

# Reducing Poverty Through Improved Agro-Logistics in a Fragile Country

*Findings from a Trader Survey in South Sudan*

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## Executive Summary

### *Introduction*

**1. South Sudan is a fragile country.** Approximately a year after it acquired independence from the Republic of Sudan in 2011, a disagreement between the two countries led to an oil shutdown and the closure of their shared border. This contributed to dramatic losses in government revenue in South Sudan, being the world's most oil dependent nation and one of the largest beneficiaries of international aid. Instability worsened in December 2013, when the ouster of the vice-president of South Sudan triggered military clashes across much of the country. Though relative peace emerged after a peace agreement was signed in August 2015, violence resumed in July 2016. An estimated 2.3 million individuals have since been forcibly displaced out of an approximate population of 10 million.

**2. South Sudan is one of the most food insecure countries in the world.** An estimated 4.9 million people in South Sudan are severely food insecure. In February 2017, famine was announced in South Sudan and its roots are largely due to longstanding economic and political factors as well as natural shocks like the current drought instead of driven by environmental considerations. In fact, most of the land in South Sudan is suitable for agricultural production but several cross-cutting dynamics inhibit the use of land for agricultural production and trade.

**3. Conflict and longstanding economic and social changes are disrupting agricultural production, markets, and community livelihoods, which are consequently increasing food insecurity and poverty rates in South Sudan.** Poverty in South Sudan rose from 52 percent in 2009 to more than an estimated 70 percent in 2016. Though recent conflict continues to disrupt agricultural production and risks increasing poverty further, the country was undergoing widespread social change before December 2013 that had already begun to diminish food security in many communities. This includes one of the fastest urbanization rates in history, which resulted in the migration of many individuals from predominately agrarian areas to urban centers. This is significant because in the past, it seems likely that households had been able to survive prolonged conflict-induced food shortages by adopting coping strategies, such as foraging. But, rapid urbanization has minimized land access and disrupted social networks and in turn contributed to an increased risk of food insecurity in a time of conflict for many South Sudanese. Given these pre-conflict demographic shifts, markets appear to have already begun playing a more significant role in reducing food insecurity.

**4. Though the current macro-economic crisis threatens to worsen food security even further, it also presents an opportunity to tap into South Sudan's vast agricultural potential.** Although South Sudan suffers from a national cereal deficit, there are some counties that have recently generated cereal surpluses. These surplus areas are located within a few counties in what were previously known as Eastern Equatoria and Western Equatoria states, where an estimated 10 to 14 out of approximately 80 counties generated a surplus over the past three years. Despite South Sudan's enormous agricultural potential, the country has long depended on imported agricultural goods to meet its food needs, which overwhelmingly arrive via road from Kenya and Uganda. With the recent oil price crises, the South Sudanese currency was strongly devalued from 3 SSP for 1 USD before December 2015 to more than 120 SSP for 1 USD in March 2017. Accordingly, prices for imports substantially increased and it is now more difficult to meet

livelihood needs, especially through imported foods. This macro-economic crisis consequently presents an opportunity to leverage South Sudan's agricultural potential because the devalued currency makes local production more competitive.

**5. Conflict sensitive efforts to improve agro-logistics in South Sudan are key to increasing the availability of agricultural commodities in markets, which could contribute to better food security.** Agro-logistics is defined as the mechanisms and systems used to connect various parts of a national or regional food supply network. Agro-logistics is part of a large and theoretically diffuse literature that seeks to understand how agricultural markets function in a variety of situations, including conflict. This study therefore defines agro-logistics in South Sudan as the labor, roads and riverine transport networks, production systems, and facilities for distributing and storing foodstuffs. It also includes broader features of the country such as formal and informal rules that govern agricultural production, markets, credit access, and transport networks. This study also recognizes that despite the 2013 conflict, markets in South Sudan are not starting from scratch. Instead, they have a long legacy of functioning during conflict, that notably includes approximately 50-years of civil war that led to the country's 2011 independence.

**6. The evidence base on approaches to conflict sensitivity in weak and fragile state situations like South Sudan highlights how agricultural commodity markets are complex sites of authority and control.** This literature also suggests that agricultural commodity markets are regulated by a variety of formal and informal institutions that structure interactions within groups of traders. This includes formal legislation and less visible factors such as social regulation, that might be more likely to function along lines such as class, ethnic identity and gender. This literature also notes how markets can often be 'sites of violence in their own right' that can continue to embed and perpetuate inequality. With this broad understanding in mind, this study raises vital considerations about the logics of power in South Sudan's agro-logistics system.

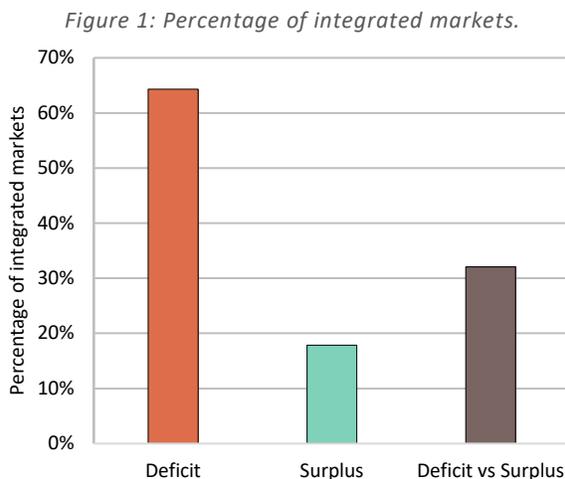
**7. This study is unique as it recommends conflict sensitive interventions that can improve selected market linkages between food surplus and food deficit areas.** In contrast to more traditional market integration analyses, this study aims to identify specific interventions on a case-by-case basis for food surplus and deficit areas that interact with existing community livelihood strategies and the formal and informal logics governing markets in the country. Additionally, this study proposes short-term interventions that can take place within 6 to 24 months. These initiatives are proposed according to an analysis of qualitative and quantitative market linkage data and a study of market prices.

**8. The World Bank's South Sudan High Frequency Market Price Survey, a Market Linkages Survey (MLS), and existing literature provide quantitative and qualitative data to inform interventions.** Various data sources have been used to assess the current situation of food markets in South Sudan. The Market Price Survey provides weekly price data from 2012 onwards for several markets and food products in South Sudan. Price data is used to assess whether and how markets are integrated in South Sudan. Following the price analysis, qualitative data on various factors that may have contributed to the integration or isolation of markets is presented. This data was collected by the MLS and administered to over 500 traders across 14 towns. The findings from these data is analyzed in tandem with literature from various sources to identify suitable market linking interventions.

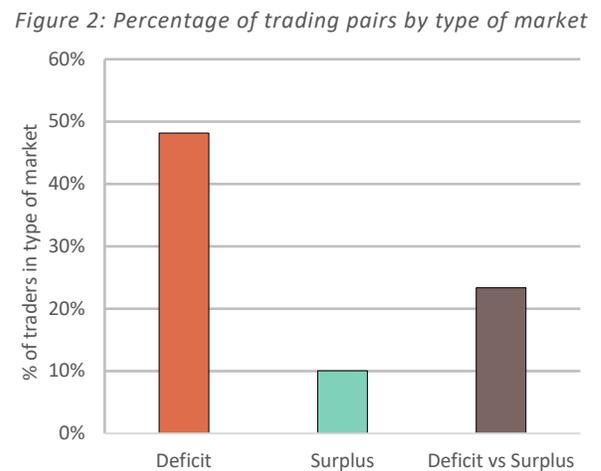
## South Sudan's food markets are not well integrated.

**9. Surplus and deficit markets in South Sudan are poorly integrated.** Weekly market prices from 2012 for 7 surplus markets, 7 deficit markets, and for 8 food products are used to measure the degree of integration between different markets. Markets are considered integrated when price differences between them have been stable over time. The analysis reveals that deficit markets show a reasonable amount of integration between them whereas surplus markets show very low integration (Figure 1). Surplus and deficit markets are also poorly integrated with each other. Very similar results emerge from the MLS where traders report little integration between deficit and surplus markets (Figure 2).

**10. Most markets that have a major road between them are integrated.** In general, major roads such as an interstate and/or primary and secondary roads help to integrate markets. About half of the markets that have a major road connecting them are also price-integrated (Table 1). Additionally, 8 out of the 11 pairs that are connected by a major road are also trading partners according to the MLS. However, this finding is stronger for deficit markets. Deficit markets that are connected by a major road show strong integration and 4 out of 5 of them are also trading partners according to the MLS. It is important to note that there are no major roads between surplus markets which likely contributes to the low integration and trade between them.



Source: Authors' Calculation.



Source: Authors' Calculation.

Table 1: Markets directly connected by road.

Markets directly connected	Type of road	# of integrated markets (out of 8)	Trading partners in MLS (Yes/No)
Deficit to deficit trade			
Torit - Juba	Interstate	7	Yes
Wau - Juba	Interstate	7	No
Juba - Bor Town	Interstate	5	Yes
Wau - Aweil	Interstate	3	Yes
Rumbek - Wau	Interstate	7	Yes
Deficit to surplus trade			
Yambio - Juba	Interstate	4	Yes
Tonj South - Wau	Interstate	2	Yes
Rumbek - Tonj South	Interstate	3	No
Wau - Yambio	Interstate	2	No
Wau - Raga	Interstate	1	Yes
Yei - Juba	Interstate	1	No

Source: Authors' Calculation.

*Markets are not well integrated because of trade barriers that include: trade route barriers such as conflict and poor road access, storage constraints, limited access to financial services, and lack of information sharing.*

**11. The MLS explores the degree of market linkages by identifying key missing links between surplus and deficit markets, and the main bottlenecks preventing market access.** Market prices are used to provide evidence for market integration. The MLS complements this quantitative assessment by exploring the barriers that may have contributed to weak integration. Four main trade barriers are hypothesized to explain the absence of strong linkages between surplus and deficit areas. These are: trade route and vehicle related barriers, storage means and access, financial access and payment mechanisms, and information constraints. The MLS survey also includes voluntary video testimonials in which traders expressed additional concerns or elaborated on the trade barriers discussed in the survey.

*Reducing transport related barriers can increase trade and lead to integration.*

**12. Transport related indicators partially explain low integration and differences in trade flows.** Many of the trade route indicators from the MLS are analyzed for each market pair that is trading according to the MLS. These include: checkpoints encountered, fuel shortages, vehicle damage, and most common trade route barrier. The indicators are aggregated by groups of deficit-deficit, surplus-deficit, and surplus-

surplus trade. Deficit-deficit pairs have relatively better transportation indicators compared to the other groups (Table 2). This coheres with the finding from the market price analysis, as 62 percent of the deficit-deficit trading pairs from the MLS were found to be price-integrated, which is much higher than surplus-deficit pairs and surplus-surplus pairs. Additionally, trading pairs that are price-integrated and are connected by an interstate, primary or secondary road have even better transportation indicators compared to pairs that are not (Table 3). Thus, it is likely that multiple checkpoints, fuel shortage problems and vehicle damage are factors contributing to the low integration between markets.

*Box 1: Testimonial findings – 1*

***Checkpoints and illicit taxes***

**Traders who transport goods from Uganda to Juba via Nimule state that checkpoints and fees are huge barriers.** They report that these interruptions are extremely costly and time-consuming. They encounter numerous checkpoints on the way, where officials go through all the traders' goods and the vehicle after which they usually demand a high fee. This continues once they enter Juba, as there are multiple interruptions from state officials that result in additional payments when off-loading goods. Some traders reported that this fee could be up to 50 million SSD, and they have no option but to oblige without negotiating the payment due to the power differential between them and the authorities. These substantial fees are then factored into costs and are passed on to consumers as higher prices.

***Recommendation:*** The Government of South Sudan, parties to the conflict, donors, NGOs, and traders' associations should coordinate to reduce the combined financial burdens and insecurity risks traders bear along checkpoints.

Efforts to streamline checkpoints should target the high-density check point areas illustrated in this survey. These include: routes to Aweil, Aweil North, Kuajok, Magwi, Wau, Torit and Juba. Specific routes are recorded in Table 19 in the Appendix. While this is a longstanding multifaceted challenge, there is scope to support on-going initiatives to streamline revenue raising and revenue-sharing and limit illicit taxation in the country. One example of which is the Intergovernmental Fiscal Relations Working Group (IFRWG). Additional research is also needed to understand how illicit taxes and fees are contributing to the politics and power dynamics that shape the on-going conflict and contribute to the physical and economic predation gravely impacting traders in the country. This is especially key as it is likely to include traditional authorities and local parties to the conflict. The Conflict Sensitivity Resource Facility (CSRF), which is joint-donor initiative supported by the governments of the UK, Switzerland and Canada, also has the remit to expand innovative research in area such as this.

***Recommendation:*** Though costly and difficult to implement in the current political climate, donors and the Government of South Sudan should repair damaged roads or construct new ones to improve links between deficit and surplus markets.

Respondents widely reported that poor roads limit their ability to trade. Moreover, there is a lack of interstate and primary roads connecting surplus markets, so these areas could be prioritized. This is even though roads in South Sudan and other weak and fragile states can be sites of violence controlled by different parties to the conflict. Likewise, building new roads in other countries can fail to address the underlying drivers of how and why markets fail to help people meet their food needs. Donors and

the Government of South Sudan should therefore examine efforts to independently and/or jointly finance road repairs or new roads, such as through the establishment of a road maintenance fund. This fund could be innovatively derived from oil revenue monies that are matched with donor funds as this could potentially increase national ownership and participation in road construction and maintenance. Given the complexity of road construction and maintenance in South Sudan and other weak and fragile states, donors and NGOs should also continue to support new research that examines conflict sensitive approaches to road construction and maintenance and market development.

Table 2: Trade route summary statistics by trade flow.

Summary Statistics	Integrated	Major road	Checkpoints	Fuel shortage	Vehicle damage	Route barrier
Deficit - Deficit	60%	30%	0%	51%	47%	Lack of safety from conflict
Surplus - Deficit	33%	38%	52%	45%	65%	Lack of safety from conflict
Surplus - Surplus	14%	0%	29%	52%	42%	Poor road condition

Source: Authors' calculation.

Table 3: Trade route summary statistics by integration and presence of road.

Price-Integrated	Major Road	Checkpoints per hour	Fuel shortage	Vehicle damage	Route barrier
Yes	Yes	33%	31%	34%	Lack of safety from conflict
Yes	No	13%	27%	50%	Poor road condition
No	Yes	40%	42%	52%	Lack of safety from conflict
No	No	42%	64%	66%	High taxes

Source: Authors' Calculation.

### Strengthening local supply and demand of cereals can decrease supply-side barriers.

#### 13. Lack of locally produced cereals is the biggest reason why traders do not source their cereals locally.

One in two traders report inadequate local cereal production as the main reason for not sourcing locally (Figure 3). This result is particularly pronounced for sorghum traders, as about 60 percent of them indicate that insufficient production is the reason they do not buy sorghum locally (Figure 4). Interestingly, a larger proportion of traders in surplus areas (65 percent) than in deficit areas (41 percent) report insufficient supply. Local production this year was insufficient, which is likely due to rising insecurity, particularly in surplus areas during the last planting season (e.g. Raga, Yambio and Yei). This likely contributed to deficits in traditional surplus areas too. Besides insecurity, this finding also suggests that there are supply-side barriers such as on-farm inefficiencies or political dynamics that limit local producers' access. Thus, it is likely that surplus production is limited, seasonal and sensitive to shifting conflict dynamics.

***Recommendation:*** Donors and NGOs should continue to test and expand innovative approaches to food aid that support agricultural producers, traders in surplus markets, such as purchasing food aid from local suppliers.

This study finds that lack of supply was the biggest reason why traders do not source their goods locally. This was especially the case for surplus area traders, indicating that these markets at the time of the survey could have been in deficit. Given that a famine was also declared during the same time, this points to an urgent need to boost agricultural production. Demand side market interventions offer a complementary pathway for generating local production. There are already existing examples of efforts to link the demand for food purchases in social programs to the supply of locally produced cereals in South Sudan, which donors could expand. For example, the World Food Programme's (WFP) Purchase for Progress (P4P) program in South Sudan provides incentives for local production by purchasing staples from local farmers. WFP also promotes the development of cereal markets by including small-scale traders as suppliers and requiring larger suppliers to source from local producers. South Sudan's current famine increases the importance of identifying conflict-resilient crops in the country and supporting programs such as P4P to stock emergency food.

***Recommendation:*** Donors and NGOs could increase the availability of cash or cash vouchers to improve the ability of food insecure communities to independently purchase agricultural commodities from markets, thereby stimulating local demand.

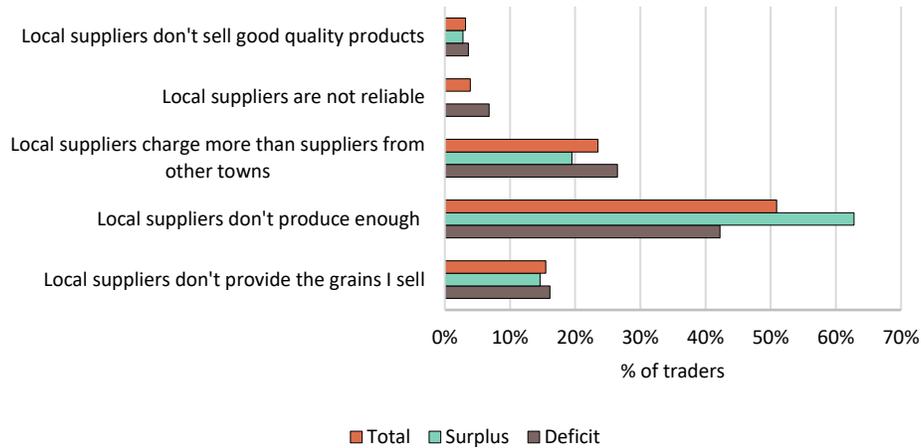
Markets are likely playing an increasingly vital role in food security in South Sudan as parts of the country urbanize and livelihoods shifts away from subsistence farming. Evidence from other countries shows that cash or cash vouchers can be vital for communities to cover their own food needs and plan for the lean and rainy seasons. Additionally, cash transfers can help stimulate local markets. Cash transfers have also been successfully delivered to beneficiaries in Afghanistan, the Democratic Republic of Congo (DRC) and Somalia, which are countries that also have high levels of insecurity and instability. Despite this, less than 8 percent of total funding in South Sudan's Food Security and Livelihoods Cluster goes through cash and voucher programming and most of this is devoted to internal displacement and refugee camps. DanChurchAid, an NGO, is already piloting cash transfers in South Sudan and there is potential for other organisations to expand or support pre-existing initiatives. There is also ambit to provide cash vouchers in South Sudan via mobile payments.

***Recommendation:*** More research is needed to understand how conflict is restricting agricultural production in South Sudan.

This study finds many traders in surplus areas reporting lack of local supply, which are the same areas that also happen to be experiencing more conflict compared to deficit areas. Though there are several technical deficiencies that likely limit agricultural production in the country, the evidence base in other weak and fragile states suggests that many production barriers are likely to be political instead of technical. Therefore, conflict resilience must be promoted by learning from and adapting coping strategies used in similar contexts. So, while this study has shed useful perspectives on trade barriers for agricultural commodities, more research is needed to understand the politics and power relations that hinder production. Anecdotally, at least, there does appear to be a strong demand for locally produced agricultural commodities. Despite ongoing initiatives that have supported this, particularly from USAID, further research to understand how conflict uniquely impacts agricultural value chains is still needed. NGOs such as Mercy Corps have experience working on this type of research in South

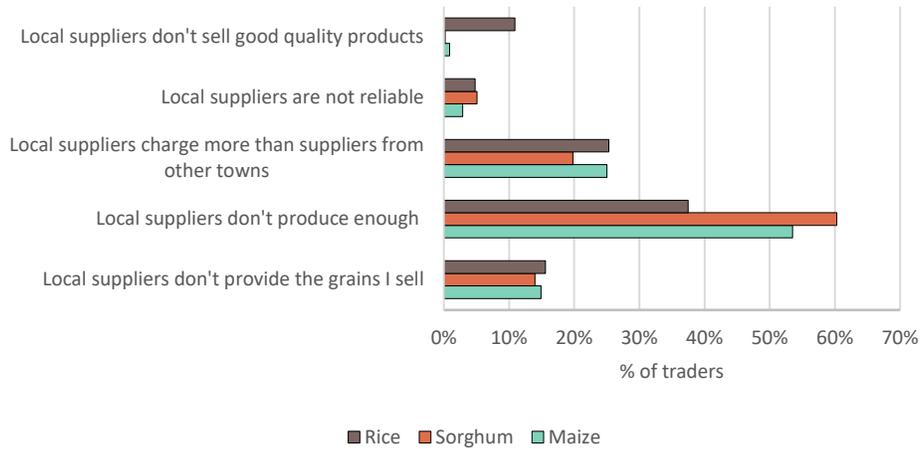
Sudan and donors should continue to support their efforts. The Conflict Sensitivity Resource Facility (CSRF) also has the remit to expand innovative research in this area.

Figure 3: Reason for not buying cereals locally by type of market.



Source: Authors' Calculation.

Figure 4: Reason for not buying cereals locally by type of cereal.



