their customary laws. Ultimately, the Supreme Court can issue final rulings based on customary laws as well as national and state laws. Statutory laws surpass customary laws; however, rarely are problems within families raised beyond local chiefs, and crimes against women are addressed with customary laws as opposed to formal courts, and community arrangement and payments often occur independently of formal court. The gender and traditional perception of judges also affect the carrying out of justice.

Regarding violence or crime against women, sexual violence was used, as a weapon of war, during the civil wars, and in many regions, it continues until today between different ethnic groups. Women and girls are sexually assaulted and abducted during cattle raiding.

3.2 Improvements in gender equality

Interviews indicated that there is a changing perception of the role of women in agriculture; although women have long been involved in farming, there was a tendency to look down on female farmers. Increasingly, women are today running and forming cooperatives, liaising with brokers, and planting in their gardens to sell in markets.

Following the war, international organizations and local community based organizations played a critical role in prioritizing more women and encouraging them to engage in value addition activities. Through capacity building training, women are becoming more confident in initiating or running an agribusiness. However, several interviewees indicated that the violent process that parallels the formation of the South Sudanese state meant that, from its very establishment, there has been a proliferation of international and humanitarian organizations from the beginning. It has naturally led to tensions between 'outsiders' and locals, with locals feeling as though international organizations are imposing a new culture that erodes the local one. This extends to conversations around "gender", as data collection shows.

While gender roles are still highly skewed towards men in South Sudan, data collection indicates that there has been some great strides over the past couple of years. There are a growing number of women-led cooperatives and farmer associations. In Juba, for instance, local women-led associations are advocating for women's rights. Women are also joining the private sector and other administrative positions in small businesses.

3.3 Gender division in agriculture

As is the case across many countries, there is a gendered division of labor when it comes to agriculture. While men tend to do more labor-intensive activities, such as cutting trees and plowing the land, women are more likely to weed and harvest. Women are significantly involved in agriculture across South Sudan. One KII said, “If you come to Bor, you’ll spot it immediately - women are the ones mostly involved in farming, while men chat with friends and relax”. It was reiterated across different interviews and focus groups that women are much more active in farming than men. Humorously, many said that women cultivate while men sit with their friends to smoke and play cards or dominoes.

The MARF

Within the MARF, the Department of Gender Analysis and Mainstreaming is under the Directorate of Planning, Statistics and Documentation. The objectives of the Department of Gender Analysis and Mainstreaming are to collect, analyze and disseminate credible gender-disaggregated information needed for rational planning and timely decision-making within the Ministry and by other stakeholders; to provide a focal point within the Ministry for ensuring gender consideration in project design and implementation; to promote development in the livestock and fisheries sector

Sometimes, for logistics and technical reasons, women’s work can be canceled or postponed. For example, in Yambio, for instance, because the topography is composed of thick forests, women might refrain from agricultural work because they are not supported with cutting trees and plowing equipment.

In terms of tools, similarly to men, women use simple tools such as malodas for tilling the land. Interviewed women said that advanced tools, such as oxen, and tractors would make their work much more efficient - however, they lack access to these tools and are often not the priority when these tools are made available within the community. Women are also less likely to have access to grinding mills. As such, they tend to pound sorghum and maize, for instance.

However, one of the constraints which we have observed is the access to the market, particularly with regards to carrying farm produce to the market. For example, heavy and bulky maize and sorghum, needing physical labor to carry, are sometimes constraining to women. An interviewee working on the SAMS project noted, “we have noticed from running agriculture projects in catchment areas, where farmers can only buy their maize. We realized that in the first year, only 10% of women were selling in aggregation centers, but by the second year, this number moved to 19% after being supported with the transportation of maize. This increase shows that the problem is transporting bags of maize to the market, which is very energy-demanding. Men who have bicycles can carry the maize to the center; but women have limited access to those modes of transport”.

Interviews estimate that over 50% of agricultural labor, is done by women. One interviewee, who has worked on the agriculture sector across the country, even estimated it at 70%. However, women have lower opportunities because of their lower literacy and cultural issues affecting their ability to be more engaged in the productive sectors of agriculture. As such, they are mainly involved on a subsistence level.

Women are involved in horticulture and other forms of crop production, and fetching water, but rarely engaged in sales. There is also a dearth of female agricultural extension workers when men dominate

access to agricultural extension. Many women are accessing markets for the sale of vegetables and fruits, which is generally dominated by women.

Forced to bear economic responsibility, many women take to farming as an opportunity to generate food and, in some cases, income for the family. Women in focus groups said that a lot of the work burden is placed on them, as they have to supervise and take over home-related tasks such as taking care of children and cleaning, as well as farming. This load of work during the day requires a lot of her time and effort, which affects her physical and psychological health, and does not give her enough time to take care of herself and relax.

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4 Cereals value chains

4.1 Note on South Sudan's cereal production

Over the years, certain agricultural commodities – for both cultural and agricultural reasons – have become a staple and are an intrinsic part of the country's consumption patterns. Largely, this includes cereal such as sorghum and maize, but also millet, and rice. It cannot be emphasized enough how crucial cereals production is for South Sudan's food security. The South Sudanese Government and international organizations have picked up on this, in a bid to revamp and increase production of cereals.

“When you look at all the land you can use to produce cereal, or the ways you can [ensure] value addition activities for cereals, you realize it is a shame that South Sudan imports any grains.” Key informant interviewee.

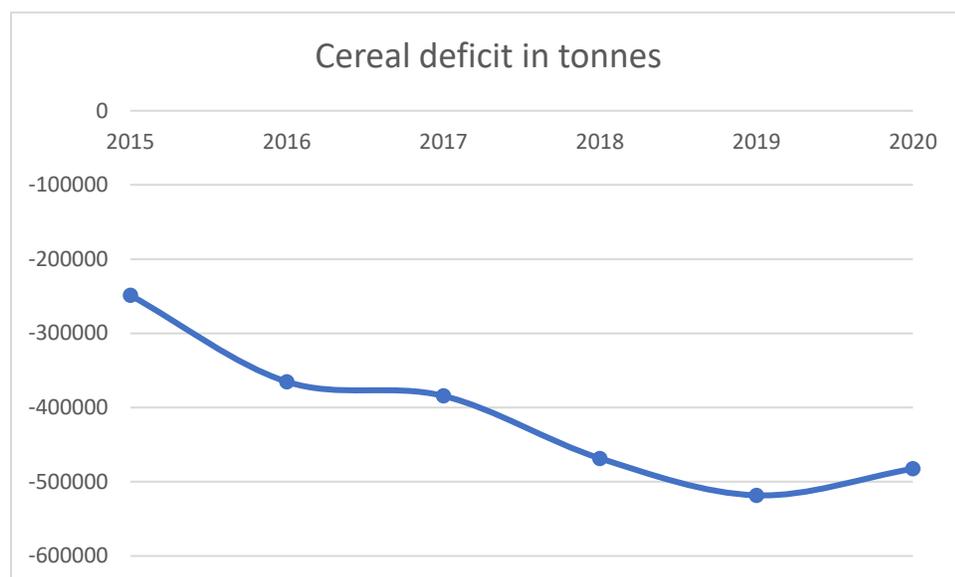
According to SSADP II's baseline study, households in Torit, Yambio, and Bor produced an average of 2 tons of maize and 0.4 tons of maize from the average land size of approximately 1.4 feddans or 0.6 Ha. KGs of sorghum from 0.588 Ha of cultivated land, and 390 kgs of maize from 0.504 Ha of cultivated land per season. However, farmers in the three counties lost an average of 155 kg of sorghum and 30 kg of maize.

In 2013, the cereal requirement for South Sudan's population was projected at 1.04 million tons; meanwhile, the cereal production has have the capacity to potentially reach 2.5 million if a medium term agricultural expansion program is implemented (AFDB, 2013) . That could lead to a surplus of cereal that may be exported to regional or even global markets. However, any agriculture expansion program needs to take into consideration key structural issues and environmental challenges - from the lack of mechanization, low quality inputs, to lack of adequate irrigation, and economic and political insecurity, among others.

Around 80% of cultivated areas in South Sudan are covered by cereals, specifically around the Greenbelt, Flood Plains, and Ironstone Plateau. Yet, because of decaying postharvest handling, a significant amount of cereal production is lost (World Bank, 2019). For instance, according to SSADP II's baseline study, households in Torit, Yambio, and Bor produced an average of 2 tons of maize and 0.4 tons of maize from the average land size of approx. 1.4 feddans or 0.6 Ha, however, losses from post-harvest handling accounted for approximately 10% of the yield. The aggregate area harvested for cereal production in the traditional farming sector is estimated at 882,860 hectares in 2018, which was a slight increase from 2017, and is largely due to an increase in farming households given improved security dynamics. Cultivated area is still extremely low in comparison with the available areas. (WFP/FAO, 2019).

As noted, South Sudan remains dependent on cereals imports. There has also been a decrease or, at the very least, fluctuation of cereal production - depending security, the rate of the local currency, and demand. An FAO report (2019) estimated the net cereal production in the year 2018, after deducting post-harvest losses and seed uses, within the traditional sector at approximately 745 000 tonnes, which is 15.5% less than the average of previous five years, and is also the smallest recorded output since the conflict started. It also reports that the cereal deficit during 2020 is estimated at around 482 thousands tonnes, which which is approximately the double deficit of 2015 (FAO/WFP, 2019). In fact, cereals deficit in South Sudan is increasing over the years, as shown in figure X below.

Figure 1: Total South Sudan Cereals Deficits in Tons (2015-2020)



Source: FAO and WFP (2020)

The Ministry of Commerce, Industry and Investment, in tandem with the Ministry of Agriculture and Forestry, had initially proposed that the following targets should be met by 2016: (i) increase the volume of cereals produced to 1 million tons; (ii) increase yields for cereals from 0.97 tons per hectare to 1.1 tons per hectare; (iii) increase the volume of cereal exports; and (iv) mobilize \$350 million of FDI for commercial production of cereals for the domestic and international markets. Yet, interviewees indicated that by 2020, the production of cereals in South Sudan certainly did not meet the country's demand, with the country having to significantly rely on imports and humanitarian assistance.

However, multiple reports and experts indicate that South Sudan can become fully self-sufficient in terms of cereals production and consumption and in fact, can export cereals. Understanding the value chain of maize and sorghum, and its opportunities and potential is key for the development and potential independence of South Sudan in cereal production and consumption. However, given the current circumstances, support to cereal export might hurt South Sudanese food security.

4.2 The sorghum Value chain

4.2.1 Sorghum: production and upstream activities

In South Sudan, sorghum is very much perceived as the ultimate crop for food security and sustenance; it is indigenous and grown by farmers across South Sudan either traditionally or as improved varieties. It is generally consumed in rural households, where food security is a daily challenge, making it a key value chain to support and upgrade. Sorghum is usually grounded for meals including porridge (asseeda), flatbreads (called kisra), cakes, and others. It is also a versatile crop that can be used as a cash crop for beer production, can be processed into flour, used as fodder and pet feed, and even as biofuel. It can also be used to make oil and pastes. Nutritionally, it is high in carbohydrates, and contains protein (10%) as well as calcium, iron, vitamin B, and niacin.

Production methods remains highly traditional, most interviewed farmers state they don't use fertilizers for sorghum fields unless these products have been provided to them or in situation where there is a significant risk to lose the crop. In some areas, such as Yambio and Bor, farmers' cooperative unions distribute supplies of pesticides they receive from international organizations, and the FAO has long been a key provider of inputs - including seeds and basic tools.

Farmers usually exchange heirloom sorghum seeds informally, reuse them from previous seasons, or rely on international organizations for distribution of (usually imported and hybrid) seeds. Indeed, South Sudanese farmers use a wide variety of sorghum seeds. Most varieties, are tolerant to drought and heat - which is key, given the predominance of arid regions in South Sudan. However, many of the traditional sorghum seed varieties are late-maturing, and thus more prone to heat and drought shocks, as well as pest damage. Many farmers faced with food shortage are forced to consume next season's seeds, resulting in shortage of seed at planting time.

There have been seed interventions, especially from humanitarian organizations and agencies such as the FAO. Farmers agreed that they preferred local seeds to the imported ones they are given by international organizations. However, as noted in the World Bank (2019) report, "Traditional varieties are more readily available through informal seed networks, have a long growing season, produce taller plants, but have a relatively low yield. They remain popular because of seed availability and consumer preferences for texture and taste. Improved varieties are early maturing, high-yielding, input responsive, and drought resistant, and there are now open-pollinated hybrids available in the market as early maturing varieties; however, they increase the cost of production because they need more inputs." Increasingly, there are more short-term varieties of sorghum used in large-scale mechanized farms as well as smallholder farms (FAO/WFP, 2019).

Some of the common varieties of sorghum include akuaracot (Jonglei State), Nyitiin, Matueel, and Kech (which is more long-term). Sorghum can be intercropped with other cereals, such as maize and millet, as well as key crops such as groundnuts and cowpeas.

Sorghum is mostly produced by smallholder farmers. There are a growing number of semi-commercial produces, yet large scale commercial sorghum farming appears to be extremely rare

In terms of land preparation, farmers usually prepare or plough the land with traditional tools, such as machetes (panga), hoes (maloda), and slashers. There is a dire need for mechanized processes for soil preparation, seeding and harvesting, especially when the soil is not highly conducive. Importantly, farmers tend to avoid waterlogged soil as they are detrimental to the growth of sorghum. Farmers said they tend to plough the land twice for sorghum, but others mentioned that they sometimes only ploughed the land once. The preferred form of planting is usually row planting; however, in South Sudan, there is broadcasting of seeds/random throwing of sorghum seeds as opposed to more structured row planting. Key informant interviewees also noted that farmers do not always properly calculate the spaces between rows, which should be between 45 to 70 cm approximately, which tends to affect sorghum yield.

In some areas, the fertilizers used are organic manure from cattle - this is the case in some areas of Bor, for instance - and in other areas, such as Yambio and Torit, crop residue and liquid manure are used.

On average, sorghum yields are of 3.6 tons per ha (SSADP II, 2019). There was, according to the general consensus amongst interviewees, an increase in sorghum production and yield over the past two years. Importantly, sorghum is highly resistant as a crop and can grow in different types of soil as it is tolerant to salinity and bad soil.

4.2.2 Sorghum: markets and downstream activities

Sorghum is mainly produced for family consumption and as a form of subsistence farming in South Sudan. However, for the most part, sorghum is produced for home consumption; home consumption channels usually absorb poor quality grains. When sold, the marketing channels of sorghum depends on multiple factors, particularly geographic distance. Farmers, who do sell their sorghum surplus, usually do so without any value addition other than shelling. There are a few actors involved in the market channels, mainly farmers and traders. Some of the local traders involved in this process are also connected through brokers. These brokers link farmers in smaller towns to those in the more urban centres.

Due to constant currency fluctuations – and since price of sorghum is determined by regional African markets – prices in local South Sudanese markets are highly volatile. Affordability of sorghum for South Sudanese remains lower than average, in comparison to the region, due to a combination of macroeconomic factors including inflation, insecurity, and the depreciation of the South Sudanese pound.

Post-harvest handling and storage are very critical for grain quality. Sorghum is usually dried in open pallets or woven mats, which exposes the grains to wind. In some counties, sorghum is stored in hermetic bags as opposed to the traditional storage ones. Many farmers store sorghum in unfit storage structures that may lead to mould and storage pests. Storing grains underground, for instance, is quite rare yet helps reduce mould significantly. After storage, Sorghum is one of the few crops in South Sudan that is processed with grinders turning sorghum into flour; however, even sorghum's processing is not properly developed and happens on a small scale. Households use traditional grinding stones or pestle and mortar to make flour. In pilot and very limited niche markets, sorghum is being sold commercially in different forms, including pure red sorghum grain, pure white sorghum grain, sorghum flour.

4.2.3 Sorghum: challenges

Access to land and land preparation . Efficient production of sorghum requires large stretches of land, which makes it difficult for small scale farmers and women who have home responsibilities to engage in. Moreover, in South Sudan a main challenge is that usually only small sizes of land are cultivated. Rain-fed sorghum requires that the field be prepared in advance in order for it to take advantage of rainfall. Additionally, sorghum farmers – because they usually have to go far away from their homes or even towns to cultivate – are more likely to be affected by waves of insecurity. For instance, farmers in Bor mentioned that they were highly affected by the Murle attacks because whenever there was an impending attack or the potential of one, they worried they would be victim of it, given that they were alone in lands quite distant from their villages.

Pest management. Some of the pests affecting sorghum include sorghum midge, fall armyworms, sorghum head caterpillars, and other soil insects. Sorghum is also highly affected by the *Quelea Quelea* birds, which can reduce sorghum's production levels immensely. These birds can eat up to 10 grams of grains per day, hence when over a million of them attack a county, it can yield significant losses. Some ways to combat soil insects includes seed dressing. Open-headed sorghum hybrid varieties can also deter pests. Importantly, an integrated pest management (IPM) strategy is highly needed. Covering sorghum crops with meshed fabrics also helps reduce their destruction by birds. Sorghum is affected by a number of diseases, most particularly smut, which is detrimental in the seed development stage. There are also fungal diseases or grain moulds that affect some varieties of sorghum. Parasitic weeds also affect sorghum and weed competition can significantly reduce yield if there are no proper measures taken. Minor hand weeding is the most common action taken.

Fall armyworm control

South Sudan's Ministry of Agriculture and Food Security, with support from the Food and Agriculture Organization of the United Nations (FAO), initiated a five-year plan to control fall armyworm in the country. Fall armyworm was reported in South Sudan in 2017, and spread quickly across the country - mostly affecting Eastern Equatoria and Central Equatoria. The worm feeds on over 80 host plants, but mostly targets maize and sorghum. However, unlike maize, sorghum is slightly more resilient to the fall armyworm (FAO, 2018)

Weed management For sorghum, weeding is not adequately carried out by smallholder farmers and is usually done once instead of twice. Farmers also lack the skills on proper preparation of land, which ultimately affects their pest and disease management as well as post-harvest management.

Lack of skills on post-harvest management. The lack of access to finance for upscaling activities, in addition to limited loans from commercial banks is a challenge. Additionally, the inaccessibility of markets due to cyclical insecurity and transportation is a persisting challenge. A main challenge with sorghum is ensuring that farmers have the tools and skills to appropriately thresh, sort, and grade sorghum. This also, importantly, extends to the lack of packaging material. Moreover, farmers do not properly store sorghum - many do not use airtight conditions, which could pests away.

Lack of business planning. Farmers, particularly women and small scale farmers, direly need support with business planning - including marketing, financial keeping, and other administrative priorities.

4.2.4 Sorghum: opportunities

There is a need to expand sorghum production to ensure food security needs, furthermore several market niches opportunities including export exist for sorghum and sorghum preparation, assuming expansion of production leads to a local surplus.

Highly resilient crop. Sorghum is versatile, dependable, and stable even in adverse agricultural conditions. It is important that yield is enhanced through local breeding. Its adaptability to drought and tough weather makes it highly popular in South Sudan, where the weather and rainfall can sometimes be unpredictable.

Input linkages between cooperatives/groups and input suppliers. Working with input dealers on a payam level can help minimize risks for farmers and increase capacity of seed distributors. This can be done

through creating linkages for farmer groups or cooperatives who can then estimate the demand for the group and later distribute it amongst sorghum producers. This minimizes costs of transaction and transportation.

Community-based seed multiplication. Moving forward, it is very important that a sustainable seed supply system that is community-oriented is established. In South Sudan, interviews showed that majority of households acquire seed varies through several channels, including informal merchants, exchange with nearby households, international organizations, or through hybrids within their own field. Currently, it does not appear that there is a monopoly on seed ownership, but moving forward community ownership is key, especially that farmers are more likely to trust seed sources within their villages as opposed to imported seeds given to them by international organizations.

Mechanization (through jointly owned machinery). Proper spacing, weed management, land preparation. Because sorghum is highly resilient, if farmers are trained on proper land preparation, it can significantly increase production. For instance, an interview noted that the step of sowing seeds in flat beds during cultivation helps conserve the soil moisture - which is a step that is sometimes not properly addressed.

Improving storage facilities. Introducing subsidized hermetic bags to sorghum producers through agro-dealers is key. Moreover, building small warehouses using good quality materials to store sorghum is also important.

Sorghum milling units. Processing grain into flour using small millers is an opportunity to add more value to their sorghum. Currently, very few millers in the five areas purchase grain from farmers. However, the production and sale of good quality grains to millers, who will then supply flour to supermarkets and other businesses, has high potential. Sorghum can be used as an ingredient for several types of food processing, including desserts. In Ethiopia, sorghum, in addition to teff, is also used for injera which is a type of bread that is exported to many different countries across the world. It is also used to make local drinks in Ethiopia. Similar processes can be done with South Sudanese foods and drinks – such as Kisra the local sorghum bread similar to Injera, to be exported to different countries, especially those with Sudanese and South Sudanese migrants. Introducing easy to operate units, spearheaded by agricultural cooperatives, is a good way to improve milling and processing of sorghum, thus reducing losses and increasing income of farmers.

Animal feed and other uses. There's an opportunity to use sorghum as animal feed, which is something that has not yet been tapped into. There are fodder shortages in several countries, which, if South Sudan can tap into, may increase export potential of sorghum. There is an increased demand for sorghum, particularly from China, which has been using sorghum crops as feed for livestock. Moreover, its stalk can also be used for different purposes, including fuel, syrup, sugar, and even shelter. There are also multiple industrial applications sorghum can be used for, which have barely been tapped into by agro entrepreneurs.

4.3 The maize value chain

4.3.1 Maize: production and upstream activities

Maize is the world's third most dominant crop, after rice and wheat, generating 219.5 billion in revenue (Daly et al., 2017). While across the world it is mostly used for animal feed and ethanol production, in South Sudan and East Africa generally, its production is mainly used for home consumption, making it a key crop for food security and together with sorghum one of the most important crop in South Sudan. Maize is also used to prepare dura, which is a type of cooked maize that is eaten with different vegetables. Ugali, a very popular type of maize flour porridge in Kenya, which is becoming very popular in South Sudan as well - it is eaten with vegetables, chicken, fish, and/or meat.

Some of the main inputs include land, water, seeds, and pesticides. Land clearing for maize is usually communal and done by either an informal group of farmers or a semi-formal cooperative, as it requires a lot of labour by hand and tools used are rather basic (machetes and slashers). As is the case with sorghum, there is very little mechanization and tractors are considered rather expensive. As such, only a limited number of farmers (mostly in Juba and Bor) do use tractors for either maize or sorghum.

It is important to note that farmers have historically grown non-hybrid and low-yielding maize in the country, using seeds imported or distributed by humanitarian organizations that are in many cases not adaptable to the country's soil and climate. Government and development partners introduced improved maize varieties called Longes. Interestingly, four new hybrid varieties have been developed by a South Sudanese scientist Luka Atwok Opio after careful identification, selection, and trials taking into account the country's agriculture and ecological climate. Opio was supported by the Alliance for a Green Revolution in Africa and the Netherlands (For more, see Agra 2020) . However, until today, most farmers use traditional low-yielding maize varieties.

Many farmers, including those interviewed, are unaware of the different maize seed varieties. They end up depending on seeds they might have saved from the previous harvest which are often low yielding. Indeed, the majority of farmers in South Sudan rely a lot on informal seeds as well as imported seeds provided by international organizations. Interestingly, in comparison to other nearby countries, this is unique. In Rwanda, for instance, input supply is mostly managed by the Ministry of Agriculture with seed supply fully subsidized and fertilizers subsidized at a 50% rate (Daly et al., 2017). One interviewed key informant asserted that, "high-yielding seeds, that can tolerate drought and lack of rainfall, can really positively affect food security and lead to a decreased reliance on imported cereal."

Generally, maize has two cultivation seasons. Depending on patterns of rains, the planting happens between March and April and the post-harvest can be at the end of June. It takes the harvester approximately one month to have the maize properly dried. The second planting usually takes place between August and September, with harvesting happening towards the end of year. SSADP (2019) notes that, "Maize production increased from 2017 to 2019 by 18%, 69%, and 73% in Bor, Torit, Yambio. Moreover, in those three areas, the yield of maize per feddan is also growing and the cost as well is also increasing, perhaps due to increase in cost of production."

Nationally, the WFP/FAO (2019) estimates the total area planted with maize is 22% of the cereal area. However, this relatively low number is due to regional differences as maize is grown popularly in the

Greenbelt and southcentral areas, as well as in the eastern counties of Jonglei. Similarly to sorghum, maize is dried on the ground or in open stalls – thereby increasing its exposure to dust, rain, and other hazards. Traditional methods of shelling, such as beating grains with wooden sticks, are done but this has decreased amongst farmers. Otherwise, shelling is done using hands - which is a time consuming process.

4.3.2 Maize: markets and downstream activities

The maize value chain is one of the more advanced chains in South Sudan yet even maize is relatively under-developed with a small number of value chain actors. In addition to producers, the main actors are processors and traders. SSADP (2019) estimates that “93 % farmers across the counties [sell] their produce in open market while 61 % at farmgate.” Some of the main actors within South Sudan include smallholder farmers, small scale posho millers, transporters, retailers, consumers. It is worth also noting that medium farmers in Uganda also export maize into South Sudan. In terms of sales, it is mostly informal networks of village agents, small scale traders, and in more advanced cases wholesalers who buy maize from producers to sell to processors.

Maize processing is still quite basic, and is usually done in households using mortar and pestles. However, in the counties, there are small scale maize mills in or nearby market centers that provide milling services. Maize is not properly dried in South Sudan, and the moisture content - according to interviewees - is higher than standards that would enable South Sudan to export maize. In South Sudan, if harvested maize isn't lost in the post-harvest stage, then most of it is consumed on the farm by rural households. In some cases, maize is sold in domestic markets and purchased by the WFP. Unlike neighboring countries, very few of the maize ends up in the export market, processed into flour or other value addition activities such as selling to breweries, or used as animal feed.

According to interviews, the major buyers are institutional food programmes (i.e. the WFP) and informal buyers, with minimal quality demands, who then sell them in local markets or small-scale flour millers. Indeed, WFP is the main market for maize, and it specifically supports smallholder farmers through absorbing locally produced maize. WFP's project, titled the Smallholder Agricultural Market Support project, ran from September 2018 to spring 2020, and procured maize from farmers. Very rarely are quality inspections done by traders. Maize, in East Africa, is mostly “accessed through untaxed and unregulated channels” (Dary et al., 2017). Indeed, as noted above, 70% of maize produced is eaten in households or on the farm (70%).

A spokesperson from the Ministry of Agriculture in Yambio noted, “Maize has a market - both here, in South Sudan, and abroad. If you question which farmers in Yambio do generate income from farming, it will most likely be those engaged in [the] production of maize. This is why there is potential for it to be sold in domestic markets as well as abroad – it is, however, about addressing the challenges preventing farmers from selling abroad. One of the main challenges is transportation – which is why it is the government's priority to maintain and improve the roads of rural areas.”

Similarly to sorghum, maize is more expensive in South Sudan than its neighboring countries. According to a report done by Farm Africa in 2014, “In Custom market, the largest commodity market in South Sudan, the wholesale market price for maize grain was quoted as \$500 per ton during the survey but on-line prices were reported at \$400-420. Taking the most conservative price of \$400, the price of maize at (August 2014) was at least 24% above the next highest market in the region (table4). With Juba prices at

\$119 per ton higher than Kampala, the cross-border trade with Uganda appears to have high gross margins even taking into account the cost of transport.” The market price depends on the land; when maize is being bought by WFP, prices tend to go up in the market. Maize is often transported to markets via bikes; in some cases, they are transported through motorcycles or cars.

Whereas in Rwanda, Kenya, Uganda, and Ethiopia, there are large scale private corporations such as the Rwanda Grain and Cereal Corporation that purchase a significant portion of maize, there is no similar entity in South Sudan. The lack of a corporation that is an intermediate between farmers, farmers’ associations, and cooperatives with institutional buyers and processors is a key challenge that needs to be addressed.

As noted above, Ugandan maize is imported to South Sudan - in fact, in 2017, 15% of the 101 million USD crop import were maize seed, 7.4 % maize flour, and 0.35% maize (Simoes 2017) . This is in large part because Ugandan maize growers tend to sell maize at low prices, leading to a significant price gap between Uganda and South Sudan. In fact, one can look at Uganda’s commercial sale of maize as a way forward for South Sudan. Uganda has a network of formal processors and traders, with surplus maize flour being exported to DRC and South Sudan (Daly et al., 2017).

4.3.3 Maize: challenges

Low quality of input supplies. There are low levels of adequate fertilizers used, in large part because they are quite pricey for farmers and as such, farmers do not have an incentive to invest in them. Moreover, there are quality seed shortages and lack of access to finance to purchase quality seeds, leading farmers to revert to using low-yielding traditional varieties.

Minimum agricultural practices. There is no proper land preparation, weeding, and pest and disease management. Similarly, to sorghum, addressing the situation of the fall armyworm and weevils is necessary. A lot of the maize is shelled with hands, which is an arduous and long process that reduces production. Weeds and fall armyworms are serious impediments to maize production. The fall army worm is not easily controlled and leads to significant losses during production. Extension services advise farmers to spray ash and leaf extracts on maize plants with fall army worms; however, this method is not always effective.

Access to market. For the all areas under study (with the exception of Juba), access to wholesale market is a problem because it is outside the state; in Juba, however, there are maize markets within the city. Some suggestions farmers put forth was aiding or subsidizing transportation; as one farmer put it, “Why can't one of the partners [i.e. government or international organizations] bring one lorry for farmers to transport their produce from one end to other?”

Post-harvest losses. There are no proper storage warehouses or storage facilities. Maize is often stored in jute bags, which are prone to pests. As is the case with sorghum, hermetic bags should be introduced through creating linkages between agro dealers and farmers or NGOs/government to subsidize, and farmers shall be trained on proper drying methods, so maize are stored at the right moisture content. More maize is produced than there are storage capacities. The lack of organized storage systems and technologies leads to pest and mould infestation. Many of the farmers interviewed actually said the lack of storage facilities is the biggest impediment in the maize value chain. When asked how they store maize, farmers said they store them in gunny sacks and jute bags, or – in some cases – simply on the floor. During

rainy periods, when roads are difficult to access, a lot of the grain left on the floor become unsellable. The challenges of maize include its quality, storage, and roads. Moreover, in terms of storage, the grains are stored in traditional jute bags which make them prone to pests. The main form of storage facility are traditional granaries, which are grass-thatched, and also very likely to be attacked by pests like weevils.

4.3.4 Maize opportunities

Improving input supplies. Procuring strong seed varieties and training farmers on seed production is crucial. In the long run, producing seeds on a community level is important for maize productivity and investing in suitable varieties of maize that adapt to the country's climate, soil, and culture is key. Farmers continue to use leftover grains as seeds. Working towards a clear and cohesive input policy for sorghum and maize is important, one that takes into account agricultural practices and use of pesticides and fertilizers in a harmonized, risk-reduced manner.

Improving productivity. While many interviewees noted that production of maize is the most effective value chain activity, it does not mean that production does not need to be raised. Indeed, ensuring that agricultural inputs and production activities such as land preparation are done well will likely increase the competitiveness of farmers, who could then have the potential to be linked to domestic markets and eventually regional ones.

Upscaling the maize value chain. As noted above, there are no large scale commercial processors, millers, or value addition facilities. The processing of maize, like sorghum, adds a lot of value to it. However, adequate machines are needed. Interestingly, a number of cooperatives in Yambio, Torit, are working on maize processing but they are scattered and not properly connected. A lot of the maize flour is actually imported from Uganda. Further, the high production capacity of maize indicates that developing a nationwide maize processing activity can have huge benefits. In Rwanda, for instance, Minimex is an exceptionally large maize processor with exceptional storage facilities and linkages to different breweries and other industries. Other opportunities include introducing mobile maize shellers in farms is a huge step forward investing in maize grinders. Flour blending and dry mill technology were also encouraged by interviewees. In Uganda, for instance, urban millers use roller millers and produce 50 tons of high-quality flour that they then sell to regional markets and large-scale buyers (Daly et al., 2017). More small-scale rural millers in Uganda and Rwanda use hammer mills and produce relatively high-quality flour, which they then sell for cheaper prices. Upscaling the maize value chain can also be done through **engaging cooperatives**. It is important that cooperatives are supported with the procurement of milling units.

Training on post-harvest management. It is crucial that farmers are trained on drying, shelling, sorting, grading, and storing. Additionally, grain storage warehouses will help lessen post-harvest losses.

Encouraging entrepreneurs. One step to do this is to engage entrepreneurs through giving loans and grants that they can use for value addition. Cordaid, for instance, is linking entrepreneurs engaged in maize processing to microfinance institutions and so far, it is going well. "In Yambio, it is key to support the local market and local entrepreneurs. Engaging them in adding value into what is produced locally is also very important. If projects can help value addition in maize (that is, turning maize grain into maize flour), a lot of challenges can be mitigated." Accessing finance in order to upscale their activities and engage in value addition activities is a huge opportunity which can be done through connecting farmers to commercial banks and microfinance institutions with minimal interest rates.

Export potential. It's crucial that interventions in maize focus mainly on food security as a starting point. However, similarly to sorghum, it is worth noting that in the case of surplus, export should be encouraged and organized. Although maize is a food security staple, many value addition processes - starting with converting maize into flour - can do well on a regional level. An interviewed agribusiness, namely Chris and Brother, buy from farmers and supply to Congo and attributed their success to having value addition activities such as converting maize into flour. Regional neighbors, such as Kenya, consume large quantities of maize and could be potential partners for exporting.

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5 Industrial crops value chains

5.1 Sesame value chain

5.1.1 Sesame: production and upstream activities

In South Sudan, oilseeds – including groundnuts, sunflower, and sesame – play an important yet rather underrated role in agriculture. Generally, oilseeds in the region are considered to be medium value cash crops without a strong market premium for cash crops.

Sesame is native to savannah areas in sub-Saharan Africa and is thought to have originated in Sudan. Sesame-seeds – otherwise called simsim, benne or nyim in South Sudan – are erect plants that are suitable for different soils, preferably a fertile and well-drained one. Although sensitive to salt, it is tolerant to dry weather and droughts and is generally suitable for South Sudan's climate. Its common varieties are black, white, and brown.