Source: Authors' Calculation.

### Existing storage arrangements can be improved and expanded

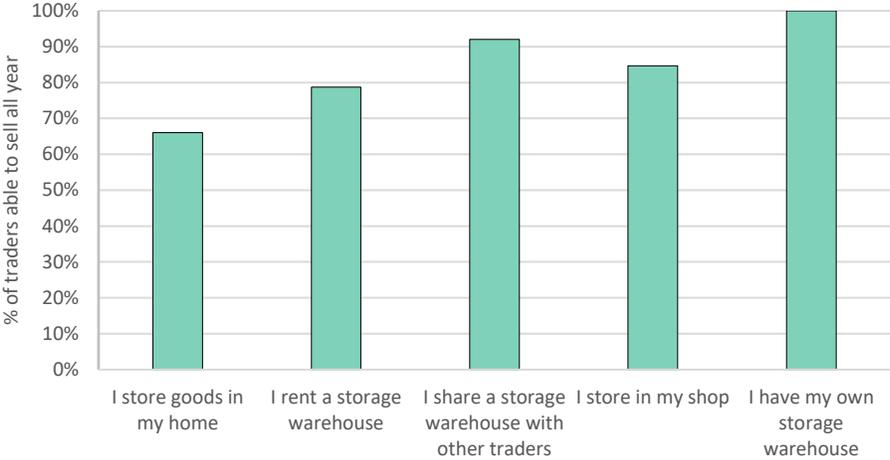
**14. Shared storage spaces allow traders to sell grains throughout the year.** Over 60 percent of all traders who sell throughout the year are using some form of storage. More specifically, 80 percent of the traders who rent warehouses can sell throughout the year. This is compared to 92 percent of those who share storage space and 85 percent of those who store cereals in their shops (Figure 5). This suggests that shops and shared spaces can be good alternatives to expensive storage warehouses, especially for small-

scale traders as a higher proportion of them use shared storage (Figure 6). Additionally, use of storage varies across towns (Figure 7). While on average 30 percent of the traders across South Sudan are not storing their cereals, more than 60 percent of traders from Rumbek, Wau and Tonj South are not using storage. This disparity presents an opportunity to promote storage in these areas.

**Recommendation:** Donors and NGOs could increase support to affordable and shared storage facilities to small-scale traders.

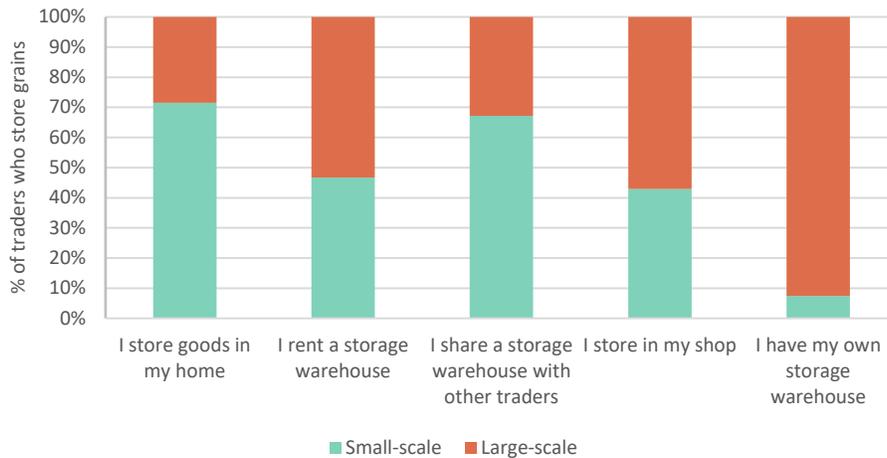
Estimates of post-harvest food losses in sub-Saharan Africa have been 20 million tonnes of grain or 40 per cent of the harvest valued at \$4 billion, lost annually through inadequate post-harvest management on the farms, poor storage, lack of structured markets and limited processing capacity. While the MLS was unable to assess such losses incurred by traders, most traders that sold throughout the year were using some form of storage. Additionally, traders reported issues of insecurity and costs with their current storage methods, which suggests the need for affordable and secure storage facilities. A cost-effective and innovative way for small-scale traders to store their grains is through community level low-capacity metal silos. Their use has led to a reduction in losses of up to 40% compared with current crop management practices in sub-Saharan Africa. A complimentary approach is to partner with farmer or trader collectives to install larger-capacity storage facilities, which would allow more harvested crops to be stored by an independent party. These larger facilities could be added to existing systems, or they could replace older systems that are in poor condition.

Figure 5: How cereals are stored by if traders sell throughout the year.



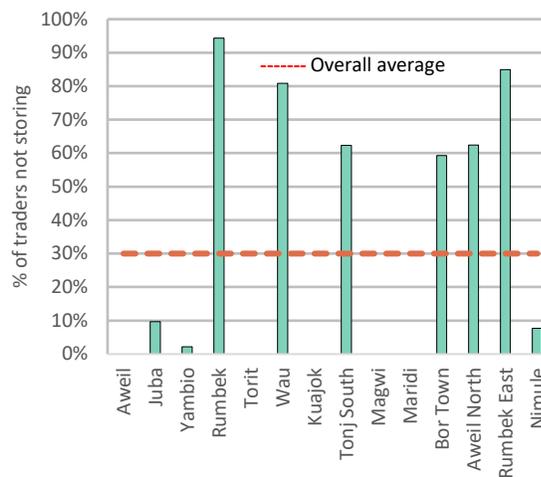
Source: Authors' Calculation.

Figure 6: How cereals are stored by type of trader.



Source: Authors' Calculation.

Figure 7: Traders without storage by town.



Source: Authors' Calculation.

## Expand lending mechanisms as financial barriers often result in the temporary suspension of trading activities

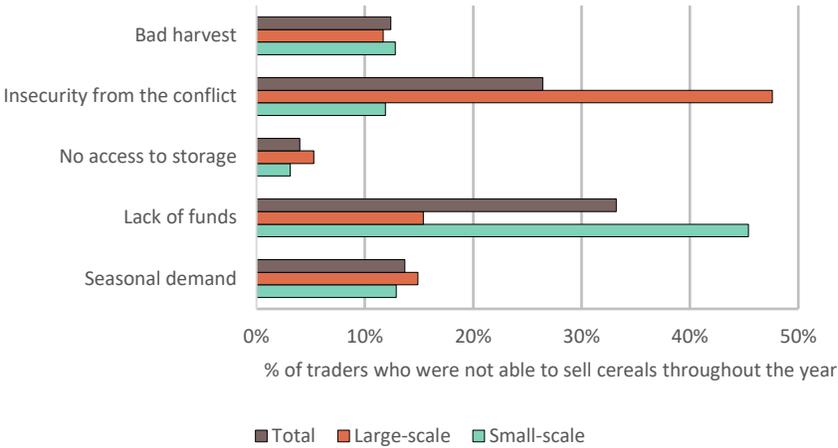
15. Most traders are unable to sell cereals throughout the year due to funding constraints, and do not use financing mechanisms like microfinance institutions to remedy it. Inadequate funds and insecurity were the two most common responses for not being able to sell throughout the year. Insecurity and poor finances impact large-scale and small-scale traders differently, though. For example, about 50 percent of large-scale traders state insecurity is the main reason for discontinuing their business temporarily, compared to 10 percent of small-scale traders (Figure 8). Meanwhile, about 45 percent of small-scale traders reported a lack of funds, which contrasts with 15 percent of large-scale traders. Small-scale

traders are much more likely to have insufficient funds to run their businesses than are large-scale traders. Two thirds of the traders stated that they took loans from another trader in the past 3 years, and about 1 in 4 stated they got it from a friend or relative (Figure 9). All those sources are informal and depend on the social and professional network of the trader while being subject to common shocks.

**Recommendation:** Donors, NGOs and the private sector should expand their efforts to improve traders’ loan, credit and foreign exchange access.

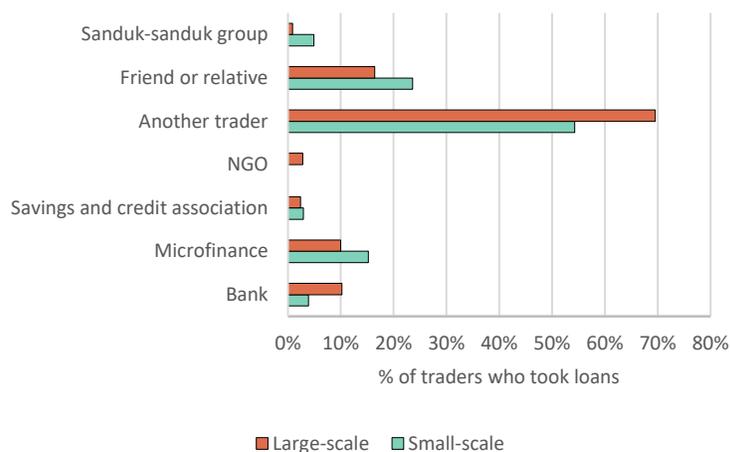
This could be achieved via a challenge fund, targeted micro-credit and/or cash grants from donors and NGOs. Though traders largely obtain loans through informal networks, efforts to improve their access to loans, credit and foreign exchange are still needed. For example, improved loan access could help small-scale traders afford better or more diverse transport options. It might also help traders purchase better storage so that they can store and therefore sell their goods year-round. One potential way this could be achieved is through the introduction of a challenge fund with the remit to meet traders’ demands for credit by matching private capital investment with donor funds. The MLS shows that microfinance institutions (MFIs), NGOs and commercial banks are also not important sources of working capital for both small and large scale traders. Instead, most traders predominantly use trader and family networks to access business finance. These monetary flows among traders suggest that traders are better able to manage information asymmetries, transaction costs and risks that influence how credit markets function themselves. Addressing the problems of market imperfections and institutional barriers that prevent access to credit from formal sources will require long-term policy, financial, and institutional interventions. So, in addition to a potential challenge fund, short-term demand for capital could be met by directly providing grants to local small-scale traders through support to micro-credit facilities that award funding to applicants through a competition. Commercial sector banks could also provide foreign exchange services that are tailored to the unique needs of small-scale traders.

Figure 8: Reason for not selling throughout the year by type of trader.



Source: Authors’ Calculation.

Figure 9: Source of loan taken by type of trader.



Source: Authors' Calculation.

### *Increasing membership in traders' associations could contribute to better informed trading decisions through more information exchange.*

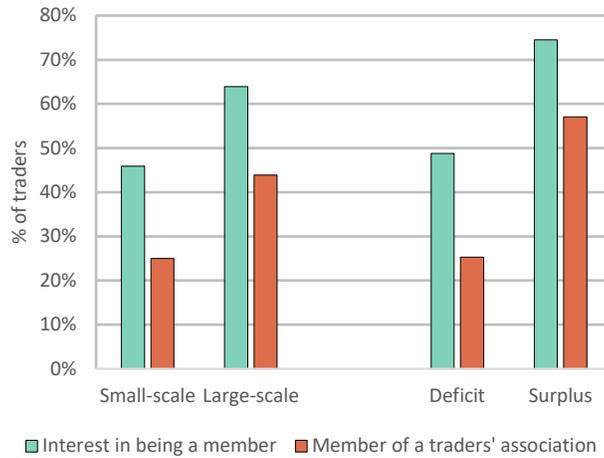
**16. Traders can acquire benefits such as price information in other markets by joining traders' associations.** One third of traders are members of traders' associations. Half of all large-scale traders are members of traders' associations, while a quarter of all small-scale traders are members (Figure 10). Also, 67 percent of traders in surplus markets are part of traders' associations compared to 27 percent of traders in deficit markets. More large-scale traders than small-scale traders and more surplus market traders than deficit traders are interested in joining traders' associations. It is likely that traders who see similar traders in traders' association realize there are benefits to gain. Additionally, of the traders that are members, 53 percent report that price information is the best information they receive from the traders' association (Figure 11). Traders' associations could therefore contribute to market integration by providing its members with price, security and other types of market information to make more informed trading decisions.

***Recommendation:* Donors and NGOs should support South Sudanese traders' associations.**

This study's research findings demonstrate traders' associations are crucial for exchanging valuable information on trade-related concerns including price information and safety of different routes in the country. Traders have also expressed a readiness to increase their participation in traders' associations. Donors and NGO have successfully supported coalitions that assist similar initiatives in other weak and fragile state situations and these should be expanded in South Sudan. Support for traders' associations and organizations such as the Eastern Africa Grain Council and the South Sudan Grain Council, in collecting and sharing price information could potentially increase the range of products and number of locations covered in their price-information system. This study also anecdotally found that traders already have a vibrant web of connections fostered through trader-to-trader loans, transportation sharing, storage sharing, and information sharing. These networks are likely to be largely positive and necessary

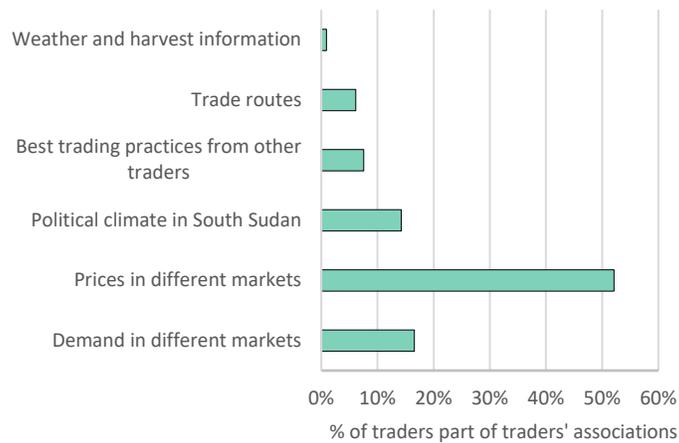
for improving agro-logistics in the country. That said, any assistance to traders' associations should remain sensitive to the potential for trader networks to unintentionally contribute to or replicate unequal power and political dynamics in the country along intersectional considerations such as gender, ethnicity or social class.

Figure 10: Membership and interest in traders' associations.



Source: Authors' Calculation.

Figure 11: Best information received from traders' associations.



Source: Authors' Calculation.

## Introduction

**1. South Sudan is a fragile country.** Approximately a year after it acquired independence from the Republic of Sudan in 2011, a disagreement between the two countries led to an oil shutdown and the closure of their shared border. This contributed to dramatic losses in government revenue in South Sudan, which is the world's most oil dependent nation and one of the largest beneficiaries of international aid. Instability worsened in December 2013 when the ouster of the vice-president of South Sudan triggered military clashes across much of the country. Though relative peace emerged after a peace agreement was signed in August 2015, violence resumed in July 2016. An estimated 2.3 million individuals have since been forcibly displaced out of an approximate population of 10 million. Significantly, fragility in South Sudan is not simply an unintended outcome of the country's recent independence. Instead, some of the governance patterns that contribute to fragility and food insecurity are shaped by historically embedded processes that predate the current conflict.

**2. South Sudan has some of the world's worst poverty and food insecurity indicators.** An estimated 4.9 million people in South Sudan are severely food insecure.<sup>1</sup> In February 2017, famine was announced in South Sudan and its roots are largely political instead of environmental. In fact, most of the land in South Sudan is suitable for agricultural production but several cross-cutting factors inhibit the use of land for agricultural production and trade. These include, but are not limited to: on-going conflicts over land ownership and grazing rights and limited access to farming equipment.

**3. Conflict and longstanding economic and social changes are disrupting livelihoods and increasing food insecurity and poverty rates in South Sudan.** Following the onset of the 2013 conflict, cereal production in states that were previously known as Western Equatoria State and Eastern Equatoria State declined by over 20 percent. These had been the country's most agriculturally productive states.<sup>2</sup> Though recent conflict continues to disrupt agricultural production and increase poverty in South Sudan, the country was undergoing widespread social change before December 2013 that had already begun to diminish food security in many communities. This includes one of the fastest urbanization rates in recorded history, which had shifted many individuals from predominately agrarian areas to urban centers where different livelihood opportunities are available.<sup>3</sup> This is significant as households had likely previously survived prolonged conflict-induced food shortages in the region by adopting other coping strategies such as foraging. But, for many South Sudanese, rapid urbanization has minimized land access and disrupted social networks and in turn contributed to an increased risk of food insecurity in a time of violent conflict. Given these demographic shifts, markets appear to have already begun playing a more significant role to reduce food insecurity prior to the 2013 conflict.<sup>4</sup>

**4. Despite conflict, there have been isolated surplus areas that have the potential to increase production and trade and reduce food insecurity.** Even as South Sudan suffers from a national cereal deficit, there were some counties that recently generated cereal surpluses. These surplus areas are located within a

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<sup>1</sup> IPC, 2017

<sup>2</sup> FAO, 2016

<sup>3</sup> Grant and Thompson, 2013

<sup>4</sup> Maxwell, D. *et al*, 2012

few counties in what were previously known as Eastern Equatoria and Western Equatoria states, where an estimated 10 to 14 out of approximately 80 counties generated a surplus over the past three years. For example, Central Equatoria's 2015 estimated surplus cereal production was 13,901 metric tons and Western Equatoria generated a 23,258-metric ton surplus. These surpluses are respectively 7 percent and 21 percent above these former states' cereal requirements at the time of the surplus.<sup>5</sup> Poor market access for producers and weak storage infrastructure have potentially reduced agricultural productivity in these surplus areas. In addition to possibly wasting much needed agricultural produce in a time of widespread poverty and food insecurity, lost food surpluses may act as a long-term disincentive to produce future agricultural surpluses. This consequently increases the importance of conflict-sensitive interventions designed to increase agricultural trade.

**5. Markets likely play a robust role in communities' livelihood strategies during the on-going conflict.**

While food aid to the country is increasing following the famine announcement, it is unlikely to form the backbone of communities' diets. For example, even when the region received what were likely peak sustained levels of food aid during the Operation Lifeline Sudan era, which spanned from the late 1980s until the mid-1990s, less than 5 percent of food aid contributed to household food.<sup>6</sup> Likewise, even prior to the 2013 conflict, markets had already begun to play a much more significant role in reducing food insecurity due to urbanization and other demographic changes.<sup>7</sup> In addition to addressing food needs, markets are also vital sites of labor and employment. Thus, rather than potentially overstate the significance of food aid, this study recognizes that South Sudanese are incredibly resilient and markets play an important role in communities' livelihood and employment strategies.

**6. Though markets are important for reducing food insecurity, there are numerous trade barriers.** These include: weak transport infrastructure, poor credit access and insecurity. As South Sudan is currently experiencing a hyperinflation crisis, traders have previously reported that access to currency and credit limit their ability to operate in the country. Road density in South Sudan is also among the lowest in Africa, with only 15 km per 1,000 sq-km of arable land. This is contrasted with 88 km for a comparably sized plot of arable land in Africa and 101 km for the East African region. Less than 2 percent of its 7,171 km of primary road network is paved, compared to 71.6 percent in low-income African countries. Consequently, transport delays are common.<sup>8</sup> South Sudan is dependent on imported agricultural goods, which mostly arrive via road from Kenya and Uganda. Despite this reliance, the main paved road from these countries deteriorates during the rainy seasons. Some trucking companies respond to this by reducing their loads, which increases transportation costs and drives up the price of agricultural commodities in South Sudan.

**7. While the current macro-economic crisis threatens to worsen food security even further, it also presents an opportunity to tap into South Sudan's vast agricultural potential.** Despite South Sudan's enormous agricultural potential, the country has long depended on imported agricultural goods to meet its food needs, which overwhelmingly arrive via road from Kenya and Uganda. With the recent oil price crises, the South Sudanese currency was strongly devalued from 3 SSP for 1 USD before December 2015 to more

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<sup>5</sup> WFP/FAO, 2015

<sup>6</sup> Bailey and Harrigin, 2009.

<sup>7</sup> Maxwell, D. *et al*, 2012

<sup>8</sup> ACTED, 2012

than 120 SSP for 1 USD in March 2017. Accordingly, prices for imports substantially increased and it is now more difficult to meet livelihood needs, especially through imported foods. This macro-economic crisis consequently presents an opportunity to leverage South Sudan's agricultural potential because the devalued currency makes local production far more competitive.

**8. Conflict sensitive efforts to improve agro-logistics in South Sudan are key to increasing the availability of agricultural commodities in markets, which could contribute to better food security.** Agro-logistics is defined as the mechanisms and systems used to connect various parts of a national or regional food supply network. Agro-logistics is part of a large and theoretically diffuse literature that seeks to understand how agricultural markets function in a variety of situations, including conflict.<sup>9</sup> This study therefore defines agro-logistics in South Sudan as the labor, roads and riverine transport networks, production systems, and facilities for distributing and storing foodstuffs. It also includes broader features of the country such as the formal and informal rules that govern agricultural production, markets, access to credit, and transport networks. This study also recognizes that despite the 2013 conflict, markets in South Sudan are not starting from scratch. Instead, they have a long legacy of operating during conflict, which notably includes the civil year wars that led to the country's 2011 independence.

**9. The evidence base on approaches to conflict sensitivity in weak and fragile state situations like South Sudan highlights how agricultural commodity markets are complex sites of authority and control.** This literature also notes how markets can often be 'sites of violence in their own right' that can embed and perpetuate inequality.<sup>10</sup> It also suggests that agricultural commodity markets are regulated by a variety of formal and informal institutions that can structure interactions within groups of traders. These institutions also likely shape interactions between traders and agricultural producers and between traders and buyers. This includes formal legislation and includes less visible factors such as social regulation, that might be more likely to function along lines such as class, ethnic identity and gender.