Agricultural experts, when asked about crops grown in South Sudan that have high export potential, reiterated that sesame is a promising value chain largely due to the ease with which it is cultivated, its suitability to the country's arid climate, and the growing global demand for it. Indeed, based on the interviews, a number of development organizations are aiming to invest in value chain development for sesame in South Sudan.

Smallholder farmers mostly grow sesame seeds, with the planting season usually being in mid-July and harvesting in September and October; however, others also sow the seeds as early as April and May during the beginning of the rainy season. Sesame production was estimated at 34,450 tonnes in 2019, which was much higher than 2017, when it was only around 8,600 tonnes (FAO/WFP, 2019). Interviewees suggested that South Sudan exports around half of its production.

Although sesame production and sale in South Sudan is not high, the value chain is slightly more expanded than cereals. Multiple actors are involved in the sesame value chain including farmers, traders, transporters, small-scale processors, and exporters.

The main inputs include seeds, the necessary farm equipment, fertilizers, and pesticides. Traditional farmers use animal draught to prepare land. Seeds are broadcasted and the weeding done is usually manual. In terms of seeds, there are two seeds native to South Sudan. There is also an imported variety from Congo, called Morada, which is said to lead to a higher yield. It is very important that viable, certified seeds are used for sesames. Fertilizers used include cow dung, crop residues, and chicken droppings. It appears to be uncommon for farmers to use organic fertilizers, although interviewees recommended using NPK fertilizers if possible, especially if soil fertility is low.

Sesame, as noted above, can grow in poor soils (although it prefers fertile soil) and is rather suitable for smallholder farmers given its short harvest cycle and capacity to be intercropped with cereals. Land preparation for sesame is not overly complicated: it requires removing shrubs and stumps. In Torit, the tools used to do so are hand hoes - in cases of more large-scale production, ox ploughs and tractors are used.

Productivity of sesame in South Sudan remains low and fragmented, due to a combination of lack of inputs, lack of access to extension, minimal policy intervention, and low yields. The main method of

planting is broadcasting instead of row planting. Until today, few farmer cooperatives are engaged in sesame seeds as it is still quite niche.

However, while the majority of sesame in South Sudan is produced on a subsistence level, there has been an increase in market production for sesame. In addition to the traditional rainfed farmers there are semi-mechanized rainfed farmers who also produce sesame seeds. In the Upper Nile, for instance, there are mechanized areas where the dominant crop in addition to sorghum is actually sesame - with large scale farmers cultivating land that reach up to 1,500 feddans (FAO/WFP, 2019). Moreover, the Ministry of Agriculture, Forestry and Animal Resources noted that sesame production has increased, in large part because of its high economic value, the increased demand of it by Sudanese traders, and high potential for export.

The harvesting of sesame seeds is labor intensive and can absorb a significant number of laborers. Sesame should be harvested without delay, to prevent seed loss. Threshing follows drying, with staking beaten open to release seeds.

5.1.2 Sesame: markets and downstream activities

The market for sesame in South Sudan is quite small domestically. However, trader channels - which are largely informal and cash-based deal with small quantities of sesame and represent a high portion of the market. A number of informal village traders collect sesame seeds from farmers, paying them in cash. They then sell the sesame to processors or exporters, or sell them in domestic markets. A number of exporters in South Sudan transport the sesame seeds to regional markets.

On the buyers side, there has been an increase in demand, from the side of independent traders and agents for industrial processors. Buyers and middle men tour rural areas to buy from farmers, before transporting it to larger towns. However, interestingly, interviewees noted that one disincentive might be the high transaction costs, as there are several chain actors involved unlike other value chains such as sorghum and maize.

On the other hand, there is also a processor channel which supplies processors in the country for oil manufacturing, although it plays a very small role. Oil can be extracted from sesame seeds through mechanical processing. The processing of sesame can be done through cleaning, dehulling, drying, and crushing it for oil. In South Sudan, there are no commercial processing facilities. As of the writing of this, there appears to be no commercial crushing plants for sesame oil.

Most exporters and processors are found in port cities such as Khartoum and Port Sudan. In these cities, exporters screen, clean and bag sesame-seed into 50kg bags. The bagged sesame-seed is then packed into 20 and 40 metric ton containers which are transported to the shipping lines for onward shipment to the export destinations. Majority of exported sesame seed is in raw material form. Domestic processors handle limited quantities of sesame-seed that they process into oil and snacks to distribute in retail shops and supermarkets, or export to neighboring countries. There is very little export of processed sesame seed.

5.1.3 Sesame: challenges

No adequate land preparation. Seeds are scattered instead of being planted in rows, and this makes the harvesting process - which includes weeding and threshing - more challenging. Additionally, most sesame farming is very traditional and there is little mechanization. As can be seen in regional countries, mechanized sesame farming can lead to an increased yield.

Insufficient inputs. Most sesame seeds are bought informally. Wholesalers usually purchase sesame seeds at farms. However, a few farmers did say that there are a number of farmers increasingly buying better quality varieties. Interviewees report that seeds are inadequately stored, which later results in haphazard quality of production.

Lack of extension services. There is a lack of extension services for the sesame sector in South Sudan. No proper guidelines have been provided to small scale farmers looking to cultivate sesame. Many farmers do not have the means to tackle pests and diseases infecting sesame seeds such as silverleaf fly, beet army worm, bollworms (pests); bacterial blight and sesame root rot (diseases). A lot of the pest management can be preventative and done through solid practices such as cultivating at low humidity and using good seeds.

Inadequate storage and processing facilities. Fungus develops when seeds are kept in moist conditions, which is typical during rainy seasons in South Sudan. Some farmers store sesame seeds in jute bags, which is recommended. However, others store them in pots and granaries.

No proper national policy regarding sesame. For the most part, there is no proper coordination for the sesame market. The government does not appear to be properly engaged in this sector and the private sector has made minimal investments in this value chain. Whereas in Sudan, there is a national standard developed for sesame seeds packaging, labeling, transport, and storage, as well as food safety standards, there is no similar equivalent in South Sudan. Moving forward, investment in the sector should take into account international standards, with the aim of working towards pushing the national standards to a quality-oriented one. Indeed, policy support for this value chain is recommended, in a bid to create cohesion between the different organizations working in sesame.

Lack of adequate national standards. With sesame seeds and oil, it is crucial that food safety issues are considered as their production is geared towards export. Poor handling and storage may lead to aflatoxins and bacteria. In EU markets, for instance, there are rigorous food safety measures. Indeed, in order to increase export revenues of sesame seed it is crucial to comply with food and phytosanitary.

5.1.4 Sesame: opportunities

Sesame multiple purposes. Additionally, the leaves of sesame can be eaten in stews while its stems can be burnt and used as fuel or even soap making. Sesame is used in several local dishes, including deserts and home-made meals. It can be used for baking, soup, and sesame oil. Sesame seeds can be exported in raw form or processed for oil or other snacks. Halwa simsim, for instance, is a famous dessert in both Sudan and South Sudan made from roasted sesame seeds and caramelized sugar.

“In Torit, there is a strong interest in cultivation of sesame. There is some export of sesame in Torit but people do not come frequently. In some cases, one company will come and take all the products from the farmers and then take it to the market where it is usually completely sold. China and the U.K. have both shown interest in importing South Sudanese sesame.”Key informant interviewee.

Low-cost of production. Interviewees noted that sesame is a low-cost crop, and it can be grown through crop rotation with staple crops such as maize and sorghum. Additionally, it is also resistant to drought and is quite tolerant of pests and diseases.

High export potential. According to an interview, over 25 countries import over 5,000 tons of sesame per year, adding that this was not a generous estimate. There is pre-existing demand in several markets including southeast Asia, Middle East, and Europe which can be exploited. EU and Middle East markets are capable of absorbing huge amounts of sesame, as it is used in multiple key food products such as hummus, halawa, tahini, desserts, and snacks. It is also increasingly used in organic and gourmet foods.

improved market linkages. The sesame value chain is one that can make use of creative strategies and interventions, as it can fare well in global markets and South Sudan is well suited to produce sesame seeds. Linking sesame farmers to agro-business companies in South Sudan and the region who purchase cash crops for sale in international markets is promising. It can boost rural areas and receive support from international donors.

5.2 The Groundnuts value chain

5.2.1 Groundnuts: production and upstream activities

Groundnut is one of the most grown crops in sub-Saharan Africa, coming fifth after maize, sorghum, millet, and cassava (Achuoth, 2018). Groundnuts are a small-holder crop largely grown in Bor, Yambio, Torit, and Rumbek - and they tend to play a significant role as a cash crop, oil, and food product. They are widely eaten across South Sudan, with meals and snacks often including groundnuts. They also have a high oil content, as well as proteins and essential vitamins.

Groundnuts can often be low-yielding due to pests and diseases (particularly aflatoxin contamination), weak input supplies and inadequate planting and harvesting procedures. The seeds used are often saved seeds shared within a community. However, seeds used are sometimes damaged or shriveled, making them more susceptible to contamination. They can be contaminated due to a combination of poor agronomic practices, including improper drying or usage of poor-quality seeds. Depending on the agro-ecological zone, there are two main varieties of groundnut in South Sudan: creeping longmature types and upright short maturing types.

South Sudan's soil is ideal for growing groundnuts. The usual planting months are April, May, June, and even July. However, growing groundnut in the same land one season after the other is not recommended, as it might lead to infestation of pests and diseases in the soil. Groundnuts, during initial stages, compete with weeds such as grasses.

The main form of planting is broadcast production and soil is dug usually by hand and, in some cases, by oxen (particularly in Bor). Generally, ox-plough cultivation is recommended. During the rainy season, there is an increase in groundnut production. Weeding and harvesting are also done by hand, but they are very labor-intensive activities especially as groundnuts are grown in large fields. Groundnut harvesting is usually carried out 90-120 days after initial planting, in September, October, and November, and is usually a family or community-led affair in the payams. Harvesting is usually done by direct lifting and sometimes using hand hoes when the soil is dried up.

5.2.2 Groundnuts: markets and downstream activities

Groundnuts are grown both for local consumption and as a cash crop to be sold in local markets or collected by traders who transport them to towns with little or no groundnut production. Groundnuts are mostly sold unshelled at farm gates. Local traders arrive to local markets to purchase raw groundnuts, groundnut oil, and groundnut paste. Local supply usually gets finished. There isn't enough production or market linkages for export, however. One female farmer noted, "grinding machines would help us a lot." Some women sell roasted groundnuts in plastic bags on the roadside.

In terms of value addition, groundnuts are processed to make maqwagna (peanut butter), usually at home. Raw groundnuts are smashed with stones and rubbed until smoothened. Other times, raw groundnuts are shelled and roasted and consumed as snacks on a household level. Some families have grinding tools that they use for maize, sorghum, and groundnuts; there are no processing units, however. Generally, there are very few market linkages for groundnut.

Processing is usually done by roasting or making a paste out of groundnuts. Roasted groundnuts are sometimes packaged in plastic and sold in markets as snack. There are a few local processing facilities, usually in local and urban markets where groundnut producers go to grind their groundnuts into paste.

5.2.3 Groundnuts: challenges

Low access to groundnut inputs. With the exception of groundnut seeds, farmers have low access to quality inputs for groundnuts, i.e. resilient organic seeds, fertilizers, donkey plough, and others.

Pest management Groundnut farmers cited pests and diseases as a huge constraint for groundnut production, adding that crop varieties are very poor. Some of the pests that attack sorghum include termites and millipedes, damaging the pods of groundnut plants. Farmers say a common practice that invites pests is when residue of sorghum and maize are not removed, thereby bringing in termites who might infest new crops planted. Aflatoxin is a seriously poisonous compound that can grow on seeds. Aflatoxin infestation is a significant cause of cancer and other potent diseases. There is no aflatoxin test for groundnuts in South Sudan, this is of particular importance for farmers who are making paste/peanut butter for household consumption or for women in the market who sell "locally packed" peanut butter

Low productivity. Groundnuts in South Sudan have a low productivity, in large part due to improper crop management, pests and diseases, and its high labor intensity.

Weak farmer groups and associations. Although groundnut production is done communally and on a household level, producers have very low linkages between one another. Unlike honey, sorghum, maize, and even horticulture, there are no strong groundnut groups and associations.

Lack of proper storage facilities. Groundnuts are stored unshelled at farm gates in traditional bags. Moreover, farmers may not know the adequate moisture content for the safe storage of groundnuts, which can also potentially lead to aflatoxin contamination.

5.2.4 Groundnuts: opportunities

Intercropping with staple crops. Groundnuts crop release nitrogen into the soil, and have a natural ability to nitrogen content. As such, they require less fertilizer for production. It is advised that groundnuts are intercropped with maize or sorghum, or rotated with cereals every two seasons to prevent infiltration of pests and diseases. Intercropping sorghum with groundnut also significantly reduces emergence of Striga.

Improving processing and packaging facilities. Value addition of groundnuts could significantly improve sales and increase process. As such, investing in community-level processing and packaging facilities, as well as pressing machines, is an important strategy.

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6 Horticulture Value chains

6.1 Horticulture: production and upstream activities

Horticulture plays a crucial role in South Sudan, as vegetables constitute a significant part of South Sudanese meals. Potentially, fruits and vegetables production in South Sudan may yield a significant yield and are easy to grow in various soil conditions.

“It is a shame that we buy onions from Uganda and Khartoum. There are no proper onions being produced across South Sudan.” Key informant interviewee.

The production of fruits and vegetables in South Sudan happens on a small-scale, backyard level. However, there have been successful examples of income generating horticulture and value addition processing in recent years. Some of the main fruits produced include bananas, pineapples, and oranges, whereas the main vegetables produced include sweet potatoes, okra, tomatoes, cassava leaves, and increasingly onions. Onions and tomatoes are growingly being planted nearby cities and supplied to urban markets. In Bor, women groups grow eggplants, dodo, okra, sweet potatoes, lemons, sugarcane and guavas. In Yambio, it is cassava leaves, pineapples, tomatoes, and pumpkin. In Torit, it is also cassava leaves, okra, oranges, and eggplants. In most regions, onion is an important vegetables crop.

In Bor, vegetables are largely grown along the river. Urban dwellers, particularly women, in Jubek are more likely to grow vegetables crops than cereals and tend to cultivate them in small plots of lands or backyard gardens. An interviewee noted, “Moving forward - we need to promote urban agriculture in Juba for high value crops such as tomatoes and some fruits, as they may lead to improved food security [...], less dependence on the market, and potential for market linkages with processors and traders.”

Land preparation also depends on the vegetables being grown but usually farmyard manure, such as cattle or poultry dung, is enough for improving the soil’s fertility and ability to retain water. Staking is sometimes done, especially for tomatoes. Tomatoes are usually grown during the dry season. Nurseries are quite common for tomato production, with nursery seedbeds prepared depending on the season. Farmer groups or vegetable producers tend to engage in crop rotation and spacing, in addition to fencing and removing infected crops. Vegetables are usually picked by hand, but in cases where farms are connected to processors, the fruits and vegetables are harvested mechanically.

Input tools include malodas to till the land. However, malodas are small and time-consuming. Upgrading to oxen and other techniques such as row planting can lead to more cultivation of land. Most seeds are distributed by IOs and NGOs. Seed inputs for vegetables vary depending on the type, with some local varieties and imported ones. While some varieties are high-yielding, others are recycled and of low quality. Sweet potato, for instance, has multiple high-yielding varieties such as Osukut and Araka red and white. Tomato seeds, for instance, are imported. However, most imported varieties appear to be good for processing and a relatively low perishability rate. Some of the common okra varieties in South Sudan include pusa sawani, which is high yielding, and other local ones including turang per and milaak bar, which are cultivated by different communities. Farmers are also more to use natural fertilisers such as manure and compost for vegetables.

6.1.1 Horticulture: markets and downstream activities

Vegetables and fruits have a relatively higher cost when sold at the Konyokonyo market in Juba, although the supply there is more consistent and likely to finish up. Other markets in Juba include Jebel, Munuki, Gudele, and Custom. On the other hand, leafy vegetables, which are highly perishable, are sold at smaller markets across Bor and Juba. However, many farmers may face the challenge of not being able to refrigerate their produce or have the means to transport them outside of Bor.

“Some fruits, such as guava and pineapples, are grown in Bor and demanded in Juba. Supplying farmers with transportation, such as pick-ups, or fridges can help create that link. Otherwise many fruits might become rotten.”Key informant interviewee.

Vegetables and fruits are sold in local market across the country.. Juba’s market, as well, can absorb domestic agricultural horticultural commodities. Farmers’ produce is sold usually in open-air retail markets, kiosks, and agribusinesses and small supermarkets and grocers (such as Fresco Supermarket, Phenicia, Lily’s, and Vamp Vegetables & Fruits) in Juba. Juba city’s main market, i.e. the Konyo Konyo Market, has multiple stalls and kiosks selling fruits and vegetables including local tomatoes, potatoes, cabbage, okra, onions, bananas, pawpaw, mangoes, watermelon in addition to imported fruits such as apples.

However, the perishability of fruits and vegetables means that in order for the chain to be competitive, it cannot solely depend on its suitable climatic conditions. Instead, it needs to improve its logistics and find sustainable means of entering other markets including Europe and the Middle East, which is largely contingent on improving transportation. The problem with transportation and lack of a cold chain network means that Juba imports fruits and vegetables that can be produced and sold in South Sudan itself. There are a few rural-urban wholesalers and brokers across the country. Yet, South Sudan is still a net importer of vegetables and fruits from Uganda and Kenya such onions and bananas, two crops that can be produced in South Sudan. Onions have a high potential but one of its main challenges are the lack of storage facilities. Because of post-harvest losses and limited production, South Sudan actually imports onions from neighboring countries including Kenya and Uganda.

There is room, however, for value addition processing of vegetables and fruits in South Sudan. Some crucial examples include tomato paste; fruit juice; vegetable oil. Sweet potatoes are processed into dry chips, called muterere, and can be sold in markets. Other ways sweet potatoes can be preserved is through pounding them into flour that can either be eaten or used as feed for small ruminants. Okra in South Sudan is sun dried, and in can be canned or frozen; because it respirates very quickly and can only be briefly stored, it needs to be quickly cooled. Tomatoes, when distributed outside home consumption, are usually packaged in cartons, wooden boxes, or trays to be sold to traders or middlemen or in local markets.

6.1.2 Horticulture: challenges

Pest management. Interviewed farmers reported that the common methods of pest control they normally use, such as crop rotation and traps or nets, are not always successful and they require intervention or support to fight them away without necessarily having to resort to chemicals. Women groups noted that they are in dire need of medicine to deal with the outbreak of pesticides attacking their fields. Tomatoes, for instance, are attacked by mites, birds, leaf miners, and others; sweet potatoes are affected by termites, weevils, rats, wild pigs, and even some domestic animals; while okras are affected by spider mites, tobacco whitefly, flower beetle, grasshoppers, and sink bug affect okras.

Water infrastructure (farm level). Horticulture production depends largely on each county's rainfall seasons. Vegetables need intensive irrigation, which is a huge challenge for vegetable growers who may not have access to water pump generators. For instance, during Bor's dry season, irrigation is critical and not all farmers can afford to move to rivers or streams.

Lack of post-harvest infrastructure. The main challenge of horticulture is that fruits and vegetables perish quickly and hence, if not produced simply for subsistence farming, they might not make it to markets. This is worsened by the fact that they are usually harvested during the rainy season when transportation becomes very difficult.

6.1.3 Horticulture: opportunities

Backyard gardening and accessibility to women.

Female farmers play an important role when it comes to horticulture, with many of them growing vegetables in their gardens or small plots. Horticulture is rather accessible to youth and women as they are able to generate, through high value vegetable and fruit crops, income in a quick amount of time.

“Women are the main actors in this sector. In Bor, you see that women are those cultivating and those doing the marketing. Some women have single-handedly created linkages with hotels in Bor.” Key informant interviewee.

Improving extension services. It is important to train vegetable producers how to adequately plant vegetables, source quality input, prepare land and engage in crop rotation, and importantly use drip and sprinkler irrigation systems, in addition to linking them to irrigation equipment.

Applying certification to increase export potential. Expanding the horticulture value chain will require abiding by standards and certification to open South Sudan up to export markets. Although South Sudan is far from regularly exporting fruits and vegetables, it is worth mainstreaming regulation and standardized protocols. For instance, The EU market, which has a high standard for sanitation and hygiene protocols, absorbs nearly half of Kenya's horticulture exports.

Cold storage and transportation premium price. Improving cold chain storage and networks, via pre-cooling chambers and/or refrigerated trucks, will lead to huge improvements in the horticulture chain. This will enable the development of the horticulture chain from merely subsistence to larger scale and market-oriented, as produce can be transported from gardens/farms to consumers.

Capitalizing on organic certification and fair-trade schemes. Most produce is actually organic, as farmers rarely use pesticides or GMOs. If the supply chain can capitalize on niche produce and package and market

them as organic and fair trade, they may be able to attract an international or elite clientele within Juba, as well as OECD export markets . This entails actively working on marketing techniques and information, and the development of phytosanitary and food safety standards.

Increased demand on processed horticulture products.

Processing of fruits and vegetables is key to growing this industry. Some cooperatives, female groups, and agrobusinesses are receiving training on processing and have had relative successes. An interviewee noted, “Processing can also be done on a small-scale amongst women groups; they don’t have to be intimidated and consider processing as strictly machine-focused. For instance, they can cut vegetables and prepare salads for markets.” Other forms of processing that can convert the products to more storable forms through freezing or dehydration can extend the shelf-life of vegetables and fruits.

Fruit juicing is becoming much more common and popular. , however there is no packaging or storing or branding. Most fruit juicing is done on spot or packed on “assumed to be manually cleaned, re-used” mineral water bottles. There is no branding or mechanical cleaning or sterilization of the packing bottles. Most of this is also sold unsealed with no expiry day. There is significant opportunity for improvement..

“There was one business entrepreneur trying all he could to produce juice, it was great - but to be honest, he didn’t have the ability to carry out research the efficiency of the juice, because all of this has to do with the nutritious aspect of it, and he doesn’t don’t have the technical know-how to produce a good quality product with a marketable shelf-life.” Key informant interviewee.

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7 Livestock value chains

South Sudan is known to be a major pastoralist country with a number of its tribes, including the Nuer, Shilluk, Dinka, Murle, Boya, and Toposa, , having livestock and treasuring it as a symbol of wealth, power, food, and nutrition. Indeed, about 60% of the population depends on livestock rearing (FAO/WFP, 2019). Livestock transactions are quite common in areas across South Sudan, such as Rumbek, whereby livestock is exchanged for crops or other commodities in markets. The livestock sector as a whole has significant potential that remains untapped and underdeveloped. Below are value chains of two three livestock sectors in South Sudan: cattle, poultry and beekeeping.

7.1 The cattle value chain

7.1.1 Cattle rearing and markets

Large animals, such as cattle, are usually seen as a symbol of power and are often owned by men and passed down through a patrilineal lineage. Indeed, cattle plays a huge role in social networks - in the form of bride wealth, reciprocal assistance during hardship, and social connectedness. Arguably, in

“In South Sudan, owning livestock is not a commercial issue - it is, instead, a cultural and community symbol of power and respect.” Key informant interviewee.

South Sudan today, the cultural value attached to cattle is perceived as more significant currently than its commercial value. Women, on the other hand, own smaller animals such as pigs, goats, and chickens -- although this is rapidly changing. Depending on the area, there may or may not be an emphasis on cattle rearing; additionally, depending on the area, there might be cases of highly dangerous and fatal cattle raiding acts. Cattle rearing in South Sudan has the detrimental effect of land degradation due to overgrazing of pastures. In Rumbek, there tend to be disputes over grazing land and cattle raiding happens intermittently in the area. There is also an obstacle with accessing water, leading many cattle keepers to migrate towards available water sources.

Cattle-owning households mostly have local breeds, but some households also have pure breeds and cross breeds. Cattle are usually passed down by inheritance, but other times they are bought from livestock markets.

Interviews indicate that over half of production is consumed by households and/or livestock owners. The livestock sector, from a value chain perspective, has very little value addition activities – whether in terms of milk production and processing, production of hides and skins, and even beeswax. There is low processing capacity amongst livestock owners and producers.

Input includes cattle, feed, water, medicine (drugs and vaccine). From the input phase, there are challenges with provision of veterinary services and animal feed, as there is no proper management of cattle on farms by the owners and herders. Meat production is usually done via the traditional production system, through the exploitation of local cattle breeds. However, in terms of sale – among herders who sell cattle – they are often sold at farm gates or at livestock markets in payams or nearby towns. Interviewees noted that there are post-processing meat losses due to improper slaughtering, as well as diseases and the lack of a proper cold chain to store meat. Meat is still imported from nearby countries and sometimes as far as Latin America. One interviewee noted, “[In Rumbek], we have low meat and milk

production because we don't have the needed equipment, deep freezers, or generators for electricity [...], or milk processing facilities. We need accessible livestock markets, proper vaccination, and water."

There are other challenges, in addition to the political repercussions, which include the lack of animal genetic quality, low animal health services, and minimal technical assistance and interventions for the sector (unlike with crops, for instance). Another interviewee noted, "It is very telling that in such a highly pastoralist country, we import meat from faraway places. Why not invest in our livestock production, instead of seeing [livestock] as something simply for respect? Why not feed ourselves with this livestock, instead of dying over it?"

Yet, at the same time, investing in the livestock value chain may unlock many opportunities. Indeed, switching the livestock sector from one of subsistence to one of income generation and potentially market integration and export might help contribute actively to better livelihoods. One research study on livestock in South Sudan posits four future pathways: "traditional mobile agro-pastoralism/pastoralism; commercialisation and export trade; added value to livestock and diversification; and people exiting agro-pastoralism and seeking alternative livelihoods" (Catley et al., 2016).

Last year, interviewees noted that there was a Livestock show organized by the FAO, whereby local pastoralists competed and won cash prizes. The event was aimed at creating awareness about the commercial value of cattle. Rumbek county has a vibrant live animal market as cattle herding there is quite popular.

7.1.2 Cattle: challenges

Cattle raiding. In several areas across South Sudan, such as Bor and Rumbek, issues of cattle raiding lead to death, conflict, displacement, and loss of livelihoods. Additionally, the competition between herders over water and pasture creates a lot of tensions between communities, which might explain the resistance international and local organizations have when it comes to intervening in the sector. However, due to targeted raidings and political insecurity, there has been a decline in livestock (Catley, 2018). In 2016, FAO concluded that wealth and medium wealth households were those most impacted by raiding, and consequently fell into the category of poor wealth (Gebreyes et al., 2016). Some of the indirect impacts of conflict include the closure of market routes. Nuer traders, for instance, began to trade cattle with Ethiopia instead of Bor and Juba because they faced blocks to their trade routes (Catley, 2018).

Barriers for women's ownership of cattle. In Rumbek, although there are relatively few gender disparities, women are sometimes prohibited from taking cattle for grazing or even full ownership of cattle. However, interviewees noted that over the past years, more women in Rumbek own cattle.

Lack of adequate data. Another significant challenge, is that "there is no proper articulation of the livestock sector; there are no proper policies implemented, as well as a lack of proper data on their population. [...] This makes it difficult to understand how to properly invest in and link it to South Sudan's economy." The lack of reliable data is a huge issue, as it makes it difficult to articulate the potential of the livestock sector for food security. Moreover, it makes it difficult to properly implement policies, as the policies might not be aligned to the actual reality on the ground.

Inappropriate taxation. Interviewees noted that there may be, in some regions, several informal taxation against livestock. There is still no proper integrated taxation framework, thereby making livestock

producers liable for both formal and informal taxes. Moreover, inputs needed for livestock production such as chicks and feeds are also highly taxed. As such, farmers and producers import these inputs in a haphazard manner.

Lack of adequate training and research in livestock. There is a dearth of training, whether vocational or university-level, on standardized animal production and veterinary sciences. There appears to be many differences, in fact, between the different public universities offering related courses. Additionally, even amongst universities, such as Juba University, there needs to be an expansion of regional collaboration and research facilities on livestock production. There is one main public training centre, Marial Lour, which provides technical skills development on animal health and production. Moreover, there are no specialized public livestock research institutions.

Poor hygiene. There are very little and informal standards on sanitary and food hygiene of animals. Moreover, the capacity to enforce these stands is also quite limited due to poor coordination. Improving animal husbandry practices and animal health care services may lead to an increase in the sale of meat and a changing mindset around livestock herding.

7.1.3 Cattle: opportunities

Already existing livestock population. Although the number of livestock, specifically cattle, have decreased due to conflict and displacement, South Sudan still has a significant number of livestock populations. Additionally, because of South Sudan's historical relationship with livestock, there are many experienced livestock keepers. However, there is a need to improve cattle breeds, as a lot of the cattle has low milk production capacity. Cross breeding with better milk-producing breeds is a key intervention.

High demand. In urban and peri-urban areas, there is a high demand for livestock. The seasonal variation of crop production in South Sudan amplifies the need to invest in livestock, as there are usually hunger gap periods for agro-pastoralists usually between June to August. During these months, maize and sorghum, for instance, might not be ready for harvesting, thereby leading to food insecurity. As such, households may depend on milk production or poultry.

Linkages with the crop production sector. There is potential to create linkages with the crop production sector, whereby animal draught can be used to expand crop production; assets from livestock can be used to purchase input for crops; and using crop residues and fodder for feed.

Milk production (import substitution) . Currently, in South Sudan, a lot of milk and milk products are imported. Countries like Kenya and Uganda have a dairy industry for locals, unlike South Sudan, and they contribute to ensuring food security. Introducing dairy goats and improving cattle and goat genetics in South Sudan so that they can produce dairy herds will potentially be a high value product. Today, the main inputs for milk production include gloves, gumboots, containers, and (preferably metallic) cups. Men are usually responsible for feeding, grazing, and fetching water; meanwhile, women are responsible for milking cows. Milk production is generally very low because of limited labor, scarcity of milk due to cow breed or reduced feeding of lactating cows; among other reasons. Very little milk is sold, and when sold it is usually to local and urban traders at low prices. Milk processing for commercial reasons is also very minimal. Number of milk handling facilities¹², such as coolers is limited. Containers for storing milk are

¹² There is one small size facility exist in Bor (storage and sale of milk)

limited or non-existent, and milk traders as such tend to have to sell milk as soon as possible as it spoils quickly. Training on milk value addition, such as yoghurt, ghee, bars, is recommended.

Vibrant regional trade. South Sudan is bordering many countries that do have strategies for the livestock sectors and tend to export and import large numbers of livestock. Additionally, there are research and training facilities in the region too, that can be a form of process tracing or lessons learnt for South Sudan.

There are a very limited number of slaughter houses and processing facilities. Investment in such infrastructure could significantly upgrade the cattle value chain. For example, In early 2019, the FAO has support the establishment of a slaughtering house in Torit with a capacity of 20 to 25 cattle and 25 to 20 small ruminants per day. The slaughterhouse is managed through a private public partnership with the ministry of Agriculture.

7.2 The poultry value chain

7.2.1 Poultry: productions and upstream activities

Poultry has highly digestible proteins, B-group vitamins, and a moderate energy content thereby making it a critical food. As noted in (Marangoni et al., 2015), “Consumption of poultry meat, as part of a vegetable-rich diet, is associated with a risk reduction of developing overweight and obesity, cardiovascular diseases, and type 2 diabetes mellitus. Also, white meat (and poultry in particular) is considered moderately protective or neutral on cancer risk.” FAO considers that poultry is key for food security in developing countries, as it is widely available and relatively inexpensive. Indeed, FAO is known to promote poultry production amongst domestic farmers in South Sudan through facilitating vaccination, housing, training, and support to markets.

Although poultry (chickens, ducks, guinea fowl, turkeys) is the smallest of the livestock in South Sudan, there is growing interest in it for multiple reasons: its importance as a value chain for women and displaced persons; nutritional value; increasing consumer demand; the relative safety and security of it in comparison to cattle. The poultry value chain is mostly low input and low output, with a small flock size raised under a traditional scavenging system. There are very little linkages along the supply chain, with a focus on home consumption or limited trade within payams or in local markets.

In terms of inputs, the main ones include animal feed, day old chicks, and vaccines. Feed, which is a major input for poultry, is lacking in South Sudan. Animal feed quality is usually not something that small scale farmers or households invest in; there is a tendency to mix feed (such as kitchen waste with some grains) in a bid to decrease costs, thereby ending with subpar nutrition for birds. Feed quality needs to ensure that adequate minerals, vitamins, protein, and energy are included - as well as ensuring that the feed is not contaminated or contains mycotoxins.

Although some NGOs and even the government do subsidize infrastructure and purchase of inputs, most of the time housing is not particularly appropriate for poultry production. In terms of land, commercial poultry enterprises struggle to find land they can rent as land-owners are quite reluctant. In terms of day-old chicks, South Sudanese poultry producers tend to import from Uganda, Kenya, or Sudan. Nutritional supplements, as well as vaccines and feeding equipment are also imported.

There are scattered and inconsistent hatching facilities in the country, and most of them have high production costs and their inability to invest in backup, such as generators, due to lack of capital or access to finance and credit. As such, credit to buy chicks is key especially for women.

Moreover, housing is usually quite basic, and built with readily available materials including wood, mud, or cereal stovers. Birds are also housed in human shelter or stores, but without proper fencing. Farmers, in some cases, rent plots of lands to grow chickens. In larger farms, there is an issue with proper ventilation and protection for birds. However, within semi-commercial production units, there is integration of hatcheries and, in some cases, feed mills.

7.2.2 Poultry: market and downstream activities

While there are few advanced poultry farms, most of which are in Juba, South Sudan's poultry remains an infant industry. As such, the marketing and market sub-systems tend to be either non-existent or too little to generate reliable information or data from. However, interviewees note there is an increased demand from urban consumers for meat and eggs, which is a major opportunity for small-scale poultry producers.