**10. Given this understanding, this study raises vital considerations about the logics of power in South Sudan's markets.** For instance, many South Sudanese markets are highly segmented and upgrading the country's road network from feeder roads to primary roads could theoretically lead to a 57 percent increase in average household consumption. Increasing road density to reduce the isolation of productive areas and working to integrate regional and global markets could also yield substantial improvements. This is because better transport methods should lower transport costs making the prices associated with domestic production more competitive. The on-going macro-economic crisis amplifies the potential benefits that could be gained from increased market integration. That said, though road construction might appear to be a straightforward reform, the conflict-sensitive agricultural markets literature also identifies how building new roads is not a panacea. For instance, new roads often fail to address the underlying political factors that led to markets that did not assist poor and vulnerable communities as well as they could have in the first place. This is because new roads can quickly become dominated by trader networks that capitalize on the new trading opportunities that roads can provide, which are more likely to benefit traders rather than the poorer communities who frequently purchase their goods.<sup>11</sup> This consequently raises considerations about the identity of traders, which is often intersectional, meaning

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<sup>9</sup> Jan and Harriss-White, 2012.

<sup>10</sup> Mallett and Pain, 2017.

<sup>11</sup> *Ibid.*

that their identities are likely to be simultaneously shaped by dynamics that factor into the country's ongoing conflict such as ethnic and political affiliations and gender. These considerations matter because in other countries they can inform traders' access to money lenders and shape the different types of contracts made between traders and agricultural producers.<sup>12</sup>

**11. This study is unique as it recommends conflict sensitive interventions that can improve selected market linkages between food surplus and food deficit areas.** South Sudan's political situation continues to change. For example, the number of states in the country has increased from the 10 it started with at independence to 32, which potentially increases the complexity of producing and trading agricultural goods in the country in contrast to more traditional market integration analyses, this study aims to identify specific interventions for food surplus and deficit areas that interact with existing community livelihood strategies and the formal and informal logics governing markets in the country. Additionally, this study proposes short-term interventions. These initiatives are proposed according to an analysis of qualitative market linkage data and a study of market prices. A timeframe of 6 to 24 months for the initial introduction of intervention was used to frame recommendations.

**12. The World Bank's South Sudan High Frequency Market Price Survey, a Market Linkages Survey (MLS), and existing literature provide quantitative and qualitative data to inform interventions.** Various data sources have been used to assess the current situation of food markets in South Sudan. The Market Price Survey provides weekly price data from 2012 onwards for several markets and food products in South Sudan. Price data is used to assess whether and how markets are integrated in South Sudan. Following the price analysis, qualitative data on various factors that may have contributed to the integration or isolation of markets is presented. This data was collected by the MLS and administered to over 500 traders across 14 towns. The findings from these data is analyzed in tandem with literature from various sources to identify suitable market linking interventions.

**13. The recommendations in this document are based on a review of the available literature and food price and market linkage data.** Part 1 provides a background on South Sudan's agriculture, trade and trade barriers. Part 2 uses weekly market prices to determine market integration preceded by reviewing food prices and the differentials in food prices for different markets and agricultural commodities. Results from the market linkages survey are presented in Part 3. Recommendations are discussed in Part 4.

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<sup>12</sup> Mallett and Pain, 2017.

## Part 1: Food Markets in South Sudan

## 1. Agriculture

### KEY MESSAGES

**Most traders in South Sudan are small-scale.** Small-scale traders mostly engage in the sorghum and rice trade while large-scale traders mostly trade maize. Since traders are categorized into small and large scale by the amount of cereal they sell in kilograms, the type of traded cereal influences this categorization.

**Small-scale traders and large-scale traders sell their goods in different parts of the country.** Small-scale traders tend to sell their goods close to where the goods were produced. In contrast, large scale traders transport and sell their goods across larger distances within and outside of South Sudan.

**Limited transport corridors are the largest barriers South Sudanese traders face.** Other barriers include limited access to cash, credit and reliable information.

**Conflict continues to disrupt trade in South Sudan.** The conflict that emerged in December 2013 was halted in August 2015 but conflict returned in June 2016 and has continued since then.

**14. More than 70 percent of South Sudan is viable for agricultural production.** Environmental agricultural potential in South Sudan differs by livelihood zone. There are seven livelihood zones that are divided by climactic conditions and farming systems. The Ironstone Plateau is the largest, which accounts for 23.5 percent of the total land area in the country (Figure 12). The Eastern Flood Plains is the second major livelihood zone and accounts for 20.4 percent of national land. This is followed by the Western Flood Plains and the Greenbelt, which respectively account for 14.2 and 12.7 percent of total national land.<sup>13</sup> These livelihood zones also reflect rainfall patterns that are vital for agricultural production. The Greenbelt, which includes what was Western Equatoria State and the southern part of the former Central Equatoria State, receives the most rainfall. This region obtains between 800 mm to 2000 mm per year. This part of the country has the highest environmental potential for agricultural production and surpluses are typically drawn from it. Other parts of South Sudan also have high agricultural potential. For example, the Eastern and Western Floodplains receive lower amounts of rainfall, but benefit from their locations on the flood plains of the Nile River. These areas include what were previously known as Northern Bahr el Ghazal, Jonglei, Lakes, Unity, Upper Nile and Warrap states. Meanwhile, the Hills and Mountains Zone receive an annual rainfall that approximately ranges from 500 to 800 mm per year.<sup>14</sup>

**15. South Sudan's harvest seasons differ by the type of crop, the livelihood zone the crop is grown in and conflict induced displacement patterns.** Harvest seasons roughly adhere to predicted harvest timeframes.<sup>15</sup> Though harvest seasons are susceptible to weather phenomena such as El Niño, conflict is arguably the biggest factor that presently disrupts agricultural production in South Sudan. For example,

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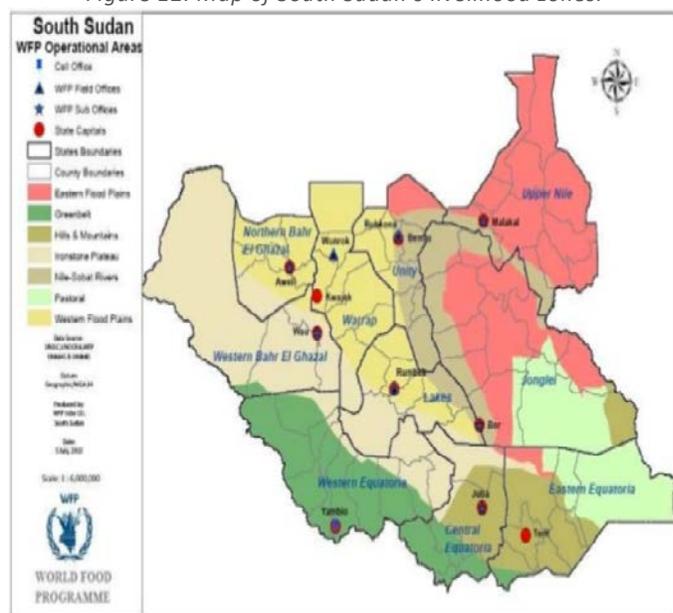
<sup>13</sup> World Bank, 2012a

<sup>14</sup> Kowr, 2013

<sup>15</sup> FAO, 2016; IGAD, 2016

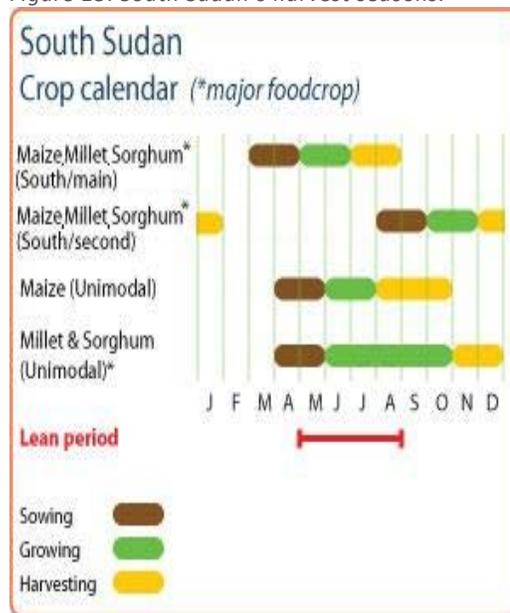
the FAO notes that the harvest seasons outlined should be interpreted as the dates by which populations need to safely return to their production areas to avoid interrupting agricultural seasons (Figure 13).

Figure 12: Map of South Sudan's livelihood zones.



Source: FESSNET, 2013.

Figure 13: South Sudan's harvest seasons.



Source: FAO, 2015.

**16. Most of South Sudan's agricultural land is under-cultivated.** More than 70 percent of the country is suitable for crop production.<sup>16</sup> Despite this, only 3.8 percent (2.5 million ha) of the total land area (64.7 million ha) was cultivated in 2009, while the largest part of the country (62.6 percent) is under trees and shrubs. This contrast with neighboring Kenya and Uganda, where cropland respectively accounts for 28.3 percent and 7.8 percent of each country's total land area.<sup>17</sup> The low percentage of land utilized for agriculture suggests that there is enormous potential to increase agricultural production.

**17. Increasing access to arable land is unlikely to be the only factor necessary to unlock South Sudan's agricultural potential.** Instead, expanding cultivation in South Sudan will likely require addressing several longstanding cross-cutting factors that potentially inhibit the use of land for agricultural production and trade. These include social and political considerations such as: on-going conflicts over land ownership and grazing rights and regular access to farming equipment that is appropriate to communities in the region.

## 2. Agricultural Consumption

**18. Cereals are crucial for addressing household food needs.** Prior to the ongoing conflict, cereals were the main staple crops that were both produced and consumed in the country. The main cereals produced

<sup>16</sup> Diao et al 2011

<sup>17</sup> World Bank, 2012a

were: sorghum, maize, millet and rice.<sup>18</sup> In 2009, over 75 percent of households consumed cereals within a week. About 68 percent of households cultivate sorghum, which makes it the main crop cultivated and the primary staple food in all states other than the three regions that were the Equatorias, where maize flour and cassava are the staples.<sup>19</sup> Maize was cultivated by 44 percent of households, groundnuts were grown by 33 percent of them, and cassava by 14 percent.

**19. Cereal consumption varies by region and between rural and urban areas.** Rural sorghum consumption per capita in 2009 was almost double the amount consumed in urban areas, at 11.07 and 6.87 kilograms per month respectively. That same year per capita consumption of sorghum in Juba was particularly low, at only 3.4 kilograms per capita per month. There were also clear differences in per capita consumption in rural areas; for example, per capita consumption of sorghum in northern rural areas was about 30 percent higher than in comparable southern areas.<sup>20</sup> These differences are likely to increase if South Sudan continues to become increasingly urban rather than rural, which was its pre-conflict trajectory.<sup>21</sup> Urbanization rates after the conflict are particularly difficult to obtain and verify after the 2013 conflict, but it is likely that the country has continued to urbanize. This is due to population shifts as many communities have relocated to Protection of Civilian sites and to areas just outside of them. It is also probable that the prolonged conflict-induced disruption of rural livelihoods has pushed communities to more urban areas where there are more livelihood opportunities.

### 3. Trade

**20. South Sudan imports most of its agricultural produce.** Staple food commodities are largely traded informally across international borders. Though data is difficult to verify given the nature of informal trade, South Sudan is considered the main informal staple food importer in East Africa. For example, in 2013 the country accounted for 57 percent of total informal imports. In contrast, that same year Kenya and Uganda respectively accounted for 15 and 11 percent.<sup>22</sup> Uganda provided most imports and Sudan, Ethiopia and Kenya supplied smaller quantities of imports.<sup>23</sup> Juba is one of the country's main market centres, and domestic production in 2015 contributed to approximately 10 to 15 percent of the available goods in Juba's markets.<sup>24</sup>

**21. Domestic and international agriculture supply chains are supported by both large and small scale traders.** These two categories of suppliers are broadly defined. Large scale traders move large volumes of storable food commodities, which are mainly grain cereal, grain legumes, maize and wheat flour, and sugar. These are transported by large capacity hired trucks and barges on the River Nile. In contrast, transportation choices for small scale traders are more limited. For example, small scale traders face

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<sup>18</sup> Government of South Sudan, 2012

<sup>19</sup> National Bureau of Statistics of South Sudan, 2009

<sup>20</sup> Dorosh, Rashid and Asselt, 2016

<sup>21</sup> Thomas, 2015: 146

<sup>22</sup> FSNWG, 2013

<sup>23</sup> IGAD, 2016

<sup>24</sup> Mosel and Henderson, 2015

quantity constraints in hiring entire trucks but pool together to share transport trucks. They also transport goods to local markets by bicycle or donkey cart.<sup>25</sup>

**22. Most traders in South Sudan are small-scale and there are only a limited number of larger traders.** Most traders tend to work through existing networks in South Sudan and neighbouring countries. Small-scale traders tend to sell their goods closer to where they were produced, whereas large-scale traders are more likely to have the resources to transport their goods across larger distances within South Sudan and from neighbouring countries into South Sudan.

**23. Trader networks include both large and small-scale traders.** Traders in trader networks sell in four types of markets: rural primary markets located in villages and small towns, rural assembly markets located in agricultural surplus areas, urban retail markets, and markets in Protection of Civilians site camps of the United Nations Mission in South Sudan (UNMISS).

**24. Previous studies report that most traders are not South Sudanese, but this survey found that the inverse is now true.** A 2015 study found that only 15 percent of traders were South Sudanese. At that time, most traders were Darfuri, Eritrean, Ethiopian, Somali or Ugandan. Of these, most were branches or subsidiaries of larger companies based elsewhere and only a few are owned by individual business people. Though some of these small and medium-sized traders solely imported foodstuffs, several larger traders and companies combined food imports with other more lucrative businesses, such as hotels and petroleum importing, which Somalis dominated. In contrast, most Ugandan businesses were small or medium-sized unregistered food traders.<sup>26</sup> While the precise constitution of business interests of different national groups fell outside the scope of this study, the shift from international traders to South Sudanese traders dominating markets is notable because it suggests that livelihood and employment shifts have been taking place in recent years.

**25. South Sudan's main import routes go through Nimule or Kaya in what was Central Equatoria state, and then up along the Jonglei-Lakes border via Rumbek.** Northern towns, which include Aweil, Bentiu and Malakal, were traditionally oriented towards Sudan for imports, although this has recently declined. Other than Juba, which continues to receive Sudanese wheat, sorghum, spices and sauce imports, towns in the southern half of the country are oriented towards Ugandan imports.<sup>27</sup>

**26. Large quantities of Ugandan goods are purchased in Juba and sold upcountry.** The regions which receive goods from Juba include what was previously known as Greater Bahr-el-Ghazal and Greater Upper Nile (Figure 14). Though estimates are difficult to verify, upcountry trade may have accounted for as much as 60 to 70 percent of traders' business prior to the conflict.<sup>28</sup> This trade is seasonal, with traders arriving with their trucks from Bor, Rumbek, Wau and Malakal during the dry season. During the rainy season fewer roads are accessible to Bor, Rumbek, Wau and Aweil and goods are then often transported to these cities by Nile barge.<sup>29</sup>

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<sup>25</sup> Wambua, 2009

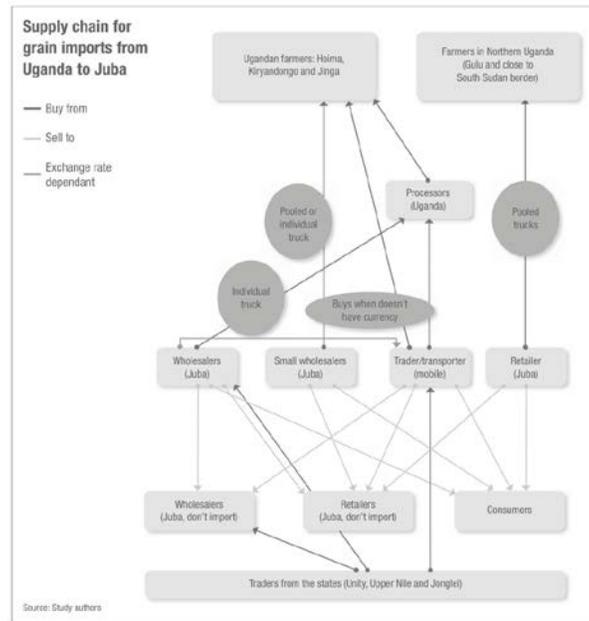
<sup>26</sup> Mosel and Henderson, 2015

<sup>27</sup> IGAD, 2016; Mosel and Henderson, 2015

<sup>28</sup> Oxfam, 2014

<sup>29</sup> IGAD, 2016

Figure 14: Supply chain for cereal imports to Juba.



Source: Mosel and Henderson, 2015.

## 4. Trade Barriers

**27. Several constraints impact small and large scale transport corridors.** Large scale traders are affected by insecurity on the roads, poor road quality, numerous tax and fee collection points along trade routes, high fuel costs, and prohibitive labour costs. For example, internal trade linkages, even in 2008, were considered very limited and varied by the type of good (i.e. perishable vs. non-perishable). Access to roads and rivers also varies at different points of the year. For example, Malakal and Juba do not simultaneously have access to road and water transport during the rainy season.<sup>30</sup> These transportation constraints prevent food trade and increase prices.

**28. Other transport-related factors make trade in South Sudan expensive.** Fuel shortages, fuel-hoarding and informal fuel sales on roadsides have led to significant variation in fuel prices across towns. For example, in April 2016, the 1-litre diesel price in Bentiu, Bor and Malakal was SSP 150 but ranged between SSP 70-100 in Juba.<sup>31</sup> Trade between South Sudan and its southern neighbors is asymmetric, with South Sudan importing more than it exports. This is a problem because it contributes to the doubling of the cost for trucking companies who return to neighboring countries with empty trucks.<sup>32</sup>

**29. Most retailers and traders operate with very low storage capacities.** Storage capacities are lowest in the Greater Upper Nile region because conflict makes investment there very risky. This also implies that maintaining small storage facilities might be a logical strategy for distributing risk in an environment

<sup>30</sup> World Bank, 2015

<sup>31</sup> WFP, 2016

<sup>32</sup> World Bank, 2012a

characterized by insecurity and the risk of looting. Storage facilities are typically small rooms measuring between 10 by 10 feet and 30 by 30 feet that also serve as sales areas. Most (64 percent) retailers store commodities for only up to 2 weeks and the majority (69 percent) of wholesalers store their commodities for up to 3 months.<sup>33</sup> Though this might be a conflict-resistant strategy, traders consequently do not benefit from the savings associated with storing goods in bulk over long timeframes and instead incur recurring transportation costs.

**30. Formal and informal checkpoints and payments are widespread and increase the cost of trade.** The National Bureau of Statistics notes there were four checkpoints per 100 km along the major South Sudanese trade routes, and drivers made payments at over 97 percent of checkpoints in 2010. Though the largest payments are made at international borders, payments on internal routes can be up to 8 percent of the value of goods transported. Even prior to the conflict, the effective tax rate on imported goods might be as high as 30 percent on food items when all taxes and charges on imported goods are accounted for.<sup>34</sup> There is a substantial risk that conflict, rising country-wide fiscal pressure, and the recent creation of new states is increasing the number of checkpoints in South Sudan.

**31. General insecurity in South Sudan disrupts the movement of people and goods across the country.** The outbreak of fighting in December 2013 and July 2016 has heightened insecurity along most trade routes, with many unofficial checkpoints and roadblocks where money is extorted.<sup>35</sup> Reported killings along major trade routes and market towns have increased in previously peaceful areas, including in the major agricultural production areas of Yei and Yambio in what was the Equatoria region.<sup>36</sup> Import traders are increasingly likely to be impacted because the main road linking Uganda to South Sudan runs through an insecure part of what was formerly known as Central Equatoria.

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<sup>33</sup> Wambua, 2009

<sup>34</sup> National Bureau of Statistics of South Sudan, 2011

<sup>35</sup> WFP, 2015

<sup>36</sup> UN News Center, 2016

## Part 2: Market Price Analysis

## KEY MESSAGES

**Food prices and the price of food between markets have both sharply increased for deficit and surplus markets since June 2016.** Food prices in deficit markets were slightly higher than surplus markets until June 2016 when the difference spikes. These increases vary depending on the market and the food product and are attributed to the worsening economic and political conditions in the country.

**Markets are integrated when price differences between them have been stable over time.** This also implies that a shock that impacts prices in one market can have a strong and fast impact in the integrated market's prices.

**Surplus and deficit markets are poorly integrated.** More than 50 percent of the pairs within deficit markets are integrated while only about 10 percent are integrated in surplus markets. More importantly, about 30 percent of the markets between surplus and deficit markets are integrated.

**Oil, rice and sugar products show the most integration while sorghum and maize are the least integrated.** This result could be attributed to taste preferences between surplus and deficit areas, where towns in the surplus region consume more maize grain than sorghum grain, for instance.

**Bor, Juba, Torit, and Rumbek are the most integrated with other markets for the seven food products considered.** These markets are all deficit markets and show high integration with both deficit and surplus markets. This is likely as these markets have better road networks and are more directly connected to other markets.

**The distance and presence of a primary or interstate road between markets matters for integration.** This implies that markets that are closer or have a road connecting them tend to be integrated. Additionally, markets that are far away from each other but have a primary or interstate road connecting them also tend to be integrated. Other factors such as insecurity in the country, poor infrastructure, and internal trade barriers, may also explain the level of integration. The MLS explores these factors and provides additional insights into the lack of integration.

**32. Market price increases, differences, and co-movement are some indicators for how markets are functioning.** Data from the Market Price Survey (MPS) is used because it records weekly prices for major food products for a range of towns in South Sudan. The complete list of the included locations is: Malakal, Bor, Kuajok, Tonj South, Aweil, Aweil North, Wau, Raga, Rumbek, Rumbek East, Yambio, Maridi, Juba, Yei, Torit, and Magwi (Figure 15).<sup>37</sup> Price trends in different markets highlight demand and supply shocks. Markets are in part considered 'integrated' when prices over time are stable with other markets.

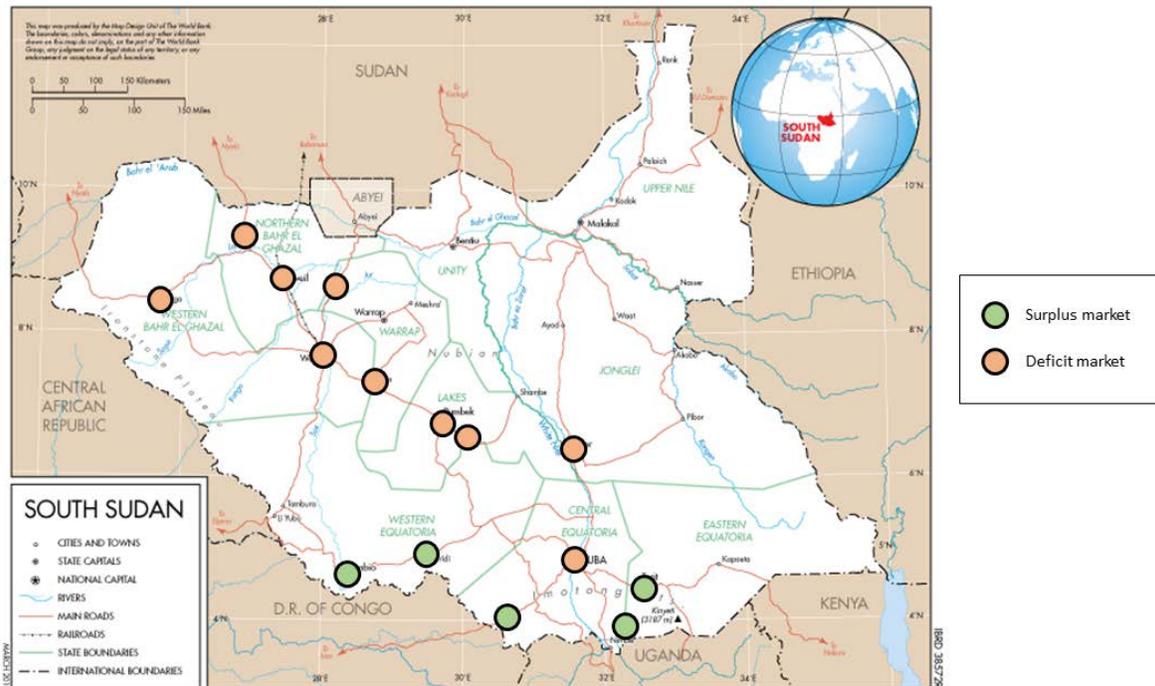
**33. Deficit to surplus trade is vital for decreasing food insecurity and poverty.** A market is considered a surplus market when its cereal production exceeds the cereal requirement, which implies that there is

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<sup>37</sup> Malakal was also included, but has been suspended since January 2014 for security reasons.

excess supply. Alternatively, a market is considered a deficit market when its cereal production does not meet the cereal requirement, in turn implying excess demand. It is therefore potentially efficient for these two types of markets to trade as excess supply in one market could meet excess demand in another. These locations were divided into surplus and deficit markets based on their 2016 cereal production estimates.<sup>38</sup> Because the timeframe and the number of observations across the locations and products is heterogeneous, only locations and products with a sufficient number of observations were used in the analysis.

Figure 15: Markets covered by the Market Price Survey (MPS).



Source: World Bank, 2016b.<sup>39</sup>

## 1. Price increases and differences

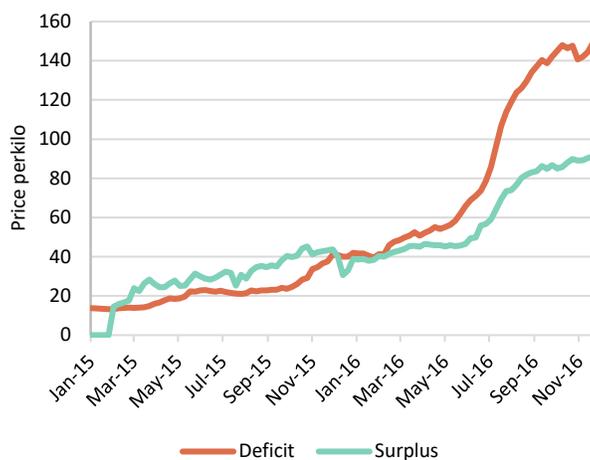
**34. Average market prices for food products have shown increasing divergence between deficit and surplus markets recently.** Food prices in deficit markets are expected to be higher as a deficit implies excess demand for the product. Since most of the surplus markets were added to the MPS after 2015, the trend in average food prices for deficit and surplus markets over the last two years is observed (Figure 16). This data indicates that food prices in deficit markets were slightly higher than surplus markets until June 2016 when the difference spikes. Thereafter, both price series show increasing divergence from each other.

<sup>38</sup> FAO, 2016; The division is binary so the extent of surplus and deficit production is not taken into account.

<sup>39</sup> The High Frequency South Sudan Survey (HFSSS) collects daily exchange rate, weekly market price data and household data with high frequency. The survey records weekly price data for 37 consumer items in South Sudan. Prices are collected from additional products including key grains that often feature heavily in food surplus areas in South Sudan, including maize, cassava, sorghum, groundnuts, cassava, sesame, and finger millet.

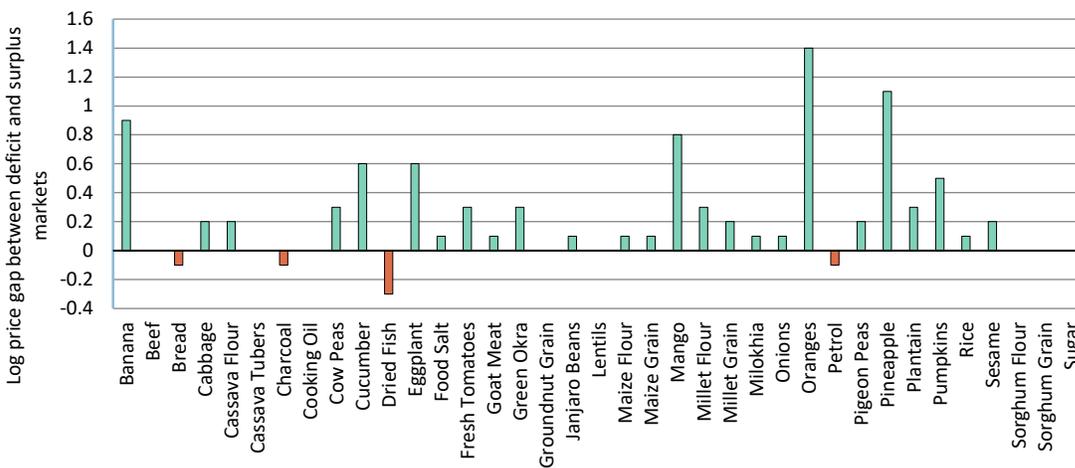
**35. Average price differences between deficit and surplus markets vary across food products.** Deficit market prices are higher than surplus market prices in 25 out of 37 products over the last two years (Figure 17). Out of the 25 products, deficit market prices are significantly higher for products such as bananas, mangoes, oranges and pineapple. This could be because fruit grows more abundantly in surplus areas, which contributes to low prices. Additionally, these fruits are heavy and perishable which makes them less feasible to transport to deficit markets to meet excess demand. Whereas for bread, charcoal, dried fish, lentils, petrol and sorghum flour, deficit market prices are slightly lower than they are in surplus markets.

Figure 16: Price trend surplus and deficit markets.



Source: World Bank, 2016b

Figure 17: Price differences between products.

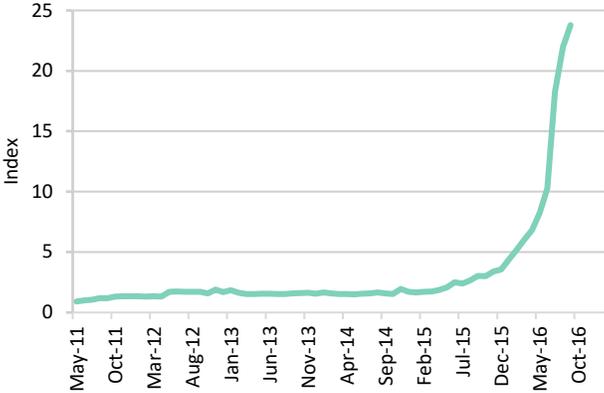


Source: Authors' Calculation.

**36. South Sudan's political and economic crises may contribute to recent increases in food prices.** Inflation, as measured by the Consumer Price Index, hit a record 550 percent in September 2016 (Figure 18). This rate is about 5 times higher than the 5-year national average. In January 2017, the South Sudan Pound hit

a record low against the U.S. Dollar, exchanging at SSP 105/1US\$ in Juba down from SSP 74/US\$ in October 2016.<sup>40</sup> Renewed fighting in Juba in July 2016 may have contributed to the latest jump in the inflation rate and the low exchange rate. Insecurity has impacted inflation through the effects of higher transportation costs and destruction of productive capital, such as farms and related infrastructure. In the case of South Sudan, which is a net importer, insecurity along trade routes has raised transportation costs. For producers, the conflict has led to the destruction of farms and the displacement of people, which has prevented cultivation. Therefore, higher prices in the market is a function of both higher costs and lower supply. As for the exchange rate, conflict-induced speculative behavior and limited foreign currency injected into South Sudan may have contributed to the low exchange rate. Since a large share of South Sudan’s food products are imported, exchange rate depreciation has further exacerbated inflation.

Figure 18: National CPI Index.



Source: World Bank, 2016b.

## 2. Price Co-Integration

**37. An integrated economy has implications for government interventions.** For instance, if the government wants to sell or purchase stocks of rice to affect average prices at the national level, it would be irrelevant where the rice is sold or bought, as the shock of excess supply (demand) in each province is expected to spillover to others relatively quickly. This would in turn reduce the costs of the intervention. While the degree of integration is likely to also be shaped by formal and informal governance dynamics, accurate information on the degree of integration, and on the factors that determine that integration, is therefore essential for policy decisions.<sup>41</sup>

**38. Market integration is analysed by price co-movement.** Spatially separated markets of a homogeneous product are considered integrated when they are connected by trade or its possibility. Thus, long-run price differences for a given pair of integrated regions reflect the long-term costs of trading between them. Large price differences within products across towns does not necessarily imply a lack of market

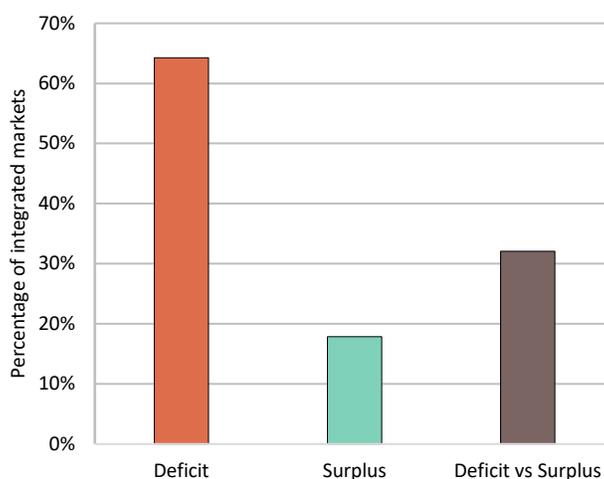
<sup>40</sup> World Bank, 2016b

<sup>41</sup> World Bank, 2012b.

integration. This is because markets can be integrated with significant price differences if these differences are relatively stable over time. Therefore, the hypothesis of market integration is tested by co-integration (price co-movement). Market integration is explored for the seven products that have observations across all markets. For each product, integration between each market pair within surplus and deficit markets as well as between the two types of markets is explored. Malakal, Nimule, and Rumbek East were excluded from the analysis as they represented under 3 percent of the total observations and failed to meet the criteria for a co-integration analysis.<sup>42</sup> Two markets are co-integrated when the co-integration test produces a significant statistic. The higher this statistic, the higher the degree of co-integration (for explanation see Methodology for Co-Integration).

**39. Surplus and deficit markets show weak integration with each other.** More than 50 percent of the pairs within deficit markets are integrated while only about 10 percent are integrated in surplus markets (Figure 19).<sup>43</sup> More importantly, about 30 percent of the markets between surplus and deficit markets are integrated. Since a surplus market has excess supply, it is more efficient for it to trade with a deficit market rather than a surplus market, given that costs of trade do not exceed added revenue. The same is true for deficit markets, which have excess demand. Surplus to deficit trade would be beneficial for both producers and consumers, which makes the low integration between them unexpected.

Figure 19: Proportion of integrated markets.



Source: Authors' Calculation.

**40. Markets are most integrated for cooking oil, rice, and sugar and least integrated for sorghum and maize.** For rice and sugar, which are also staple products, more than 50 percent of the surplus markets are integrated with deficit markets (Figure 19). Sorghum and maize, which are important staples, show

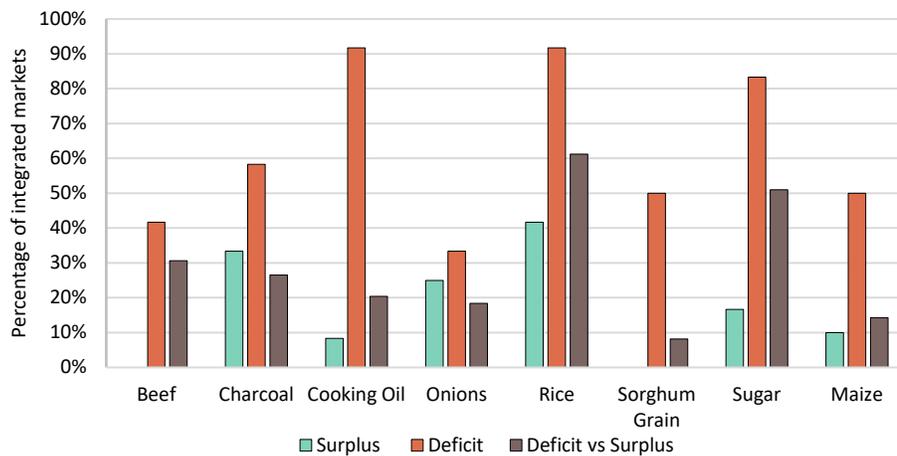
<sup>42</sup> These markets did not show a presence of a single unit root. The unit root test checks for non-stationarity in a time series. It is first done on the prices and then on their first difference. To proceed with a co-integration analysis, the null hypothesis of stationarity in prices would not be rejected, but it would be on its first difference which indicates the presence of a single unit root. A 10% significance criteria is used to reject the null hypothesis.

<sup>43</sup> Markets are considered integrated when the null of a unit root in the residual of the long-run relationship is rejected at the 5% level. The critical value is obtained from Engle and Yoo (1987).

very low integration within surplus markets and the lowest between surplus and deficit markets. This result might be attributed to taste preferences between surplus and deficit areas, where towns in surplus regions consume more maize grain than sorghum grain, for instance.<sup>44</sup>

**41. Bor, Juba, Torit, and Rumbek are the most integrated with other markets for the seven food products considered.** These markets are all deficit markets and show high integration with both deficit and surplus markets (Figure 21). This is likely as these markets are known to have better road networks and are directly connected to some markets (Table 4). For deficit-surplus integration, Torit and Juba tend to form respective markets with Magwi and Yambio. On the other hand, Wau and Yei display more isolated markets. While Wau has an extensive road network, both towns have experienced excessive violence, which may have contributed to the segmentation.<sup>45</sup>

Figure 20: Proportion of integrated markets across products.

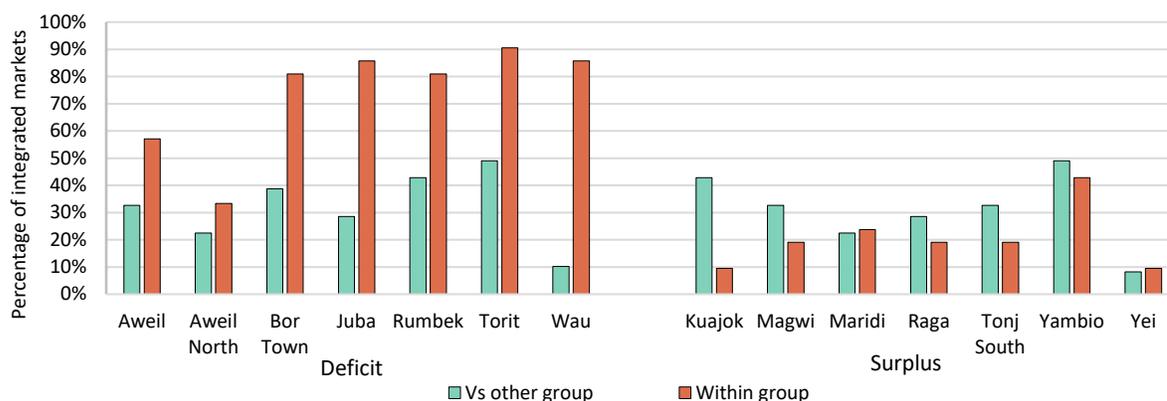


Source: Authors' Calculation.

<sup>44</sup> National Bureau of Statistics of South Sudan, 2009.

<sup>45</sup> UN News Centre, 2016.

Figure 21: Proportion of integrated markets across towns.



Source: Authors' Calculation.

Table 4: Markets directly connected by road.

Markets directly connected	Type of road	# of Integrated markets (out of 8)
Deficit to deficit trade		
Torit - Juba	Interstate	7
Wau - Juba	Interstate	7
Juba - Bor Town	Interstate	5
Wau - Aweil	Interstate	3
Rumbek - Wau	Interstate	7
Deficit to surplus trade		
Yambio - Juba	Interstate	4
Tonj South - Wau	Interstate	2
Rumbek - Tonj South	Interstate	3
Wau - Yambio	Interstate	2
Wau - Raga	Interstate	1
Yei - Juba	Interstate	1
Magwi - Torit	Secondary	4

Source: Authors' Calculation.

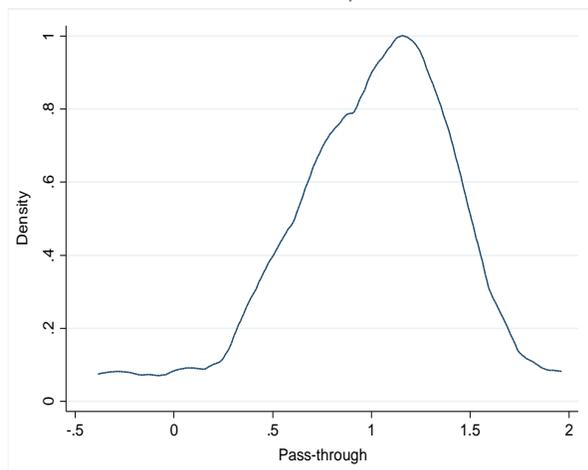
42. Price changes in Juba affect prices in surplus markets depending on the product and town.<sup>46</sup> A shock that leads to an increase in the price of a good in one market could be transmitted to prices in another integrated market.<sup>47</sup> This transmission is explored for each surplus market against Juba. The distribution

<sup>46</sup> Only results for Juba are presented in this paper since it is the main market in South Sudan. Results for the other deficit markets can be requested.