What is notable about this sector is that it is rather open to small scale farmers, as a poultry unit with commercial birds is basically what is needed to be able to start engaging with the market. Indeed, village or payam level poultry is key for livelihood support but it is crucial that public health risks are mitigated and extension support on improving hatchability, predation, and prevention are provided.

Chicken is usually sold in open markets, if not directly consumed at farm gates or households. According to a report (SSADP II, 2019), only 28% of chicken were sold in markets (average in Yambio, Bor, Torit), still mainly used for household consumption. In some cases, with layer birds, there are egg collectors who provide farmers with linkages to markets and sell their produce. For now, it appears that the majority of enterprises focus on broilers. However, it is worth noting that there should be emphasis on layers and not just broilers, as layers will be able to both sell eggs and eventually the birds (albeit at a lower price than broilers).

Based on the growing initiatives of semi-commercialized farms or poultry systems, there are a few insights that can help set the standard for future interventions in South Sudan's poultry sector. This semi-commercialized production is based on medium input and medium output, with a focus on dual purpose breeds where possible or separate layers and broilers. A dual purpose breeds enables smallholder farmers to expand from backyard production to a market oriented approach.

The private sector has also picked up on poultry farming, with private investors operating in the poultry chain. The private sector has the capacity to grow and meet the demand for slaughtering and processing facilities, in addition to meeting the demand for day old chicks, without having to import them from neighboring countries such as Uganda, through parent stock farms and proper hatcheries.

7.2.3 Poultry: challenges

Lack of adequate disease prevention and vaccines. There are very few poultry extension workers who provide vaccination and/or treatment and advice for small scale poultry farmers. As noted, there are multiple diseases affecting poultry - including NewCastle disease and guinea fowl disease. However, there is no proper public policy approach to vaccination. Disease prevention is also quite minimal and in the

majority of cases, inexistent. As such, these diseases lead to high losses; interviewees indicate that diseases culminate in the biggest reason for losses.

Electricity infrastructure. Consistent and reliable sources of energy are needed to expand hatching facilities and production of poultry. For now, there is still heavy dependence on diesel-fueled generators, which are costly and over-used. The frequent power outages hamper commercial poultry production.

Water infrastructure. Because small-scale poultry producers and commercial producers may have limited access to clean water, they tend to use water from rivers¹³ or other sources. The water may not be clean, thereby affecting birds. As a matter of fact, Access to WASH itself is a common problem for many South Sudanese. Areas like Yambio lacks piped municipal water system.

Limited market linkages. As noted, the majority of poultry production is consumed within the backyard. There hasn't been room or investment in the sector to encourage household poultry producers to engage with the market and sell meat and eggs there. In fact, egg production is limited. There are no packed eggs and "trayed eggs" are imported from Uganda. Most market traders of locally produced eggs will have at a broad average of 5-10 eggs, with above average quality (size and freshness). There is an opportunity for improving and supporting egg production

7.2.4 Poultry: opportunities

Using staple crops as feed. Importantly, sorghum and maize - two major staple crops in South Sudan - can be used as feed for poultry. This is optimal as they are readily accessible and consist of the needed energy for animal feed. Birds obtain feed supplements from cereal grains, including maize and sorghum. Indeed, ensuring and facilitating rural farmers' supply of feed is key for improving the value chain.

Proper training on input and production can lead to significant increase in production. Proper training on poultry management is needed, specifically on feeding, waste management, vaccines, and building entrepreneurial skills. Poultry enterprises, including commercial ones, tend to falter after the first or second batch of chicks. This is because there is no proper training or support - whether in terms of extension, disease prevention, or input services - thereby leading to losses. Ensuring that proper training is done can encourage farmers to pursue their enterprise.

Poultry suitable for female headed households and women and youth generally. Particularly, this is well suited to female headed households, as it does not often affect their other household duties and culturally speaking, poultry is "acceptable" and convenient as a livelihood-generating activity and ultimately for poverty alleviation. Children and youth may assist women with managing poultry. On the other hand, it is usually men who build shelters for poultry and sell meat and eggs at the market. It is important to note, however, that with the growth of the poultry production market, women might start to create more linkages with the market which requires assistance and support, as they have less access to land and credit, and may sometimes not be able to make final decisions regarding sale of meat and eggs.

Growing investment in the sector by NGOs. Over the past five years, a growing number of NGOs are investing in small ruminants, particularly goat and poultry. Interviewees noted that small ruminants are crucial for livelihoods and, unlike cattle they are less likely to create political and social tension

¹³ To note that the Nile river water is safe for poultry consumption

Importantly, for women and youth, poultry production and sales are both culturally encouraged and economically viable.

Poultry associations. Supporting the establishment of poultry associations is key for improved market linkages.

Improving market reform policies. Advocating for market reform policies and providing technological and service support. Moreover, providing technological support and institutional support to provide market linkages and service support is key. This can be done through identifying target group households and providing them with necessary supervision.

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7.3 The Honey value chain

7.3.1 Honey: productions and upstream activities

Beekeeping in developing and underdeveloped countries is encouraged as a driver of socioeconomic development of communities. South Sudan, fortunately, has vast forest covers with high potential for honey production. Honey bees in South Sudan, of the *Apis mellifera* species, provide wax and products including propolis and pollen. They also are therapeutic for chronic diseases including hypertension and cardiovascular disorders.

Honey production is mostly concentrated in the Greater Equatoria (including Torit, Juba, and Yambio), as well as parts of the Lakes State, nearby Rumbek. Vast natural forest covers over 80% of South Sudan's territory, illustrating the high potential for honey production across most of the country. Beekeeping in South Sudan has been practiced for generations for the production of honey as food products, medicine, and as a form of income generation. An interviewee noted, "The honey sector in South Sudan has very high potential - low investment is needed for [it] to kick up, and at the same time it generates income for entire households. It is also practiced by women and younger people, in addition to being sustainable."

Women beekeepers

Wulu, which is just on the periphery of Rumbek, has very high potential for honey production. Several women groups process honey there using traditional methods. Some women use bamboo to make beehives. Others produce honey and use it to make traditional beer.

Beekeepers, especially those engaged in modern beekeeping, require protecting clothing (gloves, coats, hats, and rubber boots), uncapping forks, honey strainers and extractors, smokers, and modern hives. A number of local and international NGOs, as well as individual entrepreneurs and emerging agribusinesses, provide these inputs in the honey value chain, including modern hives and quality hive equipment. NGOs have invested in modern beehives and harvesting equipment, such as the Kenya Top Bar beehives (introduced in Torit by Caritas Luxembourg) and Langstroth beehives.

However, for the most part, traditional beekeepers in South Sudan do without proper protective gear. As they have been doing it for generations, they have found ways to use local products, and are usually unable to access or afford imported modern inputs. Traditional beekeepers mostly use locally-made hives made from the bark hives or trunk hives of bamboo or plam trees. Bark and trunk hives tend to normally last for a couple of years.

Interviewees note that all interventions must ensure sustainability - as such, providing traditional beekeepers with imported inputs might be unsustainable. "Moving forward with beekeeping, it is important to also ensure that input suppliers are from the village or nearby payams themselves. What I mean is beekeeping should encourage other sectors like carpentries to make hives and tailors to make gloves." Another interviewee reiterated this noting, adding, "Large-scale interventions that demand high costs may fail in the future the moment one input is missing [...] or a machine stops working. It is better we see what local resources are available beforehand."

Honey production is done by both men and women within their communities, and is a practice passed from one generation to the next. A significant number of South Sudanese households gather wild honey

through traditional beekeeping. As noted, production is mostly traditional, with hives having low honey yields.

Harvesting techniques change from one area to the other, but producers usually do the harvesting on their own or as part of a group. Some traditional methods use fire, which can sometimes destroy colonies and endanger forest species. Empty hives are transported to hanging sites and honey extraction is done through boiling, squeezing, hand pressing, and draining. Some producers extract the honey from combs using self-drip or double cooking pans. The semi-processing may mean that impurities are found in the honey with unhygienic techniques used. Many initiatives, such as an initiative by Caritas, actively invest in honey production and attempt to train farmers to use hygienic methods.

Traditional beekeeping has had devastating effects on South Sudan's environment and its bee species - from the cutting of trees, to burning of land, and cracking barks of trees to make beehives. Traditional beekeepers use smoke when harvesting which also destroys the comb, making it difficult to separate the honey and the comb.

However, over the past decade there have been transformative improvements in the breeding of bee colonies and community-led multiplication of bee species. Modern beekeeping, although significantly more productive, is still minimal.

7.3.2 Honey: market and downstream activities

Honey is a cash commodity in Torit, Yambio and Juba and is usually bought from the beekeepers themselves by middlemen. Honey collectors are usually individual traders who gather honey from beekeepers, producers, women groups, and households who then supply it to consumers and/or processors or intermediaries in larger towns. In other cases, beekeepers may transport the honey to cooperative-owned bulking centres or local markets. In cases where NGOs, such as Caritas Luxembourg, act as intermediaries, honey is packaged and distributed with their support. Otherwise, honey is transported in bicycles, motorbikes or by foot in plastic containers to local markets or on junctions and roadsides connecting areas. Lorry drivers from neighboring countries, such as Kenya and Uganda, may purchase this honey to sell to local breweries in their home countries.

Honey can be sold for relatively high prices in Juba, to international or national customers. The honey market doesn't have set prices, with prices fluctuating depending on multiple factors - including who the honey is being sold to, whether it is packaged, and the local currency fluctuations. The different markets include individuals or households within the payam itself, traders, individual/local beer brewers, NGOs, traders from bigger towns (Rumbek, Juba, Torit, Yambio towns themselves). However, for the most part, most honey producers sell within their payam or countries as they face issues of unreliable markets, lack of access to finance to be able to properly package and store honey.

7.3.3 Honey: challenges

Environmental issues. Many areas of South Sudan have endured decades of deforestation and land degradation because of fuelwood and charcoal extraction, war, wildfires, and other reasons. This has affected areas in Juba, Yambio, Bor, and Torit (and Rumbek, although to a lesser extent), and might affect honey production in the future if such practices go on. Additionally, traditional honey production methods

themselves are dangerous for the environment. As noted, cutting trees and burning lands, as well as cracking tree barks to make beehives, have had negative effects on the environment.

Attacks by cattle keepers. Another challenge beekeepers face, which is particularly a problem in Rumbek, is that cattle keepers may attack beehives either in an act of vengeance or aggression.

Storage facilities and honey aggregation. There are no adequate storage containers or packages for honey. Indeed, increasing honey production would require more professional aggregating units, as well as larger storage rooms. According to interviewed honey stakeholders: “today, finding proper storage rooms with all the required conditions of hygiene, administrative units, a room to procure raw materials, and an adequate renting price, is definitely not easy. But it is needed, if we are to expand exporting and meeting international specifications.”

7.3.4 Honey: opportunities

Nutritional and medicinal benefits. Medicinally, honey has antifungal, antiseptic, and detoxifying capacities. Honey is non-perishable and does not need a lot of processing before entering markets. Its indefinite shelf-life and properties make it convenient for South Sudan’s weak storage and transportation infrastructure transportation.

“We train farmers [in Torit] for honey production; however, we make sure to select and train farmers who are actually interested. We then work with them on a value chain level - [...] from the input level and provision of essential equipment to support with marketing” Key informant interviewee.

Increases agricultural yield. Cross-pollination makes honey production a self-sustaining process. Beekeeping increases agricultural yields and productivity through pollination. Bees harvest nectar and pollen, without competing with other animals. As such, honey production improves crop yields and emphasizes linkages between insects and plants.

Socially rewarding. Honey production is also linked to prestige in South Sudan; as noted by an interviewee, “having hives makes you more respected in your community”. Honey has a traditional value and is used as gifts during wedding ceremonies or as payment for favors done or labor received.

Relatively active cooperatives. Over the past decade, there has been a flourishing of beekeeping associations and cooperatives, such as Yambio’s Mborisa’s Beekeeping Group and Wulu Farmers Beekeeping and Marketing Association. According to Radio Tamazuj, “Starting in January 2020, local producers such as Mborisa and other local beekeeping groups supported by the SAFER project have been linked to private companies, greatly expanding their market. As of March 2020, the five local groups have been able to harvest 39 beehives and sell over 778 kg of honey, earning them over 324 200 South Sudanese Pounds (about 2,489 USD).” Cooperatives and groups organize input supply and support with extension services and, in some cases, market sales or accessing capital.

High demand. Interviewees say that the demand for honey is higher than current production capacities. As indicated above, although honey production remains primarily on a subsistence level, there are more groups that are moving towards commercially oriented production which could potentially meet the demand. Until today, in Torit, Yambio, and Juba, honey is sold in local markets (without proper packaging) to neighbors, friends, and market frequenters. However, there are now more bulking agents including middlemen, traders, NGOs, and processors or brewers who purchase honey either at the

farmgate or from markets. Moreover, as noted above, there are also a growing number of cooperatives and farmer groups.

Potential value-addition activities. Honey production in South Sudan is currently in the form of liquid honey. However, beekeepers do harvest propolis, which if properly packaged, can be used for medicinal purposes. Similarly, beeswax can be sold if producers are properly trained. Today, beeswax is not often sold, as the majority of beekeepers do not have the training for it. Honey is also cost-effective in terms of transportation, in comparison to maize and sorghum and this makes it profitable to traders and other actors on the value chain.

International export. Honey is currently not consistently exported; however, there have been successful examples in the past when honey was exported to Japan, EU markets, and regional countries. An interviewee noted that in the early 2000s, South Sudan actually exported honey to Uganda, which then sold it to EU markets. One such brand is the Palotala honey. Moving forward, packaging and branding South Sudanese honey as organic is important. However, in order for Sudanese honey to be export, quality standards need to be developed and implemented in order to improve quality and yield.

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8 Fisheries Value chain

8.1 Fisheries: production and upstream activities

Fish has high nutritional value, packed with protein and vitamin D. It has the capacity to contribute to food security in South Sudan, particularly communities nearby the River Nile. Fish tends to be cheaper than other sources of protein. Fishing communities benefit from increasing the supply of fish from a health perspective, as well as a livelihood one. For instance, Bor's wetland areas host over 100 types of fish; some of the most important being tilapia, barbus, Nile perch, alestes, labeo, mormyrus, and others. Although there are no recent baseline surveys determining the number of households depending on fisheries, a 2010 baseline survey reported that 14% of households in South Sudan rely on fisheries. This number is likely to have increased. Fishing is usually a part-time activity amongst river-side communities in Bor.

"In Bor, fishing involves a lot of process and is more mature as a value chain than most crops. People are constantly moving and are not stable in search of green pastures; but with fish, there is the presence of the river." Key informant interviewee.

However, in South Sudan, the fishery sector lags behind and remains a secondary source of income and livelihood. "Fishing is still perceived as second-rate despite its proven capacity to contribute to livelihoods; communities in South Sudan see it as something to invest in when they suffer from losses in crop harvest or have lost cattle during a raid." This might change if fishery practices are up-scaled and invested in, as the fishery sector has the potential to be commercialized and provide potential for economic development.

South Sudan's fishing methods are highly traditional. The main inputs include fishing boats, gill nets, cast nets, and mosquito nets. There are very minimal quality fishing inputs, and fishing gear or inputs are usually imported from neighboring countries including Uganda, Kenya, and Sudan. Fishermen use basic canoes and timber boats that are paddled by fishermen; however, interviewees noted that there is a strong need for motorized boats.

Fishing trips are done overnight or early during the day. Some fish in Bor are iced in ice boxes, but most of the time fishermen do not chill their fish after catching them. However, a main issue with fishing is that there might be saturation of fishing nearby the river, without proper transportation to markets.

8.2 Fisheries: market and downstream activities

The challenges in the inputs and production phases funnel into the marketing and market subsystems. Because of limited organization of fishermen, improper fishing inputs and fishing methods, and difficulty transporting fish products, there is difficulty accessing markets.

Because fishermen and their families might not be able to consume all the fish at the landing site, surplus fishing is sold at local markets. The fish are either transported fresh, or braided and sundried (usually by women). The drying process is rudimentary and usually leads to significant losses of produce. In some cases, traders and consumers arrive at the landing spot to buy fish and sell at the market. Buyers do usually inspect the fresh and dried fish and proposed prices based on quality.

Fish are transported to markets in river boats (when available) and motorbikes on land. Generally, after fish is transported from river boat from Bor to Juba, and in some instance by road (motorbikes or vehicles), some traders in Juba export the fish abroad over ship. Fisheries: challenges and opportunities

8.2.1 Challenges

No proper storage and drying facilities. Processed fish is also not properly stored, making them susceptible to dirt, dust, and insects. Infested fish decreases nutritional content. Dried fish have been infested by beetles, which affects the nutritional content of fish.

Rainy season. From May to October, there is usually a significant decrease in fish harvests and transportation. The weak fishing technologies makes fishermen and traders highly susceptible. Additionally increased water levels affects the amount of fish produced.

Limited market information. Like many other sectors in South Sudan, there is limited information of the fishery sector regarding number of fishermen, fish production, and fish sales. In Bor and Juba (although to a lesser extent than Bor), market infrastructure is lacking. There are no official designated collection points or landing sites, and market stalls have weak infrastructure.

8.2.2 Opportunities

High production and value addition potential.