<sup>47</sup> More specifically, the market for good  $x$  in region  $i$  is said to be spatially integrated with that of region  $j$  if  $i$ , a shock that shifts, say, demand in  $i$  but not in  $j$  affects the price in both  $i$  and  $j$ . This implies that the price series for

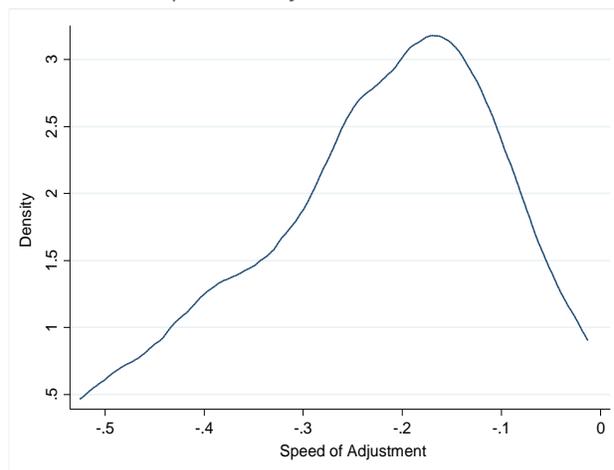
of the transmission across cities and products reflects heterogeneity in the extent of the transmission (Figure 22). For example, a shock in sorghum grain prices in Juba, implying for example, a 1 percent increase, is associated with an increase in sorghum grain prices in Yambio of about 0.6 of a percentage point in the long run (Table 11 to Table 18 in the Appendix). However, if the same shock affects the prices of sugar in Juba, transmission is almost complete: in the long run, sugar prices in Yambio will end up increasing by 0.98 percent.

Figure 22: Distribution of estimated pass-through of shocks in Juba's prices.



Source: Authors' Calculation.

Figure 23: Distribution of estimated speed of adjustment to equilibrium aftershock in Juba.



Source: Authors' Calculation.

**43. After a shock in Juba, prices in surplus markets adjust slowly and heterogeneously.** Prices are not transmitted from one market to another immediately. The speed at which these markets adjust also varies with the product and town (Figure 23). For example, after a 1 percent increase in Juba sugar prices, Yambio's price adjustment will not be automatic. Estimates of the speed of adjustment in that market for that product reveal that 35 percent of the adjustment will take place in the first week. However, the speed of adjustment to the same shock in Raga reveals that only 8 percent of the shock will be adjusted in the first period.

**44. The distance and road network between and near markets are factors that explain the level of integration.** Since a longer distance implies higher trade costs, it is expected that markets that are far away from each other will be less integrated. This notion is evident as the distance between each market is significantly and negatively correlated with the respective integration statistic (Figure 24). Deficit to deficit market integration could also be explained by better road networks in that region and the

commodity  $x$  in region  $i$  shares a long run stochastic trend with that of region  $j$ . If there is perfect integration, the effect of the shock on both prices would be the same (Fackler and Goodwin, 2001).

presence of alternative transportation methods such as water transport.<sup>48</sup> The presence of a road is significantly and positively correlated with the level of integration (Figure 25).<sup>49</sup> Furthermore, longer distances that are linked by road are positively correlated with the level integration. This is evident when plotting the interaction of distance and the presence of a road against the integration statistic (Figure 26). This finding indicates road access can improve integration even if markets are physically remote from each other.

**45. Market pairs that are connected by road show significant integration, particularly when the pairs are deficit-deficit.** More than half the food markets that are connected by an interstate, primary or secondary roads are also integrated (Table 4).<sup>50</sup> However, this is much stronger for deficit to deficit trade as 75 percent of deficit markets that have a road between them are also integrated. On the other hand, no surplus markets are connected to each other by a direct road. This is likely a big reason these markets do not show price integration. Most surplus markets have also generally experienced more conflict than deficit markets. The resulting insecurity may be preventing trade between surplus markets and between surplus and deficit markets. These factors are further explored in the MLS, which support these hypotheses.

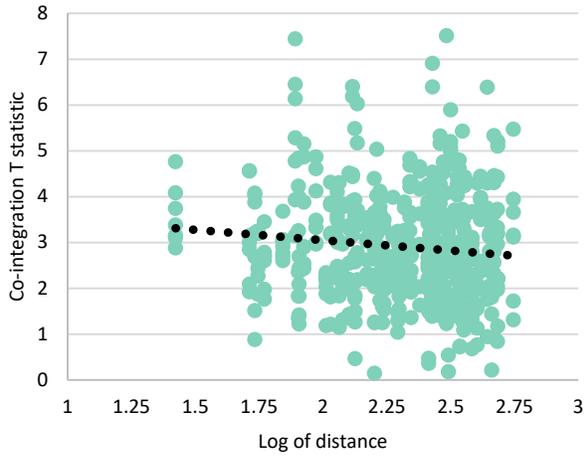
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<sup>48</sup> World Bank, 2015a; Most of the surplus markets were added to the MPS after late 2015, so the low observations undermine the conclusions that can be drawn from these results

<sup>49</sup> All pairs are connected on four levels. '0' indicated no presence of any interstate, primary or secondary road for both markets; '1' indicated presence of a road for either of the markets; '2' indicated presence of a road for both markets but are not directly connected by a road; and '3' indicated a direct road between the two markets. These ordinal variables are plotted against the co-integration t statistic.

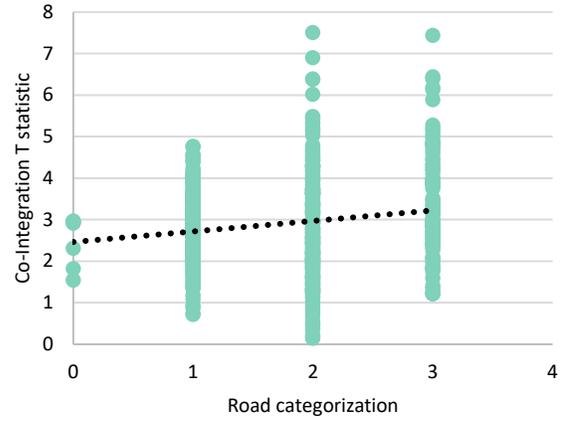
<sup>50</sup> We used the road transport strategy note (World Bank, 2015) to identify which towns had an interstate, primary and secondary road connecting them directly or indirectly. Spatial data on feeder roads in South Sudan is limited so we have not added those in the analysis.

Figure 24: Correlation between distance and integration



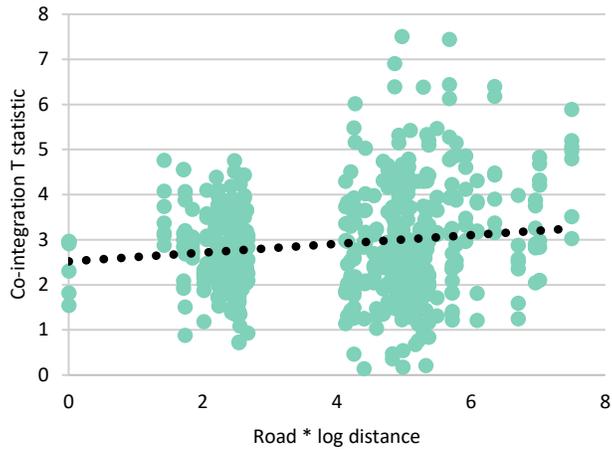
Source: Authors' Calculation

Figure 25: Correlation between road presence and integration



Source: Authors' Calculation

Figure 26: Correlation between intersection of road presence and distance with integration.



Source: Authors' Calculation.

## Part 3: Market Linkages Survey

## KEY MESSAGES

**The Market Linkages Survey (MLS) explores four main trade barriers: transportation, storage, finance and information.** This chapter presents select findings from each of these.

**Like the price co-integration analysis, the MLS reveals a greater proportion of deficit to deficit trade than deficit (surplus) to surplus (deficit) and surplus to surplus trade.** Only 25 percent of traders are engaged in surplus (deficit) to deficit (surplus) trade. On the other hand, 41 percent of traders in deficit areas reported trade with other deficit markets while only 10 percent of traders in surplus areas reported trade with other surplus markets. These results concur with the price integration findings as the respective level of integration is 30 percent, 50 percent, and 10 percent for deficit (surplus) to surplus (deficit) pairs, deficit pairs, and surplus pairs.

**Transportation indicators such as the presence of an interstate, primary or secondary road, checkpoint duration, fuel shortage, and vehicle damage are some factors that explain higher deficit to deficit trade.** Deficit-deficit trade routes have better transport indicators. For instance, towns in the deficit region have lower fuel shortage issues and insecurity from the conflict compared to towns in surplus regions.

**Most traders hire vehicles to transport cereals for resale but a bigger proportion of small-scale traders share transportation with other traders.** More specifically, 8 out of 10 large-scale traders hire vehicles compared to 5 out of 10 small-scale traders. Meanwhile, about 3 out of 10 small-scale traders share transportation with other traders compared to 2 out of 10 large-scale traders. Since most of the small-scale traders are using heavy vehicles to transport their goods, pooling transportation is a viable option.

**Lack of production emerges as the biggest reason why traders do not source their cereals locally, whereas many more traders in surplus areas stated that this was a problem.** One in two traders reported inadequate local cereal production as the main reason for not sourcing locally. Specifically, 65 percent of the traders in surplus towns reported inadequate local cereal production as the main reason for not sourcing locally compared to 40 percent of traders in deficit towns. As surplus markets have excess cereal production, this result is surprising and points to supply-side barriers in surplus regions.

**Shops and shared storage spaces allow traders to sell grains throughout the year.** About 30% of the traders are not using any form of storage. Specifically, many traders from Rumbek, Wau, and Tonj South are not storing their grains, which hints at a shortage of storage facilities in these towns. Storage enables businesses to continually operate throughout the year, especially in times of low production. Over 60 percent of all traders who sell throughout the year are using some form of storage. Specifically, 80 percent of the traders who sell throughout the year rent storage warehouses. This is compared to 92 percent of those who share storage space and 85 percent of those who store cereals in their shops. This suggests that shops and shared spaces can be good alternatives to expensive storage warehouses, especially for small-scale traders as a higher proportion of them use shared storage.

**Most traders are unable to sell cereals throughout the year due to funding constraints and do not use formal and alternative financing mechanisms to remedy it.** Two thirds of the traders stated that they took loans from another trader in the past 3 years, and about 1 in 4 stated they got it from a friend or relative. Such informal sources depend on the social and professional network of the trader and are subject to common shocks.

**Traders are interested in joining traders' associations and could benefit from the price information that is provided to members.** About half the traders that are members stated that the best information they get is about prices in other markets. Meanwhile, more than half of all traders (who may or may not be part of traders' associations) get their price information via phone calls or word of mouth.

**46. The Market Linkages Survey (MLS) explores the degree of market linkages by identifying missing links between surplus and deficit markets, and the main bottlenecks preventing market access.** The previous chapter uses market prices to provide evidence for market integration. The MLS complements this quantitative assessment by exploring the barriers that may have contributed to weak integration. Four main trade barriers are hypothesized to explain the absence of strong linkages between surplus and deficit areas. These are: trade route and vehicle related barriers, storage means and access, financial access and payment mechanisms, and information constraints.

**47. Findings are presented by type of market and trader, where conflict and liquidity constraints emerge as the largest barriers.** The MLS consists of many qualitative responses about the main problems faced by traders. This includes questions about transportation, storage, finance, and information. In addition, the MLS also includes voluntary video testimonials by the traders about the biggest challenges they face in their trading businesses. This chapter outlines some descriptive statistics, transportation indicators along trade routes, and then presents five findings that go beyond transportation barriers. Findings are presented by the type or market (surplus or deficit), and/or the type of trader (small or large scale), and town. This allows context-specific recommendations. While differences are observed between responses chosen by the location and type of trader, issues of insecurity and cost were highlighted by many. For instance, insecurity from the conflict has impacted transportation to other towns for all traders. Additionally, lack of funds was the main reason most traders were unable to sell their goods continuously throughout the year.

## 1. Descriptive Statistics

**48. Survey locations were selected to cover a range of surplus and deficit areas.** The complete list of the locations is: Aweil, Aweil North, Bor, Juba, Kuajok, Magwi, Maridi, Nimule, Rumbek, Rumbek East, Tonj South, Torit, Wau and Yambio. These locations were divided into surplus and deficit markets based on their 2016 cereal production estimates.<sup>51</sup> Here, a market is considered a surplus market when its cereal production exceeds the cereal requirement, as this implies excess supply. Alternatively, a market is considered a deficit market when its cereal production does not meet the cereal requirement, which indicates excess demand. From a food security perspective, trade between surplus and deficit markets is

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<sup>51</sup> (FAO, 2016); The division is binary so the extent of surplus and deficit production is not taken into account.

beneficial as unmet demand for food can be addressed by surplus production from another market. The MLS explores the extent of trade between markets, and what is preventing them from trading if they are not.

**49. The survey was targeted to a sample of wholesalers and retailers that engage in the cereal trade.** A rapid screening and listing survey was conducted to provide a sampling frame. Surveyors collected basic information from 100 traders in each of the 15 locations. The eligibility criteria required that a trader both be engaged in trading a cereal product and be a wholesaler or retailer. 50 cereal traders from each town were therefore randomly selected for the MLS, stratified by whether they trade across towns.<sup>52</sup> While the price integration analysis looked at a range of products, the MLS only explores cereal trade for two reasons. First, surplus markets have an agro-ecological advantage in cereal production. Second, cereal consumption is key to reducing food insecurity as cereals are a cheap and common staple.

**50. Most respondents were relatively young men engaged in maize trade.** Specifically, most cereal traders were men (Table 5). For example, the trader distribution by gender indicates that 79 percent of traders are men. This is consistent with the pattern of trader demographics observed in East Africa whereby women are more likely to be involved in retailing foodstuffs in seasonal markets and in street-side and permanent market stalls. In contrast, men are more involved in activities that demand long-distance travel.<sup>53</sup> The gender of respondents is important when considering how to design different types of interventions that work with the ways in which politics and power functions in different parts of South Sudan. Additionally, 38 percent of the traders predominantly trade sorghum while 32 percent and 29 percent of traders mainly trade maize and rice, respectively (Figure 27). Almost no trader (1 percent) reported that millet was the main product they sold.

**51. Small-scale traders tend to trade different types of cereals than large scale-traders and surplus markets tend to specialize in different types of cereals.**<sup>54</sup> For example, small-scale traders mostly engage in sorghum and rice trade while large-scale traders tend to trade maize. Since traders are categorized into small and large scale by the amount of cereal they sell in kilograms, it might be that the type of cereal influences this categorization. Surplus markets tend to specialize in maize and rice trade while deficit markets tend to specialize in sorghum trade. This is consistent with regional taste preferences as maize is more popular in surplus areas while sorghum is more common in deficit areas.

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<sup>52</sup> While the original sample size target was 750 (50 x 15 locations), Raga was dropped from the analysis due to insecurity in the markets. Additionally, some cereal traders refused to be surveyed or were traveling. This resulted in a total of 625 total observations.

<sup>53</sup> Nkonya, 2002

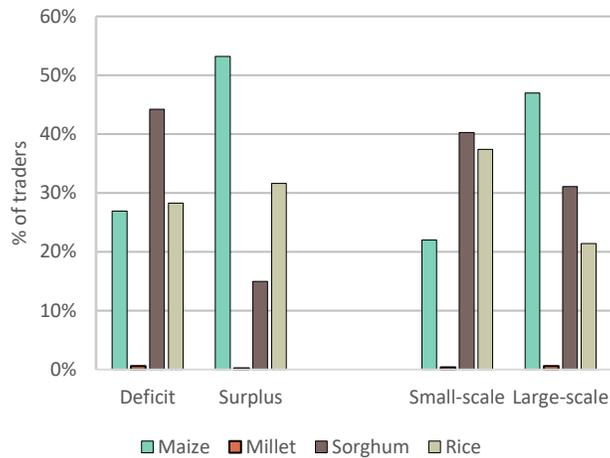
<sup>54</sup> Traders are categorized as large and small scale according to the amount of cereal sold. For simplicity, traders that sold less than the sample mean are considered small-scale while traders that sold more are considered large-scale

Table 5: Profile of traders surveyed.

Town	Women	Men	Average age	Main Product	Observations
Aweil	3	45	43	Sorghum	48
Juba	15	35	37	Maize	50
Yambio	8	39	31	Maize	47
Rumbek	0	50	34	Maize	50
Torit	34	13	36	Sorghum	47
Wau	1	48	38	Sorghum	49
Kuajok	11	39	43	Maize	50
Tonj South	6	48	35	Maize	54
Magwi	4	9	36	Rice	13
Maridi	9	15	31	Rice	25
Bor Town	7	43	34	Rice	50
Aweil North	3	43	37	Sorghum	46
Rumbek East	2	47	33	Maize	49
Nimule	20	27	37	Maize	47
Average	9	36	36	Maize	45
Total	123	501			625

Source: Authors' calculation.

Figure 27: Cereal trade by type of market and trader.



Source: Authors' Calculation.

## 2. Trade and transportation

52. The MLS reveals that a low proportion of traders trade cereals between surplus and deficit markets. Only 25 percent of traders are engaged in surplus (deficit) to deficit (surplus) trade. Additionally, there is much more trade between deficit markets than between surplus markets. Specifically, 41 percent of

traders in deficit areas reported that they bought cereal from and/or sold cereals to other deficit markets in the past 6 months (Figure 28). This is four times the number of traders who reported surplus to surplus trade. These findings are consistent with the results from the price integration analysis which showed that markets within food deficit areas are most integrated compared to markets within surplus areas, and between markets in surplus and deficit areas (Figure 19).

**53. Towns that have a direct and major road between them are also mostly trading partners.** Out of the 12 pairs of markets that were surveyed and have a major road, such as an interstate, primary or secondary road between them, 8 of them turn out to be trading partners in the MLS (Table 6 and Table 19 in the Appendix). This indicates that access to a major road tends to enable trade. However, there are some pairs that have a major road between them but do not seem to be trading, and some pairs from the MLS that are trading regardless of a direct major road between them. This finding suggests that there are additional factors that determine trade between markets other than the presence of a major road.

**54. Transport related indicators are analyzed for each trade route that emerges from the MLS.** The transportation module in the MLS was divided into two identical sections of buying and selling, which were enabled for the trader if they traded with an outside town in the last 6 months. The trader then selected the main town they traded with and several transportation questions are asked for the route to that town. The sections consist of several quantitative questions about disruptions on trade routes. Three of these indicators are: number of checkpoints encountered per hour of travel, round trips with fuel shortage as a percentage of the total round trips in the past 6 months, and round trips with vehicle damage as a percentage of the total round trips in the past 6 months. These indicators are presented for each trade pair that emerges from the MLS (Table 19 in the Appendix). In addition, price integration and the presence of a major road (both not from the MLS) are also presented.

**55. Deficit-deficit trade has relatively better transportation indicators compared to surplus-deficit and surplus-surplus trade.** All trading pairs are aggregated by three groups: deficit-deficit, surplus-deficit, and surplus-surplus trade (Table 6). About 60 percent of the deficit-deficit trading pairs from the MLS also show price-integration. Meanwhile, fewer surplus-deficit and surplus-surplus pairs show price-integration. Nearly 40 percent of deficit-deficit pairs and surplus-deficit pairs are connected by a major road while no surplus-surplus pairs are connected by a major road. This may be the biggest factor limiting trade between surplus markets. Additionally, surplus-deficit pairs have marginally worse indicators than the other pairs. This is expected as these indicators are a function of distance, and the distances between surplus-deficit pairs are much higher than the other two groups. As a result, the long distance translates to more fuel problems and vehicle damage.

*Box 2: Testimonial findings – 1*

***Checkpoints and illicit taxes***

Traders who transport goods from Uganda to Juba via Nimule state that checkpoints and fees are huge barriers because these interruptions are extremely costly and time-consuming. For example, they reportedly encounter numerous checkpoints on the way, where officials go through all the traders' goods and vehicle after which they usually demand a high fee. Additionally, if they enter Juba, there are multiple interruptions from state authorities that take place when off-loading. Some traders reported that this fee could be up to 50 million SSD, and that they have no option but to oblige. The inability to contest these payments is seemingly down to the power differential between them and authorities. These substantial fees are then factored into costs and are unfortunately passed on to consumers as higher prices.

*Box 3: Testimonial findings - 2*

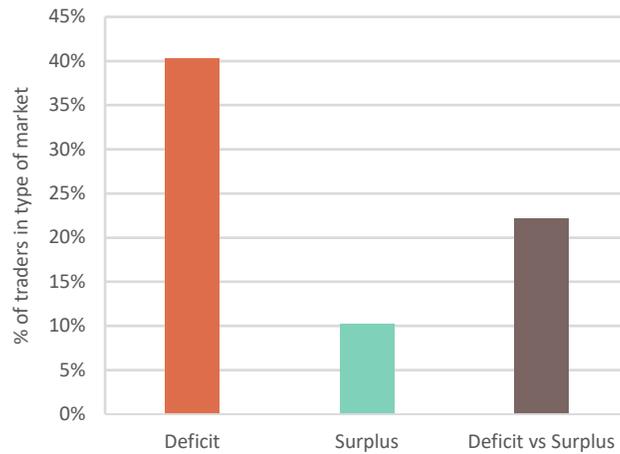
***Insecurity***

Traders report that insecurity on the roads is a major threat to their lives and businesses. Since the 2013 conflict, traveling to other cities has become difficult and is reportedly continuing to get worse. There have been instances of encountering people with guns on the trade routes where traders have had no option but to surrender their goods for fear of being shot. South Sudan's conflict has led to many death and many of those who lost their lives were reportedly also grain traders, which has caused businesses to close or vacate Juba.

**56. Trading pairs that are price-integrated and have a major road connecting them, have even better transportation indicators compared to pairs that are not.** Trading pairs are also aggregated by four groups: being price-integrated and having a road, being price-integrated and not having a road, not being price-integrated and having a road, and not being price-integrated and not having a road (Table 7). As expected, pairs that are price-integrated and connected by road have relatively better transport indicators. However, a stronger effect is observed when looking at just integration between markets. The indicators for pairs that are integrated are much better than for those that are not. It is likely that checkpoints, fuel shortages and vehicle damage are factors contributing to the low integration between markets.

**57. Importance of transportation barriers, as expressed by traders, vary across towns.** Traders were asked about the top three transportation barriers encountered on the way to the main market they trade with. Insecurity on the roads and poor road condition were found to be in the top three responses for most traders. However, disaggregating these responses by town provides specific insights. For instance, traders from Juba, Torit, Wau and Nimule gave high importance to insecurity as a trade barrier. On the other hand, traders from Rumbek East, Maridi, and Kuajok gave high importance to the condition of roads. Traders from Aweil overwhelmingly reported high taxes as a major transport barrier. These qualitative responses are vital for designing transportation related interventions.

Figure 28: Percentage of trading pairs by type of market.



Source: Authors' Calculation.

Table 6: Trade barrier summary statistics – by trade flow.<sup>55</sup>

Summary Statistics	Integrated	Major road	Checkpoints	Fuel shortage	Vehicle damage	Route barrier
Deficit - Deficit	60%	30%	0%	51%	47%	Lack of safety from conflict
Surplus - Deficit	33%	38%	52%	45%	65%	Lack of safety from conflict
Surplus - Surplus	14%	0%	29%	52%	42%	Poor road condition

Source: Authors' Calculation.

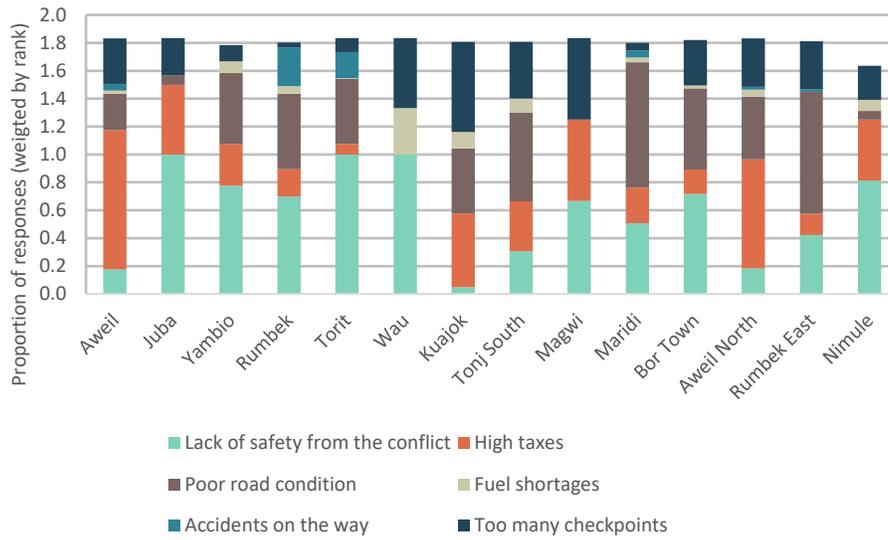
Table 7: Trade barrier summary statistics – by integration and presence of major road.

Price-Integrated	Major Road	Checkpoints	Fuel shortage	Vehicle damage	Route barrier
Yes	Yes	33%	31%	34%	Lack of safety from conflict
Yes	No	13%	27%	50%	Poor road condition
No	Yes	40%	42%	52%	Lack of safety from conflict
No	No	42%	64%	66%	High taxes

Source: Authors' Calculation.

<sup>55</sup> The 'Checkpoints' column in this table and the next indicates the percentage of traders in that group that encountered a checkpoint every two hours.

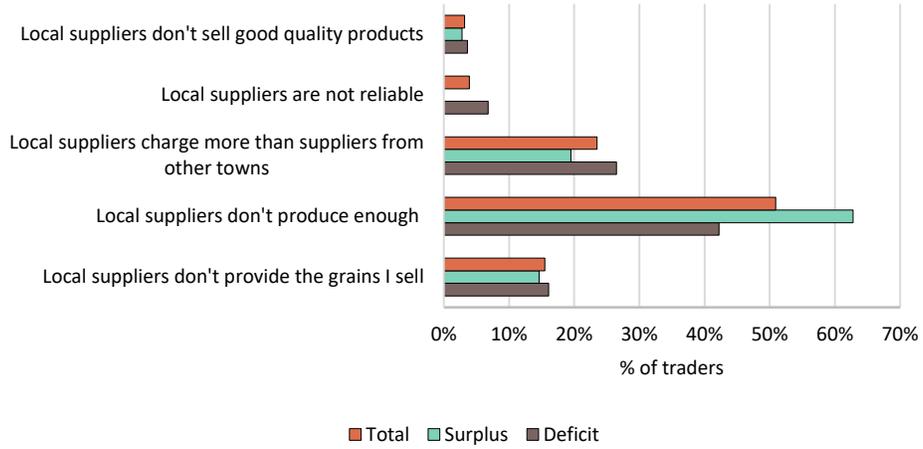
Figure 29: Biggest trade barriers reported by traders across towns.



### 3. Local production

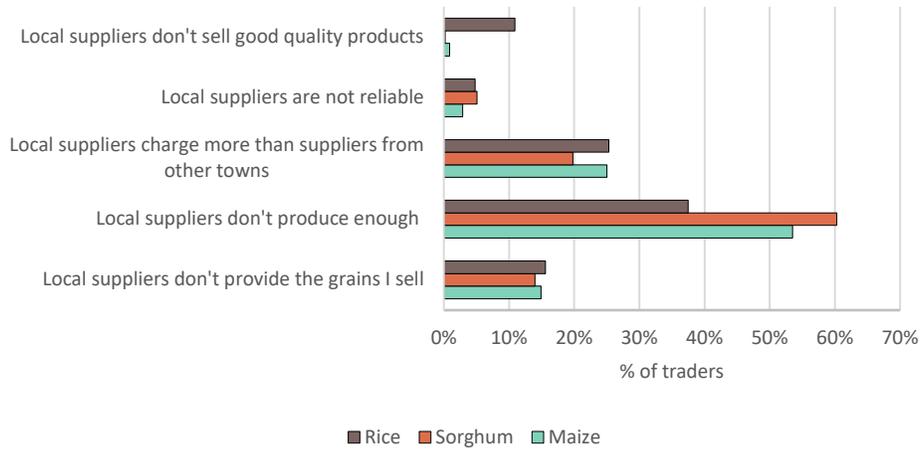
**58. Lack of production is the biggest recorded reason why traders do not source their cereals locally.** Four out of 10 traders report inadequate local cereal production as the main reason for not sourcing locally (Figure 30). This response is common among sorghum traders, as about 60 percent of them indicate that insufficient production is the reason they do not buy sorghum locally (Figure 31). Interestingly, 65 percent of the traders in surplus towns reported inadequate local cereal production as the main reason for not sourcing locally compared to 40 percent of traders in deficit towns. Given that these markets are known to have surplus cereal production, this outcome seems unexpected. However, as local production this year was insufficient due to rising insecurity that especially impacted surplus areas during the planting season (e.g. Raga, Yambio and Yei), it is unsurprising that local production has been insufficient. This dynamic is probably also contributing to a shift from traditional surplus areas to deficit areas. Besides insecurity, this finding also suggests that there are supply-side barriers limiting agricultural production or to otherwise access local producers. Thus, surplus production is limited, seasonal, and depends on the current local environment.

Figure 30: Reason for not sourcing cereals locally by type of market.



Source: Authors' Calculation.

Figure 31: Reason for not sourcing cereals locally by type of cereal.



Source: Authors' Calculation.

Figure 32: Reasons for not sourcing cereals locally by town.

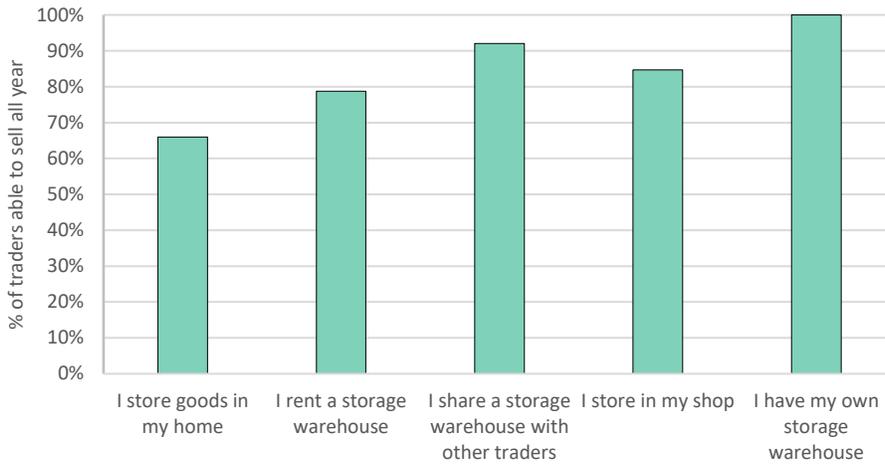


Source: Authors' Calculation.

## 4. Storage

**59. Shops and shared storage spaces allow traders to sell grains throughout the year.** Evidence from other countries suggests that storage facilities enable businesses to continually operate throughout the year, especially in times of low production. This is already partially true in South Sudan, where over 60 percent of all traders who sell throughout the year are using some form of storage (Figure 33). More specifically, 80 percent of the traders who sell throughout the year rent storage warehouses. This is compared to 92 percent of those who share storage space and 85 percent of those who store cereals in their shops. This suggests that shops and shared spaces can be good alternatives to expensive storage warehouses, especially for small-scale traders as a higher proportion of them use shared storage (Figure 34). Traders stated that the biggest storage problems they encounter are security and cost. Large-scale traders were more frequently concerned with security whereas small-scale traders tended to report that they were troubled by both security and costs (Figure 35). Additionally, use of storage varies across towns (Figure 36). While on average 30 percent of the traders across South Sudan are not storing their cereals, more than 60 percent of traders from Rumbek, Wau and Tonj South are not using storage. This disparity presents an opportunity to promote storage in these areas.

Figure 33: How cereals are stored by if traders sells throughout the year.



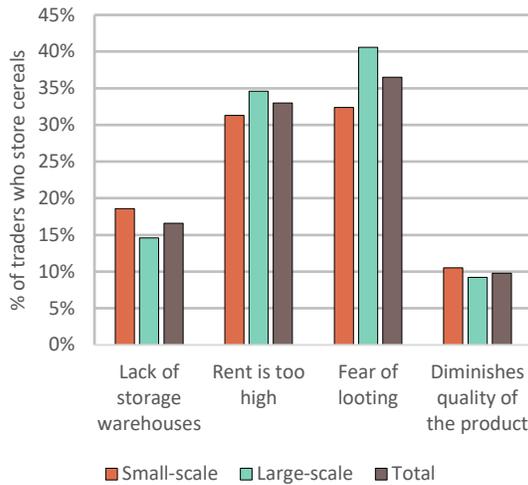
Source: Authors' Calculation.

Figure 34: How cereals are stored by type of trader



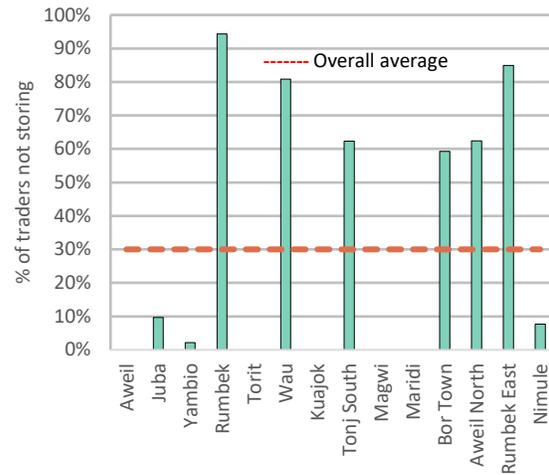
Source: Authors' Calculation.

Figure 35: Biggest storage problem by type of trader.



Source: Authors' Calculation.

Figure 36: Traders without storage by town



Source: Authors' Calculation.

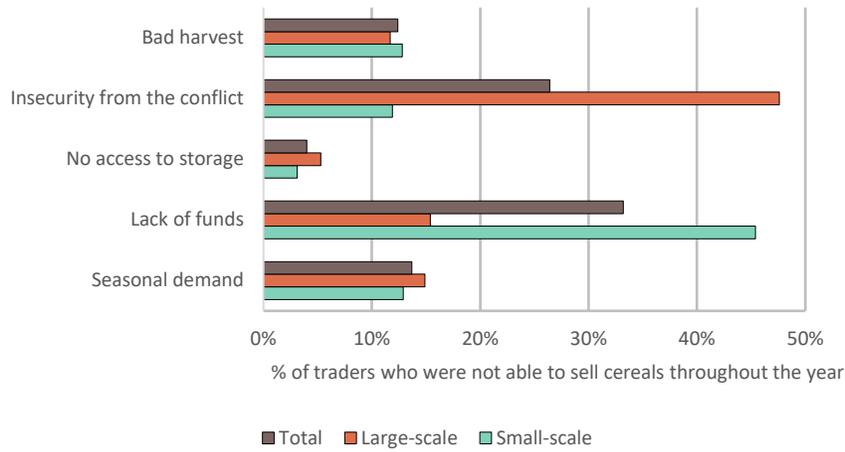
## 5. Finance

**60. Most traders are unable to sell cereals throughout the year due to funding constraints and do not have access to formal financing mechanisms like microfinance institutions to remedy it.** Inadequate funds and insecurity were the two most common responses for not being able to sell throughout the year. Insecurity and poor finances impact large-scale and small-scale traders differently, though. About 50 percent of large-scale traders state insecurity is the main reason for temporarily halting their business, compared to 10 percent of small-scale traders (Figure 37). Meanwhile, about 45 percent of small-scale traders reported a lack of funds, which contrasts with 15 percent of large-scale traders. Small-scale traders are much more likely to have insufficient funds to run their businesses than are large-scale traders. Two thirds of the traders stated that they took loans from another trader in the past 3 years, and about 1 in 4 reported they got it from a friend or relative. Nearly 70 percent of large-scale traders reportedly received a loan from other traders whereas nearly 55 percent of small-scale traders reportedly did the same (Figure 38). All these sources are informal and depend on the social and professional network of the trader. Though this is likely a logical strategy for mitigating conflict related risks, they might be more susceptible to common shocks than more formal financing arrangements.

**Dollar fluctuations**

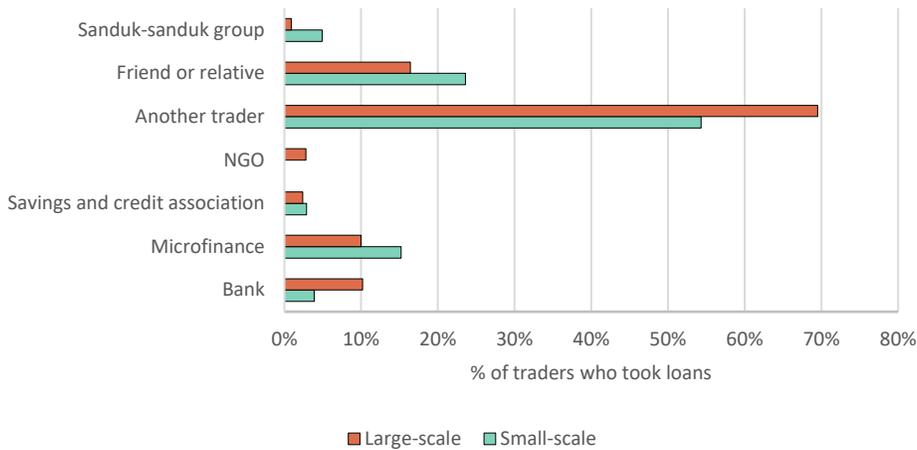
Traders who import goods report that the increasing exchange rate and fluctuations affect both the supply and demand of their goods. They state that the depreciation in the South Sudanese Pound (SSP) has made it costly for them to buy goods from other countries such as Uganda. Additionally, exchange rates have fluctuated very frequently where some traders report that exchange rates have changed by large amounts from the time they buy goods to when they bring it back to Juba. This uncertainty makes it very difficult for them to make decisions about timing the delivery of their goods and pricing goods appropriately.

Figure 37: Reason for not selling throughout the year by type of trader.



Source: Authors' Calculation.

Figure 38: Source of loan taken by type of trader.



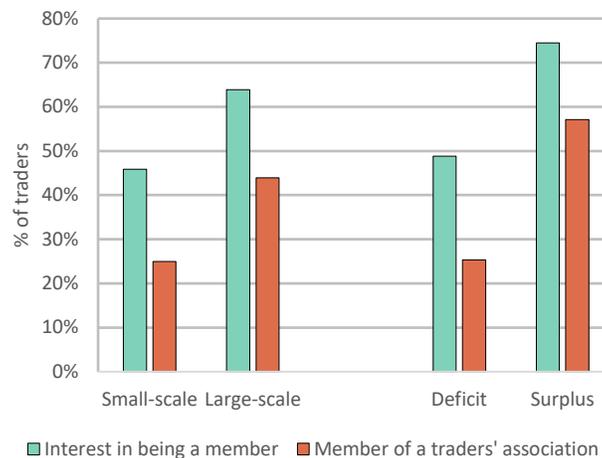
Source: Author's Calculation.

## 6. Information

**61. Most traders are interested in joining traders' associations.** One third of traders are members of traders' associations. Half of all large-scale traders are members of traders' associations, while a quarter of all small-scale traders are members (Figure 39). Also, 67 percent of traders in surplus markets are part of traders' associations compared to 27 percent of traders in deficit markets. For those who were not part of traders' associations, and were asked about their interest in joining one, the same pattern emerges. More large-scale traders than small-scale traders and more surplus market traders than deficit traders are interested in joining traders' associations. It is likely that traders who see similar traders in traders' association realize there are benefits to gain.

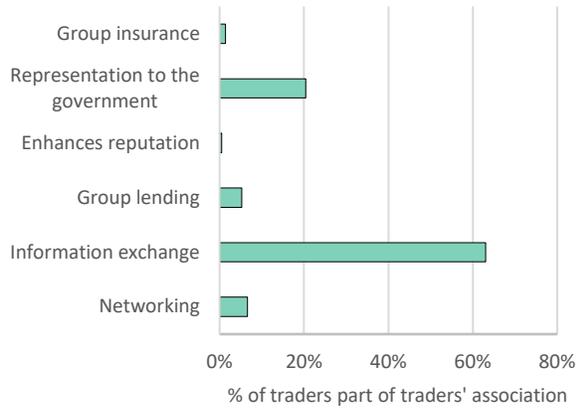
**62. Traders' associations are also known for reliable information exchange, such as price information.** Information sharing is stated as the biggest benefit of being a member of a traders' association by 65 percent of the traders who are members (Figure 40). More specifically, 53 percent of them reported that the best information they get is about prices in other markets (Figure 41). More than half of all traders (who may or may not be part of traders' associations) get their price information via phone calls or word of mouth (Figure 42). Traders' associations could therefore be a useful tool for traders to get accurate price information which would lead to more informed trading decisions.

Figure 39: Membership and interest in traders' association.



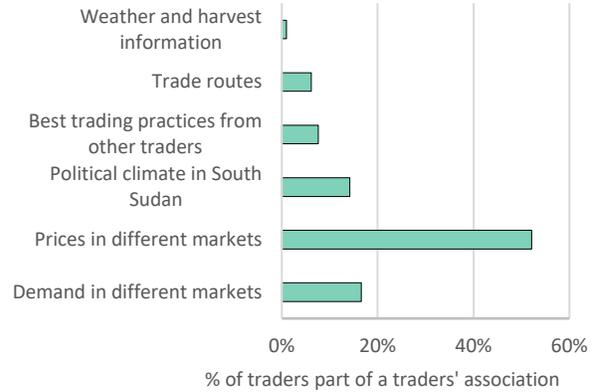
Source: Authors' Calculation

Figure 40: Biggest benefit of being part of a traders' association.



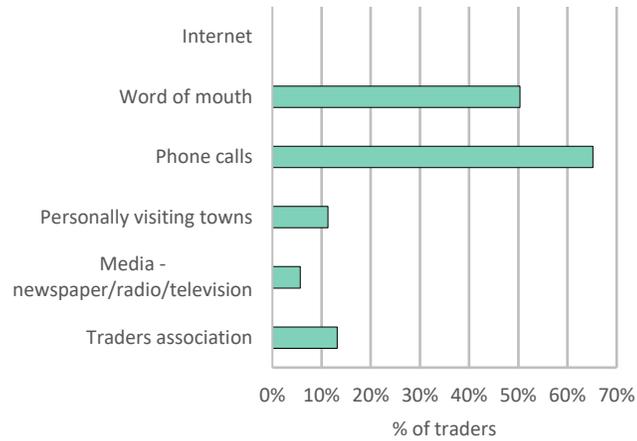
Source: Authors' Calculation.

Figure 41: Best information received from a traders' association.



Source: Authors' Calculation.

Figure 42: How traders get information on prices in other markets.



Source: Authors' Calculations.