There are many inland fisheries resources; upscaling fishing activities including through aquaculture could increase production into millions of tons per year. The value addition of fish also includes smoking and sun-drying it. The use of solar dryer modern equipment would be useful in reducing post-harvest losses and ensure economic sustainable especially at the community level.

MARF fisheries' policies

The GRSS Ministry of Animal Resources and Fisheries (MARF) is responsible for formulating and implementing laws, policies, and standards for the development of South Sudan's fisheries resources. MARF's aim is to promote quality and value addition in fisheries products, in addition to linking fisheries resources to poverty reduction and socio-economic growth in the country.

Accessible to women and existence of women

fishing groups/cooperatives. Both men and women are engaged in the fisheries sector, although it has historically been more male-dominant. In Bor, there are small scale women fisheries cooperatives, whereby women smoke and sun-dry fish. FAO supported women groups specialized in the sale of dried fish, with tilapia being the main product focused on. They worked on helping these women groups establish good fishing practices and improved natural resource and water management. Usually, men do the fishing at night, and then women go and get enough quantity to sell. There are few women involved in the actual fishing too, they speak to their colleagues and support them, move together to fishing camp and lay their night." "The project I was implementing was a big project in agriculture involving fisheries, so we were also having fishermen. The profit they were getting compared to all other sectors was significant; the women who were in that business, they are better off than those with animals and crop farming. Prices of fish are good, although it depends on the size. Some fish are low prices; others have high prices. Tilapia has a very good price, people like the taste of tilapia -- there are other types of fish like catfish, but there are many across south sudan." Many of these women groups are not formalized, and

simply help each other out with sharing goods and support received from international or governmental interventions.

Fisheries sector is more secure. Unlike cattle, the fisheries sector (similarly to poultry production) is generally more stable and accessible to women and youth. It is also not as affected by climatic shocks.

High demand in Juba. Markets in Juba are rather receptive to fish arriving. Although there are no estimates of fish sold there, interviewees note that most of the fish transported there via river barges and motorbikes from Bor are sold, specifically tilapia. Although tilapia fish from Uganda are sold there, increased production of fish in South Sudan coupled with proper storage and improved transportation can partially replace imported fish from Uganda.

Cold storage and transportation premium price. Transporting fish via refrigerated trucks from Bor to Juba is an improved and highly efficient way as a high number of fish can be transported. Investment in Fish centers with ice making machines and fish preservation facilities would be useful in reducing post-harvest losses and significantly upgrade the fishery sector.

Export potential. If properly stored and adequately transported to Juba, dried fish can be exported to neighboring countries including DRC, Uganda, and Kenya. Interviewees note that there have been successful - albeit few - cases of export. However, because production is minimal, most of the fish is absorbed at landing sites or local markets.

9 Recommendations

9.1 National level and value chain cross-cutting recommendations

1. **Support the peace building and social stability building.** interventions funded by international donors funded project, and in close coordination with the government of South Sudan, shall include peace building and social cohesion activities.
2. **Prioritize food security intervention over export-oriented production.** Within the current socio-economic context of South Sudan, intervention that focus on food security, such as ensure self-sufficiency in cereal production, are achievable on the short-term and should be prioritize over export oriented, and linkages with global value chain. Global value chain linkages for crops such as sesame and groundnuts, as well as fisheries and honey, constitute indeed great opportunities for South Sudan. However, given the current state of local infrastructure as well as food security prerogative, achieving international market competitiveness and replication of successful export initiatives is particularly challenging.
3. **Investing in infrastructure.** Lack of infrastructure is a major impediment to the development of South Sudan. National investment, especially in roads, irrigation as well as electricity and ICT is a national economic need. Indeed, such large infrastructure investment fall outside of the scope of YEPP project, it is however, a key element to future development of agriculture in South Sudan. The South Sudanese Government, with the support of the international donor community shall continue its efforts in improving the country economic infrastructure. Renewable energy projects, including water boreholes, shall also be considered.
4. **Work on the implementation of national policies and regulations.** International organization active in South Sudan should support the government implementation of national agriculture and natural resources policies.
5. **Improve farmers, herders and fishermen skills and know-how.** Efforts should be intensified to undertake national level extension services program to supporting farmers and producers with a comprehensive and mainstreamed strategy to improve agriculture practices, practices including proper land preparation, crop rotation and inter-cropping skills, pest and weed control, soil fertility maintenance, etc. **Within overall efforts to improve know-how and skills, National level intervention can:**
 - a. **Implement farmer (herders and fishermen) field schools and improved agricultural curricula.** Improving farmer and pastoral field schools with harmonized crop production, livestock, and fisheries curricula is key to transforming South sudan's subsistence agriculture. Farmer field schools should also be a means to improve market linkages. Farmer fields have been successfully implemented in Bor, Torit, and Juba previously.

- b. **Systematic nation-wide quantitative and qualitative data collection systems.** Improved data on crop areas, yields, livestock, and fisheries as there is a serious problem with accurate and disaggregated data.
 - c. **Support adoption of Small-scale and affordable on-farm processing technologies.** Introducing small-scale technologies such as grain shellers, grinding machines, and chaff cutters will help increase efficiency.
 - d. **Improving irrigation applications.** Many farmers do not have access to irrigation technologies or knowledge about proper irrigation management and crop water demands. Introducing farmers to irrigation for crop production is key and ensuring they have the knowledge about irrigation application is key.
 - e. **Business and financial skills.** Training in Business development skills and financial literacy including implementation of financial inclusion programs could significantly improve livelihoods.
6. **Improve farmers, herders and fishermen access to finance.** The YEEPP project should support the establishment of microfinancing schemes through support to existing micro-finance institutions as well as support to informal community-based saving schemes – in specific cases the project may consider providing support to the establishment of new micro-finance institutions. Grant + loans schemes, in which the project subsidized part of the investment are recommended, subsidized loans shall prioritize investment aiming at the implementation of upgraded production and post-production practices.
 7. **Ensure access to improved inputs.** Providing quality local seed varieties and improved tools to producers. Investing in local seed fairs and supporting community heirloom seed multiplication. One way is through identifying local input suppliers and creating linkages and a certification system for input supply depots between farmers and input suppliers. Supporting small group or family-based sorghum and maize nurseries, to extract seedlings for replanting even when planting season is over.
 8. **Improve value chain linkages and downstream activities.** The YEEPP project should support investment in improved downstream activities, i.e. storage, drying, milling. Moving forward, it is key that local producers are connected to traders, middlemen, and wholesalers locally and regionally.
 9. **Support creation of cooperatives and/or farmers (herders and fishermen) common action formal and informal groups.** Mobilizing people for common action around means of production and or value chain services, either through formal or informal structure, is key for the success and long-term sustainability of YEEPP interventions. Similar cooperative structure for added value activities should be encouraged.
 10. **Specific attention should be given to women economic empowerment through support to women involvement in the agriculture, livestock and fishery sectors.** Women initiatives in

agriculture and their involvement, especially in the horticulture and fisheries value chain, has yield improved living conditions for South Sudanese households' and shall be supported further.

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9.2 Value chain interventions

Value chain interventions shall be implemented around 4 Axis of intervention:

- **Axis 1: Support farmers, herders and/or fishermen common action**
- **Axis 2: Support value chain access to finance and investment**
- **Axis 3: Improve farmers, herders and/or fishermen know-how and skills**
- **Axis 4: improve value chain linkages and downstream activities**

Specific interventions shall be determined based on the identified value chain challenges and opportunities for each value chain. Table 6 below present example specific action example for each of the proposed access, while table 6 linked each value chain challenge and opportunity to the proposed action.

Table 5: Example of potential interventions

Axis 1: Support farmers, herders and/or fishermen common action	
1.1	Support creation of cooperative – with prioritization of cooperative services such as: common procurement of inputs, management of mechanized means (tractors), aggregation of production (if security situation allows), transport, access to markets
1.2	Support and improve action of local seeds production groups
1.3	Organize common transport scheme to market (day to day product aggregation and transport)- work with local transport association
1.4	Support off-grid access to power commonly managed solutions
1.5	Support women economic empowerment through agriculture, livestock and fisheries
Axis 2: Support value chain access to finance and investment	
2.1	Support investment in improved farm infrastructure (such as improved irrigation system, improved seeds)
2.2	Support agricultural expansion investment – on new agricultural land
2.3	Provide subsidized financing to procurement of livestock and livestock breeding programs
2.4	Provide subsidized financing for upgrading and new fishing boats and material
2.5	Support investment in mechanization (through cooperative or private business) along the value chain (subsidize farmers access to services in initial years).
Axis 3: Improve farmers, herders and/or fishermen know-how and skills	
3.1	Implement program of extension services and skills improvement
3.2	Implement farmers, herders and fishermen field school – including business field schools
Axis 4: improve value chain linkages and downstream activities	
4.1	Improve home storage practices (training and distribution of storage basic material such as hermetic bags)
4.2	Provided business development and access to finance services and improve output and outreach of milling centers, storage business, fish drying business
4.3	Facilitate farmers groups linkages with traders and middlemen
4.4	Facilitate access to niche market and innovative linkages

Table 6: Sorghum - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Access to land and land preparation	1.1; 1.4, 2.2, 2.5; 3.1
Pest management	3.1, 3.2
Lack of skills on post-harvest management.	4.1;
Lack of business planning	1.1; 3.2
Opportunities	Axis of interventions proposed actions
Highly resilient crop	1.2; 3.1
Input linkages between cooperatives/groups and input suppliers	1.1, 4.2, 4.3
Community-based seed multiplication	1.2
Mechanization (through jointly owned machinery)	1.1, 2.5
Improving storage facilities	4.1
Sorghum milling units	4.2
Animal feed and other uses	4.4

Table 7: Maize - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Low quality of input supplies.	1.1; 1.4, 2.2, 2.5; 3.1
Minimum agricultural practices	3.1, 3.2
Access to market	1.1, 4.3
Post-harvest losses	4.1
Opportunities	Axis of interventions proposed actions
Improving input supplies	1.1; 2.1
Improving productivity	2.5, 3.1
Upscaling the maize value chain	4.2
Training on post-harvest management.	3.1
Encouraging entrepreneurs	4.4
Export potential	4.4

Table 8: Sesame - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
No adequate land preparation	1.1; 2.5
Insufficient inputs	1.1; 1.4, 2.2, 2.5; 3.1
Lack of extension services	3.1
Inadequate storage facilities	4.1
No proper national policy regarding sesame	Recommendation 4
Lack of adequate national standards.	Recommendation 4
Opportunities	Axis of interventions proposed actions
Sesame multiple purposes	4.4
Low-cost of production	3.1
Improve market linkages	4.3
High export potential	4.4

Table 9: Groundnuts - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Low access to groundnut inputs	1.1; 1.4, 2.2, 2.5; 3.1
Pests management	3.1
Low productivity	3.1
Weak farmer groups and associations	1.1
Lack of proper storage facilities	4.1
Opportunities	Axis of interventions proposed actions
Intercropping with staple crops	3.1
Improving processing and packaging facilities.	4.2

Table 10: Horticulture - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Pest management	3.1
Water infrastructure (farm level)	2.1, 1.4
Lack of post-harvest infrastructure	4.1, 4.2
Opportunities	Axis of interventions proposed actions
Backyard gardening and accessibility to women	1.5
Improving extension services	3.1
Applying certification to increase export potential	Recommendation 4
Cold storage and transportation premium prices	4.2
Capitalizing on organic certification and fair-trade schemes	4.4
Increased demand on processed horticulture products.	4.4

Table 11: Cattle - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Cattle raiding	Recommendation 1
Barriers for women's ownership of cattle	1.5
Lack of adequate data	Recommendation 4
Inappropriate taxation	Recommendation 4
Lack of adequate training and research in livestock	3.1
Poor hygiene.	3.1
Opportunities	Axis of interventions proposed actions
Already existing livestock population	Recommendation 2
High demand	2.3, 4.4
Linkages with the crop production sector	3.1
Milk production (import substitution)	4.2, 4.4
Vibrant regional trade	4.4.

Table 12: Poultry - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Lack of adequate disease prevention and vaccines	3.1
Electricity infrastructure.	1.4 - recommendation 3
Water infrastructure	1.4 – recommendation 3
Limited market linkages.	
Opportunities	Axis of interventions proposed actions
Using staple crops as feed	3.1, 4.4
Proper training on input and production can lead to significant increase in production.	3.1
Poultry suitable for female headed households and women and youth generally	1.5
Growing investment in the sector by NGOs	1,1. 1.5, 4.4
Poultry associations	1.1, 1.5, 2.3
Improving market reform policies	Recommendation 4

Table 13: Honey - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
Environmental issues	3.1
Attacks by cattle keepers.	Recommendation 1
Storage facilities and honey aggregation	4.1, 4.2
Opportunities	Axis of interventions proposed actions
Nutritional and medicinal benefits	Recommendation 3
Increases agricultural yield	3.1
Socially rewarding	1.1, 1.5
Relatively active cooperatives	1.1
High demand.	2.3, 4.4.
Potential value-addition activities	4.4
International export	4.4
Cost effective	3.1; 3.2

Table 14: Fisheries - Linking challenges and opportunities to Axis of interventions

Challenges	Axis of interventions proposed actions
No proper storage and drying facilities	4.1, 4.2
Rainy season	N/A
Limited market information	4.3
Opportunities	Axis of interventions proposed actions
High production and value addition potential	2.4; 4.4
Accessible to women and existence of women fishing groups/cooperatives.	1.5
Fisheries sector is more secure	Recommendation 1
High demand in Juba.	4.4
Cold storage and transportation premium price	4.4
Export potential.	4.4
Upscaling to commercial fishing	2.3, 4.4

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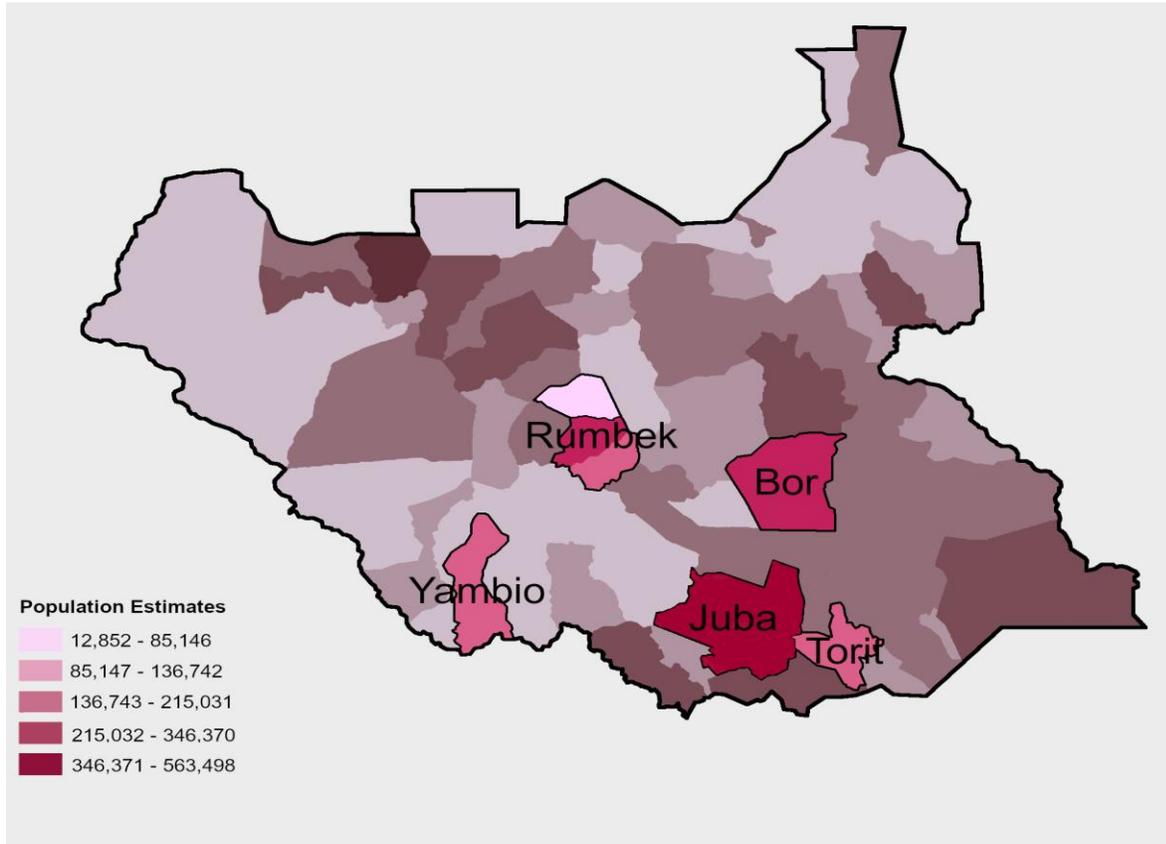
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Annex 1: Characteristics of the selected areas

It is estimated that the total population in the area under study totals approximately 1.8 million people, over a total superficies of 59.1-thousand-kilometer square. Relative size and population distribution are show in the Map below.

Figure 2: Population distribution in the areas of interest (projection 2019)



Source: South Sudan SS National Bureau of Statistics 2008. Population census and 2015-20 (2019 projections)

Bor

Area and population

Bor County is situated in the state of Jonglei which is part of the greater Upper Nile region. It has an area of 14,115km² inhabited by 325,891 people. Bor's economy is primarily based on agriculture, pastoral care, and fisheries. The Nile River runs along the west side of the county, and is a significant transportation and natural asset. The riverine area provides important grazing lands for cattle, vegetable growth, and fishing that supports dry season livelihoods. As such, Bor is a valuable agricultural area that supports grain production (mainly sesame and millet) and livestock subsistence herding; supporting neighboring areas. Cultural artifacts include primary hide processing and leather and woodworking. The county serves as a station for ferry service on the Juba-Khartoum line. It is linked to the capital Juba via roads and also has a local airport.

Infrastructure

Bor hosts a few farmer field schools and other educational institutions, however, enrollment is low and illiteracy is high due to lack of resources. Access to adequate healthcare is extremely poor, and is contingent on constant foreign aid which is heavily affected by the political and security situation. For instance, Bor Hospital, the main hospital in the county, has been in dire need of basic supplies as medicines and disinfectants.

Agriculture brief

Livelihoods were destroyed by the 2014 war, which left a devastated city with residents who fled with no possessions. Although the main market in Bor, the Marol market, was reinstated post-war, the South Sudanese Pound depreciation and the subsequent hyperinflation have seriously affected households' purchasing power, making them extremely vulnerable. Market prices fluctuate dramatically with the changes in the exchange rate of the SSP to the US dollar. Most household income is spent exclusively on food and malnutrition is highly prevalent. The main source of livelihood is agricultural (for household consumption mainly) with a high proportion of households now dependent on inconsistent income sources such as cheap labor, or natural resource sales. The main agribusiness crops cultivated are cereals like maize and sorghum and the main vegetables include tomatoes, cabbages, onions, kudhura, okra and onions. Lemons and guava are also planted. Farmers rely mainly on rainfall for irrigation. The rain season lasts for 8.7 months on average, from March 11 to December 1, witnessing a sliding 31-day rainfall of at least 0.5 inches. The most heavy rain, with a total accumulation of 5.1 inches on average, falls during the 31 days centered around August 9. The major barriers to increased output levels in the county were: small plots of the agricultural land, lack of resources, use of poorly saved seeds, inaccessibility of inputs, poor access to extension services, pests, poor post-harvest management, inadequate access to market information and generally weak commodity markets

Security Situation

Bor is prone to inter-community ethnic-based conflict as well as cattle raiding. On 23 July 2020, the WFP and FAO warned of recurring violence in Jonglei State, which has already caused the displacement of more than 60,000 people and is further hindering the food security and livelihoods of the residents.

[Juba](#)

Area and population

Juba is the capital of South Sudan. The 18,396 km² area was chosen as capital for multiple factors, of which a major part is its relatively functional and established infrastructure. In fact, Juba is close to neighboring countries and contains an airport, it also benefits from steady access to water unlike the majority of the country. Estimates based on the 2008 population census show that Juba is inhabited by 563,498 people. Nonetheless, those figures might not be accurate, especially considering that forced displacement and return have played a major role in its development. In this sense, Juba's population has fluctuated significantly, but has still seen a steady increase over the years.

Infrastructure

Throughout war and conflict, the main means of accessing Juba, rivers and roads, were restricted. Residents sustained themselves through petty business and agriculture. Physical infrastructure took a heavy toll, either from direct damage or lack of maintenance, and was in urgent need of major repairs. However, as financial capital, oil revenue, and goods started flowing into the town, the economic landscape changed significantly. Residents were presented with new opportunities as Juba's economy grew and became more commercially vibrant. Similarly, the increased prevalence of private businesses, international NGO presence, and the establishment of the regional government led the country's youth to migrate to the capital in search of employment. One growing trend appears to be that of young, semi-skilled or unskilled men moving to Juba looking for an urban lifestyle and better employment. Most expect to find unskilled labour, as office workers or drivers, for example. Others aim to set up their own small firm, work as taxi drivers on motorcycles (boda bodas) or join peers in their small businesses. Although the city and its economy are often characterized as thriving, rapid and uncontrolled growth has also drawn – and produced – a rising number of urban poor. This expansion was characterized by the unchecked growth of informal and non-permanent settlements.

Agriculture brief

An increased number of Southern Sudanese are engaged in regional trading. Retailers sell agricultural products such as salt, sugar, rice, beans, maize, and flour, as well as sodas and beers purchased from distributors either in Sudan (namely Khartoum) or from adjacent countries. Other small business owners sell hardware, cutlery and cooking utensils, household items, motorcycles and spare parts, electronic equipment, as well as telephones and mobile top-up cards.

Security Situation

There are frequent reports of ethnic and sectarian conflicts in Juba, as well as occasional reports of clashes between armed groups. Serious criminality is also a frequent threat, notably during the night hours. Currently, a truce is established; it has been mostly maintained since September 2018. But a breakdown in the security situation seems likely, and could be influenced by a variety of conditions such as developments in the current peace process, worsening of the fragile economy, or a more securitised reaction to COVID-19.

Rumbek

Area and population

Rumbek, especially its center, is the locus of commercial activities in the Lakes State. The 11,986 km² land sustains a population estimated at 544,725 people which consists of diverse ethnic groups in addition to foreign business people and workers. The Dinka and the Agar are the dominant ethnic groups in the area.

Infrastructure

The infrastructure is rudimentary and in bad condition, often leading to displacement and death. Roads quality is also poor making it hard to move within the county or from one county to another. Nonetheless, most of the North of Rumbek has been displaced to the center, placing strain on the already scarce services. Water scarcity is a major problem due to the limited number of water points. Most water pumps are of the manual one-hand type and shared by approximately 250 people each; during the dry season,

women frequently walk up to four hours to obtain water. Similarly, food insecurity is a serious issue especially in times of drought. Farmed crops often do not germinate or are destroyed by the harsh weather conditions. In fact, Rumbek exhibits extreme seasonal variation in monthly rainfall. The rainy period is characterized by a sliding 31-day rainfall of no less than 0.5 in, for a duration of around 8.5 months, from March 10 to November 25. The rainfall is the most intensive during the 31 days centered around August 10 with an accumulation of around 6.1 inches on average. Such dramatic fluctuations have serious repercussions on agricultural output and infrastructure. In addition, there is a major lack in healthcare services, including healthcare workers and essential drugs, leading to a high prevalence of maternal mortality and malaria deaths. Similarly, animals which are the main source of food for the local population, die due to prevalent diseases and lack of veterinary services.

Agriculture brief

Markets in the county are hard to access and the difficulty in transporting agricultural produce is a significant challenge. While some people engage in fishing along local rivers or small-scale trades of essential goods, both mainly for household consumption, the primary economic activities are farming (along the roads) and cattle herding. In this perspective, cattle rustling, border and grazing land disputes, in addition to rampant gun presence among communities in the area constitute key sources of conflict.

Security Situation

The seasonal migrations of cattle herders moving to grazing lands and river points affect the productivity of local pastoralists leading to recurring conflicts. Revenge attacks are also common among youth from different communities especially when cattle thieves are killed. It is important to note, however, that prior to the war and the serious socio-economic levels deterioration, the different communities shared resources without significant conflicts. In this sense, the main sources of conflict and insecurity are ethnic clashes that are locally-based.

Torit

Area and Population

Torit counties form a 5,796 km² area with an estimated 167,033 residents, situated in the Equatorias – Eastern Equatoria - which are known colloquially as the Greenbelt Zone which, due to its geographical location and climate, has the capacity to be the nation's "food basket." As such, the county constitutes an agricultural zone characterized by fertile land ideal for crop production. The county only has marginal reliance on livestock rearing.

Infrastructure

The county suffers from the heavily constrained development of infrastructure and schools. There is also a shortage of government security services including equipment, training, and human resources. There is no electricity supply on the county-level; only private generators supply electricity to the more well-off among the population. As for access to water, residents rely on hand-operated wells. Healthcare facilities are scarce and severely under-equipped.

Agriculture brief

Most households in Torit depend on crop production. However, complementary sources of income also exist and include the exploitation of natural resources (forest products) such as firewood and timber; others engage in trade activities and casual labor. Land is generally communally owned and each household obtains a small plot of cultivated land, leading to low productivity levels. The main crops cultivated, which potentially become efficient value chains are Maize, Sorghum, groundnuts, sweet potatoes, millet, and cowpeas. A major staple food is also Cassava. The county also cultivates fruits and vegetables, but on a smaller scale. Mangoes, bananas and pawpaws are the primary fruits harvested. The main agricultural season in Torit ranges from May to June as well as July to December. As for rainfall, which is the main means of crop irrigation, Torit is subject to significant monthly rainfall seasonal variation as the rainy season last for 10 months, ranging from mid-February to mid-December, with the most rainfall, at least 0.5 inches, falling during the 31 days centered around August 9. The rainfall during the planting seasons is appropriate for crop production.

The major markets in Torit were Torit and Melekia. Merely half of households report knowledge of market information such as price fluctuations despite the fact that market prices are the most accessible forms of market information, as well as information on demand from the market and potential new buyers. Such knowledge influences how farmers sell their crops, notably, when to sell and when not to. Nonetheless, the lack of or the presence of inadequate storage facilities have led farmers to sell their produce earlier. Industrial agriculture is very limited. Most farming is done manually whereas better off individuals can recruit workers and hire farm machinery for large parcels of land.

Security Situation

The area is struggling with a precarious security situation with continuing cattle raiding conflicts, inter-communal tensions and fighting between armed groups. The county itself represents a target for offenders. Although some of the crime is political, the severe economic and social crisis motivates most violence, with individuals stealing and looting merely for survival.

[Yambio](#)

Area and Population

Yambio is located in the Equatorias, in the Western Equatoria State of which it is the capital. It is located near the Democratic Republic of Congo (DRC)'s border with South Sudan. It has an area of 8,847, in which an estimated 208,502 people live. Yambio's geographical location places it without the green belt zone, a large agricultural area that has the potential to become South Sudan's "Food Basket." It has the highest potential to become the main cereal producing area due to its characteristically fertile soils. Yambio city was the center of major armed conflicts and pervasive displacement in 2016, and is consequently hosting a significant number of internally displaced persons (IDPs), many of whom began returning home in early 2018.

Infrastructure

Infrastructure in Yambio is rudimentary and precarious. Most of the residents live in rural areas which are seriously underserved and surrounded by thick forests with no proper road infrastructure. Security and livelihoods are disproportionately impacted by the inadequate road network. In fact, numerous major

roads and a large proportion of feeder roads become un navigable during the rainy season (which lasts from April to December), preventing access to the common markets, healthcare facilities as well as security services.

Agriculture brief

Most households rely on agriculture food subsistence, supplemented by fishing, hunting, livestock rearing and gathering of bush products and wild foods. There is a limited number of people engaged in wage employment or own businesses. Other small scale activities include burning of charcoal, brewing local brews and fishing. Yambio has two main agricultural seasons, the first lasting from March to June and the second from August to November. The major crops cultivated are groundnuts, sorghum and maize and constitute potential value chains. Cassava is also a staple food. Fruits are also grown of which are pawpaws, bananas, pineapples and mangoes. The WFP is a major market for harvested cereals, in addition to local markets. The main local physical markets are Masia and Nabiapai. They are extensive and known for numerous wooden stalls and concrete buildings.

There are numerous obstacles to higher levels of production. There is a general lack of equipment and infrastructure and lack of mechanization. Rural lands are shared communally as the Chief allocates lands to community members. As such, agricultural land is managed within traditional structures of ownership and labor. However, in urban areas, lands are controlled by the government and can be bought by the private sector; women cannot own lands and only gain access through male relatives.

Security Situation

Livelihoods of Yambio's residents were severely affected by the 2016 conflicts of which many fled and merely started returning in 2018. Nonetheless, the peace deal signed by the opposing groups returned some calm to the city which allowed the return of its residents. As such, the current atmosphere is relatively peaceful; but general security concerns, including crimes such as cattle raiding are still present.

Annex 2: Description of selected initiatives

South Sudan's agriculture sector has long been a focus of international organizations and agencies in South Sudan. FAO and WFP, for instance, have been very instrumental in the struggle for sustaining agricultural production in South Sudan. FAO has supported millions of farmers and people with input supplies, in addition to implementing on-the-ground projects through a number of local partners, including Ark for Humanity, Cordaid, etc. Donors such as USAID, as well, have been very instrumental too, they have supported a significant number of farmers through their partners, with seeds, training, etc.

World Food Programme. WFP focuses on providing condition and unconditional food distributions, in addition to food transfers for people suffering from chronic diseases. Importantly, in non-conflict areas, the WFP aims to build the resilience of smallholder farmers and farmers' groups and associations through infrastructural development, training in natural resources management and post harvest storage. WFP provides a market for cereals, particularly maize and sorghum, which has created a shift in market dynamics for many smallholder farmers. WFP also works with different ministries and government capacities to help strengthen their internal systems and disaster or climate risk management.

Food and Agriculture Organization. FAO plays a crucial role in South Sudan's agriculture sector. Broadly speaking, it coordinates and monitors interventions in the agriculture sector. It also actively engages in resilience activities and incorporates the value chain approach in its livestock, cultivation, and farmer training activities. For instance, they help farmers with seed production and train them on how to re-use seeds. They also provide support to farmers involved in milk production, whereby they give vaccination training to farmers, then establish milk processing groups. Farmers, after taking the training, learn how to process the milk into yogurt then sell it to the market. Others are also receiving training on how to ensure the milk is hygienic in order to sell fresh milk after longer hours. FAO's resilience-centred projects are between two to four years, whereby they try to work on a value chain level and address the various actors, especially vulnerable ones, along the way. They also coordinate actively with the WFP, in order to train farmers and facilitate the selling of their products to the WFP. FAO hosts input trade fairs as a way of stimulating local markets.

AGRA. AGRA is an NGO that works with different African governments to work towards a greener Africa. It has a number of initiatives in South Sudan, mainly to improve seed systems through training local breeders. It also aims to offer sources of livelihoods to South Sudanese through agri-entrepreneurship.

Food Security through Agribusiness in South Sudan Project (SSADP II). SSADP II is a five-year project running until 2023, funded and designed by the Netherlands Embassy. The partners include Cordaid, SPARK, and Agriterra. The main goal is to improve food security and livelihoods of around 10,000 farmers across Yambio, Torit, and Bor. They collaborate with local and international organizations, in addition to the private sector, and focus on strengthening market functions and players to become more inclusive. A strong component of the project is also to support farmers and agribusinesses to have better access to technology, organization, markets, and finance. One of their main approaches is the value chain one, in addition to cooperative development, community managed disaster risk reduction, resilient business development services, and action research.

CORDAID. Cordaid's main aim is focusing on farmers and connecting them to microfinance institutions. Cordaid focuses on production and how farmers can produce more efficiently and effectively, in addition to training farmers on good agronomic practices and providing them with required inputs and linkages to markets. While Agriterra, an agency based in the Netherlands working on international agricultural cooperation, focuses on development and working with cooperatives and some of the farmer groups registered in cooperatives. SPARK deals with the business development and entrepreneurship side, working with median and micro enterprises, and providing training to potential entrepreneurs who engage in some of the value chains. Spark also works with different advisors, whose work is to coach and mentor the MSMEs. At the same time, they scout MSMEs and do coaching and mentoring for businesses and accelerators, in addition to bringing in business development advisors. They also do partnering with a local organization called Rural Microfinance Initiative (RUFi), to help SMEs receive soft loans. When SME's have a ready business plan, Spark enables them to get a soft loan. The MSMEs they work with mainly fall under three categories - those that deal with input supply; production (specifically maize, cassava, vegetable, fruits, and poultry), and processing.

Star Trust. Star Trust has been implementing with the UNDP some vocational programs since 2019, in addition to several value chain activities in Yambio and neighboring countries. Generally, its main focus is on agriculture, food security, livelihoods, and other related sectors, and received some insights.

SERA. Norwegian Refugee Council works on multiple food security projects, one of which - titled SERA - was very relevant. In collaboration with FAO, the SERA project (Sustainable Agriculture for Economic Resilience) and it was funded by the USAID. SERA worked with several farmers, grouped into different clusters for farming. Good agronomic practices were taught, in addition to practical trials to differentiate between traditional and modern practices. Additionally, farmers were trained on business skills.

Ark for Humanity. Ark for Humanity has supported farmers since 2015, mainly in the production phase - it works with farmers on better agronomic practices, input supplies, and market distribution. Its main aim is to revive socioeconomic development in South Sudan.

Global Agriculture Innovation & Solutions (GAIS). GAIS is an eu-funded project working in the Equatoria region and now based in Rumbek. They are a social enterprise, working with the Norwegian People's Action, on seed multiplication and value chain. The three specific seeds are sorghum, cowpeas, and groundnuts. They also work on improved seeds and agriculture techniques.

Church and Development National Organization. This organization has been working in South Sudan since 1996, and is mainly involved in food security and livelihoods, as well as agricultural value chains, trading, and women empowerment. In Bor, they work with fishermen and support them with fishing kits as well as training on fish preservation and marketing.

AVSI. AVSI focuses on food security and agri-business development. They provide and procure seeds, as well as help with market entry. Their main target areas include Torit, Upper Nile, Weil and Lake State, and Juba.