# Part 4: Recommendations

## KEY MESSAGES

**The Government of South Sudan, parties to the conflict, traders' associations, donors and NGOs should coordinate to limit the impact of illicit taxes and insecurity on trade.** The MLS survey and video testimonials reveal that checkpoints increase the dangers associated with their jobs and drive up the prices of goods. This could include donor support to the Government of South Sudan's initiative to streamline revenue generation in the country through the Intergovernmental Fiscal Working Group (IFWG). Evidence from other countries suggests there might be a link between illicit taxation on traders and local conflict dynamics. Thus, additional research is also needed to understand how illicit taxes and fees are contributing to the politics and power dynamics of the on-going conflict and contribute to the physical and economic predation harming traders in the country.

**Donors and NGOs should continue to test and expand innovative approaches to food aid that support agricultural producers, traders and markets, such as purchasing food aid from local suppliers.** This study finds that lack of supply was the biggest reason why traders do not source their goods locally. Given that a famine was also declared during the same time, this points to an urgent need to boost agricultural production. Demand side market interventions offer a complementary pathway for generating local production. There are already existing examples of efforts to link the demand for food purchases in social programs to the supply of locally produced cereals in South Sudan, which donors could expand. For example, the World Food Programme's (WFP) Purchase for Progress (P4P) program in South Sudan provides incentives for local production by purchasing staples from local farmers.

**Donors and NGOs could increase the availability of cash or cash vouchers to improve the ability of food insecure communities to independently purchase agricultural commodities from markets, thereby stimulating local demand.** Markets play an increasingly vital role in food security in South Sudan as parts of the country urbanize and livelihoods shifts away from subsistence farming. Evidence from other countries shows that cash or cash vouchers can be vital for communities to cover their own food needs and plan for the lean and rainy seasons. Cash transfers have also been successfully delivered to beneficiaries in Afghanistan, the Democratic Republic of Congo (DRC) and Somalia, which are countries that also have high levels of insecurity and instability.

**Donors and NGOs should collaborate to provide inexpensive and shared storage facilities to small-scale traders.** While the MLS was unable to assess the scale of the losses traders can incur due to inadequate storage, most traders that sold throughout the year were using some form of storage. Additionally, traders reported concerns about insecurity and costs with their current storage methods, which suggests that there is a need for more affordable and secure storage facilities. Community level low-capacity metal silos are a cost-effective and innovative way for small-scale traders to store their grains. A second and complimentary approach is to collaborate with farmer or trader collectives who could install larger-capacity storage facilities, which would allow more harvested crops to be stored by an independent party. These larger facilities could be added to existing systems, or they could replace older systems that are in poor condition.

**Donors and NGOs should expand their efforts to improve traders' loan, credit and foreign exchange access.** Though traders largely obtain loans through informal networks, efforts to improve their access to loans, credit and foreign exchange are still needed. For example, expanded financial access could

help small-scale traders with inadequate storage access purchase storage so that they can store and therefore sell their goods year-round. It might also help them afford better transport options or more diverse transport options, which could improve trade as limited transportation is one of the main transport barriers reported in this study. This could be achieved through a challenge fund, expanded micro-credit facilities or cash grants.

**Donors and NGOs should support South Sudanese traders' associations.** This study's research findings demonstrate traders' associations are crucial for exchanging valuable information on trade-related concerns including the safety of different routes in the country. Importantly, traders have also expressed a readiness to increase their participation in traders' associations.

**Donors and NGOs should continue to support M4P analyses.** Though this study has usefully revealed a series of trade barriers in South Sudan, detailed qualitative research is needed to understand the power and politics shaping markets in the country. NGOs such as Mercy Corps have experience working on this type of research in South Sudan and donors should continue to support their efforts. The Conflict Sensitivity Resource Facility (CSRF), which is joint-donor initiative supported by the governments of the UK, Switzerland and Canada, also has the remit to expand innovative research in this area.

**More research is needed to understand the political barriers restricting agricultural production in South Sudan.** This study finds many traders in surplus areas reporting lack of local supply, which are areas that also happen to be experiencing more conflict compared to deficit areas. Though there are several technical deficiencies that likely limit agricultural production in the country, the evidence base in other weak and fragile states suggests that many production barriers are likely to be political instead of technical. Therefore, conflict resilience must be promoted by learning from and replicating coping strategies used in similar contexts. While this study has shed useful perspectives on trade barriers for agricultural commodities, more research is needed to understand the politics and power relations that hinder production.

**Though costly and difficult to implement in the current political climate, donors and the Government of South Sudan should repair damaged roads or construct new ones to improve links between deficit and surplus markets.** There is a lack of interstate and primary roads connecting surplus markets, so these areas could be prioritized. Roads in South Sudan and in other weak and fragile states can be sites of violence that are controlled by different parties to the conflict. That said, poor or inadequate roads are still one of the biggest barriers to improving trade between surplus and deficit areas. Donors and the Government of South Sudan should examine efforts to independently or jointly finance road repairs or new roads, such as through the establishment of a road maintenance fund. This fund could be innovatively derived from oil revenue funds that are matched with donor funds as this could potentially increase national ownership and participation in road construction and maintenance.

**63. This section lays out 9 intervention areas that we have identified according to the results from the MPS, MLS and literature.** Based on the previous analysis, interventions to remedy bottlenecks to South Sudan's agro-logistics system have been proposed. Most of these interventions speak to specific findings from the MLS while some cut across several issues that were highlighted. A timeframe of 6 to 24 months for the initial introduction of intervention is used to frame recommendations.

**64. The Government of South Sudan, parties to the conflict, donors, NGOs and traders' associations should collaborate to reduce the combined financial burdens and insecurity risks traders bear along checkpoints.**

The MLS survey and video testimonials reveal that checkpoints increase the dangers associated with their jobs and drive up the prices of goods. The number of checkpoints encountered per hour of travel is highest for deficit to surplus trade, which is also likely leading to the low integration between them (Table 6). The increase in checkpoints is a likely a symptom of the paucity of non-oil revenues in the country and the measures different communities are taking to obtain local finances by resorting to banditry or otherwise exploiting unresolved legal and administrative considerations surrounding taxes. It is also potentially the consequence of the rising financial pressures confronting local governments as part of the on-going proliferation of new states in South Sudan.<sup>56</sup> While this is a longstanding multifaceted challenge, there is scope to support on-going initiatives to streamline revenue raising and revenue-sharing and limit illicit taxation in the country. One example of which is the Intergovernmental Fiscal Relations Working Group (IFRWG). Efforts to streamline checkpoints should target the high-density check point areas illustrated in this survey. These include: routes to Aweil, Aweil North, Kuajok, Magwi, Wau, Torit and Juba. Specific routes are recorded in Table 19 in the Appendix. Additional research is also needed to understand how illicit taxes and fees are contributing to the politics and power dynamics that shape the on-going conflict and contribute to the physical and economic predation gravely impacting traders in the country. This is especially key as it is likely to include traditional authorities and local parties to the conflict. The Conflict Sensitivity Resource Facility (CSRF), which is joint-donor initiative supported by the governments of the UK, Switzerland and Canada, also has the remit to expand innovative research in area such as this.

**65. Donors and NGOs should continue to support Markets for the Poor (M4P) analyses.** Though this study has usefully revealed a series of economic barriers to trade in South Sudan, more research is needed to understand the power and politics shaping markets in the country. For example, research from other conflict affected countries such as Afghanistan suggests that illicit taxes and fees can contribute to conflict dynamics. This, in turn, means that eradicating them might be very difficult as the practice of collecting them might be embedded in how parties to the conflict (such as rebel groups, unpaid government soldiers and chiefs) weather the conflict.<sup>57</sup> There is also anecdotal evidence that different groups have derived illicit taxes for traders at various points in South Sudan's nearly 50-year civil war that led to the country's 2011 independence.<sup>58</sup> All of this strongly suggests that the practice of illicit tax collection are likely to be deeply embedded in the logics of power and exclusion that define the conflict. Likewise, though trader networks are likely to be a net good, they can also contribute to artificial price inflation if they work together to shift prices in their immediate economic interests. More qualitative research is needed to explore these and other potential factors in more detail. NGOs such as Mercy Corps have experience working on M4P research in South Sudan and donors should continue to support their efforts. Similarly, the CSRF also has the remit to expand innovative research in this area.

**66. Though costly and difficult to implement in the current political climate, donors and the Government of South Sudan should repair damaged roads or construct new ones to improve links between deficit and**

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<sup>56</sup> Schomerus *et al*, 2016.

<sup>57</sup> Mallett and Pain, 2017.

<sup>58</sup> Johnson, 2003.

**surplus markets.** Though roads in South Sudan and in other weak and fragile states can be sites of violence controlled by different parties to the conflict, respondents widely reported that poor roads limit their ability to trade. Moreover, there is a lack of interstate and primary roads connecting surplus markets, so these areas could be prioritized (Table 6). Likewise, building new roads in other countries can fail to address the underlying drivers of how and why markets fail to help people meet their food needs. Donors and the Government of South Sudan should examine efforts to independently or jointly finance road repairs or new roads while also supporting new research that examines the various ways in which roads in South Sudan can exacerbate conflict.

**67. Donors and NGOs should continue to test and expand innovative approaches to food aid that support agricultural producers, traders and markets, such as purchasing food aid from local suppliers.** This study finds that lack of supply was the biggest reason why traders do not source their goods locally (Figure 30). This was especially the case for surplus area traders, indicating that these markets at the time of the survey could have been in deficit. Given that a famine was also declared during the same time, this points to an urgent need to boost agricultural production. Demand side market interventions offer a complementary pathway for generating local production. There are already existing examples of efforts to link the demand for food purchases in social programs to the supply of locally produced cereals in South Sudan, which donors could expand. For example, the World Food Programme’s (WFP) Purchase for Progress (P4P) program in South Sudan provides incentives for local production by purchasing staples from local farmers. WFP also promotes the development of cereal markets by including small-scale traders as suppliers and requiring larger suppliers to source from local producers. South Sudan’s current famine increases the importance of identifying conflict-resilient crops in the country and supporting programs such as P4P to stock emergency food.<sup>59</sup>

*Box 5: Purchasing from local farmers to foster local production*

P4P is a trust fund and initiative managed by WFP. Launched in South Sudan in January 2010, the P4P builds on WFP’s extensive food-purchasing power and logistics capacity to stimulate local agricultural production and foster market development by creating stable demand for produce from smallholder farmers. P4P uses four approaches to support small-holder farmers: the first is to utilize Farmer Organizations (FOs) and capacity building partnerships; another is to support emerging structured demand platforms such as cereal fairs or commodity exchanges; the third is to purchase from emerging traders; and, the final approach is to help develop local food processing capacity. From 2010 to 2013, the primary strategies were to purchase from farmer organizations and capacity building partnerships. P4P was suspended when conflict reemerged in December 2013 and resumed in April 2014 in relatively stable and accessible areas in the Equatoria region. Since 2014, smallholder farmers in South Sudan have sold 376 metric tons of crops to WFP, despite the challenges posed by insecurity and poor infrastructure.

Source: Percy et al (2014)

**68. Donors and NGOs could increase the availability of cash or cash vouchers to improve the ability of food insecure communities to independently purchase agricultural commodities from markets, thereby**

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<sup>59</sup> Percy et al, 2014

**stimulating local demand.** Markets play an increasingly vital role in food security in South Sudan as parts of the country urbanize and livelihoods shifts away from subsistence farming. Evidence from other countries show that cash or cash vouchers can be vital for communities to cover their own food needs and plan for the lean and rainy seasons.<sup>60</sup> Cash transfers can also help stimulate local markets.<sup>61</sup> Cash transfers have also been successfully delivered to beneficiaries in Afghanistan, the Democratic Republic of Congo (DRC) and Somalia, which are countries that also have high levels of insecurity and instability.<sup>62</sup> Despite this, less than 8 percent of total funding in the Food Security and Livelihoods Cluster goes through cash and voucher programming and most of this is devoted to internal displacement and refugee camps. DanChurchAid, an NGO, is already piloting cash transfers in South Sudan and there is potential for other organisations to expand or support pre-existing initiatives. There is also ambit to provide cash vouchers in South Sudan via mobile payments.

*Box 6: Cash transfers to households to spur local food production via increased demand*

The Emergency Cash Relief Program (ECRP) in the Sool Plateau in Somalia in 2003-2004 was implemented by Horn Relief and Norwegian People's Aid (NPA) and funded by Novib/Oxfam Netherlands. It distributed a total of USD 691,500 to 13,830 drought-affected households. Beneficiaries receive cash transfers electronically, via remittances or money transfers. This method reduces the potential security risks associated with the physical distribution of cash. An evaluation of the ECRP found that communities spent cash transfers on food, water, and debt repayments. If cash transfers were substantial enough or effectively timed after harvests, it was devoted to assets such as livestock. The evaluation reported no inflation during the ECRP period.

Source: Ali et al. 2005

**69. Donors and NGOs should support further research that improves understandings of how conflict is impacting agricultural production in South Sudan.** This study finds many traders in surplus areas reporting lack of local supply, which are areas that also happen to be experiencing more conflict compared to deficit areas. Though there are several technical deficiencies that likely limit agricultural production in the country, the evidence base in other weak and fragile states suggests that many production barriers are likely to be political instead of technical. Therefore, conflict resilience must be promoted by learning from and replicating coping strategies used in similar contexts (Box 7). So, while this study has shed useful perspectives on trade barriers for agricultural commodities, more research is needed to understand the politics and power relations that hinder production. Anecdotally, at least, there does appear to be a strong demand for locally produced agricultural commodities. Despite ongoing initiatives that have supported this, particularly from USAID, further research on how conflict uniquely impacts agricultural value chains is still needed.<sup>63</sup>

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<sup>60</sup> Bastagli et al, 2016

<sup>61</sup> Asfaw et al, 2012

<sup>62</sup> Harvey et al, 2007

<sup>63</sup> USAID's Food, Agribusiness, and Rural Markets (FARM) Project is the largest project in South Sudan that focuses on providing agriculture inputs to farmers; Kimenyi et al, 2014.

*Box 7: Supporting conflict-resilient agricultural value chains*

Conflict in Mali and Nigeria has forced some farmers to exit the agriculture sector while others have adopted farming techniques that limit their exposure to violence and theft and enable production to continue. In northern Nigeria, crop producers who were forced to abandon their farms due to violence hire agricultural contractors that are willing to remain in the conflict zone. In Timbuktu, Mali, some farmers have negotiated with rebels to ensure safe movement to fields and to obtain necessary inputs. These types of coping strategies provide insights into the types of strategies some crop producers adopt to sustain agricultural production during times of conflict-driven insecurity and rising costs.

Source: Kimenyi et al (2014)

**70. Donors and NGOs should collaborate to provide affordable and shared storage facilities to small-scale traders.** Estimates of post-harvest food losses in sub-Saharan Africa have been 20 million tonnes of grain or 40 per cent of the harvest valued at \$4 billion, lost annually through inadequate post-harvest management on the farms, poor storage, lack of structured markets and limited processing capacity.<sup>64</sup> While the MLS was unable to assess such losses incurred by traders, most traders that sold throughout the year were using some form of storage (Figure 33). Additionally, traders reported issues of insecurity and costs with their current storage methods, which suggests the need for affordable and secure storage facilities. A cost-effective and innovative way for small-scale traders to store their grains is through community level low-capacity metal silos.<sup>65</sup> Their use has led to a reduction in losses of up to 40% compared with current crop management practices in sub-Saharan Africa.<sup>66</sup> A second and complimentary approach is to partner with farmer or trader collectives to install larger-capacity storage facilities, which would allow more harvested crops to be stored by an independent party. These larger facilities could be added to existing systems, or they could replace older systems that are in poor condition.

**71. Donors, NGOs and the private sector should expand their efforts to improve traders' loan, credit and foreign exchange access.** This could be achieved via a challenge fund, targeted micro-credit and/or cash grants from donors and NGOs. Though traders largely obtain loans through informal networks, efforts to improve their access to loans, credit and foreign exchange are still needed. For example, improved loan access could help small-scale traders afford better transport options or more diverse transport options. It might also help traders purchase better storage so that they can store and therefore sell their goods year-round. One potential way this could be achieved is through the introduction of a challenge fund with the remit to meet traders' demands for credit by matching private capital investment with donor funds. The MLS shows that microfinance institutions (MFIs), NGOs and commercial banks are not important sources of working capital for both small and large scale traders. Instead, most traders predominantly use trader and family networks to access business finance. These monetary flows among traders suggest that traders are better able to manage information asymmetries, transaction costs and risks that influence

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<sup>64</sup> FAO, 2013

<sup>65</sup> A metal silo is a strong hermetically sealed structure (mostly cylindrical), built using a galvanized steel sheet, and has been found to be very effective for storing grains for long periods of time and avoiding insects and rodents. It is considered to be one of the key technologies which will be helpful in reducing postharvest losses and improving food security of smallholder farmers.

<sup>66</sup> Kumar, Deepak and Prasanta Kalita, 2017

how credit markets function themselves. Addressing the problems of market imperfections and institutional barriers that prevent access to credit from formal sources will require long-term policy, financial, and institutional interventions. So, in addition to a potential challenge fund, short-term demand for capital could be met by directly providing grants to local small-scale traders through support to micro-credit facilities that award funding to applicants through a competition.<sup>67</sup> Commercial sector banks could also provide foreign exchange services that are tailored to the unique needs of small-scale traders.

**72. In addition to a challenge fund or expanded micro-credit access, small-scale traders could be supported via cash grants from donors and NGOs.** Cash grants could be targeted to a variety of initiatives, including the purchase of new vehicles, storage facilities, agricultural commodity inventory or staff. Thus, in addition to, or in the absence of a, challenge fund or expanded micro-credit facilities, donors could support cash transfers for small-scale traders who intend to expand and/or improve the management of their businesses.

**73. Donors and NGOs should support South Sudanese traders' associations.** This study's research findings demonstrate traders' associations are crucial for exchanging valuable information on trade-related concerns including price information and safety of different routes in the country (Figure 41). Traders have also expressed a readiness to increase their participation in traders' associations (Figure 39). Donors and NGO have successfully supported coalitions that assist similar initiatives in other weak and fragile state situations and these should be expanded in South Sudan. Support for traders' associations and organizations such as the Eastern Africa Grain Council and the South Sudan Grain Council, in collecting and sharing price information could potentially increase the range of products and number of locations covered in their price-information system.<sup>68</sup> This study also anecdotally found that traders already have a vibrant web of connections fostered through trader-to-trader loans, transportation sharing, storage sharing, and information sharing. These networks are likely to be largely positive and necessary for improving agro-logistics in the country. That said, any assistance to traders' associations should also be sensitive to the potential for trader networks to unintentionally contribute to unequal power and political dynamics in the country.

**74. Donors and NGOs should continue support for improved labor legislation in South Sudan that also supports traders.** If reporting is accurate, the shift from traders nationalities from predominantly regional to South Sudanese suggests that trading might have become a source of labor and employment for more South Sudanese, perhaps because of rapid urbanization and conflict. This suggest that markets not only might have the power to address food insecurity but to also improve and expand job opportunities for South Sudanese who work as traders. The International Labour Organization's (ILO) ILO Lab specifically works to monitor and evaluate the formal and informal contracts that impact traders from a variety of intersectional perspectives, such as gender, ethnicity and political affiliation. These factors are important because in other countries they dominate the politics of markets and can limit access to the economic

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<sup>67</sup> The Africa Enterprise Challenge Fund (AECF) is an example of a Challenge Fund which awards grants through competitions that seek business ideas that are judged on their commercial viability, innovation, and potential development impact of their projects.

<sup>68</sup> The East African Grain Council (EAGC) is a regional private sector membership organization with member from over 10 countries in the Eastern Africa region including, Kenya, Uganda, Tanzania, Rwanda, Burundi, DR Congo, Zambia, Malawi, Ethiopia and South Sudan.

opportunities markets can provide.<sup>69</sup> In addition to supporting more detailed research on the types of traders in South Sudan's markets, donors and NGOs should explore the viability of the ILO Lab's work in South Sudan.

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<sup>69</sup> Jan and Harriss-White, 2012.

## Conclusions

**75. This study of 15 locations across surplus and deficit markets provides evidence that South Sudan's markets are poorly integrated.** This suggests that surplus and deficit markets are not trading with each other, which is a problem as market integration is key to increasing food security. MLS findings show that traders also report little trade between surplus and deficit markets. Additionally, a range of agro-logistic barriers are explored in the MLS which explain the low integration. These factors include: trade route blockages, supply shortages, storage and liquidity constraints, and information gaps.

**76. The range and extent of agro-logistical barriers may not have been fully captured.** Due to time and budget constraints, the MLS was administered in 30 minutes for each of the 600 traders. Crucially, because of insecurity in South Sudan, the authors of this survey had to implement it remotely. Thus, though the survey captured many trade barriers, it is likely that some were unintentionally omitted. Additionally, since many of these traders are not formally educated, some of the concepts in the MLS may have been difficult to communicate to all participants. For instance, many may not have known what a traders' association is. However, measures were taken to mitigate these issues. First, the MLS included short video testimonials at the end of the survey where traders were encouraged to express additional problems their business faced or elaborate on themes discussed in the survey. Many traders used this opportunity to convey important trade barriers, which have been highlighted in this report. Second, a rigorous training and pilot exercise was held to make sure that the MLS was understood by both the enumerators and respondents. Incoming data was also regularly monitored and in some cases the enumerators had to return to the respondent if an answer seemed unusual. Despite these efforts, it is still likely that the trade barriers captured in this survey are understated.