Annex 3: List of interviews and focus groups

Bor. Four KIIs, two FGDs

KIIs with:

1. Food and Security Livelihoods, NRC
2. Head of Bor Field Office, FAO
3. Livelihood Officer Norwegian People's Aid
4. Program Manager, Church and Development Organization

Juba. Five KIIs, two FGDs

KIIs with:

1. CEO, Kush Bank
2. Field Office, WFP
3. Chairman of South Sudan Agricultural Producers Union
4. UNDP Coordinator
5. Head of Chamber of Commerce

Torit. Four KIIs, two FGDs

1. Executive Director, Ark for Humanity
2. National Consultant, FAO
3. Head of Mission South Sudan, Fondation Caritas Luxembourg
4. FSL Officer/Wash Specialist, AVSI Foundation

Rumbek. Three KIIs, Two FGDs.

1. Field Coordinator, UNDP
2. Value Chain Specialist, Vocational Skill Development Organization
3. CEO, Global Agriculture Innovation & Solutions (GAIS)

Yambio: Eight KIIs. Two FGDs

KIIs with:

1. Field Coordinator, Agribusiness Development Project [Cordaid]
2. Business Support Office Coordinator for Spark NGO
3. Agribusiness Owner (Chris and Brothers)
4. Chairwoman of Kodadpai Cooperative
5. Director of Ministry of Cooperatives
6. Chairwoman of Rose Cooperative
7. Ministry of Agriculture, Extension Services
8. Executive Director, Star Trust Organization

Annex 4: Data collection toolkit

Interviews with Macro-level Actors (ministries, INGOs and international agencies)

INTRODUCTION

The aim of this study is to review and map different value chains within South Sudan's agriculture, in an attempt to identify and further understand specific value chain's weaknesses, strengths, and opportunities in relation to products, processes, technological tools, institutional mechanisms and markets. These interviews are preliminary ones, prior to us speaking with local coordinators, farmers, and community groups. As such, through this interview we aim to understand on a broader level your work and understanding of value chains in South Sudan, and your specific recommendations on which value chains to select – with a keen eye on women and youth.

[For interviewer: bear in mind that literature review shows that the main staples are sorghum, maize, cassava, pulses and groundnuts, sesame and sunflower, bananas mangoes, lemons, pineapples, as well as other vegetable production such as onions, okra, tomatoes, eggplants, sweet potatoes and cabbage. Through these preliminary interviews, we are aiming to focus on specific crops, specifically the ones you perceive to be as the most competitive/high-level commodity]

QUESTIONS

Introduction/warm-up

1. How would you describe the current status quo of agriculture in South Sudan?
 - a. What do you see as its main challenges?
 - b. Probe on political/security issues; economic; climate-related; funding-related
 - i. Specifically, we want to understand how conflict has affected farmers and the different value chain steps. [Discuss, if relevant, cattle rustling, tribal and ethnic dynamics, closure of borders, etc.]
 - c. What are some of the main infrastructural constraints that affect farmers? Agricultural workers? Business owners? [Probe on road/transportation/telephone services/electric supply/storage, extension services, market information, and access to finance]
2. What is the impact of COVID-19 on the agricultural sector in South Sudan (on a macro and micro level)?
 - a. Particularly, how is the supply of finance to agriculture sectors being impacted by COVID-19?
 - b. How has the organization/agency you work with responded to COVID-19?

Governance of the agriculture sector

3. What role does the government (specifically the Ministry of Agriculture) play with regards to agriculture sector?
 - a. What are some key government policies/regulations affecting agricultural businesses? (registrations, certification requirements, subsidies, incentives, inspections)
 - b. Are there any government regulations that might create obstacles for farmers? Agricultural business owners?
4. What role do UN agencies / NGOs / donors play with regards to agriculture sector?
 - a. How do you think the local community receives these initiatives?
5. Are there any women-specific or youth-specific initiatives by the relevant ministries, or by UN agencies/NGOs?
 - a. Can you tell us more about them, and why they are relevant?
 - b. Do you think they have, thus far, been effective in drawing any change within a particular area/community?

Value chain (VC) selection

6. A recent World Bank report has mentioned the following VC: sorghum, maize, cassava, pulses and groundnuts, sesame and sunflower, bananas mangoes, lemons, pineapples, as well as other vegetable production as having high potential for development. Do you agree?

We wish to select VC for in-depth study, based on four criteria, 1) potential for employment, 2) potential to improve food security, 3) potential for import substitution, 4) potential for export.

7. Please provide a rate from 1 to 5, with 5 as having very high potential and 1 as having very low potential, for each of the following criteria and VC:

	Employment	Food security	Import substitution	Export
Sorghum				
Maize				
Cassava				
Pulses and groundnuts				
Sesame				
Sunflower				
Horticulture				
Animal Husbandry				
Other (specify)				

Interviews with Local NGOs and INGOs Project Managers and Field Coordinators

INTRODUCTION

The aim of this study is to review and map different value chains in South Sudan's agriculture, in attempt to identify and further understand each value chain's weaknesses and opportunities. We have had interviews with institutional and governmental stakeholders, and would now like to attain more local, contextual knowledge related to the specific area you operate in and benefit from your direct engagement with various value chain actors and farmers (in addition to other relevant stakeholders, specifically youth and women).

QUESTIONS

Introduction/warm-up

1. How would you describe the current status quo of agriculture in South Sudan?
 - a. What do you see as its main challenges?
 - b. Probe on political/security issues; economic; climate-related; funding-related
 - i. Specifically, we want to understand how conflict has affected farmers and the different value chain steps. [Discuss, if relevant, cattle rustling, tribal and ethnic dynamics, closure of borders, etc.]
 - c. What are some of the main infrastructural constraints that affect farmers? Agricultural workers? Business owners? [Probe on road/transportation/telephone services/electric supply/storage, extension services, market information, and access to finance]
2. What is the impact of COVID-19 on the agricultural sector in South Sudan (on a macro and micro level)?
 - a. Particularly, how is the supply of finance to agriculture sectors being impacted by COVID-19?

- b. How has the organization/agency you work with responded to COVID-19?

Governance of the agriculture sector

3. What role does the government (specifically the Ministry of Agriculture) play with regards to agriculture sector?
 - a. What are some key government policies/regulations affecting agricultural businesses? (registrations, certification requirements, subsidies, incentives, inspections)
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 - a. How do you think the local community receives these initiatives?
5. Are there any women-specific or youth-specific initiatives by the relevant ministries, or by UN agencies/NGOs?
 - a. Can you tell us more about them, and why they are relevant?
 - b. Do you think they have, thus far, been effective in drawing any change within a particular area/community?

Market-focused / employment-related

6. We are working under the assumption that market actors are highly informal. We want to understand a bit more the informal dynamics that govern employment opportunities / dynamics between different actors. Can you tell us more about this?
7. What are the entry/regulatory requirements for businesses/enterprises in South Sudan?
 - a. Generally, what are the forms of quality control and market standards?
8. Can you tell us a bit more, broadly, about the country's market opportunities?
 - a. Probe on the different target areas
 - b. Ask about size, volume of sales, and level of market integration
9. Who can access the market? Who can't? And why?
 - a. How do gender dynamics affect entry to market?
 - b. What about cultural, social, and economic dynamics?
 - c. What are the specific constraints youth face when accessing the markets?
10. What would you say are the main market channels and trends within the agriculture sector?

Zooming into agriculture: value chain analysis

11. As noted above, this is a value chain analysis, and we're looking to understand from your experience and knowledge what you think about the following:
 - a. Who are the primary actors in the agriculture sector?
 - b. What are the key agricultural commodities are in area [Juba, Torit, Borr, Yambio, and Rumbek].
12. A recent World Bank report has mentioned the following VC [sorghum, maize, cassava, pulses and groundnuts, sesame and sunflower, bananas mangoes, lemons, pineapples, as well as other] vegetable production as having high potential for development. Do you think these specific value chains may create a high impact on the of producers within your area?

We wish to select Value chain for in-depth study, based on four criteria, 1) potential for employment, 2) potential to improve food security, 3) potential for import substitution, 4) potential for export.

13. Please provide a rate from 1 to 5, 5 being very high potential and 1 very low potential, for each of the following criteria and VC – **FOR YOUR AREA**

	Employment	Food security	Import substitution	Export
Sorghum				
Maize				
Cassava				
Pulses and groundnuts				
Sesame				
Sunflower				
Horticulture				
Animal Husbandry				
Other (specify)				

14. Based on your answers, we would select the two following value chain for your region, do you agree that these two are the priority? (if yes continue interview, if no – what then would be the two-value chain of priority?)

15. For one of the selected value chains, or two (depending on your availability, knowledge and willingness, can we discuss the following:

- a. What are the specific constraints within this value chain, particularly those which hold back growth and competitiveness?
 - i. How do these constraints manifest within the chain? [List input supply – production – storage – distribution – marketing and sales]
- b. What are the opportunities within the value chain/s you have selected?
 - i. In what ways do you see this commodity as inclusive? Competitive? Sustainable?
- c. Is there any specific issue in the governance of the selected value chain locally (link to previous question on governance)?
- d. We discussed earlier the security and political tensions. Within the value chain, what power relations exist between the different actors? And is there risk for conflict?
- e. Do you know if there are farmers’ associations/cooperatives/trade unions that are specifically active and engage within the selected value chains?
- f. Generally, how is knowledge transferred between the different actors in the value chain? What about your organization – does it, in anyway, provide training/information to value chain actors?

Interviews with Value Chain Actors

INTRODUCTION

The aim of this study is to review and map different value chains in South Sudan’s agriculture, in attempt to identify and further understand each value chain’s weaknesses and opportunities. We have had interviews with institutional and governmental stakeholders, in addition to local stakeholders, and would now like to attain more specific knowledge about your role within the value chain. Please go into specifics about the node you are involved in, and we can discuss other nodes you have information/knowledge about.

[Answers will be based on value chain actors’ specific industry, which will be constricted to the selected ones]

QUESTIONS

SWOT analysis of relevant value chain node

[Keep these questions broad enough to allow in-depth responses]

1. What are the biggest incentives you have for investing in and or working in the value chain?
2. What are the largest risks you face in these investments?
3. What are the main strengths in your work?
4. What are the main weaknesses?
5. What about threats you particularly face in your business?

Inputs and production

6. What are the main needs in terms of input cost, quality, and availability?
7. What is the main source of inputs? [If relevant, ask which seed companies provide the main seeds? [Ask about fertilizers, pesticides, insecticides, etc.]
8. Where do farmers purchase their input from? Who are the main suppliers?
9. What are the challenges in obtaining inputs?
10. What is the production volume of [selected] crop?
 - a. What is the capacity for employment, based on your knowledge, experience, and estimation?

Storage

11. What are the formal and informal ways of storing crops/products?
12. Are there any specific disease-related problems? Are there any climate-related issues affecting storage?
 - a. How do value chain actors respond/deal with this?

Distribution and commercialization

13. What are the key distribution and transportation routes for agriculture value chain?
14. Where do farmers sell their products?
 - a. What about women agricultural workers/women farmers? What are the differences and challenges that women, specifically, face in terms of selling?
15. What is the dynamic between agricultural workers and traders, intermediaries, local farmers?
16. What are the prices of [selected] crop?

Technology and project development

17. What are some of the main needs in terms of product design and manufacturing that could assist those involved in the agriculture sector/different nodes of the value chain?
18. What is some equipment or machinery that could help improve agriculture workers' work?
 - a. Are there any efforts by international organizations or relevant ministries to provide them?
19. Have there been any key innovations in agriculture value chain? Can you tell us more about it? How can it be further expanded or mainstreamed to different areas/groups?

Training

20. What training do you think would be most beneficial for farmers/other value chain actors? [Specifically youth and women farmers and/or value chain actors]
- Why this training specifically?
 - Who should provide such training?
 - Which groups/organizations are providing such training? [Attempt to get specific contacts/details about said organizations/groups]

Finance

21. Where do farmers/business owners get their money from? [Micro credits, borrowing, NGOs, savings, etc.]

Cultural and social dynamics

22. What aspects of gender, cultural belief and norms, patterns of decision making and power affect agriculture sector?
- How do they manifest?
 - How do they affect issues related to mobility, access to land and resources, production, distribution and sales of crops?

Government/institutions

23. Do you trust the government's agencies? What about international ones? NGOs?
24. Have you worked with them before? Can you tell us about your experience, what worked and what didn't?
25. What training or support would you need? [Technical advice in the farm production process, market development, accessing domestic/export markets, installing cold storage facilities, access to finance]

Focus Group Discussions and Interviews with Farmers

INTRODUCTION

This interview/focus group is centered around understanding your process / what you do / how you navigate the agriculture sector. Through it, we want to better understand what the main constraints and opportunities are, and what your recommendations would be for different stakeholders, in order for the agriculture sector to be improved. We will begin slightly more generally and then become more specific.

QUESTIONS

Introduction

1. Tell us more about your job. How many years have you been working in it? Are family members involved in it?
- Which crops do you harvest? Do you work all year long?
 - Do you hire/work with any women? [Ask to men]
 - What challenges do you face as a woman in your job? [Ask to women]

Environment/context

2. What are the main contextual challenges you face in your work?
- Security issues, political, financial, gender, infrastructural [Probe and allow them to go into depth here]

- i. Can you give a direct example of how conflict has affected your work? [Probe for a case study kind of approach]
- b. How do you maneuver these issues? Do you ever try to address them, whether formally or informally?
- c. Is 'gender' something you consider in your work? How do you navigate the challenges surrounding it? [Tweak question based on gender of farmer and FGD dynamics]
- d. What cultural norms and belief systems might come in the way of your work, if any?

Input supply

- 3. Tell us more about your main needs when it comes to input cost, quality, and availability of you crops?
- 4. Who are your main suppliers for seeds, insecticides, pesticides, fertilizers? [If any]
 - a. What is your relationship with seed distributors?
 - b. Why do you choose a specific type of seed?
 - c. How often do you purchase seeds?
- 5. On the topic of insecticides and pesticides, are there any other measures you use to protect the crops from diseases, pests and weeds?
 - a. Who do you talk to / who have you previously talked to in order to understand how to protect your crops?
- 6. How do you finance input supply purchases? [Do you borrow money from family members / access microcredits / borrow from other community members etc.]
- 7. What are other challenges in terms of input supply? [For instance, lack of appropriate fertilizers, lack of planting materials or quality seeds in local markets]

Production

- 8. You told us about your job – but now we want to understand a bit more, in details, how you work. Tell us about a common working day.
- 9. Which plot of land do you work in? How do you access it? Any challenges related to access to land?
- 10. Which machinery/equipment do you use?
 - a. How do you finance such purchases?
- 11. What is the main challenge in production of maize/sorghum/groundnut/etc?
- 12. When did you plant this year? Where? When did you harvest?
 - a. Main challenges in planting this year? Harvesting?
- 13. Do you think there's sufficient labor to assist you, or do you work alone?
- 14. How did COVID-19 affect your production?
- 15. What has changed in the past [X] years of you producing [X] crop?

Storage

- 16. Where do you store [X] crop? (Sacks, granary, barrels etc.). Perhaps you do not store them. Why? Has your storage facility changed over the years?
 - a. Do you face a problem with lack of proper packaging material?
- 17. Are there any disease-related issues with regards to storage?
 - a. Do you use any type of treatment?
- 18. Are there any climatic conditions that affect storage?

- a. How do you address/mitigate them?

Distribution, market access and trends

- 19. What transportation mechanism do you use for distribution?
 - a. Are there any unnecessary taxes?
 - b. Do you have to pay bribes for distribution in your area? Have you ever had to resort to them?
- 20. What do you see as your main needs/opportunities in accessing markets?
- 21. Who do you sell your products to?
 - a. Have you been making profit?
 - b. What is your annual turnover, if you can share with us?
- 22. What is your relationship with buyers?
- 23. How do you promote your product? Do you market it?
 - a. Probe for informal marketing (newspapers, word of mouth, radio, etc.)
- 24. Who are your main competitors?
- 25. How has COVID-19 affected your sales?

Cooperatives and informal associations

- 26. We want to map out the main stakeholders/people you deal with in your work, including those informally. Do you collaborate with any:
 - a. Trade unions?
 - b. Cooperatives?
 - c. Informal farmer or rural producers' associations?
 - d. Family members?
 - e. Other farmers?
 - f. NGOs/community organizations?

Technology and product development

- 27. What products or manufacturing equipment do you think would help you?
 - a. What about access to any technical assistance or even extension services?
- 28. Have you done anything recently to improve your products?
- 29. Is there any specific training you need? Or you think would be helpful to your workers (if any?)
- 30. What are your major needs/ opportunities in product design and manufacturing (or service delivery)?
- 31. What other products do you produce/sell? What percentage does each product represent in terms of your gross revenue?
- 32. What have you done recently to improve your products or services?

Government and institutions

- 33. Do you trust the government's agencies? What about international ones? NGOs?
- 34. Have you worked with them before? Can you tell us about your experience, what worked and what didn't?

35. What training or support would you need? [Technical advice in the farm production process, market development, accessing domestic/export markets, installing cold storage facilities, access to finance]

DRAFT