**77. While the MLS finds many agro-logistical barriers to trade, these are not independent from the current conflict.** The MLS includes several questions on how trading behavior has changed since the 2013 conflict. Trade indicators worsened for most traders after 2013. Many traders also reported insecurity was the biggest concern when transporting and storing their goods. The testimonials otherwise reveal the magnitude of the threat the conflict poses; for instance, some traders noted looting during traveling was a big concern. These responses were much more common among surplus market traders, though. The conflict also disrupted data collection. For example, data collection in Raga, which is a surplus market, had to be discontinued as it was too unsafe for the enumerator to visit the markets.

**78. The proposed interventions are conflict sensitive.** In keeping with emergent development policy research in weak and fragile state situations, this study recommends interventions that work with current and long-standing economic, social and political dynamics. This includes considerations such as livelihood zones. It also incorporates more frequently overlooked factors such as longstanding livelihood shifts in South Sudan that are contributing to the increased importance of markets to reduce food insecurity. That said, this study recognises that though improving food security is undoubtedly a crucial step for improving human development in South Sudan, resolving the ongoing conflict and the concomitant economic, social and political instability it is causing is a primary consideration.

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## Appendix

### A. Figures and Tables

Table 8: South Sudan cereal production by state, 2010/2011 – 2014/2015.

States/Regions	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
<b>Upper Nile</b>	<b>156</b>	<b>99</b>	<b>112</b>	<b>136</b>	<b>50</b>
Upper Nile	49	26	38	40	19
Unity	24	8	15	26	8
Jonglei	84	65	59	70	23
<b>Bahr el Ghazal</b>	<b>254</b>	<b>166</b>	<b>287</b>	<b>310</b>	<b>403</b>
N Bahr el Ghazal	60	40	78	85	113
W Bahr el Ghazal	34	35	48	50	75
Lakes	66	45	70	75	92
Warrap	94	46	91	100	123
<b>Greater Equatoria</b>	<b>284</b>	<b>297</b>	<b>391</b>	<b>445</b>	<b>562</b>
Central Equatoria	93	78	114	150	223
Eastern Equatoria	79	99	116	116	142
Western Equatoria	112	120	161	179	197
<b>Total</b>	<b>695</b>	<b>563</b>	<b>790</b>	<b>892</b>	<b>1015</b>

Source: FAO and WFP (2012 and 2016).

Table 9: Number and range of observations for each town.

Market	Type of market	Obs	Start Date	End Date	No. of weeks
Aweil	Deficit	2467	Feb-15	Nov-16	94
Aweil North	Deficit	729	Feb-16	Nov-16	40
Bor Town	Deficit	1445	Dec-15	Nov-16	48
Juba	Deficit	4886	Dec-12	Nov-16	203
Kuajok	Surplus	1251	Dec-15	Nov-16	50
Magwi	Surplus	1519	Dec-15	Nov-16	49
Malakal	Deficit	960	Dec-12	Jan-14	53
Maridi	Surplus	1630	Dec-15	Nov-16	47
Nimule	Deficit	141	Oct-16	Nov-16	3
Raga	Surplus	962	Feb-16	Nov-16	41
Rumbek	Deficit	4429	Dec-12	Nov-16	203
Rumbek East	Deficit	752	Jan-16	Nov-16	45
Tonj South	Surplus	1046	Jan-16	Nov-16	46
Torit	Deficit	2750	Feb-15	Nov-16	94
Wau	Deficit	4258	Dec-12	Nov-16	203
Yambio	Surplus	2571	Feb-15	Nov-16	94
Yei	Surplus	1014	Dec-15	Jul-16	33

Source: FAO, 2016 and World Bank 2016b.

Table 10: Number and range of observations for each food product.

Product	Obs	Start Date	End Date	No. of weeks
Banana	527	Nov-15	Nov-16	51
Beef	1341	Dec-12	Nov-16	203
Bread	1304	Dec-12	Nov-16	203
Cabbage	415	Dec-15	Nov-16	50
Cassava Flour	479	Nov-15	Nov-16	51
Cassava Tubers	477	Nov-15	Nov-16	51
Charcoal	1340	Dec-12	Nov-16	203
Cooking Oil	1360	Dec-12	Nov-16	203
Cow Peas	348	Nov-15	Nov-16	51
Cucumber	362	Nov-15	Nov-16	51
Dried Fish	1344	Dec-12	Nov-16	203
Eggplant	500	Nov-15	Nov-16	51
Food Salt	1356	Dec-12	Nov-16	203
Fresh Tomatoes	1347	Dec-12	Nov-16	203
Goat Meat	1211	Dec-12	Nov-16	203
Green Okra	1298	Dec-12	Nov-16	203
Groundnut Grain	1134	Dec-12	Nov-16	203
Janjaro Beans	630	Nov-15	Nov-16	51
Lentils	1271	Dec-12	Nov-16	203
Maize Flour	1262	Dec-12	Nov-16	203
Maize Grain	1156	Dec-12	Nov-16	203
Mango	563	Nov-15	Nov-16	51
Millet Flour	269	Dec-15	Nov-16	49
Millet Grain	374	Nov-15	Nov-16	51
Milokhia	1300	Dec-12	Nov-16	203
Onions	1349	Dec-12	Nov-16	203
Oranges	479	Nov-15	Nov-16	51
Petrol	1357	Dec-12	Nov-16	203
Pigeon Peas	171	Nov-15	Nov-16	51
Pineapple	327	Nov-15	Nov-16	51
Plantain	228	Dec-15	Nov-16	49
Pumpkins	430	Nov-15	Nov-16	51
Rice	1340	Dec-12	Nov-16	203
Sesame	603	Nov-15	Nov-16	51
Sorghum Flour	896	Dec-12	Nov-16	203
Sorghum Grain	1307	Dec-12	Nov-16	203
Sugar	1355	Dec-12	Nov-16	203

Source: World Bank 2016b.

Table 11: Integration with Juba – Beef.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	50	1.393	17.880	0.862	0.005	-3.646	-0.349	-2.421	0.206
Magwi	44	0.890	22.543	0.886	0.004	-3.678	-0.013	-0.117	0.036
Maridi	27	1.253	12.898	0.807	0.090	-2.617	-0.180	-1.798	0.081
Raga	35	1.548	20.800	0.726	0.267	-2.046	-0.087	-0.589	0.328
Tonj South	45	1.184	31.607	0.877	0.063	-2.769	-0.148	-0.858	0.311
Yambio	94	1.084	22.573	0.826	0.053	-2.838	-0.090	-0.478	0.175
Yei	34	0.173	0.933	0.024	0.666	-1.219	-0.252	-0.886	0.225

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 12: Integration with Juba – Charcoal.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	47	0.800	9.203	0.671	0.329	-1.906	-0.107	-0.623	0.076
Magwi	45	0.684	9.639	0.688	0.075	-2.694	-0.232	-2.889	0.124
Maridi	47	-0.386	-6.867	0.390	0.027	-3.096	-0.200	-1.149	0.245
Raga	35	0.588	9.936	0.770	0.000	-4.428	-0.301	-1.221	0.398
Tonj South	43	0.754	15.091	0.842	0.021	-3.187	-0.328	-3.048	0.463
Yambio	94	0.614	9.548	0.561	0.037	-2.978	-0.178	-2.080	0.176
Yei	34	1.193	7.273	0.596	0.250	-2.086	-0.212	-1.227	0.326

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 13: Integration with Juba – Cooking Oil.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	50	1.026	26.947	0.918	0.001	-4.238	-0.324	-2.606	0.267
Magwi	45	0.946	9.530	0.738	0.044	-2.909	-0.384	-3.962	0.315
Maridi	47	1.077	13.046	0.798	0.033	-3.022	-0.212	-2.127	0.170
Raga	41	0.934	9.649	0.694	0.038	-2.965	-0.526	-3.308	0.357
Tonj South	43	0.586	8.773	0.615	0.326	-1.913	-0.101	-0.610	0.096
Yambio	94	0.954	48.078	0.961	0.000	-4.324	-0.171	-1.003	0.114
Yei	33	0.264	1.458	0.049	0.576	-1.412	-0.168	-0.844	0.254

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 14: Integration with Juba – Maize.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	42	1.843	20.118	0.864	0.006	-3.576	-0.137	-0.686	0.361
Magwi	45	1.297	10.045	0.792	0.002	-3.891	-0.149	-0.768	0.085
Maridi	47	-1.133	-4.238	0.273	0.257	-2.069	-0.194	-0.980	0.317
Tonj South	9	0.528	2.874	0.606	0.017	-3.258	-1.462	-4.982	0.730
Yambio	90	0.336	5.247	0.117	0.297	-1.976	-0.095	-0.675	0.121
Yei	27	0.950	5.474	0.554	0.238	-2.115	-0.079	-0.213	0.121

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 15: Integration with Juba – Onions.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	47	1.963	8.090	0.506	0.218	-2.168	-0.063	-0.429	0.107
Magwi	45	0.946	5.033	0.364	0.064	-2.763	-0.221	-1.470	0.165
Maridi	47	1.238	7.468	0.439	0.170	-2.305	-0.160	-1.095	0.158
Raga	40	1.441	6.271	0.276	0.807	-0.840	-0.031	-0.241	0.240
Tonj South	42	1.254	7.929	0.416	0.475	-1.617	-0.050	-0.203	0.075
Yambio	94	1.162	15.465	0.772	0.001	-4.210	-0.247	-2.606	0.156
Yei	30	0.758	2.878	0.193	0.075	-2.693	-0.343	-1.530	0.305

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 16: Integration with Juba – Rice.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	50	1.357	20.311	0.908	0.018	-3.232	-0.191	-1.336	0.272
Magwi	45	1.253	18.033	0.872	0.035	-3.002	-0.424	-2.492	0.391
Maridi	47	0.487	8.765	0.627	0.010	-3.437	-0.492	-2.651	0.316
Raga	28	0.622	6.576	0.715	0.004	-3.720	-0.232	-1.629	0.263
Tonj South	43	1.259	15.005	0.868	0.060	-2.787	-0.327	-3.182	0.449
Yambio	94	1.026	25.569	0.920	0.000	-4.686	-0.300	-2.488	0.212
Yei	30	1.515	9.351	0.621	0.131	-2.438	-0.471	-2.384	0.388

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 17: Integration with Juba – Sorghum.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	47	1.406	24.792	0.904	0.000	-4.429	-0.453	-3.639	0.304
Magwi	44	1.247	14.156	0.633	0.093	-2.599	-0.196	-1.898	0.114
Maridi	46	-0.184	-1.210	0.034	0.210	-2.188	-0.154	-0.925	0.092
Raga	41	1.144	7.979	0.503	0.300	-1.969	-0.184	-0.934	0.451
Tonj South	43	1.399	13.846	0.783	0.018	-3.241	-0.182	-1.275	0.093
Yambio	86	0.571	6.871	0.352	0.244	-2.102	-0.114	-0.775	0.124
Yei	26	0.629	4.588	0.490	0.370	-1.822	-0.105	-1.300	0.140

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 18: Integration with Juba – Sugar.

Surplus Market	Obs	Long Run Relationship			Co-integration Test		Error Correction		
		LR Pass Through	T-stat	R2	P-value	T-stat	Speed of Adjustment	T-stat	R2
Kuajok	50	1.309	20.117	0.856	0.028	-3.083	-0.135	-1.337	0.131
Magwi	45	1.117	19.063	0.859	0.029	-3.062	-0.214	-1.397	0.198
Maridi	47	0.987	10.019	0.767	0.007	-3.540	-0.274	-1.956	0.181
Raga	41	1.820	17.561	0.867	0.014	-3.321	-0.083	-0.701	0.421
Tonj South	43	1.412	13.688	0.789	0.131	-2.439	-0.158	-1.238	0.293
Yambio	93	0.987	33.584	0.924	0.000	-4.830	-0.356	-3.411	0.202
Yei	34	0.848	10.463	0.756	0.001	-3.984	-0.406	-1.742	0.300

Notes: (1) The cointegration test consists in a test for unit roots in the residuals of the long run relationship. The statistic reported is the p-value and t-statistic on that unit root test. The significance level is defined at 5% and Engel and Yoo (1987) critical values are used. Thus, when the statistic is below the critical value of 3.28, the result indicates rejection of the null of a unit root in the residual, or, evidence in favor of cointegration between prices in a given city and prices in Juba. (2) For the speed of adjustment, a t-stat in the vicinity or lower than -2 in absolute value reflects a significant speed of adjustment toward long run equilibrium.

Source: Authors' calculation.

Table 19: Transport indicators for each trading pair.

Town	Market	Product	Trade Flow	Integrated (Yes=1, No=0)	Major road (Yes=1, No=0)	Number of checkpoints per hour	Fuel shortage percentage (of number of round trips in 6 months)	Vehicle damage percentage (of number of round trips in 6 months)	Most common route barrier
Aweil	Aweil North	Sorghum	Deficit-Deficit	0	0	0.3	33%	33%	High taxes
Aweil	Aweil North	Sorghum	Deficit-Deficit	0	0	0.2	200%	100%	High taxes
Aweil	Juba	Rice	Deficit-Deficit	1	0	0.0	100%	67%	High taxes
Aweil	Raga	Sorghum	Surplus-Deficit	0	0	0.3	100%	67%	High taxes
Aweil North	Aweil	Sorghum	Deficit-Deficit	0	0	0.3	25%	25%	High taxes
Bor Town	Juba	Rice	Deficit-Deficit	1	1	0.4	0%	0%	Lack of safety from conflict
Bor Town	Wau	Sorghum	Deficit-Deficit	0	0	0.1	50%	100%	Lack of safety from conflict
Juba	Aweil	Sorghum	Deficit-Deficit	1	0	0.1	0%	0%	Lack of safety from conflict
Juba	Bor Town	Sorghum	Deficit-Deficit	1	1	0.1	100%	0%	Lack of safety from conflict
Kuajok	Aweil	Sorghum	Surplus-Deficit	0	0	1.1	100%	100%	High taxes
Kuajok	Aweil	Sorghum	Surplus-Deficit	0	0	1.0	0%	100%	High taxes
Kuajok	Aweil North	Sorghum	Surplus-Deficit	0	0	1.1	100%	0%	Too many checkpoints
Kuajok	Juba	Maize	Surplus-Deficit	0	0	0.3	100%	100%	Too many checkpoints
Kuajok	Raga	Rice	Surplus-Surplus	1	0	0.2	0%	0%	High taxes
Kuajok	Rumbek	Maize	Surplus-Deficit	1	0	1.8	100%	100%	Too many checkpoints
Kuajok	Tonj South	Sorghum	Surplus-Surplus	0	0	1.0	0%	0%	Poor road condition
Kuajok	Tonj South	Maize	Surplus-Surplus	0	0	1.0	100%	50%	High taxes
Kuajok	Wau	Sorghum	Surplus-Deficit	0	0	1.3	50%	100%	Poor road condition
Kuajok	Wau	Sorghum	Surplus-Deficit	0	0	1.3	25%	67%	Too many checkpoints
Magwi	Juba	Rice	Surplus-Deficit	0	0	1.8	67%	67%	Lack of safety from conflict
Magwi	Torit	Rice	Surplus-Deficit	1	1	0.4	33%	67%	Lack of safety from conflict
Maridi	Juba	Rice	Surplus-Deficit	1	0	0.0	0%	100%	Poor road condition
Maridi	Rumbek	Rice	Surplus-Deficit	1	0	0.1	0%	0%	Poor road condition
Maridi	Yambio	Rice	Surplus-Surplus	0	0	0.0	0%	0%	Poor road condition
Rumbek	Juba	Maize	Deficit-Deficit	1	0	0.3	0%	100%	Lack of safety from conflict
Tonj South	Aweil	Maize	Surplus-Deficit	1	0	0.3	17%	33%	Poor road condition

Tonj South	Juba	Maize	Surplus-Deficit	0	0	0.2	0%	100%	Lack of safety from conflict
Tonj South	Rumbek	Maize	Surplus-Deficit	0	1	1.9	0%	0%	Poor road condition
Tonj South	Wau	Maize	Surplus-Deficit	1	1	1.3	50%	100%	Poor road condition
Tonj South	Wau	Maize	Surplus-Deficit	1	1	0.7	0%	0%	Poor road condition
Torit	Juba	Rice	Deficit-Deficit	1	1	0.2	0%	40%	Lack of safety from conflict
Torit	Magwi	Sorghum	Surplus-Deficit	0	1	1.1	0%	0%	Lack of safety from conflict
Wau	Raga	Sorghum	Surplus-Deficit	0	1	0.0	50%	100%	Lack of safety from conflict
Yambio	Juba	Rice	Surplus-Deficit	0	1	0.1	100%	100%	Lack of safety from conflict
Yambio	Maridi	Maize	Surplus-Surplus	0	0	0.1	100%	75%	Lack of safety from conflict
Yambio	Wau	Maize	Surplus-Deficit	0	1	0.1	60%	60%	Lack of safety from conflict
Yambio	Yei	Rice	Surplus-Surplus	0	0	0.1	67%	67%	Poor road condition
Yambio	Yei	Maize	Surplus-Surplus	0	0	0.1	100%	100%	Lack of safety from conflict

Source: Authors' calculation.

## B. Methodology for Co-Integration

To assess the extent of spatial integration, either between domestic and world prices, or between the prices in two given cities in South Sudan we analyze how the price series under consideration co-move. We report correlation coefficients of the price levels and their changes, and then follow Engle and Granger (1987), and use a 2-step procedure. The first step consists of estimating a long-run static relation between every possible pair of price series  $p_{it}$  and  $p_{jt}$ , corresponding to regions  $i$  and  $j$  respectively, as in equation (1):

$$p_{it} = \beta_0 + \beta_1 p_{jt} + u_t$$

A pair of regions  $i$  and  $j$  are *integrated* forming one market, if prices in region  $i$  and  $j$  are integrated of order 1 (I(1)) and share a stochastic trend, which implies that there exists a linear combination of  $p_i$  and  $p_j$  that renders  $u$  in equation (1) stationary.<sup>70</sup> Operationally, testing for spatial integration implies estimating equation (1) testing for a unit root in the estimated residuals  $\hat{u}$  and rejecting the null. In the second stage, we look at the dynamics, estimating the following relation:<sup>71</sup>

$$\Delta p_{i,t} = \alpha_0 + \sum_{n=1}^{12} \beta_n \Delta p_{i,t-n} + \sum_{n=1}^{12} \gamma_n \Delta p_{j,t-n} + \delta \hat{u}_{t-1} + \varepsilon_t$$

The lag length is chosen using the Akaike information criterion, and the price series are purged from their seasonal components in the estimation. From equation (2) we obtain information on short and long run dynamics.

Short Run: short run responses of prices in region  $i$  to prices in region  $j$ .<sup>72</sup>

Long Run: whether the regions are integrated (an additional test to that discussed above), and a measure of integration. If  $i$  and  $j$  are integrated, then prices share a long run stochastic trend. In the short run, misalignments from the equilibrium may exist, and they are captured in  $\hat{u}$ . If  $\delta < 0$ , these are corrected period after period. If no correction process exists (either because  $\delta = 0$  or  $\delta > 0$ ), then there is no long run relationship between the two price series. Therefore, the negative sign and the significance of this coefficient constitute another test of market integration. Its size is a measure of integration and indicates

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<sup>70</sup> We control for a deterministic trend in the long run relation.

<sup>71</sup> The unit root tests are augmented Dickey Fuller, with the choice of lags being determined by the Akaike Information Criterion. Because the test is performed on the residuals from equation (1) that are estimated with error, the critical values are non-standard. We used the critical values tabulated by Engle and Yoo (1987). For brevity sake, these results, as well as the estimates of  $\beta_2$ , which represents the pass-through coefficient from region  $j$  to region  $i$  are only summarized here. The full set of results is available from the author upon request.

<sup>72</sup> We could also obtain information on whether one regional price series Granger-causes another regional price series, by testing the joint significance of the twelve  $\gamma$  coefficients. If they are jointly significantly different from zero, that implies that lagged prices in  $j$  are relevant to explain (and therefore predict) prices in  $i$ . That analysis is out of the scope of this paper.

how much of the disequilibrium is corrected every period. The more efficiently markets work, the faster information flows, and therefore, the faster these short run disequilibria will be corrected.

We choose the Engle-Granger approach to more sophisticated techniques such as those of Johansen (1988) or Stock and Watson (1993). Our decision is based on three elements. First, the Engle-Granger approach is intuitively appealing and consists essentially, of a careful examination of relative prices. Second, Johansen and Stock and Watson's techniques have proven to outperform Engle-Granger in large samples. These techniques rely on asymptotic properties (their estimators are obtained through maximum likelihood techniques), which fail to hold in small samples like the ones we are using in this study. Third, Johansen's techniques are superior to Engle-Granger when the co-integration analysis is multivariate. Our analysis is bivariate.